

# L12. ANALIZA DECIZIILOR ÎN CONDITII DE CERTITUDINE

## Agenda

- Introducere
- Analiza Pareto
- Analiza matricei deciziilor
- Analiza comparării perechilor
- Analiza costuri-beneficii
- Aplicații

Cele mai multe persoane își desfășoară activitatea de zi cu zi fără a lua decizii. Acestea reacționează la evenimente, fără a-și acorda timp să decidă asupra lor. Când telefonul sună și dacă sunt disponibile, ridică receptorul și răspund. În aceste situații, ele nu decid, ci doar lucrează. Cu toate acestea, uneori au nevoie să ia decizii. Dacă trebuie să angajeze pe cineva și există mai mulți candidați, trebuie să ia o decizie.

Spre deosebire de urmarea unei rutine, cineva ia o decizie atunci când are mai multe direcții pe care le poate urma. A decide înseamnă a ajunge la o soluție care pune capăt incertitudinii sau disputei legate de ceea ce trebuie făcut. O decizie se ia atunci când modul în care se poate acționa este selectat dintr-o serie de alternative.

În definiția formală, o decizie are următoarele componente:

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Analiza deciziilor este procesul de separare a unei decizii complexe în părțile sale componente și reconstituirea întregii decizii prin folosirea unei formule matematice. Este o metodă de a ajuta decidenții să facă alegeri simple și familiare și apoi, prin folosirea unui model matematic, de a deduce decizia complexă pe baza compunerii acestora.

Principalele elemente implicate în procesul de decizie sunt:

- un număr de posibile acțiuni,  $A_i$ , dintre care va fi selectată una;
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- valoarea, profitul sau consecința,  $P_{ij}$ , pentru decident, de realizare a uneia din acțiunile disponibile, având în vedere posibilele stări ale naturii;
- criteriul în funcție de care decidentul alege între acțiunile alternative.

		Stările naturii				
		S1	S2	S3	S4	S5
Acțiunile	A1	P11	P12	P13	P14	P15
	A2	P21	P22	P23	P24	P25
	A3	P31	P32	P33	P34	P35

### 1. Analiza Pareto

Analiza Pareto este o tehnică foarte simplă care ajută la alegerea celei mai eficace schimbări. Folosește principiul Pareto, a cărui idee de bază este că prin realizarea a 20% din volumul de lucru se poate genera 80% din avantajul realizării întregii lucrări. Analiza Pareto este o tehnică formală pentru găsirea schimbărilor care vor aduce cele mai mari beneficii. Este utilă atunci când concurează mai multe moduri în care se poate acționa.

#### Modul de folosire

- Pentru a folosi acest instrument, se notează o listă de schimbări care s-ar putea realiza. Dacă este o listă lungă, se grupează în schimbări înrudite;
- Apoi se acordă un scor fiecărui articol sau fiecărui grup. Metoda de acordare a punctajului depinde de problema care trebuie rezolvată.
- De exemplu, dacă se dorește mărirea profitului, se vor puncta opțiunile pe baza profitului pe care fiecare grup l-ar putea genera. Dacă se încearcă creșterea satisfacției clientului, se poate stabili punctajul pe baza numărului de plângeri eliminate de fiecare schimbare;
- Prima schimbare care se va produce va fi cea cu punctajul cel mai mare. Aceasta va oferi cel mai mare beneficiu în cazul rezolvării;
- Opțiunile cu punctajul cel mai mic probabil nu vor merita să fie rezolvate; rezolvarea acestora ar putea costa mai mult decât soluția în sine.

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Exemplu:

Un manager se ocupă de reabilitarea unui centru de asistență. El își propune să afle de ce clienții sunt de părere că serviciul nu este bun. Astfel, primește următoarele comentarii de la clienți:

- Telefoanele sunt preluate după multe tonuri de apel;
- Personalul pare distras și sub presiune;
- Inginerii nu par a fi bine organizați. Au nevoie de o sau două vizită pentru a aduce și alte piese de schimb, deci clienții trebuie să-și ia mai mult timp liber pentru a fi prezenți când are loc cea de-a două vizită;
- Clienții nu știu când va avea loc cea de-a două vizită, ceea ce îi determină să fie prezenți întreaga zi în aşteptarea inginerului;
- Membrii personalului nu par a ști întotdeauna ceea ce fac;
- Uneori, la sosirea membrilor personalului, clientul constată că problema s-ar fi putut rezolva la telefon.

Managerul grupează aceste probleme, apoi le acordă un punctaj în funcție de numărul de plângeri și ordonează lista:

- Scăpări în instruirea personalului: punctele 5 și 6 – 51 plângeri;
- Personal insuficient: punctele 1, 2 și 4 – 21 plângeri;
- Organizare și pregătire deficitare: punctul 3 – 2 plângeri.

În urma analizei Pareto, managerul poate observa că majoritatea problemelor (69%) pot fi rezolvate prin îmbunătățirea abilităților personalului. Odată rezolvat acest lucru, ar fi inutilă creșterea numărului de membri ai personalului. Alternativ, cu cât membrii personalului sunt mai capabili să rezolve problemele prin intermediul telefonului, este posibil ca necesitatea de mărire a personalului să se diminueze. Se observă că întrucât există mai puține comentarii în legătură cu deficiențele de organizare și pregătire, acestea ar putea avea cauze dincolo de controlul managerului.

Prin efectuarea unei analize Pareto, managerul se poate concentra asupra instruirii ca o problemă de sine stătătoare, în loc să-și irosească eforturile încercând atât instruirea cât și angajarea de noi membri de personal și eventual instalarea unui nou sistem informatic.

Analiza Pareto este o tehnică simplă care ajută la identificarea celor mai importante probleme. Pe lângă faptul că scoate în evidență cea mai importantă problemă de rezolvat, oferă de asemenea un punctaj care arată cât de severă este aceasta.

## 2. Analiza comparării perechilor

Analiza comparării perechilor este utilă pentru determinarea importanței relative a unor opțiuni, mai ales atunci când nu există date obiective pe care să se poată baza procesul de decizie. Metoda facilitează alegerea celei mai importante probleme care trebuie rezolvată, sau a soluției care aduce cel mai mare profit. De asemenea, permite stabilirea priorităților atunci când apar cerințe contradictorii asupra resurselor.

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Este de asemenea un instrument ideal pentru „a compara merele cu perele”, opțiuni complet diferite precum acelea de a investi în marketing, într-un nou sistem IT sau într-o nouă piesă a unui mecanism. Aceste decizii sunt de obicei mult mai greu de luat decât alegerea unui sistem IT din trei variante posibile, de exemplu.

### Modul de folosire

- Se notează opțiunile care se vor compara. Se atribuie o literă fiecărei opțiuni;
- Se marchează opțiunile sub formă de cap de tabel pe linii și coloane;
- Celulele din tabel unde se compară o opțiune cu ea însăși sunt blocate;
- Celulele din tabel în care apar comparații duplicate sunt de asemenea blocate;
- În cadrul celulelor rămase, se compară opțiunea de pe linie cu cea de pe coloană. Pentru fiecare celulă, se decide care dintre cele două opțiuni este mai importantă. Se notează litera celei mai importante opțiuni în celulă și se punctează diferența de importanță de la 0 (nicio diferență) la 3 (diferență majoră);
- În final, se calculează totalul tuturor valorilor pentru fiecare opțiune. Aceste rezultate se pot converti în procentaje din scorul total.

### 3. Analiza matricei deciziilor

Analiza matricei de decizii (cunoscută și ca „analiza grid”, “Pugh matrix analysis” sau “multi-attribute utility theory”) este puternică mai ales când există un număr de alternative din care se alege și mulți factori de luat în considerare.

Acest lucru face tehnica importantă pentru aproape toate problemele de decizie în care nu există o opțiune clară sau evidentă.

Tehnica funcționează prin listarea într-un tabel a opțiunilor pe linii și a factorilor care trebuie luați în considerare pe coloane. Apoi se stabilește un punctaj pentru fiecare celulă și se calculează scorul total pentru fiecare opțiune:

- Mai întâi, se listează toate opțiunile pe linii și toți factorii pe coloane;
- Apoi se decide importanța relativă a factorilor de decizie ca fiind un număr de la 0 la 5, unde 0 înseamnă că factorul nu contează deloc în decizia finală iar 5 înseamnă că factorul este foarte important. Se acceptă factori cu aceeași importanță. Valorile stabilite pot fi evidente, dar în cazul în care nu sunt evidente, se folosește o metodă precum cea a analizei comparării perechilor pentru a le estima;
- Următorul pas este atașarea unui punctaj fiecărei opțiuni pentru fiecare factor de decizie. Se stabilește un punctaj de la 0 la 5 pentru fiecare opțiune. Se observă că nu trebuie să existe un punctaj diferit pentru fiecare opțiune; dacă niciuna dintre ele nu este potrivită pentru un anumit factor de decizie, atunci toate opțiunile vor avea punctajul 0;
- Se multiplică fiecare din punctajele de la pasul 3 cu valoarea importanței relative calculate la pasul 2. Se obțin astfel punctaje pentru fiecare combinație opțiune-factor;
- În final, se sumează aceste punctaje pentru fiecare dintre opțiuni. Se alege opțiunea cu punctajul cel mai mare.

### 4. Analiza costuri-beneficii

Analiza costuri-beneficii este o tehnică relativ simplă și foarte răspândită pentru luarea unei decizii de a realiza o schimbare. Precum sugerează și numele, pur și simplu se adună valoarea beneficiilor unei acțiuni și se scad costurile asociate cu aceasta.

Costurile pot fi calculate o singură dată sau se pot acumula în timp. Beneficiile sunt de cele mai multe ori încasate după un timp. Acest efect de timp se include în cadrul analizei prin calcularea unei perioade de amortizare – timpul necesar ca beneficiile să permită recuperarea costurilor.

Multe companii își propun amortizarea proiectelor după o perioadă de timp specificată, de exemplu 3 ani.

Într-o formă simplă, analiza costuri-beneficii se efectuează folosind doar costuri și beneficii financiare. De exemplu, raportul costuri-beneficii pentru construirea unei șosele include doar costul construirii efective a drumului, precum și beneficiul economic rezultat din îmbunătățirea infrastructurii de transport. Nu se măsoară costul distrugerii mediului înconjurător sau beneficiul unui drum spre lucru mai rapid și mai ușor.

O abordare mai sofisticată este încercarea de a atribui valori financiare costurilor și beneficiilor intangibile. Acest lucru are o dimensiune foarte subiectivă. De exemplu, este greu de estimat costul renunțării la o zonă verde protejată și de asemenea valoarea unei călătorii lipsite de stress dimineața către locul de muncă.

Exemplu:

Un director de vânzări decide dacă să implementeze un nou sistem de management al contactelor și un sistem computerizat de prelucrare a vânzărilor. Departamentul lui are doar câteva calculatoare iar angajații săi nu au cunoștințe de utilizare a calculatoarelor. El este conștient că utilizând calculatorul, agenții de vânzări ar fi capabili să contacteze mai mulți clienți și că ar spori încrederea și calitatea relațiilor cu publicul. Aceștia ar lucra mai eficient și cu echipele de prelucrare și de livrare.

Analiza costuri-beneficii arată astfel:

#### Costuri:

Echipamente noi:

- 10 PC-uri conectabile la internet cu suport software: 2450 \$ fiecare;
- 1 server: 3500 \$;
- 3 imprimante: 1200 \$ fiecare;
- Cablare și instalare: 4600 \$;
- Suport software pentru vânzări: 15.000 \$;

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Costuri de pregătire:

- Introducere în calculatoare – 8 persoane: 400 \$ fiecare;
- Abilități de utilizare – 8 persoane: 400 \$ fiecare;
- Sistem suport de vânzări – 12 persoane: 700 \$ fiecare;

Alte costuri:

- Timp pierdut: 40 zile-om, 200 \$ / zi;
- Vânzări pierdute din cauza întreruperii activității: estimativ 20.000 \$;
- Vânzări pierdute din cauza ineficienței din primele luni: estimativ 20.000 \$;

**Cost total: 114.000 \$.**

**Beneficii:**

- Triplarea capacitatei de contactare a clienților: estimativ 40.000 \$ / an;
- Abilitate de susținere a campaniilor de vânzări prin telefon: estimativ 20.000 \$ / an;
- Sporirea eficienței și încrederii: estimativ 50.000 \$ / an;
- Serviciu de relații cu publicul îmbunătățit: estimativ 30.000 \$ / an;
- Acuratețe mai mare de informare a publicului: estimativ 10.000 \$ / an;
- Abilitate crescută de a se ocupa de efortul de vânzări: 30.000 \$ / an;

**Beneficiu total: 180.000 \$ / an.**

Timp de amortizare:  $114.000 / 180.000 \text{ (ani)} = 0,63 \text{ ani} \approx 8 \text{ luni.}$

Pentru analiza perioadei de recuperare a investiției se poate utiliza diagrama pragului de rentabilitate, descrisă în capitolul 3, Justificarea finanțieră a proiectului. Inevitabil, estimările beneficiilor aduse de noul sistem sunt subiective. În ciuda acestui fapt, directorul de vânzări ar trebui probabil să îl introducă, datorită perioadei scurte de amortizare.

Analiza costuri-beneficii este un instrument puternic, relativ simplu și des folosit pentru a decide dacă să se facă sau nu o schimbare. Analiza se poate realiza utilizând doar costuri și beneficii financiare. De asemenea pot include articole intangibile în cadrul analizei însă, deoarece trebuie estimată o valoare pentru acestea, va apărea inevitabil un element suplimentar de subiectivitate în cadrul procesului.

## 5. Aplicații

**5.1.** Un om de afaceri studiază căile prin care să-și extindă afacerea. Are resurse limitate, dar și următoarele opțiuni:

- Să se extindă pe piețele externe;
- Să se extindă pe piețele interne;
- Să îmbunătățească relațiile cu publicul;
- Să asigure creșterea calității produselor.

La început, se realizează tabelul pentru analiza comparării perechilor. Apoi se compară opțiunile, se notează litera celei mai importante opțiuni și se calculează diferența de importanță (tabelul de mai jos)

	Overseas Market (A)	Home Market (B)	Customer Service (C)	Quality (D)
Overseas Market (A)		A,2	C,1	A,1
Home Market (B)			C,1	B,1
Customer Service (C)				C,2
Quality (D)				

În final, se adună valorile pentru A, B, C, D și se convertește fiecare valoare într-un procentaj. Se obțin următoarele totaluri:

A = 3 (37,5%);

B = 1 (12,5%);

C = 4 (50%);

D = 0.

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În acest caz, lucrul cel mai important este să se îmbunătățească relațiile cu publicul (C) și apoi să se abordeze piețele de export (A). Calitatea nu are o prioritate mare, probabil că este deja bună. Analiza comparării perechilor este o modalitate utilă de a cîntări importanța relativă a diferitelor acțiuni, când prioritățile nu sunt clare. Metoda asigură un cadru de lucru pentru compararea fiecărei acțiuni cu toate celelalte și ajută la evidențierea diferenței de importanță dintre factori.

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**5.2.** Un surfer entuziasat dorește să-și schimbe mașina. Are nevoie de una cu care nu doar să transporte planșeta și pânzele, ci să fie bună și pentru călătorii de afaceri. Întotdeauna i-au plăcut mașinile sport. Însă nicio mașină nu respectă toate cele trei preferințe.

Opțiunile sale sunt:

- Un SUV/4x4;
- mașină de familie confortabilă;
- mașină break (“station wagon” în tabelele 12.3 și 12.4);
- mașină sport decapotabilă.

Criteriile pe care le ia în considerare sunt:

- Costul;
- Posibilitatea de a transporta în mod sigur o placă pentru windsurfing;
- Posibilitatea de a depozita în siguranță pânze și echipamente;
- Confortul pe distanțe lungi;
- Distracția;
- Aspectul plăcut și calitatea.

În primul rând, se realizează tabelul de mai jos și se stabilesc punctaje pentru fiecare opțiune, în funcție de cât de bine satisface aceasta fiecare factor.

Factors:	Cost	Board	Storage	Comfort	Fun	Look	Total
Weights:							
Sports Car	1	0	0	1	3	3	
SUV/4x4	0	3	2	2	1	1	
Family Car	2	2	1	3	0	0	
Station Wagon	2	3	3	3	0	1	

Apoi se decide importanța relativă pentru fiecare factor.

Se multiplică cu scorul deja stabilit și apoi se sumează.

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Factors:	Cost	Board	Storage	Comfort	Fun	Look	Total
Weights:	4	5	1	2	3	4	
Sports Car	4	0	0	2	9	12	27
SUV/4x4	0	15	2	4	3	4	28
Family Car	8	10	1	6	0	0	25
Station Wagon	8	15	3	6	0	4	36

Se obține un rezultat interesant: în ciuda lipsei de distracție, o mașină break ar putea fi cea mai bună alegere. Dacă surferul se simte încă nemulțumit de decizie, este posibil să fi supraestimat importanța unuia dintre factori. Poate ar fi trebuit să dea factorului „distracție” valoarea 7.

Analiza matricei de decizii ajută la luarea deciziilor între mai multe opțiuni, atunci când se iau în considerare mai mulți factori diferenți și este cea mai simplă formă de analiză a deciziilor multi-criteriale. Alte metode mai sofisticate implică o modelare complexă a diferitelor scenarii potențiale și tehnici de matematică avansată.

Implementați o interfață pentru aplicație în Visual Studio folosind C#.

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- valoarea, profitul sau consecința,  $P_{ij}$ , pentru decident, de realizare a uneia din acțiunile disponibile, având în vedere posibilele stări ale naturii;
- criteriul în funcție de care decidentul alege între acțiunile alternative.

### 1. Arbori de decizie

Arborii de decizie sunt instrumente utile pentru reprezentarea problemelor decizionale cu mai mulți pași.

Acțiunile posibile din orice moment sunt prezentate ca ramuri care pornesc dintr-un punct decizional, reprezentat de un pătrat mic.

Diversele rezultate posibile ale unei acțiuni apar ca ramuri ce pornesc dintr-un punct șansă, marcat printr-un nod sub forma unui cerc, la capătul ramurii corespunzătoare unei acțiuni.

Fiecărei ramuri îi este asociată o probabilitate de la un punct șansă spre un rezultat.

Valorile asociate fiecarui rezultat sunt reprezentate la capătul ramurilor corespunzătoare.

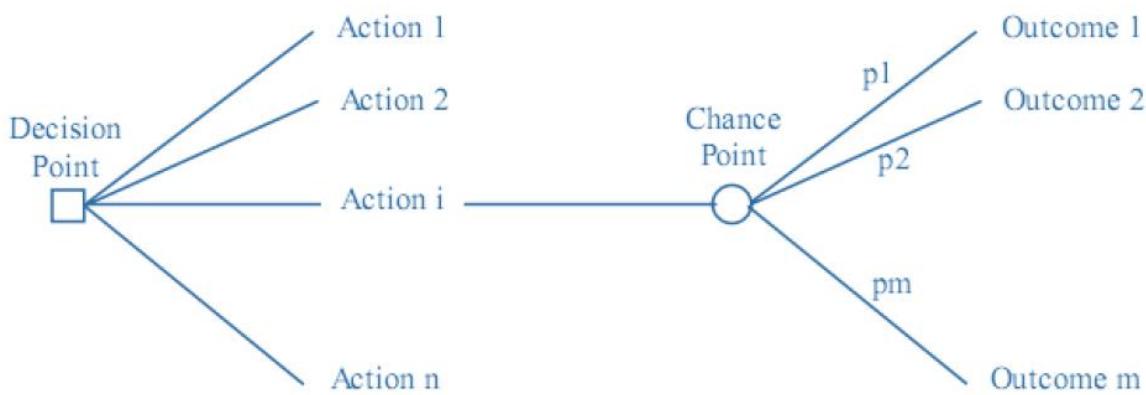


Figura 1. Structura unui arbore de decizie

După construirea arborelui, se poate identifica acțiunea recomandată de criteriul valorii așteptate, prin folosirea metodelor de infășurare înapoi și rețezare (elagaj). Infășurarea înapoi constă în calcularea valorii așteptate pentru fiecare nod. Se începe cu nodurile care nu au succesor, cele mai îndepărtate în viitor. Pentru un nod decizional fără niciun succesor de tip șansă nu există incertitudine la alegerea acțiunii. Valoarea nodului decizional reprezintă profitul acțiunii respective. Unui nod șansă fără niciun succesor de tip decizional i se atribuie valoarea așteptată a profiturilor asociate ramurilor care ies din el.

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Pentru un nod decizional ai cărui succesiuni sunt posibile, se alege acțiunea care conduce către nodul sănătății cu cel mai mare profit. Toate celelalte acțiuni posibile asociate respectivului nod decizional nu mai sunt luate în considerare, ramurile fiind reținute. Nodul decizional își se atribuie valoarea pe care o are nodul sănătății aflat la capătul acțiunii selectate. Pentru un nod sănătății ai cărui succesiuni decizionale au fost evaluate, se calculează valoarea așteptată a tuturor nodurilor decizionale succesoare.

Acest proces se repetă în mod sistematic până când se evaluatează nodul decizional aflat în rădăcina arborelui, ce reprezintă decizia care se va lua. Acele părți ale arborelui de decizie care pot fi atinse pornind din rădăcină și urmând ramurile care nu au fost reținute oferă o soluție completă a problemei.

Exemplu:

O companie trebuie să decidă între a construi o uzină mică sau una mare pentru a fabrica un produs nou cu o durată de viață pe piață de 10 ani.

Cererea pentru produsul în cauză poate fi mare în primii 2 ani, dar, în cazul în care mulți din utilizatorii inițiali îl vor considera nesatisfăcător, cererea ar putea să scadă în continuare spre un nivel mic. Ca alternativă, cererea inițială mare ar putea indica posibilitatea unui volum de piață ridicat pe termen lung. Dacă cererea este inițial mare și rămâne astfel, iar compania nu are o capacitate suficientă în primii 2 ani, cu siguranță pe piață vor fi introduse produse concurente de către alte companii.

Dacă inițial compania construiește o fabrică mare, trebuie să o susțină timp de 10 ani, indiferent de cererea de pe piață. În cazul în care construiește o fabrică mică, există posibilitatea extinderii ei după 2 ani, opțiune ce va fi aleasă numai dacă cererea este mare în perioada de început.

Dacă se construiește inițial o fabrică mică și cererea e scăzută la început, compania va menține producția și va obține un profit bun din volumul mic de produse fabricate.

## 2. Aplicație

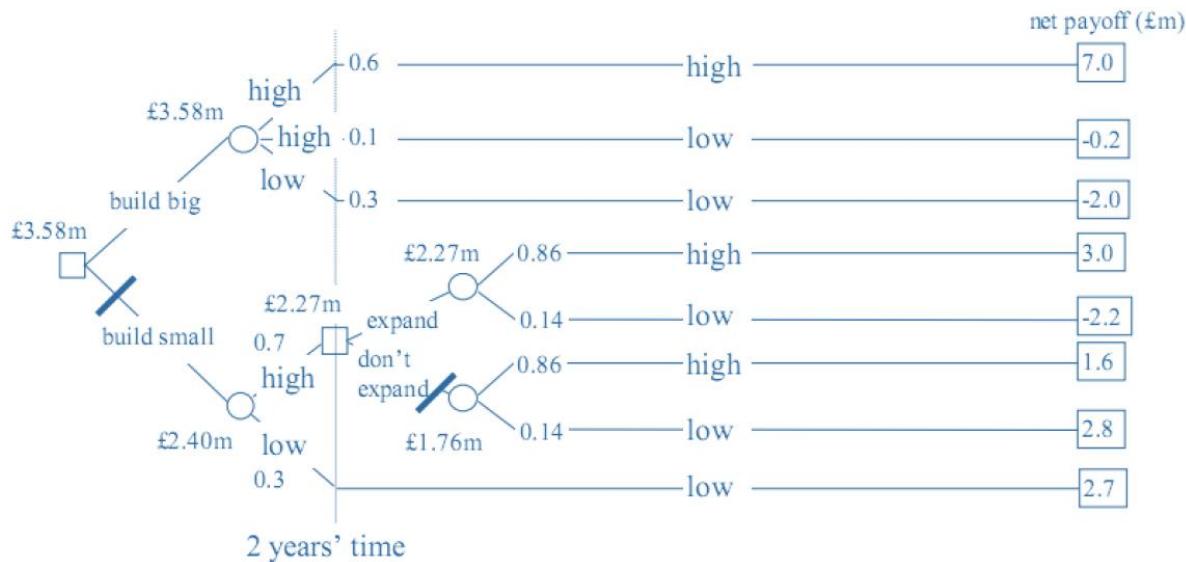
O companie trebuie să decidă între a construi o uzină mică sau una mare pentru a fabrica un produs nou cu o durată de viață pe piață de 10 ani.

Informații de piață: Se estimează că va exista următoarea evoluție a cererii:

- Inițial ridicată, pe termen lung ridicată: 60%;
- Inițial ridicată, pe termen lung scăzută: 10%;
- Inițial scăzută, în continuare scăzută: 30%;
- Inițial scăzută, pe termen lung ridicată: 0%.

Venit anual:

- Fabrică mare cu un volum de piață ridicat va avea un câștig anual de 1 m£ (1 milion de lire), timp de 10 ani;
- Fabrică mare cu un volum de piață scăzut va avea un câștig de numai 0,1 m£ pe an;
- Fabrică mică având cererea de piață scăzută va avea un venit anual de 0,4 m£;
- Fabrică mică va avea un venit anual de 0,45 m£ în cazul unei perioade inițiale cu cerere mare, dar, datorită concurenței, acesta va scădea până la 0,25 m£ pe termen lung, dacă cererea va fi în continuare mare;
- Dacă o fabrică inițial mică ar fi extinsă după 2 ani ca urmare a cererii ridicate, ar avea un câștig anual de 0,7 m£ pentru următorii 8 ani;
- Dacă o fabrică inițial mică ar fi extinsă după 2 ani, dar cererea ridicată nu ar continua, venitul anual estimat pentru următorii 8 ani ar fi de 0,05 m£.
- Costuri de capital: Construirea unei fabrici mari ar costa 3 m£, iar o fabrică mică ar presupune un cost inițial de 1,3 m£ și unul adițional de 2,2 m£ în cazul extinderii după 2 ani.



## L13. ANALIZA DECIZIILOR ÎN CONDIȚII DE RISC

Deoarece o situație corespunzătoare unui volum de piață initial scăzut, urmat de unul ridicat pe termen lung are probabilitatea zero, ramurile asociate ei au fost eliminate din arborele decizional de mai sus.

Profitul net de 7 m£ pentru cazul unui volum de piață ridicat timp de 10 ani se obține prin scăderea costului de capital în valoare de 3 m£ din venitul total de 10 m£. Valorile profiturilor nete corespunzătoare celorlalte situații se calculează într-o manieră similară.

Ramura de sus careiese din nodul sănăsă aflat la capătul acțiunii inițiale build big corespunde unei situații în care volumul este mare pe întreaga perioadă de 10 ani. Probabilitatea acestei ramuri este preluată direct din informațiile de piață. Probabilitățile celorlalte două ramuri care ies din același nod sănăsă („inițial ridicat, pe termen lung scăzut” și „inițial scăzut, pe termen lung scăzut”) se obțin în mod similar.

Ramurile care pornesc din nodul sănăsă aflat la capătul acțiunii inițiale build small corespund volumelor de piață inițial ridicat, respective inițial scăzut. Probabilitățile pot fi obținute, din nou, din informațiile de piață.

Probabilitățile nodurilor sănăsă care urmează acțiunilor expand și don't expand sunt ceva mai complicate. Să considerăm ramura de sus care pornește din nodul sănăsă ce urmează după expand. Aceasta corespunde unui volum de piață mare pe termen lung, în condițiile unui volum ridicat în primii 2 ani. Probabilitatea acestei situații este:

$$P(TermenLungRidicată|InițialRidicată) = \frac{P(InițialRidicată \& StabilRidicată)}{P(InițialRidicată)} = \frac{0.6}{0.7} = 0.86$$

În mod similar, ramura de jos care pornește din nodul sănăsă ce urmează după expand corespunde unui volum de piață scăzut pe termen lung, în condițiile unui volum ridicat în primii 2 ani. Aceasta are următoarea probabilitate:

$$P(TermenLungScăzută|InițialRidicată) = \frac{P(InițialRidicată \& TermenLungScăzută)}{P(InițialRidicată)} = \frac{0.1}{0.7} = 0.14$$

Ramurile care ies din nodul sănăsă ce urmează după don't expand au probabilități similare.

Nodul sănăsă aflat după build big are următoarea valoare așteptată:

$$7 \cdot 0,6 + (-0,2) \cdot 0,1 + (-2,0) \cdot 0,3 = 4,2 - 0,02 - 0,6 = 3,58 \text{ m£.}$$

Analog, nodurile sănăsă de după expand și don't expand au valorile 2,27 m£ și 1,76 m£.

Luând în considerare punctul decizional aflat la sfârșitul celui de-al doilea an, în contextul unei fabrici inițial mici și al unui volum de piață inițial mare, sunt posibile două acțiuni: expand și don't expand.

Aceste acțiuni conduc spre noduri sănăsă cu valori așteptate de 2,27 m£ și respectiv 1,76 m£. Un profit așteptat de 2,27 m£ este preferabil unui de 1,76 m£, astfel încât expand este ales în detrimentul lui don't expand. Acest lucru înseamnă că, în cazul în care compania construiește inițial o fabrică mică și volumul este mare, atunci conform criteriului valorii așteptate, compania

## L13. ANALIZA DECIZIILOR ÎN CONDIȚII DE RISC

ar trebui să extindă fabrica după 2 ani. Ramura don't expand este retezată, iar nodului decizional i se atribuie valoarea așteptată de 2,27 m£.

Acum, nodul sănă de după build small poate fi evaluat. De aici pornesc două ramuri, corespunzătoare celor două situații: initially high volume și initially low volume. Ramura superioară, cu o probabilitate de 0,7, ne conduce spre un nod decizional căruia tocmai i-am atribuit valoarea 2,27 m£. Ramura inferioară, cu o probabilitate de 0,3, are un rezultat cu un profit de 2,7 m£. Valoarea așteptată a acestui nod sănă este:

$$2,27 \cdot 0,7 + 2,7 \cdot 0,3 = 1,59 + 0,81 = 2,4 \text{ m£.}$$

La final, analizăm nodul aflat în rădăcina arborelui. Există două acțiuni posibile: build big și build small. Prima conduce spre un nod sănă cu o valoare așteptată de 3,58 m£. Cea de-a doua conduce spre nodul sănă discutat în paragraful anterior, cu valoarea așteptată de 2,4 m£. Acțiunea build big ne conduce către o valoare așteptată mai mare, în consecință, aceasta este acțiunea preferată. Acțiunea build small este retezată, iar nodului decizional i se atribuie valoarea așteptată de 3,58 m£.

Așadar, recomandarea este ca, din start, compania să construiască o fabrică mare.

Profitul net așteptat în acest caz este de 3,58 m£.

Realizați o aplicație în Visual Studio folosind C# pentru a implementa încărcarea informațiilor aferente structurii unui arbore de decizie și calculați seria de acțiuni care conduc la profit maxim și afișați informațiile de pe calea respectivă. Reprezentați grafic pe o interfață arborele de decizie.

## 8. Track progress: Basic techniques

### In this chapter

- [Understand progress tracking](#)
- [Save a baseline of your plan](#)
- [Track a plan as scheduled](#)
- [Enter a task's completion percentage](#)
- [Enter actual values for tasks](#)

### Practice files

For this chapter, use the practice files from the Project2016SBS\Ch08 folder. For practice file download instructions, see the introduction.

Until now, you have focused on project planning—developing and communicating the details of a plan before actual work begins. When work begins, so does the next phase of project management: tracking progress. *Tracking* means recording details such as who did what work, when the work was done, and what the cost was. These details are often called *actuals*. As you start tracking actuals on tasks, a number of things happen. As you record progress on a task, Project 2016 calculates actual and remaining cost, work, and duration values. These updated values are rolled up to their summary tasks. Such changes are the result of Project dynamically recalculating the plan.

This chapter guides you through procedures related to saving a baseline of your plan, tracking a plan as scheduled, entering a task's completion percentage, and entering actual values for tasks.

### Understand progress tracking

Tracking actuals is essential to properly managing a project, as opposed to just planning it. The project manager must know how well the team is performing and when to take corrective action. By properly tracking project performance and comparing it with the original plan (as saved in a baseline), you are able to answer such questions as the following:

- Are tasks starting and finishing as planned? If not, what will be the impact on the project's finish date?
- Are resources spending more or less time than planned to complete tasks?
- Are higher-than-anticipated task costs driving up the overall cost of the project?
- When planning similar projects in the future, will you be able to determine how good your (or the team's) estimating skills were in prior projects?

Project supports several ways to track progress. Your choice of a tracking method should depend on the level of detail or control required by you, your project sponsor, and other

stakeholders. Tracking the fine details of a project requires additional work from you and, possibly, from the resources working on the project. Therefore, before you begin tracking progress, you should determine the level of detail you need.

The different levels of tracking detail include the following, ordered from simplest to most comprehensive:

- Record project work as scheduled. This level works best if everything in the project occurs exactly as planned.
- Record each task's percentage of completion, either at precise values or at preset increments such as 25, 50, 75, and 100 percent.
- Record the actual start and finish dates, and actual and remaining work and duration values for each task or assignment.
- Track assignment-level work by time period. This is the most detailed level of tracking. Here, you record actual work values per day, week, or other interval. (This level of detail is addressed in [Chapter 14](#), “[Track progress: Detailed techniques](#).”)

Because different portions of a project might have different tracking needs, you might need to apply a combination of these approaches within a single plan. For example, you might want to track high-risk tasks more closely than low-risk ones.

## Save a baseline of your plan

After you develop a plan, one of your most important activities as a project manager is to record actuals and evaluate project performance. As you record actuals or update your plan, the scheduled plan will likely change. This makes it difficult to keep track of the plan in its original state.

The current “as scheduled” state of a task is described by its start, finish, and duration values. As you enter Actual Start and Actual Finish dates, the Start, Finish, and Duration fields will update to reflect the current state of that task.

To judge project performance properly, you'll find it helpful to compare the performance with your original plan. This original plan is called the *baseline plan*, or just the baseline. Saving a baseline captures the original scheduled start, finish, and duration values in addition to work and cost values per task, resource, and assignment. The baseline also includes work and cost values distributed over time (called timephased values, which you will work with in [Chapter 14](#), “[Track progress: Detailed techniques](#)”). Use the baseline for later comparison of what you thought was going to happen to what actually has happened.

When you save a baseline, Project takes a snapshot of the existing values and saves it in your plan for future comparison. You should save a baseline when:

- You have developed the plan as fully as possible. (However, this does not mean that you cannot add tasks, resources, or assignments to the plan after work has started—this is often unavoidable.)
- You have not yet started entering actual values, such as a task's percentage of completion.

- You want to save a subsequent baseline (up to 11 per plan).

The specific values saved in a baseline include several task, resource, and assignment fields, in addition to timephased fields.

Task fields	Resource fields	Assignment fields
Start	Work and timephased work	Start
Finish	Cost and timephased cost	Finish
Duration		Work and timephased work
Work and timephased work		Cost and timephased cost
Cost and timephased cost		

Project supports not just one baseline, but up to 11 baselines in a single plan. The first one is called *Baseline*, and the rest are *Baseline 1* through *Baseline 10*. Saving multiple baselines can be useful for projects with especially long planning phases, in which you might want to compare different sets of baseline values. For example, you might want to save and compare the baseline plans every month as the planning details change, or you might want to save a new baseline at various points during the execution of the project. You could, for example, save Baseline before work starts, Baseline 1 a month after work starts, Baseline 2 two months after work starts, and so on. You can then view the various baselines and compare them to the actual schedule throughout the project's duration.

One great way to see tasks' scheduled and baseline values side by side for easy comparison is in the Variance table.

Task Mode	Task Name	Start	Finish	Baseline Start	Baseline Finish	Start Var.	Finish Var.
0	New book laun	Mon 1/8/18	Fri 3/2/18	Mon 1/8/18	Tue 2/27/18	0 days	3 days
1	Planning Phas	Mon 1/8/18	Mon 1/22/18	Mon 1/8/18	Mon 1/22/18	0 days	0 days
2	Assign launc	Mon 1/8/18	Mon 1/8/18	Mon 1/8/18	Mon 1/8/18	0 days	0 days
3	Complete a	Tue 1/9/18	Mon 1/15/18	Tue 1/9/18	Mon 1/15/18	0 days	0 days
4	Schedule al	Mon 1/8/18	Mon 1/15/18	Mon 1/8/18	Mon 1/15/18	0 days	0 days
5	Design and	Tue 1/9/18	Mon 1/22/18	Tue 1/9/18	Mon 1/22/18	0 days	0 days
6	Planning co	Mon 1/22/18	Mon 1/22/18	Mon 1/22/18	Mon 1/22/18	0 days	0 days
7	Internal Launc	Tue 1/23/18	Wed 2/14/18	Tue 1/23/18	Fri 2/9/18	0 days	3 days
8	Kickoff booi	Tue 1/23/18	Tue 1/23/18	Tue 1/23/18	Tue 1/23/18	0 days	0 days
9	Prepare boo	Wed 1/24/18	Mon 1/29/18	Wed 1/24/18	Fri 1/26/18	0 days	1 day
10	Plan author	Tue 1/23/18	Thu 2/1/18	Wed 1/24/18	Thu 2/1/18	-1 day	0 days
11	Channel Sal	Wed 1/24/18	Mon 2/5/18	Wed 1/24/18	Wed 1/31/18	0 days	3 days
12	Complete b	Tue 2/6/18	Wed 2/7/18	Thu 2/1/18	Fri 2/2/18	3 days	3 days
13	Prepare boo	Tue 2/6/18	Mon 2/12/18	Thu 2/1/18	Wed 2/7/18	3 days	3 days
14	Distribute it	Tue 2/13/18	Wed 2/14/18	Thu 2/8/18	Fri 2/9/18	3 days	3 days

Displaying the Variance table is a great way to compare tasks' scheduled and baseline values

For example, consider a plan in which the Start and Finish dates are the “as scheduled”

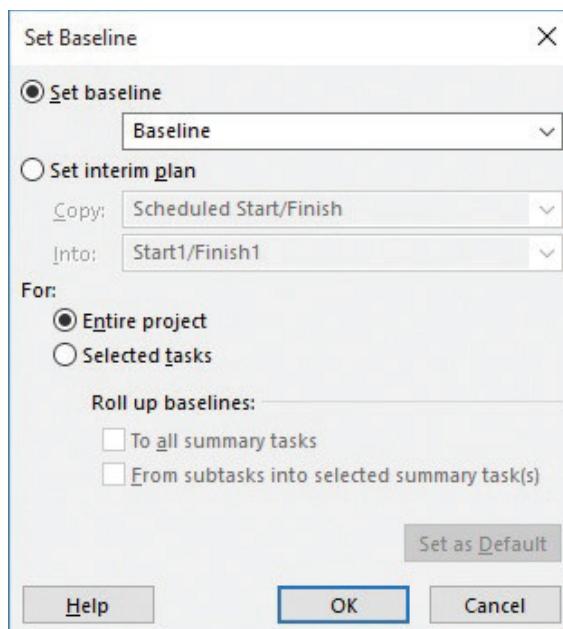
dates. These might differ from the Baseline start and finish dates due to the variance caused by actuals that did not match the baseline dates, or by other schedule adjustments made by the project manager.

Project includes several built-in views that compare the current schedule to the baseline—notably the Tracking Gantt view, which is described in [Chapter 14, “Track progress: Detailed techniques.”](#) You can also format the Gantt Chart view to include baseline Gantt bars. A baseline Gantt bar represents a task’s baseline start, finish, and duration values on the chart portion of a Gantt chart view.

## To save a baseline

1. On the Project tab, in the Schedule group, click **Set Baseline**, and then click **Set Baseline**.

The Set Baseline dialog box opens.



*In the Set Baseline dialog box, you can save or update up to 11 baselines per plan*



When working with a plan that includes a saved baseline, you can see when the baseline was saved in the Set Baseline dialog box. The date the baseline was saved appears after the baseline name in the Set Baseline field.

2. To save the plan’s initial baseline, click **Set Baseline**, and then select **Baseline** from the list.

*Or*

To save a subsequent baseline, click **Set Baseline**, and then select the baseline number you want.



## Tip

Interim plans are similar to baselines. You will work with interim plans and the other options in the Set Baseline dialog box in [Chapter 14, “Track progress: Detailed techniques.”](#)

### 3. Click **OK**.

Project saves the baseline, even though there's no indication in the Gantt Chart view that anything has changed.

## To clear a previously saved baseline

1. On the **Project** tab, in the **Schedule** group, click **Set Baseline**, and then click **Clear Baseline**.
2. In the **Clear Baseline** dialog box, select the options you want, and then click **OK**.

## To display baseline Gantt bars in a Gantt chart view

1. In a Gantt chart view, on the **Format** tab, in the **Bar Styles** group, click **Baseline**, and then click the baseline (**Baseline** or **Baseline1** through **Baseline10**) that you want to display.

Project draws baseline Gantt bars for the baseline you choose.

## To display scheduled and baseline values by using the Variance table

1. On the **View** tab, in the **Task Views** group, click **Other Views**, and then click **Task Sheet**.

The Task Sheet view appears. Because this is a tabular view, it does not include a Gantt chart, so more room is available to see the fields in the table.
2. On the **View** tab, in the **Data** group, click **Tables**.
3. Click **Variance**.

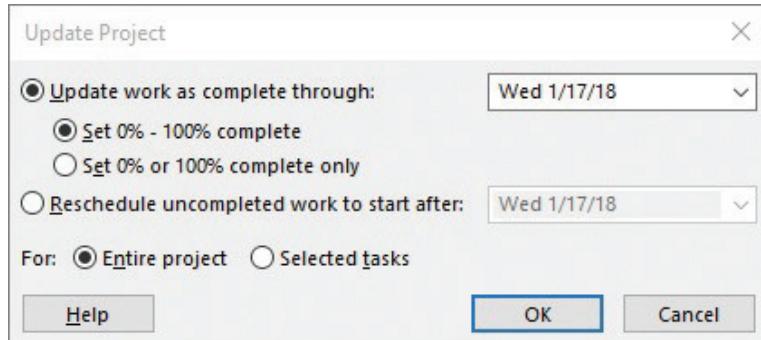


## Tip

You also can right-click the Select All button in the upper-left corner of the active table to switch to a different table.

## Track a plan as scheduled

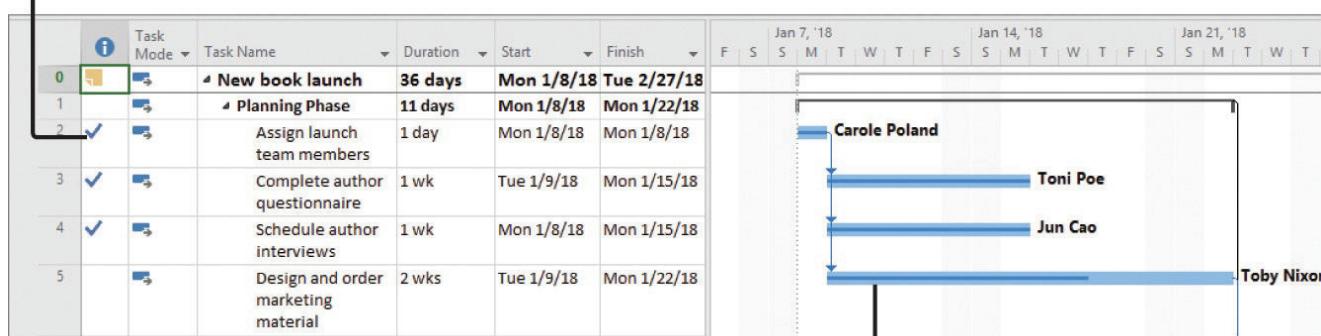
The simplest approach to tracking progress is to report that the actual work is proceeding exactly as planned. For example, if the first week of a five-week project has elapsed and all of its tasks have started and finished as scheduled, you can quickly record this in the Update Project dialog box.



The *Update Project* dialog box gives you options for basic tracking

When you record progress on tasks, Project displays that progress by drawing [progress bars](#) within the Gantt bars for those tasks.

Check marks appear in the Indicators column for tasks that have been completed



Progress bars indicate the portion of each task that has been completed

*Visual indicators of task progress in a Gantt chart view include the task completion check marks in the Indicators column and the progress bars inside the Gantt bars*

In the chart portion of the Gantt Chart view, the progress bar shows how much of each task has been completed. For example, consider a Gantt chart view in which tasks 2, 3, and 4 have been completed. A check mark appears in the Indicators column for those tasks, and the progress bars extend through the full length of those tasks' Gantt bars. Task 5, which is only partially completed, shows a partial progress bar in its Gantt bar.

When you record progress through a specific date, Project calculates the actual duration, the remaining duration, actual costs, and other values up to the date you entered. This approach might be fine even if the actual work and cost values generated by Project won't exactly match what happened in the real world, but are close enough for your schedule-tracking purposes. This is a judgment call that you as a project manager (in consultation with your project sponsors and other stakeholders) can consider.

## To record work as scheduled through a specific date

1. On the **Project** tab, in the **Status** group, click **Update Project**.

The Update Project dialog box opens.

2. Make sure **Update work as complete through** is selected. In the adjacent date box, enter or select the date through which you want to record work completed as

scheduled.

### 3. Click OK.

## To record work as scheduled through the current date or status date

1. Select the task or tasks whose work you want to record.
2. On the **Task** tab, in the **Schedule** group, click **Mark on Track**.

This command applies only to the selected tasks, and it sets them as complete through the current date or the status date. (To learn about the status date, see [Chapter 15, “View and report project status.”](#))

## Enter a task’s completion percentage

After work begins on a task, you can quickly record its progress as a percentage. When you enter a completion percentage greater than 0, Project sets the task’s actual start date to match its scheduled start date. Project then calculates the actual duration, the remaining duration, actual costs, and other values based on the percentage you enter. For example, if you specify that a four-day task is 25 percent complete, Project calculates that it has had one day of actual duration and has three days of remaining duration.

Here are some ways to enter completion percentages:

- Use the preset increment buttons 0%, 25%, 50%, 75%, and 100% Complete in the Schedule group of the Task tab.
- Add the percent complete column (labeled % Complete in the interface) to a table in a task view, and enter the value you want.
- Enter any percentage value you want in the Task Information dialog box.
- Use the mouse to set progress on Gantt bars.

Here are some additional tips and suggestions for entering task completion percentages:

- There is a simple tracking technique for projects with a large number of short-duration, “to-do-list” types of tasks that don’t require detailed tracking: use just the 0%, 50%, and 100% Complete values. A 0% value means work on the task has not yet started, 50% means work has started, and 100% means the task is complete. If you only need to know what’s in progress and what’s done, this is the simplest form of tracking you can apply.
- If you can collect the actual start date of a task, it is a good practice to record the actual start date (described in the next section) and then record a completion percentage.
- By default, Project shows Gantt bars in front of nonworking time (such as weekends), as you see in the images in this chapter. However, Project can show nonworking time in front of task bars, visually indicating that no work on the task will occur during the nonworking time. If you prefer this type of presentation, right-click any shaded nonworking time (such as a weekend) in the chart portion of the Gantt Chart view and click Nonworking Time in the shortcut menu. In the Timescale

dialog box, click the Non-Working Time tab. Next to Draw, click In Front Of Task Bars.

## To record a task's percent complete value in preset increments

1. In the **Task Name** column, select the task for which you want to record a percent complete value.
2. On the **Task** tab, in the **Schedule** group, click the **25%**, **50%**, **75%**, or **100% Complete** button.

## To record a task's percent complete value

1. In the **Task Name** column, select the task for which you want to record a percent complete value.
2. On the **Task** tab, in the **Properties** group, click **Information**.

The Task Information dialog box opens.



### Tip

You can also double-click a task name to open its Task Information dialog box.

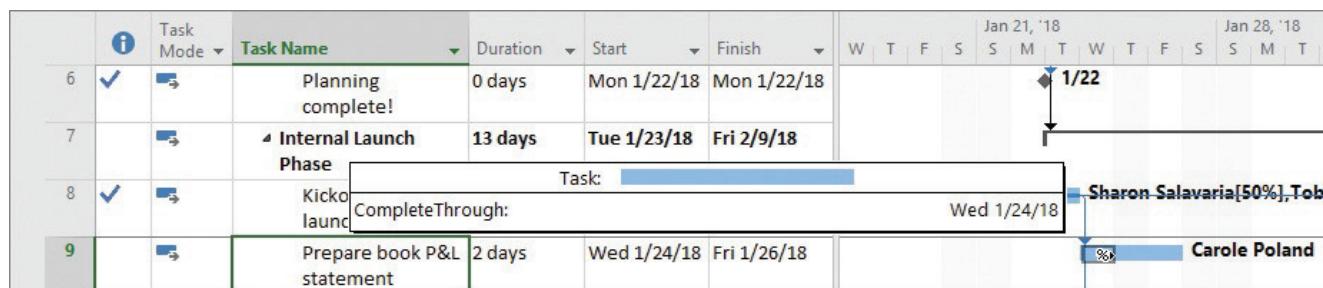
3. On the **General** tab of the dialog box, enter the **Percent Complete** value you want.

## To use the % Complete column in a table

1. Right-click any column heading in a task table.
2. In the shortcut menu that appears, click **Insert Column**.  
A list of fields appears.
3. Enter or select **% Complete**.
4. Record the percent complete values you want for any tasks in the table.

## To use the mouse to set or extend progress on Gantt bars

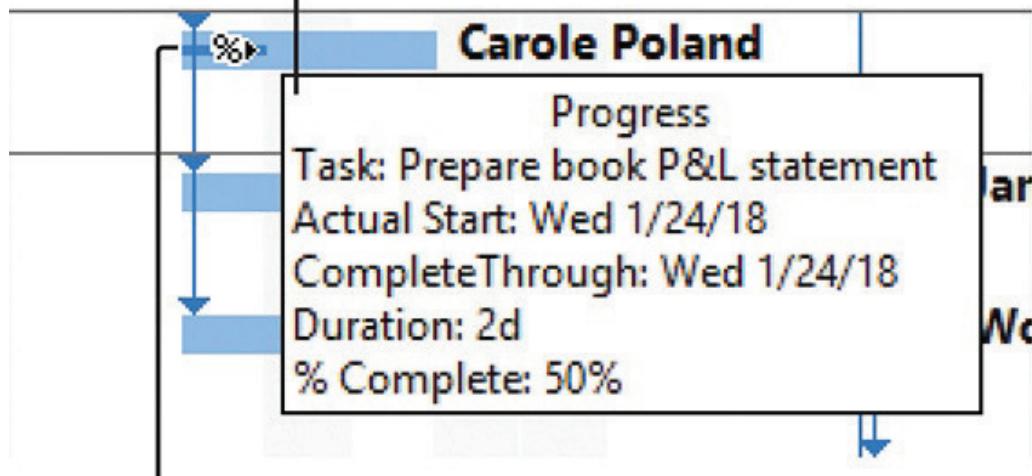
1. Point to a Gantt bar (or progress bar within a Gantt bar).
2. When the mouse pointer changes to a percent symbol and right arrow, drag the mouse pointer from left to right within the Gantt bar. As you do so, note the **CompleteThrough** date value that appears in a ScreenTip.



Drag the mouse pointer within a task's Gantt bar to record progress

3. To see a task's progress details, point to the progress bar inside the Gantt bar.

Depending on the type of bar symbol you point to—in this case, the progress bar—a ScreenTip appears, providing information about that item



*Point to any Gantt bar to see the task's key progress values*

## Enter actual values for tasks

A more detailed way to keep your schedule up to date is to record what actually happened for each task in your plan. You can record each task's actual start, finish, work, and duration values. For example, when you enter three days of actual duration on a task with five days of scheduled duration and 40 hours of work, Project calculates the actual work to be 24 hours, the percent complete to be 60%, and the remaining duration to be two days. When you record actual duration, Project recalculates the task's essential schedule values such as percent complete and remaining duration.

GANTT CHART											
	Task Name	Act. Start	Act. Finish	% Comp	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work		
3	Complete author questionnaire	Tue 1/9/18	NA	60%	0%	3 days	2 days	\$0.00	24 hrs		
Name: Complete author questionnaire Duration: 5 days Effort driven: <input type="checkbox"/> Manually Scheduled: <input type="checkbox"/> Previous: <input type="button" value="Previous"/> Next: <input type="button" value="Next"/>											
Start:	Tue 1/9/18	Finish:	Mon 1/15/18	Task type:	Fixed Units	% Complete:	60%				
ID	Resource Name	Units	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work				
14	Toni Poe	100%	40h	0h	40h	24h	16h				

*The combination of the Tracking table in a Gantt chart view and the Task Form show how actual duration affects the task's schedule values*

When you enter various actual values, Project uses the following rules to update the plan:

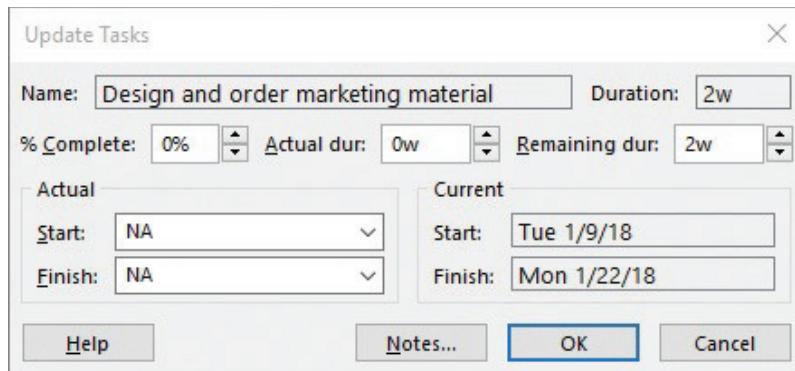
- When you enter a task's actual start date, Project moves the scheduled start date to match the actual start date.

- When you enter a task's actual finish date, Project moves the scheduled finish date to match the actual finish date and sets the task to 100 percent complete.
- When you enter a task's actual work value, Project recalculates the task's remaining work value, if any.
- When you enter a task's actual duration, if it is less than the scheduled duration, Project subtracts the actual duration from the scheduled duration to determine the remaining duration.
- When you enter a task's actual duration, if it is equal to the scheduled duration, Project sets the task to 100 percent complete.
- When you enter a task's actual duration, if it is longer than the scheduled duration, Project adjusts the scheduled duration to match the actual duration and sets the task to 100 percent complete.

Because your plan is updated with actuals, your plan as scheduled will likely change. The original plan as saved in a baseline is not altered, however.

Project supports multiple ways of recording actuals. Two we'll explore in this chapter are:

- Recording actuals in the Tracking table. This works well when you want to update actuals and see remaining duration and cost values in a single table.
- Recording actuals in the Update Tasks dialog box. This works well when you want to focus on a single task or want to update tasks in views that don't support tables, such as the Network Diagram view.



*Use the Update Tasks dialog box to record a task's actual duration, start, and other tracking values*

Here's one thing to pay attention to in the Update Tasks dialog box. When you enter a percent complete, actual duration, or remaining duration value, the other values are not dynamically updated in the dialog box. They are recalculated as soon as you click OK. If you then return to the dialog box, you'll see the updated values.

Let's look at an example of how values are handled in the Update Tasks dialog box. If you enter an initial actual duration of two days on a four-day task, the remaining duration field will still show four days. When you click OK and then open the Update Tasks dialog box again, the remaining duration field will now show two days of remaining duration. If you had entered two days of actual duration and four days of remaining duration, Project would record the task as having four days of remaining duration left and an overall

duration of six days rather than the original four.



### Tip

You can also apply all the tracking methods shown in this chapter to manually scheduled tasks. Additionally, you can record an actual start, actual finish, or remaining duration value for a manually scheduled task.

## Project management focus: Is the project on track?

Evaluating a project's status properly can be tricky. Consider the following issues:

- For many tasks, it is very difficult to evaluate a completion percentage. When is an engineer's design for a new motor assembly 50 percent complete? Or when is a programmer's code for a software module 50 percent complete? Reporting work in progress is, in many cases, a best-guess effort and inherently risky.
- The elapsed portion of a task's duration is not always equal to the amount of work accomplished. For example, a task might require relatively little effort initially, but it might require more work as time passes. (This is referred to as a *back-loaded task*.) When 50 percent of its duration elapses, far less than 50 percent of its total work will be completed. In fact, Project tracks both values: % Complete tracks the percentage of the task's *duration* that has been completed, whereas % Work Complete tracks the percentage of the task's *work* that has been completed.
- The resources assigned to a task might have different criteria for what constitutes the task's completion than the criteria determined by the project manager or the resources assigned to successor tasks. In other words, the team might lack a common definition of "done."

Good project planning and communication can help you avoid or mitigate these and other problems that arise in project execution. For example, developing proper task durations and status-reporting periods should help you identify tasks that have varied substantially from baseline values early enough to make adjustments. Having well-documented and well-communicated task-completion criteria should help prevent downstream surprises. Nevertheless, large, complex projects will almost always vary from the baseline.

## To record a task's actual values in the Tracking table

1. On the **View** tab, in the **Data** group, click **Tables** and then click **Tracking**.

The Tracking table appears.

2. Enter the actual values for the task.



## Tip

You can display whichever table is most relevant to the details you are focused on while tracking progress in a plan. Useful tables include the Work table, which focuses on work values, and the Cost table, which focuses on cost values.

### To record a task's actual values in the Update Tasks dialog box

1. In the **Task Name** column, select the task for which you want to record actual values.
2. On the **Task** tab, in the **Schedule** group, click the arrow to the right of **Mark on Track**, and then click **Update Tasks**.
3. In the **Update Tasks** dialog box, enter the task's actual values (actual duration, remaining duration, actual start, or actual finish).

### Skills review

In this chapter, you learned how to:

- Understand progress tracking
- [Save a baseline of your plan](#)
- [Track a plan as scheduled](#)
- [Enter a task's completion percentage](#)
- [Enter actual values for tasks](#)



### Practice tasks

The practice files for these tasks, SimpleTrackBaseline and SimpleTrackActuals, are located in the Project2016SBS\Ch08 folder.



### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Save a baseline of your plan

The scenario: At Lucerne Publishing, the new book launch plan is now fully developed. Actual work on the project will soon begin. To allow for later comparison of actual work and the current schedule with the original plan, you will first save a baseline. Open SimpleTrackBaseline, and then perform the following tasks:

1. Save the baseline for the entire plan; use the default baseline settings.
2. Switch to the Task Sheet view.
3. Display the **Variance** table to see scheduled and baseline values.

	Task Mode	Task Name	Start	Finish	Baseline Start	Baseline Finish	Start Var.	Finish Var.
0	▶	↳ New book launch	Mon 1/8/18	Tue 2/27/18	Mon 1/8/18	Tue 2/27/18	0 days	0 days
1	▶	↳ Planning Phase	Mon 1/8/18	Mon 1/22/18	Mon 1/8/18	Mon 1/22/18	0 days	0 days
2	▶	Assign launch team members	Mon 1/8/18	Mon 1/8/18	Mon 1/8/18	Mon 1/8/18	0 days	0 days
3	▶	Complete author questionnaire	Tue 1/9/18	Mon 1/15/18	Tue 1/9/18	Mon 1/15/18	0 days	0 days
4	▶	Schedule author interviews	Mon 1/8/18	Mon 1/15/18	Mon 1/8/18	Mon 1/15/18	0 days	0 days
5	▶	Design and order marketing material	Tue 1/9/18	Mon 1/22/18	Tue 1/9/18	Mon 1/22/18	0 days	0 days
6	▶	Planning committee meeting	Mon 1/22/18	Mon 1/22/18	Mon 1/22/18	Mon 1/22/18	0 days	0 days
7	▶	Internal Launch	Tue 1/23/18	Fri 2/9/18	Tue 1/23/18	Fri 2/9/18	0 days	0 days
8	▶	Kickoff booth setup	Tue 1/23/18	Tue 1/23/18	Tue 1/23/18	Tue 1/23/18	0 days	0 days

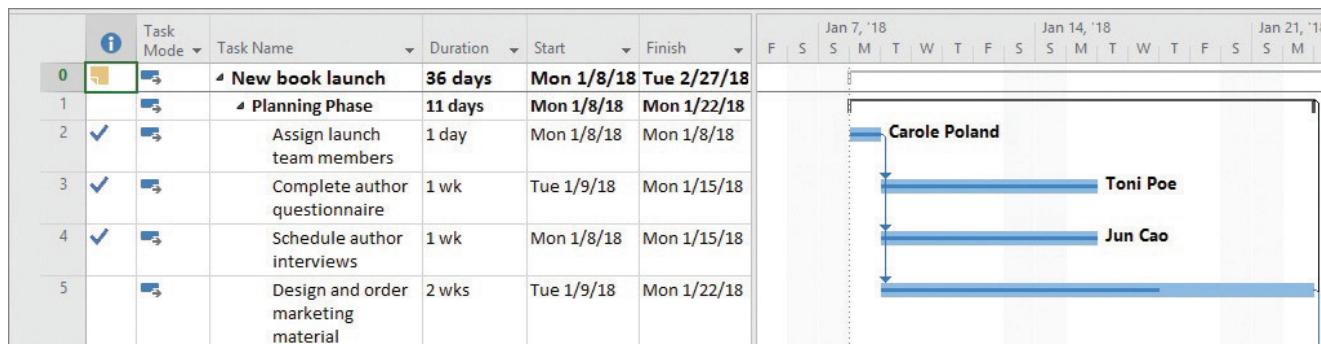
The scheduled dates in this plan match its baseline dates, so the variance values are zero

## Track a plan as scheduled

The scenario: Some time has passed since you saved the baseline in the new book launch plan. Work has been completed through the first week and a half, as planned. You need to account for the completed work in the plan. Open the SimpleTrackActuals plan, and then perform the following task:

1. Use the options in the **Update Project** dialog box to record that work has been completed as scheduled through January 17, 2018.

Project records the completion percentage for the tasks that were scheduled to start before January 17. It displays that progress by drawing progress bars in the Gantt bars for those tasks.



After you record progress through a specific date, Project displays the progress bars and, for completed tasks, the completion check marks in the Gantt Chart view

In the chart portion of the Gantt Chart view, the progress bar shows how much of each task has been completed. Because tasks 2, 3, and 4 have been completed, a check mark appears in the Indicators column for those tasks, and the progress bars extend through the full length of those tasks' Gantt bars. Task 5 is only partially completed, however.

## Enter a task's completion percentage

The scenario: Work continues on the new book launch. You have additional progress to record in the plan as percent complete values. Continuing in the SimpleTrackActuals plan, perform the following tasks:

1. Set the following tasks to 100 percent complete:

- 5, *Design and order marketing material*
- 6, *Planning complete!*
- 8, *Kickoff book launch meeting*

Project records the actual work for the tasks as scheduled and extends progress bars through the length of the Gantt bars.



*Recording 100 percent complete is a quick checklist way of recording that a task was completed as scheduled, with no variance*

Because task 6 is a milestone task with no duration, there is no change in the appearance of its symbol in the chart portion of the Gantt Chart view as there was for tasks 5 and 8. However, the completion check marks for all three tasks appear in the Indicators column.

2. Set task 9, *Prepare book P&L statement*, to 50 percent complete, and then point to its progress bar.



*Point to the progress bar in the partially completed task's Gantt bar to see its key progress indicators in a ScreenTip*

Note that although 50 percent of the work on task 9 is completed, the progress bar does not span 50 percent of the length of the Gantt bar. This is because Project measures duration in working time but draws the Gantt bars to extend over nonworking time, which in this case includes Thursday, January 25, a nonworking

day.

## Enter actual values for tasks

The scenario: A few more days have passed, and work on the new book launch has progressed. Resources performing the work have given you actual progress that differs somewhat from the plan, and you want to record these actuals and observe the effect on the overall plan. Continuing in the SimpleTrackActuals plan, perform the following tasks:

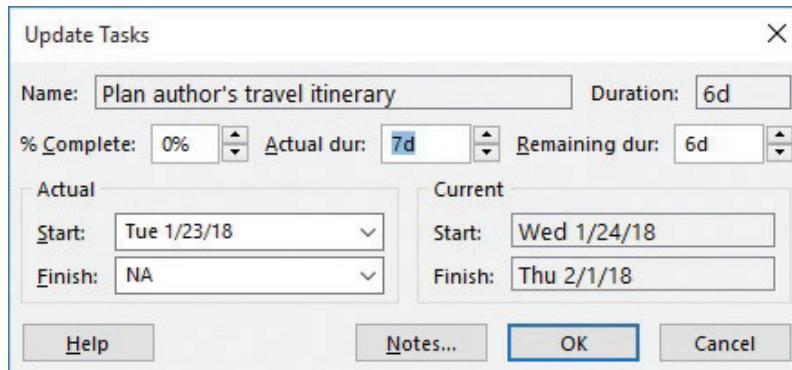
1. Use the **Tracking** table to record that task 9, *Prepare book P&L statement*, required a total of 24 hours of actual work to complete.

Because 24 hours is greater than its original duration of 16 hours, Project marks the task as completed and extends the Gantt bar of the task to indicate its longer duration.



When you record actual duration, the change highlighting is a great way to see what other changes in the plan the actuals introduced

2. Use the options in the **Update Tasks** dialog box to record that task 10, *Plan author's travel itinerary*, started one working day ahead of schedule (the Tuesday before its scheduled start date) and required a total of seven days to complete.



When recording actual duration, you should also record the actual start date if it differs from the scheduled start date

3. Click **OK**.

Project records the actual values for the task and marks it as complete. The updated values roll up to the *Internal Launch Phase* summary task (task 7) and the project summary task (task 0), as indicated by the change highlighting.

	Task Name	Act. Start	Act. Finish	% Comp.	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work	Jan 21, '18	Jan 28, '18								
										W	T	F	S	S	M	T	W	T	F
GANTT CHART	0 New book launch	Mon 1/8/18	NA	46%	0%	16.7 days	19.3 days	\$16,890.00	340 hrs										
	1 Planning Phase	Mon 1/8/18	Mon 1/22/18	100%	0%	11 days	0 days	\$11,900.00	248 hrs										
	2 Assign launch	Mon 1/8/18	Mon 1/8/18	100%	0%	1 day	0 days	\$420.00	8 hrs										
	3 Complete author	Tue 1/9/18	Mon 1/15/18	100%	0%	1 wk	0 wks	\$0.00	40 hrs										
	4 Schedule author	Mon 1/8/18	Mon 1/15/18	100%	0%	1 wk	0 wks	\$1,680.00	40 hrs										
	5 Design and order marketing	Tue 1/9/18	Mon 1/22/18	100%	0%	2 wks	0 wks	\$9,800.00	160 hrs										
	6 Planning complete!	Mon 1/22/18	Mon 1/22/18	100%	0%	0 days	0 days	\$0.00	0 hrs										
	7 Internal Launch Phase	Tue 1/23/18	NA	44%	0%	5.72 days	7.28 days	\$4,990.00	92 hrs										
	8 Kickoff book	Tue 1/23/18	Tue 1/23/18	100%	0%	1 day	0 days	\$650.00	12 hrs										
	9 Prepare book P&L	Wed 1/24/18	Mon 1/29/18	100%	0%	3 days	0 days	\$1,260.00	24 hrs										
10	Plan author's	Tue 1/23/18	Thu 2/1/18	100%	0%	7 days	0 days	\$3,080.00	56 hrs										

Actual values that you record at the task level roll up to the task's summary task and to the project summary task

#### 4. Use the options in the **Update Tasks** dialog box for task 11, *Channel Sales prep*.

This task started on time and has three days of actual duration but will still require five days of remaining duration to complete. (Remember to enter the new remaining duration value after entering the actual duration value.)

This gives the task a new total duration of eight days: three days actual duration plus five days remaining duration.

	Task Name	Act. Start	Act. Finish	% Comp.	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work	21, '18	Jan 28, '18	Feb 4, '18							
										M	T	W	F	S	S	M	T	W	F
7	Internal Launch Phase	Tue 1/23/18	NA	50%	0%	8 days	8 days	\$7,240.00	140 hrs										
8	Kickoff book	Tue 1/23/18	Tue 1/23/18	100%	0%	1 day	0 days	\$650.00	12 hrs										
9	Prepare book P&L	Wed 1/24/18	Mon 1/29/18	100%	0%	3 days	0 days	\$1,260.00	24 hrs										
10	Plan author's	Tue 1/23/18	Thu 2/1/18	100%	0%	7 days	0 days	\$3,080.00	56 hrs										
11	Channel Sales prep	Wed 1/24/18	NA	38%	0%	3 days	5 days	\$2,250.00	48 hrs										

Unless you record an actual start date, Project assumes the task started as scheduled

Because you did not specify an actual start date, Project assumes that the task started as scheduled. However, the actual duration and updated remaining duration value you entered caused Project to calculate a new finish date.

# It All Begins with a Baseline

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## In This Chapter

- ▶ Saving plan information with a baseline
  - ▶ Making use of multiple baselines
  - ▶ Setting and resetting baselines
  - ▶ Saving interim plans
- 

When you go on a diet (hasn't everyone?), you step on the scale the first day to record your starting weight. Then, as the diet progresses, you have a benchmark against which you can compare your dieting ups and downs.

Project lets you benchmark project data so that you can compare the actual activity that takes place on tasks against the original plan. This saved version of the plan data, or *baseline*, includes all information in the project, such as task timing, resource assignments, and costs.

The *interim plan* in Project is essentially a timing checklist. It includes the start and finish dates of tasks, and the estimated start and finish dates for tasks not yet started.

This chapter shows you when, why, and how to save a baseline and an interim plan for the project.

# All about Baselines

After you complete all the planning necessary to develop a robust schedule (and other documents) for a project, and after you've made the schedule presentable, it's time to baseline it. The *baseline* represents the project at the moment you consider the plan final and you're ready to commit to it before you begin any activity. The baseline, which is saved in the original Project file, exists alongside the progress you record on tasks in the project.

Key data that a baseline captures includes the baseline start, finish, duration, work, and cost information for each task. After you save a baseline and track activity against it, you can get baseline data and actual data, as well as visual indications of your progress.

You can use a baseline to debrief yourself or the team at any point in a project. The baseline is especially useful at the end of a phase, when you can compare actual progress against estimates from many weeks or months ago. You can then improve your planning skills and learn to make more accurate estimates up front. You can also use a baseline and the actual activity that you track against it to explain delays or cost overruns and to illustrate the impact of significant scope changes to employers or clients by using a wide variety of reports and printed views.



It's a good practice to revisit the baseline and estimates at the end of each phase of the project. If the project lasts longer than six months, however, you're missing out on an opportunity to learn as you go. Plus, you'll likely forget what you were thinking when you produced the original estimates.

Finally, you can also save and clear baselines for only selected tasks. If one task is thrown off track by a major change, for example, you can modify its estimates and leave the rest of the baseline alone.

## Saving a baseline

You can save a baseline at any time by opening the Set Baseline dialog box. After you save a baseline the first time, the baseline data of a summary task is updated if you make changes to a subtask below it, such as changing the start date for a task or deleting a task. However, when you're saving the baseline for only a selection of tasks, you can change that functionality by making a choice about how the baseline *rolls up*, or summarizes, data. You can choose to have modifications rolled up to all summary tasks or only from subtasks for any summary tasks you select. This second option works only if you've selected summary tasks and haven't selected their subtasks.

To use rolling wave planning, save a baseline for only selected tasks. In other words, perhaps you've sufficiently detailed the early tasks in the first phase or first month or two of a large project, and you're ready to commit to that part of the plan, but the latter detail still remains to be hammered out. Saving a baseline for earlier tasks allows you

and the team to get working on those tasks while allowing for the progressive detailing of later tasks down the line.

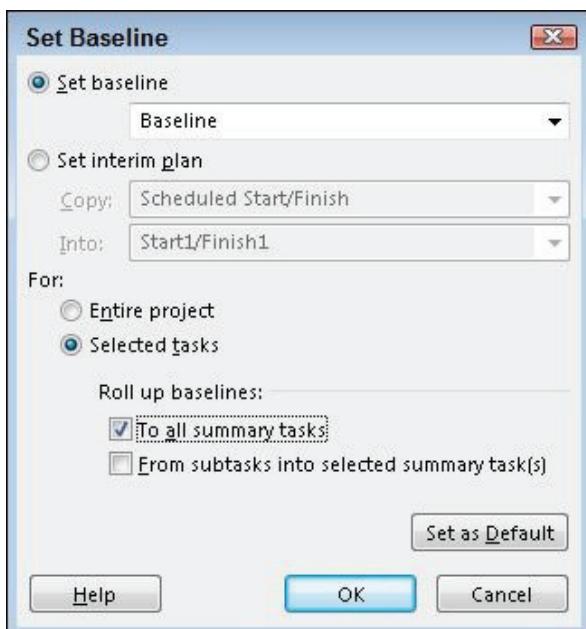
To save a baseline, follow these steps:

1. **To save a baseline for only certain tasks, select them by dragging over their task ID (row) numbers.**
2. **Click the Project tab, and in the Schedule group, click the Set Baseline drop-down arrow, and choose Set Baseline.**

The Set Baseline dialog box appears, with the Set Baseline option selected, as shown in [Figure 14-1](#).

3. **Select either the Entire Project or the Selected Tasks radio button.**
  4. **If you chose Selected Tasks in Step 3, make selections for how the baseline rolls up changes to task data.**
- You can summarize changed data in all summary tasks or for only selected summary tasks.

5. **Click the OK button to set the baseline.**



[Figure 14-1](#): Setting baselines and interim plans.

## **Saving more than one baseline**

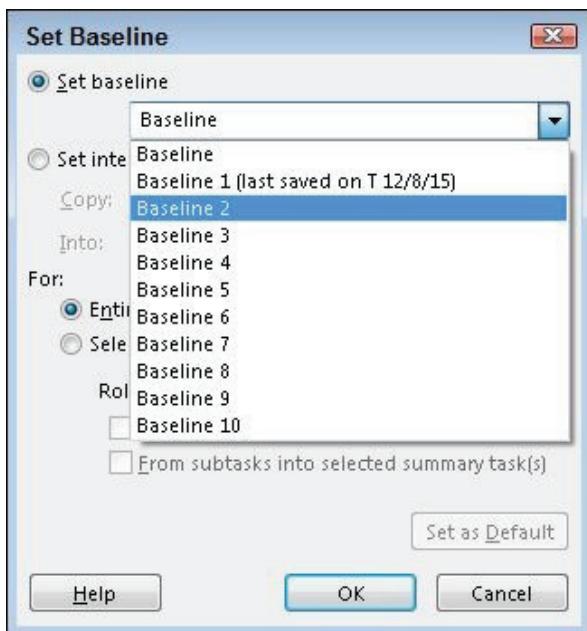
The concept of multiple baselines seems almost contrary to the definition of a baseline. After all, the purpose of a baseline is to set the proverbial stake in the sand and measure progress against it. You might keep multiple baselines for several purposes. Consider these reasons:

- ✓ **You have a baseline plan for a customer and another one for the internal team.**  
In other words, you might want to steer the team to a tighter deadline than the

promised delivery date.

- ✓ **You have multiple scenarios for the project.** Maybe you're unsure whether you'll need an extra widget for the gadget you're building. You can set one baseline that assumes the extra widget is unnecessary and set another baseline that assumes it's vital.
- ✓ **You're anticipating a risk event taking place.** You want to develop a recovery plan or response plan in one baseline version of the plan.
- ✓ **You're analyzing the effect of a change to the project schedule (or another element of the project plan) that affects the project or product scope.** You can set a different baseline to see the before-and-after effect of the change, though in this case you may prefer to reset the baseline. I discuss resetting the baseline in the later section "[Clearing and resetting a baseline](#)."

The Set Baseline dialog box includes a list of these baselines, with a date stamp of the last date each was saved, as shown in [Figure 14-2](#). When you save a baseline, you can save without overwriting an existing baseline by simply selecting another one of the baselines in this list before saving.



[Figure 14-2:](#) Multiple baseline options.

If you save multiple baselines or interim plans, you can view them by displaying columns in any sheet view for those plans. For example, if you want to display information for a baseline you saved with the name Baseline 7, you would insert the column named Baseline 7 into the Gantt Chart view sheet.

You can view multiple baselines at one time by going to View in the Task Ribbon, clicking to show the drop-down menu, selecting More Views, and then selecting Multiple Baselines Gantt. Then click Apply.



When calculating variances (whether the schedule is early or late or costs are over or under budget), Project uses only the first baseline that's saved (the one named Baseline, not Baseline1). If the project schedule and other parameters change dramatically, such as when a project is delayed and later revived, you produce more valid variance data by clearing and resetting the baseline, as described in the next section.



The more baselines you save, the larger the Project file becomes and the more it can slow performance.

## ***Clearing and resetting a baseline***

A baseline is intended to be a frozen picture of the project plan that remains sacrosanct and never changes. Well, that's the theory. In practice, events can make an original baseline less than useful — and even obsolete.

For example, if a project that spans four years from beginning to end, you may want to save a new baseline every year because costs increase or resources change. Then you can see incremental versions of the estimates that reflect the changes you made based on changes in the real world.

In contrast, a project that starts with a well-thought-out baseline plan can change a week later when the entire industry shuts down from a massive strike that lasts for three months. All original timing estimates then become bogus, so you would adjust the plan, save a new baseline, and move ahead after the strike is resolved.

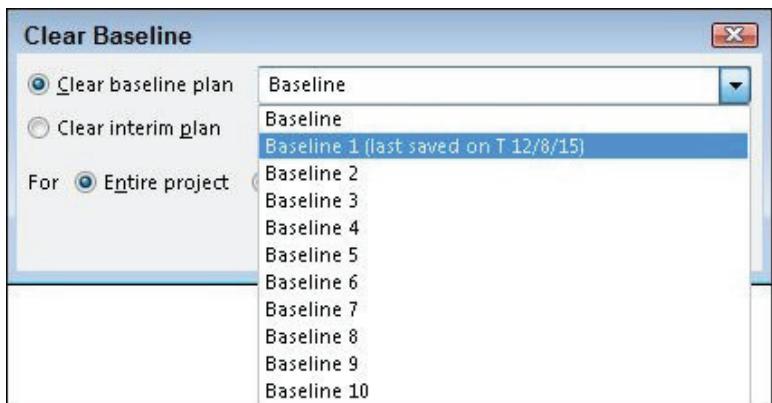
To clear an existing baseline, follow these steps:

1. **To clear the baseline for only certain tasks, select them.**
2. **Click the Project tab and, in the Schedule group, click the Set Baseline drop-down and choose Clear Baseline.**

The Clear Baseline dialog box appears, with the Clear Baseline Plan option selected by default.

3. **From the Clear Baseline Plan drop-down list, choose a baseline to clear, as shown in [Figure 14-3](#).**
4. **Select either the Entire Project radio button to clear the baseline for the entire project or the Selected Tasks radio button to clear selected tasks.**
5. **Click the OK button.**

The project baseline is cleared or selected tasks are cleared.



**Figure 14-3:** Clearing the baseline or the interim plan.

# In the Interim

An interim plan is sort of a “baseline light,” in which you save only the actual start and finish dates of tasks that have had activity tracked on them, as well as the baseline start and finish dates for all tasks that haven’t started.

An interim plan saves only timing information. If that’s all you need, all the data about resource assignments and costs, for example, aren’t saved. (When you save a large number of baselines, the Project file is *huge*. Saving an interim schedule makes the schedule less bulky.)

Because a baseline holds a great deal of data, the baseline can eventually become obsolete. An interim plan can be saved to record date changes but not overwrite the original baseline cost data.

Finally, you’re allowed to save as many as 11 baseline plans (the original baseline plus baselines 1–10). If you need more than 11, consider using interim and some baseline data to expand the number of sets of data you can save.



Don’t go crazy for baselines and interim plans. Even in a long-term project, saving too many sets of plans can become confusing. To keep track of a plan when you save it, print a copy for your records, and note when and why the plan was saved.

## Saving an interim plan

Interim plans and baselines are saved using the same dialog box. The difference is that you have to specify where the data in an interim plan originates. For example, if you want to save the start and finish dates from the Baseline2 plan to the third interim plan, you copy from Baseline2 to Start/Finish3. If you want the current scheduled start and finish dates for all tasks, choose to copy from Start/Finish.

If you want to change currently scheduled start and finish dates in a baseline, but you don’t want to change all the other data that’s typically saved in a baseline, you can copy from Start/Finish to the baseline plan that you want to change.

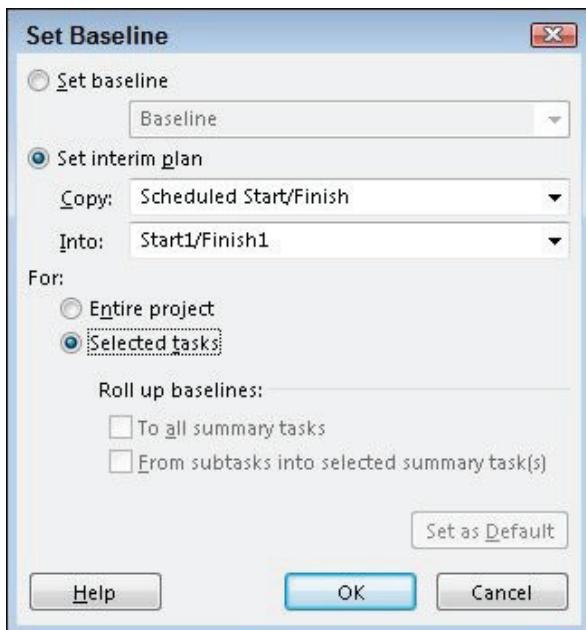
Follow these steps to save an interim plan:

1. **To save an interim plan for only certain tasks, select them.**
2. **Click the Project tab and, in the Schedule group, click the Set Baseline drop-down arrow, and choose Set Baseline.**

The Set Baseline dialog box appears.
3. **Select the Set Interim Plan radio button.**
4. **From the Copy drop-down list box, select the set of data that you want to copy**

to the interim plan.

5. From the Into drop-down list box, select the fields in which you want to store the interim plan data, as shown in [Figure 14-4](#).
6. Select the appropriate radio buttons to save the plan for the entire project or selected tasks.
7. If you choose to save the plan for selected tasks, use the check boxes to indicate how roll-up baseline options should work.
8. Click the OK button to save the plan.



[Figure 14-4:](#) Copy settings from any saved baseline to an interim plan.

By using the Copy and Into fields in the Set Baseline dialog box, you can save as many as ten interim plans based on either baseline or actual data.

## ***Clearing and resetting an interim plan***

Ten interim plans may seem like a lot when you're starting out in Project, but in the thick of a busy and ever-changing project, ten may fall short of the number you need. You may eventually need to clear one and resave it.

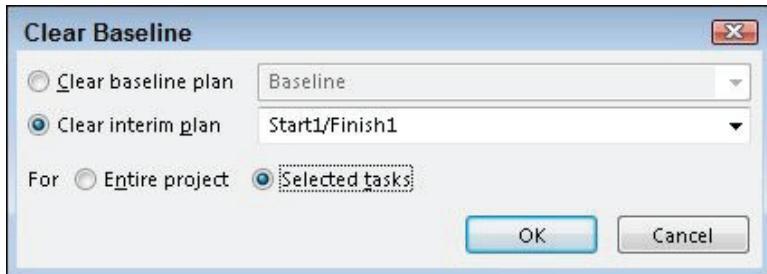
Project piggybacks baseline and interim plan settings, so you choose the Clear Baseline menu command to clear an interim plan.

To clear an interim plan, follow these steps:

1. To clear only certain tasks in an interim plan, select them.
2. Click the Project tab and, in the Schedule group, click the Set Baseline drop-down arrow, and choose Clear Baseline.

The Clear Baseline dialog box appears, as shown in [Figure 14-5](#). You can use it to clear and reset interim plans as often as you like.

3. Select the Clear Interim Plan option, and then, from the accompanying list, choose the plan that you want to clear.
4. Click to clear the specified interim plan for the entire project or for any tasks you've selected.
5. Click the OK button to clear the plan.

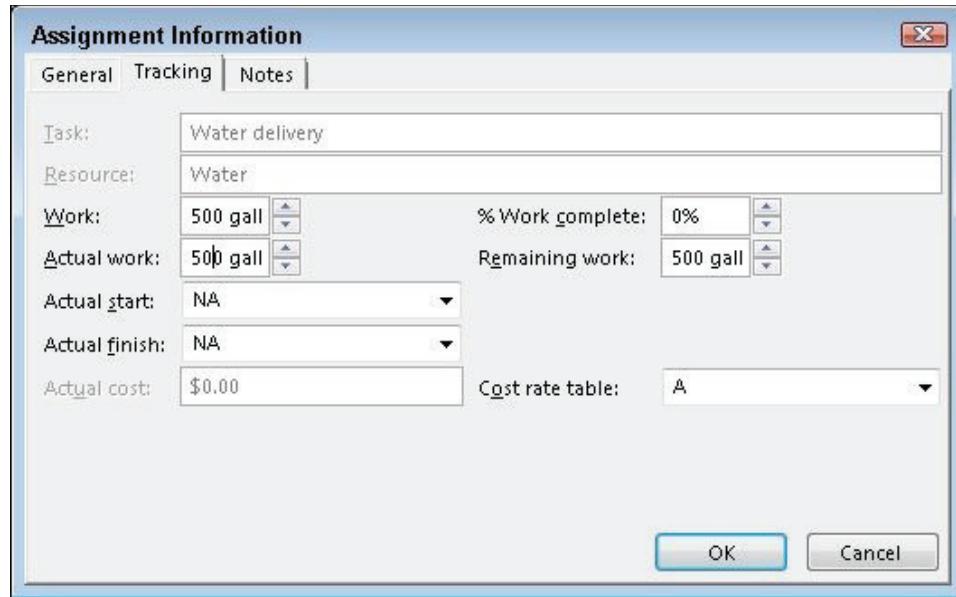


**Figure 14-5:** The Clear Baseline dialog box.

You can now save a new set of information to that interim plan, if you like.

You may want to save a backup copy of various versions of the file with interim and baseline data. If you clear a baseline or an interim plan, its data disappears forever.

# Staying on Track



Read about time-saving techniques at [www.dummies.com/extras/project2016](http://www.dummies.com/extras/project2016).

# On the Right Track

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## In This Chapter

- ▶ Planning communications
  - ▶ Using tracking tools
  - ▶ Recording actual activity on tasks
  - ▶ Specifying the amount of work complete
  - ▶ Updating fixed costs
  - ▶ Moving a task
  - ▶ Using Update Project to make changes to the big picture
  - ▶ Consolidating multiple projects
- 

After a project moves from the planning stage into action, it's a continually changing game that features rules, goals, a general time frame — and chaos.

Whether a task happens as planned or wanders off in an unexpected direction, your job after the planning stage is to record what is happening. In other words, you're *tracking* the progress. Tracking starts when team members report their progress on the project. Then you (or someone else assigned to tracking) record the progress of every task in Project.

When you track activity, you'll be amazed at the data Project returns to you. Some of it's good news, and some of it's bad, but all of it's useful in managing the project.

# **Developing a Communications Management Plan**

When you’re planning a project, consider what information you (or any other stakeholder) need to track, who has the information, how it will be delivered, and how often it needs to be updated. Frequently, this information is stored in a separate document known as the *communications management plan*. [Table 15-1](#) shows a simple example.

**Table 15-1** Communications Management Plan

Stakeholder	Information	Method	Frequency
Project manager	Status report	Email	Weekly
Team members	Project status	Meeting	Biweekly
Sponsor	Progress report	PowerPoint	Monthly

The communications management plan can be complex — or as simple as a Word table or an Excel spreadsheet. You enter the name or position of each stakeholder in the leftmost column, and then, across the top, enter the information that’s needed, its method, and frequency of delivery.

It isn’t rocket science, but you still have to determine up front which information you might want to track, when you might want it, and in which form.

## **Gathering data**

The first step in tracking progress on a project is to gather information about what’s been going on. The simpler it is to report progress on a project, the better, because people will *do* it. The more routine you can make the reporting — such as every Friday, on a specific form turned into the same person — the easier it is to gather data.

You can then input that information into Project in several ways: Use various views and tables to enter information in sheets of data, enter information in the Task Information dialog box, or use the tracking tools in the Schedule group of the Task tab on the Ribbon.

The amount of data you collect is determined by the information you need to track and the level of detail. For example, some people use Project only to create a timeline for their activities. Others use resources and track their total work on tasks, just not to the level of detail that scrutinizes hourly work performed. For some people, simply marking one task 50% complete and another 100% complete — and letting Project assume that all resources completed their estimated amounts of work — is fine.

## **Applying a tracking method**

You have to identify the best tracking method for you, which is determined by the amount and type of information you need to monitor. Microsoft provides four tracking methods in Project 2016:

- ✓ Task – total
- ✓ Task – time phased
- ✓ Assignment – total
- ✓ Assignment – time phased

I guide you throughout the rest of this chapter, but you can begin to understand these methods by comparing task tracking and assignment tracking. You can track information by *task*, indicating to the present time (or a status date you select) the total work completed or costs for the task. Or you can track information by *assignment*, which is a more detailed tracking that shows you the total work completed or costs by each resource.

Suppose that the Test Electrical Components task is estimated to take 12 hours of work, according to the project baseline. An Engineer, Electrician, and Assistant — three human resources — are assigned at 100% of their time. Tracking by *task – total*, you can simply note that the task is 75% complete, which translates into nine hours of work finished.

Project assumes that the three resources split the work equally — three hours for each resource. In reality, however, the Engineer spent one hour, the Electrician spent six, and the Assistant spent two. Therefore, the *time phased* variable enters the picture. Time-phased tracking uses specific time increments, whether you choose to track work by task or work completed by individual resources on the task.

So in the Test Electrical Components task, you can use the *task – time phased* approach to track the nine hours on a daily basis. Or you can use the *assignment – time phased* approach to track each resource's work, hourly or daily.



If the project or organization doesn't require detailed assignment or time-phased tracking, you're better off using the *task – total* method. Then you can spend less time entering information into Project and more time managing the team and the stakeholders.

## Using the tracking tools

Sometimes, it seems that Project provides a handy button for everything you need to do on a project, so why should tracking be any different? The tracking tools at the top of the Schedule group on the Task tab perform updates on selected tasks in any sheet view. [Figure 15-1](#) shows the tracking tools. The five on the left are the percent complete buttons, and the button on the right allows you to mark on track or update

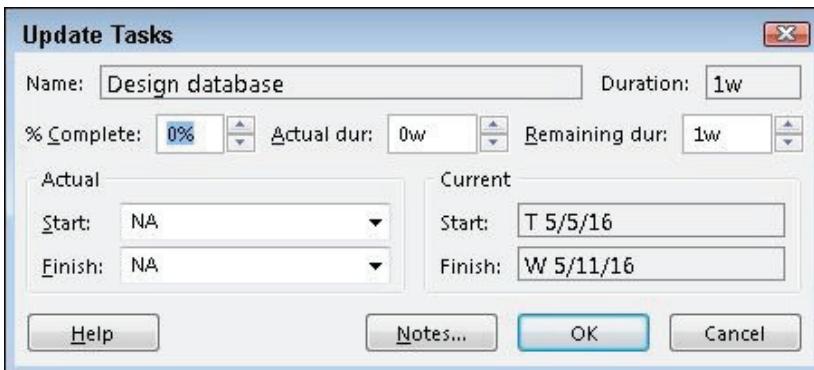
tasks.



**Figure 15-1:** The tracking buttons.

These tools make specific updates to selected tasks:

- ✓ **Percent Complete:** Click this tool to quickly mark a task's progress using a calculation of the percentage (from 0% to 100%) of hours of work completed.
- ✓ **Mark on Track:** Selecting a task and clicking this tool records activity automatically to the status date as you scheduled it in the baseline. (See the later section "[Specifying the status date](#)" to set a status date.)
- ✓ **Update Tasks:** To display a dialog box that contains tracking information about the progress, duration, start, and finish dates, find this tool on the menu that opens when you click the down arrow on the Mark on Track button. For example, you can indicate whether a task's actual start date varied from its current start date. [Figure 15-2](#) shows the Update Tasks dialog box.



**Figure 15-2:** The Update Tasks dialog box.

You can use a few more tools, found elsewhere in Project, to track and illustrate progress:

- ✓ **Update Project:** Mark all tasks in a project as complete to a specific status date. You can also use this tool to reschedule uncompleted work. The section "[Update Project: Sweeping Changes](#)," later in this chapter, explains how to perform overall updates.
- ✓ **Move Task:** Reschedule all or part of a selected task. You can use this tool, found in the Tasks group on the Task tab on the Ribbon, to move a task forward or backward or to reschedule parts of it by the status date. The "[Moving a Task](#)" section, later in this chapter, explains how to use this tool.
- ✓ **Add Progress Line:** Turn on a type of drawing tool. On the Format tab, in the Format group, choose Gridlines. Click the down arrow and select Progress Lines. A dialog box appears so that you can, at particular dates, set up *progress lines*: They

indicate which tasks are ahead of or behind schedule by way of a vertical line that connects in-progress tasks.

## For everything, there's a view

You may already know that Project has a view for everything you want to do. For example, you can use Task Sheet view and Task Usage view (as shown in [Figures 15-3](#) and [15-4](#), respectively) to easily update either task or resource information. So many variations are available that you may believe Microsoft charges by the view.

	Task Name	Predecessors	Duration	Start	Finish	% Complete	Resource Names
24	▪ Registration		64 days	T 4/28/16	T 7/26/16	0%	
25	▪ Database		25 days	T 4/28/16	W 6/1/16	0%	
26	Collect database requirements	15	1 wk	T 4/28/16	W 5/4/16	0%	Dion Anthony
27	Design database	26	1 wk	T 5/5/16	W 5/11/16	0%	Dion Anthony
28	Develop database	27	1 wk	T 5/12/16	W 5/18/16	0%	Dion Anthony
29	Test database	28	1 wk	T 5/19/16	W 5/25/16	0%	Dion Anthony
30	User acceptance	29	1 wk	T 5/26/16	W 6/1/16	0%	Bonnie Rush
31	▪ User Interface		27 days	T 6/2/16	F 7/8/16	0%	
32	Collect user interface requirements	30	1 wk	T 6/2/16	W 6/8/16	0%	Ally Mac
33	Design user interface	32	2 wks	T 6/9/16	W 6/22/16	0%	Ally Mac
34	Develop user interface	33	1 wk	T 6/23/16	W 6/29/16	0%	Ally Mac
35	Test user interface	34	3 days	T 6/30/16	M 7/4/16	0%	Ally Mac
36	User acceptance	35	4 days	T 7/5/16	F 7/8/16	0%	Bonnie Rush
37	▪ Payment		12 days	M 7/11/16	T 7/26/16	0%	
38	Collect payment requirements	36	2 days	M 7/11/16	T 7/12/16	0%	Julie Moore
39	Design payment function	38	2 days	W 7/13/16	T 7/14/16	0%	Julie Moore
40	Develop payment function	39	1 wk	F 7/15/16	T 7/21/16	0%	Julie Moore
41	Test payment function	40	2 days	F 7/22/16	M 7/25/16	0%	Julie Moore
42	User acceptance	41	1 day	T 7/26/16	T 7/26/16	0%	Bonnie Rush

[Figure 15-3:](#) Task Sheet view.

	Task Mode	Task Name	Work	Duration	Start	Finish	Add New Column
24	▪ Registration		512 hrs	64 days	T 4/28/16	T 7/26/16	
25	▪ Database		200 hrs	25 days	T 4/28/16	W 6/1/16	
26	Collect database requirements	Dion Anthony	40 hrs	1 wk	T 4/28/16	W 5/4/16	
27	Design database	Dion Anthony	40 hrs	1 wk	T 5/5/16	W 5/11/16	
28	Develop database	Dion Anthony	40 hrs	1 wk	T 5/12/16	W 5/18/16	
29	Test database	Dion Anthony	40 hrs	1 wk	T 5/19/16	W 5/25/16	
30	User acceptance	Bonnie Rush	40 hrs	1 wk	T 5/26/16	W 6/1/16	

[Figure 15-4:](#) Task Usage view.



When tracking using the Task Sheet view, I insert a column that shows % complete. To insert the column, simply right-click a column head and choose Insert Column ⇒ Select % Complete.

Depending on the tracking method you need (see the section “[Applying a tracking method](#),” earlier in this chapter), different views serve different purposes. [Table 15-2](#) specifies the best view to use for each tracking method.

**Table 15-2** Tracking Views

<i>Tracking Method</i>	<i>Best View</i>	<i>Table or Column That's Displayed</i>
Task	Task Sheet	Tracking table
Task – time phased	Task Usage	Actual Work row
Assignment	Task Usage	Tracking table
Assignment – time phased	Task Usage	Actual Work row

When you find the appropriate view with the correct columns displayed, entering tracking information is as simple as typing a number of hours, a dollar amount for fixed costs, or a start or finish date in the appropriate column for the task you’re updating.

# **Tracking Work for the Record**

To track progress on a project, you enter several types of information. First, you tell Project as of when you want to track progress: By default, it records information as of the current date based on your computer's date-and-time settings. However, if you want to record progress as of, say, the end of the company's quarter, you can do that, too.

You can record the actual start and finish dates of a task, the percent complete (for example, 75% complete), and the actual work performed (the number of hours that resources spent on each task). If you believe that the task will take less or more time than you anticipated, based on progress to date, you can modify the remaining duration of the task. You can also enter units of materials used and fixed-cost information for expenditures incurred, such as equipment rental or consulting fees.

## **Specifying the status date**

If you don't know the day of the week, you can't very well gauge whether you're making headway on the week's work. Tracking is like that: First, establish the *status date*, or the date as of which you're tracking progress.

By default, Project uses the date-and-time setting on your computer as the date for entering actual activity information. However, sometimes you want to time-travel. Suppose that the boss asks for a report showing the status of the project as of the last day of the quarter, December 31. You've gathered time sheets from all resources through that date, but you didn't enter those updates into Project until three days after the quarter ended. You can set the status date in Project to December 31 and then enter the tracking data. Even better, certain automated tracking tools work along with the status date. For example, if you know that all tasks in the project were on schedule as of the status date, use the Update Project tool to mark all scheduled work as complete up to that date.

After you set the status date and enter information, Project uses that date to calculate *earned value*, which is the value of work completed to date. Also, any task-complete or percent-complete information records as of that date and progress lines in the chart area reflect that timing. Any reports or printouts of views that you generate paint a picture of the status of the project as of that date.

Here's how to set the status date:

- 1. Select the Project tab and then click the calendar in the Status group of the tab.**

A Status Date window will appear.
- 2. Click the down arrow to display the calendar.**
- 3. If you want to set the status date in another month, click the right or left arrow in the upper-right corner of the calendar to navigate to that month.**

4. Click the date you want.

5. Click the OK button.

Now you're ready to start entering tracking data.

## ***Remaining on track***

When you're determining the project status, and you find that a task was, or will be, on schedule as of the status date, you can use a tool to mark the task as partially complete through the status date. Project assumes an even distribution of work over time and calculates the percentage complete as of the status date. It then marks the percent complete accordingly. To use this tool, simply select tasks to update and click the Mark on Track button in the Schedule group on the Task tab.

## ***Determining the percent complete***

When I'm asked how to determine whether a task is 25%, 50%, or even 36.5% complete, I usually refer people to their own intuition. If the boss asks you how that report is coming along, you typically make a quick, internal calculation and supply a rough estimate. A rough estimate, based on your experience and the information your resources provide about their progress, is often good enough.

You can also calculate the percent complete in more precise ways. For example, if you estimate that a task should take ten hours of effort, and your resources report performing five hours of effort, you can say that the task is 50% complete. Be careful, though: Just because people have spent half the allocated time doesn't mean that they have accomplished half the work.

Cost is another way to estimate the percent complete: If you originally estimated that four resources assigned to a four-day task would tally \$4,000 in costs, and the total time that the resources report spending on the task is \$3,000, you can *guess* that the task is 75% finished. But again, just because you've spent three quarters of the money doesn't mean that you've accomplished three quarters of what you set out to do.

Determining the percentage of work that's done is easier when the deliverable is measurable. For example, if your task is to produce 100 cars on the assembly line in four days, and you've produced 25 cars, the task may be about 25% finished. Or if you were supposed to install software on ten computers in a computer lab, and the installation is complete on five of them, that's an easy 50% estimate.

But not every task can be calculated as neatly. If you know it'll be hard to gauge the percent complete when you're in the planning phase, collaborate with the team member on the interim measurements to allocate 25%, 50%, 75%, and 100% complete. For example, if you want to determine interim measurements for the three-week task Develop Medical Protocols, you might agree that when a complete list of protocols is needed and they've been assigned to development, the task is 25% complete. When 50% are drafted, the task is 50% complete. When the protocols are 100% drafted, the

task is 75% complete. When the list has been edited and someone in charge has signed off on it and approved it, the task is 100% complete.



To avoid finding out (usually, at the last minute) that a team member's version of "almost complete" is significantly different from yours, agree up front that you'll sign off on 75% complete only after specific criteria are met.

## Don't let tracking become too detailed

Does it make sense to track 2.25% of progress every other day on a two-month task? Probably not. Except on the longest tasks, entering a percent complete that's more specific than 25, 50, 75, or 100 probably isn't worth the trouble. That's partly because multiweek tasks can often be divided into subtasks for ease of tracking and partly because reporting is one purpose of tracking. If your boss or board of directors or client couldn't care less about reaching exactly 33.75% complete, you shouldn't care, either.

On the other hand, if the project must include (for a reason known only to you) a six-month task and you can't break it into subtasks, you may use percentages such as 10, 20, 30, 40, 50, and so on to prevent having to wait a month between updates with (apparently) no progress to show.

Here's the simplest and quickest way to update the percent complete on a task: Click the task name to select it in any task-related view and then click the 0%, 25%, 50%, 75%, or 100% button on the Task tab. Alternatively, you can double-click any task to open the Task Information dialog box and then enter the Percent Complete value on the General tab there. You can also select a task, open the Mark on Track drop-down list, and click Update Tasks to open the Update Tasks dialog box and make the change there. If you want to enter a percentage in increments other than 25%, you'll have to enter it in the Task Information or Update Tasks dialog box or the % Complete column in any sheet view.

## Recording start and finish information

If you note that a task is complete, and you don't enter the actual start date, Project (ever the optimist) assumes that you started on time. If you didn't start on time, and you want to reflect the actual timing, modify the actual start date; if you finished late, enter the actual finish date. However, if you don't modify the task duration, and you enter an earlier finish date, be aware that the start date is calculated to have occurred earlier.

You have two options to track this information:

- ✓ **Use the Update Tasks dialog box.** To open it (refer to [Figure 15-2](#)), click the Mark on Track button in the Schedule group on the Task tab.
- ✓ **Display a sheet view with Actual Start and Actual Finish columns (such as Tracking Gantt or Gantt Chart view) with the Tracking table displayed.** Then use the drop-down calendar in the Actual Start or Actual Finish column to specify a date. If you need to change the actual start date, you must mark the task as partially complete first. When you need to change both the Actual Start and Actual Finish dates, mark the task as 100% complete before specifying the dates.



A few conditions can cause a warning message to appear when you enter an actual start date or finish date — for example, when the actual start date precedes the start date of the project or when the actual start date causes a conflict with a dependent task. When this warning message appears, you have these options:

- ✓ Cancel the operation.
- ✓ Allow the conflict to exist (or the task to start) before the project starts.

To cancel the change, correct the problem (for example, by modifying the project start date), and then go back and enter the actual information. Or you can force the conflict and let it stand.

## ***Knowing what to do when John works three hours and Mary works ten***

To get to the blow-by-blow level of tracking, you record exactly how many hours each resource spends on tasks. This process can be about as much fun as typing all the names in the New York City phone book into a database, but it has certain benefits: After you track the number of actual hours, you can produce tallies of the total hours each resource invests in the project by day, week, or month. If you have to bill clients based on resource hours (for example, contract work by the hour), you have a clear record to refer to. If you're tracking a budget in detail, multiplying resource hours by their individual rates provides an accurate accounting of costs as finely as computing them day by day.

If you don't enter specific hours, Project simply calculates the hours of work completed on the task as a percentage of the total hours assigned. It assumes that every person assigned to the task has completed the same percentage of work. For many people, this strategy works well; other people need more detail. If you're in the detail camp, specify actual resource hours as a total by task or day by day through the life of each task.

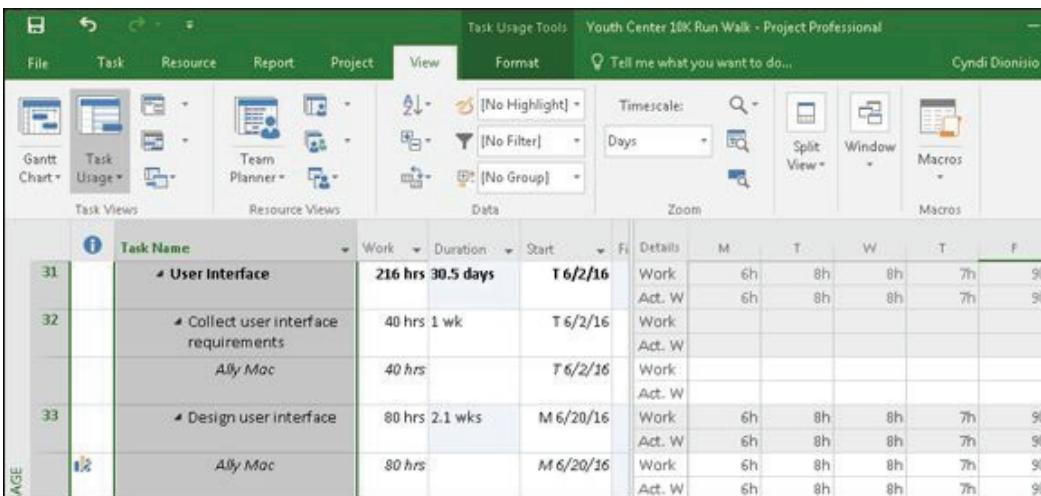
To enter resource hours, follow these steps:

- 1. Display Task Usage view.**
- 2. Scroll down to locate the task that you want to track and its resource assignments.**

Each assigned resource is listed on a separate row underneath the task name.

- 3. Enter the number of hours completed by the resource:**

- *To enter only total hours:* Insert the Actual Work column into the sheet by right-clicking a column, choosing Insert Column, and selecting the Actual Work column. Enter total hours in the newly displayed column.
- *To enter hours on the task day by day:* Right-click the chart pane and then choose Actual Work to display the row labeled Act. Work. [Figure 15-5](#) shows this row in Task Usage view with actual values entered. Click the Act. Work cell on a day on which the resource worked, and enter a number. Repeat this step for every day that the resource worked on the task.



**Figure 15-5:** Track resource activity day by day in this view.

If the hours you enter for a resource total more or less than the baseline estimate for that resource on that task, here's what happens:

- ✓ When you enter an amount in the Act. Work row and press Enter, the Actual Work column total recalculates to reflect the total number of hours worked on that task.
- ✓ A little pencil symbol appears in the ID column for that task, indicating that the assignment has been edited.
- ✓ A Person icon appears in the Indicators column to the left of the task name, indicating a resource overallocation.

You can change the entries in the Work column or the time-phased work row for a task or an assignment. If you do so, Project changes the task schedule accordingly. Then, if you mark actual work, it's tracked compared with the edited working hours.



To easily look up the total hours spent by each resource on the project, check the summary number of work hours listed next to the resource in the Resource Name column in Resource Usage view. This view is another handy way to track assignments.

## Uh-oh — we're in overtime

When you enter 16 hours of work in a single day for a resource, even though the resource's availability is based on a calendar with an 8-hour day, Project doesn't recognize those hours as overtime. It's one instance of having to lead Project by the hand and tell it to specify overtime work.

When you enter hours in the Overtime Work field, Project interprets them as the number of total work hours that are overtime hours. So if you enter **16** hours of work on a task in the Work column and then enter **4** in the Overtime Work column, Project assumes 12 hours of work at the standard resource rate and 4 hours at the overtime rate.

To enter overtime hours, follow these steps:

1. **Display Resource Usage view.**
2. **Right-click a column heading and choose Insert Column.**  
The list of columns appears.
3. **Select Overtime Work in the list.**
4. **Click in the Overtime Work column for a specific assignment for a resource and then click the spinner arrows to specify the overtime hours.**

[Figure 15-6](#) shows that you have allocated two hours of overtime for Dion Anthony.

The screenshot shows the Microsoft Project application window. The ribbon tabs at the top are File, Task, Resource, Report, Project, View, Format, and a search bar. Below the ribbon, there are buttons for Team Planner, Assign Resources, Resource Pool, Add Resources, Information, Notes, Details, Level Selection, Level Resource, Level All, Clear Leveling, and Next Overallocation. The main area displays a table titled 'Resource Usage' with columns for Resource Name, Overtime Work, Work, Details, and a weekly grid (M, T, W, T, F). A row for Dion Anthony has three tasks: 'Develop registration plan' (0 hrs, 40 hrs), 'Collect database requirements' (2 hrs, 40 hrs), and 'Design database' (0 hrs, 40 hrs). The 'Collect database requirements' task has '2 hrs' highlighted in blue with a small spinner icon to its right.

	Resource Name	Overtime Work	Work	Details	M	T	W	T	F
3	Dion Anthony	0 hrs	280 hr	Work					
	Develop registration plan	0 hrs	40 hr	Work					
	Collect database requirements	2 hrs	40 hr	Work					
	Design database	0 hrs	40 hr	Work					
	Develop database	0 hrs	40 hr	Work					

[Figure 15-6](#): Assigning overtime.

If you specify overtime, Project assumes that effort-driven tasks have a shorter duration. After all, if the task were to take three 8-hour days (24 hours of work) to complete, and you recorded the resource working 12 hours for two days in a row, Project figures that all the effort was accomplished in less time. The duration of the task *shrinks*. If that's not what happened, you have to manually modify the task duration.

## ***Specifying remaining durations for auto-scheduled tasks***

Tracking information for auto-scheduled tasks has a weird and wonderful relationship in Project. For example, Project tries to help you by calculating the duration based on other entries you make, such as actual start dates and finish dates. In that particular case, Project calculates task duration according to those dates. (This process works in reverse, too: If you enter the task duration, Project recalculates the finish date to reflect it.)

You may instead want to enter the duration yourself. For example, if you have entered a start date and 20 hours of work on a task that has a baseline of 16 hours of work, Project can't comprehend that the scope of the task has changed, and that now the task is incomplete and requires another 20 hours of work. You have to tell Project about it.

To modify the duration of a task either in progress or completed, follow these steps:

1. Display Gantt Chart view.
  2. Click View, and in the Data group, click Tables and then click Tracking.
- The Tracking table is displayed, as shown in [Figure 15-7](#).
3. Click in the Actual Duration column of the task you want to modify and then use the arrows to adjust the actual duration up or down.
  4. If you want to enter a remaining duration, click in the Rem. Dur. (Remaining Duration) column, and type a number and an increment symbol.

For example, you may type **25d** (where **d** is the increment symbol for days). If the remaining duration is greater than the original estimate and the task is on the critical path, Project warns you that the task is linked to a task constraint or linked to a task that can't move. You can either continue and allow the scheduling conflict or cancel and allow the scheduling conflict.

	Task Name	Act. Start	Act. Finish	% Comp.	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work
24	▪ Registration	T 4/28/16	NA	79%	0%	1.64 days	3.36 days	\$29,400.00	468 hrs
25	▪ Database	T 4/28/16	W 6/1/16	100%	0%	25 days	0 days	\$14,400.00	200 hrs
26	Collect database requirements	T 4/28/16	W 5/4/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
27	Design database	T 5/5/16	W 5/11/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
28	Develop database	T 5/12/16	W 5/18/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
29	Test database	T 5/19/16	W 5/25/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
30	User acceptance	T 5/26/16	W 6/1/16	100%	0%	1 wk	0 wks	\$4,000.00	40 hrs
31	▪ User Interface	T 6/2/16	T 7/14/16	100%	0%	1.25 days	0 days	\$12,400.00	216 hrs
32	Collect user interface requirements	T 6/2/16	W 6/8/16	100%	0%	1 wk	0 wks	\$2,000.00	40 hrs
33	Design user interface	M 6/20/16	M 7/4/16	100%	0%	2.05 wks	0 wks	\$4,000.00	80 hrs
34	Develop user interface	M 7/4/16	M 7/11/16	100%	0%	1 wk	0 wks	\$2,000.00	40 hrs
35	Test user interface	M 7/11/16	T 7/14/16	100%	0%	3 days	0 days	\$1,200.00	24 hrs
36	User acceptance	T 7/5/16	F 7/8/16	100%	0%	4 days	0 days	\$3,200.00	32 hrs
37	▪ Payment	M 7/11/16	NA	54%	0%	6.5 days	5.5 days	\$2,600.00	52 hrs
38	Collect payment requirements	M 7/11/16	T 7/12/16	100%	0%	2 days	0 days	\$800.00	16 hrs
39	Design payment function	W 7/13/16	T 7/14/16	100%	0%	2 days	0 days	\$800.00	16 hrs
40	Develop payment function	F 7/15/16	NA	50%	0%	0.5 wks	0.5 wks	\$1,000.00	20 hrs
41	Test payment function	NA	NA	0%	0%	0 days	2 days	\$0.00	0 hrs
42	User acceptance	NA	NA	0%	0%	0 days	1 day	\$0.00	0 hrs

[Figure 15-7:](#) Gantt Chart, with Tracking table.



If you enter the percent complete for a task and then modify the duration to differ from the baseline, Project automatically recalculates the percent complete to reflect the new duration. For example, if you enter 50% complete on a 10-hour task and then modify the actual duration to 20 hours, Project considers those 5 hours (50% of 10 hours) being only 25% of the 20 hours.

## Entering fixed-cost updates

*Fixed costs* are costs that aren't influenced by time, such as equipment purchases and consulting fees. Compared with the calculations and interactions of the percent

completes and the start and finish dates for hourly resources, fixed-cost tracking will seem like simplicity itself!

Here's how to track fixed costs:

- 1. Display Gantt Chart view.**

- 2. Click View, and in the Data group, click Tables and click Cost.**

The Cost table is displayed.

- 3. Click in the Fixed Cost column for the task you want to update.**

- 4. Type the fixed cost, or a total of several fixed costs, for the task.**

That's it! However, because Project lets you enter only one fixed-cost amount per task, consider adding a note to the task to itemize the costs you've included in the total.



The fixed cost assigned to the task is only the scheduled cost for the task. For this cost to become the planned cost, the task has to be baselined. Also, updates to the % Complete column update actual costs, depending on the accrual method that's selected for the task: Prorated is the default setting, but the start and finish dates of the task also influence the actual costs when the percent complete is applied.



Consider using some of the ten customizable Cost columns for itemized fixed-cost entry. Rename one Equipment Purchase, and another Facility Rental, for example, and then enter the costs in those columns. Of course, these columns of data may not perform calculations such as rolling up total costs to the summary tasks in the project, but they serve as reminders about itemized fixed costs.



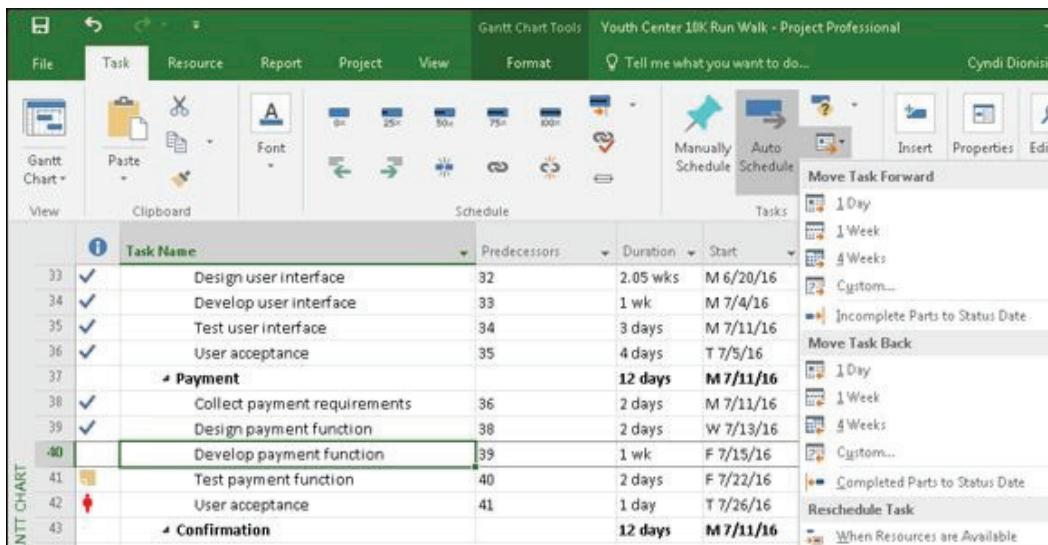
In Project 2016, you can designate a resource type as a cost and assign a cost every time you assign the resource. The Cost column calculation of total cost includes the amount spent for cost resources on tasks. See [Chapter 7](#) for more about resource types.

# Moving a Task

If you've ever managed the subcontractors on any type of construction project, you've probably heard these dreaded words: "My current job is running long, so I'll get to your job in about a week." What you'd rather hear from a subcontractor (or any other type of resource) is this: "My schedule opened up, so I can start work on this assignment a week early." Project helps you easily reschedule an entire task or reschedule part of a task as of the status date.

Here's how to use the Move Task tool to move a task:

1. **Display Gantt Chart view.**
  2. **If the task is partially complete and you want to move its uncompleted portion, select the Project tab. In the Status group, choose the Status Date drop-down and set a status date.**
  3. **Select the task to move.**
  4. **Click the Move button in the Tasks group on the Task tab.**
- The choices for rescheduling the task appear, as shown in [Figure 15-8](#).
5. **Specify how to move the task:**
    - *To move the task forward or back by a default amount:* Click 1 Day, 1 Week, or 4 Weeks in either the Move Task Forward or Move Task Back section.
    - *To move the task by a custom time frame:* Click the appropriate Custom option, specify the number of working days by which to move the task in the dialog box that appears, and click the OK button.
    - *To reschedule part of the task according to the status date:* Choose the Incomplete Parts to Status Date option to split the task and move the uncompleted portion to resume later, starting on the status date. Choose the Completed Parts to Status Date option to split the task and move the completed portion earlier, before the status date.
    - *To reschedule the task based on the availability of the assigned resources:* Choose the appropriate Custom option, specify the number of working days by which to move the task in the dialog box that appears, and click OK.



**Figure 15-8:** Moving a task.

When you're moving a task that's auto-scheduled, a constraint is applied, to honor the newly scheduled task. Be aware that constraints apply restrictions to task scheduling and can make it challenging to manage the dates.

# **Update Project: Sweeping Changes**

If it's been a while since you tracked activity, and you want to update the schedule, Update Project may be for you. This feature lets you track chunks of activity for specified periods. Update Project works best, however, if most tasks have been completed on schedule.

This type of tracking isn't finely tuned: It's similar to recording in your checkbook the balance that the bank sends in your mailed statement rather than accounting for your balance check by check. Doing so assumes that all your checks and deposits align with the bank's version as of that date; therefore, going forward, you're back on track.

Here are the settings options that Update Project offers you:

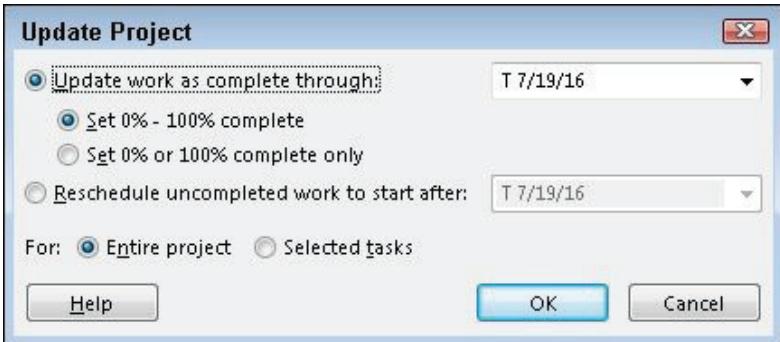
- ✓ **Update Work As Complete Through:** You can update the project in one of two ways through the status date you specify in this box. The Set 0% – 100% Complete setting lets Project calculate the percent complete on every task that should have begun by that time. By choosing this option, you tell Project to assume that the tasks started and progressed exactly on time. The Set 0% or 100% Complete Only setting works a little differently: It tells Project to record 100% complete on tasks that the baseline indicated would be complete by now and to leave all other tasks at 0% complete.
- ✓ **Reschedule Uncompleted Work to Start After:** This setting reschedules the portions of tasks that aren't yet complete to start after the specified date.

To use Update Project, follow these steps:

1. **Display Gantt Chart view.**
2. **To update only certain tasks, select them.**
3. **In the Project tab, in the Status group, choose Update Project.**

The Update Project dialog box appears, as shown in [Figure 15-9](#).

4. **Choose the update method you prefer: Set 0% – 100% Complete or Set 0% or 100% Complete Only.**
5. **If you want a status date other than the one shown or you didn't previously set one, set the date to use in the field in the upper-right corner.**
6. **If you want Project to reschedule any work rather than update work as complete, select the Reschedule Uncompleted Work to Start After option and then select a date from the list.**
7. **Choose whether you want these changes to apply to the entire project or to only selected tasks.**
8. **Click the OK button to save the settings and have Project make updates.**



**Figure 15-9:** You can update only selected tasks or the entire project.

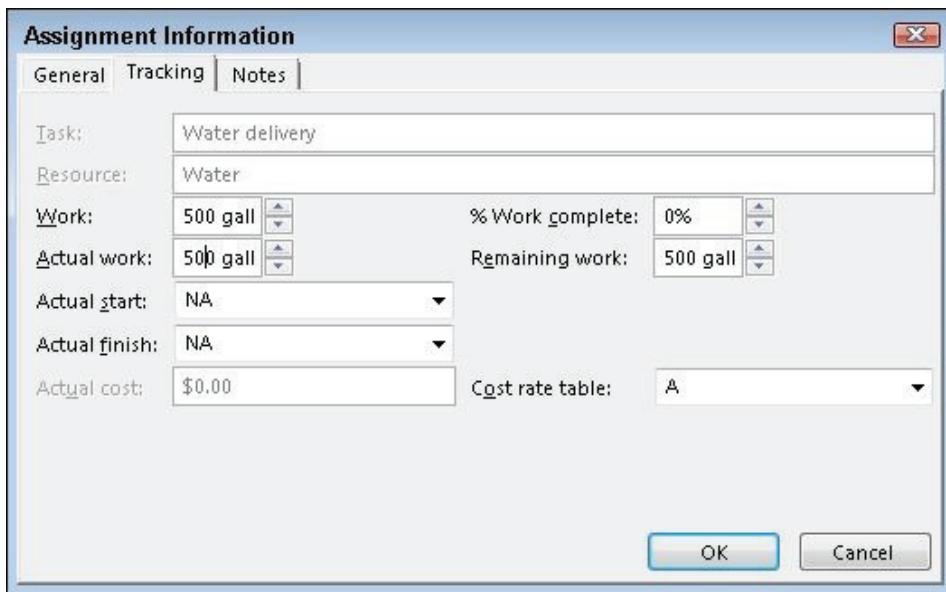
If you want, you can use Update Project to make certain global changes, such as to mark as 100% complete all tasks that should be complete according to the baseline. Then you perform more detailed task-by-task tracking on individual tasks that are only partially complete.

# Tracking Materials

Tracking the amount of materials used on tasks involves tracking actual units at the level of material resources. If you create a resource named Rubber and assign it to the Manufacture Tires task at 500 tons, for example, and then you use only 450 tons, you enter the actual units used.

This situation resembles the way you track work resource hours on tasks. To make it happen, simply follow these steps:

1. **Display Resource Usage view.**
  2. **Locate the material resource in the list, and under the resource name, double-click the assignment for which you want to enter the actual units.**
- The Assignment Information dialog box appears (see [Figure 15-10](#)).
3. **Click the Tracking tab.**
  4. **Enter the actual units used in the Actual Work field.**
  5. **Click the OK button.**



[Figure 15-10:](#) You can use the Assignment Information dialog box to enter actuals, too.

If you need to enter actual units for multiple assignments, you can use the method I describe in the earlier section "[Knowing what to do when John works three hours and Mary works ten](#)." Right-click the right side of the view and choose Actual Work to display the row labeled Act. Work. You can then plug in the actual data. If you assign the material resource of 500 tons to a five-day task, for example, remember that Resource Usage view shows Project spreading out the usage — 100 tons for each of the five days of the task. If you don't care on which day the materials were used, you can simply increase or decrease one setting to make up for any difference in actual usage.

# **Tracking More Than One: Consolidated Projects**

Often, projects are related in some fashion (such as sharing resources or having timing dependencies between them), or a series of smaller projects make up a larger program. In such a case, you can consolidate these separate projects into one file, either as a series of summary tasks or with all summary tasks and subtasks included.

When you consolidate projects, you can choose to link to the source file. When you do, any changes to the source file are represented and updated in the consolidated file.

If it's your job to keep track of the big picture, you have to understand how consolidated projects are updated, as I describe in the following section.

## ***Consolidating projects***

To consolidate projects in Project, you open a blank file and then insert existing projects to build a satisfying master project schedule.

The neat thing about consolidated projects is that you have some choices about the interaction between the consolidated project and the source files you insert in it. For example, you can link to a source file so that changes made in the source file are reflected in the consolidated project. This capability is helpful for a project manager who has to keep her eye on multiple phases or many smaller projects.



You can also create dependencies between inserted projects in the consolidated file. If you have, for example, one project that can't start until another one finishes, you can clearly see in the consolidated file how various separate projects in your organization affect each other.

Another way to relate consolidated projects to their source files is to make the consolidated project a two-way street, allowing changes in it to be reflected in the source files. You can also make the source files read-only so that no changes can affect other people's files.

To create a consolidated file, follow these steps:

- 1. Open a blank Project file and display Gantt Chart view.**
- 2. Click anywhere in the Task Name column.**

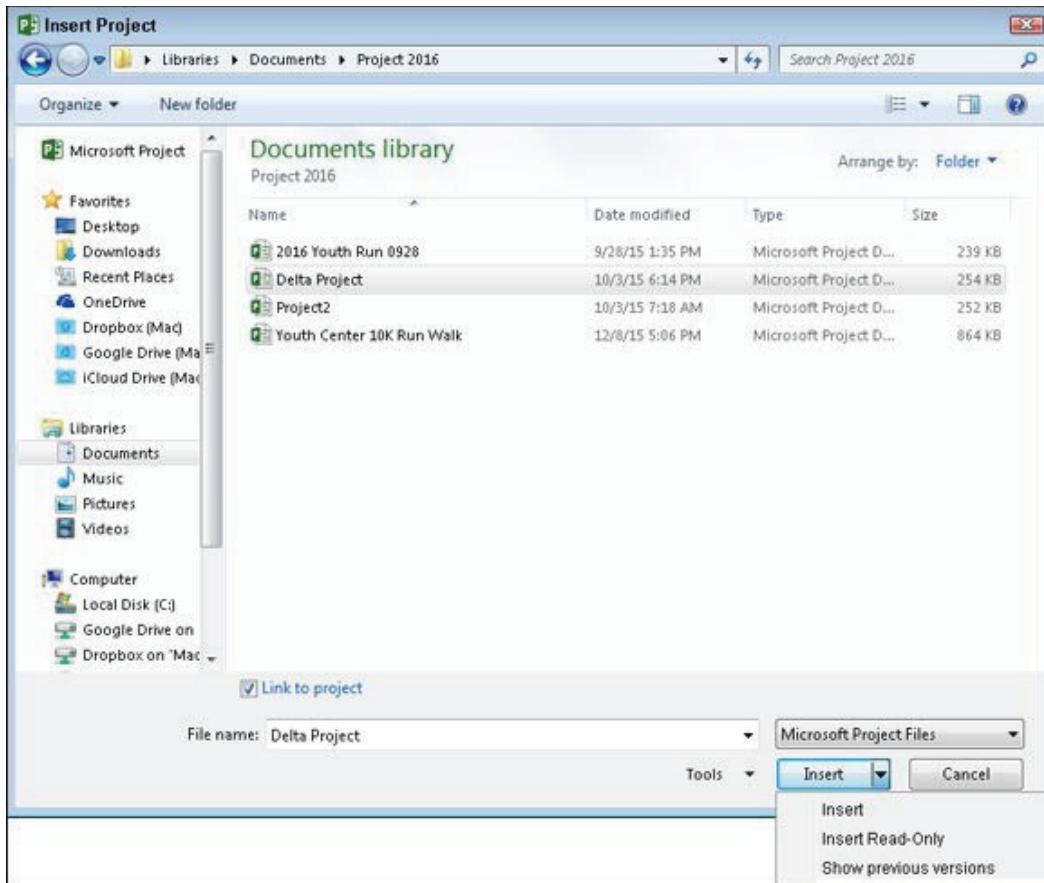
If you're inserting multiple projects, click the row in which you want the inserted file (or files) to appear. If you want to insert a project between existing tasks, click the task beneath the spot where you want the project to be inserted.

- 3. Choose Project ⇒ Subproject in the Insert group.**

The Insert Project dialog box, shown in [Figure 15-11](#), appears.

4. Using the navigation pane and file list, locate the Project file that you want to insert, and select it.
5. (Optional) Click the down arrow on the Insert button if you want to change the default setting to Insert Read Only.
6. If you want to link the project in this file to the source file so that the consolidated file is updated automatically whenever you open it, ensure that the Link to Project check box is selected.
7. Click the Insert button.

The project is inserted into the file, with the summary task showing and all subtasks hidden. To display all tasks in the inserted project, simply click the plus sign to the left of the summary task.



[Figure 15-11:](#) The Insert Project dialog box.



If you want to insert multiple subprojects, leave them all collapsed. This strategy ensures that they're all inserted at the topmost level of the outline in the consolidated project.

## ***Updating consolidated projects***

You have two ways to skin the cat known as “updating a consolidated project,” and the one you use depends on whether you linked to the source files when you inserted them. If you linked the files and inserted them without using the read-only setting, changes in source files are reflected in the consolidated file (and vice versa). Updating is simply a matter of ensuring that all files are available in their original linked locations (for example, in a folder on the network); then Project updates automatically.

If you haven’t linked the files, changes in source files aren’t reflected in consolidated files, and the consolidated file information doesn’t affect the source information. You may create this type of unlinked consolidated file if you simply want to see a snapshot of how all projects are progressing and don’t want to run the risk of your settings changing the source information. In this case, however, if you want to track progress, you have to create a new consolidated project or enter all updates manually.



After you insert projects in a file, you can move them around by using the Cut and Paste tools. When you do, message windows may appear, offering you options to resolve any conflicts that may occur because of dependency links you’ve created between inserted projects.

## ***Changing linking settings***

Changing your mind is a project manager’s prerogative. If you’ve inserted a source file into a consolidated file, and you find that you didn’t initially establish a link, you can change that setting so that the files update each other automatically.

Follow these steps to make changes to the inserted project:

- 1. Open the consolidated file.**
- 2. Display Gantt Chart view.**
- 3. Double-click the task name of the inserted project that you want to update.**

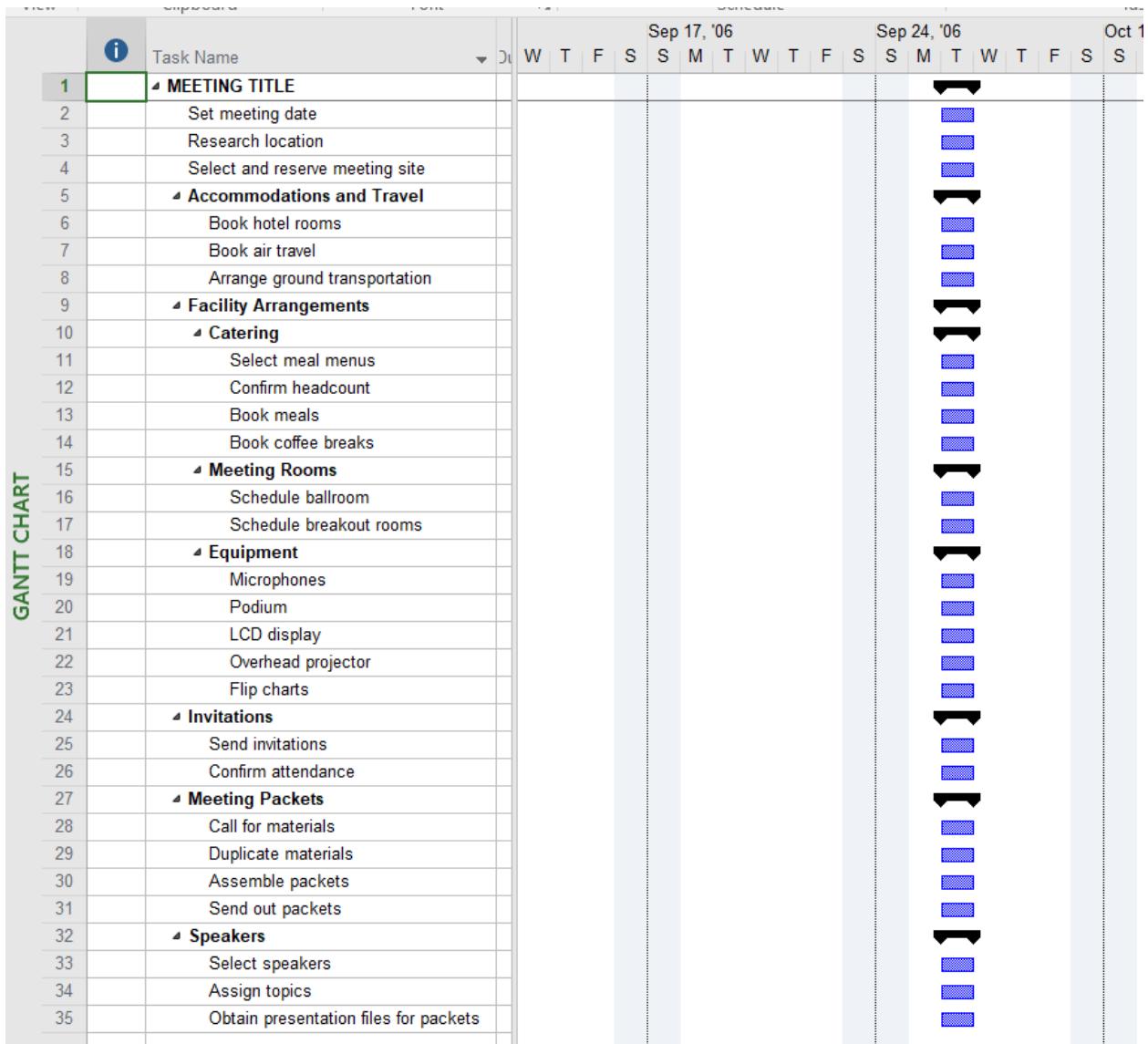
The Inserted Project Information dialog box appears.

- 4. Click the Advanced tab.**
- 5. Select the Link to Project check box and then click the Browse button.**  
The Inserted Project dialog box appears.
- 6. Use the Look In feature to locate the file that you want to link to and then select the file.**
- 7. Click the OK button.**
- 8. If you want the source file to be read-only, click the Read Only box in the Inserted Project Information dialog box.**
- 9. Click OK to save the link.**

## Aplicații

1. Care este diferența dintre o linie de bază (*baseline*) și un plan interimar (*interim plan*)?
2. Care este diferența dintre câmpurile *% Complete* și *Physical % Complete*?
3. În proiectul *Meeting.mpp* introduceți duratele și constrângerile corespunzătoare activităților, precum și resursele necesare. Din echipa care pregătește întâlnirea fac parte două persoane cu normă întreagă și una cu normă part-time (deci unele activități se pot desfășura în paralel, dacă are sens acest lucru în logica acțiunilor).
4. Salvați o linie de bază a proiectului.
5. Vizualizați diagrama Gantt de monitorizare (*Tracking Gantt*) cu următorul cap de tabel:

Task Name	Act. Start	Act. Finish	% Comp.	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work
-----------	------------	-------------	---------	---------------	-----------	-----------	-----------	-----------
6. Se amână cu o săptămână toate activitățile din *Meeting Packets* (documentele necesare pentru discuție) și *Speakers*. Reflectați această schimbare în proiect.
7. Atribuiți diferite stadii de completare activităților și vizualizați-le în contrast cu linia de bază salvată.



## 14. Track progress: Detailed techniques

### In this chapter

- [Update a baseline](#)
- [Track actual and remaining work for tasks and assignments](#)
- [Track timephased actual work for tasks and assignments](#)
- [Reschedule incomplete work](#)

### Practice files

For this chapter, use the practice files from the Project2016SBS\Ch14 folder. For practice file download instructions, see the introduction.

Building, verifying, and communicating a sound plan might take much or even most of your time as a project manager. However, planning is only the first phase of managing your projects. After the planning is completed, the implementation of the project starts—carrying out the plan that was previously developed. Ideally, projects are implemented exactly as planned, but this is seldom the case. In general, the more complex the plan and the longer its duration, the more opportunity there is for variance to appear. Variance is the difference between what you intended to happen (as recorded in the plan's baseline) and what actually happened (as recorded by your tracking efforts).

Properly tracking actual work and comparing it against the original plan enables you to identify variance early and adjust the remaining portion of the plan when necessary.

This chapter guides you through procedures related to updating a baseline, tracking actual and remaining work for tasks and assignments, tracking timephased actual work for tasks and assignments, and rescheduling incomplete work.

### Update a baseline

In [Chapter 8, “Track progress: Basic techniques,”](#) you learned how to save a baseline for a plan. Recall that a baseline is a collection of important values in a plan, such as the planned start dates, finish dates, and costs of tasks, resources, and assignments. When you save (or set) a baseline, Project takes a “snapshot” of the existing values and saves it in the plan for future comparison. If you’ve previously saved a baseline, you might need to update it before recording actual work.



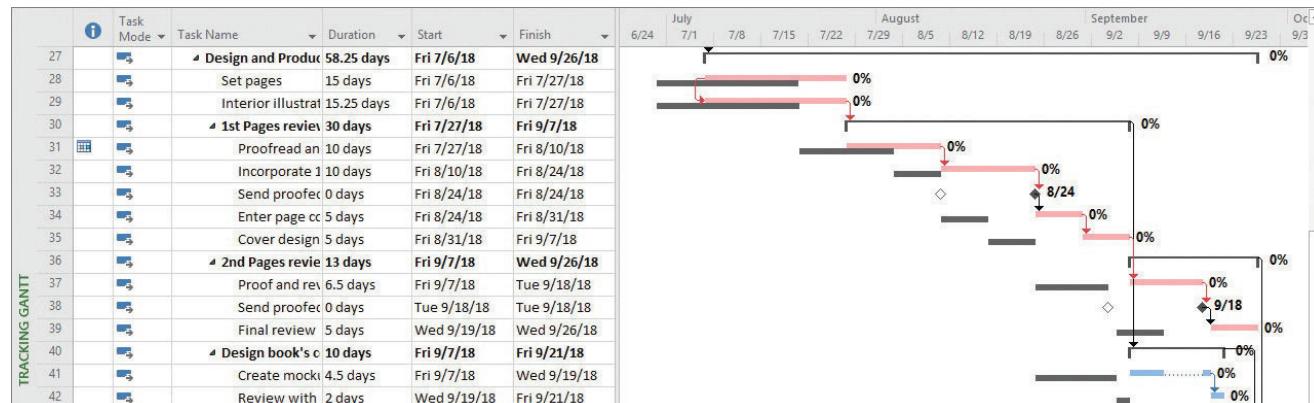
## Tip

If you're not sure whether a plan already has a saved baseline (or multiple baselines), or if you'd like to see when a baseline was saved, here's what to do: On the Project tab, in the Schedule group, click the Set Baseline button, and then click the Set Baseline command. In the Set Baseline field of the dialog box, any previously saved baselines in the plan will be indicated by the dates they were saved.

Keep in mind that the purpose of the baseline is to record what you expected the plan to look like at one point in time. As time passes, however, you might need to change your expectations. After saving an initial baseline plan, you might need to fine-tune the plan by adding or removing tasks or assignments or making other adjustments. To keep an accurate baseline for later comparison, you have several options:

- **Update the baseline for the entire project** This simply replaces the original baseline values with the currently scheduled values.
- **Update the baseline for selected tasks** This does not affect the baseline values for other task or resource baseline values in the plan.
- **Save a second or subsequent baseline** You can save up to 11 baselines in a single plan. The first one is called *Baseline*, and the rest are *Baseline 1* through *Baseline 10*.

A great view for comparing a baseline with the plan as it is currently scheduled is the Tracking Gantt view.



*The Tracking Gantt view shows how tasks in the plan as it is currently scheduled compare to its baseline schedule*

In the chart portion of this view, the tasks as they are currently scheduled appear as blue bars (if they are not critical tasks) or red bars (if they are critical tasks). Below them, the baseline values of each task appear as gray bars.



## Tip

In Gantt chart views such as the Tracking Gantt view, the colors, patterns, and shapes of the bars on the right side of the view represent specific things. To see what any item represents, just point to it and a description will appear in a ScreenTip. To see a complete legend of Gantt chart items and their formatting, on the Format tab, in the Bar Styles group, click Format, and then click Bar Styles.

### Save interim plans

After you start tracking actual values or any time you adjust your plan, you might want to take another snapshot of the current start and finish dates. You can do this with an [interim plan](#). Like a baseline, an interim plan is a set of current values from the plan that Project saves with the file. Unlike the baseline, however, an interim plan saves only the start and finish dates of tasks, not resource or assignment values. You can save up to 10 different sets of interim dates in a plan. (If you find that you need multiple snapshots of scheduled values in addition to start and finish dates, you should instead save additional baselines.)

Depending on the scope and duration of your projects, you might want to save an interim plan at any of the following junctures:

- At the conclusion of a major phase of work
- At preset time intervals, such as weekly or monthly
- Just before or after entering a large number of actual values

### To compare a plan as it is currently scheduled with its previously saved baseline

1. On the **View** tab, in the **Task Views** group, click the **Gantt Chart** arrow, and then click **Tracking Gantt**.
2. If necessary, adjust the zoom level: on the **View** tab, in the **Zoom** group, in the **Timescale** box, select the timescale setting you want. Project compares the plan with the baseline.
3. To compare the plan with another baseline (Baseline 1 through Baseline 10), on the **Gantt Chart Tools Format** tab, in the **Bar Styles** group, click **Baseline**, and then click the baseline you want to see compared.

### To update a previously saved baseline or add an additional baseline

1. On the **Project** tab, in the **Schedule** group, click **Set Baseline**, and then click **Set Baseline** to open the Set Baseline dialog box.
2. Do either of the following:
  - To update a previously saved baseline, click **Set Baseline**, and then select the

specific baseline you want to update.

- To save a new baseline, click **Set Baseline**, and then select the additional baseline you want to save.

**3.** Then do either of the following:

- To update or add the selected baseline for the plan, under **For**, click **Entire Project**, and then click **OK**.
- To update or add the selected baseline just for the selected tasks, under **For**, click **Selected Tasks**. When you do this, the options under Roll Up Baselines become available. You can control how baseline updates should affect the baseline values for summary tasks. For example, you could resave a baseline for a subtask and update its related summary task baseline values if you want.

**4.** Click **OK**.

## To remove a baseline

1. On the **Project** tab, in the **Schedule** group, click the **Set Baseline** button, and then click **Clear Baseline**.

## To save an interim plan

1. On the **Project** tab, in the **Schedule** group, click the **Set Baseline** button, and then click **Set Baseline**.
2. In the **Set Baseline** dialog box, select **Set Interim Plan**.
3. In the **Copy** field, select the date values you want to copy.
4. In the **Into** field, select the date values into which you want to copy the fields you selected in the **Copy** field.
5. Click **OK**.

## Track actual and remaining work for tasks and assignments

In [Chapter 8, “Track progress: Basic techniques,”](#) you learned how to work with actual start, finish, and duration values for individual tasks. For tasks that have resources assigned to them, you can enter actual and remaining work values for the task as a whole or for specific assignments to that task. To help you understand how Project handles the actual values you enter, consider the following:

- If a task has a single resource assigned to it, the actual work values you enter for the task or assignment apply equally to both the task and the resource assignment. For example, if you record that the assignment has five hours of actual work, those values apply to the task and to the assigned resource.
- If a task has multiple resources assigned to it, the actual work values you enter for the task are distributed among or rolled down to the assignments according to their assignment units. This level of detail is appropriate if you aren’t concerned about the details at the individual assignment level.

- If a task has multiple resources assigned to it, the actual work values you enter for one assignment are rolled up to the task. However, the new actual work values do not affect the other assignments' work values on the task. This level of detail is appropriate if details at the individual assignment level are important to you.
- If the actual work value you enter is greater than the planned work, Project sets Remaining Work to zero. If actual work is less than planned work, Project recalculates Remaining Work accordingly. You can also directly edit the Remaining Work value if you want.

A great view for recording actual and remaining work is the Task Usage view with the Work table displayed.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	T	W
0	↳ Children's Book Scl	2,317.5 hrs	2,317.5 hrs	0 hrs	127 hrs	2,190.5 hrs	5%	Work	8h	8h
1	↳ Editorial staff mee	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work		
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	120 hrs	324 hrs	27%	Work	8h	8h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work		
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h
	Carole Polar	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h
18	↳ Original art revi	164 hrs	164 hrs	0 hrs	0 hrs	164 hrs	0%	Work		
	Hany Morcc	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		
	Jane Dow	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		
19	↳ Author review c	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work		
	Copyeditors	80 hrs	80 hrs	0 hrs	0 hrs	80 hrs	0%	Work		

*The Task Usage view has two parts: a table on the left and timephased data (that is, data organized under a timescale) on the right*

As you might recall from [Chapter 9](#), “[Fine-tune task scheduling](#),” the two sides of the usage view are split by a vertical divider bar. This view lists resources under the tasks to which they’re assigned. This information appears in the table on the left side. On the right side are rows organized under a timescale. The rows show you the scheduled work values for each task and assigned resource. The Task Usage view color-codes the rows on the right side: task rows have a shaded background, and assignment rows have a white background.



In this topic, we focus on the Task Usage view to show the results of entering actual work per task or assignment. Other means of recording actual work include the Task Form or the Task Details Form with the Work detail displayed in a split view with a Gantt chart, Task Usage, or other task-centric view. For a refresher on the Task Form, see [Chapter 6](#), “[Assign resources to tasks](#).”

Let’s walk through some examples of entering actual work. We’ll start in the Task Usage view with the Work table displayed.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	W	T	F
0	↳ Children's Book Schedule	2,317.5 hrs	2,317.5 hrs	0 hrs	127 hrs	2,190.5 hrs	5%	Work	8h	20h	24h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work			
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	120 hrs	324 hrs	27%	Work	8h	20h	24h
16	Manuscript received	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work			
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
	Carole Poland	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
18	↳ Original art review	164 hrs	164 hrs	0 hrs	0 hrs	164 hrs	0%	Work		12h	16h
	Hany Morcos	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		6h	8h
	Jane Dow	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		6h	8h
19	↳ Author review of content edit	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work			

In this example, task 18 initially has 164 hours of scheduled work, which is evenly split between the two assigned resources

The Work table includes the Actual Work and Remaining Work columns. The values in the Work column are the task-level and assignment-level totals for scheduled work. Note that each task's work value is the sum of its assignment work values.

In a usage view, you see work values at two different levels of detail: the total value for a task or assignment on the left and the more detailed timephased level on the right. These two sets of values are directly related. Consider, for example, a task named *Original art review*, which is task 18 in the plan. The 164 hours of total work for task 18 is the sum of Hany Morcos's 82 hours of work on the task plus Jane Dow's 82 hours.

In the timephased grid, the scheduled work values per time period are displayed—daily, in this example. If you add up the daily work values for a specific task or assignment, the total equals the value in the Work column for that task or assignment.

Let's look more closely at the results of entering an actual work value. In this example, when we enter 92 hours of actual work on task 18, Project distributes the actual work among the assigned resources and adjusts their remaining work.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	W	T	F
0	↳ Children's Book Schedule	2,317.5 hrs	2,317.5 hrs	0 hrs	219 hrs	2,098.5 hrs	9%	Work	8h	20h	24h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work			
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	212 hrs	232 hrs	48%	Work	8h	20h	24h
16	Manuscript received	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work			
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
	Carole Poland	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
18	↳ Original art review	164 hrs	164 hrs	0 hrs	92 hrs	72 hrs	56%	Work		12h	16h
	Hany Morcos	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	56%	Work		6h	8h
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	56%	Work		6h	8h
19	↳ Author review of content edit	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work			

This is what the view looks like after 92 hours of actual work are recorded on task 18

Several important things occurred when we entered the actual work on task 18:

- Project applied change highlighting to the updated values in the table.
- The amount of actual work we entered was subtracted from the Remaining Work column (labeled *Remaining* in the Work table).
- The actual work was distributed to the two assignments on the task, resulting in 46

hours of actual work being recorded for Hany Morcos and 46 hours for Jane Dow. Likewise, the remaining work values were recalculated for each assignment.

- The updated actual and remaining work values were rolled up to the Acquisition summary task and to the Project summary task.

Now that you've seen the effect of recording actual work at the task level, let's look at entering actual work at the assignment level. Again, we'll focus on task 18. When we assigned 92 hours of work to the task, Hany Morcos was assigned 46 hours of that work. Now, after we record actual work of 62 hours for Hany, we see that her actual and remaining work values are updated, and those updates also roll up to the task and its summary task. (Project highlights the changed values.) However, the actual and remaining work values for Jane Dow, the other resource assigned to the task, are not affected.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	W	T	F
0	↳ Children's Book Schedule	2,317.5 hrs	2,317.5 hrs	0 hrs	235 hrs	2,082.5 hrs	10%	Work	8h	20h	24h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work			
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	228 hrs	216 hrs	51%	Work	8h	20h	24h
16	Manuscript received	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work			
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
	Carole Poland	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
18	↳ Original art review	164 hrs	164 hrs	0 hrs	108 hrs	56 hrs	66%	Work		12h	16h
	Hany Morcos	82 hrs	82 hrs	0 hrs	62 hrs	20 hrs	76%	Work		6h	8h
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	56%	Work		6h	8h
19	↳ Author review of content edit	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work			

*After 62 hours of actual work are recorded on Hany Morcos's assignment to task 18, Hany's work values are updated, but Jane Dow's assignment is not affected*



A handy way to quickly record actual work and other progress details per assignment is via the Tracking tab of the Assignment Information dialog box. In either the Task Usage or Resource Usage view, double-click an assignment. In the dialog box, you can set actual work, remaining work, actual start, and other values. This dialog box is available regardless of what table is displayed in the usage view.

Tracking a task's actual work-complete value is more detailed than entering a simple percentage-complete value on a task. However, neither method is as detailed as entering timephased actual work for tasks or assignments (as you will see in the next topic). There's nothing wrong with tracking actual work at the task or assignment level (or simply entering a percentage-complete value, for that matter), if that level of detail meets your needs. In fact, whether you see the timephased details or not, Project always distributes any percentage-complete or task-level or assignment-level actual work value you enter into corresponding timephased values.

## Enter actual costs manually

When you enter actual work values, Project calculates actual cost values for the affected task, its summary task, the resources assigned to the task, and the entire plan. By default, Project calculates actual costs and does not allow you to enter them directly. In most cases, this is what we recommend and what is done with the practice files used in this book. However, if you want to enter actual cost values yourself in your own plans, follow these steps.

### Important

The following procedure is provided for your general information; however, do not follow this procedure now if you are completing the practice tasks in this book. Doing so will produce results that will not match those shown in this book.

1. Click the **File** tab to display the Backstage view, and then click **Options** to open the Project Options dialog box.
2. Click the **Schedule** tab.
3. Under the **Calculation options for this project** label, clear the **Actual costs are always calculated by Project** check box.
4. Click **OK**.

After automatic cost calculation is turned off, you can enter or import task-level or assignment-level actual costs in the Actual field. This field is available in several locations, such as the Cost table. You can also enter actual cost values daily or at another interval in any timescale view, such as the Task Usage or Resource Usage view. To do so, with a usage view displayed, click Actual Cost on the Format tab, in the Details group.

## To record actual and remaining work per task

1. On the **View** tab, in the **Task Views** group, click **Task Usage** to display the Task Usage view.
2. On the **View** tab, in the **Data** group, click **Tables**, and then click **Work** to display the Work table.
3. In the **Actual** column for the task for which you want to record actual work, enter an actual work value.
4. If you want, enter a new **Remaining Work** value for the task.

## To record actual and remaining work per assignment

1. Display the Task Usage view and the **Work** table.
2. In the **Actual** column for the assigned resource for which you want to record actual work, enter an actual work value.
3. If you want, enter a new **Remaining Work** value for the assignment.

## Track timephased actual work for tasks and assignments

In [Chapter 8, “Track progress: Basic techniques,”](#) you were introduced to simpler ways of tracking actuals in a plan. These include recording the percentage of a task that has been completed, in addition to its actual start and finish dates. These methods of tracking progress are fine for many projects, but Project 2016 also supports more detailed ways of tracking.

This topic introduces techniques to track work per time period, such as actual work completed per week or per day. Information distributed over time is commonly referred to as being *timephased*, so tracking work by time period is sometimes referred to as *tracking timephased actuals*. This is the most detailed level of tracking progress available in Project.

As with the simpler tracking methods, tracking timephased actuals helps you address the most basic questions of managing a project:

- Are tasks starting and finishing as planned? If not, what will be the impact on the project’s finish date?
- Are resources spending more or less time than planned to complete tasks?
- Is it taking more or less money than planned to complete tasks?

Entering timephased actuals requires more work on the project manager’s part and might require more work from resources, if they have to inform the project manager of their daily or weekly actuals. However, using timephased actuals gives you far more detail about the plan’s task and resource status than the other methods used for tracking progress. Entering timephased values might be the best approach to take if you have a group of tasks or an entire plan that includes the following:

- High-risk tasks
- Tasks of relatively short duration, for which a variance of even one day could put the overall project at risk
- Tasks for which you’d like to develop or validate throughput metrics, or rates at which a specified quantity of a deliverable can be completed over a specified time period, such as *Copyedit 3000 words per day*
- Tasks in which sponsors or other stakeholders have an especially strong interest
- Tasks that require hourly billing for labor

When you need to track actual work at the most detailed level possible, use the Work table and the timephased grid in the Task Usage or Resource Usage view.

In the Task Usage view, you can enter timephased actual work at the task or assignment level. In the Resource Usage view, you enter actuals at the assignment level. In both views, entering actual work in the left side of the view will cause Project to update work values distributed over time in the right side of the view. In this topic, we’ll look at the reverse: entering actual work in the timephased side of the view and seeing the results per task or assignment on the left side of the view.

The previous topic's example featured the Task Usage view; in this topic, we'll begin with the Resource Usage view.

Resource Name		% Comp	Work	Overtime	Baseline	Variance	Actual	Remaining	May 13, '18							
RESOURCE USAGE	3	Copyeditors	29%	316 hrs	0 hrs	300 hrs	16 hrs	92 hrs	224 hrs	Details	S	M	T	W	T	F
		Author review of content	100%	92 hrs	0 hrs	80 hrs	12 hrs	92 hrs	0 hrs	Work		4h	8h	8h	8h	8h
		Copyedit	0%	184 hrs	0 hrs	180 hrs	4 hrs	0 hrs	184 hrs	Act. W		4h	8h	8h	8h	8h
		Author review of copyedit	0%	20 hrs	0 hrs	20 hrs	0 hrs	0 hrs	20 hrs	Work		4h	8h	8h	8h	8h
		Proofread and index	0%	20 hrs	0 hrs	20 hrs	0 hrs	0 hrs	20 hrs	Act. W						
	4	Dan Jump	3%	114.5 hrs	0 hrs	114.5 hrs	0 hrs	3.5 hrs	111 hrs	Work			0.5h			
	5	Hany Morcos	16%	563 hrs	0 hrs	563 hrs	0 hrs	89 hrs	474 hrs	Act. W			0.5h			
		Handoff to Production	0%	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work		1h				
		Incorporate 1st Pages review	0%	80 hrs	0 hrs	80 hrs	0 hrs	0 hrs	80 hrs	Act. W		1h				

*The Resource Usage view shows assignments per resource*



You can change the details (that is, the fields) shown in the timephased grid in a usage view. You can add or remove fields and change the formatting of the fields that are shown. For example, you can add the Actual Work field. To see the available fields and formatting options, on the Format tab, in the Details group, click Add Details.

In both views, you can enter actual work values for individual assignments daily, weekly, or at whatever time period you want (by adjusting the timescale). For example, if a task has three resources assigned to it and you know that two resources worked on the task for eight hours one day and the third resource worked for six hours, you can enter these as three separate values on a timephased grid.

A key to working effectively in a usage view is setting the timescale correctly. You can change the zoom level of the timescale to control the time period in which you enter actual values in the timephased grid. For example, you can change the timescale to show weeks rather than days; when you enter an actual value at the weekly level, that value is distributed over the week.



## Tip

Project includes several handy shortcuts for navigating in the timephased grid side of the usage views. In the Task Usage view, use the Scroll To Task button on the Task Tab, in the Editing group, to display the earliest scheduled work on the selected task or assignment. You can also use the Scroll To Task command in the shortcut menu for tasks. In the Resource Usage view, use Scroll To Task to see the selected resource's or assignment's scheduled work. In both views, you can quickly get to a specific date in the grid (or a task or resource ID) by using the Go To command via the keyboard shortcut Ctrl+G. If you forget this keyboard shortcut, just enter *go to* in the Tell Me box and Project will show you the command.

Here's an example of entering timephased actuals in a usage view. As you saw in the previous topic, the scheduled work per task, resource, or assignment is equal on the two sides of a usage view. The difference is that the scheduled work is shown as a single total value on the left side but distributed over time on the right side.

We'll begin in the timephased grid of the Task Usage view with the Work table displayed. We'll record actual work for task 19, *Author review of content edit*.

Task Usage	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	May 13, '18				
								T	F	S	M	T
15	Acquisition	444 hrs	444 hrs	0 hrs	302 hrs	142 hrs	Work	16h	10h			16h
							Act. W	16h	10h			
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work					
							Act. W					
17	Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work					
							Act. W					
18	Original art review	164 hrs	164 hrs	0 hrs	164 hrs	0 hrs	Work	8h				
							Act. W	8h				
19	Author review of	160 hrs	160 hrs	0 hrs	18 hrs	142 hrs	Work	8h	10h			16h
							Act. W	8h	10h			16h
	Copyeditors	80 hrs	80 hrs	0 hrs	9 hrs	71 hrs	Work	4h	5h			8h
							Act. W	4h	5h			8h
	Tad Orman	80 hrs	80 hrs	0 hrs	9 hrs	71 hrs	Work	4h	5h			8h
							Act. W	4h	5h			8h
20	Handoff to Edito	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work					
							Act. W					
	Carole Polar	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work					
							Act. W					

Here we've entered 8 hours of actual work for Thursday (which is what was scheduled) and 10 hours of actual work for Friday (when 16 hours was originally scheduled) on task 19

As you saw in the previous topic, the actual work recorded on the task is distributed to its assignments. In the timephased grid, you can see per time period how the actual work gets distributed.



## Tip

When entering actual work, you do not need to include the “h” abbreviation (to denote hours). You can simply enter the number and Project will record it as hours. Hours is the default work value for data entry. If you want, you can change this. Click the File tab to display the Backstage view, and then click Options. On the Schedule page of the Project Options dialog box, in the Work Is Entered In box, select the default time increment you want.

Next we'll enter actual work on the assignment in the timephased grid.

Task Name	Work	Baseline	Variance	Actual	Remaining	Details	May 13, '18					
							T	F	S	S	M	T
15 ▾ Acquisition	444 hrs	444 hrs	0 hrs	316 hrs	128 hrs	Work	16h	10h			14h	16h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	Act. W	16h	10h			14h	
17	▷ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	Work						
18	▷ Original art review	164 hrs	164 hrs	0 hrs	164 hrs	Act. W						
19 ▾ Author review c	160 hrs	160 hrs	0 hrs	32 hrs	128 hrs	Work	8h				14h	16h
	Copyeditors	80 hrs	80 hrs	0 hrs	15 hrs	Act. W	8h	10h			14h	
	Tad Orman	80 hrs	80 hrs	0 hrs	17 hrs	Work	4h	5h			6h	8h
					63 hrs	Act. W	4h	5h			6h	
20 ▾ Handoff to Edit	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work						
	Carole Polar	0 hrs	0 hrs	0 hrs	0 hrs	Act. W						

Here we've entered 6 hours of actual work for the Copyeditors and 8 hours for Tad Orman for Monday on the same task

In this example, the actual work values entered for the assignments differed from the scheduled work. Project accounted for the difference by adjusting the scheduled work at the end of the assignments.

	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	T	W	T	F
15	▲ Acquisition	444 hrs	444 hrs	0 hrs	316 hrs	128 hrs	Work	16h	16h	15h	1h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Act. W				
17	▷ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work				
18	▷ Original art review	164 hrs	164 hrs	0 hrs	164 hrs	0 hrs	Act. W				
19	▲ Author review c	160 hrs	160 hrs	0 hrs	32 hrs	128 hrs	Work	16h	16h	15h	1h
	Copyeditors	80 hrs	80 hrs	0 hrs	15 hrs	65 hrs	Act. W	8h	8h	8h	1h
20	Tad Orman	80 hrs	80 hrs	0 hrs	17 hrs	63 hrs	Work	8h	8h	7h	
	▲ Handoff to Edit	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Act. W				0h
	Carole Polai	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work				0h
							Act. W				

*Project adjusted the scheduled work to account for the actual work values that were recorded that varied from scheduled work*

When you record actual work in the table on the left side of the view, Project records the actual work to match scheduled work in the timephased grid on the right side of the usage view. The main advantage of entering actual work in the timephased grid instead of in the table on the left side of the view is that you can precisely control the dates for which the actual work gets recorded.

## **Project management focus: Collect actuals from resources**

The Resource Usage view is similar to a timecard. In fact, to enter assignment-level actual work values, you might need some form of paper timecard or its electronic equivalent. Several methods are used to collect such data from resources, assuming that you need to track actual and remaining work at this level of detail. Some collection methods include the following:

- **Collect actual values yourself** This method is feasible if you communicate with only a small group of resources on a frequent basis, such as a weekly status meeting. It's also a good opportunity to talk directly to the resources about any blocking issues or surprises they might have encountered (either positive or negative) while performing the work.
- **Collect actuals through a formal status reporting system** This technique might work through the already-existing hierarchy of your organization and serve additional purposes besides project status reporting.

Regardless of the data collection methods you use, be aware that resources might have some concern about how their actual work values reflect their overall performance. You might need to communicate to resources that schedule actuals help in managing the project, but performance evaluation is a business management focus, not a project management focus.

If your organization uses a timecard reporting system, you might be able to utilize this timecard data in Project as timephased actuals. You might not need to track at this level, but if resources complete timesheets for other purposes (billing other departments within the organization, for example), you can use their data and save yourself some work.

Speaking of timecards, depending on how your organization operates, you might want to explore Project Professional and its interoperability with Microsoft SharePoint and Project Web App (PWA). For more information, see [Appendix C, "Collaborate: Project, SharePoint, and PWA."](#)



## Tip

Task and assignment values are directly related; an update to one directly affects the other. However, you can break this relationship if you want. Doing so enables you to record progress for resource assignments, for example, and manually enter actual values for the tasks to which those resources are assigned. You normally should not break this relationship unless you have special reporting needs within your organization—for example, when you must follow a status reporting methodology based on something other than the actual values recorded for assignments in plans. To break this relationship, do the following: Click the File tab to display the Backstage view, and click Options. In the Project Options dialog box, on the Schedule tab, under the Calculation Options For This Project label, clear the Updating Task Status Updates Resource Status check box. This setting applies to the entire plan you have open at the time; you cannot apply it only to some tasks within a plan.

### To record timephased actual work in the Task Usage view

1. On the **View** tab, in the **Task Views** group, click **Task Usage** to display the Task Usage view.
2. On the **Task Usage Tools Format** tab, in the **Details** group, click **Actual Work**. The Actual Work detail row appears in the timephased portion of the view.
3. If needed, adjust the timescale to match the time interval at which you want to enter actual work (for example, daily or weekly): On the **View** tab, in the **Zoom** group, click the **Timescale** arrow, and then click the timescale time unit you want.
4. In the timephased grid, at the intersection of the task or assignment and the date you want, enter an actual work value.

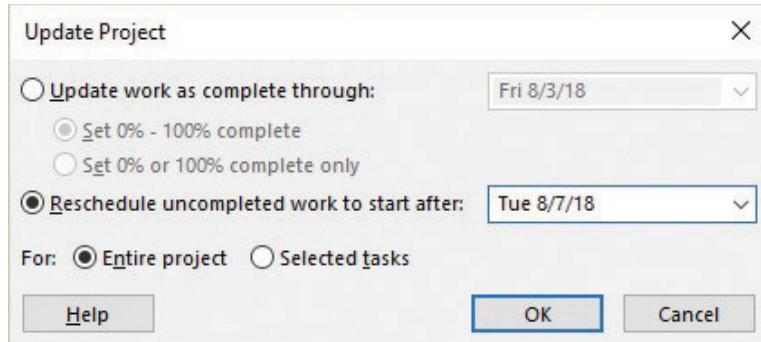
### To record timephased actual work in the Resource Usage view

1. Display the Resource Usage view and Actual Work detail, and adjust the timescale as needed.
2. In the timephased grid, at the intersection of an assignment and the date you want, enter an actual work value.

## Reschedule incomplete work

During the course of a project, work might occasionally be interrupted for a specific task or for the entire project. If this happens, you can have Project reschedule the remaining work to restart after the date you specify.

When you reschedule incomplete work, you specify the date after which work can resume—the rescheduled date. You reschedule incomplete work in the Update Project dialog box.



*Use the Update Project dialog box to reschedule incomplete work*

Here is how Project handles tasks in relation to the rescheduled date:

- If the task does not have any actual work recorded for it prior to the rescheduled date and does not have a constraint applied, the entire task is rescheduled to begin after that date.
- If the task has some actual work recorded prior to the rescheduled date but none after it, the task is split so that all remaining work starts after the rescheduled date. The actual work is not affected.
- If the task has some actual work recorded for it prior to, and after, the rescheduled date, the task is not affected.

## To reschedule incomplete work

1. To reschedule work just for specific tasks, select those tasks first.
2. On the **Project** tab, in the **Status** group, click **Update Project** to open the Update Project dialog box.
3. Select **Reschedule incomplete work to start after**, and in the date box, enter or select the date you want.
4. Do one of the following:
  - Click **Selected Tasks** to reschedule work just for the selected tasks.
  - Click **Entire Project** to reschedule work for the entire project.
5. Click **OK**.

## Skills review

In this chapter, you learned how to:

- [Update a baseline](#)
- [Track actual and remaining work for tasks and assignments](#)
- [Track timephased actual work for tasks and assignments](#)
- [Reschedule incomplete work](#)



## Practice tasks

The practice files for these tasks are located in the Project2016SBS\Ch14 folder.



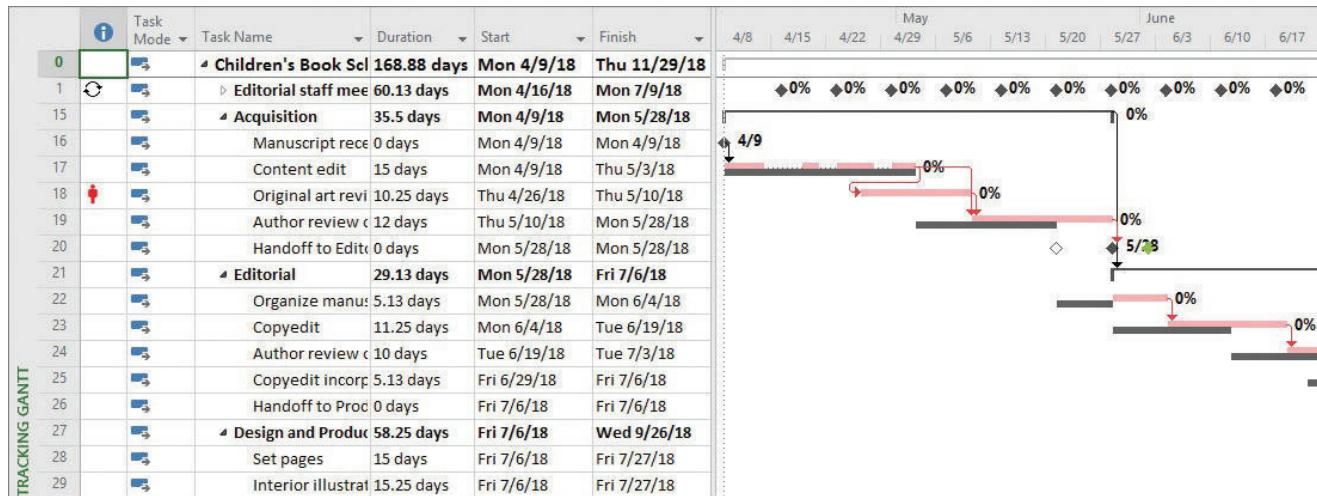
### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Update a baseline

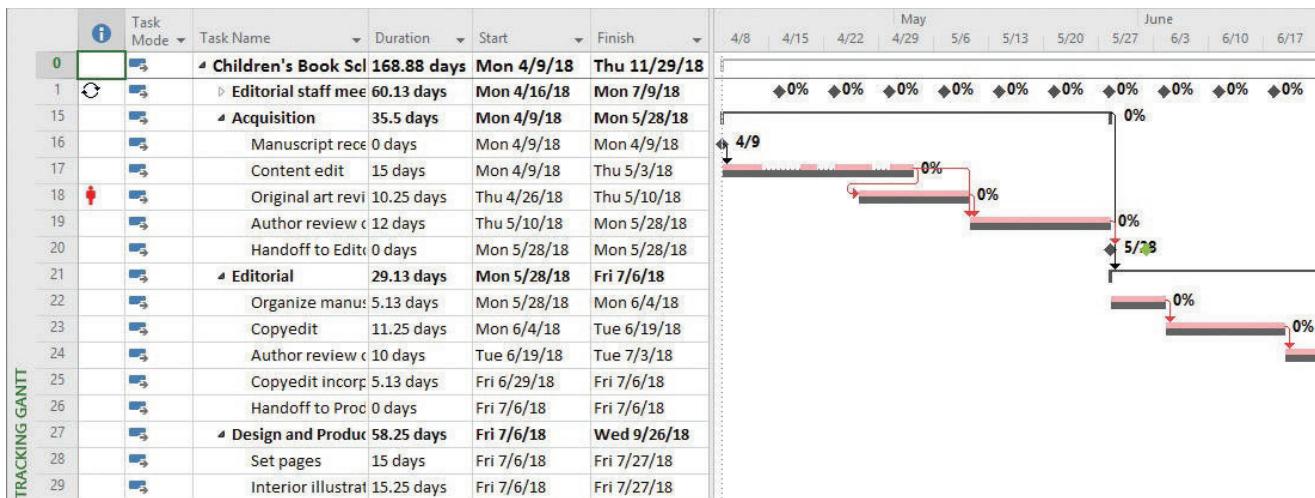
The scenario: At Lucerne Publishing, the planning for the new children's book project has undergone some additional fine-tuning, including adjustments to task durations and the addition of a task. Because of these changes, you need to capture a new baseline before work begins. Open the UpdateBaseline plan in Project, and perform the following tasks:

1. Examine the current baseline in the Tracking Gantt view with the timescale set to weekly.



*In the Tracking Gantt view, note that the recently added task 18 lacks a baseline*

2. Update the baseline for the entire plan.



After the plan's baseline is updated, the baseline dates align with the as-scheduled task dates and task 18 now has a baseline

## Track actual and remaining work for tasks and assignments

The scenario: Several tasks in the plan have more than one resource assigned. You'd like to get a better look at how your recording of actual work on such tasks affects assigned work. Open the TrackWork plan in Project, and perform the following tasks:

1. Display the Work table in the Task Usage view.
2. Record 92 hours of actual work on task 18, *Original art review*.

	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	Apr 8, '18			
								S	M	T	W
0	Children's Book Scl	2,317.5 hrs	2,317.5 hrs	0 hrs	219 hrs	2,098.5 hrs	Work		8h	8h	8h
1	Editorial staff mee	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	Work				
15	Acquisition	444 hrs	444 hrs	0 hrs	212 hrs	232 hrs	Work		8h	8h	8h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work				
17	Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work		8h	8h	8h
	Carole Polari	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work		8h	8h	8h
18	Original art revi	164 hrs	164 hrs	0 hrs	92 hrs	72 hrs	Work				
	Hany Morcos	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	Work				
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	Work				
19	Author review c	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	Work				

After entering actual work on task 18, note how the actual work is split between the two assigned resources

3. On the same task, change Hany Morcos's 46 hours of actual work to 62 hours.

	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	Apr 8, '18	S	M	T	W
0	↳ Children's Book Sel	2,317.5 hrs	2,317.5 hrs	0 hrs	235 hrs	2,082.5 hrs	Work		8h	8h	8h	
1	↳ Editorial staff mee	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	Work					
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	228 hrs	216 hrs	Work		8h	8h	8h	
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work					
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work		8h	8h	8h	
	Carole Polai	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work		8h	8h	8h	
18	↳ Original art revi	164 hrs	164 hrs	0 hrs	108 hrs	56 hrs	Work					
	Hany Morcc	82 hrs	82 hrs	0 hrs	62 hrs	20 hrs	Work					
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	Work					
19	↳ Author review c	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	Work					

After entering actual work on an assignment to task 18, note that the other assignment to the same task is not affected

## Track timephased actual work for tasks and assignments

The scenario: The Acquisition phase of work has been completed, and the Editorial phase has begun. Because of the larger number of resources involved and the variability of the editorial work, these tasks are the riskiest ones so far in the project. To manage the actuals of these tasks in the most detailed way possible, you will record timephased actuals. Open the TrackTimephasedWork plan in Project, and perform the following tasks:

1. Scroll the timephased grid in the Task Usage view until the scheduled work for task 22, *Organize manuscript for copyedit*, is visible.
2. Show the **Actual Work** detail in the timephased grid of the view.
3. Record **9** hours of actual work on task 22 for Wednesday, May 30, and **15** hours for Thursday, May 31.

	Task Name	Work	Baseline	Variance	Actual	Details	T	W	T	F
0	↳ Children's Book Sel	2,345.5 hrs	2,317.5 hrs	28 hrs	516.5 hrs	Work	8h	9h	15h	12h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	24.5 hrs	Act. W	8h	9h	15h	
15	↳ Acquisition	468 hrs	444 hrs	24 hrs	468 hrs	Work	8h			
21	↳ Editorial	404 hrs	400 hrs	4 hrs	24 hrs	Act. W	8h			
22	↳ Organize manus	60 hrs	60 hrs	0 hrs	24 hrs	Work		9h	15h	12h
	Dan Jump	20 hrs	20 hrs	0 hrs	8 hrs	Act. W		9h	15h	
	Hany Morcc	40 hrs	40 hrs	0 hrs	16 hrs	Work		6h	10h	8h
23	↳ Copyedit	184 hrs	180 hrs	4 hrs	0 hrs	Act. W		6h	10h	
	Copyeditors	184 hrs	180 hrs	4 hrs	0 hrs	Work				
						Act. W				

After entering task-level timephased actual work, note the updates to the two assignments on the task

4. Adjust the timescale to weekly.

5. Record **12** hours of actual work for Dan Jump's assignment to task 22, *Organize manuscript*, for the week of June 3.

Task Usage	Task Name	Work	Baseline	Variance	Actual	June				
						Details	5/20	5/27	6/3	6/10
0	↳ Children's Book Sel	2,345.5 hrs	2,317.5 hrs	28 hrs	528.5 hrs	Work	83.5h	51.5h	79.5h	83.5h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	24.5 hrs	Act. W	83.5h	43.5h	12h	
15	↳ Acquisition	468 hrs	444 hrs	24 hrs	468 hrs	Work	3.5h	3.5h	3.5h	3.5h
21	↳ Editorial	404 hrs	400 hrs	4 hrs	36 hrs	Act. W	80h	16h		
22	↳ Organize manus	60 hrs	60 hrs	0 hrs	36 hrs	Work	80h	16h		
	Dan Jump	20 hrs	20 hrs	0 hrs	20 hrs	Act. W	32h	28h		
	Hany Morcc	40 hrs	40 hrs	0 hrs	16 hrs	Work	24h	16h	16h	16h
23	↳ Copyedit	184 hrs	180 hrs	4 hrs	0 hrs	Act. W	48h	80h		
	Copyeditors	184 hrs	180 hrs	4 hrs	0 hrs	Work			48h	80h
						Act. W				

After actual work is recorded on one assignment to task 22, the blue change highlighting shows you the task-level and summary task-level changes to actual work

## Reschedule incomplete work

The scenario: Editorial work has been completed. The team has started work on the next phase. However, you need to troubleshoot a delay in work caused by an unforeseen problem. Open the RescheduleIncompleteWork plan in Project, and perform the following tasks:

1. Scroll the Task Usage view to display the latest actual work recorded for task 31, *Proofread and index*.
2. Reschedule incomplete work for the entire project to start after August 7, 2018.

SAGE	Task Name	Work	Baseline	Variance	Actual	Aug 5, '18							
						Details	F	S	S	M	T	W	T
27	↳ Design and Production	906 hrs	888 hrs	18 hrs	410 hrs	Work	16h			0h	0h	12h	8h
28	↳ Set pages	120 hrs	120 hrs	0 hrs	120 hrs	Act. W	16h						
29	↳ Interior illustration design	258 hrs	240 hrs	18 hrs	258 hrs	Work							
30	↳ 1st Pages review	320 hrs	320 hrs	0 hrs	32 hrs	Act. W	16h			0h	0h	12h	8h
31	↳ Proofread and index	100 hrs	100 hrs	0 hrs	32 hrs	Work	16h			0h	0h	12h	8h
	Copyeditors	20 hrs	20 hrs	0 hrs	16 hrs	Act. W	16h			0h	0h	4h	
	Tad Orman	80 hrs	80 hrs	0 hrs	16 hrs	Work	8h			0h	0h	8h	8h
						Act. W	8h						

Note the absence of scheduled work for task 31 (as indicated by 0h) on Monday and Tuesday due to the rescheduled incomplete work; in a Gantt chart view, this would appear as a split task

# Project Views: Observing Progress

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## In This Chapter

- ▶ Viewing your progress with indicators and taskbars
  - ▶ Seeing progress from various Project views
  - ▶ Examining cost and time variances
  - ▶ Understanding earned value
  - ▶ Observing multiple critical paths
- 

Some project managers use Project simply to paint a picture all the effort that their project will entail and then stash the plan in a drawer. That's a mistake. After you enter all the project data, save a baseline, and then track actual activity on the project, you receive in return an amazing array of information from Project that can help you stay on time and on budget.

After you track some actual activity on several tasks, Project lets you view baseline estimates alongside the real-time plan. Project alerts you to tasks that are running late and also shows how the critical path shifts over time. To read about the critical path, review [Chapter 12](#).

Project also provides detailed performance information. In fact, the information you can see about the cost and schedule performance can be quite robust. You can produce a simple cost-and-schedule variance, or you can use more complex metrics, such as a cost performance index using earned-value management techniques. I discuss this particular measurement technique in the later section “[Tracking Progress Using Earned Value Management](#).”

Keep the project file close at hand — and take a look at how Project can make you the most informed project manager in town.

# Seeing Where Tasks Stand

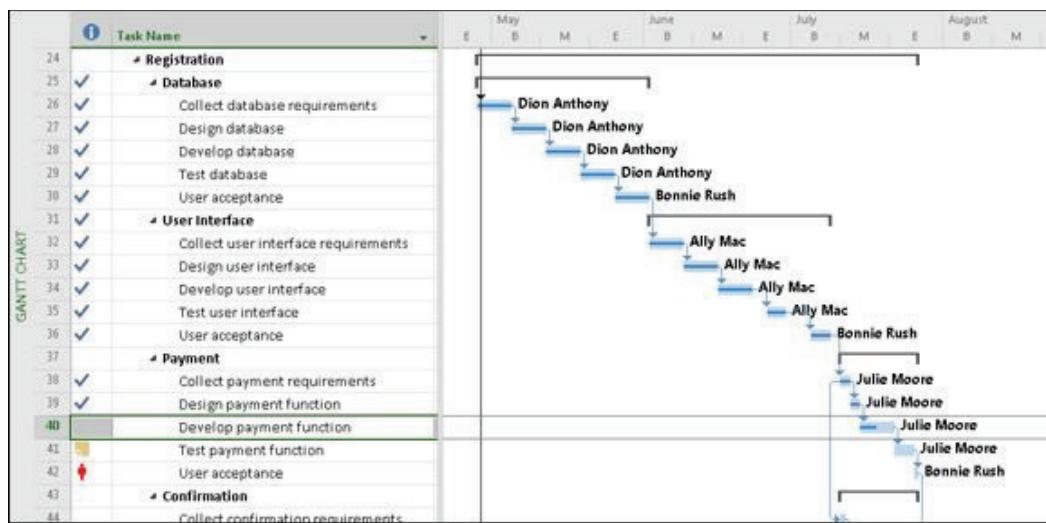
You've diligently entered resource work hours on tasks, recorded the progress on tasks, and entered fixed costs. Now what? Well, all that information has initiated several calculations and updates to the project schedule. It's time to take a quick look at the changes that all this tracking has produced in the project schedule.



A check mark in the Indicator field tells you that a task is complete. If you see an unfamiliar indicator icon crop up in the project, hold the mouse pointer over the indicator. A text box opens and describes its meaning. To see a list of Project icons and their meanings, click Tell Me What You Want to Do next to the Format tab and type **indicators** in the Search box. Click Search and then click Indicator Fields.

## Baseline versus actual progress

One obvious way to view the difference between a baseline estimate and the progress you've tracked in the project is by using a taskbar. After you track progress on several tasks, the Gantt chart shows a black bar superimposed on the baseline taskbar. For example, in [Figure 16-1](#), Tasks 26–39 are complete; you can tell by the solid black bar that extends the full length of the taskbar. Task 40 is only partially complete; the black line that indicates actual progress only partially fills the duration for the task. Task 41 has no recorded activity on it; you see no black line indicating progress — only the normal taskbar.

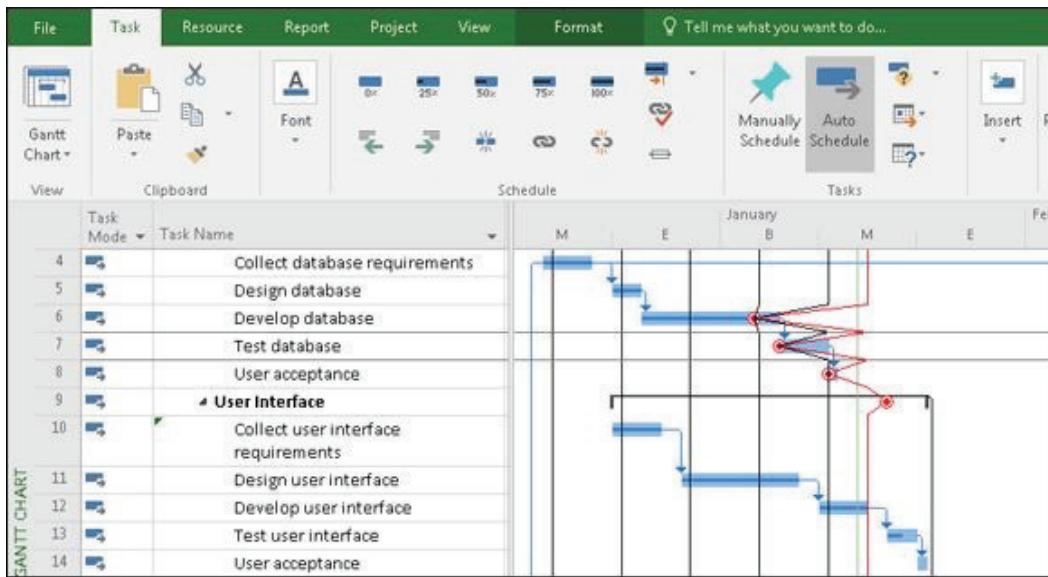


[Figure 16-1:](#) The solid line on a taskbar represents actual activity in the project.

## Lines of progress

Progress lines offer additional visual indicators of how you're doing. As you can see in [Figure 16-2](#), a progress line zigzags among tasks and forms, showing left- or right-pointing peaks. These peaks indicate late or early tasks (calculated according to the

status date you set for tracking or another date that you specify). A progress line that points to the left of a task indicates that the task is running late. Progress lines that point to the right show that — wonder of wonders — you’re running ahead of schedule. (Treasure these lines: They don’t seem to appear often in projects.)



**Figure 16-2:** Progress lines, seemingly run amok.

In [Figure 16-2](#), progress is measured as of the actual date. You can see that the tasks under the Finish Line Beverage are running behind, because the line points to the left.

## Displaying progress lines

By default, Project doesn’t display progress lines. You have to turn them on. And while you’re at it, you may as well specify when and how they appear. Here’s how to display progress lines and change their settings:

1. **Display Gantt Chart view.**
2. **Right-click the chart portion of the view and choose Progress Lines.**  
The Progress Lines dialog box appears, as shown in [Figure 16-3](#).
3. **If you want Project to always show a progress line for the current or status date, select the Display check box in the Current Progress Line section and then select At Project Status Date or At Current Date.**
4. **If you want progress lines to be displayed at set intervals, do this:**
  - a. *Select the Display Progress Lines check box in the Recurring Intervals section and then select Daily, Weekly, or Monthly.*
  - b. *Specify the interval settings.*

For example, if you select Weekly, you can choose every week, every other week, and so on, as well as for which day of the week the line should be displayed on the timescale.

5. **Choose whether you want to display progress lines beginning at the Project**

**start date or on another date.**

To use the Project start date, simply select the Project Start option in the Begin At section of the dialog box. To select an alternative start date, select the second option and then select a date from the calendar drop-down list.

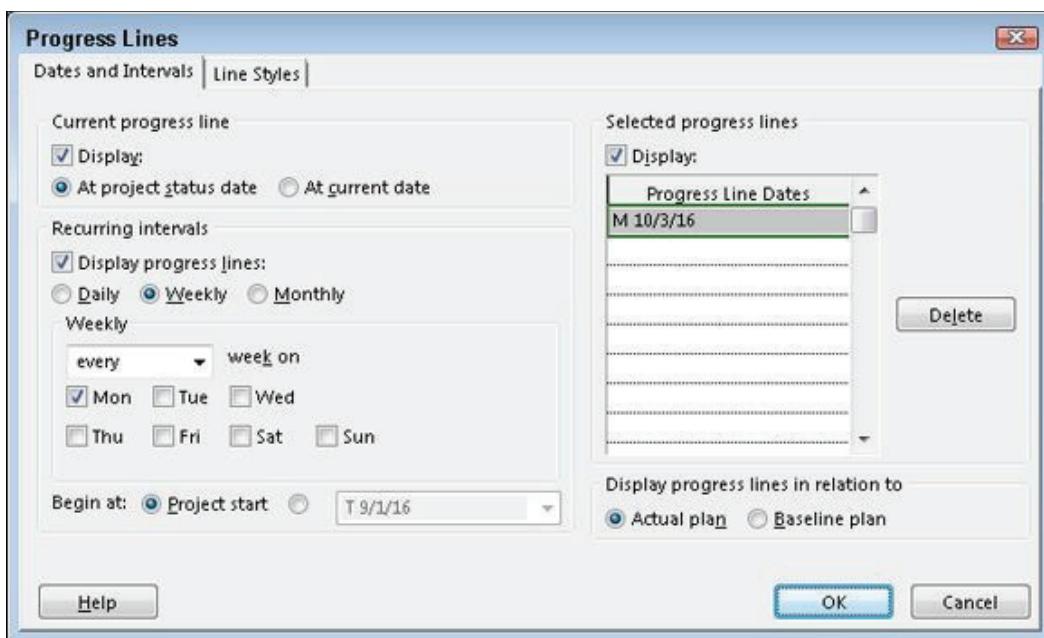
6. **If you want to display a progress line on a specific date, select the Display check box in the Selected Progress Lines section and then choose a date from the Progress Line Dates drop-down calendar.**

You can make this setting for multiple dates by clicking subsequent lines in this list and selecting additional dates.

You can choose to display progress lines in relation to actual or baseline information.

If a task has been tracked to show 50 percent complete, for example, and you choose to have Project display progress lines based on actual information, the peak appears relative to the 50 percent *actual* line, not to the complete baseline taskbar.

7. **Click the OK button to save these settings.**



**Figure 16-3:** The Progress Lines dialog box.

### Formatting progress lines

In keeping with the almost mind-boggling array of formatting options that Project makes available to you, you can modify how progress lines are formatted.

As with any changes to formatting, you're tampering with the way Project codes visual information for readers. Be cautious about making formatting changes that cause the plan to be difficult to read for those who are accustomed to the default Project formatting.

To modify progress-line formatting:

1. **Display Gantt Chart view.**
2. **Right-click the chart portion of the view and choose Progress Lines.**

The Progress Lines dialog box appears (refer to [Figure 16-3](#)).

3. **Select the Line Styles tab.**

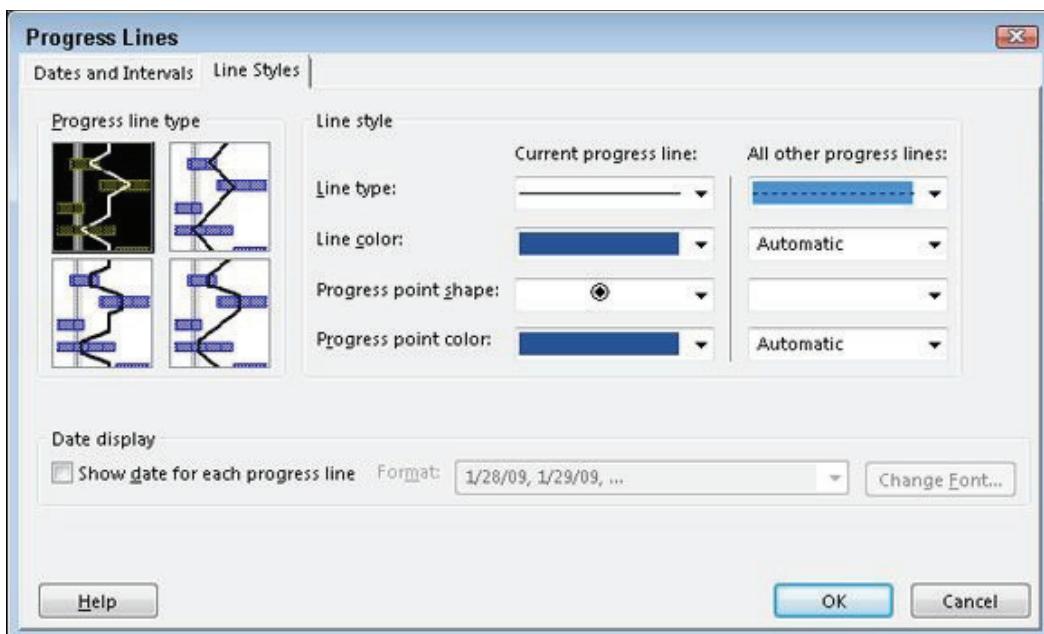
You see the display options shown in [Figure 16-4](#).

4. **In the Progress Line Type area, select a line style sample.**

5. **In the Line Type fields, select a style from the samples.**

You can make two settings: one for the current progress line and one for all other progress lines.

6. **You can change the line color, progress point shape, and progress point color by making different choices in those boxes.**
7. **If you want a date to appear alongside each progress line, select the Show Date for Each Progress Line check box and then select a date from the Format field.**
8. **If you want to change the font that's used for the displayed date, click the Change Font button and make the changes. Click OK in the Font dialog box.**
9. **Click the OK button to save these settings.**

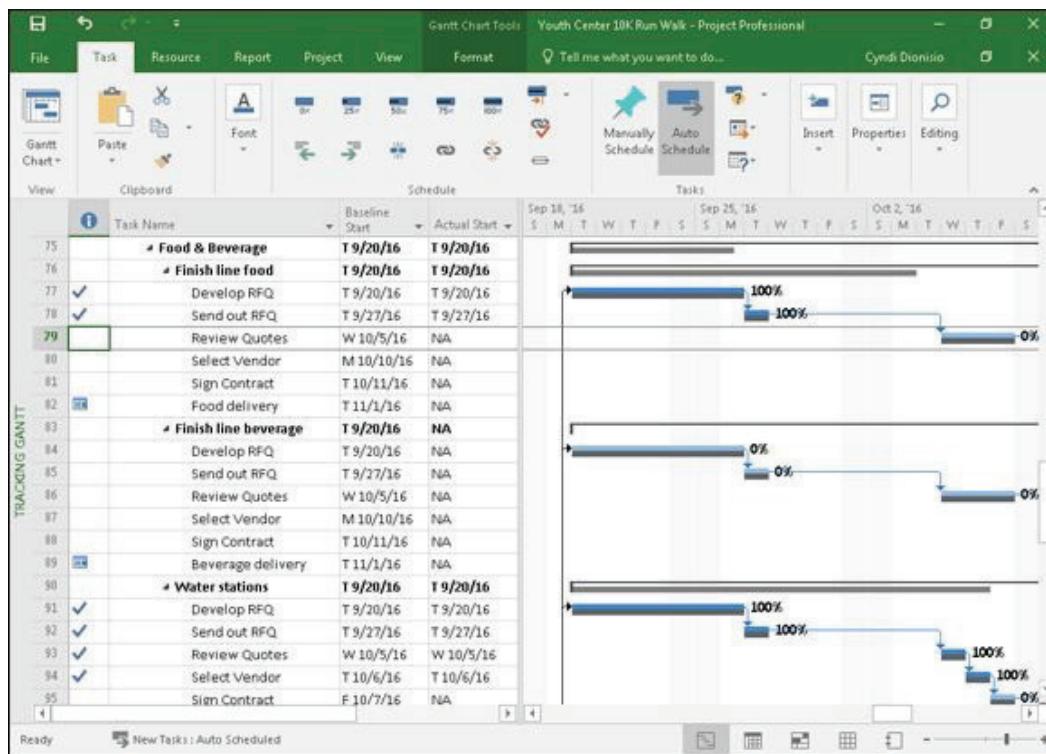


[Figure 16-4:](#) Progress line styles.

# Delving into the Detail

Visual indicators such as taskbars and indicator icons are useful to alert you to delays or variances between estimated and actual performance, but they don't provide detailed information. To get the lowdown on how far ahead (or behind) you are, down to the day or penny, scan the numbers. The numbers that Project provides reveal much about whether you're on schedule and within the budget.

One way to view variances is to show Tracking Gantt view. From the Task tab, go to the View section on the far left side and click the down arrow. Choose Tracking Gantt. This view has, by default, two thin taskbars for each task. The gray bar at the bottom shows the baseline, whereas the top bar shows the current (scheduled) or actual (tracked) schedule. The color of the top bar varies, depending on whether it's a critical task if it's auto-scheduled or a manually scheduled task. As shown in [Figure 16-5](#), in Tracking Gantt view, you can show and tell exactly where a project went off track or picked up steam.



[Figure 16-5:](#) Tracking Gantt view.

Two tables that you can display in Gantt Chart view bring the options into focus. The Cost table and Variance table provide information about dollars spent and variations in timing between baseline and actual activity.



To display a table, choose View => Data Group => Tables and click the table name. Another option is in the Tracking Gantt view, to place the pointer on the blank square immediately above row 1 and to the left of the first column. Then right-click the mouse to display the available tables for easy selection.

In the Cost table shown in [Figure 16-6](#), you can review data that compares baseline estimates to actual costs and the variance between them. These three columns are presented side by side. In the project shown in the figure, you can see the database work came in right on target. The user interface and the payment work packages each had a \$50 variance. By looking at the detail, you can identify the exact activities that caused the variance and how much each activity contributed to the total variance.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
25	# Database	\$0.00	Prorated	\$14,400.00	\$14,400.00	\$0.00	\$14,400.00	\$0.00
26	Collect database requirements	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
27	Design database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
28	Develop database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
29	Test database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
30	User acceptance	\$0.00	Prorated	\$4,000.00	\$4,000.00	\$0.00	\$4,000.00	\$0.00
31	# User Interface	\$0.00	Prorated	\$10,350.00	\$10,300.00	\$50.00	\$10,350.00	\$0.00
32	Collect user interface requirements	\$0.00	Prorated	\$2,000.00	\$2,000.00	\$0.00	\$2,000.00	\$0.00
33	Design user interface	-\$300.00	Prorated	\$1,600.00	\$1,900.00	-\$300.00	\$1,600.00	\$0.00
34	Develop user interface	\$200.00	Prorated	\$2,200.00	\$2,000.00	\$200.00	\$2,200.00	\$0.00
35	Test user interface	\$150.00	Prorated	\$1,350.00	\$1,200.00	\$150.00	\$1,350.00	\$0.00
36	User acceptance	\$0.00	Prorated	\$3,200.00	\$3,200.00	\$0.00	\$3,200.00	\$0.00
37	# Payment	\$0.00	Prorated	\$5,250.00	\$5,200.00	\$50.00	\$5,250.00	\$0.00
38	Collect payment requirements	\$25.00	Prorated	\$825.00	\$800.00	\$25.00	\$825.00	\$0.00
39	Design payment function	\$0.00	Prorated	\$800.00	\$800.00	\$0.00	\$800.00	\$0.00
40	Develop payment function	\$0.00	Prorated	\$2,000.00	\$2,000.00	\$0.00	\$2,000.00	\$0.00
41	Test payment function	\$25.00	Prorated	\$825.00	\$800.00	\$25.00	\$825.00	\$0.00
42	User acceptance	\$0.00	Prorated	\$800.00	\$800.00	\$0.00	\$800.00	\$0.00
43	# Confirmation	\$0.00	Prorated	\$5,260.00	\$5,260.00	\$0.00	\$5,260.00	\$0.00

[Figure 16-6:](#) Cost table.

For the Cost table, a variance that's positive indicates that you've spent more than expected. A variance that's negative indicates that you're under budget.



Project assumes that the remaining costs will remain at the budgeted amount.

In other words, from the total budgeted amount for the work, it assumes that the remaining work will be completed on budget, and it adds the actual costs to date to produce the total cost. Rarely do future estimates end on budget when the work to date is in a cost-overrun situation, so don't rely on the information in the Total Cost column.

In [Figure 16-7](#), the Variance table shows whether the schedule is on track or has variances (much like the Cost table shows cost variances). The table shows the variance between the start and finish of tasks and the baseline start and finish dates. Notice in the example that the “Define route” task was late by two days, which in turn caused the “Get route approval” task to be delayed as well. Because there is float between the route approval and marking the route, this did not negatively impact the critical path.

GANTT CHART

	Task Name	Start	Finish	Baseline Start	Baseline Finish	Start Var.	Finish Var.
114	Course Logistics	M 5/2/16	W 11/2/16	T 4/28/16	W 11/2/16	2 days	0 days
115	Route	M 5/2/16	T 11/1/16	T 4/28/16	T 11/1/16	2 days	0 days
116	Define route	M 5/2/16	F 5/13/16	T 4/28/16	W 5/11/16	2 days	2 days
117	Get route approval	M 5/16/16	F 7/15/16	T 5/12/16	W 7/13/16	2 days	2 days
118	Mark route	T 11/1/16	T 11/1/16	T 11/1/16	T 11/1/16	0 days	0 days
119	Signs	T 7/14/16	W 11/2/16	T 7/14/16	W 11/2/16	0 days	0 days
120	Identify signage points	T 7/14/16	T 7/14/16	T 7/14/16	T 7/14/16	0 days	0 days
121	Post signs	W 11/2/16	W 11/2/16	W 11/2/16	W 11/2/16	0 days	0 days
122	Take down signs	T 11/1/16	T 11/1/16	T 11/1/16	T 11/1/16	0 days	0 days
123	Parking	T 7/14/16	W 11/2/16	T 7/14/16	W 11/2/16	0 days	0 days
124	Identify parking areas	T 7/14/16	T 7/14/16	T 7/14/16	T 7/14/16	0 days	0 days
125	Manage parking	W 11/2/16	W 11/2/16	W 11/2/16	W 11/2/16	0 days	0 days

**Figure 16-7:** Variance table.



If you created contingency reserve to help handle unexpected delays, the total variance shown in the Variance table tells you how many days you may have to deduct from the contingency duration to get back on track. You can read more in [Chapter 17](#) about making adjustments for delays and cost overruns and about contingency reserve in [Chapter 12](#).

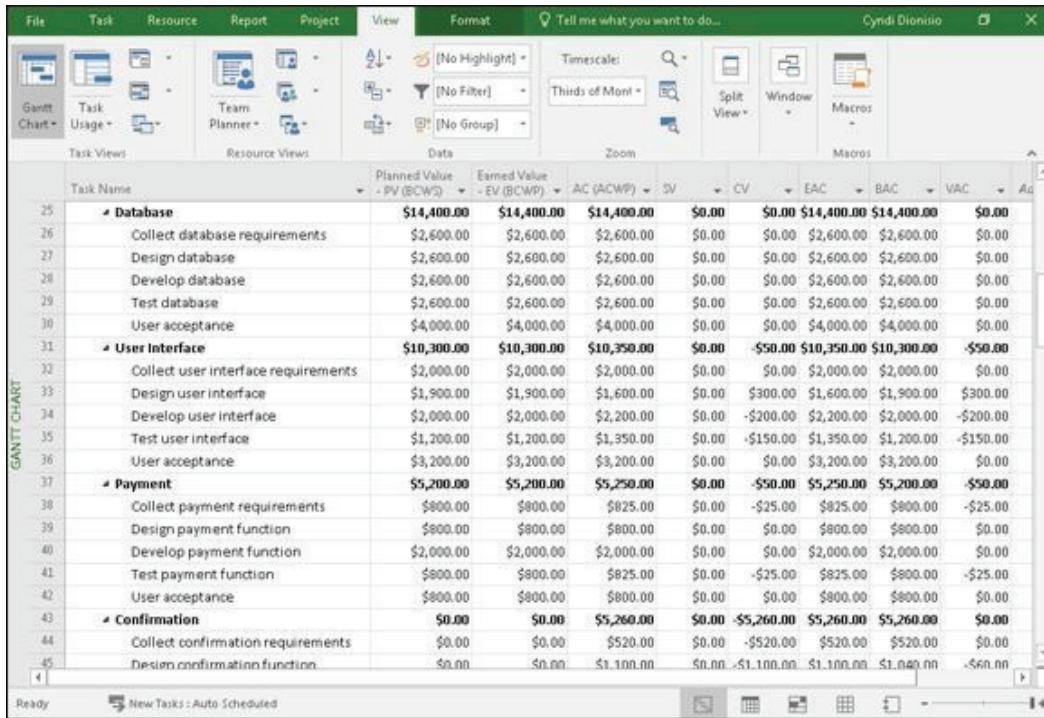
# Tracking Progress Using Earned Value Management

On large projects, especially large government projects, project managers are required to track progress using the earned value management (EVM) method. I won't bore you with a detailed discussion of EVM, but you should become familiar with some of the most common terms and calculations surrounding this concept because many organizations require information on these specific numbers in project reports. Some common terms are defined in this list:

- ✓ **Planned value (PV):** The budgeted (or baseline) cost of tasks based on the cost of resources assigned to the task, plus any fixed costs associated with the tasks, at the point of measurement. In some circles, planned value is also known as the budgeted cost of work scheduled, or BCWS. For example, if you're installing 100 fixtures, the baseline cost to install a fixture is \$100, and you estimate that you can install 5 fixtures per day, the cumulative planned value for Day 3 is \$1,500.
- ✓ **Earned value (EV):** The value of the work you've completed, expressed in dollars. For example, if you've installed only 13 fixtures at the end of Day 3, the earned value is \$1,300. In some circles, earned value is referred to as the budgeted cost of work performed, or BCWP.
- ✓ **Actual cost (AC):** A calculation that includes tracked resource hours or units expended on the task plus fixed costs. In the example, assume that you had to pay overtime to complete some of the work and that the actual costs at the end of Day 3 are \$1,650. AC is also known as actual cost of work performed, or ACWP.
- ✓ **Budget at completion (BAC):** The sum of the planned value. In the example, the BAC of the project is 100 fixtures × \$100, or \$10,000.
- ✓ **Estimate at completion (EAC):** A forecast of the total cost of the project. Project calculates that  $EAC = BAC - EV + AC$ . EVM practitioners cringe at the assumption that future costs will stay on budget. However, Project isn't an EVM tool. If you need to get serious about using EVM, you can buy a plug-in that accurately calculates multiple EACs based on assumptions of future performance.
- ✓ **Variance at completion (VAC):** The difference between the budget at completion (BAC) and the estimate at completion (EAC) is  $VAC = BAC - EAC$ .
- ✓ **Cost variance (CV):** The difference between earned value and actual costs. The equation is  $CV = EV - AC$ . This number is expressed as a negative number if the project is over budget and as a positive number if you're under budget.
- ✓ **Schedule variance (SV):** The difference between earned value and planned value. The equation is  $SV = EV - PV$ . This number is expressed as a negative number if you're accomplishing less work than planned; it's a positive number if you're accomplishing more work than planned. Be aware of saying aloud that you're behind or ahead of schedule. If the work isn't on the critical path, the schedule

performance doesn't necessarily indicate an ahead-of-schedule status or a behind-schedule status.

To see the Earned Value table, as shown in [Figure 16-8](#), select the View tab on the Ribbon, click Tables in the Data group, select More Tables, and choose Earned Value. You can also look at tables that focus only on Earned Value Cost Indicators or Earned Value Schedule Indicators.



The screenshot shows the Microsoft Project application window. The ribbon is visible at the top with tabs like File, Task, Resource, Report, Project, View, Format, and Tell me what you want to do... The View tab is selected. In the Data group, there is a 'Tables' button with a dropdown menu. The 'More Tables' option is selected, and the 'Earned Value' table is chosen. The main area of the window displays a table titled 'Task Name' with columns for Planned Value, Earned Value, AC (ACWP), SV, CV, EAC, BAC, VAC, and Ad. The table lists tasks under four categories: Database, User Interface, Payment, and Confirmation. Each task has its specific values filled in the respective columns.

Task Name	Planned Value	Earned Value	AC (ACWP)	SV	CV	EAC	BAC	VAC	Ad
25 Database	\$14,400.00	\$14,400.00	\$14,400.00	\$0.00	\$0.00	\$14,400.00	\$14,400.00	\$0.00	
26 Collect database requirements	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
27 Design database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
28 Develop database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
29 Test database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
30 User acceptance	\$4,000.00	\$4,000.00	\$4,000.00	\$0.00	\$0.00	\$4,000.00	\$4,000.00	\$0.00	
31 User Interface	\$10,300.00	\$10,300.00	\$10,350.00	\$0.00	-\$50.00	\$10,350.00	\$10,300.00	-\$50.00	
32 Collect user interface requirements	\$2,000.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$2,000.00	\$0.00	
33 Design user interface	\$1,900.00	\$1,900.00	\$1,600.00	\$0.00	\$300.00	\$1,600.00	\$1,900.00	\$300.00	
34 Develop user interface	\$2,000.00	\$2,000.00	\$2,200.00	\$0.00	-\$200.00	\$2,200.00	\$2,000.00	-\$200.00	
35 Test user interface	\$1,200.00	\$1,200.00	\$1,350.00	\$0.00	-\$150.00	\$1,350.00	\$1,200.00	-\$150.00	
36 User acceptance	\$3,200.00	\$3,200.00	\$3,200.00	\$0.00	\$0.00	\$3,200.00	\$3,200.00	\$0.00	
37 Payment	\$5,200.00	\$5,200.00	\$5,250.00	\$0.00	-\$50.00	\$5,250.00	\$5,200.00	-\$50.00	
38 Collect payment requirements	\$800.00	\$800.00	\$825.00	\$0.00	-\$25.00	\$825.00	\$800.00	-\$25.00	
39 Design payment function	\$800.00	\$800.00	\$800.00	\$0.00	\$0.00	\$800.00	\$800.00	\$0.00	
40 Develop payment function	\$2,000.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$2,000.00	\$0.00	
41 Test payment function	\$800.00	\$800.00	\$825.00	\$0.00	-\$25.00	\$825.00	\$800.00	-\$25.00	
42 User acceptance	\$800.00	\$800.00	\$800.00	\$0.00	\$0.00	\$800.00	\$800.00	\$0.00	
43 Confirmation	\$0.00	\$0.00	\$5,260.00	\$0.00	-\$5,260.00	\$5,260.00	\$5,260.00	\$0.00	
44 Collect confirmation requirements	\$0.00	\$0.00	\$520.00	\$0.00	-\$520.00	\$520.00	\$520.00	\$0.00	
45 Design confirmation function	\$0.00	\$0.00	\$1,100.00	\$0.00	-\$1,100.00	\$1,100.00	\$1,100.00	-\$1,100.00	

[Figure 16-8](#): Earned value table.

# **Calculating Behind the Scenes**

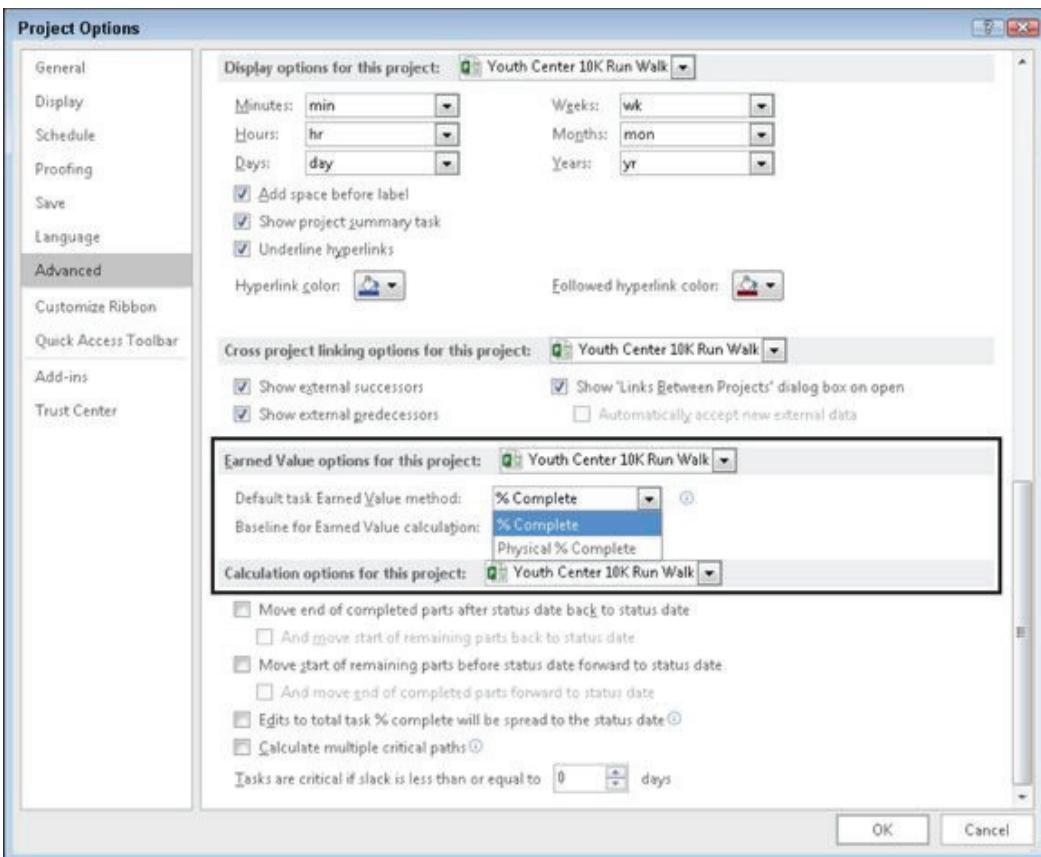
While you're happily entering resource hours and fixed costs into the project, Project is busy making calculations that can shift around task timing and resource workload in the plan. These calculations relate to how tasks are updated, how the critical path is determined, and how earned value is calculated. If you're a control freak, you'll be happy to know that you can, to some extent, control how Project goes about making these calculations.



To change when Project calculates plan updates, select the File tab on the Ribbon, click the Options button to open the Project Options dialog box, and then examine the Schedule category. Scroll to the bottom until you see a section called Calculation Options for This Project. If you turn off the Calculate Project After Each Edit setting, you must click the Calculate Project button in the Schedule group on the Project tab of the Ribbon whenever you want Project to perform all its calculations. You can also choose to set different modes for only the current project or for all open projects.

## ***Earned-value options***

As I mention earlier in this chapter, usually only large projects use earned value management. To find the settings to customize how earned value works in the project, select the File tab, click the Options button, and select Advanced. Scroll down until you see Earned Value Options for This Project. [Figure 16-9](#) shows you the two sample settings for calculating earned value.



**Figure 16-9:** Two settings to calculate earned value.

The Default Task Earned Value Method setting provides these two choices:

- ✓ **% Complete:** This setting calculates earned value using the percent complete that you record on each task. The setting assumes that, on a task that's halfway complete, half the work hours have been used.
- ✓ **Physical % Complete:** Use this setting if you want to manually enter a percentage of completion not based on a straight percent-complete calculation. For example, if you have a four-week task to complete a mail survey, 50 percent of the effort may happen in the first 25 percent of the duration of the project: Design, print, and mail the survey. Nothing happens for two weeks while you wait for responses and then you see a flurry of activity when the responses are returned to you. So a straight calculation that 50 percent of the task is completed 50 percent of the way through isn't accurate. If your projects have a lot of tasks of this type, you may consider changing the settings to use this method. Then you can display the Physical % Complete column in the Gantt Chart sheet and enter more accurate (in your opinion) percent-complete information for each task.

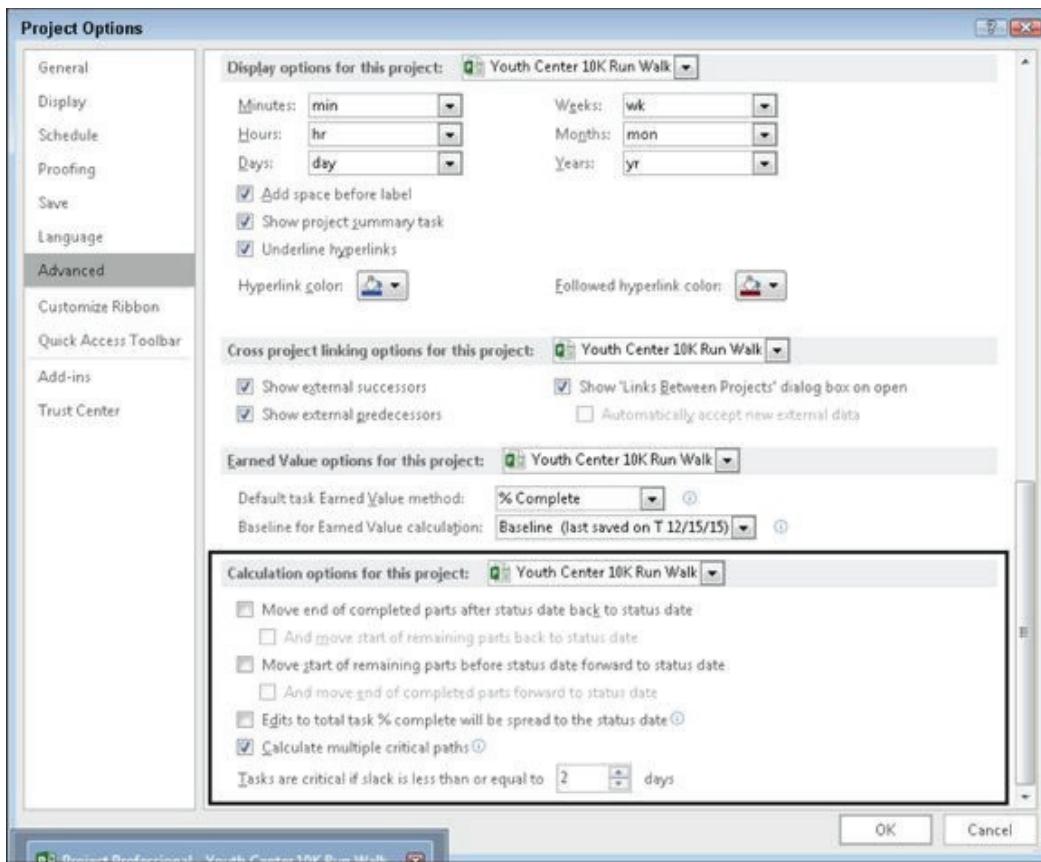
The second setting in the earned-value options in the Project section of the Project Options dialog box is the Baseline for Earned Value Calculation drop-down list. The baseline you use to calculate earned value is essentially setting the planned value for the project. If you're using multiple baselines — such as one for reporting and one for managing — pay close attention to the baseline against which you choose to measure the earned value. Choose any of the 11 possible baselines you may have saved in the

project. After you make these two choices, click OK to close the Project Options dialog box.

## An abundance of critical paths

While I'm talking about the Project Options box, let's take a quick look at some options for calculating the critical path. Three settings in the Project Options dialog box concern critical path calculations. If following one project's critical path is too tame for you, start reviewing multiple critical paths. In Options ⇒ Advanced, the very bottom section is Calculation Options for This Project (see [Figure 16-10](#)). By selecting the Calculate Multiple Critical Paths check box you set up Project to calculate a different critical path for each set of tasks in the project. Doing so can be helpful if you want to identify tasks that, if delayed, will cause you to miss the final project deadline or the goals of a single phase in the project.

You can establish which factors add a task to the critical path, by specifying the number of days of slack the critical tasks may have. Tasks with no slack are, by default, on the critical path. However, you can change this situation if you want to be alerted that tasks with only one day of slack are critical — figuring that one day isn't much padding and that these tasks are still in jeopardy. The setting labeled Tasks Are Critical If Slack Is Less Than or Equal to (x) Days is immediately beneath the Calculate Multiple Critical Paths check box in the Advanced category.



**Figure 16-10:** Selecting multiple critical paths.

Finally, in Options ⇒ Schedule, the Inserted Projects Are Calculated Like Summary

Tasks is straightforward. If you insert another project as a task in the project, selecting this setting allows Project to calculate one critical path for the entire project. If you don't select it, any projects that you insert are treated as outsiders — that is, they aren't considered in the master project's critical-path calculations. If an inserted project won't affect the project's timing, you may deselect this option.

## Aplicații

O companie aerospatială a primit o comandă de la NASA pentru asamblarea unui modul spațial (*NASA.mpp*). S-au identificat două tipuri de resurse critice necesare pentru proiect: ingineri și tehnicieni. Informațiile despre activități sunt date în tabelul de mai jos. Activitățile sunt de tip *Fixed Duration* și *Effort Driven*.

Numele activității	Durata (zile)	Costul material	Ingineri necesari	Tehnicieni necesari
Construct Shell of Module	30	35000	3	7
Procure Life Support System and Experimentation Package	15	50000	1	5
Procure Components of Control and Navigational System	30	80000	1	3
Wire Module	3	4500	1	5
Assemble Control and Navigational System	7	1500	2	5
Preliminary Test of Life Support System	2	1500	1	5
Install Life Support in Module	7	1000	1	5
Install Experimentation Package in Module	3	1200	2	4
Preliminary Test of Control and Navigational System	4	1800	2	4
Install Control and Navigational System in Module	10	3000	2	3
Final Testing and Debugging	8	4800	3	3

Se consideră că proiectul necesită 5 ingineri și 15 tehnicieni. Un inginer este plătit cu 100 \$ / oră iar un tehnician cu 35 \$ / oră. Orele suplimentare se plătesc cu o rată de 150% față de orele de program normal.

Data de start a proiectului este 6 aprilie 2009. Începând cu data de 1 mai 2009, salariul de bază al inginerilor va crește la 120 \$ / oră.

1. Care este estimarea privind costul total al proiectului? Salvați această linie de bază (*baseline*). Aici, toate persoanele lucrează full-time, fără ore suplimentare.
2. Pe data de 20 mai 2009, activitățile se opresc pentru 2 săptămâni. Reflectați această situație în proiect.
3. După această dată, pentru activitățile rămase, lucrează numai 4 ingineri și 12 tehnicieni. Toate persoanele sunt dispuse să lucreze 2 ore suplimentare pe zi. În aceste condiții, care este costul final minim al proiectului? Costul minim presupune reducerea cât mai mult a numărului de ore suplimentare. Care este diferența față de estimarea inițială?

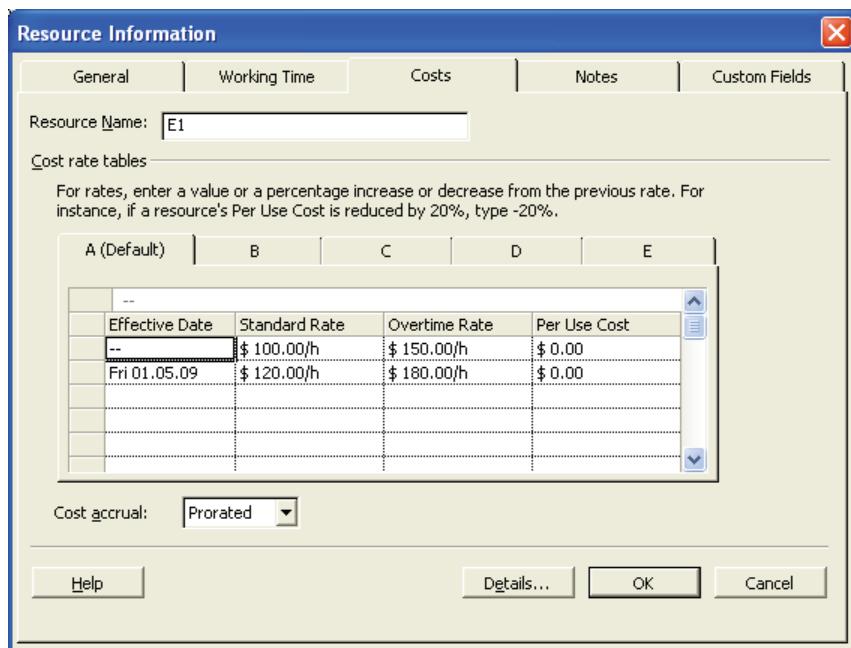
Numărul total de ore lucrate (*Work* în *Project Information → Statistics*) trebuie să fie la fel în linia de bază și în lucrul efectiv.

## Indicații

1. Costurile materiale ale activităților corespund costurilor fixe care pot fi setate din tabela de costuri:

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance
1	Construct Shell of Module	\$ 35,000.00	Prorated	\$ 169,320.00	\$ 0.00	\$ 169,320.00

2. Costul variabil al resurselor se poate seta din fereastra de informații despre resurse:



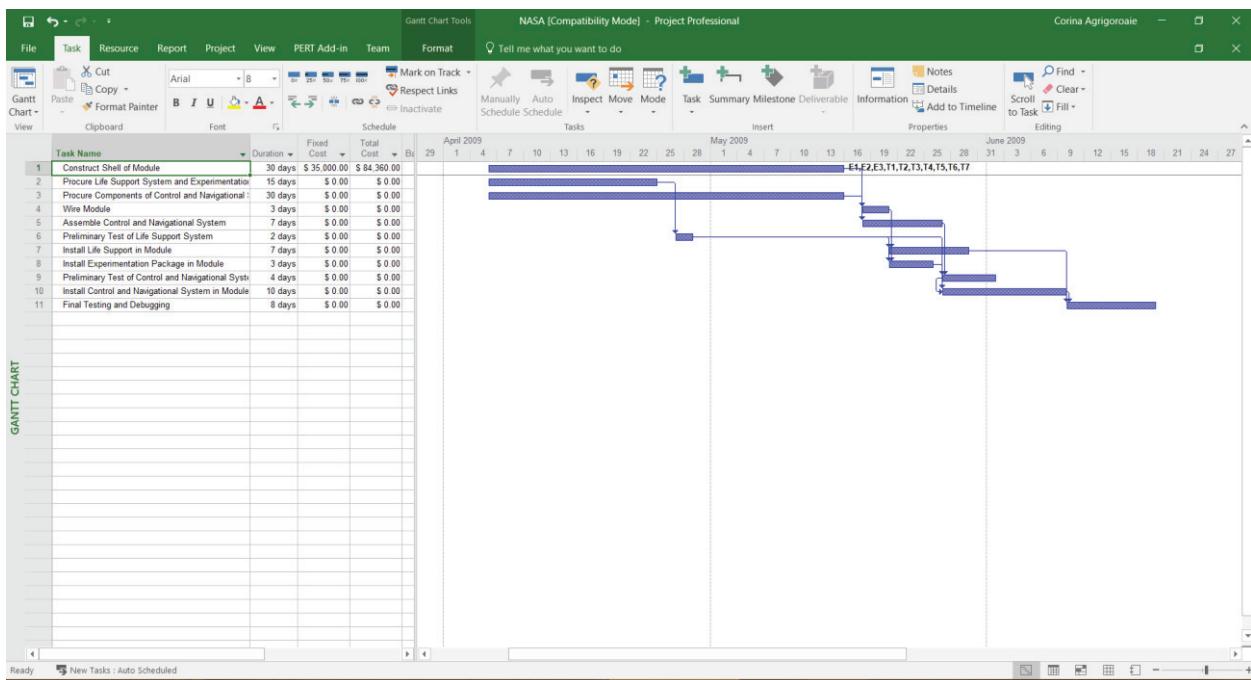
3. Se recomandă alocarea mai întâi a resurselor pentru activitățile/perioadele care impun cele mai multe constrângerile, de exemplu când 3 activități se desfășoară în paralel.

În planificarea inițială, activitățile *Construct Shell of Module*, *Procure Life Support System and Experimentation Package*, *Procure Components of Control and Navigational System* necesită  $7 + 5 + 3 = 15$  tehnicieni iar activitățile *Assemble Control and Navigational System*, *Install Life Support in Module* și *Install Experimentation Package in Module* necesită  $5 + 5 + 4 = 14$  tehnicieni.

După alocarea corectă a resurselor la aceste activități, se pot aloca resurse și pentru celelalte. La fel se procedează și pentru ingineri.

4. Întârzierea cu 2 săptămâni se realizează cel mai ușor cu ajutorul celor două funcții din fereastra *Update Project*.

5. După întârziere, din nou apar 3 activități în paralel, care necesită inițial 5 ingineri. Într-o zi, aceștia ar lucra împreună 40 de ore. După 20 mai, rămân doar 4 ingineri, care pot lucra 10 ore pe zi. Prin urmare, cele 8 ore ale inginerului eliminat trebuie transferate celor 4 ingineri rămași. Inginerul care nu mai lucrează după 20 mai trebuie să rămână în continuare alocat la activitățile dinainte de 20 mai! La fel se procedează și pentru tehnicieni.



## 14. Track progress: Detailed techniques

### In this chapter

- [Update a baseline](#)
- [Track actual and remaining work for tasks and assignments](#)
- [Track timephased actual work for tasks and assignments](#)
- [Reschedule incomplete work](#)

### Practice files

For this chapter, use the practice files from the Project2016SBS\Ch14 folder. For practice file download instructions, see the introduction.

Building, verifying, and communicating a sound plan might take much or even most of your time as a project manager. However, planning is only the first phase of managing your projects. After the planning is completed, the implementation of the project starts—carrying out the plan that was previously developed. Ideally, projects are implemented exactly as planned, but this is seldom the case. In general, the more complex the plan and the longer its duration, the more opportunity there is for variance to appear. Variance is the difference between what you intended to happen (as recorded in the plan's baseline) and what actually happened (as recorded by your tracking efforts).

Properly tracking actual work and comparing it against the original plan enables you to identify variance early and adjust the remaining portion of the plan when necessary.

This chapter guides you through procedures related to updating a baseline, tracking actual and remaining work for tasks and assignments, tracking timephased actual work for tasks and assignments, and rescheduling incomplete work.

### Update a baseline

In [Chapter 8, “Track progress: Basic techniques,”](#) you learned how to save a baseline for a plan. Recall that a baseline is a collection of important values in a plan, such as the planned start dates, finish dates, and costs of tasks, resources, and assignments. When you save (or set) a baseline, Project takes a “snapshot” of the existing values and saves it in the plan for future comparison. If you’ve previously saved a baseline, you might need to update it before recording actual work.



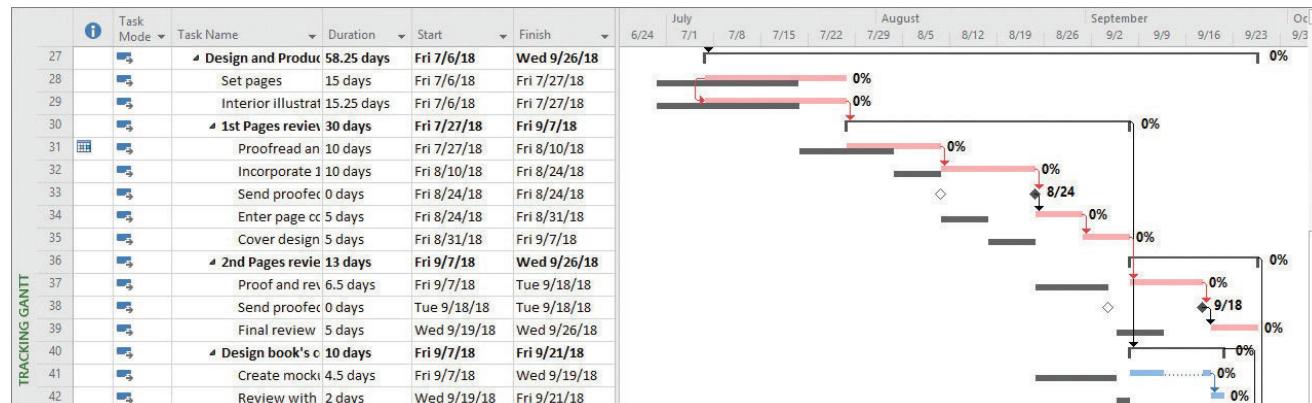
## Tip

If you're not sure whether a plan already has a saved baseline (or multiple baselines), or if you'd like to see when a baseline was saved, here's what to do: On the Project tab, in the Schedule group, click the Set Baseline button, and then click the Set Baseline command. In the Set Baseline field of the dialog box, any previously saved baselines in the plan will be indicated by the dates they were saved.

Keep in mind that the purpose of the baseline is to record what you expected the plan to look like at one point in time. As time passes, however, you might need to change your expectations. After saving an initial baseline plan, you might need to fine-tune the plan by adding or removing tasks or assignments or making other adjustments. To keep an accurate baseline for later comparison, you have several options:

- **Update the baseline for the entire project** This simply replaces the original baseline values with the currently scheduled values.
- **Update the baseline for selected tasks** This does not affect the baseline values for other task or resource baseline values in the plan.
- **Save a second or subsequent baseline** You can save up to 11 baselines in a single plan. The first one is called *Baseline*, and the rest are *Baseline 1* through *Baseline 10*.

A great view for comparing a baseline with the plan as it is currently scheduled is the Tracking Gantt view.



*The Tracking Gantt view shows how tasks in the plan as it is currently scheduled compare to its baseline schedule*

In the chart portion of this view, the tasks as they are currently scheduled appear as blue bars (if they are not critical tasks) or red bars (if they are critical tasks). Below them, the baseline values of each task appear as gray bars.



## Tip

In Gantt chart views such as the Tracking Gantt view, the colors, patterns, and shapes of the bars on the right side of the view represent specific things. To see what any item represents, just point to it and a description will appear in a ScreenTip. To see a complete legend of Gantt chart items and their formatting, on the Format tab, in the Bar Styles group, click Format, and then click Bar Styles.

### Save interim plans

After you start tracking actual values or any time you adjust your plan, you might want to take another snapshot of the current start and finish dates. You can do this with an [interim plan](#). Like a baseline, an interim plan is a set of current values from the plan that Project saves with the file. Unlike the baseline, however, an interim plan saves only the start and finish dates of tasks, not resource or assignment values. You can save up to 10 different sets of interim dates in a plan. (If you find that you need multiple snapshots of scheduled values in addition to start and finish dates, you should instead save additional baselines.)

Depending on the scope and duration of your projects, you might want to save an interim plan at any of the following junctures:

- At the conclusion of a major phase of work
- At preset time intervals, such as weekly or monthly
- Just before or after entering a large number of actual values

### To compare a plan as it is currently scheduled with its previously saved baseline

1. On the **View** tab, in the **Task Views** group, click the **Gantt Chart** arrow, and then click **Tracking Gantt**.
2. If necessary, adjust the zoom level: on the **View** tab, in the **Zoom** group, in the **Timescale** box, select the timescale setting you want. Project compares the plan with the baseline.
3. To compare the plan with another baseline (Baseline 1 through Baseline 10), on the **Gantt Chart Tools Format** tab, in the **Bar Styles** group, click **Baseline**, and then click the baseline you want to see compared.

### To update a previously saved baseline or add an additional baseline

1. On the **Project** tab, in the **Schedule** group, click **Set Baseline**, and then click **Set Baseline** to open the Set Baseline dialog box.
2. Do either of the following:
  - To update a previously saved baseline, click **Set Baseline**, and then select the

specific baseline you want to update.

- To save a new baseline, click **Set Baseline**, and then select the additional baseline you want to save.

**3.** Then do either of the following:

- To update or add the selected baseline for the plan, under **For**, click **Entire Project**, and then click **OK**.
- To update or add the selected baseline just for the selected tasks, under **For**, click **Selected Tasks**. When you do this, the options under Roll Up Baselines become available. You can control how baseline updates should affect the baseline values for summary tasks. For example, you could resave a baseline for a subtask and update its related summary task baseline values if you want.

**4.** Click **OK**.

## To remove a baseline

1. On the **Project** tab, in the **Schedule** group, click the **Set Baseline** button, and then click **Clear Baseline**.

## To save an interim plan

1. On the **Project** tab, in the **Schedule** group, click the **Set Baseline** button, and then click **Set Baseline**.
2. In the **Set Baseline** dialog box, select **Set Interim Plan**.
3. In the **Copy** field, select the date values you want to copy.
4. In the **Into** field, select the date values into which you want to copy the fields you selected in the **Copy** field.
5. Click **OK**.

## Track actual and remaining work for tasks and assignments

In [Chapter 8, “Track progress: Basic techniques,”](#) you learned how to work with actual start, finish, and duration values for individual tasks. For tasks that have resources assigned to them, you can enter actual and remaining work values for the task as a whole or for specific assignments to that task. To help you understand how Project handles the actual values you enter, consider the following:

- If a task has a single resource assigned to it, the actual work values you enter for the task or assignment apply equally to both the task and the resource assignment. For example, if you record that the assignment has five hours of actual work, those values apply to the task and to the assigned resource.
- If a task has multiple resources assigned to it, the actual work values you enter for the task are distributed among or rolled down to the assignments according to their assignment units. This level of detail is appropriate if you aren’t concerned about the details at the individual assignment level.

- If a task has multiple resources assigned to it, the actual work values you enter for one assignment are rolled up to the task. However, the new actual work values do not affect the other assignments' work values on the task. This level of detail is appropriate if details at the individual assignment level are important to you.
- If the actual work value you enter is greater than the planned work, Project sets Remaining Work to zero. If actual work is less than planned work, Project recalculates Remaining Work accordingly. You can also directly edit the Remaining Work value if you want.

A great view for recording actual and remaining work is the Task Usage view with the Work table displayed.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	T	W
0	↳ Children's Book Scl	2,317.5 hrs	2,317.5 hrs	0 hrs	127 hrs	2,190.5 hrs	5%	Work	8h	8h
1	↳ Editorial staff mee	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work		
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	120 hrs	324 hrs	27%	Work	8h	8h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work		
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h
	Carole Polar	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h
18	↳ Original art revi	164 hrs	164 hrs	0 hrs	0 hrs	164 hrs	0%	Work		
	Hany Morcc	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		
	Jane Dow	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		
19	↳ Author review c	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work		
	Copyeditors	80 hrs	80 hrs	0 hrs	0 hrs	80 hrs	0%	Work		

*The Task Usage view has two parts: a table on the left and timephased data (that is, data organized under a timescale) on the right*

As you might recall from [Chapter 9](#), “[Fine-tune task scheduling](#),” the two sides of the usage view are split by a vertical divider bar. This view lists resources under the tasks to which they’re assigned. This information appears in the table on the left side. On the right side are rows organized under a timescale. The rows show you the scheduled work values for each task and assigned resource. The Task Usage view color-codes the rows on the right side: task rows have a shaded background, and assignment rows have a white background.



In this topic, we focus on the Task Usage view to show the results of entering actual work per task or assignment. Other means of recording actual work include the Task Form or the Task Details Form with the Work detail displayed in a split view with a Gantt chart, Task Usage, or other task-centric view. For a refresher on the Task Form, see [Chapter 6](#), “[Assign resources to tasks](#).”

Let’s walk through some examples of entering actual work. We’ll start in the Task Usage view with the Work table displayed.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	W	T	F
0	↳ Children's Book Schedule	2,317.5 hrs	2,317.5 hrs	0 hrs	127 hrs	2,190.5 hrs	5%	Work	8h	20h	24h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work			
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	120 hrs	324 hrs	27%	Work	8h	20h	24h
16	Manuscript received	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work			
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
	Carole Poland	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
18	↳ Original art review	164 hrs	164 hrs	0 hrs	0 hrs	164 hrs	0%	Work		12h	16h
	Hany Morcos	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		6h	8h
	Jane Dow	82 hrs	82 hrs	0 hrs	0 hrs	82 hrs	0%	Work		6h	8h
19	↳ Author review of content edit	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work			

In this example, task 18 initially has 164 hours of scheduled work, which is evenly split between the two assigned resources

The Work table includes the Actual Work and Remaining Work columns. The values in the Work column are the task-level and assignment-level totals for scheduled work. Note that each task's work value is the sum of its assignment work values.

In a usage view, you see work values at two different levels of detail: the total value for a task or assignment on the left and the more detailed timephased level on the right. These two sets of values are directly related. Consider, for example, a task named *Original art review*, which is task 18 in the plan. The 164 hours of total work for task 18 is the sum of Hany Morcos's 82 hours of work on the task plus Jane Dow's 82 hours.

In the timephased grid, the scheduled work values per time period are displayed—daily, in this example. If you add up the daily work values for a specific task or assignment, the total equals the value in the Work column for that task or assignment.

Let's look more closely at the results of entering an actual work value. In this example, when we enter 92 hours of actual work on task 18, Project distributes the actual work among the assigned resources and adjusts their remaining work.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	W	T	F
0	↳ Children's Book Schedule	2,317.5 hrs	2,317.5 hrs	0 hrs	219 hrs	2,098.5 hrs	9%	Work	8h	20h	24h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work			
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	212 hrs	232 hrs	48%	Work	8h	20h	24h
16	Manuscript received	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work			
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
	Carole Poland	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
18	↳ Original art review	164 hrs	164 hrs	0 hrs	92 hrs	72 hrs	56%	Work		12h	16h
	Hany Morcos	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	56%	Work		6h	8h
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	56%	Work		6h	8h
19	↳ Author review of content edit	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work			

This is what the view looks like after 92 hours of actual work are recorded on task 18

Several important things occurred when we entered the actual work on task 18:

- Project applied change highlighting to the updated values in the table.
- The amount of actual work we entered was subtracted from the Remaining Work column (labeled *Remaining* in the Work table).
- The actual work was distributed to the two assignments on the task, resulting in 46

hours of actual work being recorded for Hany Morcos and 46 hours for Jane Dow. Likewise, the remaining work values were recalculated for each assignment.

- The updated actual and remaining work values were rolled up to the Acquisition summary task and to the Project summary task.

Now that you've seen the effect of recording actual work at the task level, let's look at entering actual work at the assignment level. Again, we'll focus on task 18. When we assigned 92 hours of work to the task, Hany Morcos was assigned 46 hours of that work. Now, after we record actual work of 62 hours for Hany, we see that her actual and remaining work values are updated, and those updates also roll up to the task and its summary task. (Project highlights the changed values.) However, the actual and remaining work values for Jane Dow, the other resource assigned to the task, are not affected.

	Task Name	Work	Baseline	Variance	Actual	Remaining	% W. Comp.	Details	W	T	F
0	↳ Children's Book Schedule	2,317.5 hrs	2,317.5 hrs	0 hrs	235 hrs	2,082.5 hrs	10%	Work	8h	20h	24h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	15%	Work			
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	228 hrs	216 hrs	51%	Work	8h	20h	24h
16	Manuscript received	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	100%	Work			
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
	Carole Poland	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	100%	Work	8h	8h	8h
18	↳ Original art review	164 hrs	164 hrs	0 hrs	108 hrs	56 hrs	66%	Work		12h	16h
	Hany Morcos	82 hrs	82 hrs	0 hrs	62 hrs	20 hrs	76%	Work		6h	8h
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	56%	Work		6h	8h
19	↳ Author review of content edit	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	0%	Work			

*After 62 hours of actual work are recorded on Hany Morcos's assignment to task 18, Hany's work values are updated, but Jane Dow's assignment is not affected*



A handy way to quickly record actual work and other progress details per assignment is via the Tracking tab of the Assignment Information dialog box. In either the Task Usage or Resource Usage view, double-click an assignment. In the dialog box, you can set actual work, remaining work, actual start, and other values. This dialog box is available regardless of what table is displayed in the usage view.

Tracking a task's actual work-complete value is more detailed than entering a simple percentage-complete value on a task. However, neither method is as detailed as entering timephased actual work for tasks or assignments (as you will see in the next topic). There's nothing wrong with tracking actual work at the task or assignment level (or simply entering a percentage-complete value, for that matter), if that level of detail meets your needs. In fact, whether you see the timephased details or not, Project always distributes any percentage-complete or task-level or assignment-level actual work value you enter into corresponding timephased values.

## Enter actual costs manually

When you enter actual work values, Project calculates actual cost values for the affected task, its summary task, the resources assigned to the task, and the entire plan. By default, Project calculates actual costs and does not allow you to enter them directly. In most cases, this is what we recommend and what is done with the practice files used in this book. However, if you want to enter actual cost values yourself in your own plans, follow these steps.

### Important

The following procedure is provided for your general information; however, do not follow this procedure now if you are completing the practice tasks in this book. Doing so will produce results that will not match those shown in this book.

1. Click the **File** tab to display the Backstage view, and then click **Options** to open the Project Options dialog box.
2. Click the **Schedule** tab.
3. Under the **Calculation options for this project** label, clear the **Actual costs are always calculated by Project** check box.
4. Click **OK**.

After automatic cost calculation is turned off, you can enter or import task-level or assignment-level actual costs in the Actual field. This field is available in several locations, such as the Cost table. You can also enter actual cost values daily or at another interval in any timescale view, such as the Task Usage or Resource Usage view. To do so, with a usage view displayed, click Actual Cost on the Format tab, in the Details group.

## To record actual and remaining work per task

1. On the **View** tab, in the **Task Views** group, click **Task Usage** to display the Task Usage view.
2. On the **View** tab, in the **Data** group, click **Tables**, and then click **Work** to display the Work table.
3. In the **Actual** column for the task for which you want to record actual work, enter an actual work value.
4. If you want, enter a new **Remaining Work** value for the task.

## To record actual and remaining work per assignment

1. Display the Task Usage view and the **Work** table.
2. In the **Actual** column for the assigned resource for which you want to record actual work, enter an actual work value.
3. If you want, enter a new **Remaining Work** value for the assignment.

## Track timephased actual work for tasks and assignments

In [Chapter 8, “Track progress: Basic techniques,”](#) you were introduced to simpler ways of tracking actuals in a plan. These include recording the percentage of a task that has been completed, in addition to its actual start and finish dates. These methods of tracking progress are fine for many projects, but Project 2016 also supports more detailed ways of tracking.

This topic introduces techniques to track work per time period, such as actual work completed per week or per day. Information distributed over time is commonly referred to as being *timephased*, so tracking work by time period is sometimes referred to as *tracking timephased actuals*. This is the most detailed level of tracking progress available in Project.

As with the simpler tracking methods, tracking timephased actuals helps you address the most basic questions of managing a project:

- Are tasks starting and finishing as planned? If not, what will be the impact on the project’s finish date?
- Are resources spending more or less time than planned to complete tasks?
- Is it taking more or less money than planned to complete tasks?

Entering timephased actuals requires more work on the project manager’s part and might require more work from resources, if they have to inform the project manager of their daily or weekly actuals. However, using timephased actuals gives you far more detail about the plan’s task and resource status than the other methods used for tracking progress. Entering timephased values might be the best approach to take if you have a group of tasks or an entire plan that includes the following:

- High-risk tasks
- Tasks of relatively short duration, for which a variance of even one day could put the overall project at risk
- Tasks for which you’d like to develop or validate throughput metrics, or rates at which a specified quantity of a deliverable can be completed over a specified time period, such as *Copyedit 3000 words per day*
- Tasks in which sponsors or other stakeholders have an especially strong interest
- Tasks that require hourly billing for labor

When you need to track actual work at the most detailed level possible, use the Work table and the timephased grid in the Task Usage or Resource Usage view.

In the Task Usage view, you can enter timephased actual work at the task or assignment level. In the Resource Usage view, you enter actuals at the assignment level. In both views, entering actual work in the left side of the view will cause Project to update work values distributed over time in the right side of the view. In this topic, we’ll look at the reverse: entering actual work in the timephased side of the view and seeing the results per task or assignment on the left side of the view.

The previous topic's example featured the Task Usage view; in this topic, we'll begin with the Resource Usage view.

Resource Name	% Comp	Work	Overtime	Baseline	Variance	Actual	Remaining	May 13, '18						
								Details	S	M	T	W	T	F
3 ▾ Copyeditors	29%	316 hrs	0 hrs	300 hrs	16 hrs	92 hrs	224 hrs	Work		4h	8h	8h	8h	8h
	Author review of content	100%	92 hrs	0 hrs	80 hrs	12 hrs	92 hrs	0 hrs	Act. W	4h	8h	8h	8h	8h
	Copyedit	0%	184 hrs	0 hrs	180 hrs	4 hrs	0 hrs	184 hrs	Work	4h	8h	8h	8h	8h
	Author review of copyedit	0%	20 hrs	0 hrs	20 hrs	0 hrs	0 hrs	20 hrs	Act. W	4h	8h	8h	8h	8h
	Proofread and index	0%	20 hrs	0 hrs	20 hrs	0 hrs	0 hrs	20 hrs	Work					
								Act. W						
4 ▾ Dan Jump	3%	114.5 hrs	0 hrs	114.5 hrs	0 hrs	3.5 hrs	111 hrs	Work		0.5h				
								Act. W		0.5h				
5 ▾ Hany Morcos	16%	563 hrs	0 hrs	563 hrs	0 hrs	89 hrs	474 hrs	Work		1h				
	Handoff to Production	0%	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Act. W		1h				
	Incorporate 1st Pages review	0%	80 hrs	0 hrs	80 hrs	0 hrs	0 hrs	Work						
								Act. W						

*The Resource Usage view shows assignments per resource*



You can change the details (that is, the fields) shown in the timephased grid in a usage view. You can add or remove fields and change the formatting of the fields that are shown. For example, you can add the Actual Work field. To see the available fields and formatting options, on the Format tab, in the Details group, click Add Details.

In both views, you can enter actual work values for individual assignments daily, weekly, or at whatever time period you want (by adjusting the timescale). For example, if a task has three resources assigned to it and you know that two resources worked on the task for eight hours one day and the third resource worked for six hours, you can enter these as three separate values on a timephased grid.

A key to working effectively in a usage view is setting the timescale correctly. You can change the zoom level of the timescale to control the time period in which you enter actual values in the timephased grid. For example, you can change the timescale to show weeks rather than days; when you enter an actual value at the weekly level, that value is distributed over the week.



## Tip

Project includes several handy shortcuts for navigating in the timephased grid side of the usage views. In the Task Usage view, use the Scroll To Task button on the Task Tab, in the Editing group, to display the earliest scheduled work on the selected task or assignment. You can also use the Scroll To Task command in the shortcut menu for tasks. In the Resource Usage view, use Scroll To Task to see the selected resource's or assignment's scheduled work. In both views, you can quickly get to a specific date in the grid (or a task or resource ID) by using the Go To command via the keyboard shortcut Ctrl+G. If you forget this keyboard shortcut, just enter *go to* in the Tell Me box and Project will show you the command.

Here's an example of entering timephased actuals in a usage view. As you saw in the previous topic, the scheduled work per task, resource, or assignment is equal on the two sides of a usage view. The difference is that the scheduled work is shown as a single total value on the left side but distributed over time on the right side.

We'll begin in the timephased grid of the Task Usage view with the Work table displayed. We'll record actual work for task 19, *Author review of content edit*.

Task Usage	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	May 13, '18					
								T	F	S	S	M	T
15	Acquisition	444 hrs	444 hrs	0 hrs	302 hrs	142 hrs	Work	16h	10h			16h	16h
							Act. W	16h	10h				
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work						
							Act. W						
17	Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work						
							Act. W						
18	Original art review	164 hrs	164 hrs	0 hrs	164 hrs	0 hrs	Work	8h					
							Act. W	8h					
19	Author review of content edit	160 hrs	160 hrs	0 hrs	18 hrs	142 hrs	Work	8h	10h			16h	16h
							Act. W	8h	10h				
	Copyeditors	80 hrs	80 hrs	0 hrs	9 hrs	71 hrs	Work	4h	5h			8h	8h
							Act. W	4h	5h				
	Tad Orman	80 hrs	80 hrs	0 hrs	9 hrs	71 hrs	Work	4h	5h			8h	8h
							Act. W	4h	5h				
20	Handoff to Editor	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work						
							Act. W						
	Carole Polar	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work						
							Act. W						

Here we've entered 8 hours of actual work for Thursday (which is what was scheduled) and 10 hours of actual work for Friday (when 16 hours was originally scheduled) on task 19

As you saw in the previous topic, the actual work recorded on the task is distributed to its assignments. In the timephased grid, you can see per time period how the actual work gets distributed.



## Tip

When entering actual work, you do not need to include the “h” abbreviation (to denote hours). You can simply enter the number and Project will record it as hours. Hours is the default work value for data entry. If you want, you can change this. Click the File tab to display the Backstage view, and then click Options. On the Schedule page of the Project Options dialog box, in the Work Is Entered In box, select the default time increment you want.

Next we'll enter actual work on the assignment in the timephased grid.

Task Name	Work	Baseline	Variance	Actual	Remaining	Details	May 13, '18					
							T	F	S	S	M	T
15 ▾ Acquisition	444 hrs	444 hrs	0 hrs	316 hrs	128 hrs	Work	16h	10h			14h	16h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	Act. W	16h	10h			14h	
17	▶ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	Work						
18	▶ Original art review	164 hrs	164 hrs	0 hrs	164 hrs	Act. W	Work	8h				
19	◀ Author review c	160 hrs	160 hrs	0 hrs	32 hrs	128 hrs	Act. W	8h			14h	16h
	Copyeditors	80 hrs	80 hrs	0 hrs	15 hrs	65 hrs	Work	4h	5h		6h	8h
	Tad Orman	80 hrs	80 hrs	0 hrs	17 hrs	63 hrs	Act. W	4h	5h		6h	
	Handoff to Edito	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work	4h	5h		8h	8h
20	Carole Polar	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Act. W					

Here we've entered 6 hours of actual work for the Copyeditors and 8 hours for Tad Orman for Monday on the same task

In this example, the actual work values entered for the assignments differed from the scheduled work. Project accounted for the difference by adjusting the scheduled work at the end of the assignments.

	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	T	W	T	F
15	▲ Acquisition	444 hrs	444 hrs	0 hrs	316 hrs	128 hrs	Work	16h	16h	15h	1h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Act. W				
17	▷ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work				
18	▷ Original art review	164 hrs	164 hrs	0 hrs	164 hrs	0 hrs	Act. W				
19	▲ Author review c	160 hrs	160 hrs	0 hrs	32 hrs	128 hrs	Work	16h	16h	15h	1h
	Copyeditors	80 hrs	80 hrs	0 hrs	15 hrs	65 hrs	Act. W	8h	8h	8h	1h
20	Tad Orman	80 hrs	80 hrs	0 hrs	17 hrs	63 hrs	Work	8h	8h	7h	
	▲ Handoff to Edit	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Act. W				0h
	Carole Polai	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work				0h
							Act. W				

*Project adjusted the scheduled work to account for the actual work values that were recorded that varied from scheduled work*

When you record actual work in the table on the left side of the view, Project records the actual work to match scheduled work in the timephased grid on the right side of the usage view. The main advantage of entering actual work in the timephased grid instead of in the table on the left side of the view is that you can precisely control the dates for which the actual work gets recorded.

## **Project management focus: Collect actuals from resources**

The Resource Usage view is similar to a timecard. In fact, to enter assignment-level actual work values, you might need some form of paper timecard or its electronic equivalent. Several methods are used to collect such data from resources, assuming that you need to track actual and remaining work at this level of detail. Some collection methods include the following:

- **Collect actual values yourself** This method is feasible if you communicate with only a small group of resources on a frequent basis, such as a weekly status meeting. It's also a good opportunity to talk directly to the resources about any blocking issues or surprises they might have encountered (either positive or negative) while performing the work.
- **Collect actuals through a formal status reporting system** This technique might work through the already-existing hierarchy of your organization and serve additional purposes besides project status reporting.

Regardless of the data collection methods you use, be aware that resources might have some concern about how their actual work values reflect their overall performance. You might need to communicate to resources that schedule actuals help in managing the project, but performance evaluation is a business management focus, not a project management focus.

If your organization uses a timecard reporting system, you might be able to utilize this timecard data in Project as timephased actuals. You might not need to track at this level, but if resources complete timesheets for other purposes (billing other departments within the organization, for example), you can use their data and save yourself some work.

Speaking of timecards, depending on how your organization operates, you might want to explore Project Professional and its interoperability with Microsoft SharePoint and Project Web App (PWA). For more information, see [Appendix C, "Collaborate: Project, SharePoint, and PWA."](#)



## Tip

Task and assignment values are directly related; an update to one directly affects the other. However, you can break this relationship if you want. Doing so enables you to record progress for resource assignments, for example, and manually enter actual values for the tasks to which those resources are assigned. You normally should not break this relationship unless you have special reporting needs within your organization—for example, when you must follow a status reporting methodology based on something other than the actual values recorded for assignments in plans. To break this relationship, do the following: Click the File tab to display the Backstage view, and click Options. In the Project Options dialog box, on the Schedule tab, under the Calculation Options For This Project label, clear the Updating Task Status Updates Resource Status check box. This setting applies to the entire plan you have open at the time; you cannot apply it only to some tasks within a plan.

### To record timephased actual work in the Task Usage view

1. On the **View** tab, in the **Task Views** group, click **Task Usage** to display the Task Usage view.
2. On the **Task Usage Tools Format** tab, in the **Details** group, click **Actual Work**. The Actual Work detail row appears in the timephased portion of the view.
3. If needed, adjust the timescale to match the time interval at which you want to enter actual work (for example, daily or weekly): On the **View** tab, in the **Zoom** group, click the **Timescale** arrow, and then click the timescale time unit you want.
4. In the timephased grid, at the intersection of the task or assignment and the date you want, enter an actual work value.

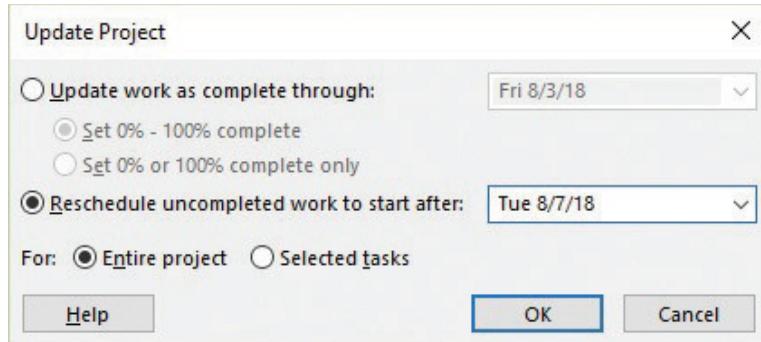
### To record timephased actual work in the Resource Usage view

1. Display the Resource Usage view and Actual Work detail, and adjust the timescale as needed.
2. In the timephased grid, at the intersection of an assignment and the date you want, enter an actual work value.

## Reschedule incomplete work

During the course of a project, work might occasionally be interrupted for a specific task or for the entire project. If this happens, you can have Project reschedule the remaining work to restart after the date you specify.

When you reschedule incomplete work, you specify the date after which work can resume—the rescheduled date. You reschedule incomplete work in the Update Project dialog box.



*Use the Update Project dialog box to reschedule incomplete work*

Here is how Project handles tasks in relation to the rescheduled date:

- If the task does not have any actual work recorded for it prior to the rescheduled date and does not have a constraint applied, the entire task is rescheduled to begin after that date.
- If the task has some actual work recorded prior to the rescheduled date but none after it, the task is split so that all remaining work starts after the rescheduled date. The actual work is not affected.
- If the task has some actual work recorded for it prior to, and after, the rescheduled date, the task is not affected.

## To reschedule incomplete work

1. To reschedule work just for specific tasks, select those tasks first.
2. On the **Project** tab, in the **Status** group, click **Update Project** to open the Update Project dialog box.
3. Select **Reschedule incomplete work to start after**, and in the date box, enter or select the date you want.
4. Do one of the following:
  - Click **Selected Tasks** to reschedule work just for the selected tasks.
  - Click **Entire Project** to reschedule work for the entire project.
5. Click **OK**.

## Skills review

In this chapter, you learned how to:

- [Update a baseline](#)
- [Track actual and remaining work for tasks and assignments](#)
- [Track timephased actual work for tasks and assignments](#)
- [Reschedule incomplete work](#)



## Practice tasks

The practice files for these tasks are located in the Project2016SBS\Ch14 folder.



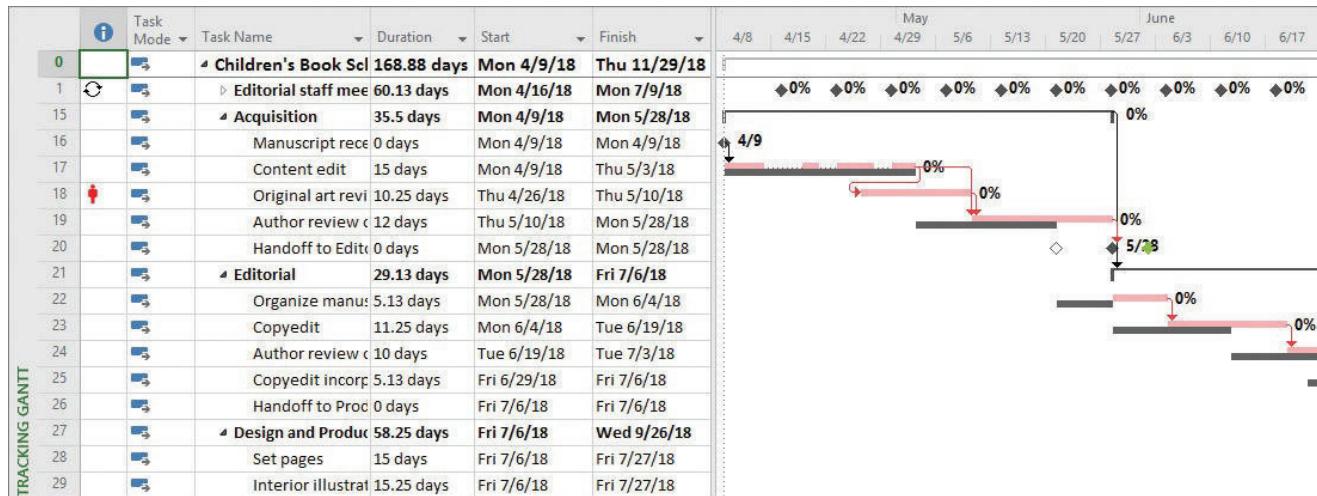
### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Update a baseline

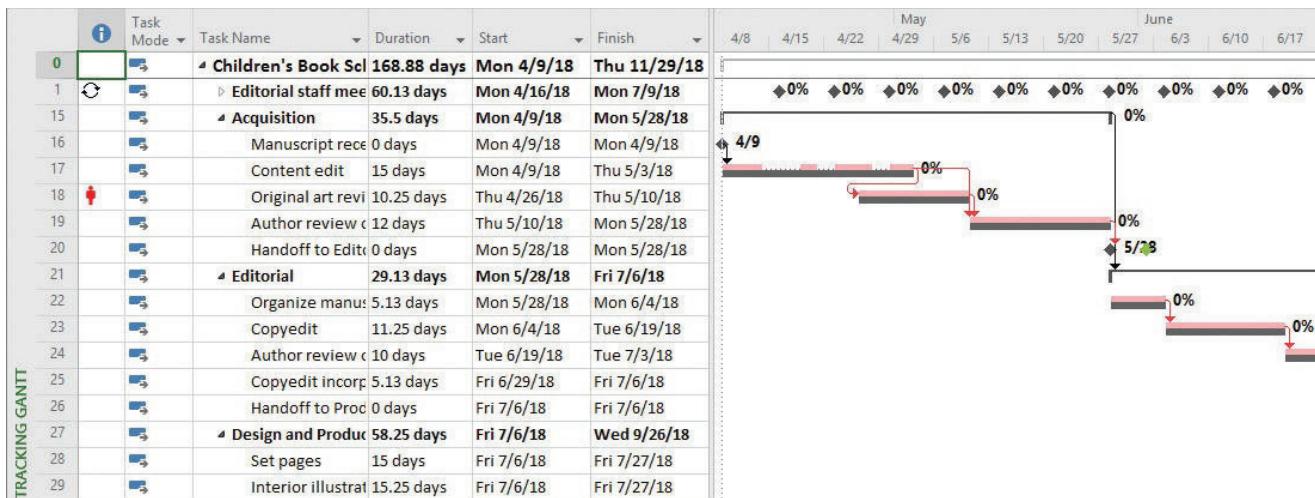
The scenario: At Lucerne Publishing, the planning for the new children’s book project has undergone some additional fine-tuning, including adjustments to task durations and the addition of a task. Because of these changes, you need to capture a new baseline before work begins. Open the UpdateBaseline plan in Project, and perform the following tasks:

1. Examine the current baseline in the Tracking Gantt view with the timescale set to weekly.



*In the Tracking Gantt view, note that the recently added task 18 lacks a baseline*

2. Update the baseline for the entire plan.



After the plan's baseline is updated, the baseline dates align with the as-scheduled task dates and task 18 now has a baseline

## Track actual and remaining work for tasks and assignments

The scenario: Several tasks in the plan have more than one resource assigned. You'd like to get a better look at how your recording of actual work on such tasks affects assigned work. Open the TrackWork plan in Project, and perform the following tasks:

1. Display the Work table in the Task Usage view.
2. Record 92 hours of actual work on task 18, *Original art review*.

	Task Name	Work	Baseline	Variance	Actual		Remaining	Details	Apr 8, '18			
					Actual	Remaining			S	M	T	W
0	Children's Book Scl	2,317.5 hrs	2,317.5 hrs	0 hrs	219 hrs	2,098.5 hrs		Work		8h	8h	8h
1	Editorial staff mee	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs		Work				
15	Acquisition	444 hrs	444 hrs	0 hrs	212 hrs	232 hrs		Work		8h	8h	8h
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs		Work				
17	Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs		Work		8h	8h	8h
	Carole Polari	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs		Work		8h	8h	8h
18	Original art revi	164 hrs	164 hrs	0 hrs	92 hrs	72 hrs		Work				
	Hany Morcos	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs		Work				
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs		Work				
19	Author review c	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs		Work				

After entering actual work on task 18, note how the actual work is split between the two assigned resources

3. On the same task, change Hany Morcos's 46 hours of actual work to 62 hours.

	Task Name	Work	Baseline	Variance	Actual	Remaining	Details	Apr 8, '18	S	M	T	W
0	↳ Children's Book Sel	2,317.5 hrs	2,317.5 hrs	0 hrs	235 hrs	2,082.5 hrs	Work		8h	8h	8h	
1	↳ Editorial staff mee	45.5 hrs	45.5 hrs	0 hrs	7 hrs	38.5 hrs	Work					
15	↳ Acquisition	444 hrs	444 hrs	0 hrs	228 hrs	216 hrs	Work		8h	8h	8h	
16	Manuscript rece	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs	Work					
17	↳ Content edit	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work		8h	8h	8h	
	Carole Polai	120 hrs	120 hrs	0 hrs	120 hrs	0 hrs	Work		8h	8h	8h	
18	↳ Original art revi	164 hrs	164 hrs	0 hrs	108 hrs	56 hrs	Work					
	Hany Morcc	82 hrs	82 hrs	0 hrs	62 hrs	20 hrs	Work					
	Jane Dow	82 hrs	82 hrs	0 hrs	46 hrs	36 hrs	Work					
19	↳ Author review c	160 hrs	160 hrs	0 hrs	0 hrs	160 hrs	Work					

After entering actual work on an assignment to task 18, note that the other assignment to the same task is not affected

## Track timephased actual work for tasks and assignments

The scenario: The Acquisition phase of work has been completed, and the Editorial phase has begun. Because of the larger number of resources involved and the variability of the editorial work, these tasks are the riskiest ones so far in the project. To manage the actuals of these tasks in the most detailed way possible, you will record timephased actuals. Open the TrackTimephasedWork plan in Project, and perform the following tasks:

1. Scroll the timephased grid in the Task Usage view until the scheduled work for task 22, *Organize manuscript for copyedit*, is visible.
2. Show the **Actual Work** detail in the timephased grid of the view.
3. Record **9** hours of actual work on task 22 for Wednesday, May 30, and **15** hours for Thursday, May 31.

	Task Name	Work	Baseline	Variance	Actual	Details	T	W	T	F
0	↳ Children's Book Sel	2,345.5 hrs	2,317.5 hrs	28 hrs	516.5 hrs	Work	8h	9h	15h	12h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	24.5 hrs	Act. W	8h	9h	15h	
15	↳ Acquisition	468 hrs	444 hrs	24 hrs	468 hrs	Work	8h			
21	↳ Editorial	404 hrs	400 hrs	4 hrs	24 hrs	Act. W	8h			
22	↳ Organize manus	60 hrs	60 hrs	0 hrs	24 hrs	Work		9h	15h	12h
	Dan Jump	20 hrs	20 hrs	0 hrs	8 hrs	Act. W		9h	15h	
	Hany Morcc	40 hrs	40 hrs	0 hrs	16 hrs	Work		6h	10h	8h
23	↳ Copyedit	184 hrs	180 hrs	4 hrs	0 hrs	Act. W		6h	10h	
	Copyeditors	184 hrs	180 hrs	4 hrs	0 hrs	Work				
						Act. W				

After entering task-level timephased actual work, note the updates to the two assignments on the task

4. Adjust the timescale to weekly.

5. Record **12** hours of actual work for Dan Jump's assignment to task 22, *Organize manuscript*, for the week of June 3.

Task Usage	Task Name	Work	Baseline	Variance	Actual	June				
						Details	5/20	5/27	6/3	6/10
0	↳ Children's Book Sel	2,345.5 hrs	2,317.5 hrs	28 hrs	528.5 hrs	Work	83.5h	51.5h	79.5h	83.5h
1	↳ Editorial staff meeting	45.5 hrs	45.5 hrs	0 hrs	24.5 hrs	Act. W	83.5h	43.5h	12h	
15	↳ Acquisition	468 hrs	444 hrs	24 hrs	468 hrs	Work	3.5h	3.5h	3.5h	3.5h
21	↳ Editorial	404 hrs	400 hrs	4 hrs	36 hrs	Act. W	80h	16h		
22	↳ Organize manus	60 hrs	60 hrs	0 hrs	36 hrs	Work	80h	16h		
	Dan Jump	20 hrs	20 hrs	0 hrs	20 hrs	Act. W	32h	28h		
	Hany Morcc	40 hrs	40 hrs	0 hrs	16 hrs	Work	24h	16h	16h	16h
23	↳ Copyedit	184 hrs	180 hrs	4 hrs	0 hrs	Act. W	48h	80h		
	Copyeditors	184 hrs	180 hrs	4 hrs	0 hrs	Work			48h	80h
						Act. W				

After actual work is recorded on one assignment to task 22, the blue change highlighting shows you the task-level and summary task-level changes to actual work

## Reschedule incomplete work

The scenario: Editorial work has been completed. The team has started work on the next phase. However, you need to troubleshoot a delay in work caused by an unforeseen problem. Open the RescheduleIncompleteWork plan in Project, and perform the following tasks:

1. Scroll the Task Usage view to display the latest actual work recorded for task 31, *Proofread and index*.
2. Reschedule incomplete work for the entire project to start after August 7, 2018.

SAGE	Task Name	Work	Baseline	Variance	Actual	Aug 5, '18							
						Details	F	S	S	M	T	W	T
27	↳ Design and Production	906 hrs	888 hrs	18 hrs	410 hrs	Work	16h			0h	0h	12h	8h
28	↳ Set pages	120 hrs	120 hrs	0 hrs	120 hrs	Act. W	16h						
29	↳ Interior illustration design	258 hrs	240 hrs	18 hrs	258 hrs	Work							
30	↳ 1st Pages review	320 hrs	320 hrs	0 hrs	32 hrs	Act. W	16h			0h	0h	12h	8h
31	↳ Proofread and index	100 hrs	100 hrs	0 hrs	32 hrs	Work	16h			0h	0h	12h	8h
	Copyeditors	20 hrs	20 hrs	0 hrs	16 hrs	Act. W	16h			0h	0h	4h	
	Tad Orman	80 hrs	80 hrs	0 hrs	16 hrs	Work	8h			0h	0h	8h	8h
						Act. W	8h						

Note the absence of scheduled work for task 31 (as indicated by 0h) on Monday and Tuesday due to the rescheduled incomplete work; in a Gantt chart view, this would appear as a split task

# Project Views: Observing Progress

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## In This Chapter

- ▶ Viewing your progress with indicators and taskbars
  - ▶ Seeing progress from various Project views
  - ▶ Examining cost and time variances
  - ▶ Understanding earned value
  - ▶ Observing multiple critical paths
- 

Some project managers use Project simply to paint a picture all the effort that their project will entail and then stash the plan in a drawer. That's a mistake. After you enter all the project data, save a baseline, and then track actual activity on the project, you receive in return an amazing array of information from Project that can help you stay on time and on budget.

After you track some actual activity on several tasks, Project lets you view baseline estimates alongside the real-time plan. Project alerts you to tasks that are running late and also shows how the critical path shifts over time. To read about the critical path, review [Chapter 12](#).

Project also provides detailed performance information. In fact, the information you can see about the cost and schedule performance can be quite robust. You can produce a simple cost-and-schedule variance, or you can use more complex metrics, such as a cost performance index using earned-value management techniques. I discuss this particular measurement technique in the later section “[Tracking Progress Using Earned Value Management](#).”

Keep the project file close at hand — and take a look at how Project can make you the most informed project manager in town.

# Seeing Where Tasks Stand

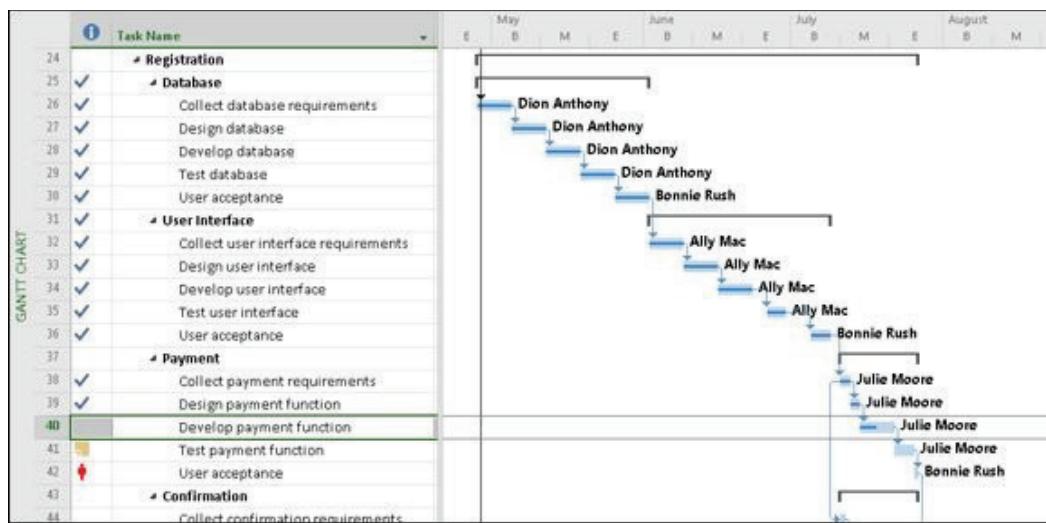
You've diligently entered resource work hours on tasks, recorded the progress on tasks, and entered fixed costs. Now what? Well, all that information has initiated several calculations and updates to the project schedule. It's time to take a quick look at the changes that all this tracking has produced in the project schedule.



A check mark in the Indicator field tells you that a task is complete. If you see an unfamiliar indicator icon crop up in the project, hold the mouse pointer over the indicator. A text box opens and describes its meaning. To see a list of Project icons and their meanings, click Tell Me What You Want to Do next to the Format tab and type **indicators** in the Search box. Click Search and then click Indicator Fields.

## Baseline versus actual progress

One obvious way to view the difference between a baseline estimate and the progress you've tracked in the project is by using a taskbar. After you track progress on several tasks, the Gantt chart shows a black bar superimposed on the baseline taskbar. For example, in [Figure 16-1](#), Tasks 26–39 are complete; you can tell by the solid black bar that extends the full length of the taskbar. Task 40 is only partially complete; the black line that indicates actual progress only partially fills the duration for the task. Task 41 has no recorded activity on it; you see no black line indicating progress — only the normal taskbar.

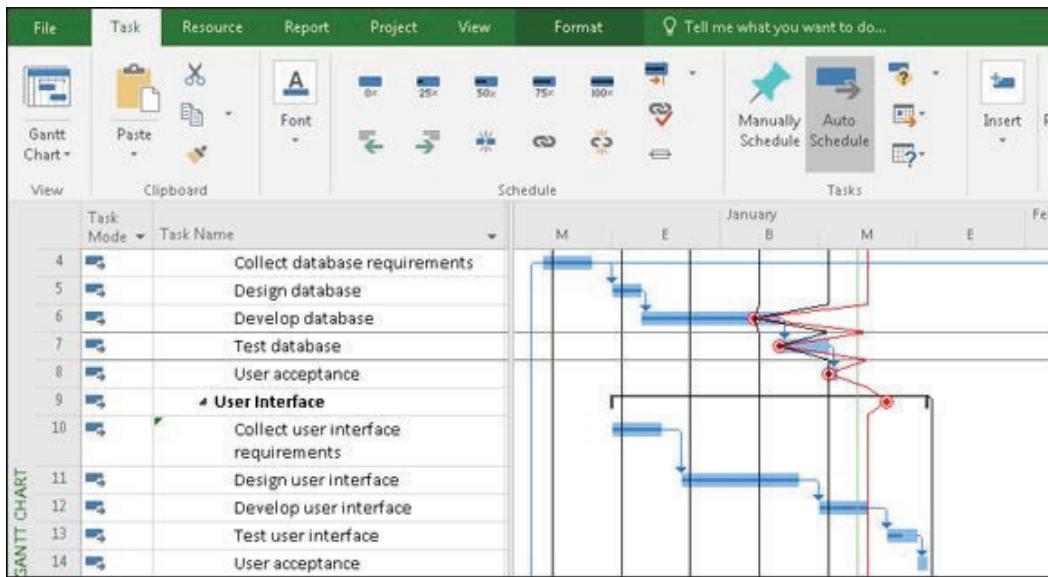


[Figure 16-1:](#) The solid line on a taskbar represents actual activity in the project.

## Lines of progress

*Progress lines* offer additional visual indicators of how you're doing. As you can see in [Figure 16-2](#), a progress line zigzags among tasks and forms, showing left- or right-pointing peaks. These peaks indicate late or early tasks (calculated according to the

status date you set for tracking or another date that you specify). A progress line that points to the left of a task indicates that the task is running late. Progress lines that point to the right show that — wonder of wonders — you’re running ahead of schedule. (Treasure these lines: They don’t seem to appear often in projects.)



**Figure 16-2:** Progress lines, seemingly run amok.

In [Figure 16-2](#), progress is measured as of the actual date. You can see that the tasks under the Finish Line Beverage are running behind, because the line points to the left.

## Displaying progress lines

By default, Project doesn’t display progress lines. You have to turn them on. And while you’re at it, you may as well specify when and how they appear. Here’s how to display progress lines and change their settings:

1. **Display Gantt Chart view.**
2. **Right-click the chart portion of the view and choose Progress Lines.**  
The Progress Lines dialog box appears, as shown in [Figure 16-3](#).
3. **If you want Project to always show a progress line for the current or status date, select the Display check box in the Current Progress Line section and then select At Project Status Date or At Current Date.**
4. **If you want progress lines to be displayed at set intervals, do this:**
  - a. *Select the Display Progress Lines check box in the Recurring Intervals section and then select Daily, Weekly, or Monthly.*
  - b. *Specify the interval settings.*

For example, if you select Weekly, you can choose every week, every other week, and so on, as well as for which day of the week the line should be displayed on the timescale.

5. **Choose whether you want to display progress lines beginning at the Project**

**start date or on another date.**

To use the Project start date, simply select the Project Start option in the Begin At section of the dialog box. To select an alternative start date, select the second option and then select a date from the calendar drop-down list.

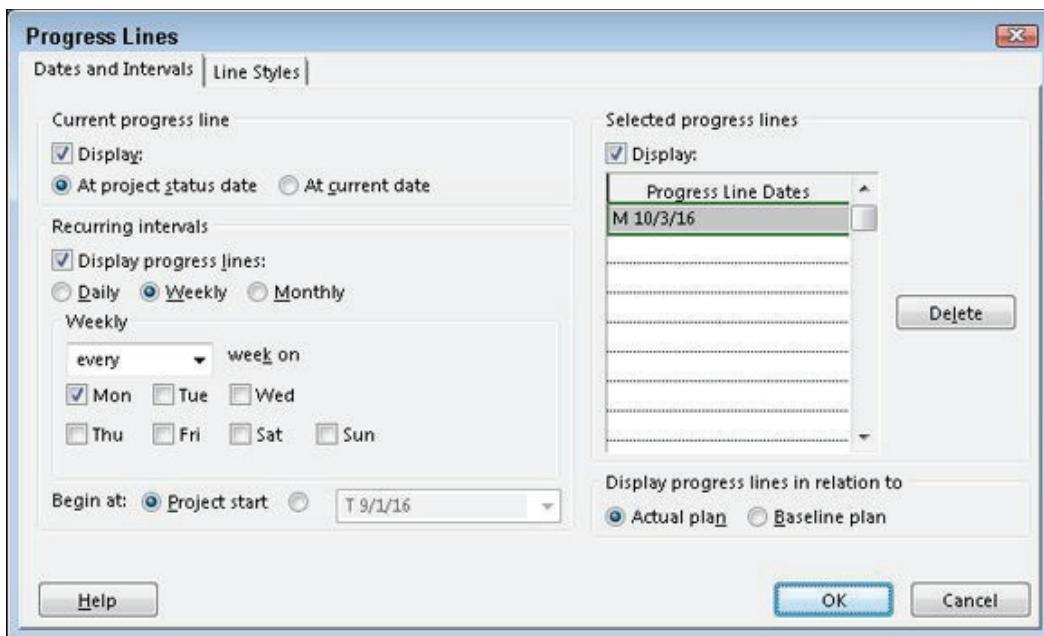
6. **If you want to display a progress line on a specific date, select the Display check box in the Selected Progress Lines section and then choose a date from the Progress Line Dates drop-down calendar.**

You can make this setting for multiple dates by clicking subsequent lines in this list and selecting additional dates.

You can choose to display progress lines in relation to actual or baseline information.

If a task has been tracked to show 50 percent complete, for example, and you choose to have Project display progress lines based on actual information, the peak appears relative to the 50 percent *actual* line, not to the complete baseline taskbar.

7. **Click the OK button to save these settings.**



**Figure 16-3:** The Progress Lines dialog box.

### Formatting progress lines

In keeping with the almost mind-boggling array of formatting options that Project makes available to you, you can modify how progress lines are formatted.

As with any changes to formatting, you're tampering with the way Project codes visual information for readers. Be cautious about making formatting changes that cause the plan to be difficult to read for those who are accustomed to the default Project formatting.

To modify progress-line formatting:

1. **Display Gantt Chart view.**
2. **Right-click the chart portion of the view and choose Progress Lines.**

The Progress Lines dialog box appears (refer to [Figure 16-3](#)).

3. **Select the Line Styles tab.**

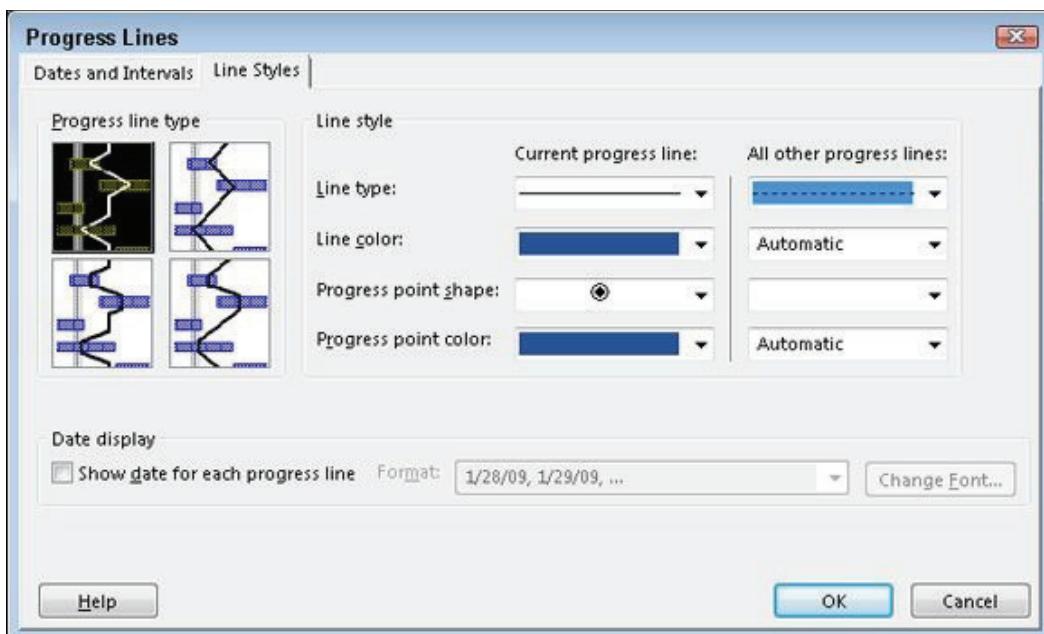
You see the display options shown in [Figure 16-4](#).

4. **In the Progress Line Type area, select a line style sample.**

5. **In the Line Type fields, select a style from the samples.**

You can make two settings: one for the current progress line and one for all other progress lines.

6. **You can change the line color, progress point shape, and progress point color by making different choices in those boxes.**
7. **If you want a date to appear alongside each progress line, select the Show Date for Each Progress Line check box and then select a date from the Format field.**
8. **If you want to change the font that's used for the displayed date, click the Change Font button and make the changes. Click OK in the Font dialog box.**
9. **Click the OK button to save these settings.**

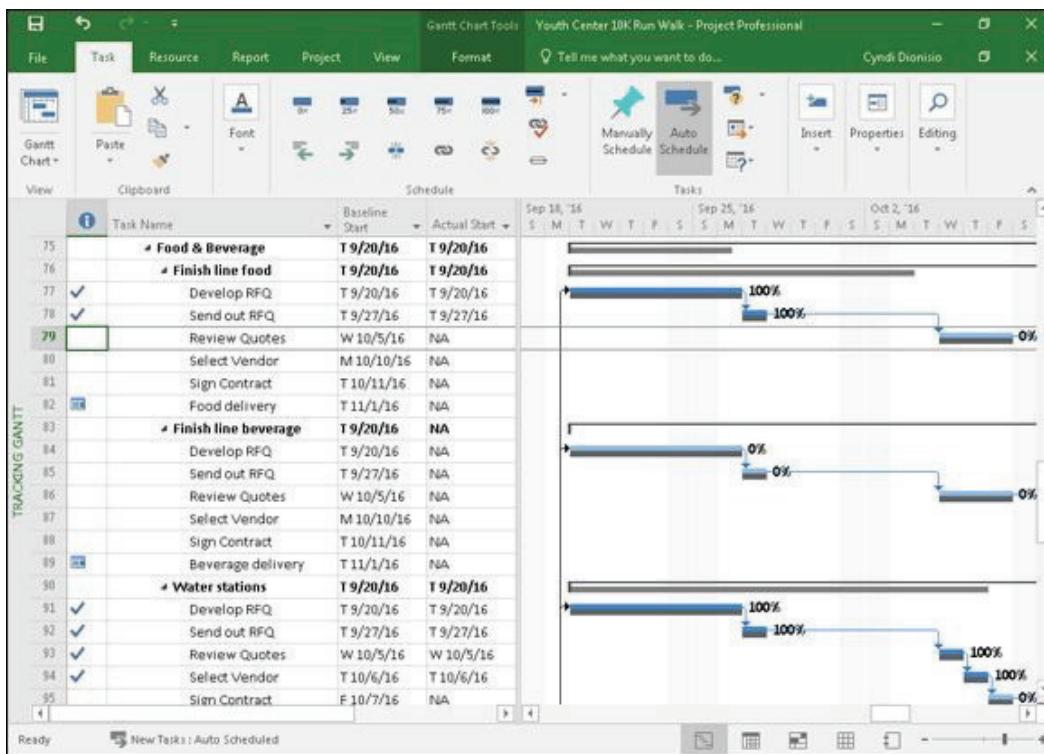


[Figure 16-4:](#) Progress line styles.

# Delving into the Detail

Visual indicators such as taskbars and indicator icons are useful to alert you to delays or variances between estimated and actual performance, but they don't provide detailed information. To get the lowdown on how far ahead (or behind) you are, down to the day or penny, scan the numbers. The numbers that Project provides reveal much about whether you're on schedule and within the budget.

One way to view variances is to show Tracking Gantt view. From the Task tab, go to the View section on the far left side and click the down arrow. Choose Tracking Gantt. This view has, by default, two thin taskbars for each task. The gray bar at the bottom shows the baseline, whereas the top bar shows the current (scheduled) or actual (tracked) schedule. The color of the top bar varies, depending on whether it's a critical task if it's auto-scheduled or a manually scheduled task. As shown in [Figure 16-5](#), in Tracking Gantt view, you can show and tell exactly where a project went off track or picked up steam.



[Figure 16-5:](#) Tracking Gantt view.

Two tables that you can display in Gantt Chart view bring the options into focus. The Cost table and Variance table provide information about dollars spent and variations in timing between baseline and actual activity.



To display a table, choose View => Data Group => Tables and click the table name. Another option is in the Tracking Gantt view, to place the pointer on the blank square immediately above row 1 and to the left of the first column. Then right-click the mouse to display the available tables for easy selection.

In the Cost table shown in [Figure 16-6](#), you can review data that compares baseline estimates to actual costs and the variance between them. These three columns are presented side by side. In the project shown in the figure, you can see the database work came in right on target. The user interface and the payment work packages each had a \$50 variance. By looking at the detail, you can identify the exact activities that caused the variance and how much each activity contributed to the total variance.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
25	# Database	\$0.00	Prorated	\$14,400.00	\$14,400.00	\$0.00	\$14,400.00	\$0.00
26	Collect database requirements	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
27	Design database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
28	Develop database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
29	Test database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
30	User acceptance	\$0.00	Prorated	\$4,000.00	\$4,000.00	\$0.00	\$4,000.00	\$0.00
31	# User Interface	\$0.00	Prorated	\$10,350.00	\$10,300.00	\$50.00	\$10,350.00	\$0.00
32	Collect user interface requirements	\$0.00	Prorated	\$2,000.00	\$2,000.00	\$0.00	\$2,000.00	\$0.00
33	Design user interface	-\$300.00	Prorated	\$1,600.00	\$1,900.00	-\$300.00	\$1,600.00	\$0.00
34	Develop user interface	\$200.00	Prorated	\$2,200.00	\$2,000.00	\$200.00	\$2,200.00	\$0.00
35	Test user interface	\$150.00	Prorated	\$1,350.00	\$1,200.00	\$150.00	\$1,350.00	\$0.00
36	User acceptance	\$0.00	Prorated	\$3,200.00	\$3,200.00	\$0.00	\$3,200.00	\$0.00
37	# Payment	\$0.00	Prorated	\$5,250.00	\$5,200.00	\$50.00	\$5,250.00	\$0.00
38	Collect payment requirements	\$25.00	Prorated	\$825.00	\$800.00	\$25.00	\$825.00	\$0.00
39	Design payment function	\$0.00	Prorated	\$800.00	\$800.00	\$0.00	\$800.00	\$0.00
40	Develop payment function	\$0.00	Prorated	\$2,000.00	\$2,000.00	\$0.00	\$2,000.00	\$0.00
41	Test payment function	\$25.00	Prorated	\$825.00	\$800.00	\$25.00	\$825.00	\$0.00
42	User acceptance	\$0.00	Prorated	\$800.00	\$800.00	\$0.00	\$800.00	\$0.00
43	# Confirmation	\$0.00	Prorated	\$5,260.00	\$5,260.00	\$0.00	\$5,260.00	\$0.00

[Figure 16-6:](#) Cost table.

For the Cost table, a variance that's positive indicates that you've spent more than expected. A variance that's negative indicates that you're under budget.



Project assumes that the remaining costs will remain at the budgeted amount.

In other words, from the total budgeted amount for the work, it assumes that the remaining work will be completed on budget, and it adds the actual costs to date to produce the total cost. Rarely do future estimates end on budget when the work to date is in a cost-overrun situation, so don't rely on the information in the Total Cost column.

In [Figure 16-7](#), the Variance table shows whether the schedule is on track or has variances (much like the Cost table shows cost variances). The table shows the variance between the start and finish of tasks and the baseline start and finish dates. Notice in the example that the “Define route” task was late by two days, which in turn caused the “Get route approval” task to be delayed as well. Because there is float between the route approval and marking the route, this did not negatively impact the critical path.

GANTT CHART

	Task Name	Start	Finish	Baseline Start	Baseline Finish	Start Var.	Finish Var.
114	Course Logistics	M 5/2/16	W 11/2/16	T 4/28/16	W 11/2/16	2 days	0 days
115	Route	M 5/2/16	T 11/1/16	T 4/28/16	T 11/1/16	2 days	0 days
116	Define route	M 5/2/16	F 5/13/16	T 4/28/16	W 5/11/16	2 days	2 days
117	Get route approval	M 5/16/16	F 7/15/16	T 5/12/16	W 7/13/16	2 days	2 days
118	Mark route	T 11/1/16	T 11/1/16	T 11/1/16	T 11/1/16	0 days	0 days
119	Signs	T 7/14/16	W 11/2/16	T 7/14/16	W 11/2/16	0 days	0 days
120	Identify signage points	T 7/14/16	T 7/14/16	T 7/14/16	T 7/14/16	0 days	0 days
121	Post signs	W 11/2/16	W 11/2/16	W 11/2/16	W 11/2/16	0 days	0 days
122	Take down signs	T 11/1/16	T 11/1/16	T 11/1/16	T 11/1/16	0 days	0 days
123	Parking	T 7/14/16	W 11/2/16	T 7/14/16	W 11/2/16	0 days	0 days
124	Identify parking areas	T 7/14/16	T 7/14/16	T 7/14/16	T 7/14/16	0 days	0 days
125	Manage parking	W 11/2/16	W 11/2/16	W 11/2/16	W 11/2/16	0 days	0 days

**Figure 16-7:** Variance table.



If you created contingency reserve to help handle unexpected delays, the total variance shown in the Variance table tells you how many days you may have to deduct from the contingency duration to get back on track. You can read more in [Chapter 17](#) about making adjustments for delays and cost overruns and about contingency reserve in [Chapter 12](#).

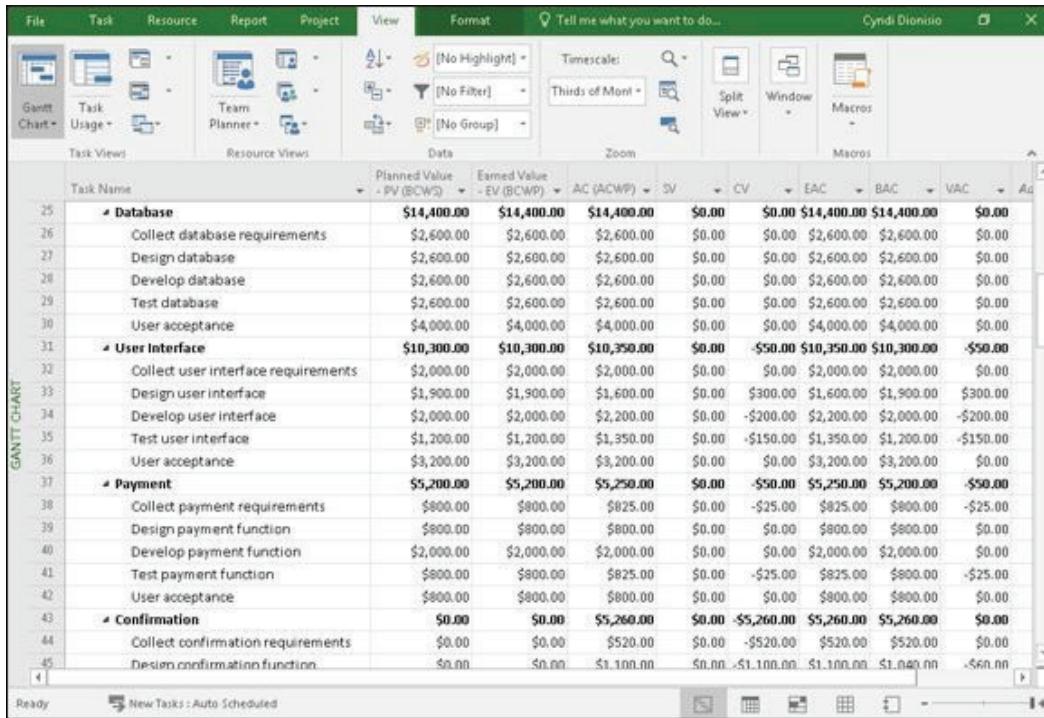
# Tracking Progress Using Earned Value Management

On large projects, especially large government projects, project managers are required to track progress using the earned value management (EVM) method. I won't bore you with a detailed discussion of EVM, but you should become familiar with some of the most common terms and calculations surrounding this concept because many organizations require information on these specific numbers in project reports. Some common terms are defined in this list:

- ✓ **Planned value (PV):** The budgeted (or baseline) cost of tasks based on the cost of resources assigned to the task, plus any fixed costs associated with the tasks, at the point of measurement. In some circles, planned value is also known as the budgeted cost of work scheduled, or BCWS. For example, if you're installing 100 fixtures, the baseline cost to install a fixture is \$100, and you estimate that you can install 5 fixtures per day, the cumulative planned value for Day 3 is \$1,500.
- ✓ **Earned value (EV):** The value of the work you've completed, expressed in dollars. For example, if you've installed only 13 fixtures at the end of Day 3, the earned value is \$1,300. In some circles, earned value is referred to as the budgeted cost of work performed, or BCWP.
- ✓ **Actual cost (AC):** A calculation that includes tracked resource hours or units expended on the task plus fixed costs. In the example, assume that you had to pay overtime to complete some of the work and that the actual costs at the end of Day 3 are \$1,650. AC is also known as actual cost of work performed, or ACWP.
- ✓ **Budget at completion (BAC):** The sum of the planned value. In the example, the BAC of the project is 100 fixtures × \$100, or \$10,000.
- ✓ **Estimate at completion (EAC):** A forecast of the total cost of the project. Project calculates that  $EAC = BAC - EV + AC$ . EVM practitioners cringe at the assumption that future costs will stay on budget. However, Project isn't an EVM tool. If you need to get serious about using EVM, you can buy a plug-in that accurately calculates multiple EACs based on assumptions of future performance.
- ✓ **Variance at completion (VAC):** The difference between the budget at completion (BAC) and the estimate at completion (EAC) is  $VAC = BAC - EAC$ .
- ✓ **Cost variance (CV):** The difference between earned value and actual costs. The equation is  $CV = EV - AC$ . This number is expressed as a negative number if the project is over budget and as a positive number if you're under budget.
- ✓ **Schedule variance (SV):** The difference between earned value and planned value. The equation is  $SV = EV - PV$ . This number is expressed as a negative number if you're accomplishing less work than planned; it's a positive number if you're accomplishing more work than planned. Be aware of saying aloud that you're behind or ahead of schedule. If the work isn't on the critical path, the schedule

performance doesn't necessarily indicate an ahead-of-schedule status or a behind-schedule status.

To see the Earned Value table, as shown in [Figure 16-8](#), select the View tab on the Ribbon, click Tables in the Data group, select More Tables, and choose Earned Value. You can also look at tables that focus only on Earned Value Cost Indicators or Earned Value Schedule Indicators.



The screenshot shows the Microsoft Project application window. The ribbon is visible at the top with tabs like File, Task, Resource, Report, Project, View, Format, and Tell me what you want to do... The View tab is selected. In the Data group, there is a 'Tables' button with a dropdown menu. The 'More Tables' option is selected, and the 'Earned Value' table is chosen. The main area of the window displays a table titled 'Task Name' with columns for Planned Value, Earned Value, AC (ACWP), SV, CV, EAC, BAC, VAC, and Ad. The table lists tasks categorized under Database, User Interface, Payment, and Confirmation, along with their respective values.

Task Name	Planned Value	Earned Value	AC (ACWP)	SV	CV	EAC	BAC	VAC	Ad
25 Database	\$14,400.00	\$14,400.00	\$14,400.00	\$0.00	\$0.00	\$14,400.00	\$14,400.00	\$0.00	
26 Collect database requirements	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
27 Design database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
28 Develop database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
29 Test database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
30 User acceptance	\$4,000.00	\$4,000.00	\$4,000.00	\$0.00	\$0.00	\$4,000.00	\$4,000.00	\$0.00	
31 User Interface	\$10,300.00	\$10,300.00	\$10,350.00	\$0.00	-\$50.00	\$10,350.00	\$10,300.00	-\$50.00	
32 Collect user interface requirements	\$2,000.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$2,000.00	\$0.00	
33 Design user interface	\$1,900.00	\$1,900.00	\$1,600.00	\$0.00	\$300.00	\$1,600.00	\$1,900.00	\$300.00	
34 Develop user interface	\$2,000.00	\$2,000.00	\$2,200.00	\$0.00	-\$200.00	\$2,200.00	\$2,000.00	-\$200.00	
35 Test user interface	\$1,200.00	\$1,200.00	\$1,350.00	\$0.00	-\$150.00	\$1,350.00	\$1,200.00	-\$150.00	
36 User acceptance	\$3,200.00	\$3,200.00	\$3,200.00	\$0.00	\$0.00	\$3,200.00	\$3,200.00	\$0.00	
37 Payment	\$5,200.00	\$5,200.00	\$5,250.00	\$0.00	-\$50.00	\$5,250.00	\$5,200.00	-\$50.00	
38 Collect payment requirements	\$800.00	\$800.00	\$825.00	\$0.00	-\$25.00	\$825.00	\$800.00	-\$25.00	
39 Design payment function	\$800.00	\$800.00	\$800.00	\$0.00	\$0.00	\$800.00	\$800.00	\$0.00	
40 Develop payment function	\$2,000.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$2,000.00	\$0.00	
41 Test payment function	\$800.00	\$800.00	\$825.00	\$0.00	-\$25.00	\$825.00	\$800.00	-\$25.00	
42 User acceptance	\$800.00	\$800.00	\$800.00	\$0.00	\$0.00	\$800.00	\$800.00	\$0.00	
43 Confirmation	\$0.00	\$0.00	\$5,260.00	\$0.00	-\$5,260.00	\$5,260.00	\$5,260.00	\$0.00	
44 Collect confirmation requirements	\$0.00	\$0.00	\$520.00	\$0.00	-\$520.00	\$520.00	\$520.00	\$0.00	
45 Design confirmation function	\$0.00	\$0.00	\$1,100.00	\$0.00	-\$1,100.00	\$1,100.00	\$1,100.00	-\$1,100.00	

[Figure 16-8](#): Earned value table.

# **Calculating Behind the Scenes**

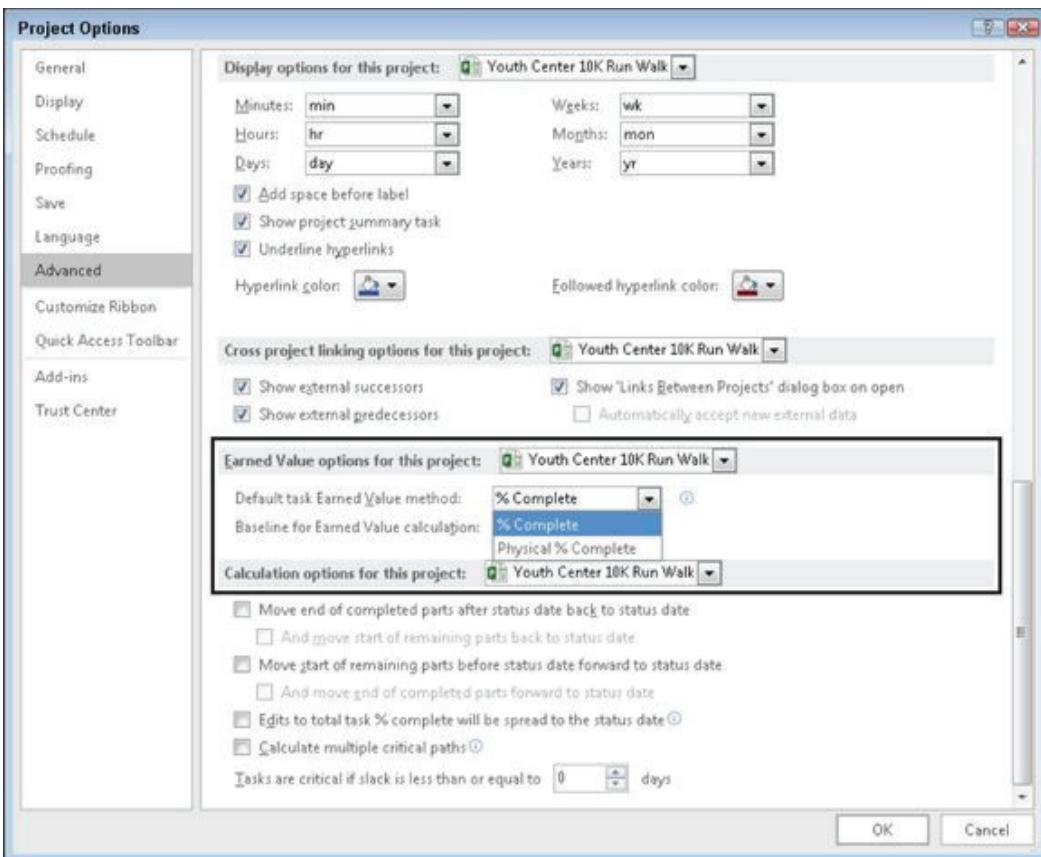
While you're happily entering resource hours and fixed costs into the project, Project is busy making calculations that can shift around task timing and resource workload in the plan. These calculations relate to how tasks are updated, how the critical path is determined, and how earned value is calculated. If you're a control freak, you'll be happy to know that you can, to some extent, control how Project goes about making these calculations.



To change when Project calculates plan updates, select the File tab on the Ribbon, click the Options button to open the Project Options dialog box, and then examine the Schedule category. Scroll to the bottom until you see a section called Calculation Options for This Project. If you turn off the Calculate Project After Each Edit setting, you must click the Calculate Project button in the Schedule group on the Project tab of the Ribbon whenever you want Project to perform all its calculations. You can also choose to set different modes for only the current project or for all open projects.

## ***Earned-value options***

As I mention earlier in this chapter, usually only large projects use earned value management. To find the settings to customize how earned value works in the project, select the File tab, click the Options button, and select Advanced. Scroll down until you see Earned Value Options for This Project. [Figure 16-9](#) shows you the two sample settings for calculating earned value.



**Figure 16-9:** Two settings to calculate earned value.

The Default Task Earned Value Method setting provides these two choices:

- ✓ **% Complete:** This setting calculates earned value using the percent complete that you record on each task. The setting assumes that, on a task that's halfway complete, half the work hours have been used.
- ✓ **Physical % Complete:** Use this setting if you want to manually enter a percentage of completion not based on a straight percent-complete calculation. For example, if you have a four-week task to complete a mail survey, 50 percent of the effort may happen in the first 25 percent of the duration of the project: Design, print, and mail the survey. Nothing happens for two weeks while you wait for responses and then you see a flurry of activity when the responses are returned to you. So a straight calculation that 50 percent of the task is completed 50 percent of the way through isn't accurate. If your projects have a lot of tasks of this type, you may consider changing the settings to use this method. Then you can display the Physical % Complete column in the Gantt Chart sheet and enter more accurate (in your opinion) percent-complete information for each task.

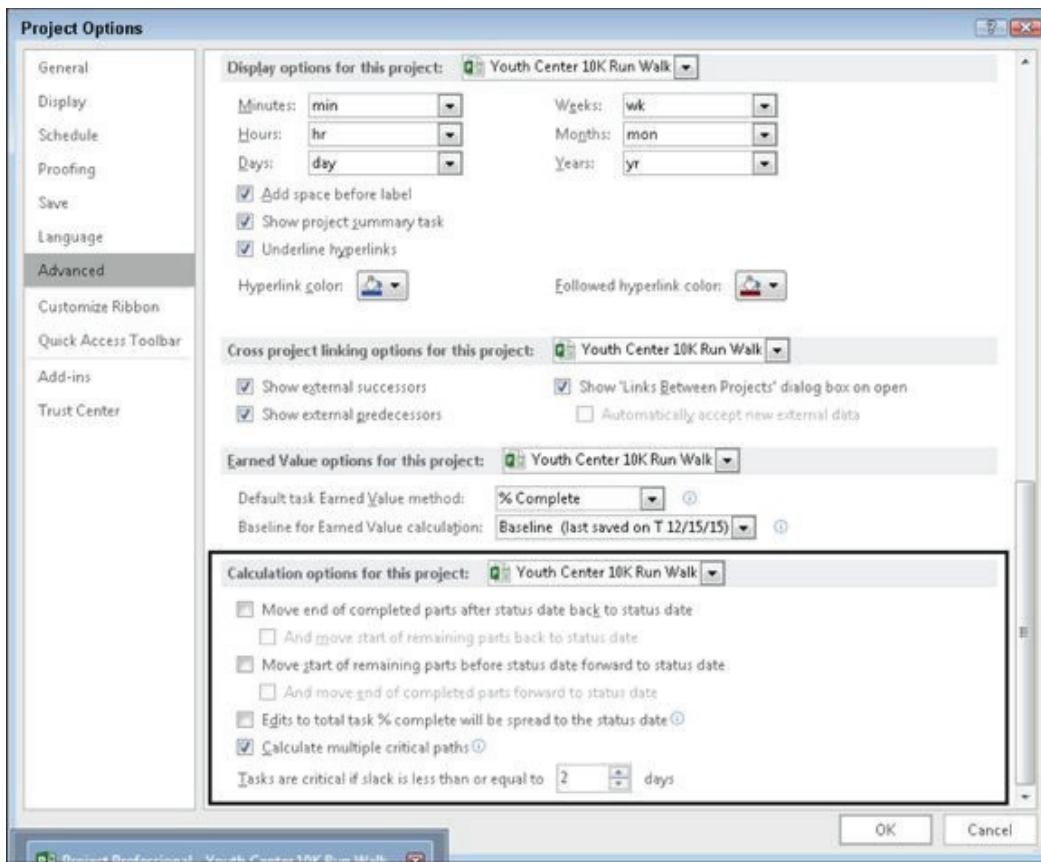
The second setting in the earned-value options in the Project section of the Project Options dialog box is the Baseline for Earned Value Calculation drop-down list. The baseline you use to calculate earned value is essentially setting the planned value for the project. If you're using multiple baselines — such as one for reporting and one for managing — pay close attention to the baseline against which you choose to measure the earned value. Choose any of the 11 possible baselines you may have saved in the

project. After you make these two choices, click OK to close the Project Options dialog box.

## An abundance of critical paths

While I'm talking about the Project Options box, let's take a quick look at some options for calculating the critical path. Three settings in the Project Options dialog box concern critical path calculations. If following one project's critical path is too tame for you, start reviewing multiple critical paths. In Options ⇒ Advanced, the very bottom section is Calculation Options for This Project (see [Figure 16-10](#)). By selecting the Calculate Multiple Critical Paths check box you set up Project to calculate a different critical path for each set of tasks in the project. Doing so can be helpful if you want to identify tasks that, if delayed, will cause you to miss the final project deadline or the goals of a single phase in the project.

You can establish which factors add a task to the critical path, by specifying the number of days of slack the critical tasks may have. Tasks with no slack are, by default, on the critical path. However, you can change this situation if you want to be alerted that tasks with only one day of slack are critical — figuring that one day isn't much padding and that these tasks are still in jeopardy. The setting labeled Tasks Are Critical If Slack Is Less Than or Equal to (x) Days is immediately beneath the Calculate Multiple Critical Paths check box in the Advanced category.



**Figure 16-10:** Selecting multiple critical paths.

Finally, in Options ⇒ Schedule, the Inserted Projects Are Calculated Like Summary

Tasks is straightforward. If you insert another project as a task in the project, selecting this setting allows Project to calculate one critical path for the entire project. If you don't select it, any projects that you insert are treated as outsiders — that is, they aren't considered in the master project's critical-path calculations. If an inserted project won't affect the project's timing, you may deselect this option.

## Aplicații

O companie aerospatială a primit o comandă de la NASA pentru asamblarea unui modul spațial (*NASA.mpp*). S-au identificat două tipuri de resurse critice necesare pentru proiect: ingineri și tehnicieni. Informațiile despre activități sunt date în tabelul de mai jos. Activitățile sunt de tip *Fixed Duration* și *Effort Driven*.

Numele activității	Durata (zile)	Costul material	Ingineri necesari	Tehnicieni necesari
Construct Shell of Module	30	35000	3	7
Procure Life Support System and Experimentation Package	15	50000	1	5
Procure Components of Control and Navigational System	30	80000	1	3
Wire Module	3	4500	1	5
Assemble Control and Navigational System	7	1500	2	5
Preliminary Test of Life Support System	2	1500	1	5
Install Life Support in Module	7	1000	1	5
Install Experimentation Package in Module	3	1200	2	4
Preliminary Test of Control and Navigational System	4	1800	2	4
Install Control and Navigational System in Module	10	3000	2	3
Final Testing and Debugging	8	4800	3	3

Se consideră că proiectul necesită 5 ingineri și 15 tehnicieni. Un inginer este plătit cu 100 \$ / oră iar un tehnician cu 35 \$ / oră. Orele suplimentare se plătesc cu o rată de 150% față de orele de program normal.

Data de start a proiectului este 6 aprilie 2009. Începând cu data de 1 mai 2009, salariul de bază al inginerilor va crește la 120 \$ / oră.

1. Care este estimarea privind costul total al proiectului? Salvați această linie de bază (*baseline*). Aici, toate persoanele lucrează full-time, fără ore suplimentare.
2. Pe data de 20 mai 2009, activitățile se opresc pentru 2 săptămâni. Reflectați această situație în proiect.
3. După această dată, pentru activitățile rămase, lucrează numai 4 ingineri și 12 tehnicieni. Toate persoanele sunt dispuse să lucreze 2 ore suplimentare pe zi. În aceste condiții, care este costul final minim al proiectului? Costul minim presupune reducerea cât mai mult a numărului de ore suplimentare. Care este diferența față de estimarea inițială?

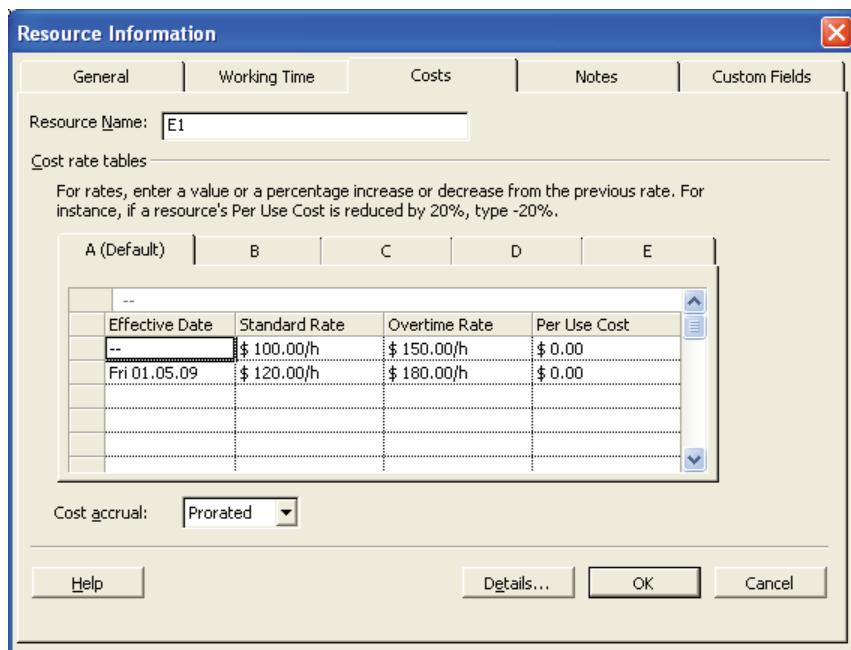
Numărul total de ore lucrate (*Work* în *Project Information → Statistics*) trebuie să fie la fel în linia de bază și în lucrul efectiv.

## Indicații

1. Costurile materiale ale activităților corespund costurilor fixe care pot fi setate din tabela de costuri:

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance
1	Construct Shell of Module	\$ 35,000.00	Prorated	\$ 169,320.00	\$ 0.00	\$ 169,320.00

2. Costul variabil al resurselor se poate seta din fereastra de informații despre resurse:



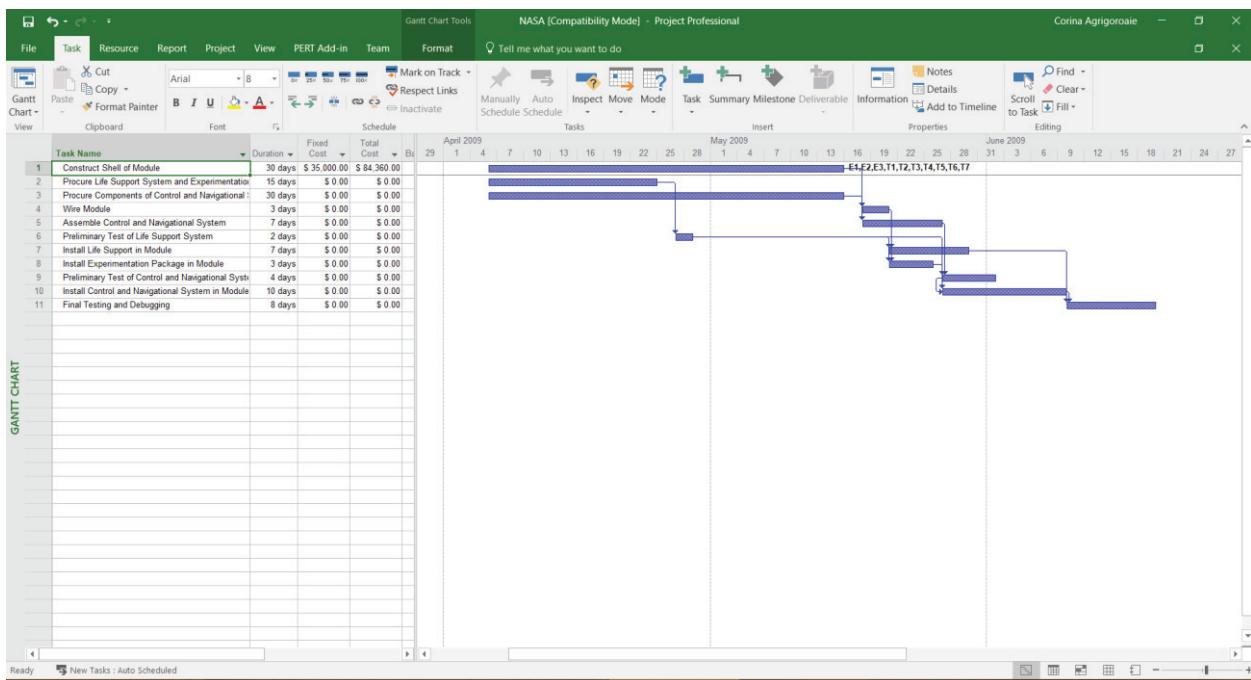
3. Se recomandă alocarea mai întâi a resurselor pentru activitățile/perioadele care impun cele mai multe constrângerile, de exemplu când 3 activități se desfășoară în paralel.

În planificarea inițială, activitățile *Construct Shell of Module*, *Procure Life Support System and Experimentation Package*, *Procure Components of Control and Navigational System* necesită  $7 + 5 + 3 = 15$  tehnicieni iar activitățile *Assemble Control and Navigational System*, *Install Life Support in Module* și *Install Experimentation Package in Module* necesită  $5 + 5 + 4 = 14$  tehnicieni.

După alocarea corectă a resurselor la aceste activități, se pot aloca resurse și pentru celelalte. La fel se procedează și pentru ingineri.

4. Întârzierea cu 2 săptămâni se realizează cel mai ușor cu ajutorul celor două funcții din fereastra *Update Project*.

5. După întârziere, din nou apar 3 activități în paralel, care necesită inițial 5 ingineri. Într-o zi, aceștia ar lucra împreună 40 de ore. După 20 mai, rămân doar 4 ingineri, care pot lucra 10 ore pe zi. Prin urmare, cele 8 ore ale inginerului eliminat trebuie transferate celor 4 ingineri rămași. Inginerul care nu mai lucrează după 20 mai trebuie să rămână în continuare alocat la activitățile dinainte de 20 mai! La fel se procedează și pentru tehnicieni.



# Becoming a Task Master

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## *In This Chapter*

- ▶ Creating summary tasks and subtasks
  - ▶ Moving tasks
  - ▶ Collapsing and expanding tasks
  - ▶ Creating milestones
  - ▶ Deleting tasks and inactive tasks
  - ▶ Entering a task note
- 

The foundational unit in a project schedule is the project task; everything starts with it. After you identify and document your tasks, you can work with resources, dependencies, costs, durations, and other elements.

To be an effective task master, you need to be nimble in managing your tasks: Determine how to summarize work with a summary task, move work around, start and stop work in the middle of a task, and do all kinds of other tricks that help your schedule reflect what you want to happen on your project.

# Creating Summary Tasks and Subtasks

When you look at a project work breakdown structure, also known as WBS (refer to [Chapter 2](#)), or a project task list, such as the one shown in [Figure 3-1](#), you see that it organizes tasks into levels. The upper levels are from the WBS. The lower level consists of tasks that have been decomposed from the WBS. A task that has other tasks indented below it in this outline structure is a *summary task*, or *parent task*. The tasks indented below the summary task are *subtasks*, or *child tasks*. Summary tasks are indicated in bold in the Project outline. You can tell when a summary task has a family of subtasks clinging to its skirts: When a subtask is hidden, a little clear triangle is displayed to the left of the summary task. When you click the triangle with the tip of the pointer, the task expands to show its whole clan of subtasks, and the summary task adds a black triangle to its left.

WBS	Task Name
4	<b>Registration</b>
4.1	▷ Database
4.2	▷ User Interface
4.3	<b>Payment</b>
4.3.1	Collect payment requirements
4.3.2	Design payment function
4.3.3	Develop payment function
4.3.4	Test payment function
4.3.5	User acceptance
4.4	<b>Confirmation</b>
4.4.1	Collect confirmation requirements
4.4.2	Design confirmation function
4.4.3	Develop confirmation function
4.4.4	Test confirmation function
4.4.5	User acceptance
4.4.6	Registration Available

[Figure 3-1:](#) Project outline, showing summary tasks and subtasks.

In [Figure 3-1](#) you can see that the summary tasks of Database and User Interface have hidden subtasks. The Payment and Confirmation summary tasks show all their subtasks.

All information about a family of tasks is rolled up into its highest-level summary task. Therefore, any task with subtasks has no timing or cost information of its own: It gathers its total duration and cost from the sum of its parts.

This roll-up functionality is cumulative: The lowest-level task rolls up to its parent, which might roll up into another summary task, which rolls up (for example) into a project summary task. Any task with tasks below it gets its duration and cost information from a roll-up of its subtasks, no matter how deeply nested it may be in the hierarchy.



The structure of families in an outline is also useful when you need to reorganize an outline: When you move a summary task, all its subtasks come right along for the ride, regardless of whether it's expanded!

If a summary task is manually scheduled, the roll-up functionality doesn't work, and Project displays warnings telling you so. The Gantt bar for the summary task has a red warning bar that shows you the calculated duration of the subtasks when they don't match up with the summary task's duration. The summary task's Finish field entry also has a red, squiggly underline to indicate a potential scheduling problem. To deal with this situation, you can change the summary task to use auto-scheduling, in which case it calculates roll-up data correctly. If you want the summary task to continue to be manually scheduled, you can edit its finish date or use the Task Inspector as described in [Chapter 11](#) to fix the summary task schedule.

## How many levels can you go?

You have no practical limit on how many levels of tasks you can create in an outline. Project enables you to indent to more levels of detail than you'll need for all but the most complex schedules. Remember, though: At some point, you have to deal with assigning timing and resources to each of these tasks and then track their progress. Too much detail can make your project plan difficult to manage. For example, if your project is a few months long, you don't want to track to a level where activities last only a few hours. Best practices suggest that you always set up your schedule to the level to which you want to manage your team — typically, business (working) days or weeks.

For longer projects, you can schedule by using *rolling wave planning*, a method of progressively elaborating the amount of detail for near-term work and keep at a higher level any work that's further out. For example, if you have a two-year project, you may have the first three months planned out in detail, the next three months at a higher level, and the remainder of the project schedule showing only milestones and key deliverables. As you progress through the project, you start to add more detail for six months and beyond. A good rule of thumb is to keep a good amount of detail for 90 days out.

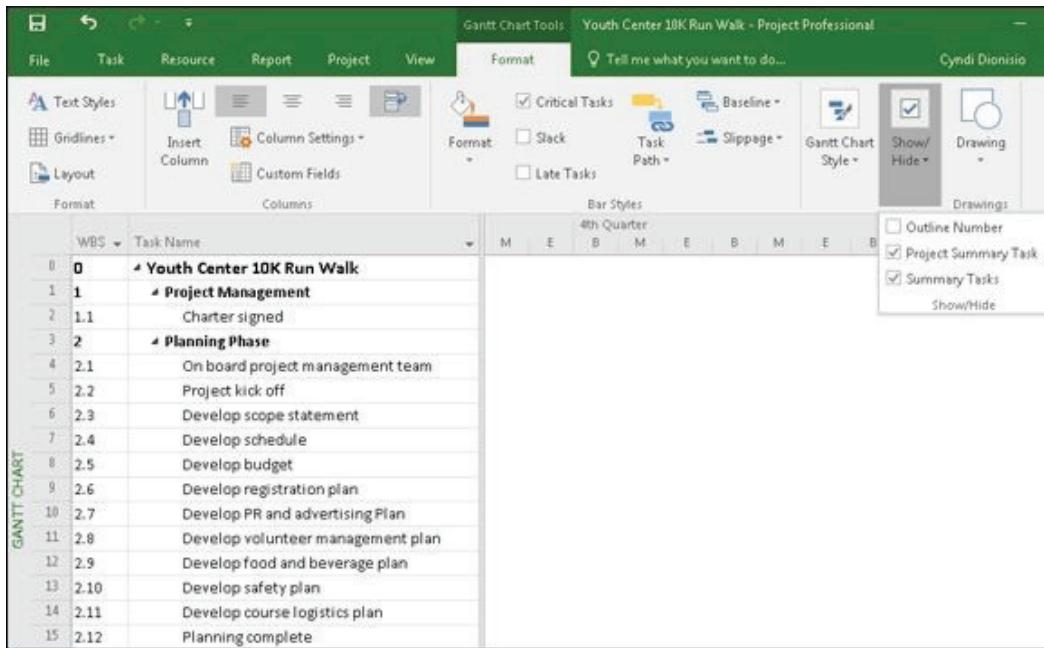


Rolling wave planning isn't an excuse to add scope; it's only the elaboration of existing scope.

## The project summary task

Just as a ship has only one captain, only one task summarizes all other tasks in a project. I strongly suggest that you display the *project summary task*, which represents the highest (least detailed) level of information and is often simply the title of the

project, such as New Product Rollout. When you tell Project to display the project summary task, every task in the project falls under it in the outline, as shown in [Figure 3-2](#).



[Figure 3-2:](#) The project summary task.

As you build your project, you can easily create a project summary task yourself (indent other tasks beneath it) or use a Project feature to generate one automatically at any time — even after you build all the phases of your project. To have Project automatically display a project summary task, follow these steps:

1. In the Gantt Chart view, select the Gantt Chart Tools Format context tab.
2. In the Show/Hide group, select the Project Summary Task check box.

As you can see in [Figure 3-2](#), Task 0, Youth Center 10K Run/Walk, is the project summary task. Notice that the bar for the project summary task on the chart is gray and that the bars for other summary tasks are black.

When you think about it, an upper-level headline in an outline is the sum of its parts: The headline reflects the overall topic for all items below it. The project summary task advances this concept a step further: This task rolls up all actual data from other tasks into one line item. Thus, the project summary task's duration reflects the duration of the entire project. From a monetary angle, the project summary task's total cost reflects the total costs for the entire project. Figures such as these can be handy to have at your fingertips — and that's one value of a summary task.



If you're confused about the length of your summary task, remember that the *summary task duration* is the difference between the earliest task start date and latest task end date. However, nonworking days aren't counted in the summary task duration. The length of the summary task, therefore, equals the number of

days of work over the course of the subtasks, not the number of calendar days between the start of the first task and end of the last.

Not everyone uses project summary tasks. You can simply create, at the highest level of your outline, tasks that represent major project deliverables or phases — with subphases and subtasks below them — and not create one task that's higher in the order than all others. However, having a project summary task has certain benefits:

- ✓ **You can quickly view totals for the project at a glance in the columns of data in Gantt Chart view and other views.**
- ✓ **You can place a link to your project summary task in another project so that all data for one project is reflected in another.** For example, if you create five schedules for new product launches in your company, you can easily create a master schedule for all company product launches by linking to the project summary tasks in each of the projects.

# **Moving Tasks Up, Down, and All Around**

In [Chapter 2](#), I show you how to outdent and indent tasks to create the WBS and the project outline. In this section, I show you additional ways to move tasks, collapse and expand tasks, and set up recurring tasks.

A maxim of project management says that things change: Tasks that you thought you could complete early can't happen yet because money, people, or materials are in short supply. Or a task that you thought you couldn't start until next July gets bumped up in priority when your customer changes his mind (again) about deliverables. Because of this changeability, when you enter tasks in a project outline, odds are that you'll need to move those tasks around at some point.

You should understand that moving a task can change its outline level. A task retains its level in the outline only when you move the task to follow a task at the same level. (Okay, there's an exception, which I get to in a minute.) Comparatively, if you move a lower-level task to a section of tasks at a higher level — for example, move a third-level task to a section of second-level tasks — the moved task takes on the level of the task preceding it. And the converse is true when you move a higher-level task to follow a lower-level task. The point is that you'll need to check your outline level for the tasks you move and adjust it using the indent and outdent features.

The exception I hinted at happens when you move a lower-level task to follow a summary task. For example, a second-level task that you move to immediately follow a summary task stays at the second level rather than taking on the summary task level of the task that now precedes it, because there's only one summary task.

## ***Moving tasks with the drag-and-drop method***

If you ask me, drag-and-drop is to computing what the remote control is to television. It's a quick, no-brainer method of moving stuff around in software that just makes life simpler. Here's an example:

To move a task up and down with the drag-and-drop method, follow these steps:

- 1. Display a column view, such as Gantt Chart view.**
- 2. Select a task by clicking its task ID number.**

Simply click and release; don't hold down the mouse button.
- 3. Click and drag the task to wherever you want it to appear in the outline.**

A gray "T-bar" line appears, indicating the new task position.
- 4. When the gray line is located where you want to insert the task, release the mouse button.**

The task appears in its new location. If you want the task to be at a different level of the outline, you can now indent or outdent it as needed.

# **Moving tasks with the cut-and-paste (or copy-and-paste) method**

Dragging and dropping works fine in most cases, but in very large projects — with a few hundred tasks or more, for example — it's easier to cut and paste.

In a larger outline, use the cut-and-paste method to move tasks:

- 1. Select a task by clicking its task ID number.**
- 2. Click the Cut button in the Clipboard group on the Task tab.**

The task is removed from its current location and placed on the Windows Clipboard.

- 3. Scroll to display the location where you want the task to appear.**
- 4. Click the task after which you want to insert the task.**
- 5. Click the top part of the Paste button, also on the Task tab.**

If you want to insert a copy of a task in a project outline, you can follow the preceding steps and click Copy rather than Cut.



If you're cutting and copying only a single cell and not a whole task, click in the cell rather than click the task ID number.



You can use the standard Microsoft shortcuts Ctrl+C to copy, Ctrl+X to cut, and Ctrl+V to paste.

# **Now You See It, Now You Don't: Collapsing and Expanding the Task Outline**

Since the caveman days (or whenever the first fourth-grade teacher taught the first set of kids how to outline their book reports), outlines have allowed you to focus on different levels of detail. Outlines do this on paper by essentially ordering information so that you can more easily focus on the level of information you need and ignore the rest.

With the invention of computer outlining, the capability to focus on only certain portions of an outline comes into its own, because you can easily open and close an outline to show or hide different levels of information — or entire sections of your outline. The black triangle symbol next to the Database summary (refer to [Figure 3-1](#)) indicates that all subtasks below it are displayed. The clear triangle next to the User Interface label indicates that the subtasks aren't displayed. Remember that all summary tasks are in bold in the project outline.

This capability means that you can hide all but the upper level of tasks in a project to give your manager an overview of progress. Or you can close every phase of your project except the one in progress so that your team can focus on only those tasks in a status meeting. Or you can close most of your outline to make it easy to move to a late phase of a very large schedule.

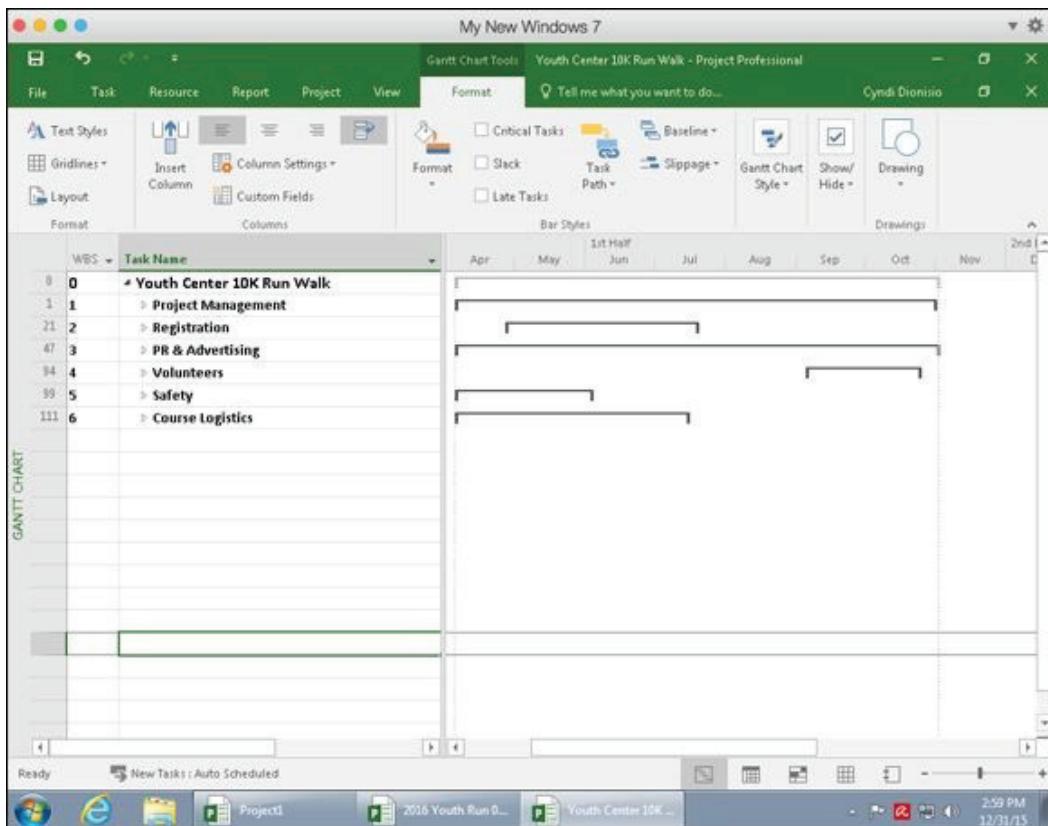
If you want to hide all the summary tasks and just see the child tasks, you can go to the Gantt Chart Tools context tab and uncheck the Summary Tasks box. Another nifty feature in Project is the ability to choose which level of detail you want to see in your outline. To wrangle the tasks to the level you want them, it's best to work with the View tab. In the View tab under the Data group, there is a drop-down option called Outline. [Figure 3-3](#) shows you the options you have for looking at your outline.



**Figure 3-3:** Outline options.

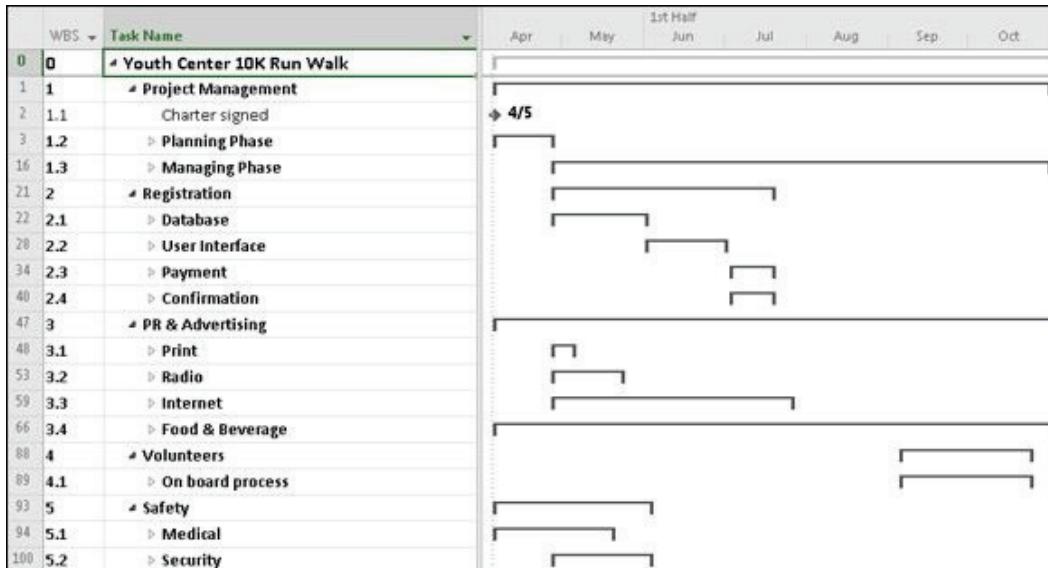
The options that say Show Subtasks and Hide Subtasks can be done at any level of summary tasks. Just select the summary task you want — regardless of whether it's at Level 1 or Level 5 — and click Show Subtasks to see everything underneath, or click Hide Subtasks to just see the summary task.

When you want an overview of your project, it's helpful to look at it from Level 1 or Level 2. You can see our 10K Run at Level 1 in [Figure 3-4](#). Notice the duration for each of the summary level tasks and you can see how they nest within the Project Summary Task.



**Figure 3-4:** Level 1 Outline for 10K Run.

Level 2, shown in [Figure 3-5](#), shows all the subtasks and the two milestones of Charter Signed and Race. This level gives you a good overview of the project with a bit more detail than Level 1. Level 2 is the view I like to show management or other high-level stakeholders to give them an overall understanding of the project.



**Figure 3-5:** Level 2 Outline for 10K Run.



To quickly reveal all subtasks in a project, click the Show Outline button and then click All Subtasks.



To show subtasks from the keyboard, you can press Alt+Shift+\* (asterisk). To hide subtasks, you can press Alt+Shift+- (hyphen) or Alt+Shift+- (minus sign) if you're using the numeric keypad.

# **Showing Up Again and Again: Recurring Tasks**

Some tasks occur repeatedly in projects. For example, attending a monthly project debriefing or generating a quarterly project report is considered a recurring task.

No one wants to create all the tasks for the monthly debriefing in a project that will take a year to complete. Instead, you can designate the recurrence, and Project automatically creates the 12 tasks for you.

Here's how to create a recurring task:

- 1. Click the Task tab on the Ribbon, click the bottom part of the Task button (with the down arrow) in the Insert group, and then click Recurring Task.**

[Figure 3-6](#) shows the Recurring Task Information dialog box that will insert a recurring task for a monthly meeting on the 11th of every month. The meeting is scheduled to occur every month for eight months.

- 2. In the Task Name box, type a name for the task.**
- 3. In the Duration box, click the spinner arrows to set a duration, or type a duration, such as 10d for 10 days.**

Edit the abbreviation to specify a different time unit, if needed.



You can read about the abbreviations that you can use for units of duration — such as *h* for hours — in [Chapter 5](#).

- 4. Select a recurrence pattern by selecting the Daily, Weekly, Monthly, or Yearly option.**

The option you select provides different choices for the rest of the recurrence pattern.

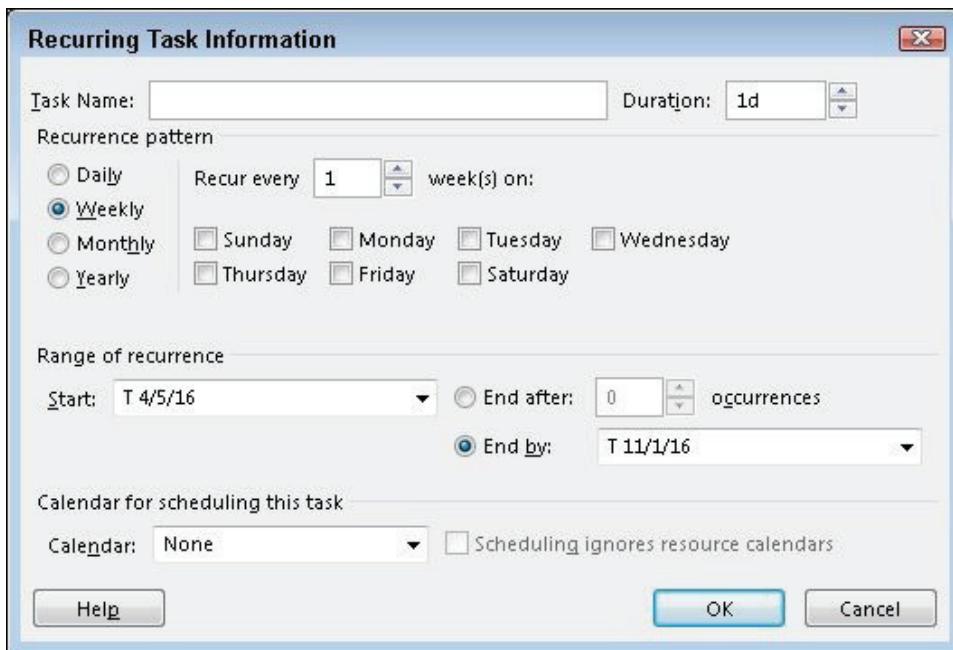
- 5. Depending on the selections offered to you, make choices for the rest of the pattern.**

For example, if you select the Weekly option, you must choose a Recur Every *x* Week(s) On setting and then choose a day such as Friday. Or, if you select Monthly, you must specify which day of every month the task is to recur.

- 6. In the Range of Recurrence area, type a date in the Start box; then select and fill in either the End After or End By option.**

For example, you might start on January 1 and end after 12 occurrences to create a task that occurs every month for a year.

- 7. Click the OK button to save the recurring task.**



**Figure 3-6:** The Recurring Task Information dialog box.

If your settings cause a task to fall on a nonworking day (for example, if you choose to meet on the eighth day of every month and the eighth day is a Sunday in one of those months), a dialog box appears, asking you how to handle this situation. You can choose not to create the task, or you can let Project adjust the day to the next working day in that period.



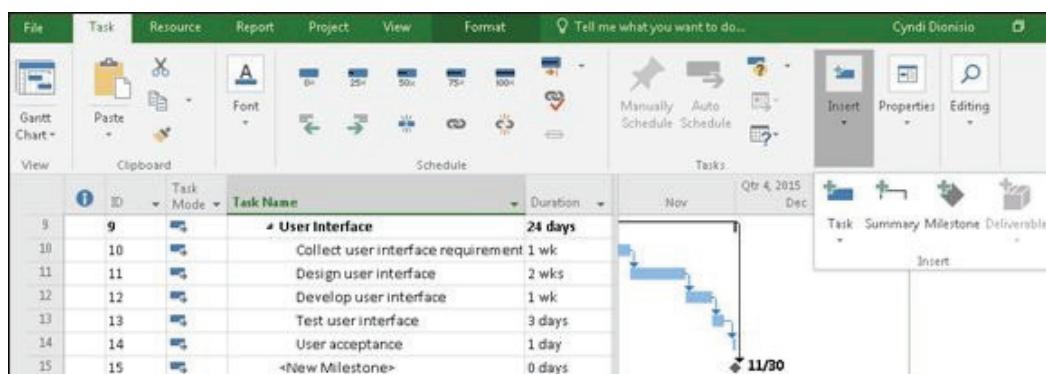
To assign resources to a recurring task, you have to assign the resources to the individual recurrences, not to the “summary” recurring task. If you assign resources to the summary recurring task, Project doesn’t calculate the hours of work correctly. I talk about assigning resources to tasks in [Chapter 9](#).

# Setting Milestones

Milestones are signposts that mark significant events. Examples of milestones are the approval of a prototype (although the deliberations to make that decision might have taken months), the completion of a key deliverable, or the start or end of a project phase.

Some people include tasks such as Design Completed or Testing Completed at the end of each phase of their projects. They can then create timing relationships to the moment of completion — for example, allowing the production of a drug to proceed after the testing and approval is complete. Such milestones also alert you and your team members to a moment of progress in your project that can help keep the team motivated.

Project creates new tasks with an estimated duration of one day unless you enter a duration. To create a milestone, you indicate that the task has zero duration. An easy way to do this is to simply type **0** in the Duration column in Gantt Chart view. When you do, the milestone is designated in Gantt Chart view with a diamond shape rather than a taskbar. You can also click **Milestone** in the Insert Group of the Task Ribbon. As shown in [Figure 3-7](#), a new task will show up that says <New Milestone>. Finally, you can click the Advanced tab in the Task Information dialog box and select the **Mark Task As Milestone** check box. Use this latter method for any milestone that has a duration other than zero but that you want to mark as a milestone anyway; its milestone marker is charted at the end of the duration period on the Gantt chart.



[Figure 3-7:](#) Creating a new milestone.

# **Deleting Tasks and Using Inactive Tasks**

If your style is to delve into a lot of planning detail for everything you do, you may tend to overanalyze and add more tasks than you need to track in a project plan. In such cases, when you're refining the project plan, you may decide that you need to delete a task or two to tighten up the plan. After all, the process of planning includes not only decomposing the work, but also consolidating tasks when they become too detailed. To delete a task, click its row (Task ID) number at the left side of the sheet and press the Delete key.



Project doesn't display a warning or ask you to confirm deleting a task, so make sure that you *really* mean it when you press Delete. If you screw up, click the undo arrow in your Quick Access toolbar or press Ctrl+Z immediately to restore the deleted task. Also, be sure to check that any task dependencies (links) adjust as needed after you delete the task.

Another approach is to mark a task as *inactive*. Doing this leaves the task visible in the plan but strikes it out in the task sheet and on the Gantt chart, as shown in [Figure 3-8](#). If any automatically scheduled tasks were dependent on the inactive task, Project ignores the now-inactive task when calculating the schedules for those other tasks. Leaving an inactive task in the schedule provides another opportunity to track and document what happened. For example, you can add a note explaining why the task was removed, such as not having a budget that's sufficient for television advertising.

The screenshot shows the Microsoft Project application interface. The ribbon tabs include File, Task, Resource, Report, Project, View, Gantt Chart Tools, and Format. The Gantt Chart Tools tab is selected. The Task Sheet is open, showing a list of tasks with their Task Name, Task ID, and duration. The Gantt chart displays the tasks as bars over a timeline from April to October. An arrow points to the 'Inactivate' button in the Schedule group of the ribbon, which is located next to the 'Manually Schedule' and 'Auto Schedule' buttons. The 'Inactivate' button is represented by a small square with a minus sign. The task 'Television' (Task ID 53) is highlighted in the Task Sheet, and its bar is struck through on the Gantt chart, indicating it is inactive.

Task Name	Task ID	Duration
Planning Phase	3	1 day
Managing Phase	16	1 day
Registration	21	1 day
Database	22	1 day
User Interface	28	1 day
Payment	34	1 day
Confirmation	40	1 day
PR & Advertising	47	1 day
Print	48	1 day
Television	53	1 day
Write-spots	54	1 day
Edit-spots	55	1 day
Approve-spots	56	1 day
Record-spots	57	1 day
Place-spots	58	1 day
Radio	59	1 day
Internet	65	1 day

**Figure 3-8:** Marking a task as Inactive.

Follow these steps to mark a task as inactive:

- 1. In Gantt Chart view, select the task to make inactive.**
- 2. Click the Inactivate button in the Schedule group on the Task tab of the Ribbon.**

Project immediately reformats the task as inactive.

# Making a Task Note

Despite the wealth of information that you can enter about a task and its timing, not everything can be said with settings. That's why every task includes an area to enter notes. You may use this feature, for example, to enter background information about constraints, detail a step-by-step process that's summarized by the task duration, change the timing, or list vendor contact information that's relevant to the task.

To enter task notes, follow these steps:

- 1. Double-click a task.**

The Task Information dialog box appears.

- 2. Select the Notes tab, as shown in [Figure 3-9](#).**

- 3. In the Notes area, type any information you like.**

You can enter contact information, notes about resources, or other useful information about the task.

- 4. Format the note.**

Click the buttons at the top of the Notes area to change the font. You can also

- Left-align, center, or right-align text.
- Format text as a bulleted list.
- Insert an object.

- 5. Click the OK button to save the note.**

You will notice that a note icon appears in the information column indicating there is now a note there.

Task Mode	Task Name	Duration	Start	Finish	Prec.
▶	Payment	12 days	M 7/4/16	T 7/19/16	
▶	Collect payment requirements	2 days	M 7/4/16	T 7/5/16	33
▶	Design payment function	2 days	W 7/6/16	T 7/7/16	35
▶	Develop payment function	1 wk	F 7/8/16	T 7/14/16	36
▶	Test payment function	2 days	F 7/15/16	M 7/18/16	37

**Task Information**

General | Predecessors | Resources | Advanced | Notes | Custom Fields | X

Name: Test payment function Duration: 2 days  Estimated

Notes:

Make sure Visa, MC, Am Ex, and PayPal all function.

Help OK Cancel

The screenshot shows a Microsoft Project interface. At the top, there's a table with tasks: 'Payment' (12 days), 'Collect payment requirements' (2 days), 'Design payment function' (2 days), 'Develop payment function' (1 week), and 'Test payment function' (2 days). Below the table is a 'Task Information' dialog box. In the dialog, under 'General', the task name is 'Test payment function' and its duration is '2 days'. There's a checked checkbox for 'Estimated'. The 'Notes' tab is selected, containing the text 'Make sure Visa, MC, Am Ex, and PayPal all function.' at the top. At the bottom of the dialog are 'Help', 'OK', and 'Cancel' buttons.

**Figure 3-9:** Task note.

# The Codependent Nature of Tasks

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## In This Chapter

- ▶ Identifying the different kinds of dependency relationships
  - ▶ Creating dependency links
  - ▶ Discovering how dependency links affect timing
  - ▶ Allowing for lag and lead time
  - ▶ Reflecting the timing of external tasks in your project
- 

Imagine this: If you create a hundred tasks and leave their default constraints so that they start as soon as possible and have no dependencies, all those tasks start on the project start date and occur simultaneously. The project consisting of a hundred tasks takes exactly as long to complete as the longest task.

Wander back over here to reality for a moment. When did you ever have a set of tasks in which not a single task had to be completed before another one could start? Imagine what would happen if you tried to train your employees to use a new piece of equipment before the equipment even arrived.

The reality is that not all tasks in a project start at the same time. To reflect this reality in a Project plan, you have to set dependency links between tasks. *Dependencies* are timing relationships between tasks — for example, when one task depends on the completion of another. Dependencies are caused by one of these factors:

- ✓ **The nature of the tasks:** You can't frame a house, for example, until its concrete foundation is dry; otherwise, the building will sink. This concept is sometimes referred to as a *mandatory dependency* or *hard logic*.
- ✓ **A best practice or preference:** You should document all requirements before you start designing, however — you can start *some* of the high-level design work before documenting every requirement; it just isn't a good practice to do so. This concept is sometimes referred to as a *discretionary dependency* or *soft logic*.
- ✓ **Resource availability:** When your operations manager can't attend two plant inspections simultaneously, the situation is known as a *resource dependency*.
- ✓ **Reliance on a resource or an action outside the project:** When you need a deliverable from another project before you can start your work, or you're waiting on someone from an external agency to sign off on it, you have an *external dependency*.

# How Tasks Become Dependent

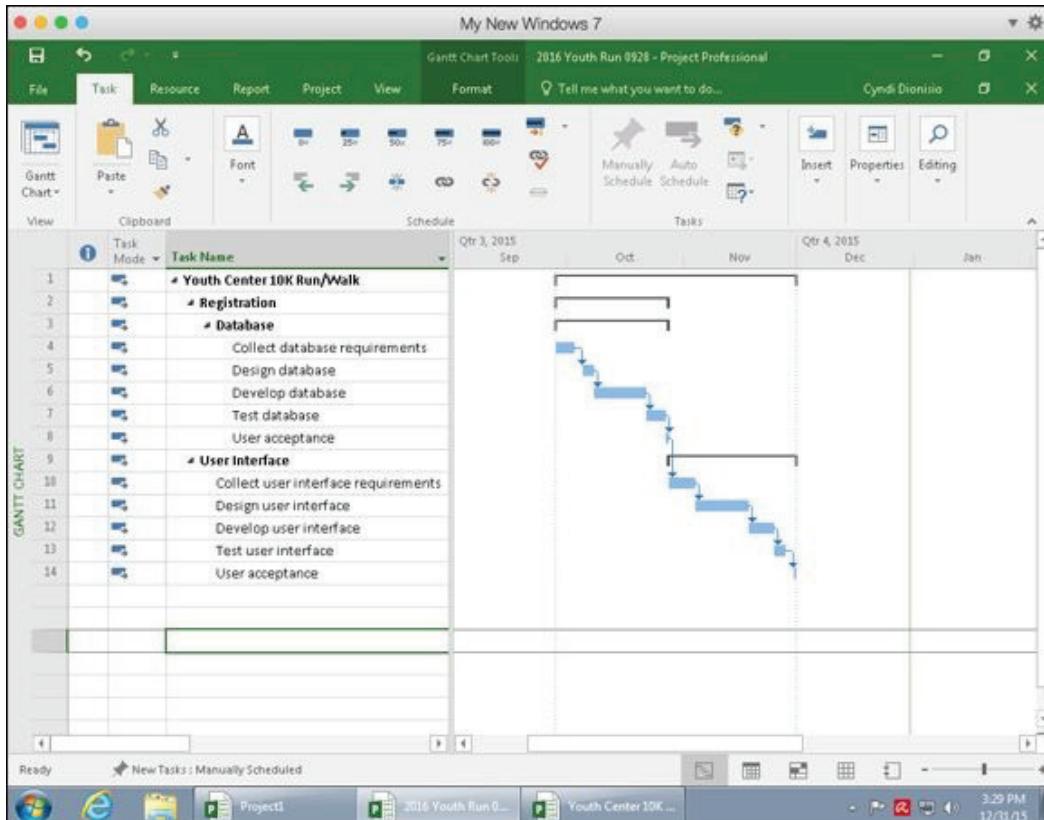
In [Chapter 1](#), I talk about manually scheduled tasks versus auto-scheduled tasks. If you allow the auto-scheduling and your network logic (dependencies) to build your schedule instead of manually assigning specific dates to tasks, Project can reflect changes to your schedule and adjust the dates and timing automatically.

For example, if the task of receiving materials in-house is delayed by a week, the dependent task of starting the manufacturing process moves out a week automatically. You can note the change when you're tracking activity in your plan, and Project makes adjustments accordingly. The alternative is to change the start date of just about every task in your schedule *every time a task is running late*; you don't even want to think about doing that!

## Dependent tasks: Which comes first?

When we talk about task relationships, we talk about a task having a predecessor and successor. The predecessor task comes first and impacts when the *successor* (following) task is scheduled, particularly under the auto-scheduling method.

[Figure 4-1](#) shows you how the taskbars in Gantt Chart view graphically depict the predecessors and successors in dependency relationships between tasks. Notice how taskbars represent the relationship when a task starts after another task. Also notice the lines drawn between tasks: These lines indicate *dependency links*.



[Figure 4-1:](#) Dependency relationships.



Here's some important advice about dependencies: You can have more than one dependency link to a task, but don't overdo it. Many people who are new to Project make the mistake of building every logical timing relationship that can exist. If the situation changes and the dependencies have to be deleted or changed (for example, to shorten a schedule), the web of dependencies starts to get convoluted — and can easily create a nightmare.

For example, you must complete the tasks of obtaining a permit and pouring a foundation for a building before you can start framing it. However, if you set up a dependency between obtaining the permit and pouring the foundation, setting a dependency from foundation to framing is sufficient to establish the correct timing. Because you can't start pouring the foundation until you have a permit, and you can't frame until you pour the foundation, framing can't start before you have a permit. This common mistake is known as having a *redundant predecessor*.



You don't have to use dependencies to prevent resources from working on two tasks simultaneously. When you set the availability of resources and assign them to two tasks happening at the same time, you can use tools such as Team Planner view (see [Chapter 9](#)) and resource leveling (discussed in [Chapter 12](#)) rather than establish a dependency that forces one task to happen after another. This feature delays tasks when scheduling causes a resource overallocation. See [Chapters 9](#) and [12](#) for more about how resource assignments affect task timing.

## Dependency types

There are four types of dependency links: finish-to-start, start-to-start, finish-to-finish, and start-to-finish. Using these types efficiently can mean the difference between a project that finishes on time and one that's still limping along long after you retire.

Here's how the four dependency types work:

- ✓ **Finish-to-start:** This most common type of dependency link should account for about 90 percent of the dependencies you create. In this relationship, the predecessor task must be completed before the successor task can start. When you create a dependency, the default setting is finish-to-start.

An example of a finish-to-start dependency is when you must complete the Develop Database task before you can begin the Test Database task. All the dependencies shown in [Figure 4-1](#) are finish-to-start. The relationship is indicated by a successor taskbar that starts where the predecessor taskbar leaves off. You see the finish-to-start type abbreviated as FS.

- ✓ **Start-to-start:** The start of one task is dependent on the start of another. In this dependency type, two tasks can start simultaneously, or one task might have to start

before another task can start. For example, assuming that you have the resources, you can start collecting requirements for payment and confirmation at the same time. A start-to-start relationship is abbreviated as SS.

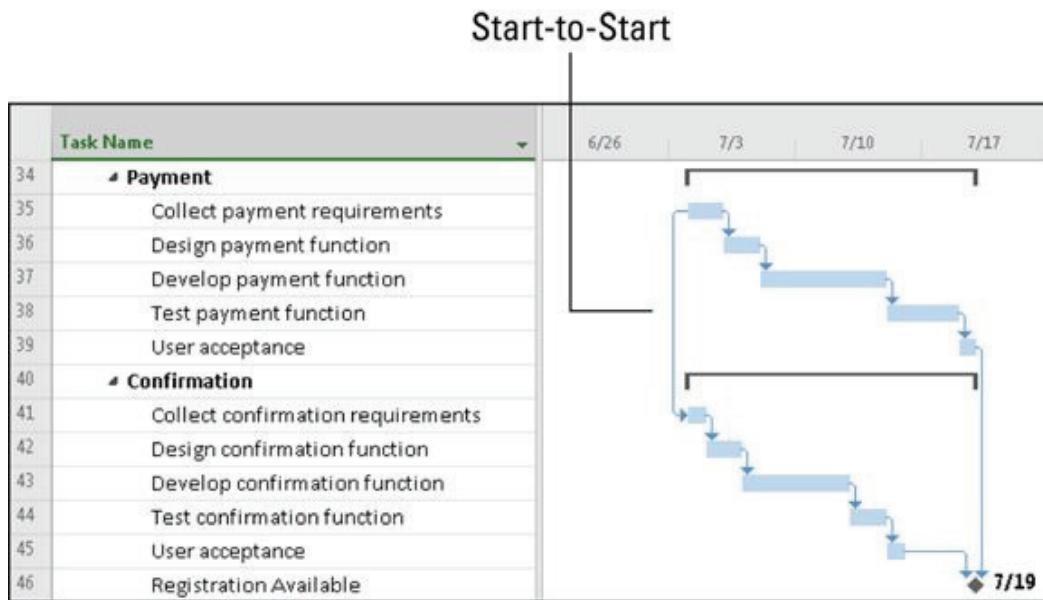
[Figure 4-2](#) shows, accordingly, the start-to-start relationship between the Collect Payment Requirements and Collect Confirmation Requirements tasks.

- ✓ **Finish-to-finish:** In a finish-to-finish relationship, one task (you guessed it) must finish before or at the same time as another task.

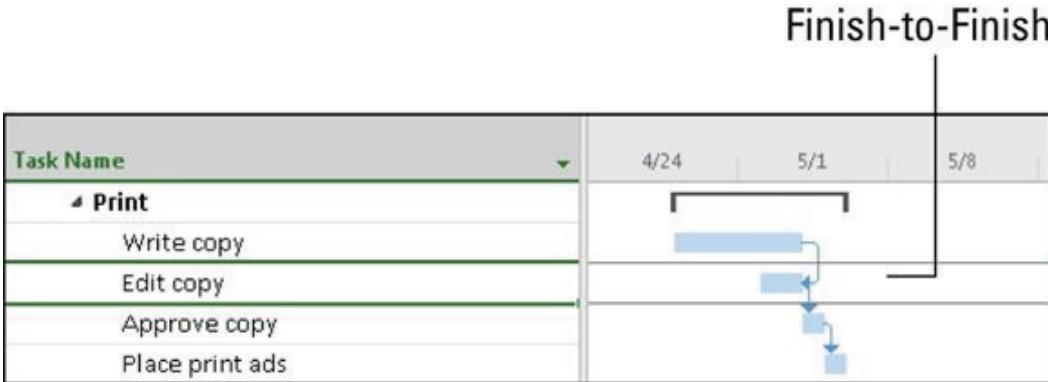
Suppose that you're developing copy for print advertising. You know that the copy will require several rounds of writing and editing. Rather than show a Write ⇒ Edit ⇒ Write ⇒ Edit ⇒ Write ⇒ Edit set of tasks, you can show Write and Edit in a finish-to-finish relationship in which editing finishes at the same time as, or after, writing is done. [Figure 4-3](#) shows a finish-to-finish relationship between Write Copy and Edit Copy. Finish-to-finish is abbreviated as FF.

- ✓ **Start-to-finish:** In a start-to-finish dependency, the predecessor task can finish only after the successor task has started. If the successor is delayed, the predecessor task can't finish. Of course, this type of relationship is abbreviated as SF.

Suppose that you're bringing online a new accounting application. The predecessor task of Turn-Off Old Application can't be completed before the successor task of Start Up New Application has started. You need to make sure the new application works as expected, even though you have tested it — run both for a month or so. Therefore, the demise of the old application is dependent on when the new application starts up.



[Figure 4-2](#): The start-to-start relationship.



[Figure 4-3:](#) The finish-to-finish relationship.



The start-to-finish dependency type is tricky. Leave this type of logic to the professional schedulers and try to find a different way to indicate the relationship between tasks. Often, simply breaking down the tasks and resequencing them accomplishes the same goal.

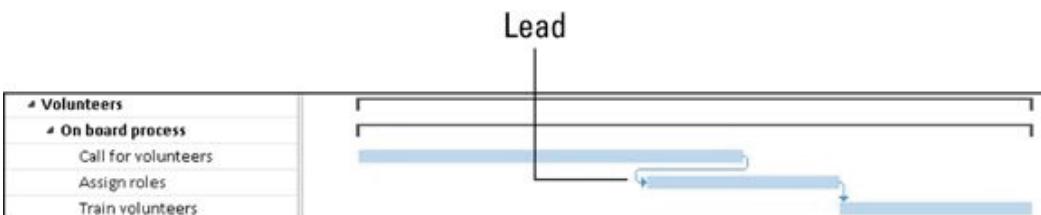
## Allowing for Murphy's Law: Lag and lead time

Dependencies can become a little more complex than simply applying the four types of dependency links that I describe in the preceding section. You can use lag time or lead time to fine-tune your timing relationships:

- ✓ **Lag time** occurs when you add time to the start or finish of a predecessor task; lag time causes a gap in timing, which delays the start of the successor task. For example, a period almost always exists between sending out a Request for Quote for a service and receiving the quotes. [Figure 4-4](#) shows the lag time that's scheduled between the Send Out RFQ and Review Quotes tasks. When you show a lag, you show the plus (+) sign and then the amount of lag. For example, a lag of one week is shown as +1wk (wk is the abbreviation for *week*). Therefore, the relationship between Send Out RFQ and Review Quotes is FS+1wk.
- ✓ **Lead time** is created when you accelerate time between the start or finish of the predecessor. In [Figure 4-5](#), you see that the call for volunteers is set to start eight weeks before the race day — this gives us a start-to-start with an eight-week lead. We also don't have to wait for all the volunteers to be onboard before we start assigning roles. In this case, we're overlapping the call for volunteers and assigning the roles by a week. This is called *fast tracking*. Finally, we want the Train volunteers task to be done two days prior to the race, so we set a finish-to-finish with a two-day lead (FF-2d). A lead is sometimes considered negative lag.



**Figure 4-4:** Lag time between tasks.



**Figure 4-5:** Lead time between tasks.

# Setting the Dependency Connection

Setting dependency relationships is simple: You create a dependency, select the dependency type, and build in any lag time or lead time. The tricky part lies in understanding how each type of dependency affects your plan when your project goes live and you start to record actual work that resources perform on tasks.

## Adding the dependency link

When you create a dependency, it's a finish-to-start relationship by default: One task must finish before another can start. If that's just the kind of dependency you want, that's all there is to it. If it isn't the kind you want, after you create this link, you can edit it to change the dependency type or to build in lag or lead time.

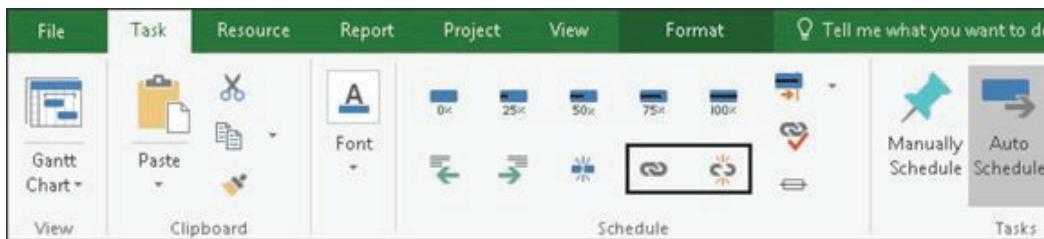
To establish a simple finish-to-start link, follow these steps:

1. **Display Gantt Chart view and ensure that the two tasks you want to link are visible.**

You may have to collapse some tasks in your project or use the Zoom button on the View tab to fit more tasks on the screen.

2. **Click the predecessor task and Ctrl+click the successor task, and when both tasks are highlighted, click the Chain Link icon (see [Figure 4-6](#)) on the Task file tab in the Schedule Group.**

You can continue holding down the Ctrl key and highlighting as many tasks as you want to link. [Figure 4-6](#) outlines the Link button and Unlink buttons.



[Figure 4-6:](#) Linking and unlinking tasks.

You can link multiple tasks in a row in a finish-to-start relationship by clicking the first task and dragging to the last task. When you release the mouse button, click the Chain Link icon to link all the tasks in order.



Best practice is to link only subtasks, which represent the actual work performed, not the summary tasks. The Ctrl+click method is helpful for skipping over summary tasks when selecting tasks for linking. Also, whether you use the mouse or the Link Tasks button to drag between tasks, the task that's selected first always becomes the predecessor. Therefore, if you're not careful in how you select the tasks, the dependency arrow could move backward in the schedule.

To establish a link in the Task Information dialog box or to modify an existing relationship, make note of the task ID number of the predecessor task and then follow these steps:

**1. Double-click the successor task.**

The Task Information dialog box opens for the selected task.

**2. Click the Predecessors tab, as shown in [Figure 4-7](#).**

On this tab, you can build as many dependency relationships as you like.

**3. In the ID field, type a task ID number for the predecessor task.**

Alternatively, you can select the task from the Task Name drop-down list. All the tasks you've already entered into the project appear. To display this list, click the next blank Task Name cell and then click the drop-down list arrow that appears.

**4. Press Tab.**

The task name and the default finish-to-start dependency type showing 0d (no days, which is the default unit of time) of lag time are entered automatically.

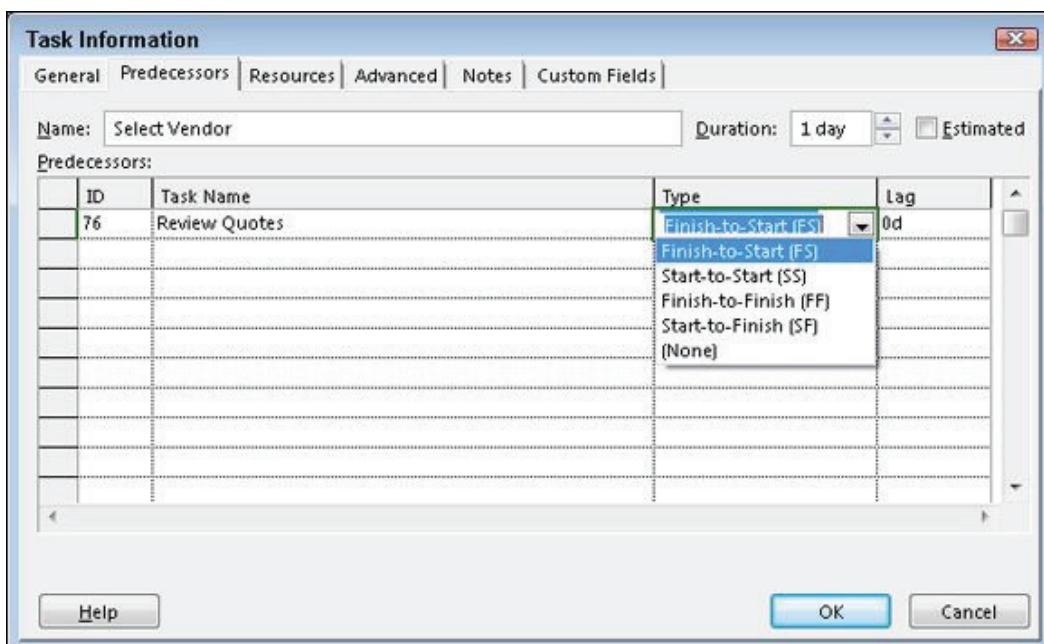
**5. Click the Type column and click the arrow that appears to display the dependency types, and then click the appropriate dependency for your situation (refer to [Figure 4-6](#)).**

**6. If you want to add lag or lead time, click the Lag field and use the spinner arrows that appear to set the amount of time.**

Click up to a positive number for lag time, or click down to a negative number for lead time.

**7. Repeat Steps 3 through 6 to establish additional dependency relationships.**

**8. When you're finished, click the OK button to save the dependencies.**



[Figure 4-7:](#) Setting dependency relationships.



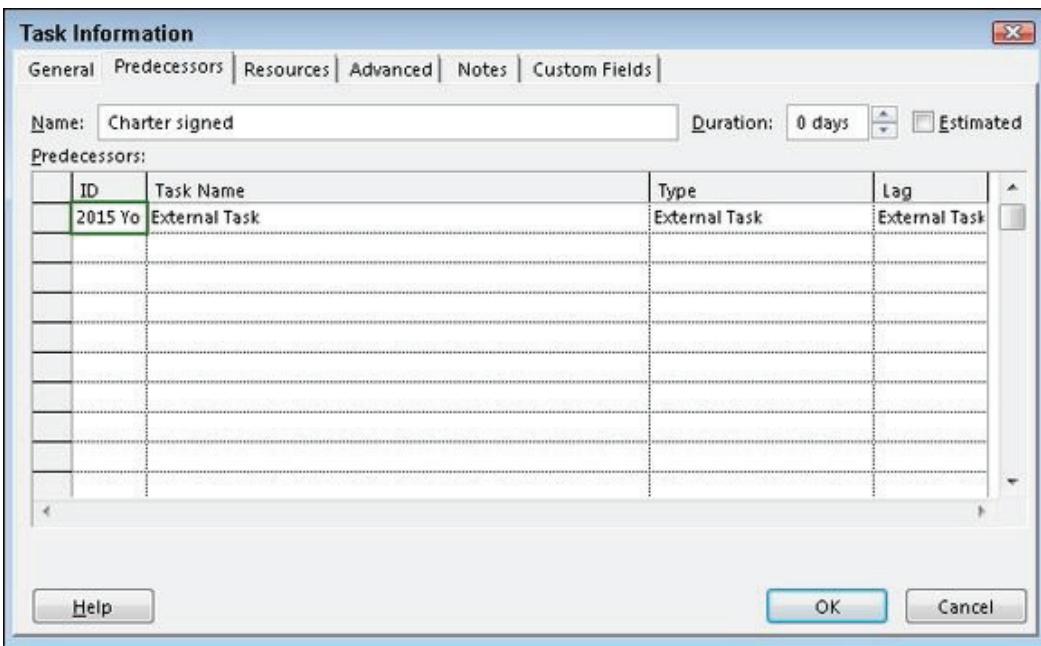
To “keystroke” a link between tasks, select both tasks and then press Ctrl+F2.  
To unlink, press Ctrl+Shift+F2.

Another way to enter dependencies is to expand the Task Sheet pane until you see the Predecessors column. You can enter the task number of the predecessor task directly into that column, as shown in [Figures 4-4](#) and [4-5](#).

## ***Extending your reach with external dependencies***

Unfortunately, no project exists in isolation. Many times, another project you’re managing or another project going on somewhere else in your organization affects your project. Perhaps resources or facilities are shared, or perhaps the timing of tasks in other projects affects the timing of tasks in yours. For example, if your project is to plan the opening of a new store, you may have to create a dependency from your Begin Move-In task to the Final Building Inspection Complete task in someone else’s construction project.

To deal with this balancing act, you can create a linked task that represents the timing of the other project (or of a particular task in it). This is also called creating a *cross-project link*. Make sure that both the file with the predecessor task and the file with the successor task are open. Identify the filename and task ID (row) number for the predecessor task. Then switch to the file with the successor task and open the Task Information dialog box for the successor task, as just described. Click in the ID column on a blank row. Type the predecessor filename, a backslash, and then the predecessor task ID number, as in Delta Project/2. Then press Tab to complete the entry. The linked task from the other file appears in the list, as shown in [Figure 4-8](#). In the Gantt chart, that external successor appears in gray so you know that it doesn’t really “live” in the current schedule file.



**Figure 4-8:** The task ID refers to an external task.



You can also insert an entire project and add a link to it so that updates to the other file are reflected in your plan automatically.

## Words to the wise

I can't stress enough how important it is to understand the nature of your dependencies. Assuming that you have identified the project work correctly — the way tasks are linked, coupled with your duration estimates (described in [Chapter 5](#)) — is the key driver to developing an accurate schedule for your project. If you don't enter the correct relationship between tasks, or if you leave out a linkage, your schedule will be incorrect.

When all your tasks are logically linked, the result is a *network diagram*, or *precedence diagram* — a visual display of how all the tasks relate to one another. This diagram shows the flow of work through the project. If you're missing a relationship or dependency, the flow isn't right, and you're likely to be late or to have to scurry to try to make up for your oversight.



Every task except the first and last tasks has a predecessor and a successor. If one of these elements is missing, the *hanger* task is left dangling. If a task has no predecessor, connect the task to the start milestone of the project. If the task has no successor, connect the task to the end of the phase or the finish milestone of the project.

In addition to making sure you understand the predecessor and successors of each task, you should make sure that the type of relationship is correct. If you try to save time by

overlapping tasks, you should understand whether a FS relationship with a lead is a better option than an FF or SS with a lag. To help you determine the better option, ask yourself these questions:

- ✓ If the start of the predecessor is delayed, will it cause the successor to be delayed?
- ✓ If the finish of the predecessor is delayed, will it cause the successor to be delayed?

The answer to these questions will help you understand how the predecessor task affects the scheduling of the successor task.

## ***Understanding that things change: Deleting dependencies***

Just like the latest trend in fashion, dependencies in a project can suddenly change. For example, sometimes they're no longer needed because of a shift in priorities or overall project timing. When you need to get rid of a dependency, you can undo what you did in either the Gantt Chart or the Task Information dialog box.



Leading practices in project management suggest that dependencies should not be built based on resource availability when first creating the schedule. Rather, you should concern yourself with the logical order of the work regardless of who does it at this point in creating your schedule. *Resource leveling*, or the smoothing out of the peaks and valleys of resource usage, is always a factor in scheduling, of course, but it is a factor that will be addressed in later steps in project planning.

With Gantt Chart view displayed, follow these steps:

- 1. Select the two tasks whose dependency you want to delete.**
  - *For two adjacent tasks:* Drag to select their ID numbers.
  - *For nonadjacent tasks:* Click one task, press and hold Ctrl, and then click a nonadjacent task.
- 2. Click the Unlink Tasks button in the Schedule group on the Task tab (refer to [Figure 4-6](#)).**



Use the above method carefully. If you click only one task and then click the Unlink Tasks button, the result is somewhat drastic: *All* dependency relationships for that task are removed.

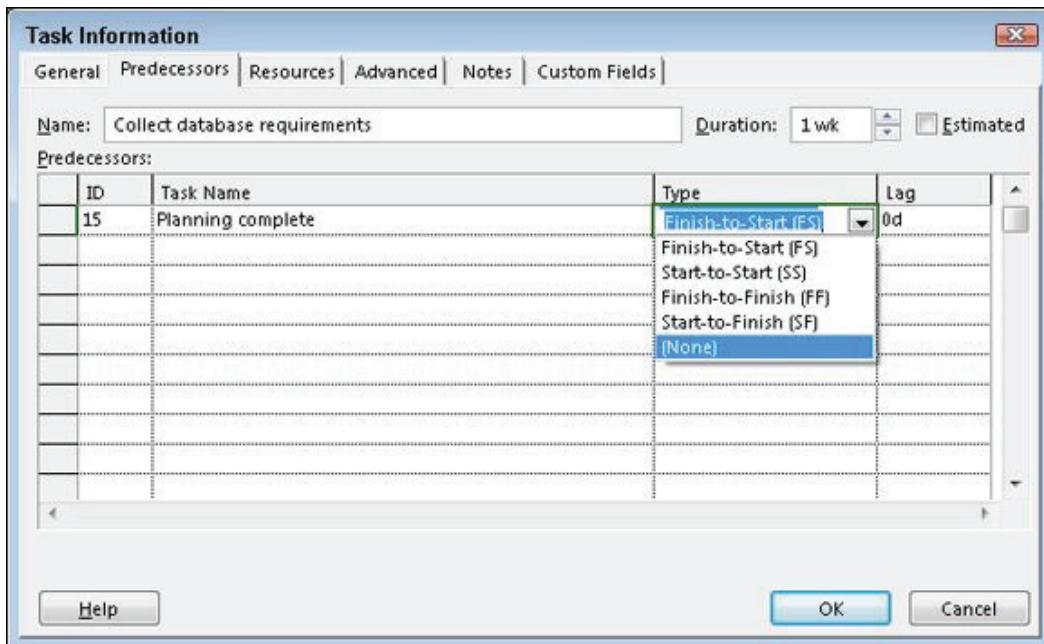
To remove dependency relationships in the Task Information dialog box, here's the drill:

- 1. Double-click a successor task name.**

The Task Information dialog box appears.

2. Click the Predecessors tab to display it.
  3. Click the Type box for the dependency you want to delete.
- A list of dependency types appears, as shown in [Figure 4-9](#).
4. Choose None.
  5. Click the OK button to save the change.

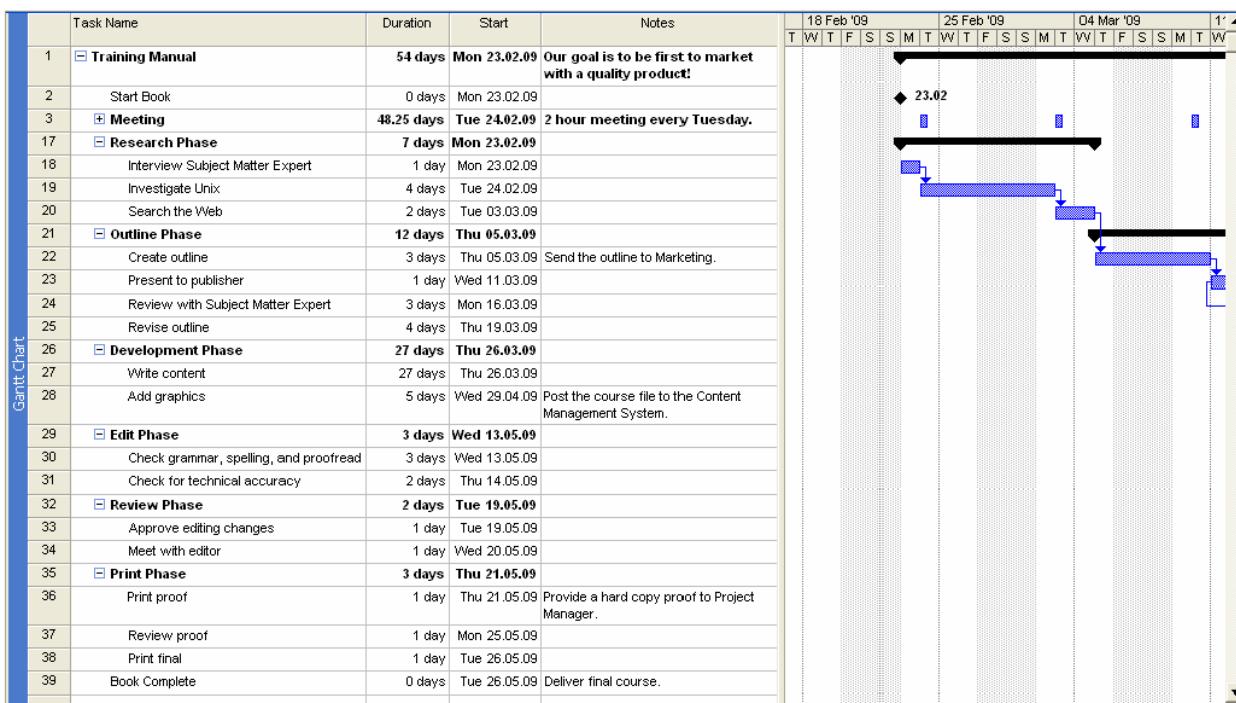
The dependency line on the Gantt chart is gone. The next time you open that Task Information dialog box, the dependency is gone, too.

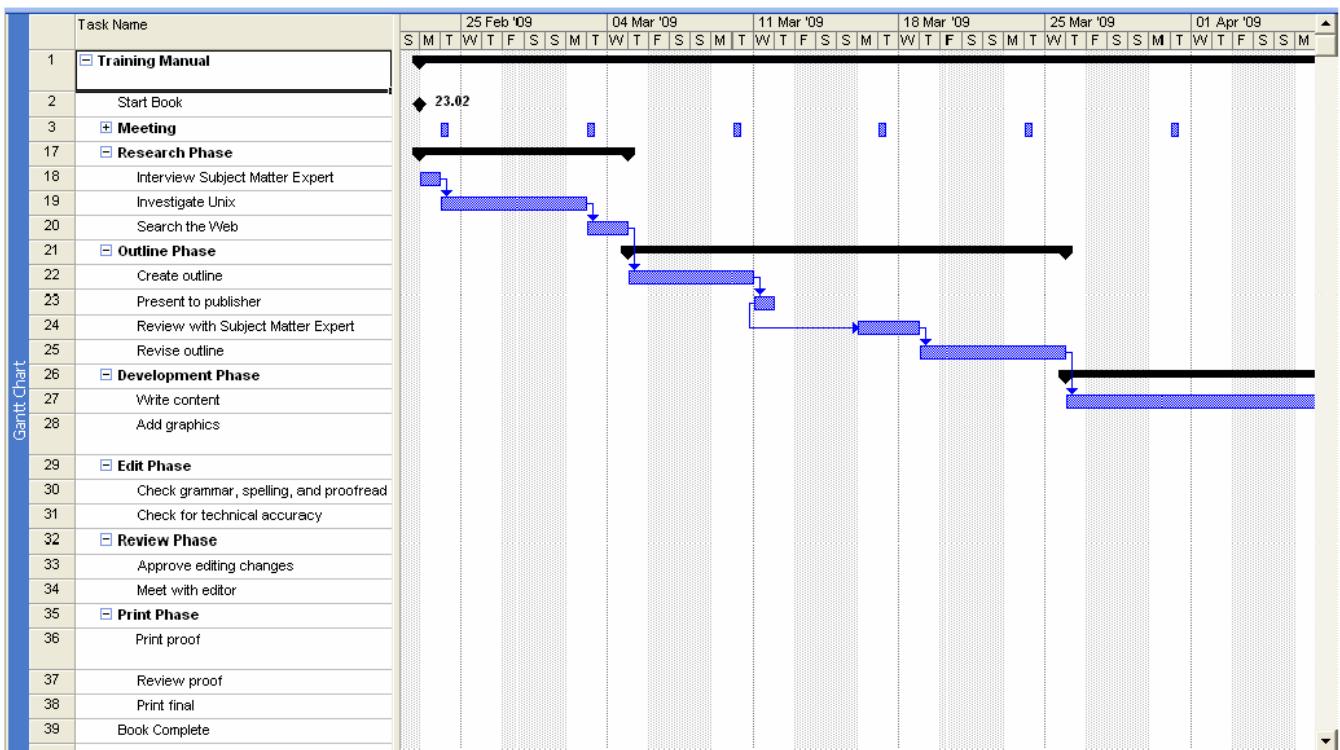


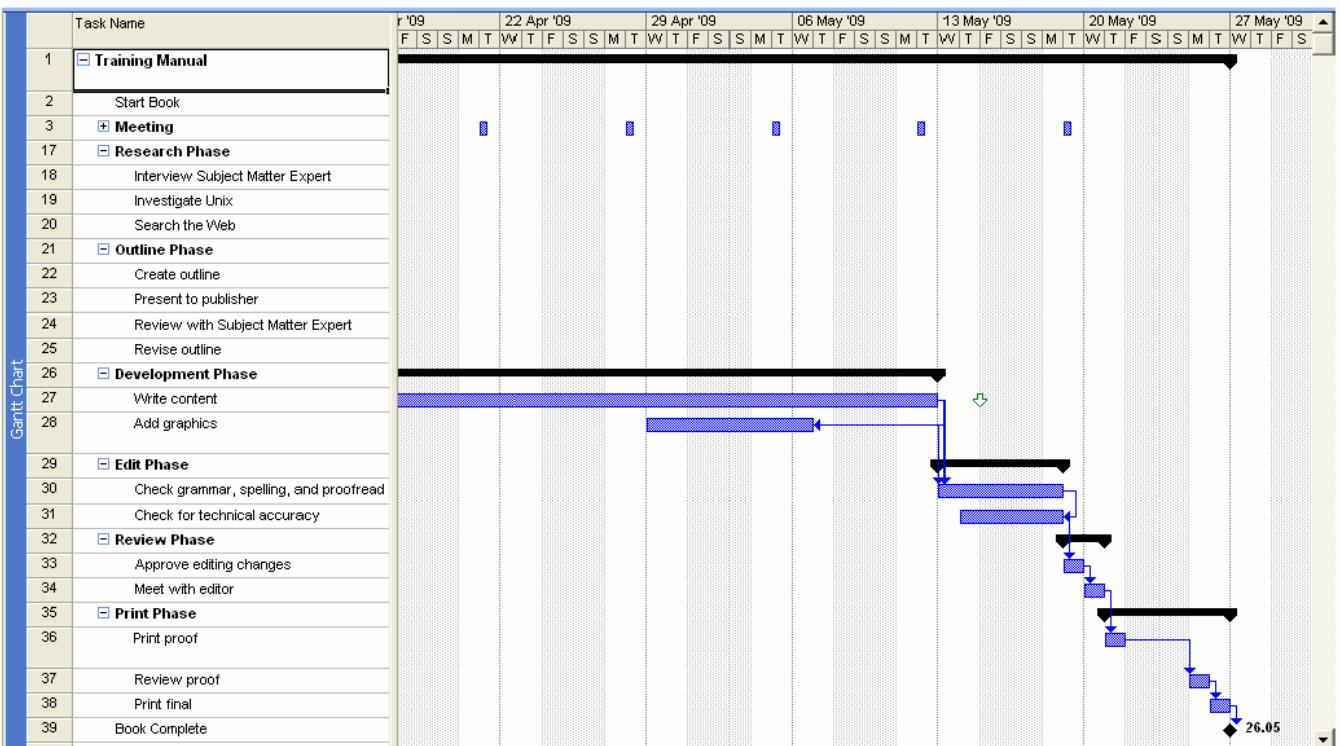
[Figure 4-9:](#) You can use the Predecessors tab to create and delete dependency links.

## 8. Aplicații

**8.1.** Realizați următorul proiect, introducând activitățile, activitatea recurrentă, termenele limită, constrângerile, dependențele, notele etc. Calendarul proiectului presupune 3 zile libere pe săptămână: vineri, sâmbătă și duminică.







# INTRODUCERE ÎN MANAGEMENTUL PROIECTELOR

## Obiective

- Să creeze un proiect nou în Project 2016;
- Să identifice opțiunile disponibile în meniul Project 20016;
- Să configureze un calendar personalizat pentru proiect;
- Să construiască o listă de activități;
- Să grupeze activitățile în pachete de lucru;
- Să asocieze durate activităților;
- Să asocieze relații de dependență simple Finish-to-Start între activități.

## Cuprins

- Obiective
- Noțiuni introductive din Project 2016
- Aplicații
- Notare

# Project Management, Project 2016, and You

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## *In This Chapter*

- ▶ Understanding the elements of a project
- ▶ Laying out the project manager's role
- ▶ Benefiting from Project 2016
- ▶ Exploring the software interface
- ▶ Finding help in Project

Welcome to the world of computerized project management with Microsoft Project. If you've never used project management software, you're entering a brave new world.

Everything you used to do with handwritten to-do lists, word processors, and spreadsheets magically comes together in Project. However, this transition doesn't come in a moment, and you need a basic understanding of what project management software can do to get you up to speed. If you've used previous versions of Project, the overview in this chapter can refresh your memory and ease you into a few of the new Project 2016 features.

Even if you're a seasoned project manager, this chapter provides the foundation for how to work with Project.

# Introducing Project Management

You probably handle projects day in and day out. Some are obvious, because your boss named them so that any fool would know that they're projects: Acme Drilling Project or Network Expansion IT Project, for example. Others are less obvious, such as that presentation you need to put together for your director or that how-to guide on planting a vegetable garden in your backyard.

In this book, a project is defined as a unique venture undertaken to produce distinct deliverables, products, or outcomes. In the context of a project, a *deliverable* is a discrete component or item that meets the requirements of the project, such as a design document or a prototype. Projects have multiple variables; some are straightforward to define, and others aren't.

Using the information about variables in [Table 1-1](#), you can say that *project management* is the practice of organizing, managing, and controlling project variables to meet the project outcomes and mission.

**Table 1-1** Project Variables

Variable	Description
<i>Defined</i>	
Scope	The work needed to produce the deliverables, products, or outcomes for the project.
Time	The duration required to complete the project work.
Cost	The funds required to complete the project.
Resources	The people, equipment, material, supplies, and facilities needed to accomplish the project.
<i>Undefined</i>	
Change	The type, timing, number, and degree of modifications from a project baseline; can affect the project's scope, time, cost, or resources.
Risk	Uncertainty (associated with the scope, time, cost, resources, stakeholders, or environment) that can threaten the completion of any aspect of the project. Fortunately, risks can also present opportunities to accelerate the schedule or come in under budget.
Stakeholder	A person who can affect, or who is affected by, the project, either positively or negatively.
Environment	The location, culture, or organization in which the project occurs.

## Defining project manager

Although understanding the role (let alone the usefulness) of certain managers isn't always easy, you can easily spot the value of a *project manager*: This person creates the master plan for a project and ensures that it is implemented successfully. Along the way, the project manager uses technical, business, and professional skills to manage the completion of tasks and keep the schedule on track.



A truly professional project manager may have a degree in project management or a professional certification. For example, if you see the initials *PMP* beside a name, that person has been certified as a project management professional by the Project Management Institute, the leading global organization establishing project management standards and credentials, and offering educational and other types of resources in the field.

## ***Identifying what a project manager does***

A project manager isn't always the highest authority in a project. Often, that role belongs to whoever manages the project manager — including, possibly, members of senior management. Rather, the project manager is the person who ensures that aspects of the project are integrated and assumes hands-on responsibility for successes as well as failures.



In project management parlance, the person who champions (and funds) a project is the *project sponsor*. Although the project manager may work for the project sponsor, the project often also has a *customer* — outside the project manager's own company or within it — for whom the end product is produced.

The project manager manages these essential pieces of a project:

- ✓ **Scope:** Define and organize all work that needs to be done in order to meet the project mission and create deliverables.
- ✓ **Schedule:** This element, which you create by working with Project, includes the estimated steps and associated timing involved in reaching the project goal.
- ✓ **Resources:** Assign resources and track their activities on the project as well as resolve resource conflicts and build consensus. This part of the job also involves managing nonhuman resources such as materials and equipment.
- ✓ **Cost:** Estimate project costs and apply those estimates across the schedule to create a time-phased budget.
- ✓ **Communication:** Notify appropriate *stakeholders* (everyone who has a legitimate stake in its success) of the project status.

Creating a logical balance of the defined variables of scope, time, cost, and resources is at the core of a good project manager's job throughout the life of a project. Managing a project requires overseeing all its variables to ensure that the project goals are accomplished on time, within the limits of the budget, and using the assigned resources while also addressing risks, managing change, and satisfying stakeholders. Sound easy? Maybe not. However, one thing is certain: Having software to help organize and structure the work makes managing the project less daunting. That's where Project

2016 can help.

## Introducing Project 2016

Project 2016, which is a scheduling tool, helps you organize, manage, and control defined variables, as identified in the preceding section. Project can also help you manage the undefined variables as well. In this book, I show you how to use Project to organize and manage your work, create realistic schedules, and optimize your use of resources.

Take a moment to look at some of the wonderful ways in which Project can help you organize, manage, and control your project. Now that you have, or your company has, bought Project (and this book) and you're investing your time to understand how to use it, you can enjoy these benefits:

- ✓ **Use built-in templates to get a head start on your project.** Project *templates* are prebuilt plans for a typical business project, such as commercial construction, an engineering project, a new product rollout, software development, or an office move.
- ✓ **Organize your project by phase, deliverable, geography, or any other method.** The outline format allows you to progressively elaborate the information in greater granularity depending on how detailed you want your plan to be.
- ✓ **Determine costs by your chosen method.** Examples are time period, resource type, deliverable, or cost type.
- ✓ **Organize resources by resource type.** Level your resources to avoid overallocation, or determine the impact on the duration of a task based on a change in resources.
- ✓ **Calculate costs and timing based on your input.** You can quickly calculate what-if scenarios to solve resource conflicts, maintain costs within your budget, or meet a deliverable deadline.
- ✓ **Use views and reports with the click of a button.** A wealth of information is now available to you — and those you report to. You no longer have to manually build a report on total costs to date to meet a last-minute request from your boss.
- ✓ **Manage complex algorithms** (that you couldn't even begin to figure out on your own) to complete such tasks as leveling resource assignments to solve resource conflicts, filtering tasks by various criteria, modeling what-if scenarios, and calculating the dollar value of work performed to date.



No matter how cool the tool, you have to take the time to enter meaningful data. Great software doesn't ensure great outcomes; it only makes them easier to achieve.

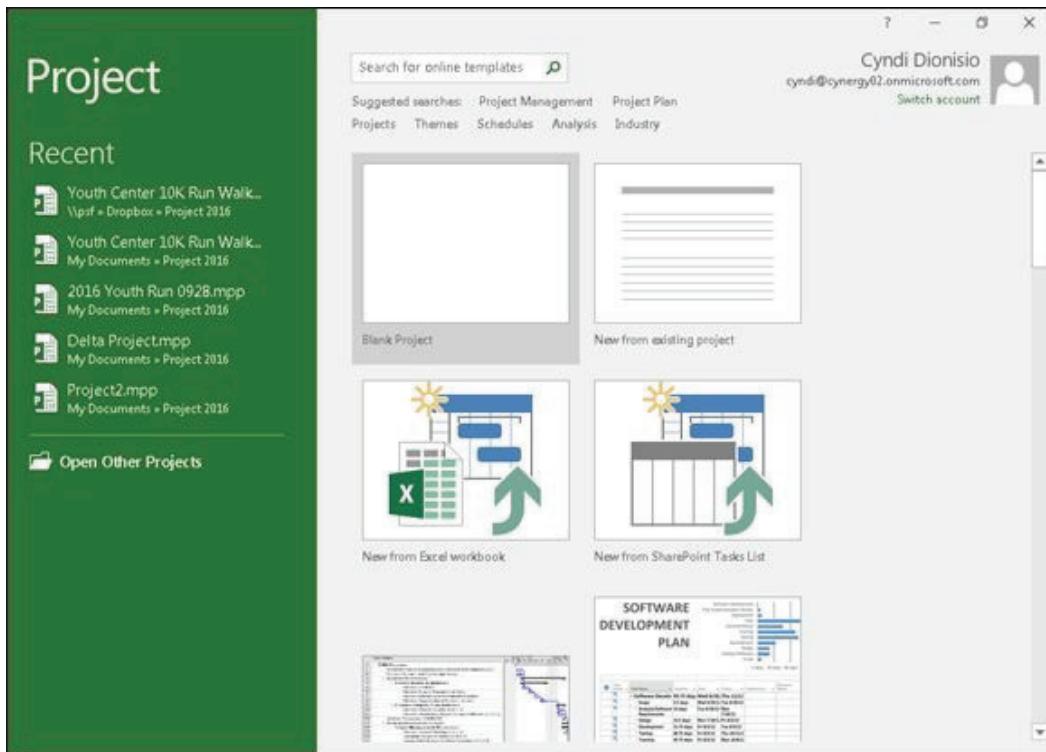
# Getting to Know You

The file you create in Project is a Project *schedule model*. It's a model because it models what you think will happen given what you know at the time. However, for ease of reference, I just refer to it as a schedule. The schedule has a plethora of data about various aspects of your project as well as graphical representations of that information.



Some people refer to the project schedule as the project plan. In reality, the project plan *contains* the project schedule — plus information such as the budget, work breakdown structure, project life cycle, risk management plan, and many other ingredients necessary to effectively manage a project.

When you first open Project 2016, you see several options for starting a new project, as shown in [Figure 1-1](#).



[Figure 1-1:](#) What you see when you open Project 2016.

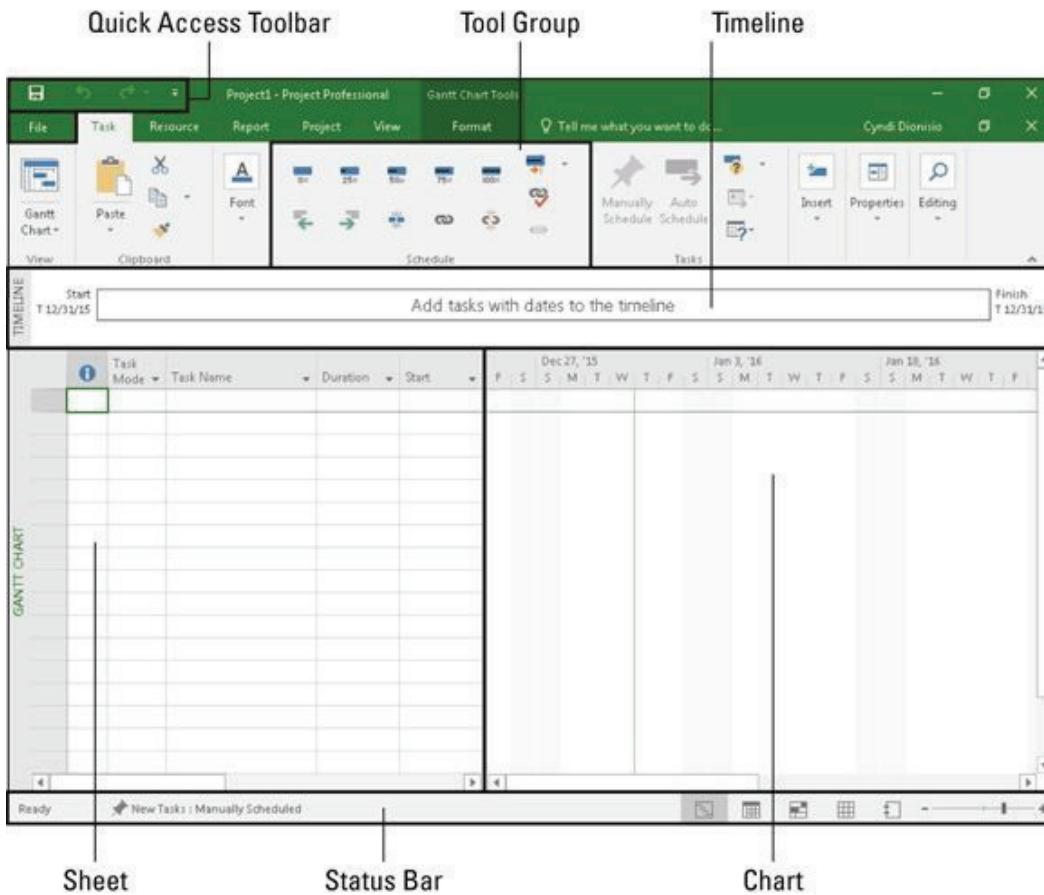
You can open a blank project, create a new project from an existing project, or create a new project by importing information from Microsoft Excel or SharePoint. You can also take advantage of premade templates for common project types, such as these examples:

- ✓ Agile project management
- ✓ Software development
- ✓ New product launch

## ✓ Residential construction

If you don't see the template you need, you can search for online templates by entering keywords in the search box at the top of the page. For purposes of this discussion, I assume that you're starting with a new, blank project.

When you open a new project, you see the Quick Access toolbar, a few file tabs, the Ribbon, the Timeline, a pane with a sheet and a chart, and the status bar, as shown in [Figure 1-2](#).



[Figure 1-2](#): A blank project.

In [Figure 1-2](#), you see Gantt Chart view. (I discuss views in [Chapter 6](#).) For now, here's an overview of the major elements in Project (refer to [Figure 1-2](#)):

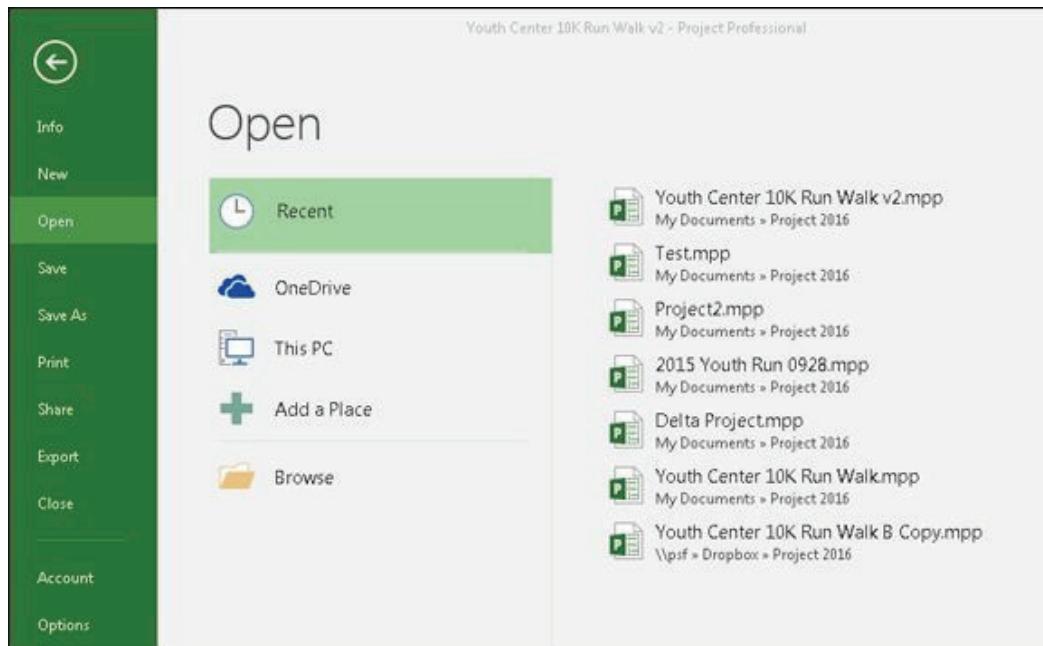
- ✓ **Quick Access toolbar:** The Quick Access toolbar, above and to the left of the Ribbon, is onscreen at all times and in all views.
- ✓ **File tab:** The file tabs organize commands based on a particular type of activity. For example, if you're working with resources, you'll likely find the command or setting you want on the Resource tab.
- ✓ **Ribbon:** The Ribbon provides easy access to the most commonly used tools and commands. When you change tabs, the available tools on the Ribbon change.
- ✓ **Group:** A *group* is a set of related commands or choices on the Ribbon. For example, to format text in a cell on the sheet, first find the formatting information you need in the Font group on the Task tab of the Ribbon.

- ✓ **Timeline:** The Timeline provides an overview of the entire project — a graphical view of the project from start to finish. You have the option of showing the Timeline or hiding it.
- ✓ **Sheet:** Similar to a spreadsheet, the sheet displays the data in the project. The default fields change depending on the file tab you're working in. You can customize the columns and fields in the sheet to meet your needs.
- ✓ **Chart:** The *chart* is a graphical depiction of the information on the sheet. Depending on the view or file tab you see, you might also see a bar chart depicting the duration of a task or a resource histogram showing resource usage.
- ✓ **Status bar:** The status bar, at the bottom of the Project window, has information on views and zoom level on the right, and information on how newly entered tasks are scheduled on the left.

## ***Navigating file tabs and the Ribbon***

Each of the seven file tabs in Project shows different options on the Ribbon. In this section, I provide an overview of each file tab and of the Ribbon and the Quick Access toolbar. I elaborate on various functions and commands on the Ribbon in later chapters.

The first tab on the left, the File tab, stands out in bright green. After you click this tab, you see the menu bar down the left side, as shown in [Figure 1-3](#).



[Figure 1-3:](#) The File tab menu.

The File tab puts you into Backstage view, where you find choices for working with files and changing options. For example, you can create a new project, open an existing project, save your current project, or print your current project. From Backstage view, you can also share, export, or close your current project. If you're feeling adventurous, you can even customize the Ribbon and the Quick Access toolbar.

The Task file tab is where you spend a lot of your time in Project. As you can see in

[Figure 1-4](#), on the far left side of the Task file tab is the View. The default view is Gantt Chart view. It shows the task information and the chart that displays a bar chart representing the duration of each task.



[Figure 1-4](#): The Task file tab.

In addition to Gantt Chart, you can choose these views:

Calendar      Network Diagram

Resource Sheet    Resource Usage

Resource Form    Resource Graph

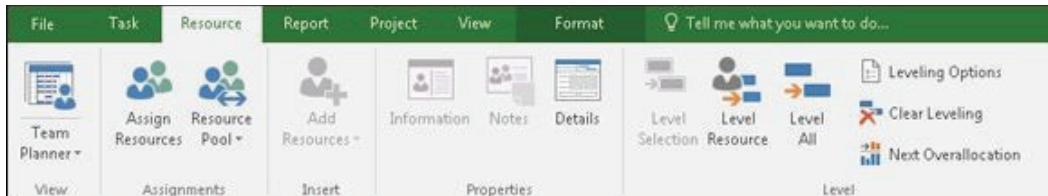
Task Usage      Task Form

Task Sheet      Team Planner

Timeline      Tracking Gantt

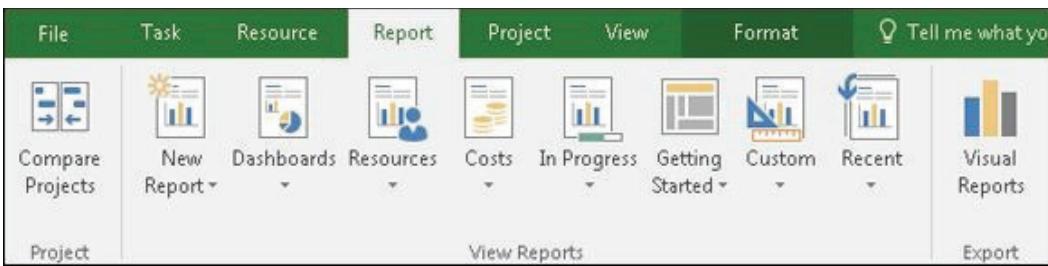
You may recognize some of the groups of commands on the Task file tab. For example, the Clipboard and Font groups are standard in many Windows applications. Other groups, such as Schedule and Tasks, are specific to a particular view — in this case, Gantt Chart view. Look for the deep green Gantt Chart Tools Format tab when you see the Task file tab in Gantt Chart view. In other views, you see different tools above the Format tab.

The Resource file tab, shown in [Figure 1-5](#), helps you organize resources, such as adding, assigning, and leveling resources across tasks. In Project, resources include people, equipment, material, locations, and supplies. You can assign costs and calendars to resources. (I talk more about resources in [Chapter 7](#).)



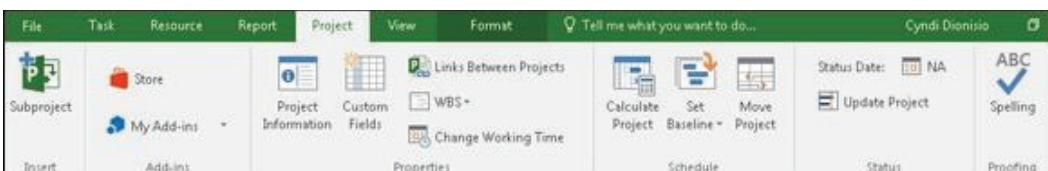
[Figure 1-5](#): The Resource file tab.

The Report file tab, shown in [Figure 1-6](#), is new in Project 2016. You can create reports on resources, costs, or progress, or put them all together in a dashboard report. You can create a report that compares your current status to previous versions of your project. I tell you all about reports, including how to customize and export your reports, in [Chapter 18](#).



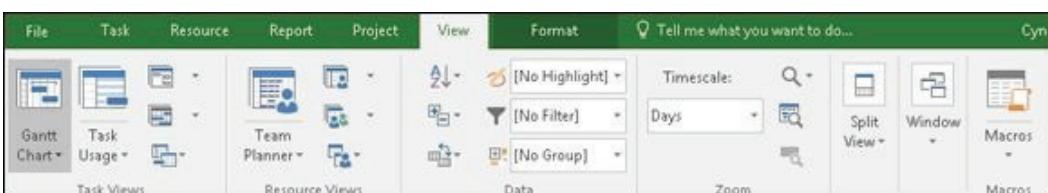
**Figure 1-6:** The Report file tab.

On the Project file tab, you find commands to help you manage your project as a whole, rather than by task or resource. For example, you can enter or change the project start and finish dates and the baseline. If you need to change working time or add a subproject, this is the place to do it. [Figure 1-7](#) shows the Project file tab.



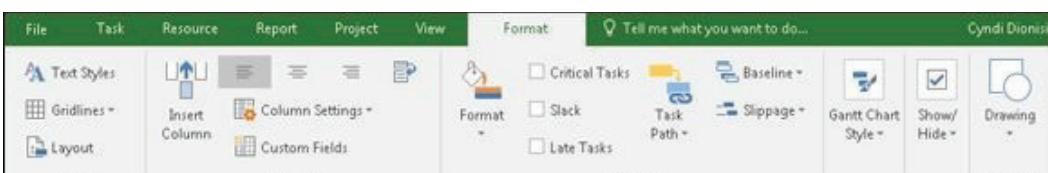
**Figure 1-7:** The Project file tab.

The View file tab lets you see some standard views. Examples are Task views, such as Gantt Chart, and Resource views, such as Resource Usage or Team Planner. You can use the View file tab to look at information sorted by date or a specific period. You can see the View file tab in [Figure 1-8](#).



**Figure 1-8:** The View file tab.

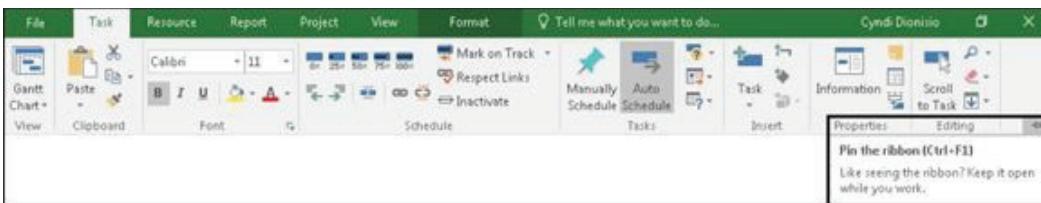
The Format file tab has commands that help you present your schedule, such as font styles, page breaks, and column settings. You can see the options in [Figure 1-9](#).



**Figure 1-9:** The Format file tab.



You can either show or hide the Ribbon to produce more real estate on your screen. The pushpin to the far right of the Ribbon pins it to your display, keeping it open and visible (as shown in [Figure 1-10](#)). The upward-facing arrow (^) on the far-right side hides the Ribbon. If your Ribbon is closed, click on any tab, look in the lower-right corner of the Ribbon and you will see a pushpin. Click on the pushpin to keep your Ribbon open. You can also press Ctrl+F1 to show or hide the Ribbon.



**Figure 1-10:** Keeping your Ribbon visible.

## Displaying more tools

The Quick Access toolbar, which appears onscreen at all times, initially contains the Save, Undo, and Redo buttons. You can customize the Quick Access toolbar by clicking the down arrow at the right end of the toolbar and clicking the option you want to hide or display. If you don't see the option you want, click More Commands near the bottom of the menu to get a full list of commands you can add. [Figure 1-11](#) shows the list of commands you can choose from.



**Figure 1-11:** Customizing the Quick Access toolbar.

The nifty *Timeline* tool shows the entire scaled time span of the project. To show the Timeline, go to the View file tab, in the Split View group and click the check box that says Timeline. You can add tasks or milestones to the Timeline. You can also copy the Timeline and paste it into reports or other presentations. To hide the Timeline, uncheck the Timeline box. You can also work with the Timeline by right-clicking to insert tasks, copy the Timeline, change the font, or view detailed information.

The *status bar* sits at the bottom of the project, to indicate whether your tasks are manually or automatically scheduled. (Read more on this topic in [Chapter 2](#).) The status bar also lets you move quickly to some of the most popular views, such as Gantt, Task Usage, Team Planner, Resource Sheet, and Reports. You can also adjust the time scale from a high-level, time scaled view to a detailed time-scaled view with the View slider, on the far-right end of the status bar. I talk more about views in [Chapter 6](#).

# **Tell Me What You Want to Do**

In previous versions of Microsoft Office, there was a Help function. That has been replaced by the Tell Me What You Want to Do feature. If you want some coaching on how to do something in Project 2016, just click the light bulb next to the Format tab. Enter a keyword, and you have several options to choose from. I searched on “critical path” and the information in [Figure 1-12](#) came up.



[Figure 1-12:](#) A search for “critical path.”

# Starting the Project

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## *In This Chapter*

- ▶ Moving from concept to plan
  - ▶ Creating the project's work breakdown structure (WBS)
  - ▶ Entering project information into Project
  - ▶ Entering the WBS into Project
  - ▶ Entering tasks into Project
  - ▶ Saving the project
- 

Congratulations — you're the proud project manager of a new project! Before you do anything, you need to understand the scope of the project. You must clearly specify, for example, any intended outcomes, expectations for milestones, main deliverables, budgeted amounts, key stakeholders, and what denotes success.

Planning a project isn't as easy as opening a file in Project and entering all the activities you have to complete. Before you can begin to plan, you need to understand the purpose of the project and the high-level information about the project, such as milestone dates and overall budget.

To complete a successful project, you need to plan well. To plan well, you need to understand the project's objectives as well as its success criteria. Therefore, before you enter the first task into Project, you create the project charter (described a little later in this chapter) to initiate the project and develop the work breakdown structure (WBS) to organize project deliverables. Then you can start organizing the project and entering tasks into Project.

This chapter describes how to move from imagining a concept to planning a project so that you know how to enter and work with tasks and how to save the new project.

# *Creating the Project Charter*

Having a high-level understanding of a project is critical to project success. The *project charter* is a document that formally authorizes or recognizes a project; it contains high-level information about the project. The project charter is frequently developed by the project manager, with the project sponsor. The charter functions as an agreement about the purpose and objectives of the project.

The elements of a project charter are

- ✓ Purpose
- ✓ Description
- ✓ Objectives
- ✓ High-level requirements
- ✓ Summary milestone schedule
- ✓ Summary budget
- ✓ Assigned project manager



Other names for the charter are project-initiating document and statement of work.

The high-level information in the charter provides background information to help you plan the project approach and organize the work logically. Using the information from the charter, you can start to define the project's major deliverables and its life cycle — and your approach to accomplishing all the project work.

Throughout this book, I use a sample project to demonstrate key concepts in Project. The project charter for the 10K Run/Walk sample project is shown in [Figure 2-1](#). Project objectives describe the intended outcome to raise \$2.5 million for youth recreation facilities in the metro area by November 1.

<b>Summary Milestones</b>	<b>Due Date</b>
Planning begins.	6-1
Call for volunteers opens.	7-1
Finalize course route.	7-15
PR and advertising begin.	8-1
Registration opens.	8-15
All food and beverage contracts are completed.	10-1
Day of event arrives.	11-1
Funds are finalized and turned over to community center board.	11-15
Project is completed.	11-15

#### **Estimated Budget**

\$10,000

#### **Approvals**

*Bonnie Rush*

*Ida Know*

---

Project manager signature

---

Sponsor or originator signature

**Figure 2-1:** The 10K Run/Walk project charter.

# **Introducing the Work Breakdown Structure (WBS)**

If you have a small project, you may be able to start entering tasks into Project and organize them on the fly. But for any project with more than 50 tasks, consider how to structure and organize the work before you open Project. One best practice is to create the *work breakdown structure*, or WBS — a hierarchically organized representation of all the project work.



The concept of *project work* includes work that's necessary to *create* the product and work that's necessary to *manage* the project, such as attending meetings, completing training, and creating documentation.

Generally, you approach the WBS from the top down. In other words, you evaluate the entire project and then break it into large chunks, and then break the larger chunks into smaller chunks, and so on, until you have a defined deliverable. That's where the WBS stops and project tasks begin.



The breaking of WBS deliverables into smaller chunks is known as *decomposition*.

The WBS houses all deliverables for the project and product scope. It doesn't include the tasks. Those are strictly for the schedule. Another way of thinking about the WBS is that it's composed of nouns, whereas the schedule is composed of actionable verbs. For example, the Water Stations deliverable might be the lowest-level deliverable you would show on the WBS. Then define these tasks for the schedule using the “verb-noun” naming convention:

1. Identify water companies.
2. Develop request for quote.
3. Receive quotes.
4. Select vendor.
5. Develop contract.
6. Sign contract.
7. Oversee water station setup.

# Organizing the Work

Frequently, the most challenging aspect of creating a WBS is figuring out how to organize it. You have several options. For example, if you have multiple locations for a hardware deployment, you can arrange it by geography. Many times, software projects are managed by life-cycle phases, such as Concept, Requirements, Design, Build, Test, and Deploy.

Another common way to organize work is by major deliverable. The needs and deliverables of the project determine how best to organize work. The WBS for the Youth Center Run/Walk is arranged by the type of work. You can see it presented in two different ways. One way looks like an organizational chart, and the other way is via outline. Either way works well; however, when you start decomposing past two levels, the organizational chart method becomes difficult to manage. After you delve into the detail, consider moving to an outline format. [Figure 2-2](#) shows an organizational chart format for the high-level WBS.



[Figure 2-2:](#) High-level WBS.

Using the high-level WBS, you can further decompose the work into outline format:

1. Registration
  - 1.1 Database
  - 1.2 User interface
  - 1.3 Payment
  - 1.4 Confirmation
2. PR and advertising
  - 2.1 Print
  - 2.2 Television
  - 2.3 Radio
  - 2.4 Internet
3. Food and beverage
  - 3.1 Finish-line food
  - 3.2 Finish-line beverage
  - 3.3 Water stations
4. Safety
  - 4.1 Medical
  - 4.2 Security
5. Course logistics

5.1 Route

5.2 Signage

5.3 Parking

## 6. Volunteers

6.1 Onboard process

6.2 Management

## 7. Project management

7.1 Communication

7.2 Planning

7.3 Management

7.4 Risk management

7.5 Stakeholder management

After outlining the organization of the work, you can start defining the tasks that comprise the project schedule.

# Starting the Project

In [Chapter 1](#), I discuss how to open a blank project. After you open a blank project, you can begin entering basic project information, such as the start or end date.

## Entering project information

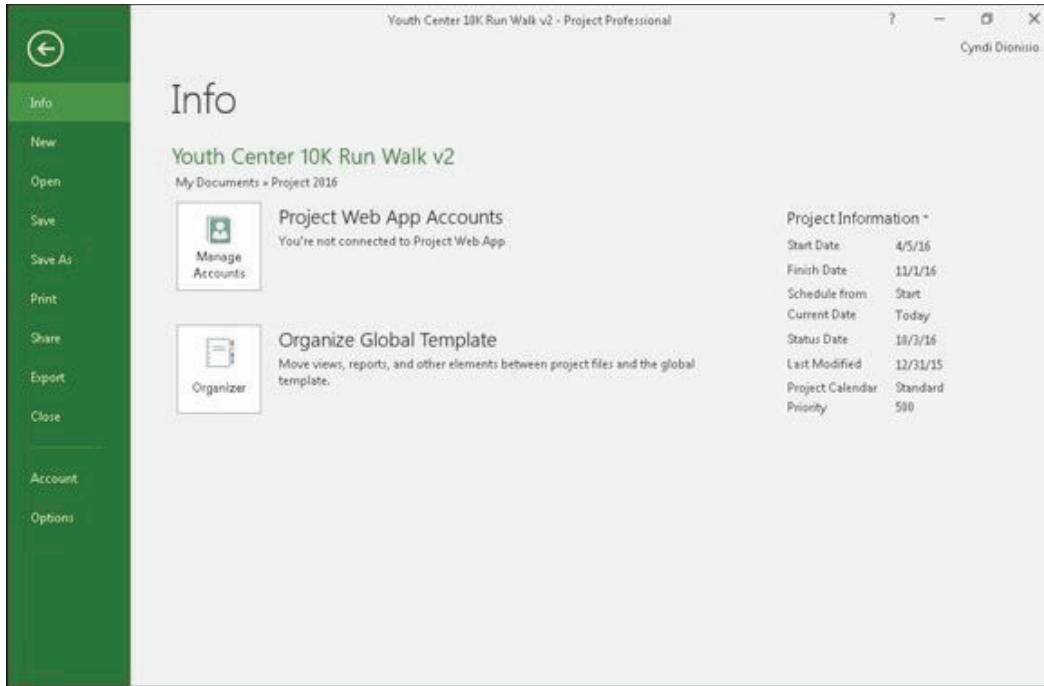
You can enter project information into Project in two ways:

- ✓ **Choose File ⇒ Info.** In the Project Information section on the right side of the screen, as shown in [Figure 2-3](#), you can enter the start, finish, current, and status dates for the project.

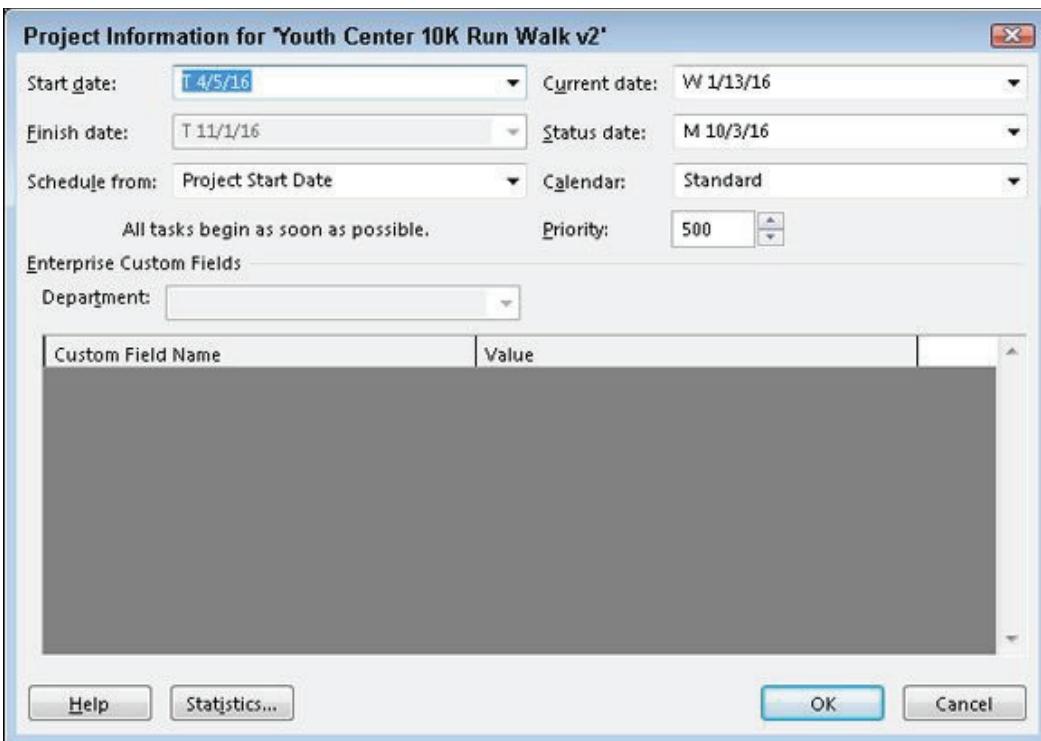


After choosing File ⇒ Info, you can click the Project Information down arrow, then click advanced properties. Enter the name of the project where it says “Title” and enter your name where it says “Author.” You can also enter company name, keywords, and other information. This information is used in many of the automated reports that Project creates.

- ✓ **On the Ribbon, go to the Project tab and click the Project Information icon.** You see the Project Information dialog box, shown in [Figure 2-4](#). It holds the same information as the Project Information section on the File menu.



[Figure 2-3:](#) The result of choosing the File ⇒ Info command.



**Figure 2-4:** The Project Information dialog box.

This list describes the settings within the Project Information dialog box:

- ✓ **Start Date and Finish Date:** For a project scheduled forward from the start date (see the next bullet), enter only the start date. Or if you schedule backward from the finish date, enter a finish date.
- ✓ **Schedule From:** You can choose to have tasks scheduled backward from the finish date or forward from the start date. Most folks move forward from the start date.



Although you can schedule backward, use this feature only to schedule the work backward initially, by selecting the finish date and clicking the OK button. Immediately after doing so, return to this dialog box and revert to the (newly calculated) start date. If you don't, you may encounter problems down the road if you eventually record progress. At that point, the end date will be fixed because you've backward-scheduled, and the start date will be fixed because you've recorded actuals, so the schedule will no longer be dynamic and won't expand or contract.

- ✓ **Current Date:** By default, this setting matches the computer clock setting. However, you can change it so that it doesn't match the computer clock setting. Changing this date is useful for looking at what-if scenarios or for tracking progress as of a certain date in the past or any date you choose.
- ✓ **Status Date:** You typically set the current date to track the progress on the project. When tracking, you usually want to see the status of the project as of the current moment, so you can ignore this setting. However, if you want to track as of the end

of a fiscal period or another time frame, change it to track the status of tasks as of any other date.

- ✓ **Calendar:** Select from this drop-down list the Base calendar template to use for the Project calendar. I list this setting first because it's the only one you *have* to deal with when you start a new project. For now, assume you will use the Standard calendar. I describe calendars in [Chapter 8](#).
- ✓ **Priority:** This field is useful if your organization has many projects and you create links among them. If you use a tool such as resource leveling (see [Chapter 12](#) for more about this topic) to resolve conflicts, it can consider this project priority setting when calculating what to delay and what to keep on track.

## **Weighing manual scheduling versus automatic scheduling**

One of the most valuable aspects offered by Project has traditionally been its ability to recalculate task schedules when you change the project start date or a change to one task's schedule affects one or more dependent (*linked*) tasks. This powerful behavior saves the project manager — *you* — from having to rethink and reenter dates to rescheduled tasks throughout the project.

But flip sides to the benefits of automation always exist, and in the case of project scheduling, automatic scheduling can lead to unwanted schedule changes based on software behavior and not on human expertise.

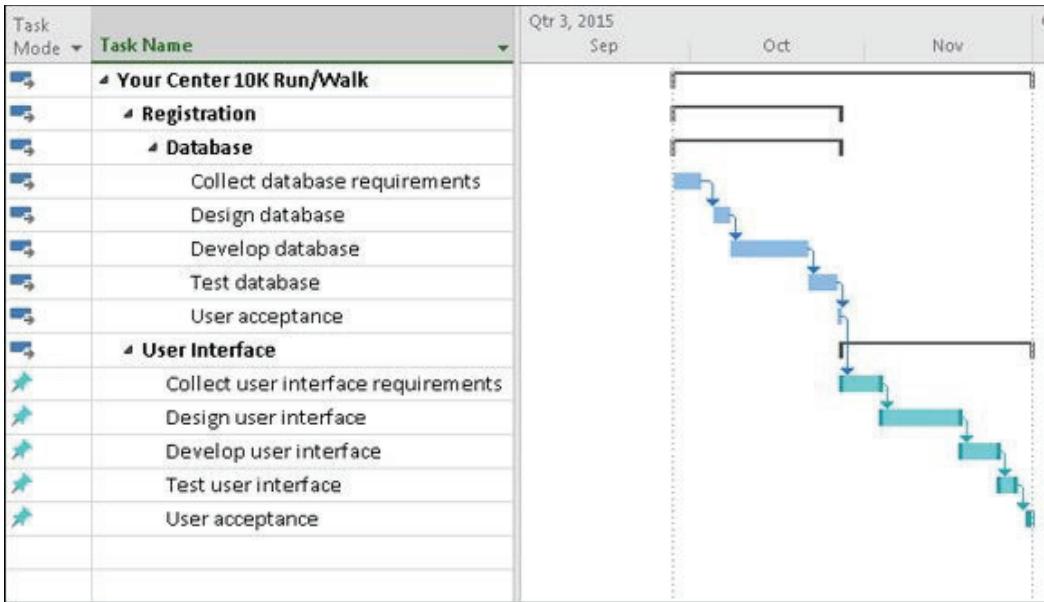
To retain the helpful aspects of automation that make scheduling less time-consuming while allowing project managers to retain schedule control when needed, Project 2016 allows *user-controlled scheduling*.

In user-controlled scheduling, you can select one of these scheduling modes for each task:

- ✓ **Auto Schedule:** Project calculates task schedules for you based on the project start date and finish date, task dependencies, calendar selections, and resource scheduling.
- ✓ **Manually:** Project enables you to skip entering the duration and dates, and specifying them later. When you enter the duration and dates, Project fixes the schedule for the task and doesn't move it unless you do so manually. The manually scheduled tasks move if you reschedule the entire project, in most cases. The Gantt bars for manually scheduled tasks also differ in appearance from those for automatically scheduled tasks.

The indicator for auto-scheduled and manually scheduled tasks is at the bottom of the Project window. [Figure 2-5](#) shows the Registration tasks are auto-scheduled, as indicated by the time bar and the arrow in the Task Mode column. The User Interface tasks are manually scheduled, as indicated by the pushpin in the Task Mode column.

On the time scale, the auto-scheduled tasks show up as blue bars on your screen and the manually scheduled tasks show up as aqua bars with vertical lines on each end.

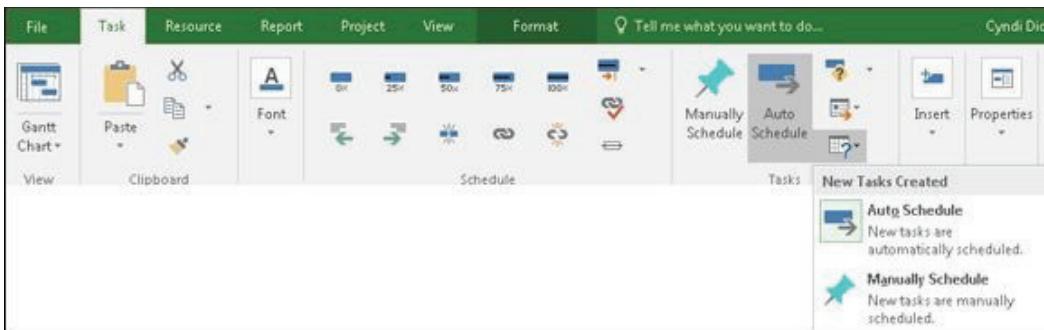


**Figure 2-5:** Manually and automatically scheduled tasks.

The project file can have all manually scheduled tasks or all auto-scheduled tasks — or any mix of the two. By default, all tasks that you create use the manually scheduled mode.

You can change the task mode for the overall project in two ways:

- ✓ To change the mode for all new tasks, select the Task tab, click Mode in the Tasks group, and then choose Auto Schedule or Manually Schedule from the menu, as shown in [Figure 2-6](#).
- ✓ Another way to change the mode for all new tasks is to click the New Tasks link at the left end of the status bar at the bottom of the project, then select the mode you want.



**Figure 2-6:** Changing the task mode from the Ribbon.

You can change the task mode for individual tasks in three ways:

- ✓ Select the task, click the Task tab on the Ribbon, and then click either Manually Schedule or Auto Schedule in the Schedule group.
- ✓ Select the task, click the Task Mode cell for the task, click the drop-down arrow

that appears, and click either Manually Scheduled or Auto Scheduled in the drop-down list.

- ✓ Go to the Information button (Task tab, Properties group), click the information box, and use the radio buttons to select Manually Scheduled or Auto Scheduled.



You need to balance the desires of your inner control freak versus the need to be an efficient project manager in determining how often to use manual scheduling. Though manual scheduling prevents Project from moving tasks that you want to stay put in the schedule, you may need to edit the schedules for dozens of dependent tasks in a long or complicated project. The best balance — particularly for beginning project managers — may be to use manual scheduling sparingly.

## *Entering the WBS*

The schedule should be set up the same way as the WBS. If you want to continue the outline numbering scheme from the WBS, Project automatically extends to the schedule tasks the outline numbering used for the WBS. You can do this in two ways:

1. **Select the Format tab.**
2. **In the Columns group, click Insert Column.**
3. **Select the Outline Number option.**
4. **Press Enter.**

You can also enter the outline number directly into the task cell by following these steps:

1. **Click to open the Format tab.**
2. **In the Show/Hide group, select the Outline Number check box.**

The first information to enter into the new project is the WBS. Follow these simple steps to enter the WBS in Gantt Chart view:

1. **In the Task Name column, click a blank cell.**
2. **Type the name of the WBS element.**

Using the example of the Youth Center 10K Run/Walk, the first element is Registration.

3. **Press Enter to move to the next cell in the column and then type the WBS element name.**
4. **Repeat Step 3 until you enter all WBS names.**

You can edit the text that you type by pressing the Delete or Backspace key to clear characters.

After you enter the WBS, you can use the Indent feature to create the outline format. In Project, you can indent two ways:

- ✓ Select the Task tab and click the Schedule group's Indent Task or Outdent Task icons.
- ✓ Select the task you want to indent and press Alt+Shift+right arrow.

[Figure 2-7](#) shows part of the screen display after you enter the WBS outline. This version shows the outline numbering as a separate column. Notice that after you indent a task, its parent task switches from manually scheduled to auto-scheduled because the duration and dependencies of the child tasks determine when the parent task can start and finish. Therefore, you don't fill in the duration or start and finish dates for WBS elements — that information will auto-populate when you enter tasks beneath the WBS elements.

	Task Mode ▾	WBS ▾	Task Name	W T
1	☒	1	▫ Registration	
2	☒?	1.1	Database	
3	☒?	1.2	User Interface	
4	☒?	1.3	Payment	
5	☒?	1.4	Confirmation	
6	☒	2	▫ PR & Advertising	
7	☒	2.1	Internet	
8	☒?	2.2	Print	
9	☒?	2.3	Radio	
10	☒	3	▫ Food & Beverage	
11	☒?	3.1	Finish line food	
12	☒?	3.2	Finish line beverage	
13	☒?	3.3	Water Stations	

[Figure 2-7](#): The WBS for the 10K run/walk event.

## Entering tasks

After the WBS information is entered, you can start entering tasks. You can create tasks in a few different ways:

- ✓ Type information in the sheet area of the Gantt chart.
- ✓ Enter information in the Task Information dialog box.
- ✓ Import tasks from Outlook.
- ✓ Import tasks from Excel.

You can fill in the details of the task duration and start date when you enter the task, or

later.

## ***Entering tasks in Gantt Chart view***

Many people who work on lengthy projects find that entering all task names in the sheet pane of Gantt Chart view is the quickest and easiest method. This method is the same one I used to enter the WBS information. You can simply enter a task name in the Task Name column, press the Enter or down-arrow key on the keyboard to move to the next blank row, enter another task, and so on.



Use the Task Mode column to change the task scheduling mode from Manually Schedule to Auto Schedule for any task not using the default method.

## ***Entering tasks via the Task Information dialog box***

If dialog boxes provide the kind of centralized information form that fits the way you like to work, consider using the Task Information dialog box to enter, well, task information. The series of tabs in this dialog box contain all the information about a task.

Follow these steps to create a task via the Task Information dialog box:

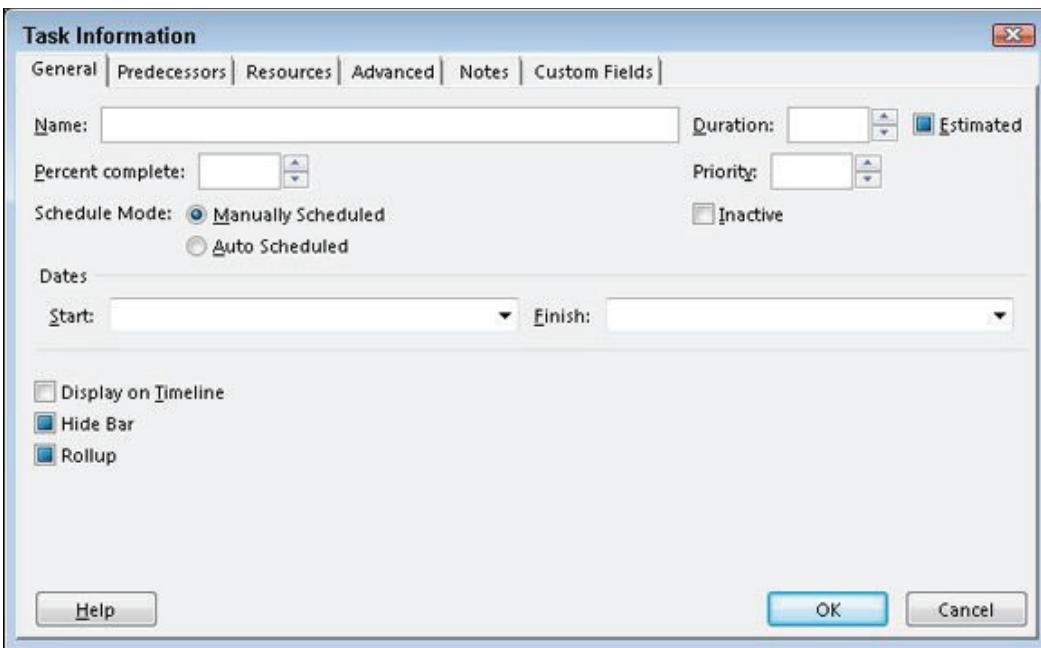
- 1. In the Task Name column, double-click a blank cell.**

The Task Information dialog box appears, as shown in [Figure 2-8](#).

- 2. In the Name field, type a task name.**
- 3. Click the OK button to save the new task.**

The task name appears in Gantt Chart view in the cell you clicked in Step 1.

- 4. Press the down-arrow key to move to the next cell.**
- 5. Repeat Steps 1–4 to add as many tasks as you like.**



**Figure 2-8:** The Task Information dialog box.

As you name tasks, make task names in the project both descriptive and unique. However, if you can't make all names unique (for example, you have three tasks named Hire Staff), you can use the automatically assigned task number or the outline number to identify tasks; these numbers are always unique for each task.

Naming tasks is a trade-off between giving a full description (which is much too long for a Task Name field) and being too brief (which can lead to misunderstandings and uncertainty). When in doubt, be brief in the Task Name and elaborate with a Task Note. I cover Task Notes in [Chapter 3](#).



To insert a task anywhere within the list of tasks in Project, from the Task tab, Insert group, click a task name cell where you want the new task to appear, and click the Insert Task icon. The new task is inserted in the row above. You can also press the Insert key on the keyboard.

## ***Importing tasks from Outlook***

After you start thinking about what has to be accomplished in a project, tasks start resembling breeding rabbits; what might start as a series of simple to-do tasks in Outlook often becomes a full-fledged project. When that happens, you'll be glad to know that Microsoft provides an easy-to-use import feature that transfers the tasks you create in Outlook to Project.

The Import Outlook Tasks feature is essentially an import map that's preset to work with Outlook task fields. Follow these steps to import Outlook tasks into Project:

- 1. Open the plan that you want to insert tasks into, or open a new project (choose File ⇒ New, click Blank Project, and click Create).**

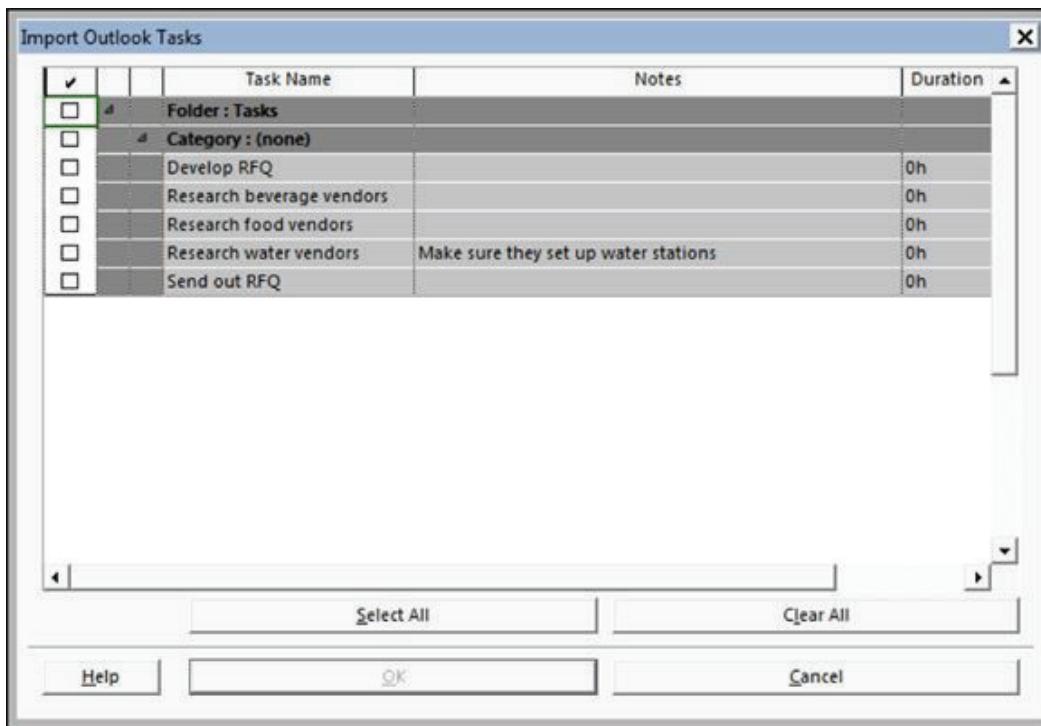
2. Click the Task tab on the Ribbon, click the bottom part (with the down arrow) of the Task button in the Insert group, and click Import Outlook Tasks.
  3. If a Microsoft Outlook warning message appears, click Allow.
- The Import Outlook Tasks dialog box appears, as shown in [Figure 2-9](#).
4. Select the check box beside each task you want to import, or click the Select All button to import all Outlook tasks.



By default, Outlook stores tasks in the Tasks folder. Selecting the Folder: Tasks check box is another way to select all tasks in Outlook.

5. Click the OK button.

The tasks are imported and then appear at the end of the list of tasks with change highlighting applied.



[Figure 2-9:](#) Importing task information into Project.

When you import a task from Outlook, its name, duration, and notes (if any) are also imported. If a task in Outlook has no duration, and you've set Auto Schedule as the project task mode, Project creates the task with an estimated one-day time frame.

### ***Inserting hyperlinks***

You can insert hyperlinks in a project outline, which provides a handy way to quickly open another project, another file of any type, or a web page.

To insert a hyperlink to a project document, follow these steps:

1. Right-click the cell where you want the hyperlinked task to appear.

## 2. Choose Hyperlink.

The Insert Hyperlink dialog box appears, as shown in [Figure 2-10](#).

### 3. In the Text to Display box, type the text that you want to appear for the hyperlink.

Ensure that this text clearly states what information is being summarized. In this case, I'm linking the Safety Plan to a task in the project.

### 4. In the Link To area, click the Existing File or Web Page icon.

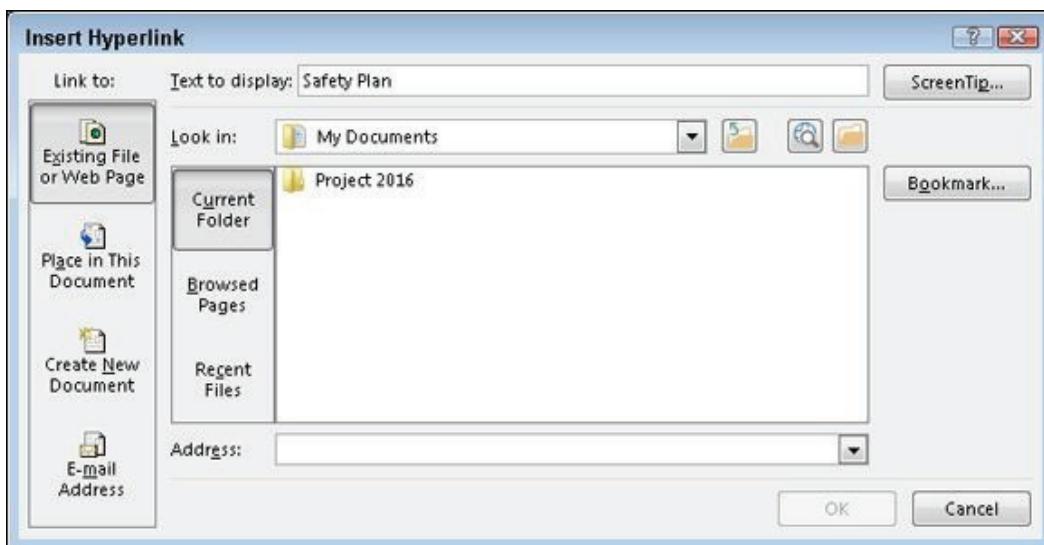
You can link to a document of any type or to a web page.

### 5. In the Look In list, locate and select the file to which you want to insert a hyperlink.

In my example, I'm keeping the supporting documentation in a file called Project 2016.

### 6. Click the OK button.

The link text is inserted, and a hyperlink symbol appears in the Indicator field. You can simply click that link symbol to open the linked file.



[Figure 2-10:](#) Linking a file.

## *Inserting one project into another*

You can also insert tasks from one project into another. You do this by inserting an entire, existing project into another project. The project that's inserted is called a *subproject*. This method is useful when various project team members manage different phases of a larger project. The capability to assemble subprojects in one place allows you to create a master schedule from which you can view, all in one place, all the pieces of a larger, more complex project.

Follow these steps to insert another Project file into the schedule:

### 1. In Gantt Chart view, select the task in the task list above which you want the

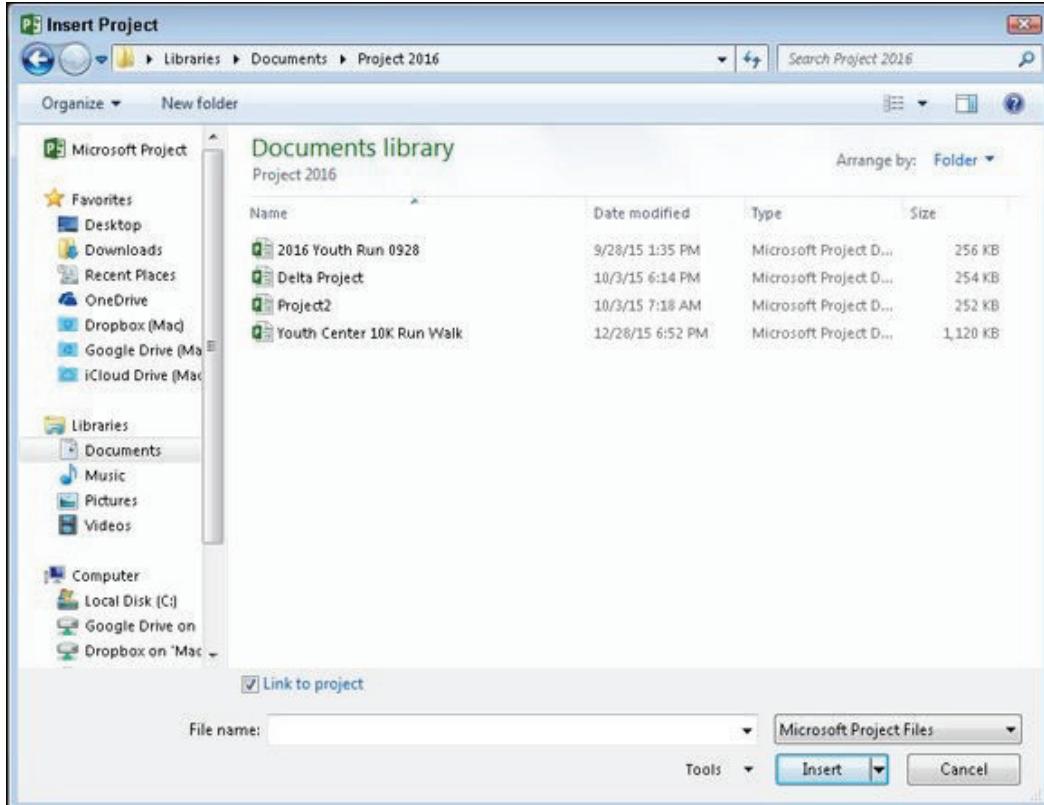
other project to be inserted.

## 2. Choose Project ⇒ Subproject.

The Subproject command is in the Insert group. The Insert Project dialog box appears, as shown in [Figure 2-11](#).

3. Using the navigation pane and file list, locate the file that you want to insert, and click it to select it.
4. If you want to link to the other file so that any updates to it are reflected in the copy of the project you’re inserting, make sure that the Link to Project check box is selected.
5. Click the Insert button to insert the file.

The inserted project appears above the task you selected when you began the insert process.



[Figure 2-11:](#) Inserting a link to another project.



The inserted project’s highest-level task appears at the level of the task you selected when you inserted the project, with all other tasks below it in outline order. If you need to, use the Outdent and Indent tools (described in the following section) on the Formatting toolbar to place the inserted tasks at the appropriate level in the project.

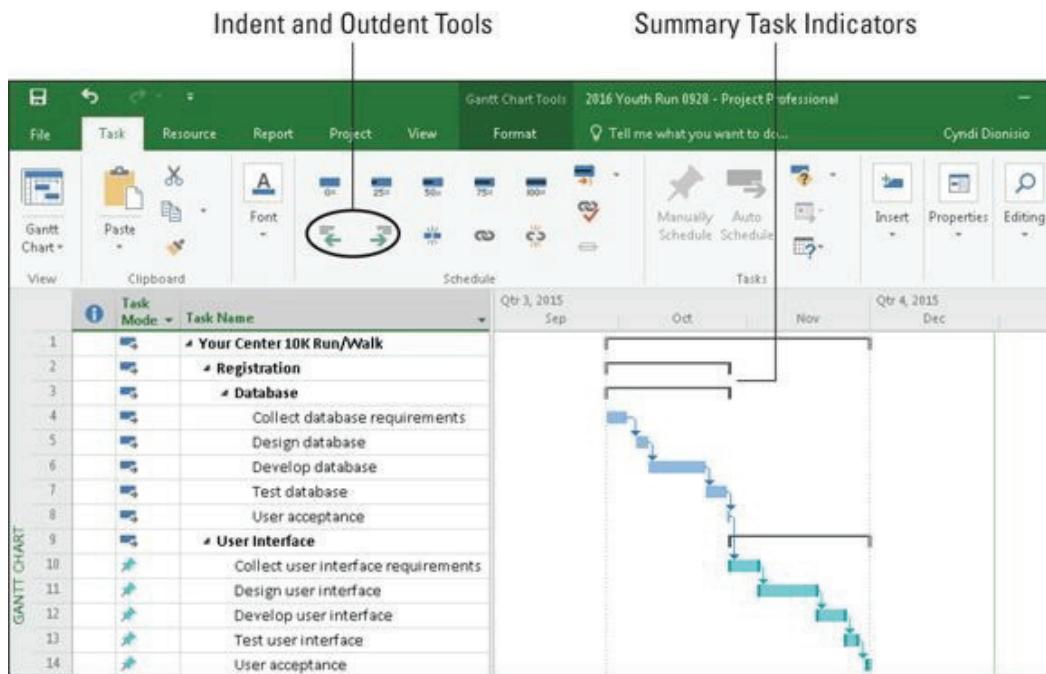
## **Promoting and demoting: The outdent-and-indent**

# shuffle

Outdenting and indenting are the functions you use to move tasks to higher or lower levels of detail in the WBS and the task list. In several software programs, these terms are *promoting* and *demoting*, respectively:

- ✓ **Outdenting** a task moves it up a level in the outline (literally shifting it to the left in the outline).
- ✓ **Indenting** a task moves it down a level in the outline (literally indenting the task to the right in the outline). Whenever you indent one or more tasks, the task above becomes the summary task. You can read more about summary tasks in [Chapter 3](#).

You use tools from the Schedule group on the Task tab of the Ribbon, shown in [Figure 2-12](#), to outdent and indent tasks in a project outline. The Outdent Task tool has a left-facing arrow; the Indent Task tool has a right-facing arrow.



[Figure 2-12](#): Outdenting and indenting.

To outdent or indent a task, follow these steps:

1. **Click a task to select it.**
2. **Click the Indent Task or Outdent Task button, according to the action you want to take.**

When you indent a task, the task above it becomes a summary task. The summary task is in bold on the sheet. On the chart, a summary task has a bracket that stretches from the beginning of the earliest task to the end of the latest task.



You can build the outline even faster by indenting multiple tasks at a time.

Drag to select multiple task IDs and then indent them. You can also use the standard Shift+click and Ctrl+click selection methods to select multiple tasks in a Project outline. Shift+click the task IDs to select contiguous tasks, and Ctrl+click to select discrete tasks.



You can indent using keystrokes by pressing Alt+Shift+right arrow. You can outdent using keystrokes by pressing Alt+Shift+left arrow.

# *Saving the Project*

Saving Project files works just as saving does in other Microsoft software. Here's a reminder.

To save a Project file that you haven't yet saved, follow these steps:

- 1. Choose File ⇒ Save As.**

You can choose Save instead if you created the project from scratch rather than from a template.

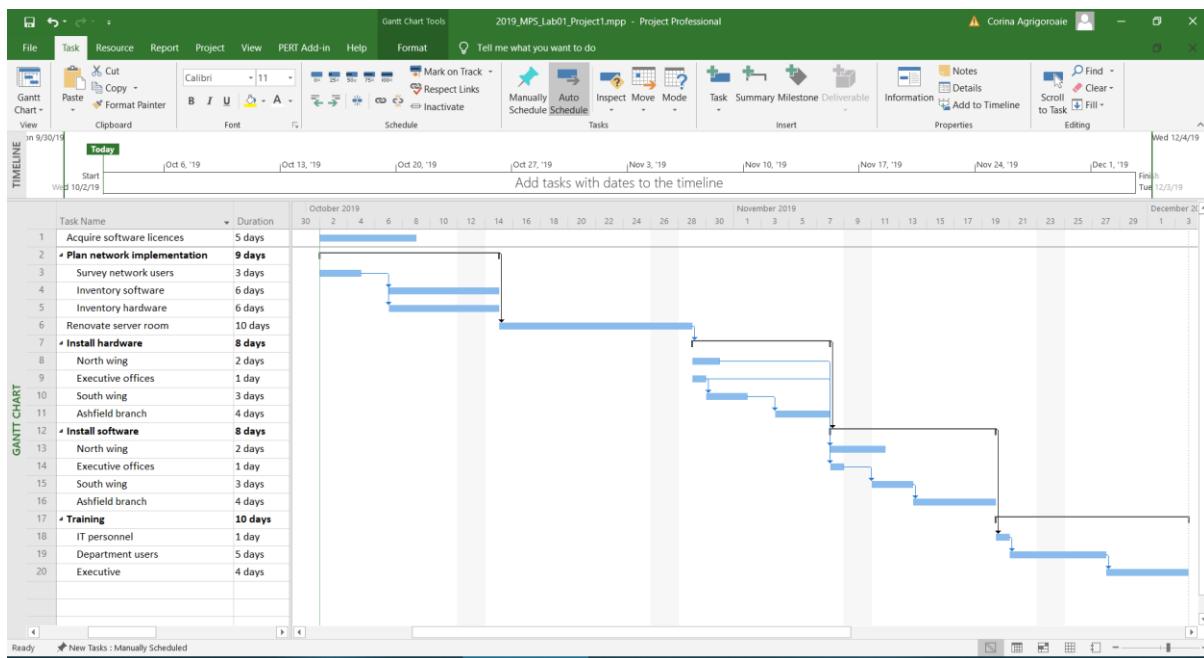
- 2. Use the navigation pane at the left to locate the folder where you want to save the file; then double-click to select it.**
- 3. The Save As window will open. In the File Name text box, type a name for the project.**
- 4. Click the Save button.**



Good organizational practice suggests that you create a folder for your project where you save — in one spot — your Project file and its supporting documents, such as email messages and other items. You can create a new folder from within the Save As dialog box by clicking the New Folder button.

## Aplicații

- Creați un proiect nou, cu data de start xx octombrie 2019 (data actuală) și introduceți activitățile din figura de mai jos, respectând relațiile de precedență indicate în diagramă:



## Notare:

- Configurare calendar – 0.25p
- Listă de activități – 0.5p
- Stabilire etape plan – 0.25p
- Stabilire duree activități – 0.25p
- Stabilire relații de precedență – 0.5p

## Analiza deciziilor

### 1. Introducere

Cele mai multe persoane își desfășoară activitatea de zi cu zi fără a lua decizii. Acestea reacționează la evenimente, fără a-și acorda timp să decidă asupra lor. Când telefonul sună și dacă sunt disponibile, ridică receptorul și răspund. În aceste situații, ele nu decid, ci doar lucrează. Cu toate acestea, uneori au nevoie să ia decizii. Dacă trebuie să angajeze pe cineva și există mai mulți candidați, trebuie să ia o decizie.

Spre deosebire de urmarea unei rutine, cineva ia o decizie atunci când are mai multe direcții pe care le poate urma. A decide înseamnă a ajunge la o soluție care pune capăt incertitudinii sau disputei legate de ceea ce trebuie făcut. O decizie se ia atunci când modul în care se poate acționa este selectat dintr-o serie de alternative. Mai formal, o decizie are următoarele componente:

- O mulțime de alternative sau opțiuni;
- Fiecare alternativă conduce la o serie de consecințe asupra căruia decidentul are un control redus;
- Decidentul este nesigur în legătură cu ceea ce s-ar putea întâmpla;
- Decidentul are diferite preferințe cu privire la rezultate asociate cu diversele consecințe;
- O decizie implică alegerea între rezultate incerte cu valori diferite.

Analiza deciziilor este procesul de separare a unei decizii complexe în părțile sale componente și reconstituirea întregii decizii prin folosirea unei formule matematice. Este o metodă de a ajuta decidenții să facă alegeri simple și familiare și apoi, prin folosirea unui model matematic, de a deduce decizia complexă pe baza compunerii acestora.

Principalele elemente implicate în procesul de decizie sunt:

- un număr de posibile acțiuni,  $A_i$ , dintre care va fi selectată una;
- un număr de evenimente sau „stări ale naturii”,  $S_j$ , din care oricare poate avea loc;
- valoarea, profitul sau consecința,  $C_{ij}$ , pentru decident, de realizare a uneia din acțiunile disponibile, având în vedere posibilele stări ale naturii;
- criteriul în funcție de care decidentul alege între acțiunile alternative.

		STATE OF NATURE					
		S1	S2	S3	S4	S5	S6
A C T I O N	A1	C11	C12	C13	C14	C15	C16
	A2	C21	C22	C23	C24	C25	C26
	A3	C31	C32	C33	C34	C35	C36

Figura 1. Matricea profiturilor

## 2. Decizii în condiții de incertitudine

Când decidentul trebuie să aleagă o acțiune din mai multe posibile, repercușiunile cătorva acțiuni, dacă nu a tuturor, vor depinde în general de evenimente incerte și de acțiuni viitoare care se vor prelungi pe termen lung. Datorită incertitudinilor, acesta trebuie:

1. Să inventarieze toate opțiunile viabile disponibile pentru a se informa, a experimenta și a acționa;
2. Să enumere toate evenimentele care pot să apară;
3. Să aranjeze toate informațiile pertinente și alegerile sau presupunerile făcute;
4. Să ordoneze consecințele rezultate din cursurile diferite ale acțiunilor;
5. Să determine probabilitatea apariției unui eveniment incert.

### 2.1. Criteriul Laplace

Criteriul Laplace, al rațiunii insuficiente, susține următorul lucru: dacă nu există informații cu privire la probabilitățile diverselor rezultate, se poate afirma că aceste probabilități sunt egale. În consecință, dacă există  $n$  rezultate posibile, probabilitatea fiecărui este de  $1/n$ . De asemenea, această abordare sugerează că decidentul calculează beneficiul fiecărei alternative și alege opțiunea cu cea mai mare valoare. Utilizarea *valorilor așteptate* distinge această abordare de criteriile care folosesc valorile extreme ale beneficiilor. Această caracteristică face ca abordarea să fie similară cu luarea deciziilor în condiții de risc. În figura 1, a doua alternativă este mai bună atunci când profitul așteptat se calculează cu stări echiprobabile.

Actions\States	S1 (P=.25)	S2 (P=.25)	S3 (P=.25)	S4 (P=.25)	Expected Payoff
A1	20	60	-60	-20	0
A2	0	20	-20	20	5
A3	50	-20	-80	20	-7.5

Figura 1. Ilustrarea criteriului Laplace

### 2.2. Criteriul maximax

Criteriul maximax este o abordare optimistă. El sugerează faptul că decidentul examinează *valorile maxime* ale profiturilor date de alternative și alege opțiunea cu cel mai bun rezultat. Acest criteriu este atractiv pentru persoanele care își asumă riscuri, fiind atrase de profiturile mari. De asemenei, abordarea este atrăgătoare și pentru cei cărora le plac pariurile, dar care pot suporta pierderi fără inconvenințe majore. În figura 2, prima alternativă este cea câștigătoare.

Actions\States	S1	S2	S3	S4	Max Payoff
A1	20	60	-60	20	60
A2	0	20	-20	20	20
A3	50	-20	-80	20	50

Figura 2. Ilustrarea criteriului maximax

### 2.3. Criteriul maximin

Criteriul maximin reprezintă o abordare pesimistă, afirmând că decidentul analizează doar *profiturile minime* date de alternative și o alege pe aceea al cărei rezultat este cel mai puțin slab. Criteriul este potrivit pentru decidenții precauți, care vor să se asigure că în cazul unui eveniment defavorabil, există măcar un profit minim garantat. Abordarea se justifică datorită faptului că beneficiile mici pot să aibă probabilități mai mari de apariție sau că profitul cel mai mic poate conduce la un rezultat extrem de defavorabil. În figura 3, a doua alternativă este câștigătoare.

Actions\States	S1	S2	S3	S4	Min payoff
A1	20	60	-60	20	-60
A2	0	20	-20	20	-20
A3	50	-20	-80	20	-80

**Figura 3. Ilustrarea criteriului maximin**

### 2.4. Criteriul Hurwicz

Această abordare încearcă să găsească un echilibru între criteriile maximax și maximin, sugerând că minimul și maximul din cele două strategii trebuie mediate, folosind ponderile  $\alpha$  și  $(1 - \alpha)$ . Alternativa cu *media ponderată cea mai mare* este selectată. Coeficientul  $\alpha$ , numit și „indexul de pesimism”, reflectă atitudinea decidentului față de asumarea riscului. O persoană precaută va folosi  $\alpha = 1$ , valoare ce reduce criteriul Hurwicz la criteriul maximin, în vreme ce o persoană îndrăzneață va folosi  $\alpha = 0$ , fapt ce reduce criteriul la maximax. În figura 4 este prezentată aplicarea acestui criteriu, cu  $\alpha = 0,5$ . Primele două alternative se află la egalitate.

Actions\States	S1	S2	S3	S4	$\alpha = .5$
A1	20	60	-60	20	0
A2	0	20	-20	20	0
A3	50	-20	-80	20	-15

**Figura 4. Ilustrarea criteriului Hurwicz cu  $\alpha = 0,5$**

De exemplu, pentru a treia alternativă, profitul este:

$$P_{Hurwicz} = \alpha \cdot P_{maximin} + (1 - \alpha) \cdot P_{maximax} = 0,5 \cdot (-80) + 0,5 \cdot 50 = -15.$$

### 2.5. Criteriul Savage (al regretelor)

Criteriul regretului minim analizează regretul, costul sau pierderile rezultate atunci când profitul alternativei selectate este mai mic decât cel maxim care ar fi putut fi atins în situația respectivă. Regretul corespunzător unui anumit profit  $X_{ij}$  este definit ca  $R_{ij} = X_j^{max} - X_{ij}$ , unde  $X_j^{max}$  este cel mai mare beneficiu care poate fi obținut în situația  $S_j$ . Această definiție a regretului permite decidentului să transforme matricea profiturilor într-o *matrice a regretelor*. Decidentul ia în considerare regretul maxim corespunzător fiecărei strategii și alege varianta cu cea mai mică valoare. Această abordare este atractivă pentru persoanele precaute, care vor să se asigure că varianta aleasă este bună în comparație cu celelalte alternative, indiferent de situația ivită. Abordarea este în special atractivă pentru un decident care știe că o parte din competitorii săi se confruntă cu circumstanțe identice sau similare și care este conștient că performanțele sale vor fi

evaluate în comparație cu cele ale concurenților săi. Criteriul se aplică aceleiași situații decizionale, transformând matricea profiturilor în matricea regretelor. În figura 5, prima alternativă este câștigătoare.

Actions\States	R1	R2	R3	R4	Max Regret
A1	30	0	40	0	40
A2	50	40	0	0	50
A3	0	80	60	0	80

**Figura 5. Ilustrarea criteriului Savage**

De exemplu, pentru prima coloană, cu valorile din figurile 6-8, valoarea maximă este 50, pe linia 3. Prin urmare, regretul pentru linia 1 este  $50 - 20 = 30$ , iar regretul pentru linia 2 este  $50 - 0 = 50$ . Pentru linia 3, regretul este 0. Dintre valorile maxime ale regretelor pe linii (40, 50 și 80), se alege cea mai mică valoare, adică 40, iar linia sa corespunde alternativei câștigătoare.

### 3. Aplicație

Realizați un program care să calculeze deciziile optime conform celor 5 criterii prezentate.

# On the Right Track

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## In This Chapter

- ▶ Planning communications
  - ▶ Using tracking tools
  - ▶ Recording actual activity on tasks
  - ▶ Specifying the amount of work complete
  - ▶ Updating fixed costs
  - ▶ Moving a task
  - ▶ Using Update Project to make changes to the big picture
  - ▶ Consolidating multiple projects
- 

After a project moves from the planning stage into action, it's a continually changing game that features rules, goals, a general time frame — and chaos.

Whether a task happens as planned or wanders off in an unexpected direction, your job after the planning stage is to record what is happening. In other words, you're *tracking* the progress. Tracking starts when team members report their progress on the project. Then you (or someone else assigned to tracking) record the progress of every task in Project.

When you track activity, you'll be amazed at the data Project returns to you. Some of it's good news, and some of it's bad, but all of it's useful in managing the project.

# **Developing a Communications Management Plan**

When you’re planning a project, consider what information you (or any other stakeholder) need to track, who has the information, how it will be delivered, and how often it needs to be updated. Frequently, this information is stored in a separate document known as the *communications management plan*. [Table 15-1](#) shows a simple example.

**Table 15-1** Communications Management Plan

Stakeholder	Information	Method	Frequency
Project manager	Status report	Email	Weekly
Team members	Project status	Meeting	Biweekly
Sponsor	Progress report	PowerPoint	Monthly

The communications management plan can be complex — or as simple as a Word table or an Excel spreadsheet. You enter the name or position of each stakeholder in the leftmost column, and then, across the top, enter the information that’s needed, its method, and frequency of delivery.

It isn’t rocket science, but you still have to determine up front which information you might want to track, when you might want it, and in which form.

## **Gathering data**

The first step in tracking progress on a project is to gather information about what’s been going on. The simpler it is to report progress on a project, the better, because people will *do* it. The more routine you can make the reporting — such as every Friday, on a specific form turned into the same person — the easier it is to gather data.

You can then input that information into Project in several ways: Use various views and tables to enter information in sheets of data, enter information in the Task Information dialog box, or use the tracking tools in the Schedule group of the Task tab on the Ribbon.

The amount of data you collect is determined by the information you need to track and the level of detail. For example, some people use Project only to create a timeline for their activities. Others use resources and track their total work on tasks, just not to the level of detail that scrutinizes hourly work performed. For some people, simply marking one task 50% complete and another 100% complete — and letting Project assume that all resources completed their estimated amounts of work — is fine.

## **Applying a tracking method**

You have to identify the best tracking method for you, which is determined by the amount and type of information you need to monitor. Microsoft provides four tracking methods in Project 2016:

- ✓ Task – total
- ✓ Task – time phased
- ✓ Assignment – total
- ✓ Assignment – time phased

I guide you throughout the rest of this chapter, but you can begin to understand these methods by comparing task tracking and assignment tracking. You can track information by *task*, indicating to the present time (or a status date you select) the total work completed or costs for the task. Or you can track information by *assignment*, which is a more detailed tracking that shows you the total work completed or costs by each resource.

Suppose that the Test Electrical Components task is estimated to take 12 hours of work, according to the project baseline. An Engineer, Electrician, and Assistant — three human resources — are assigned at 100% of their time. Tracking by *task – total*, you can simply note that the task is 75% complete, which translates into nine hours of work finished.

Project assumes that the three resources split the work equally — three hours for each resource. In reality, however, the Engineer spent one hour, the Electrician spent six, and the Assistant spent two. Therefore, the *time phased* variable enters the picture. Time-phased tracking uses specific time increments, whether you choose to track work by task or work completed by individual resources on the task.

So in the Test Electrical Components task, you can use the *task – time phased* approach to track the nine hours on a daily basis. Or you can use the *assignment – time phased* approach to track each resource's work, hourly or daily.

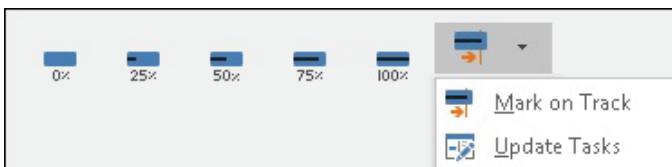


If the project or organization doesn't require detailed assignment or time-phased tracking, you're better off using the *task – total* method. Then you can spend less time entering information into Project and more time managing the team and the stakeholders.

## Using the tracking tools

Sometimes, it seems that Project provides a handy button for everything you need to do on a project, so why should tracking be any different? The tracking tools at the top of the Schedule group on the Task tab perform updates on selected tasks in any sheet view. [Figure 15-1](#) shows the tracking tools. The five on the left are the percent complete buttons, and the button on the right allows you to mark on track or update

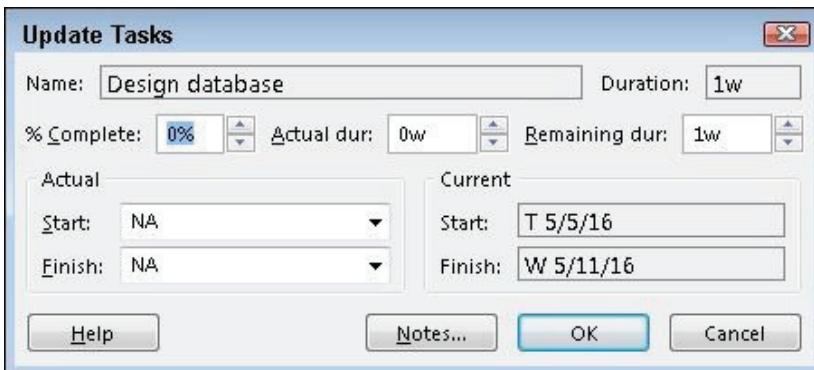
tasks.



**Figure 15-1:** The tracking buttons.

These tools make specific updates to selected tasks:

- ✓ **Percent Complete:** Click this tool to quickly mark a task's progress using a calculation of the percentage (from 0% to 100%) of hours of work completed.
- ✓ **Mark on Track:** Selecting a task and clicking this tool records activity automatically to the status date as you scheduled it in the baseline. (See the later section "[Specifying the status date](#)" to set a status date.)
- ✓ **Update Tasks:** To display a dialog box that contains tracking information about the progress, duration, start, and finish dates, find this tool on the menu that opens when you click the down arrow on the Mark on Track button. For example, you can indicate whether a task's actual start date varied from its current start date. [Figure 15-2](#) shows the Update Tasks dialog box.



**Figure 15-2:** The Update Tasks dialog box.

You can use a few more tools, found elsewhere in Project, to track and illustrate progress:

- ✓ **Update Project:** Mark all tasks in a project as complete to a specific status date. You can also use this tool to reschedule uncompleted work. The section "[Update Project: Sweeping Changes](#)," later in this chapter, explains how to perform overall updates.
- ✓ **Move Task:** Reschedule all or part of a selected task. You can use this tool, found in the Tasks group on the Task tab on the Ribbon, to move a task forward or backward or to reschedule parts of it by the status date. The "[Moving a Task](#)" section, later in this chapter, explains how to use this tool.
- ✓ **Add Progress Line:** Turn on a type of drawing tool. On the Format tab, in the Format group, choose Gridlines. Click the down arrow and select Progress Lines. A dialog box appears so that you can, at particular dates, set up *progress lines*: They

indicate which tasks are ahead of or behind schedule by way of a vertical line that connects in-progress tasks.

## For everything, there's a view

You may already know that Project has a view for everything you want to do. For example, you can use Task Sheet view and Task Usage view (as shown in [Figures 15-3](#) and [15-4](#), respectively) to easily update either task or resource information. So many variations are available that you may believe Microsoft charges by the view.

	Task Name	Predecessors	Duration	Start	Finish	% Complete	Resource Names
24	▪ Registration		64 days	T 4/28/16	T 7/26/16	0%	
25	▪ Database		25 days	T 4/28/16	W 6/1/16	0%	
26	Collect database requirements	15	1 wk	T 4/28/16	W 5/4/16	0%	Dion Anthony
27	Design database	26	1 wk	T 5/5/16	W 5/11/16	0%	Dion Anthony
28	Develop database	27	1 wk	T 5/12/16	W 5/18/16	0%	Dion Anthony
29	Test database	28	1 wk	T 5/19/16	W 5/25/16	0%	Dion Anthony
30	User acceptance	29	1 wk	T 5/26/16	W 6/1/16	0%	Bonnie Rush
31	▪ User Interface		27 days	T 6/2/16	F 7/8/16	0%	
32	Collect user interface requirements	30	1 wk	T 6/2/16	W 6/8/16	0%	Ally Mac
33	Design user interface	32	2 wks	T 6/9/16	W 6/22/16	0%	Ally Mac
34	Develop user interface	33	1 wk	T 6/23/16	W 6/29/16	0%	Ally Mac
35	Test user interface	34	3 days	T 6/30/16	M 7/4/16	0%	Ally Mac
36	User acceptance	35	4 days	T 7/5/16	F 7/8/16	0%	Bonnie Rush
37	▪ Payment		12 days	M 7/11/16	T 7/26/16	0%	
38	Collect payment requirements	36	2 days	M 7/11/16	T 7/12/16	0%	Julie Moore
39	Design payment function	38	2 days	W 7/13/16	T 7/14/16	0%	Julie Moore
40	Develop payment function	39	1 wk	F 7/15/16	T 7/21/16	0%	Julie Moore
41	Test payment function	40	2 days	F 7/22/16	M 7/25/16	0%	Julie Moore
42	User acceptance	41	1 day	T 7/26/16	T 7/26/16	0%	Bonnie Rush

[Figure 15-3:](#) Task Sheet view.

	Task Mode	Task Name	Work	Duration	Start	Finish	Add New Column
24	▪ Registration		512 hrs	64 days	T 4/28/16	T 7/26/16	
25	▪ Database		200 hrs	25 days	T 4/28/16	W 6/1/16	
26	Collect database requirements	Dion Anthony	40 hrs	1 wk	T 4/28/16	W 5/4/16	
27	Design database	Dion Anthony	40 hrs	1 wk	T 5/5/16	W 5/11/16	
28	Develop database	Dion Anthony	40 hrs	1 wk	T 5/12/16	W 5/18/16	
29	Test database	Dion Anthony	40 hrs	1 wk	T 5/19/16	W 5/25/16	
30	User acceptance	Bonnie Rush	40 hrs	1 wk	T 5/26/16	W 6/1/16	

[Figure 15-4:](#) Task Usage view.



When tracking using the Task Sheet view, I insert a column that shows % complete. To insert the column, simply right-click a column head and choose Insert Column ⇒ Select % Complete.

Depending on the tracking method you need (see the section “[Applying a tracking method](#),” earlier in this chapter), different views serve different purposes. [Table 15-2](#) specifies the best view to use for each tracking method.

**Table 15-2** Tracking Views

<i>Tracking Method</i>	<i>Best View</i>	<i>Table or Column That's Displayed</i>
Task	Task Sheet	Tracking table
Task – time phased	Task Usage	Actual Work row
Assignment	Task Usage	Tracking table
Assignment – time phased	Task Usage	Actual Work row

When you find the appropriate view with the correct columns displayed, entering tracking information is as simple as typing a number of hours, a dollar amount for fixed costs, or a start or finish date in the appropriate column for the task you’re updating.

# **Tracking Work for the Record**

To track progress on a project, you enter several types of information. First, you tell Project as of when you want to track progress: By default, it records information as of the current date based on your computer's date-and-time settings. However, if you want to record progress as of, say, the end of the company's quarter, you can do that, too.

You can record the actual start and finish dates of a task, the percent complete (for example, 75% complete), and the actual work performed (the number of hours that resources spent on each task). If you believe that the task will take less or more time than you anticipated, based on progress to date, you can modify the remaining duration of the task. You can also enter units of materials used and fixed-cost information for expenditures incurred, such as equipment rental or consulting fees.

## **Specifying the status date**

If you don't know the day of the week, you can't very well gauge whether you're making headway on the week's work. Tracking is like that: First, establish the *status date*, or the date as of which you're tracking progress.

By default, Project uses the date-and-time setting on your computer as the date for entering actual activity information. However, sometimes you want to time-travel. Suppose that the boss asks for a report showing the status of the project as of the last day of the quarter, December 31. You've gathered time sheets from all resources through that date, but you didn't enter those updates into Project until three days after the quarter ended. You can set the status date in Project to December 31 and then enter the tracking data. Even better, certain automated tracking tools work along with the status date. For example, if you know that all tasks in the project were on schedule as of the status date, use the Update Project tool to mark all scheduled work as complete up to that date.

After you set the status date and enter information, Project uses that date to calculate *earned value*, which is the value of work completed to date. Also, any task-complete or percent-complete information records as of that date and progress lines in the chart area reflect that timing. Any reports or printouts of views that you generate paint a picture of the status of the project as of that date.

Here's how to set the status date:

- 1. Select the Project tab and then click the calendar in the Status group of the tab.**

A Status Date window will appear.
- 2. Click the down arrow to display the calendar.**
- 3. If you want to set the status date in another month, click the right or left arrow in the upper-right corner of the calendar to navigate to that month.**

4. Click the date you want.

5. Click the OK button.

Now you're ready to start entering tracking data.

## ***Remaining on track***

When you're determining the project status, and you find that a task was, or will be, on schedule as of the status date, you can use a tool to mark the task as partially complete through the status date. Project assumes an even distribution of work over time and calculates the percentage complete as of the status date. It then marks the percent complete accordingly. To use this tool, simply select tasks to update and click the Mark on Track button in the Schedule group on the Task tab.

## ***Determining the percent complete***

When I'm asked how to determine whether a task is 25%, 50%, or even 36.5% complete, I usually refer people to their own intuition. If the boss asks you how that report is coming along, you typically make a quick, internal calculation and supply a rough estimate. A rough estimate, based on your experience and the information your resources provide about their progress, is often good enough.

You can also calculate the percent complete in more precise ways. For example, if you estimate that a task should take ten hours of effort, and your resources report performing five hours of effort, you can say that the task is 50% complete. Be careful, though: Just because people have spent half the allocated time doesn't mean that they have accomplished half the work.

Cost is another way to estimate the percent complete: If you originally estimated that four resources assigned to a four-day task would tally \$4,000 in costs, and the total time that the resources report spending on the task is \$3,000, you can *guess* that the task is 75% finished. But again, just because you've spent three quarters of the money doesn't mean that you've accomplished three quarters of what you set out to do.

Determining the percentage of work that's done is easier when the deliverable is measurable. For example, if your task is to produce 100 cars on the assembly line in four days, and you've produced 25 cars, the task may be about 25% finished. Or if you were supposed to install software on ten computers in a computer lab, and the installation is complete on five of them, that's an easy 50% estimate.

But not every task can be calculated as neatly. If you know it'll be hard to gauge the percent complete when you're in the planning phase, collaborate with the team member on the interim measurements to allocate 25%, 50%, 75%, and 100% complete. For example, if you want to determine interim measurements for the three-week task Develop Medical Protocols, you might agree that when a complete list of protocols is needed and they've been assigned to development, the task is 25% complete. When 50% are drafted, the task is 50% complete. When the protocols are 100% drafted, the

task is 75% complete. When the list has been edited and someone in charge has signed off on it and approved it, the task is 100% complete.



To avoid finding out (usually, at the last minute) that a team member's version of "almost complete" is significantly different from yours, agree up front that you'll sign off on 75% complete only after specific criteria are met.

## Don't let tracking become too detailed

Does it make sense to track 2.25% of progress every other day on a two-month task? Probably not. Except on the longest tasks, entering a percent complete that's more specific than 25, 50, 75, or 100 probably isn't worth the trouble. That's partly because multiweek tasks can often be divided into subtasks for ease of tracking and partly because reporting is one purpose of tracking. If your boss or board of directors or client couldn't care less about reaching exactly 33.75% complete, you shouldn't care, either.

On the other hand, if the project must include (for a reason known only to you) a six-month task and you can't break it into subtasks, you may use percentages such as 10, 20, 30, 40, 50, and so on to prevent having to wait a month between updates with (apparently) no progress to show.

Here's the simplest and quickest way to update the percent complete on a task: Click the task name to select it in any task-related view and then click the 0%, 25%, 50%, 75%, or 100% button on the Task tab. Alternatively, you can double-click any task to open the Task Information dialog box and then enter the Percent Complete value on the General tab there. You can also select a task, open the Mark on Track drop-down list, and click Update Tasks to open the Update Tasks dialog box and make the change there. If you want to enter a percentage in increments other than 25%, you'll have to enter it in the Task Information or Update Tasks dialog box or the % Complete column in any sheet view.

## Recording start and finish information

If you note that a task is complete, and you don't enter the actual start date, Project (ever the optimist) assumes that you started on time. If you didn't start on time, and you want to reflect the actual timing, modify the actual start date; if you finished late, enter the actual finish date. However, if you don't modify the task duration, and you enter an earlier finish date, be aware that the start date is calculated to have occurred earlier.

You have two options to track this information:

- ✓ **Use the Update Tasks dialog box.** To open it (refer to [Figure 15-2](#)), click the Mark on Track button in the Schedule group on the Task tab.
- ✓ **Display a sheet view with Actual Start and Actual Finish columns (such as Tracking Gantt or Gantt Chart view) with the Tracking table displayed.** Then use the drop-down calendar in the Actual Start or Actual Finish column to specify a date. If you need to change the actual start date, you must mark the task as partially complete first. When you need to change both the Actual Start and Actual Finish dates, mark the task as 100% complete before specifying the dates.



A few conditions can cause a warning message to appear when you enter an actual start date or finish date — for example, when the actual start date precedes the start date of the project or when the actual start date causes a conflict with a dependent task. When this warning message appears, you have these options:

- ✓ Cancel the operation.
- ✓ Allow the conflict to exist (or the task to start) before the project starts.

To cancel the change, correct the problem (for example, by modifying the project start date), and then go back and enter the actual information. Or you can force the conflict and let it stand.

## ***Knowing what to do when John works three hours and Mary works ten***

To get to the blow-by-blow level of tracking, you record exactly how many hours each resource spends on tasks. This process can be about as much fun as typing all the names in the New York City phone book into a database, but it has certain benefits: After you track the number of actual hours, you can produce tallies of the total hours each resource invests in the project by day, week, or month. If you have to bill clients based on resource hours (for example, contract work by the hour), you have a clear record to refer to. If you're tracking a budget in detail, multiplying resource hours by their individual rates provides an accurate accounting of costs as finely as computing them day by day.

If you don't enter specific hours, Project simply calculates the hours of work completed on the task as a percentage of the total hours assigned. It assumes that every person assigned to the task has completed the same percentage of work. For many people, this strategy works well; other people need more detail. If you're in the detail camp, specify actual resource hours as a total by task or day by day through the life of each task.

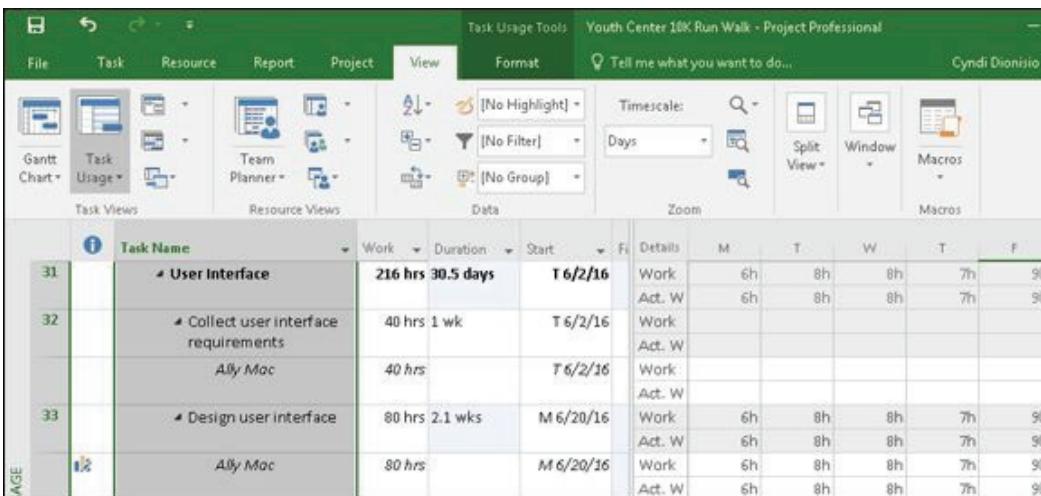
To enter resource hours, follow these steps:

- 1. Display Task Usage view.**
- 2. Scroll down to locate the task that you want to track and its resource assignments.**

Each assigned resource is listed on a separate row underneath the task name.

- 3. Enter the number of hours completed by the resource:**

- *To enter only total hours:* Insert the Actual Work column into the sheet by right-clicking a column, choosing Insert Column, and selecting the Actual Work column. Enter total hours in the newly displayed column.
- *To enter hours on the task day by day:* Right-click the chart pane and then choose Actual Work to display the row labeled Act. Work. [Figure 15-5](#) shows this row in Task Usage view with actual values entered. Click the Act. Work cell on a day on which the resource worked, and enter a number. Repeat this step for every day that the resource worked on the task.



**Figure 15-5:** Track resource activity day by day in this view.

If the hours you enter for a resource total more or less than the baseline estimate for that resource on that task, here's what happens:

- ✓ When you enter an amount in the Act. Work row and press Enter, the Actual Work column total recalculates to reflect the total number of hours worked on that task.
- ✓ A little pencil symbol appears in the ID column for that task, indicating that the assignment has been edited.
- ✓ A Person icon appears in the Indicators column to the left of the task name, indicating a resource overallocation.

You can change the entries in the Work column or the time-phased work row for a task or an assignment. If you do so, Project changes the task schedule accordingly. Then, if you mark actual work, it's tracked compared with the edited working hours.



To easily look up the total hours spent by each resource on the project, check the summary number of work hours listed next to the resource in the Resource Name column in Resource Usage view. This view is another handy way to track assignments.

## Uh-oh — we're in overtime

When you enter 16 hours of work in a single day for a resource, even though the resource's availability is based on a calendar with an 8-hour day, Project doesn't recognize those hours as overtime. It's one instance of having to lead Project by the hand and tell it to specify overtime work.

When you enter hours in the Overtime Work field, Project interprets them as the number of total work hours that are overtime hours. So if you enter **16** hours of work on a task in the Work column and then enter **4** in the Overtime Work column, Project assumes 12 hours of work at the standard resource rate and 4 hours at the overtime rate.

To enter overtime hours, follow these steps:

1. **Display Resource Usage view.**
2. **Right-click a column heading and choose Insert Column.**  
The list of columns appears.
3. **Select Overtime Work in the list.**
4. **Click in the Overtime Work column for a specific assignment for a resource and then click the spinner arrows to specify the overtime hours.**

[Figure 15-6](#) shows that you have allocated two hours of overtime for Dion Anthony.

The screenshot shows the Microsoft Project application window. The ribbon tabs at the top are File, Task, Resource, Report, Project, View, Format, and a search bar. Below the ribbon, there are buttons for Team Planner, Assign Resources, Resource Pool, Add Resources, Information, Notes, Details, Level Selection, Level Resource, Level All, Clear Leveling, and Next Overallocation. The main area displays a table titled 'Resource Usage' with columns for Resource Name, Overtime Work, Work, Details, and a weekly grid (M, T, W, T, F). A row for Dion Anthony has three tasks: 'Develop registration plan' (0 hrs, 40 hrs), 'Collect database requirements' (2 hrs, 40 hrs), and 'Design database' (0 hrs, 40 hrs). The 'Collect database requirements' task has '2 hrs' in the Overtime Work column highlighted with a green border.

	Resource Name	Overtime Work	Work	Details	M	T	W	T	F
3	Dion Anthony	0 hrs	280 hr	Work					
	Develop registration plan	0 hrs	40 hr	Work					
	Collect database requirements	2 hrs	40 hr	Work					
	Design database	0 hrs	40 hr	Work					
	Develop database	0 hrs	40 hr	Work					

[Figure 15-6](#): Assigning overtime.

If you specify overtime, Project assumes that effort-driven tasks have a shorter duration. After all, if the task were to take three 8-hour days (24 hours of work) to complete, and you recorded the resource working 12 hours for two days in a row, Project figures that all the effort was accomplished in less time. The duration of the task *shrinks*. If that's not what happened, you have to manually modify the task duration.

## ***Specifying remaining durations for auto-scheduled tasks***

Tracking information for auto-scheduled tasks has a weird and wonderful relationship in Project. For example, Project tries to help you by calculating the duration based on other entries you make, such as actual start dates and finish dates. In that particular case, Project calculates task duration according to those dates. (This process works in reverse, too: If you enter the task duration, Project recalculates the finish date to reflect it.)

You may instead want to enter the duration yourself. For example, if you have entered a start date and 20 hours of work on a task that has a baseline of 16 hours of work, Project can't comprehend that the scope of the task has changed, and that now the task is incomplete and requires another 20 hours of work. You have to tell Project about it.

To modify the duration of a task either in progress or completed, follow these steps:

1. Display Gantt Chart view.
  2. Click View, and in the Data group, click Tables and then click Tracking.
- The Tracking table is displayed, as shown in [Figure 15-7](#).
3. Click in the Actual Duration column of the task you want to modify and then use the arrows to adjust the actual duration up or down.
  4. If you want to enter a remaining duration, click in the Rem. Dur. (Remaining Duration) column, and type a number and an increment symbol.

For example, you may type **25d** (where **d** is the increment symbol for days). If the remaining duration is greater than the original estimate and the task is on the critical path, Project warns you that the task is linked to a task constraint or linked to a task that can't move. You can either continue and allow the scheduling conflict or cancel and allow the scheduling conflict.

	Task Name	Act. Start	Act. Finish	% Comp.	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work
24	▪ Registration	T 4/28/16	NA	79%	0%	1.64 days	3.36 days	\$29,400.00	468 hrs
25	▪ Database	T 4/28/16	W 6/1/16	100%	0%	25 days	0 days	\$14,400.00	200 hrs
26	Collect database requirements	T 4/28/16	W 5/4/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
27	Design database	T 5/5/16	W 5/11/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
28	Develop database	T 5/12/16	W 5/18/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
29	Test database	T 5/19/16	W 5/25/16	100%	0%	1 wk	0 wks	\$2,600.00	40 hrs
30	User acceptance	T 5/26/16	W 6/1/16	100%	0%	1 wk	0 wks	\$4,000.00	40 hrs
31	▪ User Interface	T 6/2/16	T 7/14/16	100%	0%	1.25 days	0 days	\$12,400.00	216 hrs
32	Collect user interface requirements	T 6/2/16	W 6/8/16	100%	0%	1 wk	0 wks	\$2,000.00	40 hrs
33	Design user interface	M 6/20/16	M 7/4/16	100%	0%	2.05 wks	0 wks	\$4,000.00	80 hrs
34	Develop user interface	M 7/4/16	M 7/11/16	100%	0%	1 wk	0 wks	\$2,000.00	40 hrs
35	Test user interface	M 7/11/16	T 7/14/16	100%	0%	3 days	0 days	\$1,200.00	24 hrs
36	User acceptance	T 7/5/16	F 7/8/16	100%	0%	4 days	0 days	\$3,200.00	32 hrs
37	▪ Payment	M 7/11/16	NA	54%	0%	6.5 days	5.5 days	\$2,600.00	52 hrs
38	Collect payment requirements	M 7/11/16	T 7/12/16	100%	0%	2 days	0 days	\$800.00	16 hrs
39	Design payment function	W 7/13/16	T 7/14/16	100%	0%	2 days	0 days	\$800.00	16 hrs
40	Develop payment function	F 7/15/16	NA	50%	0%	0.5 wks	0.5 wks	\$1,000.00	20 hrs
41	Test payment function	NA	NA	0%	0%	0 days	2 days	\$0.00	0 hrs
42	User acceptance	NA	NA	0%	0%	0 days	1 day	\$0.00	0 hrs

[Figure 15-7:](#) Gantt Chart, with Tracking table.



If you enter the percent complete for a task and then modify the duration to differ from the baseline, Project automatically recalculates the percent complete to reflect the new duration. For example, if you enter 50% complete on a 10-hour task and then modify the actual duration to 20 hours, Project considers those 5 hours (50% of 10 hours) being only 25% of the 20 hours.

## Entering fixed-cost updates

*Fixed costs* are costs that aren't influenced by time, such as equipment purchases and consulting fees. Compared with the calculations and interactions of the percent

completes and the start and finish dates for hourly resources, fixed-cost tracking will seem like simplicity itself!

Here's how to track fixed costs:

1. **Display Gantt Chart view.**
2. **Click View, and in the Data group, click Tables and click Cost.**  
The Cost table is displayed.
3. **Click in the Fixed Cost column for the task you want to update.**
4. **Type the fixed cost, or a total of several fixed costs, for the task.**

That's it! However, because Project lets you enter only one fixed-cost amount per task, consider adding a note to the task to itemize the costs you've included in the total.



The fixed cost assigned to the task is only the scheduled cost for the task. For this cost to become the planned cost, the task has to be baselined. Also, updates to the % Complete column update actual costs, depending on the accrual method that's selected for the task: Prorated is the default setting, but the start and finish dates of the task also influence the actual costs when the percent complete is applied.



Consider using some of the ten customizable Cost columns for itemized fixed-cost entry. Rename one Equipment Purchase, and another Facility Rental, for example, and then enter the costs in those columns. Of course, these columns of data may not perform calculations such as rolling up total costs to the summary tasks in the project, but they serve as reminders about itemized fixed costs.



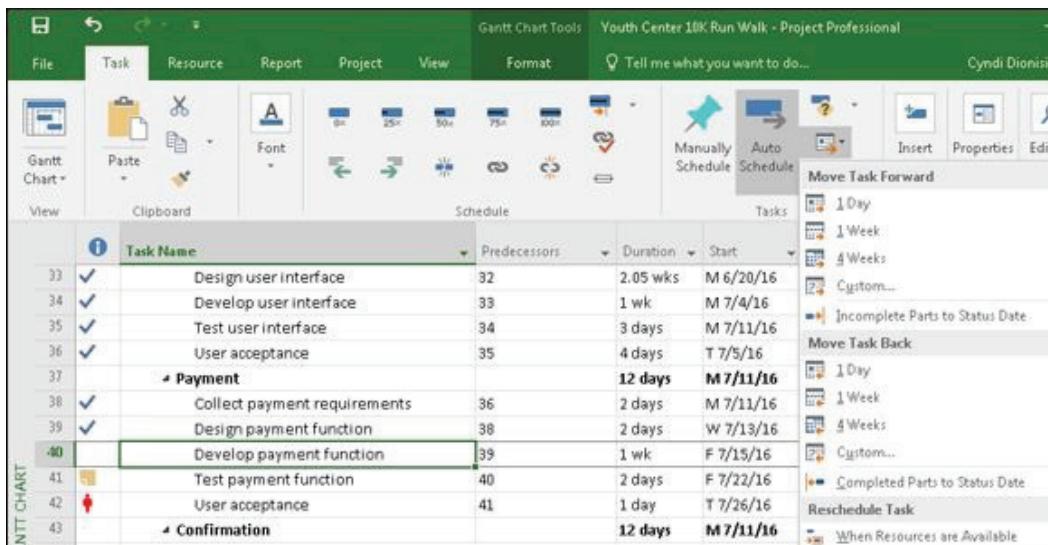
In Project 2016, you can designate a resource type as a cost and assign a cost every time you assign the resource. The Cost column calculation of total cost includes the amount spent for cost resources on tasks. See [Chapter 7](#) for more about resource types.

# Moving a Task

If you've ever managed the subcontractors on any type of construction project, you've probably heard these dreaded words: "My current job is running long, so I'll get to your job in about a week." What you'd rather hear from a subcontractor (or any other type of resource) is this: "My schedule opened up, so I can start work on this assignment a week early." Project helps you easily reschedule an entire task or reschedule part of a task as of the status date.

Here's how to use the Move Task tool to move a task:

1. **Display Gantt Chart view.**
  2. **If the task is partially complete and you want to move its uncompleted portion, select the Project tab. In the Status group, choose the Status Date drop-down and set a status date.**
  3. **Select the task to move.**
  4. **Click the Move button in the Tasks group on the Task tab.**
- The choices for rescheduling the task appear, as shown in [Figure 15-8](#).
5. **Specify how to move the task:**
    - *To move the task forward or back by a default amount:* Click 1 Day, 1 Week, or 4 Weeks in either the Move Task Forward or Move Task Back section.
    - *To move the task by a custom time frame:* Click the appropriate Custom option, specify the number of working days by which to move the task in the dialog box that appears, and click the OK button.
    - *To reschedule part of the task according to the status date:* Choose the Incomplete Parts to Status Date option to split the task and move the uncompleted portion to resume later, starting on the status date. Choose the Completed Parts to Status Date option to split the task and move the completed portion earlier, before the status date.
    - *To reschedule the task based on the availability of the assigned resources:* Choose the appropriate Custom option, specify the number of working days by which to move the task in the dialog box that appears, and click OK.



**Figure 15-8:** Moving a task.

When you’re moving a task that’s auto-scheduled, a constraint is applied, to honor the newly scheduled task. Be aware that constraints apply restrictions to task scheduling and can make it challenging to manage the dates.

# **Update Project: Sweeping Changes**

If it's been a while since you tracked activity, and you want to update the schedule, Update Project may be for you. This feature lets you track chunks of activity for specified periods. Update Project works best, however, if most tasks have been completed on schedule.

This type of tracking isn't finely tuned: It's similar to recording in your checkbook the balance that the bank sends in your mailed statement rather than accounting for your balance check by check. Doing so assumes that all your checks and deposits align with the bank's version as of that date; therefore, going forward, you're back on track.

Here are the settings options that Update Project offers you:

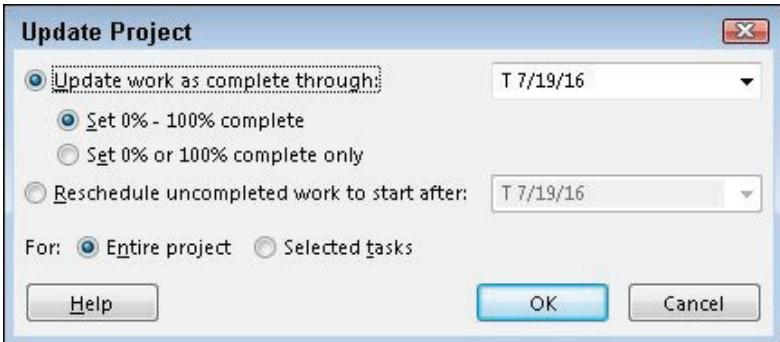
- ✓ **Update Work As Complete Through:** You can update the project in one of two ways through the status date you specify in this box. The Set 0% – 100% Complete setting lets Project calculate the percent complete on every task that should have begun by that time. By choosing this option, you tell Project to assume that the tasks started and progressed exactly on time. The Set 0% or 100% Complete Only setting works a little differently: It tells Project to record 100% complete on tasks that the baseline indicated would be complete by now and to leave all other tasks at 0% complete.
- ✓ **Reschedule Uncompleted Work to Start After:** This setting reschedules the portions of tasks that aren't yet complete to start after the specified date.

To use Update Project, follow these steps:

1. **Display Gantt Chart view.**
2. **To update only certain tasks, select them.**
3. **In the Project tab, in the Status group, choose Update Project.**

The Update Project dialog box appears, as shown in [Figure 15-9](#).

4. **Choose the update method you prefer: Set 0% – 100% Complete or Set 0% or 100% Complete Only.**
5. **If you want a status date other than the one shown or you didn't previously set one, set the date to use in the field in the upper-right corner.**
6. **If you want Project to reschedule any work rather than update work as complete, select the Reschedule Uncompleted Work to Start After option and then select a date from the list.**
7. **Choose whether you want these changes to apply to the entire project or to only selected tasks.**
8. **Click the OK button to save the settings and have Project make updates.**



**Figure 15-9:** You can update only selected tasks or the entire project.

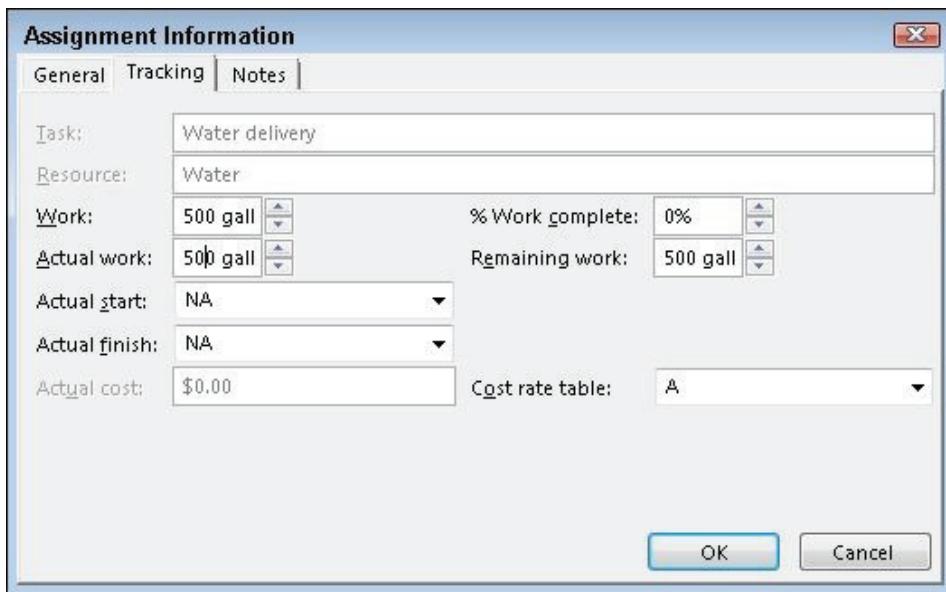
If you want, you can use Update Project to make certain global changes, such as to mark as 100% complete all tasks that should be complete according to the baseline. Then you perform more detailed task-by-task tracking on individual tasks that are only partially complete.

# Tracking Materials

Tracking the amount of materials used on tasks involves tracking actual units at the level of material resources. If you create a resource named Rubber and assign it to the Manufacture Tires task at 500 tons, for example, and then you use only 450 tons, you enter the actual units used.

This situation resembles the way you track work resource hours on tasks. To make it happen, simply follow these steps:

1. **Display Resource Usage view.**
  2. **Locate the material resource in the list, and under the resource name, double-click the assignment for which you want to enter the actual units.**
- The Assignment Information dialog box appears (see [Figure 15-10](#)).
3. **Click the Tracking tab.**
  4. **Enter the actual units used in the Actual Work field.**
  5. **Click the OK button.**



[Figure 15-10:](#) You can use the Assignment Information dialog box to enter actuals, too.

If you need to enter actual units for multiple assignments, you can use the method I describe in the earlier section "[Knowing what to do when John works three hours and Mary works ten](#)." Right-click the right side of the view and choose Actual Work to display the row labeled Act. Work. You can then plug in the actual data. If you assign the material resource of 500 tons to a five-day task, for example, remember that Resource Usage view shows Project spreading out the usage — 100 tons for each of the five days of the task. If you don't care on which day the materials were used, you can simply increase or decrease one setting to make up for any difference in actual usage.

# **Tracking More Than One: Consolidated Projects**

Often, projects are related in some fashion (such as sharing resources or having timing dependencies between them), or a series of smaller projects make up a larger program. In such a case, you can consolidate these separate projects into one file, either as a series of summary tasks or with all summary tasks and subtasks included.

When you consolidate projects, you can choose to link to the source file. When you do, any changes to the source file are represented and updated in the consolidated file.

If it's your job to keep track of the big picture, you have to understand how consolidated projects are updated, as I describe in the following section.

## ***Consolidating projects***

To consolidate projects in Project, you open a blank file and then insert existing projects to build a satisfying master project schedule.

The neat thing about consolidated projects is that you have some choices about the interaction between the consolidated project and the source files you insert in it. For example, you can link to a source file so that changes made in the source file are reflected in the consolidated project. This capability is helpful for a project manager who has to keep her eye on multiple phases or many smaller projects.



You can also create dependencies between inserted projects in the consolidated file. If you have, for example, one project that can't start until another one finishes, you can clearly see in the consolidated file how various separate projects in your organization affect each other.

Another way to relate consolidated projects to their source files is to make the consolidated project a two-way street, allowing changes in it to be reflected in the source files. You can also make the source files read-only so that no changes can affect other people's files.

To create a consolidated file, follow these steps:

- 1. Open a blank Project file and display Gantt Chart view.**
- 2. Click anywhere in the Task Name column.**

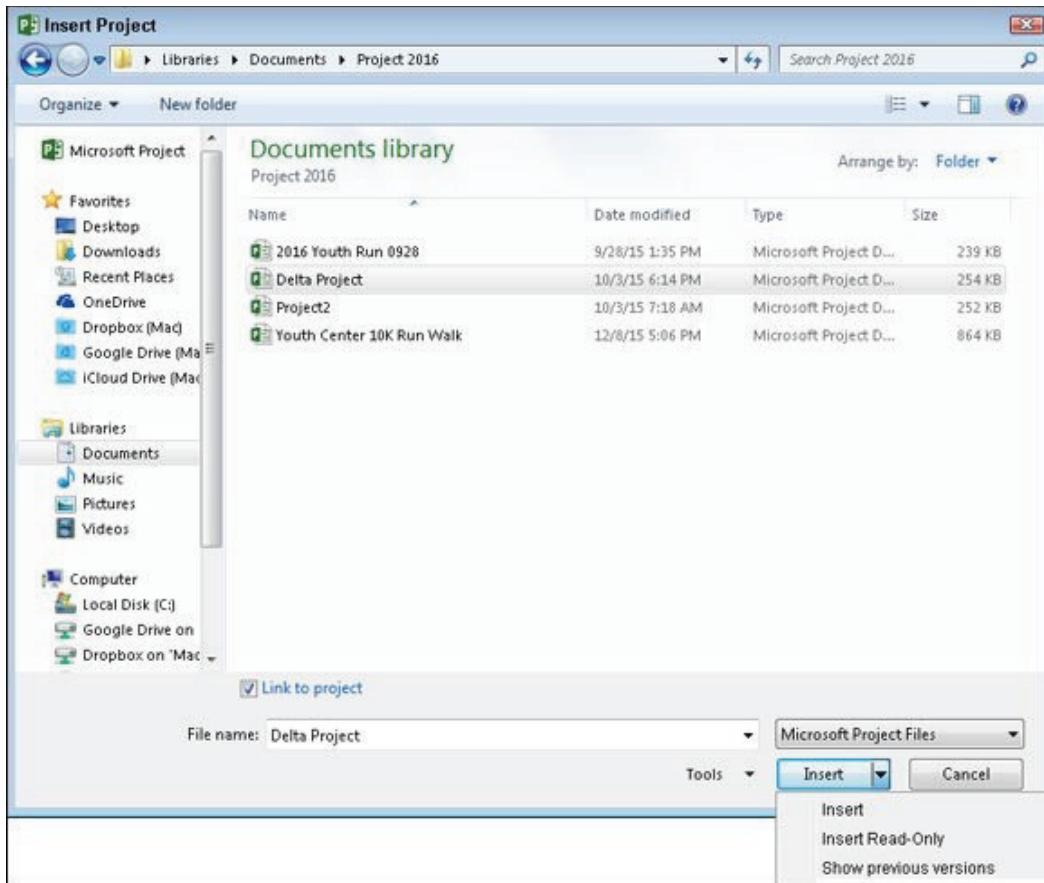
If you're inserting multiple projects, click the row in which you want the inserted file (or files) to appear. If you want to insert a project between existing tasks, click the task beneath the spot where you want the project to be inserted.

- 3. Choose Project ⇒ Subproject in the Insert group.**

The Insert Project dialog box, shown in [Figure 15-11](#), appears.

4. Using the navigation pane and file list, locate the Project file that you want to insert, and select it.
5. (Optional) Click the down arrow on the Insert button if you want to change the default setting to Insert Read Only.
6. If you want to link the project in this file to the source file so that the consolidated file is updated automatically whenever you open it, ensure that the Link to Project check box is selected.
7. Click the Insert button.

The project is inserted into the file, with the summary task showing and all subtasks hidden. To display all tasks in the inserted project, simply click the plus sign to the left of the summary task.



[Figure 15-11:](#) The Insert Project dialog box.



If you want to insert multiple subprojects, leave them all collapsed. This strategy ensures that they're all inserted at the topmost level of the outline in the consolidated project.

## ***Updating consolidated projects***

You have two ways to skin the cat known as “updating a consolidated project,” and the one you use depends on whether you linked to the source files when you inserted them. If you linked the files and inserted them without using the read-only setting, changes in source files are reflected in the consolidated file (and vice versa). Updating is simply a matter of ensuring that all files are available in their original linked locations (for example, in a folder on the network); then Project updates automatically.

If you haven’t linked the files, changes in source files aren’t reflected in consolidated files, and the consolidated file information doesn’t affect the source information. You may create this type of unlinked consolidated file if you simply want to see a snapshot of how all projects are progressing and don’t want to run the risk of your settings changing the source information. In this case, however, if you want to track progress, you have to create a new consolidated project or enter all updates manually.



After you insert projects in a file, you can move them around by using the Cut and Paste tools. When you do, message windows may appear, offering you options to resolve any conflicts that may occur because of dependency links you’ve created between inserted projects.

## ***Changing linking settings***

Changing your mind is a project manager’s prerogative. If you’ve inserted a source file into a consolidated file, and you find that you didn’t initially establish a link, you can change that setting so that the files update each other automatically.

Follow these steps to make changes to the inserted project:

- 1. Open the consolidated file.**
- 2. Display Gantt Chart view.**
- 3. Double-click the task name of the inserted project that you want to update.**

The Inserted Project Information dialog box appears.

- 4. Click the Advanced tab.**
- 5. Select the Link to Project check box and then click the Browse button.**  
The Inserted Project dialog box appears.
- 6. Use the Look In feature to locate the file that you want to link to and then select the file.**
- 7. Click the OK button.**
- 8. If you want the source file to be read-only, click the Read Only box in the Inserted Project Information dialog box.**
- 9. Click OK to save the link.**

# Project Views: Observing Progress

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## In This Chapter

- ▶ Viewing your progress with indicators and taskbars
  - ▶ Seeing progress from various Project views
  - ▶ Examining cost and time variances
  - ▶ Understanding earned value
  - ▶ Observing multiple critical paths
- 

Some project managers use Project simply to paint a picture all the effort that their project will entail and then stash the plan in a drawer. That's a mistake. After you enter all the project data, save a baseline, and then track actual activity on the project, you receive in return an amazing array of information from Project that can help you stay on time and on budget.

After you track some actual activity on several tasks, Project lets you view baseline estimates alongside the real-time plan. Project alerts you to tasks that are running late and also shows how the critical path shifts over time. To read about the critical path, review [Chapter 12](#).

Project also provides detailed performance information. In fact, the information you can see about the cost and schedule performance can be quite robust. You can produce a simple cost-and-schedule variance, or you can use more complex metrics, such as a cost performance index using earned-value management techniques. I discuss this particular measurement technique in the later section “[Tracking Progress Using Earned Value Management](#).”

Keep the project file close at hand — and take a look at how Project can make you the most informed project manager in town.

# Seeing Where Tasks Stand

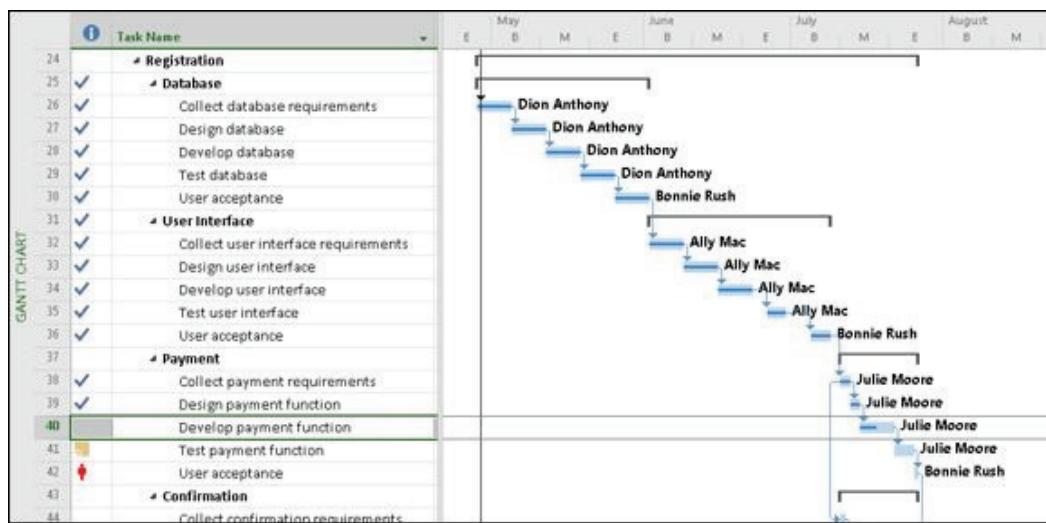
You've diligently entered resource work hours on tasks, recorded the progress on tasks, and entered fixed costs. Now what? Well, all that information has initiated several calculations and updates to the project schedule. It's time to take a quick look at the changes that all this tracking has produced in the project schedule.



A check mark in the Indicator field tells you that a task is complete. If you see an unfamiliar indicator icon crop up in the project, hold the mouse pointer over the indicator. A text box opens and describes its meaning. To see a list of Project icons and their meanings, click Tell Me What You Want to Do next to the Format tab and type **indicators** in the Search box. Click Search and then click Indicator Fields.

## Baseline versus actual progress

One obvious way to view the difference between a baseline estimate and the progress you've tracked in the project is by using a taskbar. After you track progress on several tasks, the Gantt chart shows a black bar superimposed on the baseline taskbar. For example, in [Figure 16-1](#), Tasks 26–39 are complete; you can tell by the solid black bar that extends the full length of the taskbar. Task 40 is only partially complete; the black line that indicates actual progress only partially fills the duration for the task. Task 41 has no recorded activity on it; you see no black line indicating progress — only the normal taskbar.

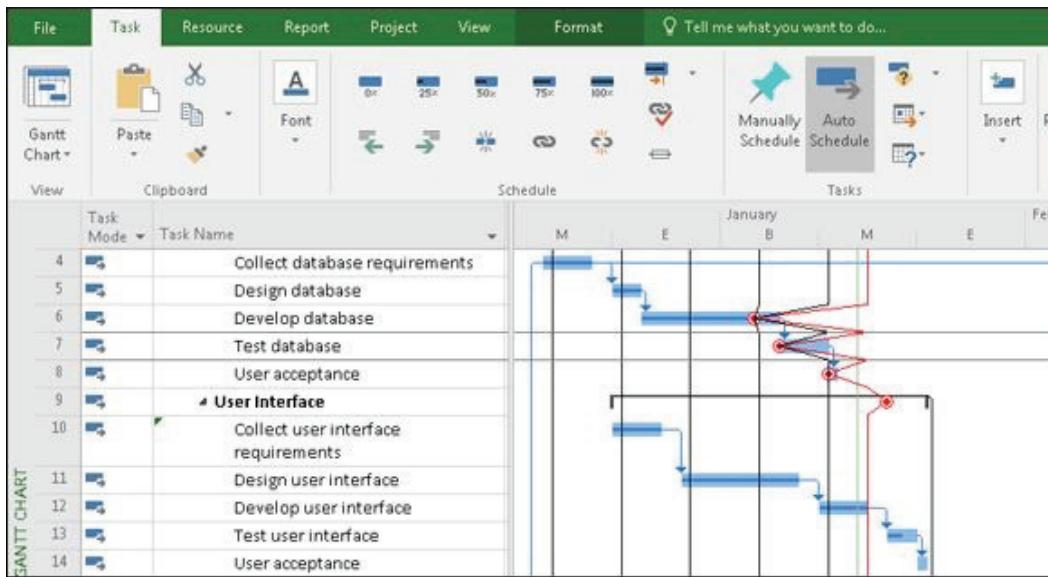


[Figure 16-1:](#) The solid line on a taskbar represents actual activity in the project.

## Lines of progress

Progress lines offer additional visual indicators of how you're doing. As you can see in [Figure 16-2](#), a progress line zigzags among tasks and forms, showing left- or right-pointing peaks. These peaks indicate late or early tasks (calculated according to the

status date you set for tracking or another date that you specify). A progress line that points to the left of a task indicates that the task is running late. Progress lines that point to the right show that — wonder of wonders — you’re running ahead of schedule. (Treasure these lines: They don’t seem to appear often in projects.)



**Figure 16-2:** Progress lines, seemingly run amok.

In [Figure 16-2](#), progress is measured as of the actual date. You can see that the tasks under the Finish Line Beverage are running behind, because the line points to the left.

## Displaying progress lines

By default, Project doesn’t display progress lines. You have to turn them on. And while you’re at it, you may as well specify when and how they appear. Here’s how to display progress lines and change their settings:

1. **Display Gantt Chart view.**
2. **Right-click the chart portion of the view and choose Progress Lines.**  
The Progress Lines dialog box appears, as shown in [Figure 16-3](#).
3. **If you want Project to always show a progress line for the current or status date, select the Display check box in the Current Progress Line section and then select At Project Status Date or At Current Date.**
4. **If you want progress lines to be displayed at set intervals, do this:**
  - a. *Select the Display Progress Lines check box in the Recurring Intervals section and then select Daily, Weekly, or Monthly.*
  - b. *Specify the interval settings.*

For example, if you select Weekly, you can choose every week, every other week, and so on, as well as for which day of the week the line should be displayed on the timescale.

5. **Choose whether you want to display progress lines beginning at the Project**

**start date or on another date.**

To use the Project start date, simply select the Project Start option in the Begin At section of the dialog box. To select an alternative start date, select the second option and then select a date from the calendar drop-down list.

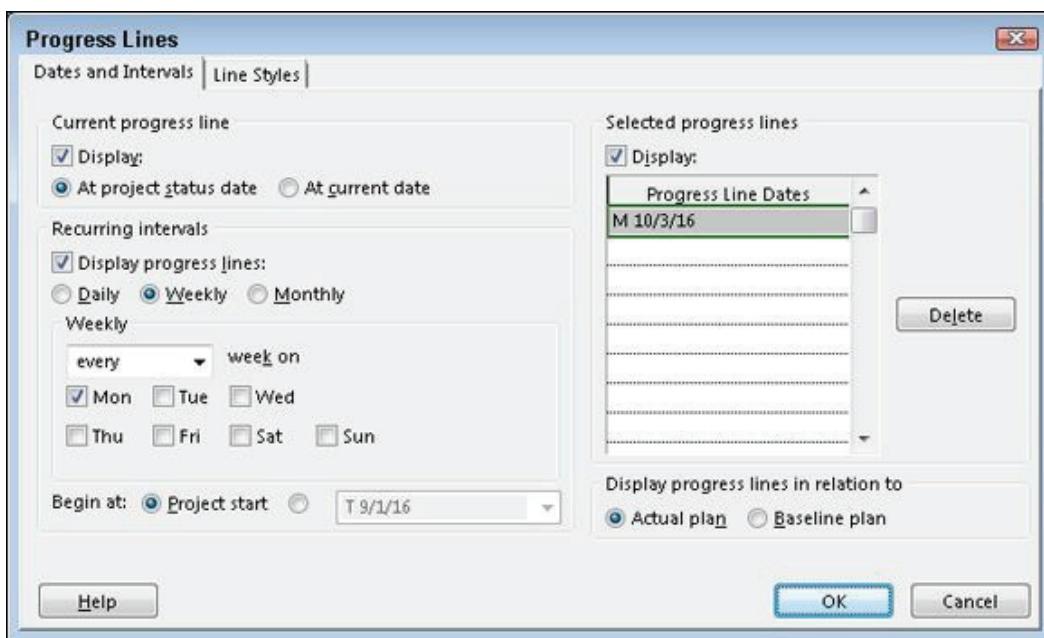
6. **If you want to display a progress line on a specific date, select the Display check box in the Selected Progress Lines section and then choose a date from the Progress Line Dates drop-down calendar.**

You can make this setting for multiple dates by clicking subsequent lines in this list and selecting additional dates.

You can choose to display progress lines in relation to actual or baseline information.

If a task has been tracked to show 50 percent complete, for example, and you choose to have Project display progress lines based on actual information, the peak appears relative to the 50 percent *actual* line, not to the complete baseline taskbar.

7. **Click the OK button to save these settings.**



**Figure 16-3:** The Progress Lines dialog box.

### Formatting progress lines

In keeping with the almost mind-boggling array of formatting options that Project makes available to you, you can modify how progress lines are formatted.

As with any changes to formatting, you're tampering with the way Project codes visual information for readers. Be cautious about making formatting changes that cause the plan to be difficult to read for those who are accustomed to the default Project formatting.

To modify progress-line formatting:

1. **Display Gantt Chart view.**
2. **Right-click the chart portion of the view and choose Progress Lines.**

The Progress Lines dialog box appears (refer to [Figure 16-3](#)).

3. **Select the Line Styles tab.**

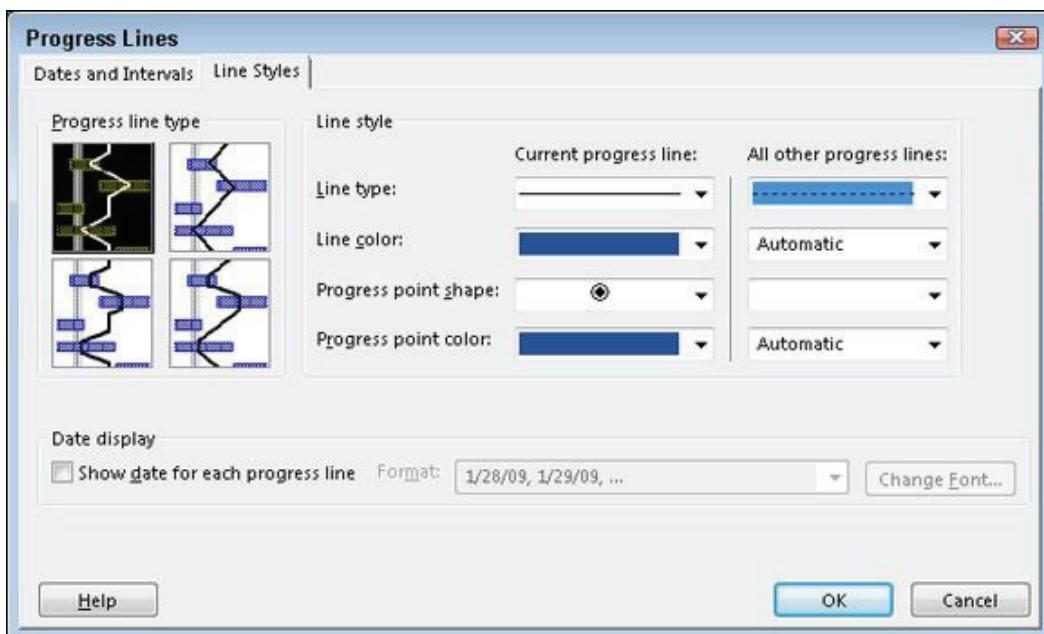
You see the display options shown in [Figure 16-4](#).

4. **In the Progress Line Type area, select a line style sample.**

5. **In the Line Type fields, select a style from the samples.**

You can make two settings: one for the current progress line and one for all other progress lines.

6. **You can change the line color, progress point shape, and progress point color by making different choices in those boxes.**
7. **If you want a date to appear alongside each progress line, select the Show Date for Each Progress Line check box and then select a date from the Format field.**
8. **If you want to change the font that's used for the displayed date, click the Change Font button and make the changes. Click OK in the Font dialog box.**
9. **Click the OK button to save these settings.**

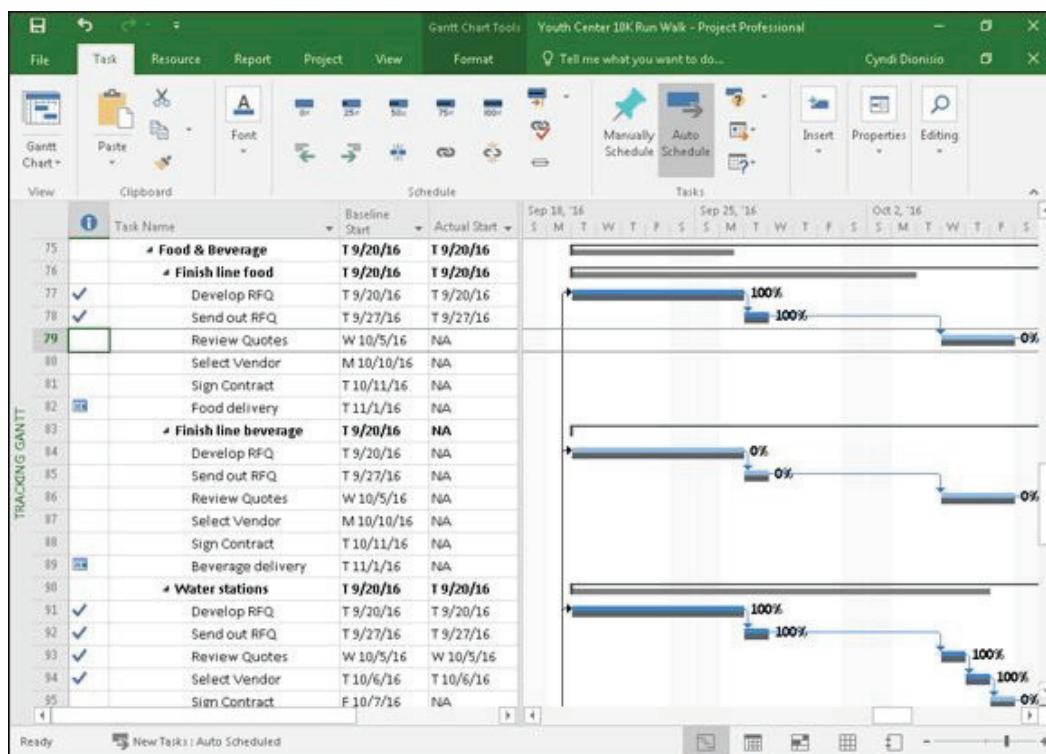


[Figure 16-4:](#) Progress line styles.

# Delving into the Detail

Visual indicators such as taskbars and indicator icons are useful to alert you to delays or variances between estimated and actual performance, but they don't provide detailed information. To get the lowdown on how far ahead (or behind) you are, down to the day or penny, scan the numbers. The numbers that Project provides reveal much about whether you're on schedule and within the budget.

One way to view variances is to show Tracking Gantt view. From the Task tab, go to the View section on the far left side and click the down arrow. Choose Tracking Gantt. This view has, by default, two thin taskbars for each task. The gray bar at the bottom shows the baseline, whereas the top bar shows the current (scheduled) or actual (tracked) schedule. The color of the top bar varies, depending on whether it's a critical task if it's auto-scheduled or a manually scheduled task. As shown in [Figure 16-5](#), in Tracking Gantt view, you can show and tell exactly where a project went off track or picked up steam.



[Figure 16-5:](#) Tracking Gantt view.

Two tables that you can display in Gantt Chart view bring the options into focus. The Cost table and Variance table provide information about dollars spent and variations in timing between baseline and actual activity.



To display a table, choose **View** => **Data Group** => **Tables** and click the table name. Another option is in the Tracking Gantt view, to place the pointer on the blank square immediately above row 1 and to the left of the first column. Then right-click the mouse to display the available tables for easy selection.

In the Cost table shown in [Figure 16-6](#), you can review data that compares baseline estimates to actual costs and the variance between them. These three columns are presented side by side. In the project shown in the figure, you can see the database work came in right on target. The user interface and the payment work packages each had a \$50 variance. By looking at the detail, you can identify the exact activities that caused the variance and how much each activity contributed to the total variance.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
25	# Database	\$0.00	Prorated	\$14,400.00	\$14,400.00	\$0.00	\$14,400.00	\$0.00
26	Collect database requirements	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
27	Design database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
28	Develop database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
29	Test database	\$0.00	Prorated	\$2,600.00	\$2,600.00	\$0.00	\$2,600.00	\$0.00
30	User acceptance	\$0.00	Prorated	\$4,000.00	\$4,000.00	\$0.00	\$4,000.00	\$0.00
31	# User Interface	\$0.00	Prorated	\$10,350.00	\$10,300.00	\$50.00	\$10,350.00	\$0.00
32	Collect user interface requirements	\$0.00	Prorated	\$2,000.00	\$2,000.00	\$0.00	\$2,000.00	\$0.00
33	Design user interface	-\$300.00	Prorated	\$1,600.00	\$1,900.00	-\$300.00	\$1,600.00	\$0.00
34	Develop user interface	\$200.00	Prorated	\$2,200.00	\$2,000.00	\$200.00	\$2,200.00	\$0.00
35	Test user interface	\$150.00	Prorated	\$1,350.00	\$1,200.00	\$150.00	\$1,350.00	\$0.00
36	User acceptance	\$0.00	Prorated	\$3,200.00	\$3,200.00	\$0.00	\$3,200.00	\$0.00
37	# Payment	\$0.00	Prorated	\$5,250.00	\$5,200.00	\$50.00	\$5,250.00	\$0.00
38	Collect payment requirements	\$25.00	Prorated	\$825.00	\$800.00	\$25.00	\$825.00	\$0.00
39	Design payment function	\$0.00	Prorated	\$800.00	\$800.00	\$0.00	\$800.00	\$0.00
40	Develop payment function	\$0.00	Prorated	\$2,000.00	\$2,000.00	\$0.00	\$2,000.00	\$0.00
41	Test payment function	\$25.00	Prorated	\$825.00	\$800.00	\$25.00	\$825.00	\$0.00
42	User acceptance	\$0.00	Prorated	\$800.00	\$800.00	\$0.00	\$800.00	\$0.00
43	# Confirmation	\$0.00	Prorated	\$5,260.00	\$5,260.00	\$0.00	\$5,260.00	\$0.00

[Figure 16-6:](#) Cost table.

For the Cost table, a variance that's positive indicates that you've spent more than expected. A variance that's negative indicates that you're under budget.



Project assumes that the remaining costs will remain at the budgeted amount.

In other words, from the total budgeted amount for the work, it assumes that the remaining work will be completed on budget, and it adds the actual costs to date to produce the total cost. Rarely do future estimates end on budget when the work to date is in a cost-overrun situation, so don't rely on the information in the Total Cost column.

In [Figure 16-7](#), the Variance table shows whether the schedule is on track or has variances (much like the Cost table shows cost variances). The table shows the variance between the start and finish of tasks and the baseline start and finish dates. Notice in the example that the “Define route” task was late by two days, which in turn caused the “Get route approval” task to be delayed as well. Because there is float between the route approval and marking the route, this did not negatively impact the critical path.

Gantt Chart Tools Youth Center 10K Run Walk - Project Professional

Task Mode	Task Name	Start	Finish	Baseline Start	Baseline Finish	Start Var.	Finish Var.
114	Course Logistics	M5/2/16	W11/2/16	T4/28/16	W11/2/16	2 days	0 days
115	Route	M5/2/16	T11/1/16	T4/28/16	T11/1/16	2 days	0 days
116	Define route	M5/2/16	F5/13/16	T4/28/16	W5/11/16	2 days	2 days
117	Get route approval	M5/16/16	F7/15/16	T5/12/16	W7/13/16	2 days	2 days
118	Mark route	T11/1/16	T11/1/16	T11/1/16	T11/1/16	0 days	0 days
119	Signs	T7/14/16	W11/2/16	T7/14/16	W11/2/16	0 days	0 days
120	Identify signage points	T7/14/16	T7/14/16	T7/14/16	T7/14/16	0 days	0 days
121	Post signs	W11/2/16	W11/2/16	W11/2/16	W11/2/16	0 days	0 days
122	Take down signs	T11/1/16	T11/1/16	T11/1/16	T11/1/16	0 days	0 days
123	Parking	T7/14/16	W11/2/16	T7/14/16	W11/2/16	0 days	0 days
124	Identify parking areas	T7/14/16	T7/14/16	T7/14/16	T7/14/16	0 days	0 days
125	Manage parking	W11/2/16	W11/2/16	W11/2/16	W11/2/16	0 days	0 days

**Figure 16-7:** Variance table.



If you created contingency reserve to help handle unexpected delays, the total variance shown in the Variance table tells you how many days you may have to deduct from the contingency duration to get back on track. You can read more in [Chapter 17](#) about making adjustments for delays and cost overruns and about contingency reserve in [Chapter 12](#).

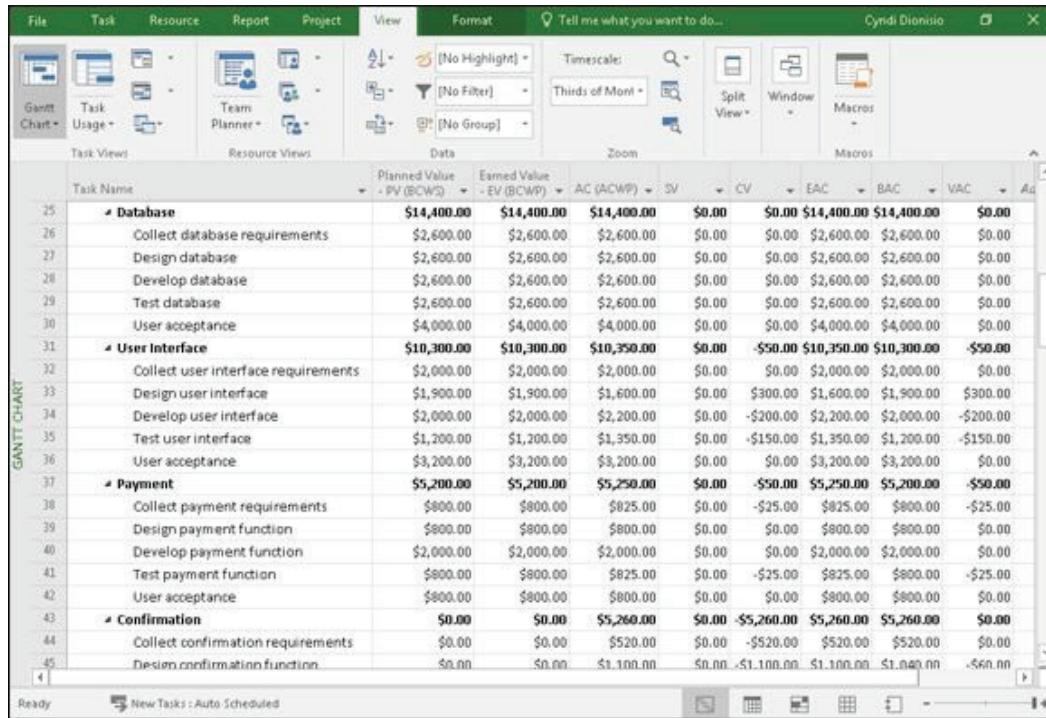
# Tracking Progress Using Earned Value Management

On large projects, especially large government projects, project managers are required to track progress using the earned value management (EVM) method. I won't bore you with a detailed discussion of EVM, but you should become familiar with some of the most common terms and calculations surrounding this concept because many organizations require information on these specific numbers in project reports. Some common terms are defined in this list:

- ✓ **Planned value (PV):** The budgeted (or baseline) cost of tasks based on the cost of resources assigned to the task, plus any fixed costs associated with the tasks, at the point of measurement. In some circles, planned value is also known as the budgeted cost of work scheduled, or BCWS. For example, if you're installing 100 fixtures, the baseline cost to install a fixture is \$100, and you estimate that you can install 5 fixtures per day, the cumulative planned value for Day 3 is \$1,500.
- ✓ **Earned value (EV):** The value of the work you've completed, expressed in dollars. For example, if you've installed only 13 fixtures at the end of Day 3, the earned value is \$1,300. In some circles, earned value is referred to as the budgeted cost of work performed, or BCWP.
- ✓ **Actual cost (AC):** A calculation that includes tracked resource hours or units expended on the task plus fixed costs. In the example, assume that you had to pay overtime to complete some of the work and that the actual costs at the end of Day 3 are \$1,650. AC is also known as actual cost of work performed, or ACWP.
- ✓ **Budget at completion (BAC):** The sum of the planned value. In the example, the BAC of the project is 100 fixtures × \$100, or \$10,000.
- ✓ **Estimate at completion (EAC):** A forecast of the total cost of the project. Project calculates that  $EAC = BAC - EV + AC$ . EVM practitioners cringe at the assumption that future costs will stay on budget. However, Project isn't an EVM tool. If you need to get serious about using EVM, you can buy a plug-in that accurately calculates multiple EACs based on assumptions of future performance.
- ✓ **Variance at completion (VAC):** The difference between the budget at completion (BAC) and the estimate at completion (EAC) is  $VAC = BAC - EAC$ .
- ✓ **Cost variance (CV):** The difference between earned value and actual costs. The equation is  $CV = EV - AC$ . This number is expressed as a negative number if the project is over budget and as a positive number if you're under budget.
- ✓ **Schedule variance (SV):** The difference between earned value and planned value. The equation is  $SV = EV - PV$ . This number is expressed as a negative number if you're accomplishing less work than planned; it's a positive number if you're accomplishing more work than planned. Be aware of saying aloud that you're behind or ahead of schedule. If the work isn't on the critical path, the schedule

performance doesn't necessarily indicate an ahead-of-schedule status or a behind-schedule status.

To see the Earned Value table, as shown in [Figure 16-8](#), select the View tab on the Ribbon, click Tables in the Data group, select More Tables, and choose Earned Value. You can also look at tables that focus only on Earned Value Cost Indicators or Earned Value Schedule Indicators.



The screenshot shows the Microsoft Project application window. The ribbon is visible at the top with tabs like File, Task, Resource, Report, Project, View, Format, and Tell me what you want to do... The View tab is selected. In the Data group, there are buttons for Tables, More Tables, and Filter. The More Tables dropdown is open, showing options like Earned Value, Earned Value Cost Indicators, and Earned Value Schedule Indicators. The main area displays a table titled 'Task Name' with columns for Planned Value, Earned Value, AC (ACWP), SV, CV, EAC, BAC, VAC, and Ad. The table lists tasks categorized under Database, User Interface, Payment, and Confirmation, along with their respective values.

	Task Name	Planned Value	Earned Value	AC (ACWP)	SV	CV	EAC	BAC	VAC	Ad
25	Database	\$14,400.00	\$14,400.00	\$14,400.00	\$0.00	\$0.00	\$14,400.00	\$14,400.00	\$0.00	
26	Collect database requirements	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
27	Design database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
28	Develop database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
29	Test database	\$2,600.00	\$2,600.00	\$2,600.00	\$0.00	\$0.00	\$2,600.00	\$2,600.00	\$0.00	
30	User acceptance	\$4,000.00	\$4,000.00	\$4,000.00	\$0.00	\$0.00	\$4,000.00	\$4,000.00	\$0.00	
31	▪ User Interface	\$10,300.00	\$10,300.00	\$10,350.00	\$0.00	-\$50.00	\$10,350.00	\$10,300.00	-\$50.00	
32	Collect user interface requirements	\$2,000.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$2,000.00	\$0.00	
33	Design user interface	\$1,900.00	\$1,900.00	\$1,600.00	\$0.00	\$300.00	\$1,600.00	\$1,900.00	\$300.00	
34	Develop user interface	\$2,000.00	\$2,000.00	\$2,200.00	\$0.00	-\$200.00	\$2,200.00	\$2,000.00	-\$200.00	
35	Test user interface	\$1,200.00	\$1,200.00	\$1,350.00	\$0.00	-\$150.00	\$1,350.00	\$1,200.00	-\$150.00	
36	User acceptance	\$3,200.00	\$3,200.00	\$3,200.00	\$0.00	\$0.00	\$3,200.00	\$3,200.00	\$0.00	
37	▪ Payment	\$5,200.00	\$5,200.00	\$5,250.00	\$0.00	-\$50.00	\$5,250.00	\$5,200.00	-\$50.00	
38	Collect payment requirements	\$800.00	\$800.00	\$825.00	\$0.00	-\$25.00	\$825.00	\$800.00	-\$25.00	
39	Design payment function	\$800.00	\$800.00	\$800.00	\$0.00	\$0.00	\$800.00	\$800.00	\$0.00	
40	Develop payment function	\$2,000.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$2,000.00	\$0.00	
41	Test payment function	\$800.00	\$800.00	\$825.00	\$0.00	-\$25.00	\$825.00	\$800.00	-\$25.00	
42	User acceptance	\$800.00	\$800.00	\$800.00	\$0.00	\$0.00	\$800.00	\$800.00	\$0.00	
43	▪ Confirmation	\$0.00	\$0.00	\$5,260.00	\$0.00	-\$5,260.00	\$5,260.00	\$5,260.00	\$0.00	
44	Collect confirmation requirements	\$0.00	\$0.00	\$520.00	\$0.00	-\$520.00	\$520.00	\$520.00	\$0.00	
45	Design confirmation function	\$0.00	\$0.00	\$1,100.00	\$0.00	-\$1,100.00	\$1,100.00	\$1,100.00	-\$1,100.00	

[Figure 16-8:](#) Earned value table.

# **Calculating Behind the Scenes**

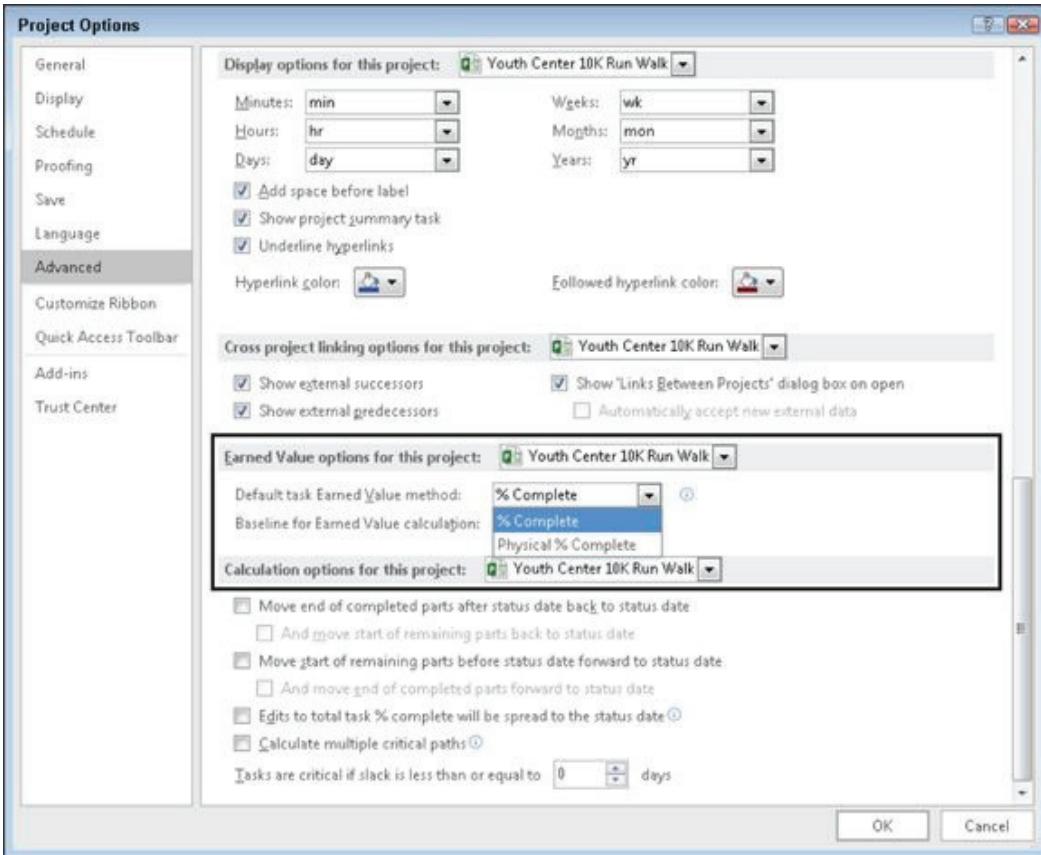
While you're happily entering resource hours and fixed costs into the project, Project is busy making calculations that can shift around task timing and resource workload in the plan. These calculations relate to how tasks are updated, how the critical path is determined, and how earned value is calculated. If you're a control freak, you'll be happy to know that you can, to some extent, control how Project goes about making these calculations.



To change when Project calculates plan updates, select the File tab on the Ribbon, click the Options button to open the Project Options dialog box, and then examine the Schedule category. Scroll to the bottom until you see a section called Calculation Options for This Project. If you turn off the Calculate Project After Each Edit setting, you must click the Calculate Project button in the Schedule group on the Project tab of the Ribbon whenever you want Project to perform all its calculations. You can also choose to set different modes for only the current project or for all open projects.

## ***Earned-value options***

As I mention earlier in this chapter, usually only large projects use earned value management. To find the settings to customize how earned value works in the project, select the File tab, click the Options button, and select Advanced. Scroll down until you see Earned Value Options for This Project. [Figure 16-9](#) shows you the two sample settings for calculating earned value.



**Figure 16-9:** Two settings to calculate earned value.

The Default Task Earned Value Method setting provides these two choices:

- ✓ **% Complete:** This setting calculates earned value using the percent complete that you record on each task. The setting assumes that, on a task that's halfway complete, half the work hours have been used.
- ✓ **Physical % Complete:** Use this setting if you want to manually enter a percentage of completion not based on a straight percent-complete calculation. For example, if you have a four-week task to complete a mail survey, 50 percent of the effort may happen in the first 25 percent of the duration of the project: Design, print, and mail the survey. Nothing happens for two weeks while you wait for responses and then you see a flurry of activity when the responses are returned to you. So a straight calculation that 50 percent of the task is completed 50 percent of the way through isn't accurate. If your projects have a lot of tasks of this type, you may consider changing the settings to use this method. Then you can display the Physical % Complete column in the Gantt Chart sheet and enter more accurate (in your opinion) percent-complete information for each task.

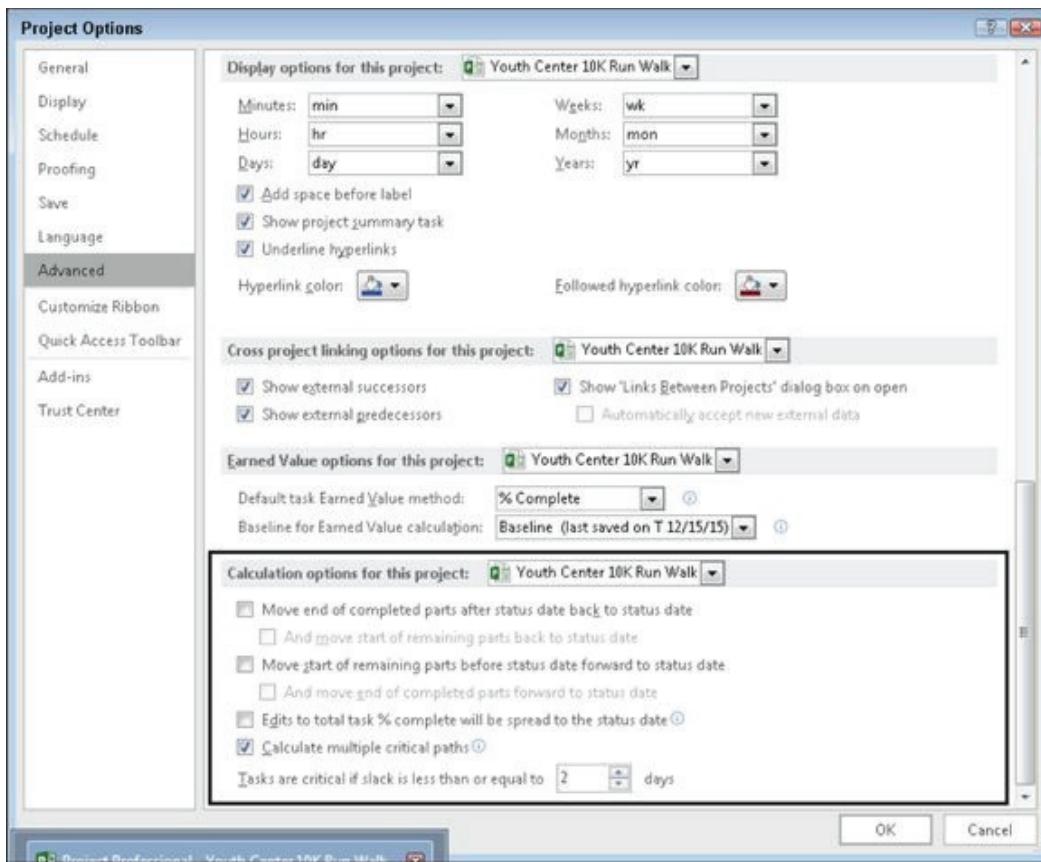
The second setting in the earned-value options in the Project section of the Project Options dialog box is the Baseline for Earned Value Calculation drop-down list. The baseline you use to calculate earned value is essentially setting the planned value for the project. If you're using multiple baselines — such as one for reporting and one for managing — pay close attention to the baseline against which you choose to measure the earned value. Choose any of the 11 possible baselines you may have saved in the

project. After you make these two choices, click OK to close the Project Options dialog box.

## An abundance of critical paths

While I'm talking about the Project Options box, let's take a quick look at some options for calculating the critical path. Three settings in the Project Options dialog box concern critical path calculations. If following one project's critical path is too tame for you, start reviewing multiple critical paths. In Options ⇒ Advanced, the very bottom section is Calculation Options for This Project (see [Figure 16-10](#)). By selecting the Calculate Multiple Critical Paths check box you set up Project to calculate a different critical path for each set of tasks in the project. Doing so can be helpful if you want to identify tasks that, if delayed, will cause you to miss the final project deadline or the goals of a single phase in the project.

You can establish which factors add a task to the critical path, by specifying the number of days of slack the critical tasks may have. Tasks with no slack are, by default, on the critical path. However, you can change this situation if you want to be alerted that tasks with only one day of slack are critical — figuring that one day isn't much padding and that these tasks are still in jeopardy. The setting labeled Tasks Are Critical If Slack Is Less Than or Equal to (x) Days is immediately beneath the Calculate Multiple Critical Paths check box in the Advanced category.



**Figure 16-10:** Selecting multiple critical paths.

Finally, in Options ⇒ Schedule, the Inserted Projects Are Calculated Like Summary

Tasks is straightforward. If you insert another project as a task in the project, selecting this setting allows Project to calculate one critical path for the entire project. If you don't select it, any projects that you insert are treated as outsiders — that is, they aren't considered in the master project's critical-path calculations. If an inserted project won't affect the project's timing, you may deselect this option.

# You're Behind — Now What?

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## *In This Chapter*

- ▶ Analyzing plan versions and notes to understand what went wrong
  - ▶ Experimenting with what-if scenarios
  - ▶ Benefitting from more time or more people
  - ▶ Adjusting the timing going forward
- 

Let's face it: A project rarely proceeds as planned. Every project has issues (situations that must be handled before the project can move forward) and risks (uncertain events that can prevent a project objective from being met). Issues and risks either crop up suddenly or barrel down on you like a freight train coming down the track. Regardless of whether you see risks approaching, at some point you may feel that the floor has dropped out from under you. One day the project is doing just fine, and the next day it's \$75,000 over budget. Or it appears that you'll miss the drop-dead finish date by two weeks. All the aspirin in the world won't solve this one.

The first step is to find the cause and then fix it so that you can move forward and try to save the project. To try to save the day when the project rolls off the track you will need to analyze the options and make tough choices. Project can help you analyze possible solutions and anticipate the likely results. After you decide what to do, you will update Project to reflect the solutions.

# Using Project with Risk and Issue Logs

You can proactively document problems on the project in a number of ways, especially if you create and maintain an issue log and a risk register on the project. In [Chapter 12](#), I describe how to handle risk, assign contingency reserve, and update the project schedule to include the work, resources, time, and funding necessary to implement risk responses.

An *issue* is a situation that you have to deal with before you can move forward, such as a risk that develops, a decision that has to be made, or an uncooperative stakeholder. Whatever the case, you should record issues in an *issue log* so that you can assign accountability for managing and resolving them in a timely manner.

You can also use Project to run what-if scenarios and develop alternative approaches for responding to issues or risks. You may have developed multiple baselines (described in [Chapter 14](#)) to account for various outcomes. It is a good practice to record task notes for those tasks affected by a risk or an issue. (Information on task notes is in [Chapter 3](#).) Storing interim plans, multiple baselines, and task notes in Project helps you more easily explain messy situations to the powers that be.

## Printing interim plans and baselines

Interim plans and multiple baselines demonstrate how you've made adjustments for risks or issues. Using these two items indicates that you were attuned to potential problems. You should also update the boss and other stakeholders by generating printouts or reports reflecting potential major issues and risks. I talk more about reports in [Chapter 18](#).



A *baseline* saves pertinent project data, including start and finish dates, duration, work, and cost; an *interim plan* saves only the start and finish dates of tasks in the project. [Chapter 14](#) describes interim plans and baselines in depth.

To view multiple baselines, follow these steps:

1. **Click the Task tab. In the View section, click the down arrow for a list of Views.**
2. **At the bottom of the list, choose More Views.**
3. **In the More Views dialog box, select Multiple Baselines Gantt.**
4. **Click Apply.**

Multiple Baselines Gantt view shows the original Baseline, Baseline 1, and Baseline 2. To customize what you see by including baselines and interim plans in whichever way you want to see them, follow these steps:

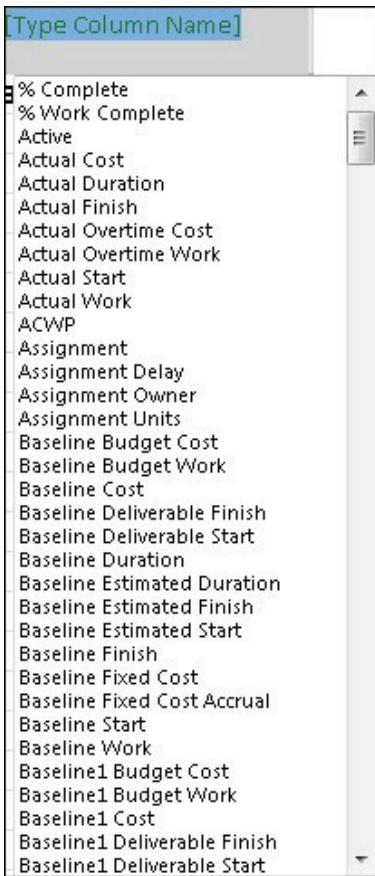
1. **Display Task Sheet view.**
2. **Scroll the sheet pane to the right and click the Add New Column column heading.**

The menu listing available fields appears, as shown in [Figure 17-1](#).

3. **Scroll down and click the field to insert.**

For example, you may choose Start 1–10 and Finish 1–10 for any interim plan (or choose Baseline through Baseline 10 for baseline data).

4. **If necessary, repeat Steps 2 and 3 to display additional columns.**



[Figure 17-1:](#) Adding new columns.

## Printing task notes

In addition to printing interim plans and baselines, you can print task notes. They should include information about risk and issues such as vendor problems or late deliveries.

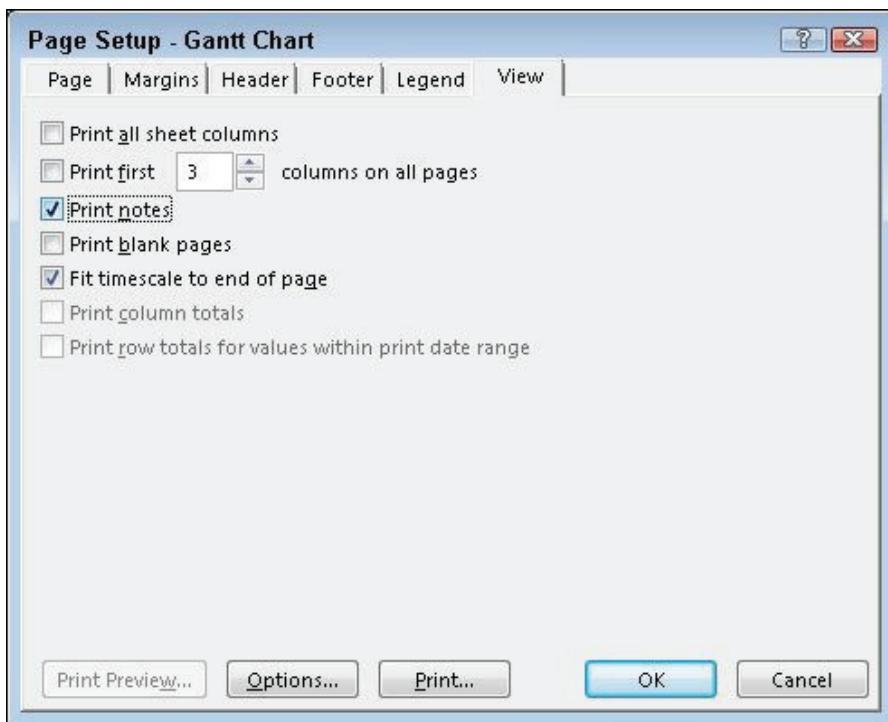


To add a note to a task, either display the Notes column in a task sheet pane or double-click a task and add the note on the Notes tab of the Task Information dialog box.

Project doesn't let you print a single note or only the notes; you have to print the entire

project and include the notes. To print task notes, follow these steps:

1. **Click the File tab.**
2. **Click Print.**
3. **Click the Page Setup link.**  
A dialog box appears.
4. **Select the View tab.**
5. **Check the Print Notes check box.**
6. **Click OK to save your changes.**
7. **Click Print.**



**Figure 17-2:** Printing notes.

When a note is associated with a task, a Note icon appears in the leftmost column of the schedule. You can hover the mouse on the icon to show the note content. If the information in the note is explained in greater detail in another project document — such as a risk register, an issue log, or a specification document — you can use the note to indicate where to find the detailed information. The note then serves as an indicator of additional relevant information about that task.

# What-If Scenarios

Just as you can be too close to a problem to see its solution, you can be too close to the project to recognize what you need to do. Using the filtering and sorting features in Project, though, you can slice and dice various aspects of the project somewhat differently to see a fresh perspective.

You can also use tools, such as resource leveling, to solve resource conflicts. Resource leveling may not always solve problems to your satisfaction, but it's a good way to let Project show you a what-if scenario that may solve resource problems instantly.



See [Chapter 12](#) for more information about how to use resource leveling.

## Sorting tasks

Sometimes when the project isn't going as planned, it's time to sort tasks. In Project, you can sort tasks by several criteria, including start date, finish date, priority, and cost.

To determine how sorting can help you, consider these examples:

- ✓ **To cut costs:** When you sort tasks by cost, you can focus on the most expensive tasks first, to see whether you have room to trim useful-but-pricey items.
- ✓ **To review task timing:** When you sort by duration in descending order, you can see the longest tasks first.

To apply a preset sorting order, simply choose View ⇒ Data Group ⇒ Sort and then choose an option from the submenu, such as By Start Date or By Cost. The sort button has an A over a Z with a down arrow next to it.

If you want to see additional sort criteria or to sort by more than one criterion, follow these steps:

1. **Choose View ⇒ Sort ⇒ Sort By.**

The Sort dialog box appears, as shown in [Figure 17-3](#). You can use it to sort by as many as three criteria in ascending or descending order. The Then By field is empty without a value selected.

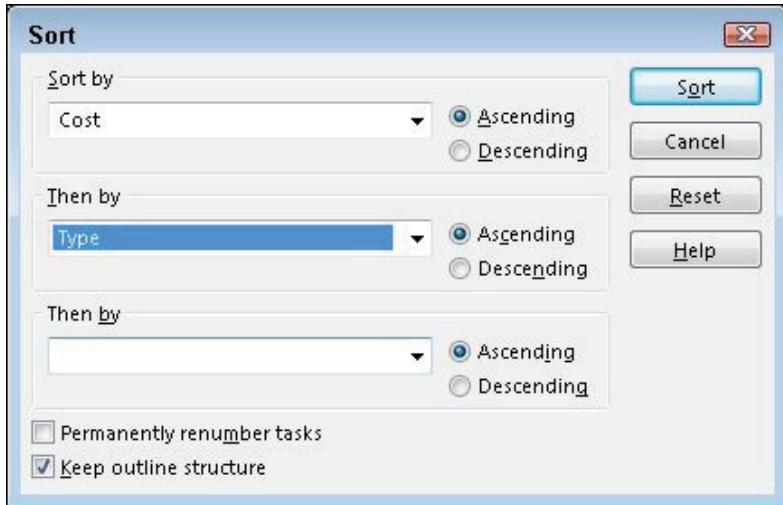
2. **In the Sort By list, select a criterion.**
3. **Select either Ascending (to sort from lowest to highest) or Descending (to sort from highest to lowest).**

In a date field, the sorting order is from soonest to latest and from latest to soonest, respectively; in a text field, alphabetical is the order.

4. **(Optional) If you want a second criterion, select the first Then By check box and make a selection.**

For example, if you choose to sort first by cost and then by type, tasks are sorted from least expensive to most expensive and then (within each cost level) by type (Fixed Duration, Fixed Units, and Fixed Work).

5. **(Optional) If you want to add a third criterion, select the second Then By check box and make a selection.**
6. **Click the Sort button.**



**Figure 17-3:** Choosing criteria for sorting.

To return to the original task order, choose View ⇒ Sort ⇒ By ID. Tasks are now back in *task ID number* order, which is the standard sorting criterion in Project.

## Filtering

Filtering, as described in [Chapter 11](#), is a good way to focus on the areas of the project that are at risk. Especially in larger projects, where it can be difficult to scan hundreds of tasks and notice which ones are running late or over budget, filters can home in on exactly where the trouble lies. Filters are on the View tab, in the Data group.



You can choose to remove from the display any tasks that don't meet filter criteria, or you can simply highlight tasks that meet the criteria onscreen.

[Table 17-1](#) lists filters that are useful when you're trying to identify and solve problems with the schedule.

### Table 17-1 Filters That Isolate Problems

Filter Name	What It Displays
<i>Task Filters</i>	
Critical	Tasks that must be completed according to schedule to meet the final deadline (the critical path)
Cost Overbudget	Tasks that exceed budgeted expenditures
Incomplete Tasks	Tasks that haven't been marked as complete

Late/Overbudget Tasks Assigned To	Tasks assigned to a resource you specify that exceed their baseline estimates and are over budget
Should Start By	Tasks that should have started as of a specified date
Slipped/Late Progress	Tasks that are running late and have no progress recorded
<i>Resource Filters</i>	
Overallocated Resources	Tasks with resources assigned that are overbooked at some point during the life of the task
Slipping Assignments	Tasks involving resource work that should have already begun
Work Incomplete	Tasks whose work should have been recorded already
Work Overbudget	The number of work hours that have exceeded the original estimate



You may not see all these choices in the More Filters dialog box; when you click View and, in the Data group, click Filter and then click More Filters to open it, you have to enable the Task option to see task-related filters and enable the Resource option to see resource-related filters.



You can export Project information to a program such as Excel so that you can use analysis tools, such as pivot tables. If this idea excites you, check out *Excel 2016 For Dummies*, by Greg Harvey. The Save As Type drop-down list at the bottom of the Project Save As dialog box enables you to choose the export format.

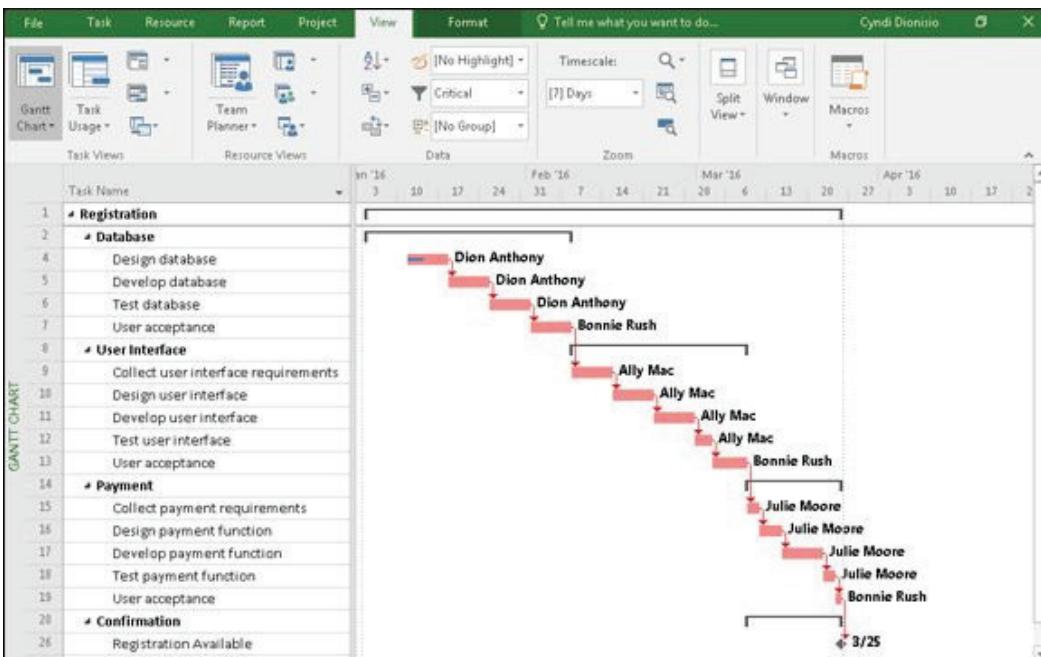
## Examining the critical path

One useful filter in Project is named Critical; it displays or highlights all tasks that are on the critical path. If you’re running late, knowing which tasks can’t slip helps you identify areas that have no room for delay — and, conversely, areas where you can delay noncritical tasks and still meet the deadline. You may use the Critical filter to help determine how to free overallocated resources or get a task that’s running late back on track.

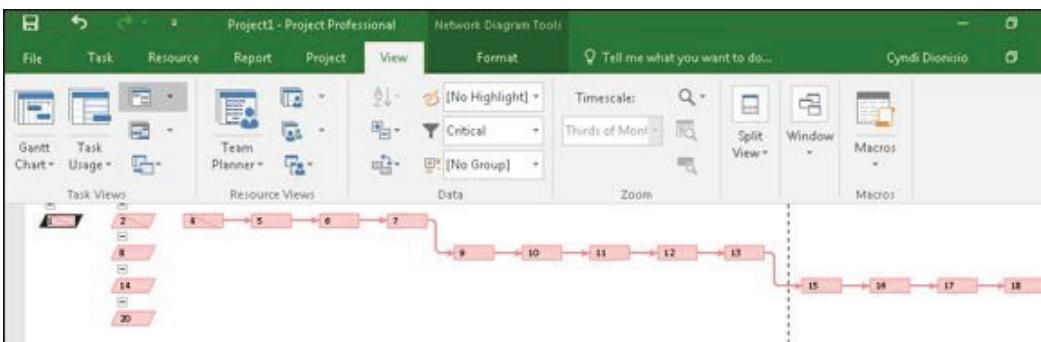


Ensure that the Gantt chart shows the Gantt bars for critical tasks in red. To do so, make sure you’re in the Gantt chart view; then select the Gantt Chart Tools Format tab on the Ribbon and ensure that the Critical Tasks option is selected in the Bar Styles group.

You can look at the critical path in any Gantt Chart or Network Diagram view. [Figure 17-4](#) shows Gantt Chart view of a project sorted for the critical path. [Figure 17-5](#) shows Network Diagram view (with the boxes collapsed) with the same filter applied.



**Figure 17-4:** Gantt Chart sorted for the critical path.



**Figure 17-5:** Network Diagram view of the critical path.

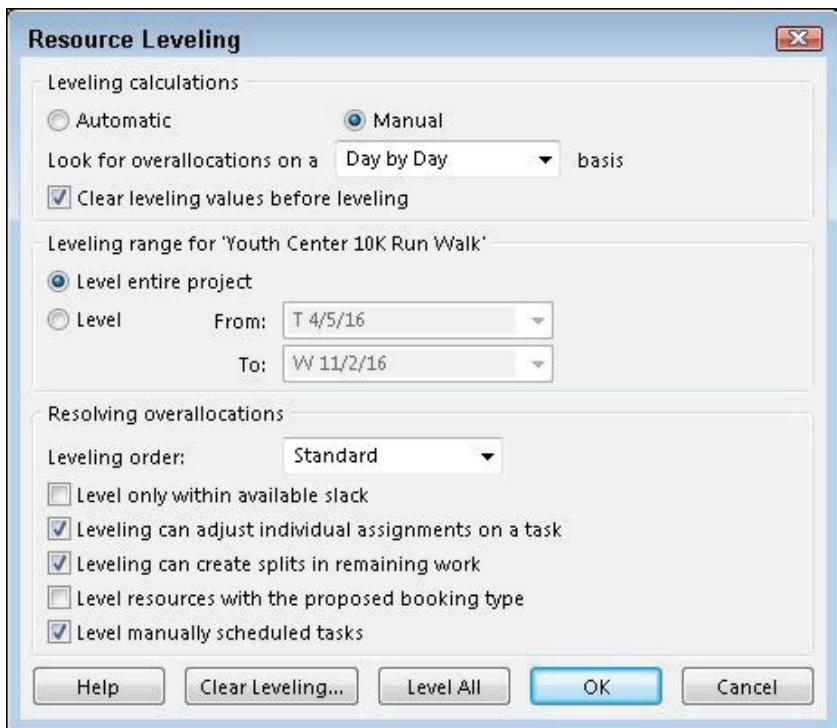


If you need a closer look at task timing, modify the timescale display to use smaller increments, such as days or hours. To do so, right-click the timescale itself and then choose Timescale, or click View and then, in the Zoom group, click the Zoom drop-down arrow, and select Zoom In.

## Using resource leveling (again)

If you use manual resource leveling early in the project to solve resource conflicts prior to baselining, try it again to help you when you need to update the schedule. With changes to tasks and tracked activity, resource leveling may uncover new options to solve conflicts.

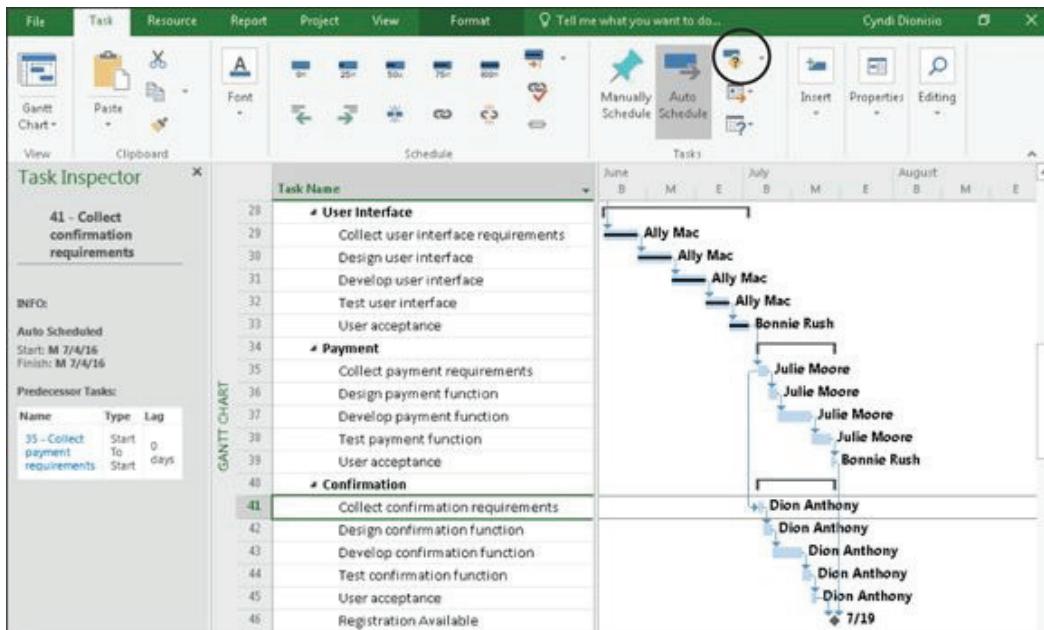
If resource leveling is set to Automatic, Project automatically performs this calculation every time you modify the schedule. To see whether the option is set to Automatic or Manual, choose Resource => Leveling Options to open the Resource Leveling dialog box, as shown in [Figure 17-6](#). If the Manual radio button is selected, close the dialog box and click Level All in the Leveling group to run resource leveling.



**Figure 17-6:** Resource-leveling controls.

## Determining which factors are driving the timing of a task

You can use the Task Inspector feature to determine what's causing tasks to occur in a certain time frame, such as dependencies, task calendars, or task constraints. You simply select a task and then, on the Task tab, click the Task Inspector button in the Tasks group. A pane then lists all factors that affect the timing of that task. [Figure 17-7](#) shows an example of the Select Vendor task for the Finish Line Food work package. In this figure, the Task Inspector button is circled on the taskbar.



**Figure 17-7:** Task Inspector.

By using this feature (read more about it in [Chapter 11](#)), you can determine whether a task that you want to take place earlier can do so if you remove a dependency or constraint that's affecting it. For example, early in the planning phase, you may have believed that collecting payment requirements could start only after the user interface is complete, but now you realize that it can start *while* the user interface is being developed. By understanding what's driving the timing of the task, you can better search for a solution if that timing is causing problems.

# **How Adding People or Time Affects the Project**

Human nature in a corporate environment often causes people to want to throw money and people at projects. In certain cases, that instinct is on target; however, you aren't always able to draw on an endless supply of resources or time. For this reason, you may have to experiment with a combination of options that involve time and resources.

## ***Hurrying up and making modifications***

Saving time in Project requires that a task be completed earlier than scheduled or that the timing of the task be adjusted to use up slack. You're likely to find that making this adjustment is similar to trying to solve an intricate puzzle: Correct one piece, and another one begins causing aggravation.

To accomplish work faster, you have these two options:

- ✓ **Find more resources to help with tasks that are auto-scheduled.** Adding people requires money, so even the schedule gets back on track, it will cost you.
- ✓ **Modify the scope of tasks.** This strategy may have an effect on the task quality. If you make two inspections rather than three or you shorten the QA cycle by a week, you may run the risk of causing problems down the road.

Changing the timing of tasks and shifting dependencies uses up slack to make up for delays, but it may leave you with no wiggle room. The next time a problem crops up, you'll be up against the wall with no slack.

In reality, combining small modifications for both time and money can often help save the day.

## ***Throwing people at the problem***

When auto-scheduled tasks are effort-driven, tasks are accomplished when the specified amount of effort is expended. A task with a duration of three days and based on the Standard calendar, for example, requires three days × eight hours per day to complete (a total of 24 hours of effort). One resource performing this task and working full time takes three days to complete it; three resources working full time take one day to complete the 24 hours of work. When you add resources to a task in this way, Project automatically recalculates its duration.



If you want Project to reduce the duration of a task when you assign more work resources to it, the task must be auto-scheduled, and effort-driven scheduling must be turned on.

## ***Changing how resources are assigned***

Beyond simply adding resources to a task, you can modify existing assignments. On any given project, you may have dozens (or even hundreds) of resources working on tasks. All these people are working according to their working calendars, the percentage of resource time assigned to particular tasks, and their ability to do the job. Take a look at how folks were assigned to begin with to see whether you can save time or money by modifying those assignments.

You can modify assignments in several ways:

- ✓ If someone is working at, say, only 50 percent capacity on a task, consider increasing the person's assignment units.
- ✓ If a resource is available who can perform a given task more quickly, switch resources on the task and shorten its duration. Remember that the new Team Planner view can be helpful when making this type of switch.
- ✓ Have certain resources work overtime or let them be overbooked at various points during the project. You may have modified an overbooked resource's assignments earlier to eliminate a conflict, but now you find that you have no choice other than to have the resource work an occasional 10- or 12-hour day.

## ***Calculating the consequences of schedule modifications***

Before you get carried away from making changes to resources, stop and think: Adding resources to effort-driven, auto-scheduled tasks can shrink the task and help the project get back on track. However, depending on the resources' hourly rates, this approach may cost more.

Assigning three people to work on a task doesn't necessarily shrink the duration of the task geometrically. That's because those people have to coordinate their efforts, hold meetings, and spend more time communicating than they would if they were working on the task alone. If you add resources, Project shrinks the task geometrically: Consider adding a little time to the task to accommodate the inefficiencies of multiple resources.

Another concern about adding resources to tasks is that it may cause more resource conflicts, with people who are already busy being overbooked on too many tasks that happen in the same time frame. If you have the resources, and they have the skills and the time, though, beefing up the workforce is definitely one way to perform certain tasks more quickly.



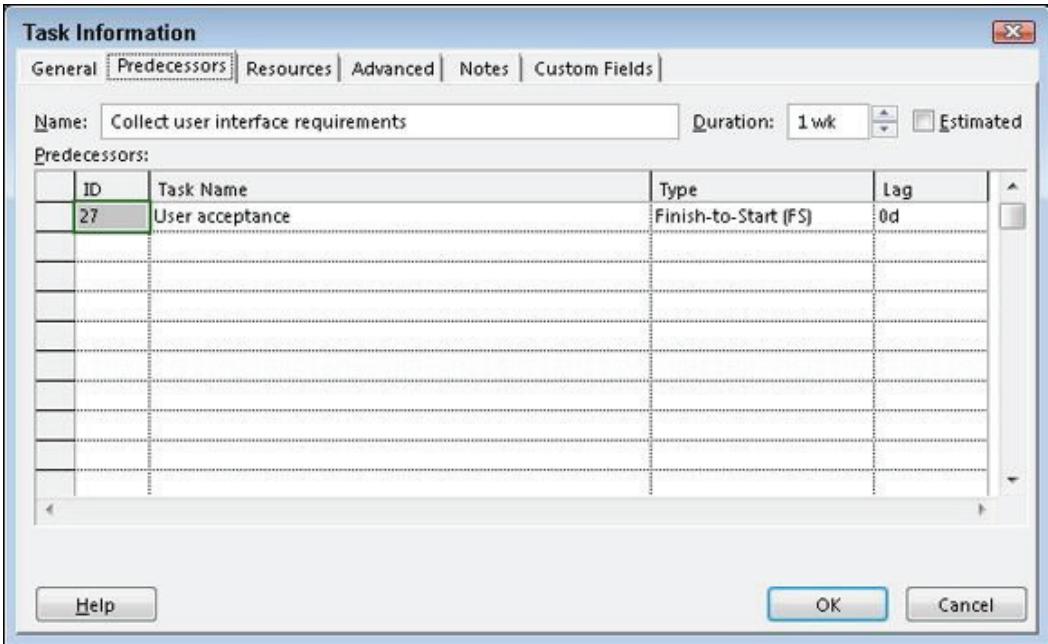
To add resources to a task, you can use the Resources tab in the Task Information dialog box, or choose the task and click the Assign Resources button in the Assignments group on the Resource tab of the Ribbon.

## ***Shifting dependencies and task timing***

Time is a project manager's greatest enemy. There's never enough time, and the time you have is eaten up quickly.

Follow these suggestions to modify task timing and save time:

- ✓ **Delete a task.** You heard me. If a task represents a step that can be skipped and no actual work for it is tracked, simply delete the task. It doesn't happen often, but sometimes — after you rethink the project — you realize that a few actions are unnecessary or have already been handled by someone else. You also can mark the task as inactive.
- ✓ **Adjust dependencies.** Perhaps the revision of the manual can start a few days before *all* the feedback is returned. Or perhaps the electrical and plumbing chores can take place at the same time rather than one after the other (assuming that the electrician and the plumber can stay out of each other's way). Use the Predecessors tab in the Task Information dialog box, shown in [Figure 17-8](#), to modify dependencies. In the Lag column, you can enter a negative number to allow tasks to overlap.
- ✓ **Modify constraints.** Perhaps you've set a task to start no earlier than the first of the year because you don't want to spend money on it until the new fiscal year budget kicks in. To save time, consider whether you can allow it to start a week before the end of the year and bill the costs in January. Examine any constraint of this type — especially those created to verify the timing logic.
- ✓ **Verify external dependencies.** If you've created an external link to a task in another project and set dependencies with tasks in the project, see whether the other project manager can speed up certain tasks. Or if the timing relationship isn't absolutely critical, delete the link to the other project. It may be slowing you down more than you realize.
- ✓ **Change the scheduling method or move the task.** Remember that Project usually cannot automatically reschedule a task based on dependency changes if the task is manually scheduled. You can either change the task to be auto-scheduled by using the Auto Schedule button in the Tasks group on the Task tab of the Ribbon, or you can select a manually scheduled task and then click the Respect Links button in the Schedule group on the Task tab to move it to its proper time frame. Or you can use the Move drop-down list on the Task tab to reschedule a task to a particular earlier or future time slot, or to one when resources are available.



**Figure 17-8:** Modifying task dependencies and applying lag.



If you've set resource leveling to Automatic, Project may have delayed certain tasks until overbooked resources are freed up. On the Resource tab, click the Leveling Options button in the Level group and change the setting to Manual.

# **When All Else Fails**

Okay. You've monkeyed with resource assignments and shifted around task dependencies to save time, and you've deleted tasks and assigned less expensive resources to save money. Still, it's not enough. In this scenario, you have to say to the boss, "You can have it on time, you can have it on budget, or you can have quality work. Choose two."



If the boss throws money at you, add resources to tasks, as discussed in the earlier section "[Throwing people at the problem](#)." But keep in mind that not all tasks are effort driven. Some tasks aren't shortened by adding resources.

## ***Taking the time you need***

If the boss is willing to give you more time, grab it. However, when you do, you have to update the project a few ways:

- ✓ **Modify task durations.** Add time to tasks that are running late. In Project, you do this by increasing their durations or moving out their start dates.
- ✓ **Review task constraints.** If you've specified that certain tasks can finish no later than a certain date, but now you're extending the project finish date three months, you may be able to remove or adjust those original constraints accordingly.
- ✓ **Add to the contingency reserve.** If you have a contingency reserve task, you can simply add to its duration, giving more waffle room to all other tasks. (See [Chapter 12](#) for more about contingency reserve.)

After you insert the extra time, you should make sure that the new timing of tasks doesn't cause new resource conflicts by looking at Resource Graph view and then reset the baseline to reflect the new schedule. To reset a baseline, select the Project tab and then Set Baseline ⇒ Set Baseline. Choose Baseline 1–10 in the Save Baseline dialog box to save to a different baseline and preserve the original. Click OK after choosing a baseline.



Inform team members of the new timing and provide them an updated version of the plan.

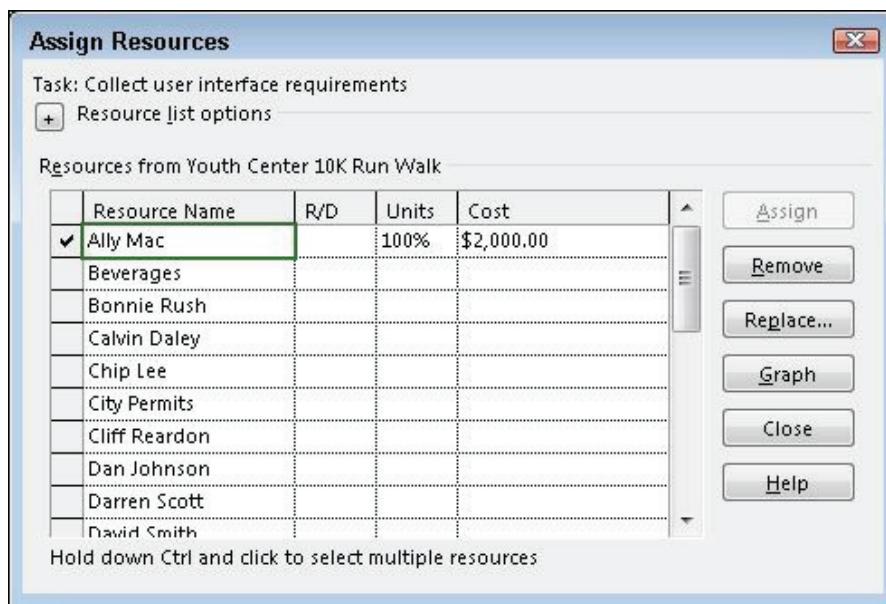
## ***Finding ways to cut corners***

If your manager tells you to cut some corners that sacrifice quality, you have license to modify the quality of the deliverables. You can eliminate tasks that may ensure higher quality, such as a final proofreading of the employee manual. You can hire less-experienced and less-expensive workers, for example, and you can use cheaper paper

or computer equipment.

To cut corners in Project, you have to

- ✓ **Take fewer steps:** Delete tasks. Click the ID of the task in Gantt Chart view, and click Delete. You also can mark the task as Inactive. (Review any dependencies that were broken because you deleted tasks!)
- ✓ **Use less-expensive resources:** Delete one set of resource assignments, and assign other resources to tasks in the Assign Resources dialog box.
- ✓ **Use less-expensive materials:** Change the unit price of material resources you've created in Resource Sheet view. Or shop around for better pricing on items that are set up as cost resources, and enter the lower prices of tasks to which you've assigned those resources by using the Cost column in the Assign Resources dialog box, as shown in [Figure 17-9](#). To get to the Assign Resources dialog box, right-click a task or a resource. From the right-click drop-down menu choose Assign Resources.



[Figure 17-9:](#) Modifying the resource cost.

You can also take a more sweeping approach: Simply redefine the goal of the project. If the goal were to launch a new product line, perhaps you can modify the goal to simply manage the design of the new product and then leave the launch to a later date or another project manager. If you were supposed to produce 10,000 widgets, see whether the company can make do with 7,500. To make this type of change, you may have to slice and dice entire phases of the project — or even start from scratch and build a new plan.



Save the revised project schedule with a new name to provide a head start on the revised project schedule. Clear the baseline (from the Project tab, choose Project => Set Baseline => Clear Baseline, click OK), make modifications, and then

save a new baseline.

## Aplicație

Să considerăm un proiect care durează 18 săptămâni iar costurile planificate ale proiectului, pe fiecare săptămână, sunt prezentate în figura 1. Activitățile sunt deja introduse în proiectul *Cost analysis.mpp*.

*Notă: Datele au fost preluate din următoarea sursă: Helsinki University of Technology,  
[https://noppa.tkk.fi/noppa/kurssi/tu-22.1120/materiaali/the\\_second\\_exercise\\_of\\_the\\_english\\_course\\_version.pdf](https://noppa.tkk.fi/noppa/kurssi/tu-22.1120/materiaali/the_second_exercise_of_the_english_course_version.pdf)*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Decisions about the structure	2500																	
Hardware design and spesifications		4200	3500	2300														
Software design and specifications	1500	6500	2800	2000														
tuotantolinjan määritykset			1300															
Purchasing of the components			300	19000														
Documenting			4300	8000	2000										3400			
Prototype				5000	4100	3500	3300											
System evaluation					2200	800												
Assembly						2000	2000	2000	3500	3000	300							
Administrational costs	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
Other costs	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
<b>TOTAL</b>	<b>5900</b>	<b>8400</b>	<b>4700</b>	<b>3900</b>	<b>6100</b>	<b>6700</b>	<b>8800</b>	<b>28900</b>	<b>8900</b>	<b>6000</b>	<b>5400</b>	<b>5200</b>	<b>6100</b>	<b>4700</b>	<b>3900</b>	<b>8800</b>	<b>4900</b>	<b>2200</b>

**Figura 1. Bugetul planificat**

După urmărirea proiectului timp de 9 săptămâni situația este aceea din figurile 2 și 3. În fiecare săptămână, proiectul a costat sumele din figura 2, iar activitățile au avut gradul de completare din figura 3.

	1	2	3	4	5	6	7	8	9
Decisions about the structure	2500	500							
Hardware design and spesifications			4200	4000	2700				
Software design and specifications	1500	6500	2800	2000					
tuotantolinjan määritykset				1500					
Purchasing of the components					100	700	25000		
Documenting						4300	8000	2000	
Prototype							5000		
System evaluation									
Assembly									
Administrational costs	1400	1400	1400	1400	1400	1600	1600	1600	1600
Other costs									1350
<b>TOTAL</b>	<b>5400</b>	<b>8400</b>	<b>4200</b>	<b>3400</b>	<b>5600</b>	<b>7100</b>	<b>8700</b>	<b>10300</b>	<b>34950</b>

**Figura 2. Costurile efective**

	1	2	3	4	5	6	7	8	9
Decisions about the structure	85 %	100 %							
Hardware design and spesifications			40 %	75 %	100 %				
Software design and specifications	12 %	63 %	85 %	100 %					
tuotantolinjan määritykset				100 %					
Purchasing of the components					2 %	12 %	100 %		
Documenting						24 %	69 %	80 %	
Prototype							20 %		
System evaluation									
Assembly									
Administrational costs	6 %	12 %	18 %	24 %	30 %	36 %	42 %	48 %	54 %
Other costs									15 %

**Figura 3. Gradul de completare a activităților**

Realizați un grafic al modului de realizare al proiectului pe cele 9 săptămâni, considerând următoarele câmpuri ale valorii dobândite:

- *BCWS*: cât ar fi trebuit realizat din proiect
- *BCWP*: valoarea a ceea ce s-a făcut
- *ACWP*: cât s-a cheltuit

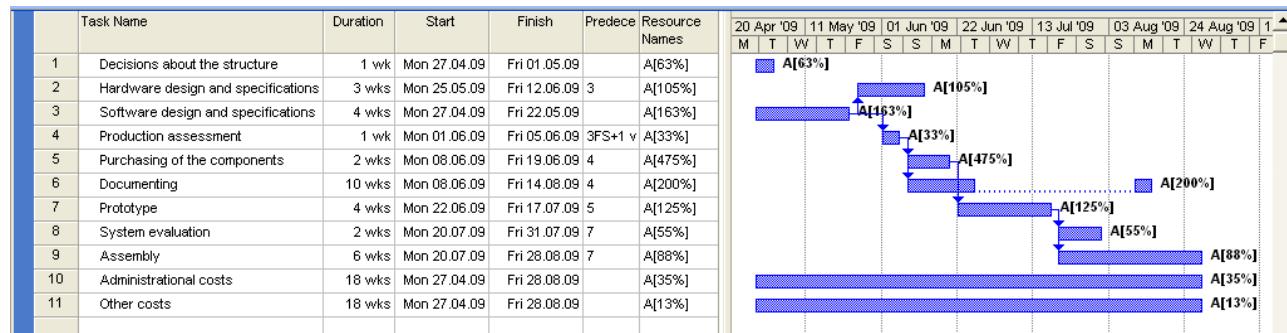
Opțional, se pot reprezenta și următoarele câmpuri:

- $CV = BCWP - ACWP$
- $SV = BCWP - BCWS$
- $CPI = BCWP / ACWP$

*Indicații:*

- Pentru simplitate, se poate introduce o singură resursă generică, cu un cost fix, de exemplu 100 de unități/oră, care să fie atribuită la toate activitățile. Costurile pe săptămână (din figurile 1 și 2) vor rezulta din atribuirea unui volum diferit de muncă la fiecare activitate pe săptămână, de exemplu stabilirea numărului de ore pe săptămână în tabelul *Resource Usage*. În funcție de rezoluția ecranului, se poate face zoom pe 45 de zile ca să apară orele pe săptămână. Disponibilitatea resursei trebuie să fie cuprinsătoare, adică mai mare de 100%, pentru a nu apărea probleme legate de orele suplimentare. Activitățile trebuie marcate *Fixed Duration* pentru a nu se modifica graficul de lucru atunci când se schimbă numărul de ore alocate.

Resource Name	Work	Details	May '09							Jun '09						
			27	04	11	18	25	01	08	15	22	29	06	13	20	27
1 A	1,295 hrs		59h	84h	47h	39h	61h	67h	86h	42h	35h	23h	13h	43h	14h	14h
Decisions about the structure	25 hrs	Work	25h													
Hardware design and specifications	100 hrs	Work														
Software design and specifications	128 hrs	Work	15h	65h	20h	20h										
Production assessment	13 hrs	Work														
Purchasing of the components	193 hrs	Work														
Documenting	177 hrs	Work														
Prototype	159 hrs	Work														
System evaluation	30 hrs	Work														
Assembly	128 hrs	Work														
Administrational costs	252 hrs	Work	14h	14h	14h	14h	14h	14h	14h							
Other costs	90 hrs	Work	5h	5h	5h	5h	5h	5h	5h							

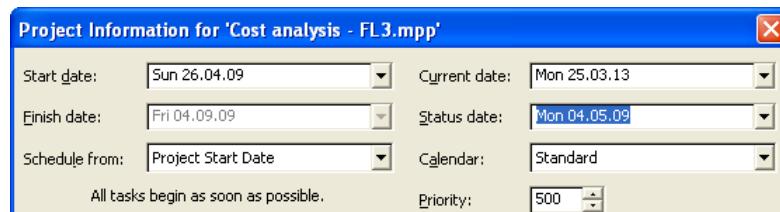


- După ce introduceți toate datele din figura 1, salvați linia de bază.
- Apoi introduceți datele din figura 2, privind lucrul efectiv. Observați, de exemplu, cum prima activitate trebuia inițial să dureze 1 săptămână și să coste 2500 de unități și în derularea efectivă a proiectului durează 2 săptămâni și costă 3000 de unități.

	Resource Name	Work	Details	May '09					Jun '09		
				27	04	11	18	25	01	08	
1	A	1,402.5 hrs	Work	54h	84h	42h	34h	56h	71h	87h	
	Decisions about the structure	30 hrs	Work	25h	5h						
	Hardware design and specification	109 hrs	Work						42h	40h	27h
	Software design	128 hrs	Work	15h	65h	28h	20h				
	Production assessment	15 hrs	Work						15h		
	Purchasing of the components	258 hrs	Work							1h	
	Documenting	177 hrs	Work							43h	
	Prototype	209 hrs	Work								
	System evaluation	30 hrs	Work								
	Assembly	128 hrs	Work								
	Administrational costs	260 hrs	Work	14h	14h	14h	14h	14h	16h	16h	
	Other costs	58.5 hrs	Work	0h	0h	0h	0h	0h	0h	0h	
			Work								

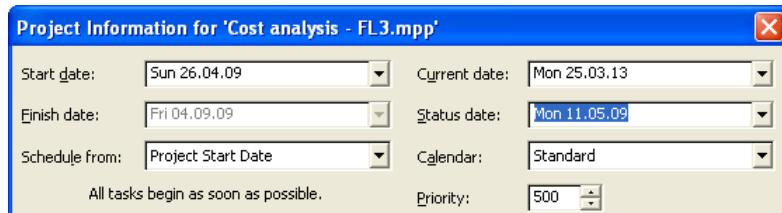
- Gradul de completare corespunde mărimei *Physical % Complete*. Acest lucru trebuie reflectat în metoda de calcul al valorii dobândite (vezi figurile 14-1 și 14-2).
- Probleme posibile: dacă BCWS este 0, trebuie salvată linia de bază. Indicatorul BCWP devine diferit de 0 când gradul de completare este diferit de 0. Dacă BCWP rămâne 0, trebuie efectuată operația *Calculate project* (prin setările implicate, aceasta se realizează automat).
- Pentru analiza săptămânală, se va modifica succesiv valoarea *Status Date* din *Project Information* (vezi figura 14-4). În fiecare săptămână trebuie introduse valorile efective. De exemplu, prima activitate are alocată în linia de bază 1 săptămână, însă în realitate durează 2 săptămâni, iar după prima săptămână activitatea este finalizată doar în proporție de 85%.

### Săptămâna 1:



	Task Name	BCWS	BCWP	ACWP	SV	CV	EAC	BAC	Physical % Complete	% Complete	VAC
1	Decisions about the structure	2,500.00 lei	1,150.00 lei	2,500.00 lei	-1,350.00 lei	-1,350.00 lei	5,434.78 lei	2,500.00 lei	85%	50%	-2,934.78 lei
2	Hardware design and specification	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	10,900.00 lei	10,000.00 lei	0%	0%	-900.00 lei
3	Software design and specification	2,800.00 lei	768.00 lei	1,500.00 lei	-2,032.00 lei	-732.00 lei	25,000.00 lei	12,800.00 lei	12%	25%	-12,200.00 lei
4	Production assessment	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	1,500.00 lei	1,300.00 lei	0%	0%	-200.00 lei
5	Purchasing of the components	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	25,800.00 lei	19,300.00 lei	0%	0%	-6,500.00 lei
6	Documenting	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	17,700.00 lei	17,700.00 lei	0%	0%	0.00 lei
7	Prototype	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	20,900.00 lei	15,900.00 lei	0%	0%	-5,000.00 lei
8	System evaluation	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	3,000.00 lei	3,000.00 lei	0%	0%	0.00 lei
9	Assembly	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	12,800.00 lei	12,800.00 lei	0%	0%	0.00 lei
10	Administrational costs	1,680.00 lei	756.00 lei	1,512.00 lei	-924.00 lei	-756.00 lei	50,400.00 lei	25,200.00 lei	6%	6%	-25,200.00 lei
11	Other costs	600.00 lei	0.00 lei	0.00 lei	-600.00 lei	0.00 lei	5,850.00 lei	9,000.00 lei	0%	0%	3,150.00 lei

*Săptămâna 2:*



	Task Name	BOWS	BCWP	ACWP	SV	CV	EAC	BAC	Physical % Complete	% Complete	VAC
1	Decisions about the structure	2,500.00 lei	2,500.00 lei	3,000.00 lei	0.00 lei	-500.00 lei	3,000.00 lei	2,500.00 lei	100%	100%	-500.00 lei
2	Hardware design and specification	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	10,900.00 lei	10,000.00 lei	0%	0%	-900.00 lei
3	Software design and specification	8,560.00 lei	8,064.00 lei	8,000.00 lei	-496.00 lei	64.00 lei	12,698.41 lei	12,800.00 lei	63%	50%	101.59 lei
4	Production assessment	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	1,500.00 lei	1,300.00 lei	0%	0%	-200.00 lei
5	Purchasing of the components	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	25,800.00 lei	19,300.00 lei	0%	0%	-6,500.00 lei
6	Documenting	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	17,700.00 lei	17,700.00 lei	0%	0%	0.00 lei
7	Prototype	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	20,900.00 lei	15,900.00 lei	0%	0%	-5,000.00 lei
8	System evaluation	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	3,000.00 lei	3,000.00 lei	0%	0%	0.00 lei
9	Assembly	0.00 lei	0.00 lei	0.00 lei	0.00 lei	0.00 lei	12,800.00 lei	12,800.00 lei	0%	0%	0.00 lei
10	Administrational costs	3,080.00 lei	3,024.00 lei	3,024.00 lei	-56.00 lei	0.00 lei	25,200.00 lei	25,200.00 lei	12%	12%	0.00 lei
11	Other costs	1,100.00 lei	0.00 lei	0.00 lei	-1,100.00 lei	0.00 lei	5,850.00 lei	9,000.00 lei	0%	0%	3,150.00 lei

- Se poate vedea la prima activitate cum costul bugetat este de 2500 de unități, iar costul actual este de 3000 de unități după terminare. În săptămâna 3 și ulterior, gradul de completare al primei activități rămâne 100%.
- Este suficientă reprezentarea unui singur indicator (de exemplu ACWP), pentru toate activitățile, timp de 9 săptămâni, pentru a vedea cum se acumulează costurile – evoluția costurilor este monoton crescătoare.
- Pentru reprezentarea grafică, în loc de *Microsoft Excel* se poate folosi programul *OpenOffice Calc*, care permite importarea unui *workbook (\*.xls)* exportat de *Microsoft Project*.

# Spreading the News: Reporting

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## *In This Chapter*

- ▶ Generating standard reports
  - ▶ Creating custom reports
  - ▶ Dazzling readers with Visual Reports
  - ▶ Adding graphics and formatting to reports
  - ▶ Making printer settings
  - ▶ Sharing a snapshot of the Timeline
  - ▶ Enhancing reports with copy and paste
- 

Here it is — the big payoff. It's your reward for entering all those task names and resource hourly rates, and for tracking activity on dozens of tasks during those late-hour sessions in the first hectic weeks of the project. You're finally ready to print a report or another type of project data, receiving tangible benefits from Project that you can hand out at meetings and show off to impress the boss.

Reports help you communicate information about projects by conveying schedule progress, resource assignments, cost accumulation, and activities that are in progress or scheduled soon. You can take advantage of built-in reports or create new reports to include the data that's most relevant to you. Dashboard Reports and Visual Reports in Project 2016 offer graphical possibilities to help paint a picture of the progress.

Knowing that you want to impress people, Project also makes it possible to apply certain themes, images, shapes, charts, and tables to reports to help make the point.

A report isn't the only tool you use to communicate with. You can customize headers, footers, and legends, and insert graphics into the schedule to make a presentation memorable. Other capabilities, such as customizing and copying Timeline view, enable you to incorporate Project data into reports in other programs.

# Generating Standard Reports

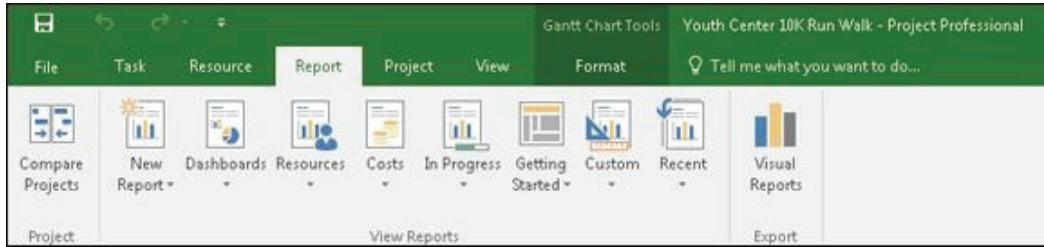
Standard reports are already designed for you, offering numerous choices regarding the information you can include. You do little more than click a few buttons to generate them. Essentially, you select a report category, choose a specific report, and print it. If the plain-vanilla version of a report isn't quite right, you can modify standard reports in a variety of ways.



You can also print any view in Project: Simply press Ctrl+P, and then click Print. The entire project is printed in whichever view is onscreen at the time. Or you can choose File ⇒ Print. In the Print dialog box that appears, you can choose to print only certain pages of the project or only a specific date range from the timescale. Any filter or grouping that you've applied is shown in the printed document.

## What's available

On the Report tab, Project has four standard report categories: Dashboards, Resources, Costs, and In Progress. Each category contains several predesigned reports (as you can see on the Report Ribbon, shown in [Figure 18-1](#)), for a total 16 standard reports.



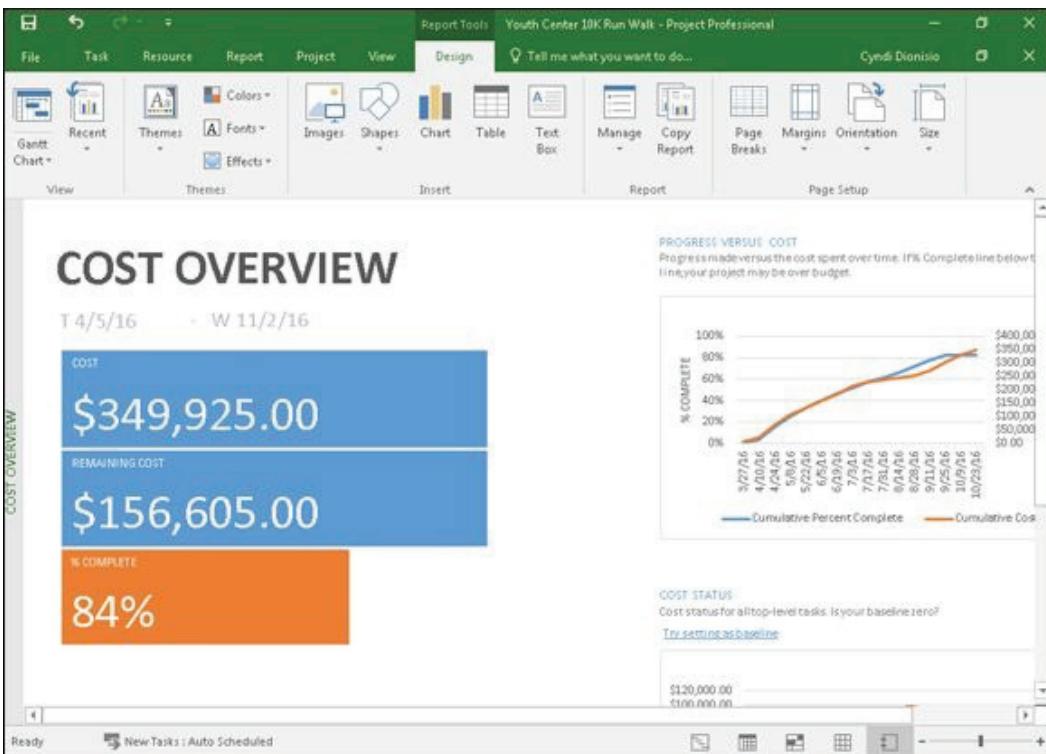
[Figure 18-1:](#) The Report Ribbon.

Standard reports vary in content, format (for example, a table, chart, or a comparison report), and sometimes page orientation (landscape or portrait). You can edit a report to change its name, the period it covers, the table of information it's based on, and the filters applied to it. You can also sort information as you generate the report and add formatting, such as themes, images, and shapes.

## Overviewing the dashboard reports

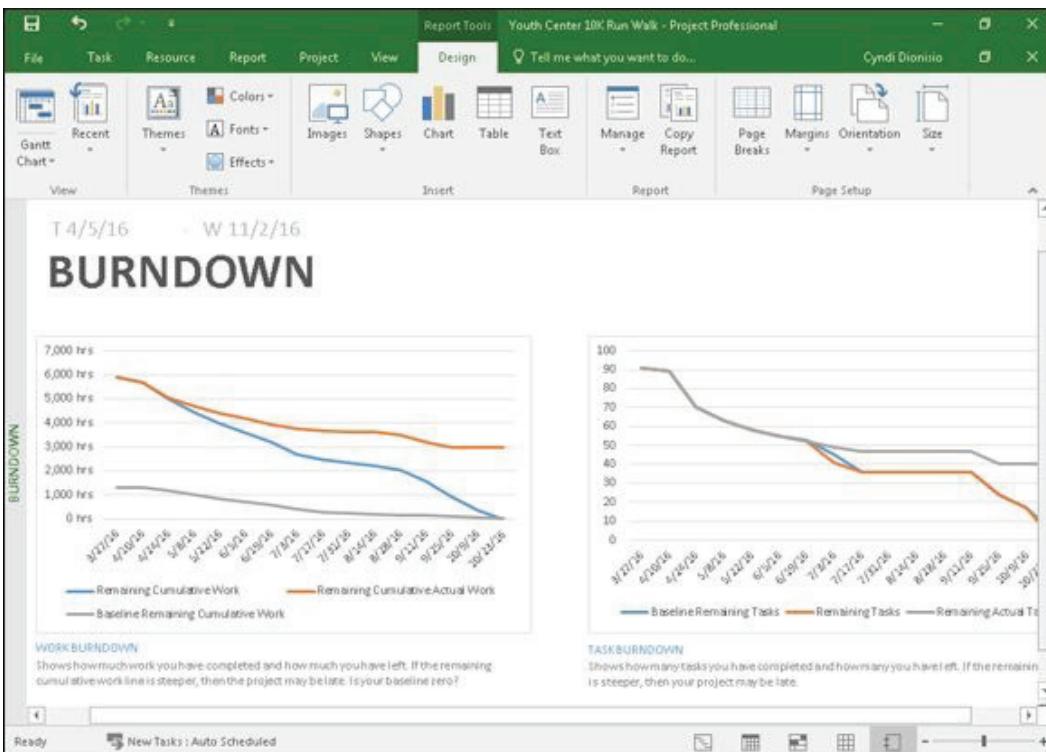
One cool feature in Project 2016 is dashboard reporting. The program has five standard dashboard reports: Burndown, Cost Overview, Project Overview, Upcoming Tasks, and Work Overview.

To see a dashboard report, simply click the Report tab, click the Dashboards down arrow, and select the report you want. [Figure 18-2](#) shows an example of a Cost Overview dashboard report.



**Figure 18-2:** Cost Overview report.

A dashboard report you may not be familiar with is a burndown chart. You use it to compare the amount of work remaining to the baseline work remaining and the number of tasks remaining compared with the baseline remaining tasks. On the burndown chart, you can see the rate of work compared with the planned rate of work to determine whether you're accomplishing work at the same rate as planned. If the number of tasks remaining is higher than the baseline rate, you're in jeopardy of delivering late. [Figure 18-3](#) shows a burndown chart.



**Figure 18-3:** Burndown report.

# **Creating New Reports**

Suppose that the standard report set doesn't have exactly what you want. No problem! The reporting function in Project 2016 makes it a snap to create a new report. Follow these steps:

- 1. From the Report tab, select New Report.**

Select the type of report you want: Blank, Chart, Table, or Comparison.

- 2. When the Report Name dialog box opens, enter a name for the report and click OK.**

A split window opens: The left side holds the report, and the right side holds a Field List.

- 3. In the Select Category section, choose among Time, ID, Name, Resource Names, and Unique ID.**

- 4. From the Select Fields scroll list, check the check box next to the fields you want from the various categories (cost, duration, number, or work).**

- 5. If you want to apply a filter, such as incomplete tasks or active tasks, select one from the Filter drop-down menu.**

- 6. If you want to group information, select the appropriate grouping from the Group By drop-down menu.**

- 7. Select at which level you want to see information reported using the Outline Level drop-down menu — for example, Level 1 (the entire project), Level 2, or Level 3.**

- 8. Choose how to sort the data.**

It's the order in which you want to present it based on the fields you selected in Step 4.

After you create a new report, the report is saved on the Custom Report tab.

## ***Gaining a new perspective on data with visual reports***

Project offers six categories of visual reports and some custom reports that you can build yourself. Some visual reports are based on *time-phased data* (data distributed over time, such as allocations of resource time or costs), and some aren't. Report categories are described in this list:

- ✓ **Task Usage:** Based on time-phased data for tasks, this report category lets you peek at information such as cash flow and earned value over time.
- ✓ **Resource Usage:** Based on time-phased resource data, this type of report includes

resource costs, resource availability, and resource work data.

- ✓ **Assignment Usage:** Also based on time-phased data, this category provides information in areas such as baseline versus actual costs and baseline versus actual work. It also provides an earned value report.
- ✓ **Task Summary, Resource Summary, and Assignment Summary:** These three report categories provide diagram views of a variety of work and cost data. None of these three categories is based on time-phased data.

Use the Visual Reports feature to select the fields you want to view and to modify the reports on the fly.

Additionally, if you enjoy the capabilities offered by pivot table reports in Excel, you'll be glad to know that the same capability is available in Project. Using pivot tables, you can view data from a variety of perspectives beyond the standard Project report capabilities. Pivot tables offer perspectives that are especially useful for data analysis.



All Visual Reports require you to have Microsoft Excel 2010 or higher; some require Visio.

## *Creating a visual report*

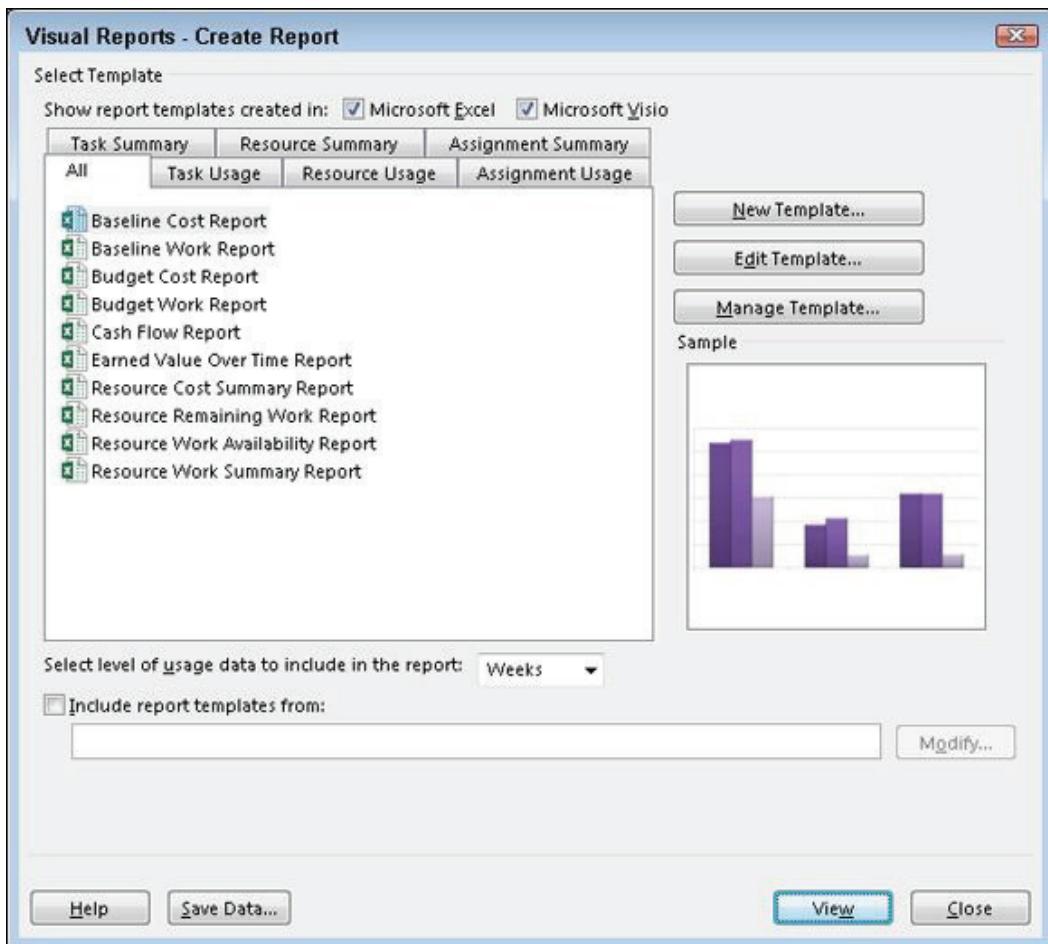
Generating a visual report is simplicity itself. Follow these steps:

1. **From the Report tab, choose Visual Reports Export.**

The Visual Reports – Create Report dialog box appears, as shown in [Figure 18-4](#).

2. **Click the type of report you want from the available tabs.**

3. **Click View.**



**Figure 18-4:** The Visual Reports dialog box.



To customize a visual report, you need to know about pivot tables. Because a discussion of pivot tables in those products is beyond the scope of this book, I heartily recommend *Excel 2016 For Dummies*, by Greg Harvey (Wiley).



You can modify the Visual Reports templates or create your own templates by using the New Template and Edit Template buttons in the Visual Reports dialog box. When you edit a template, you add fields to it or remove fields from it. Creating a new template involves specifying the format (Excel or Visio), choosing the data you want to report on, and selecting fields to include.

# Fine-Tuning a Report

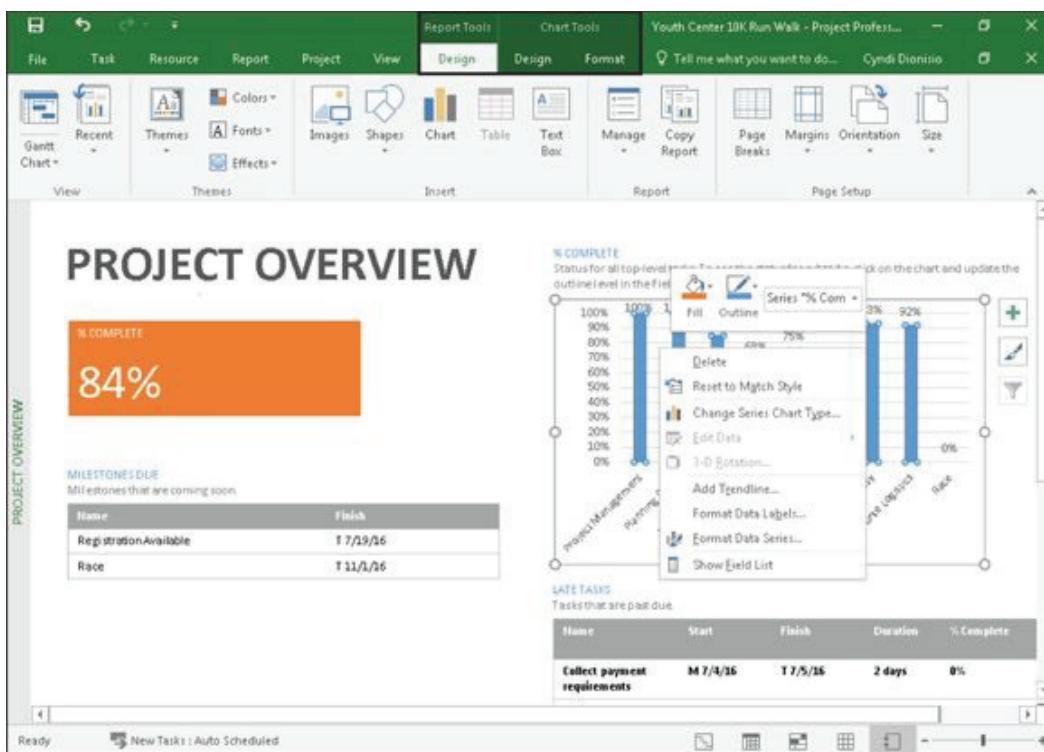
After you have lots of data available to you in Project reports, it would be a shame not to customize the presentation to maximize its impact. Project 2016 helps you create reports that not only show off the information, but also make the information look good!

As soon as you start creating a report, Project opens a new Ribbon, named Report Tools, and shows a Design tab. From this tab, you can work with themes; insert images, shapes, and charts; and work with Page Setup in the print function. Before getting into all the wonderful ways you can make reports attractive, I cover some of the easy ways you can manipulate the information in the reports.

## Dragging, dropping, and sizing

In Project 2016, you can resize and relocate any item on a report by simply clicking the item and then moving it or resizing it. If you want a particular section of the project overview to stand out, enlarge it and shrink the other sections.

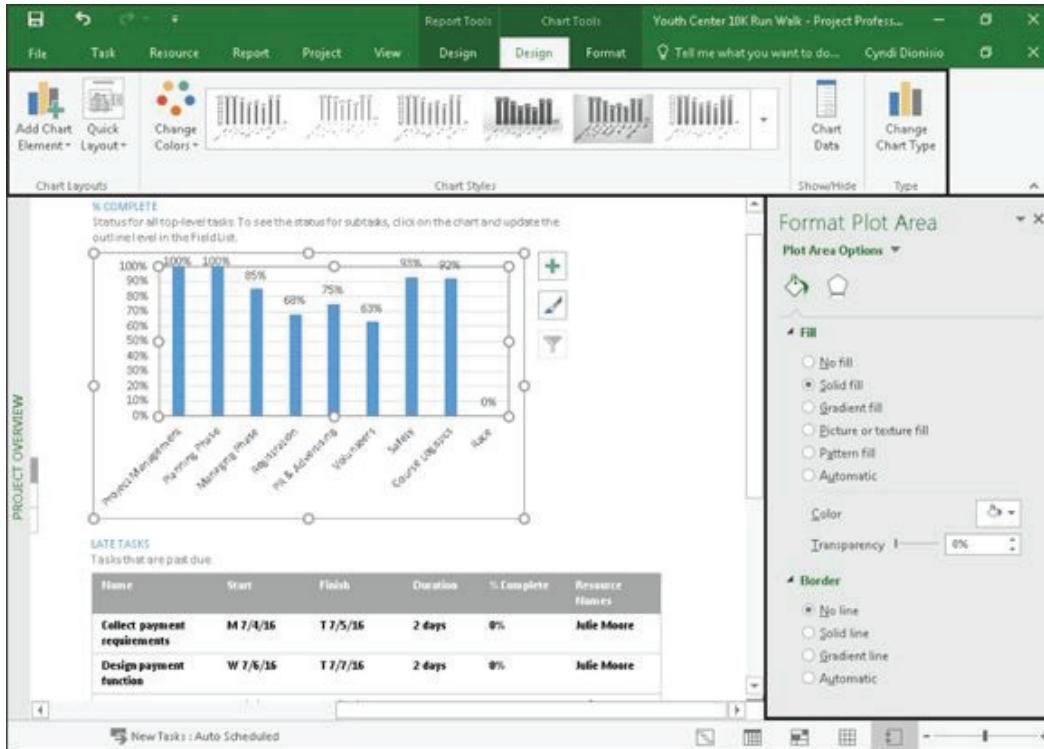
You can also change the way almost any report looks by simply right-clicking and working with the pop-up menus that appear. [Figure 18-5](#) shows the Project Overview Dashboard report with the % Complete section after right-clicking. Notice that you can change its fill, outline, plot area, chart type, and fields. I also drew a box around the Design tab that shows where the Report Tools and Chart Tools are located on the Ribbon.



[Figure 18-5:](#) Changing the report layout.

You can format the data series in the chart by double-clicking a chart section. [Figure](#)

[18-6](#) shows what happens when you double-click the % Complete chart on the Project Overview Dashboard. I've drawn a box around the Ribbon to highlight the fact that you can change the colors, chart data, and chart type. Along the right side of the chart are options to format the plot area by changing the border, color, transparency, width, line format, and dash type.



[Figure 18-6:](#) Changing the report format.

## Looking good!

If you have no creative flair, don't worry — Project does. You can work with the themes that Project provides to present all the reports with flair. From the Report Tools Ribbon on the Design tab, in the Themes group, click Themes. You see 35 different themes that you can apply to reports. Themes include color, type, font, and effect. Play around with a few to find one you like.

If none of the themes works for you, look around on the color, font, and effects drop-down lists until you create *just* the look you're hoping for.

To customize the reports even more, you can add images such as a team logo, shapes, and text boxes. [Figure 18-7](#) shows a portion of a report with a text box and shape added.

# PROJECT OVERVIEW

% COMPLETE

84%

*Yay! We are ahead of  
schedule!*



**Figure 18-7:** Customizing with shapes and text boxes.



Experimenting with customization options can be fun, but as with any other business document, the goal in layout and formatting is readability.

Keep these points in mind when you're formatting Project text:

- ✓ **Font:** Choose simple sans serif fonts, such as Arial. If you're publishing the project on the web, consider using Verdana, which is a font created for readability online.
- ✓ **Color:** You have to consider factors such as whether the printout will be in color or black and white, whether the use of too many colors will become confusing for the reader, and whether certain colors (such as yellow) will be difficult to read.
- ✓ **Font size:** Use a font size that's readable, without making it so big that the taskbar labels become too crowded.
- ✓ **Effects:** Avoid text effects that can make certain text difficult to read (such as bold, italic, or underlining). Use these effects only to call attention to a few elements of the project.

# *Spiffing Things Up*

These days, image is everything. You and the project may be judged to a certain extent by how professional the printed information looks. Even if the project is a million dollars over budget and four months behind, making reports or other printouts look good can make delivering bad news easier to do. You can make the project presentation look good by adding graphics.

Wouldn't the company logo look spiffy in the header of the report? Or a picture of the new product box in Gantt Chart view of the New Product Launch project?

Graphics can add visual information or make the plan just plain look nicer. You can insert graphics in the project file by using one of these three methods:

- ✓ **Cut and paste a graphic from another file.** A graphical image that you cut and paste essentially can't be edited by you in Project.
- ✓ **Insert a link to an existing graphics file.** Linking reduces the Project file.
- ✓ **Embed a graphic.** Embedding lets you edit the content of the graphic in Project, using the tools of an image program such as Paint.

You can't add graphics willy-nilly, however. You can add graphics in only a few places: the chart pane of any Gantt Chart view; a task note; a resource note; or a header, footer, or legend that's used in reports or printouts of views.

For example, you may put pictures of resources in the Resource Note field so that you can remember who's who, or you may include a photo of the corporate headquarters in the header of the report.



Graphics swell the size of the Project file like a sponge in a pail of water. If you're thinking of using a lot of graphics, don't let them detract from the main information in printouts. Or try linking to them instead of inserting them into the file.

If you want to insert an existing graphics file into a Notes box, follow these steps:

1. **Double-click a task in the Gantt Chart view. Then select the Notes tab in the Task Information or Resource Information dialog box.**
2. **Click the Insert Object button.**  
The Insert Object dialog box, shown in [Figure 18-8](#), appears.
3. **Choose the Create from File option.**
4. **Click the Browse button to locate the file.**
5. **To insert to the file, click the Insert button and then click the OK button.**

You may see a warning before you insert an image. If you want to continue, click Yes.

**6. To link the file, select the Link check box next to the Browse button.**

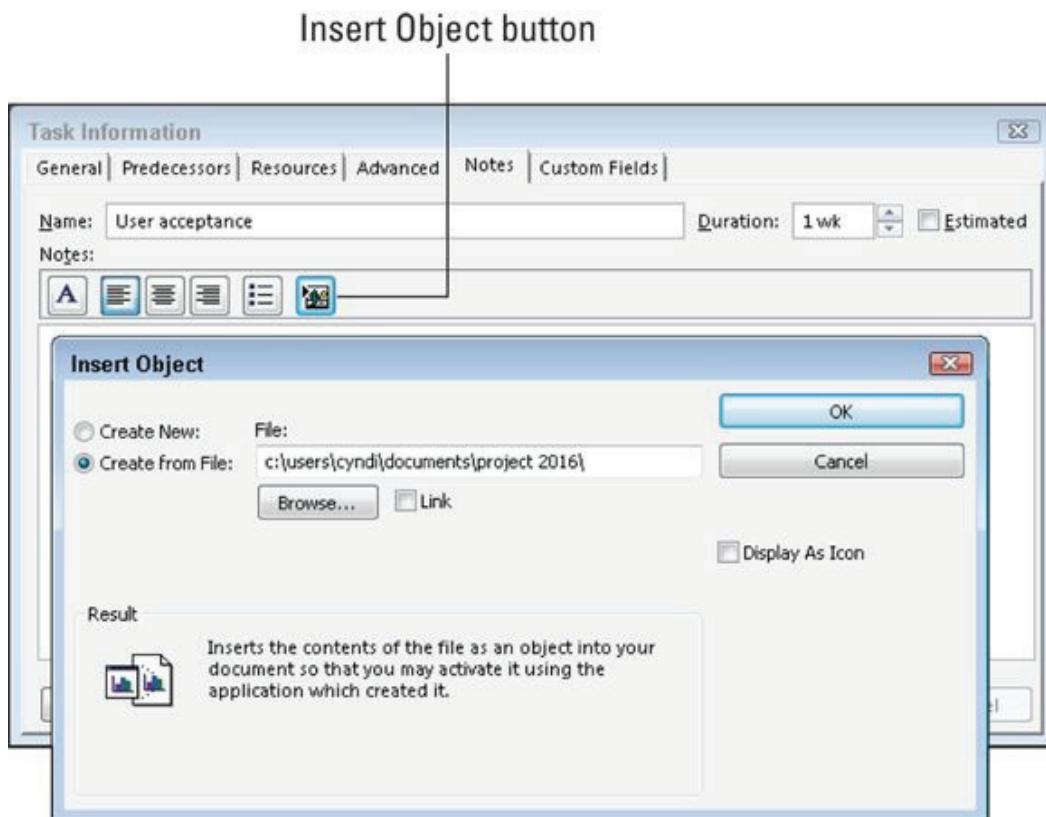
If you don't select this option, the object is embedded in the file.

**7. To insert the object as an icon, select the Display as Icon check box.**



When you display the object as an icon, someone viewing the project on a computer can click the icon to view the picture.

**8. Click the OK button.**



**Figure 18-8:** Browse to locate a file on the network or the hard drive.

If you want to insert an existing graphics file in a header or footer, follow these steps:

**1. Choose File ⇒ Print.**

**2. Click the Page Setup link at the bottom of the page.**

**3. Go to the Header or Footer tab in the Page Setup dialog box.**

**4. Click the Insert Picture button, as shown in [Figure 18-9](#).**

The Insert Picture dialog box appears.

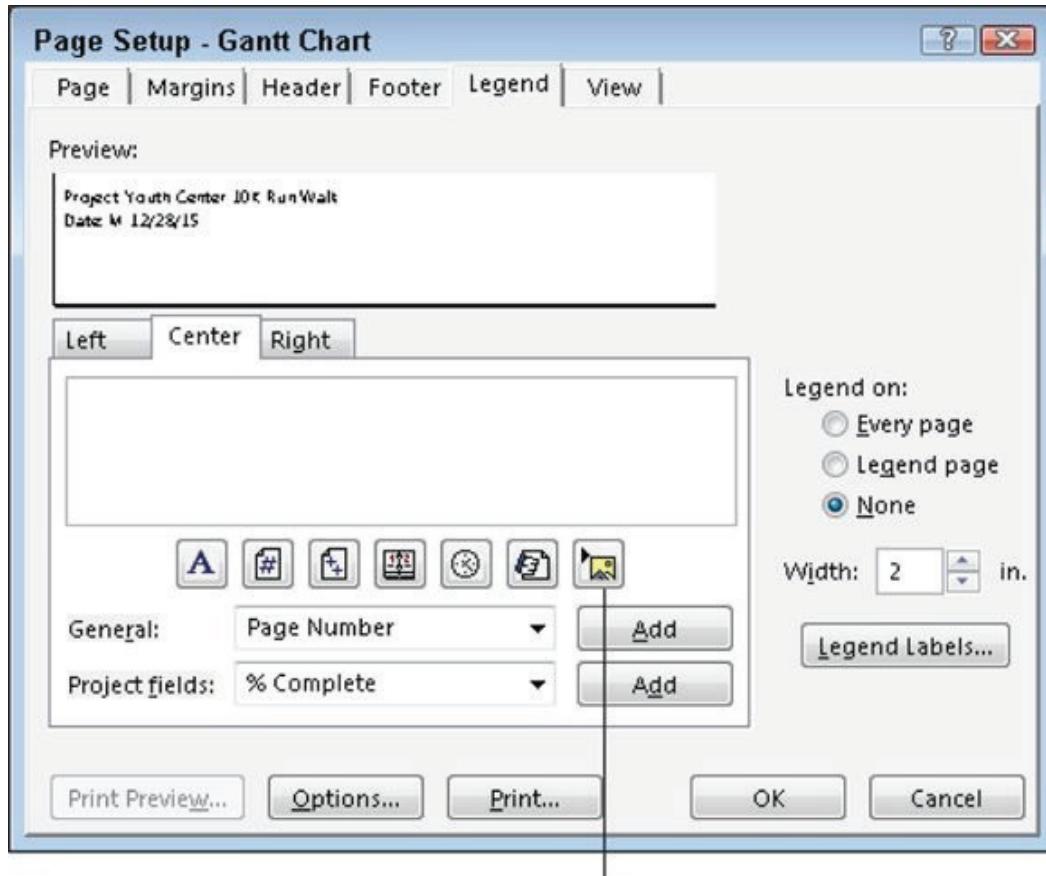
**5. Navigate to the folder that holds the file to insert.**

**6. Click to select the file.**

**7. Click the Insert button.**

The image appears in the header or footer.

**8. Click OK.**



Insert picture

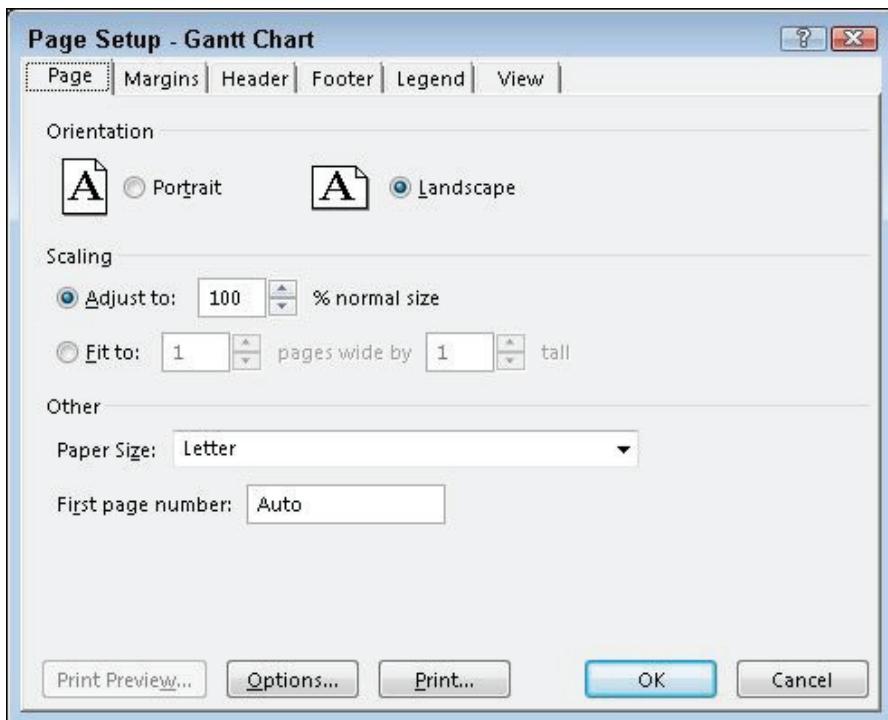
**Figure 18-9:** The Page Setup dialog box.

# Call the Printer!

The proof of the report is in the printing, but you should see to several adjustments before you click the button to print. In Project, it's not only margins or page orientation that you need to set (although you have to set them, too); you can also add useful information to headers and footers and set legends to help readers understand the many bars, diamonds, and other graphical elements that many Project views and reports display.

## Working with Page Setup

The Page Setup dialog box can be used to control printouts of any displayed Project view. You can open this dialog box by choosing File ⇒ Print ⇒ Page Setup. The Page Setup dialog box, as shown in [Figure 18-10](#), contains six tabs.



[Figure 18-10:](#) Page setup.

### Sizing

The Page tab contains several basic page settings that determine the orientation, the paper size, and the way content is scaled to fit the page. By making these settings, you influence how much material can fit on a page and how many pages comprise the document.

You have these choices on the Page tab (refer to [Figure 18-10](#)):

- ✓ **Portrait or Landscape orientation:** You've no doubt already dealt with this choice. Portrait orientation is set up like the *Mona Lisa*, with the short edge of the paper running across the top of the page. In landscape orientation, the long edge of the paper runs across the top instead.

- ✓ **Scaling:** You can use the Adjust To setting, which is based on a percentage of the original size, or the Fit To setting, which gives you some control over scaling to fit to the width of a single page or to the height of a single page.
- ✓ **Other:** This area is a catch-all for two options: Paper Size and First Page Number. All the standard choices for paper size are available in the Paper Size list, including index cards and envelopes. First Page Number can remain as Auto (in which case the first page is numbered 1, the second page is 2, and so on), or you can enter another number there yourself.

## ***Staying within the margins***

I won't bore you by defining a margin. However, I'll remind you that a margin serves the dual purpose of controlling how much information can fit on a page and creating a border of white space that frames the document (making it cleaner-looking and easier to read).

To set margins using the Page Setup dialog box, follow these steps:

- 1. Click the Margins tab.**

As you modify margin settings, the preview shows you where they'll appear on the page.

- 2. Use the arrows to set the top, bottom, left, and right margins.**

Click the up arrow for a wider margin, and click the down arrow for a narrower margin.

- 3. If you want a border that represents the margin, use the Borders Around options.**

You can choose to print a border on every page, on only outer pages (print a border on the first and last pages only — available only when printing in Network Diagram view), or on none of the pages.

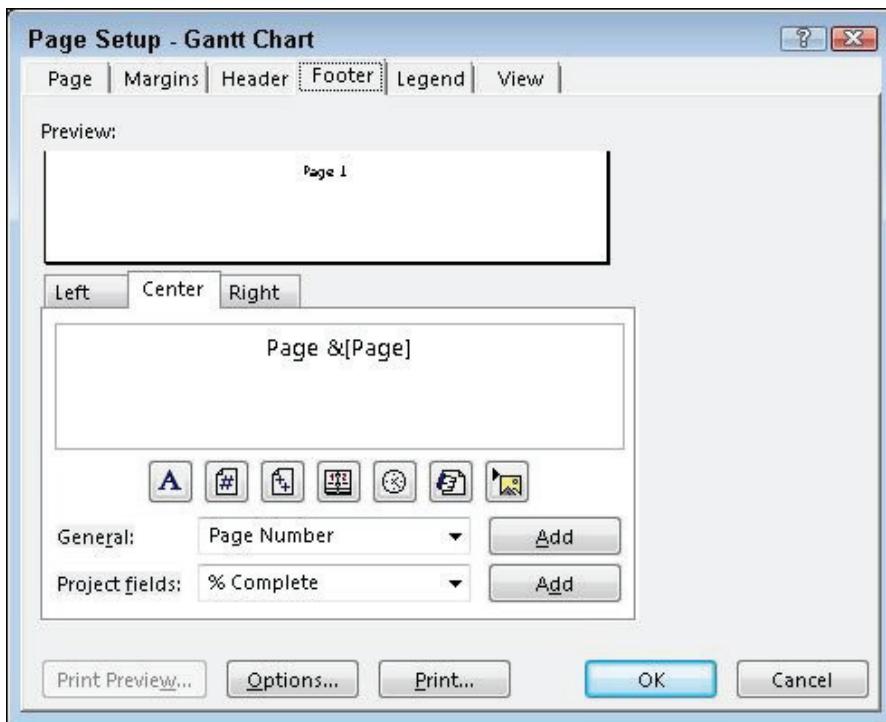


Setting margins to less than  $\frac{1}{4}$  inch (.25") can cut off the printed output, because printers can print only so close to the edge of a page.

## ***Inserting headers and footers***

Throughout the life of a project, you print many versions of the project, many reports, and many types of information using various tables. Headers and footers are useful features to help you, and readers, keep track of all this information.

You can use the Header and Footer tabs of the Page Setup dialog box (see [Figure 18-11](#)) to set and preview header (top) and footer (bottom) contents.



**Figure 18-11:** The Header and Footer tabs are nearly identical.

This list describes the settings you can make on these tabs:

- ✓ **Text location:** Specify that the text you enter will appear to the left, at the center, or to the right of the header or footer by clicking the corresponding tab and then typing the text.
- ✓ **Format text:** Use the tool buttons, or quickly insert such elements as the page number, the date, or a picture file.
- ✓ **Select standard text:** Insert additional text by using these lists:

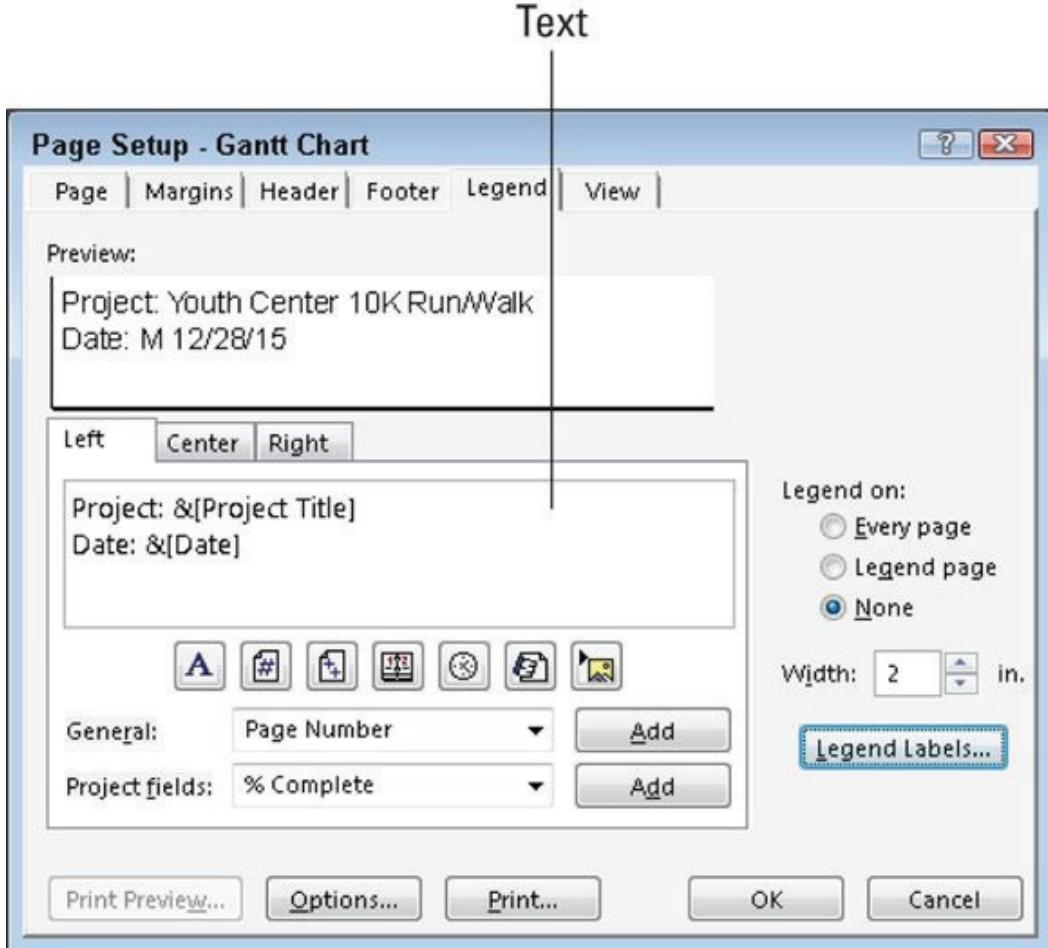
*General:* Includes such options as Total Page Count, Project Title, and Company Name

*Project Fields:* Includes all fields available in Project

You can use these fields to alert readers to important fields to review or to the nature of the printout. To add General or Project Fields items, select them from their respective lists and then click the Add button to add them to the Left, Center, or Right tab.

## Working with a legend

A *legend* acts as a guide to the meanings of various graphical elements, as shown in [Figure 18-12](#). The Legend tab bears a striking resemblance to the Header and Footer tabs except that the legend is generated automatically. All you can specify on this tab is the text that fits in the box to the left of the legend.



**Figure 18-12:** Page setup with legend information.

The Legend tab of the Page Setup dialog box has a few settings that differ from the Header and Footer tabs:

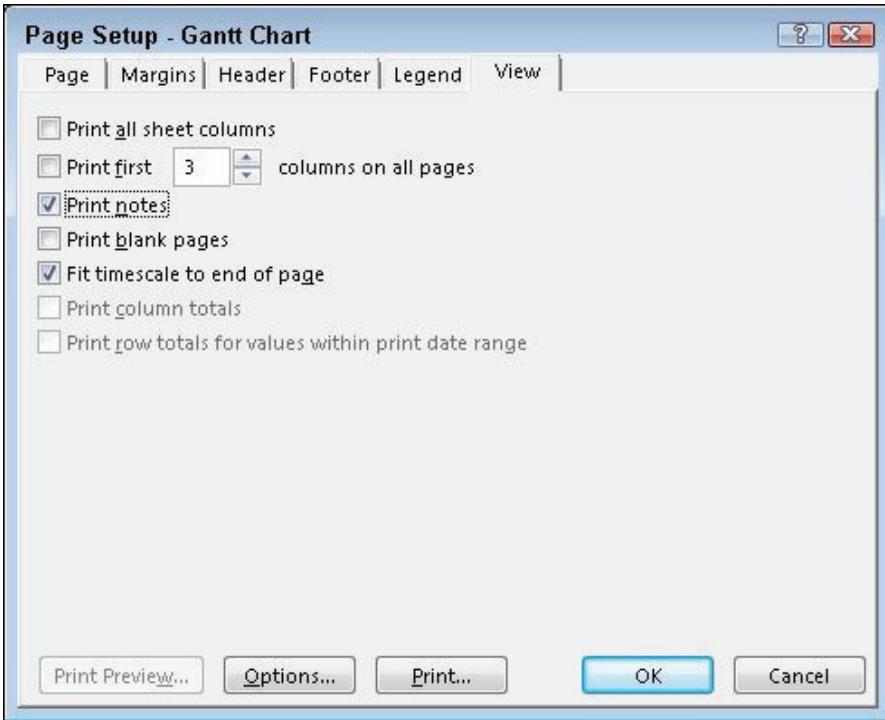
- ✓ You can print the legend on every page or on a separate legend page, or you can decide not to print a legend.
- ✓ You can establish the width of the text area of the legend (the area where you can insert elements such as the page number or the date).
- ✓ You can edit the text font, style, size, and color of the legend by clicking the Legend Labels box.



Unlike a header or footer, where you have to enter something to make anything appear, a legend prints by default. If you don't want a legend to print, click the Legend tab and then set the Legend On option to None.

## ***Deciding what to print***

If you're printing a currently displayed view, the View tab of the Page Setup dialog box is available to you, as shown in [Figure 18-13](#).



**Figure 18-13:** The View tab.

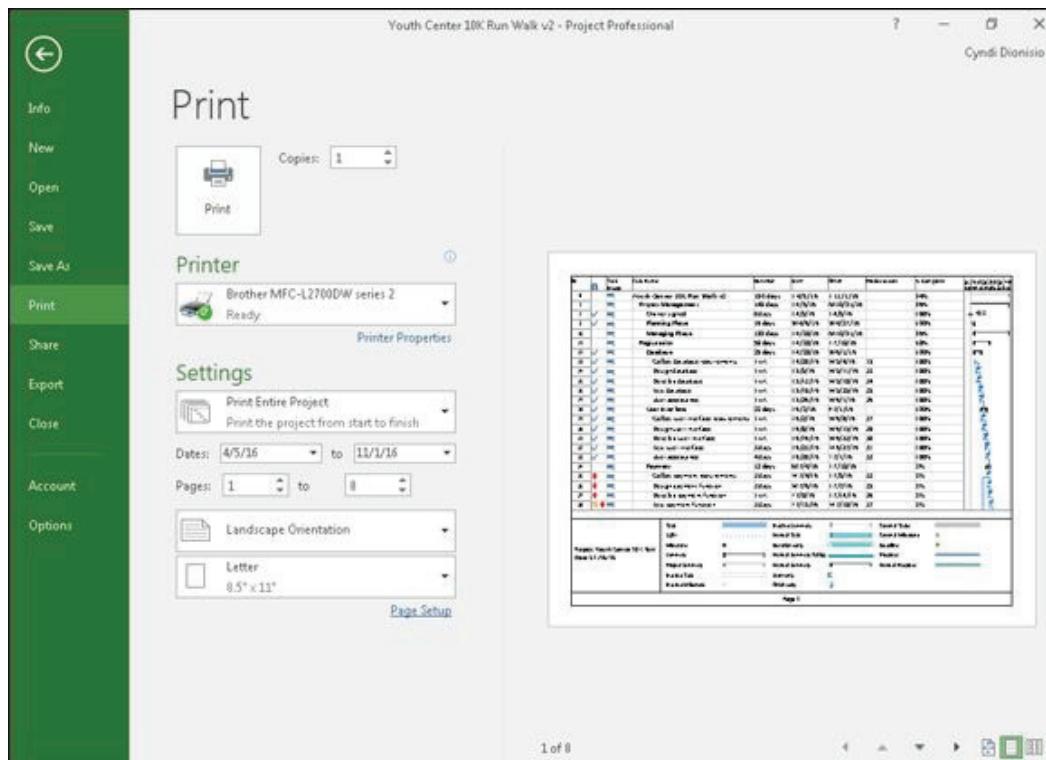
You can make these settings on the View tab:

- ✓ **Print All Sheet Columns:** Prints every sheet column in the view, regardless of whether it's visible onscreen. With this option deselected, only the columns that show in the view are printed.
- ✓ **Print First # Columns on All Pages:** Lets you control a specific number of columns to print.
- ✓ **Print Notes:** Prints every task, resource, and assignment note. These items are printed on a separate Notes page.
- ✓ **Print Blank Pages:** Lets you print blank pages. For example, use this setting to print a page that represents a time in the project when no tasks are occurring. If you want a smaller number of pages in the printout, ignore this setting.
- ✓ **Fit Timescale to End of Page:** Scales the timescale to fit more of the project on the page.
- ✓ **Print Column Totals:** Adds a column that contains column totals. It pertains to printouts of Usage views.
- ✓ **Print Row Totals for Values within Print Date Range:** Adds a column that contains row totals. It pertains to printouts of Usage views.

## **Getting a preview**

Granted, although software print previews aren't quite as exciting as movie previews, they help you make everything look right before you print the project. When you choose a report or choose File ⇒ Print to print a view, the preview automatically

appears in the Backstage. [Figure 18-14](#) has a box around the buttons in the lower-right corner of the preview that enable you to modify the preview so that you can work with the settings more effectively.



[Figure 18-14:](#) Backstage Print view.

You can use the buttons in the Backstage preview to

- ✓ Move around the pages of the report by using the first four arrow buttons and the horizontal and vertical scroll bars
- ✓ View more detail by clicking the Actual Size button and then clicking the report
- ✓ Focus on a single page or all pages in the report by using the One Page and Multiple Pages buttons

**Note:** Always preview the document before printing it to review the number of pages being printed. One click or one instance of zooming in or out can easily double — or cut in half — the number of pages being sent to the printer. You can easily waste paper if you're not careful.

## Printing, at last!

In this section, I describe how to print the document for which you've made all the eye-pleasing settings discussed in this chapter. For this task, you need to make the print settings to the left of the preview in the Backstage, as shown in [Figure 18-14](#).

This list describes the settings you encounter in this area:

- ✓ **The Copies up arrow and down arrow:** Click the Copies up arrow to print more copies, or click the down arrow to print fewer (but not less than 1).

- ✓ **The Printer area:** This area of the dialog box indicates the printer you will use. You can choose a printer from the list and click the Printer Properties link to control printer settings such as color quality and paper source.
- ✓ **The Settings area:** You can print the entire project or select another option from the drop-down list so that you can print specific dates, print specific pages, or print custom dates and pages. The accompanying options change depending on the choice. You also can use the Settings drop-down list to specify whether to print notes, all sheet columns, or only the left column of pages (to print only the leftmost column on every page).
- ✓ **The remaining settings:** These choices control the orientation and paper size, if you didn't make them elsewhere.

After you make all the settings and you're ready to print, simply click the big Print button in the upper-left corner.

# Working on the Timeline

The Timeline gives sort of a 10,000-foot overview of the project schedule. It shows a graphical timeline spanning from the project's start date to its end date, and it highlights the period shown in the main view, such as the time frame shown on the Gantt chart. You can toggle the Timeline on and off as needed. To do so, click the View tab on the Ribbon and select the Timeline check box in the Split View group.

The Timeline even has its own toolbar, Timeline Tools, as shown in [Figure 18-15](#).



[Figure 18-15:](#) The Timeline Tools toolbar.

From the Timeline Tools toolbar, you can format text and dates, format the display of tasks on the toolbar, and copy the Timeline in various presentation formats.

## Adding tasks to the Timeline

You can add summary tasks, detailed tasks, and milestones to the Timeline. For example, the Timeline shown in [Figure 18-16](#) shows milestones, the Volunteers summary task, and a callout for the Obtain City Permits task. Yes, you can do all these wonderful things!



[Figure 18-16:](#) The Timeline, with tasks, summary tasks, and milestones.

You can add information to the Timeline in a number of ways. To add several tasks at a time, follow these simple steps:

### 1. Open the Timeline from the View tab.

Go to the Task Views tool group and click the Timeline view. The timeline will be visible in the chart area, and the Timeline Tools toolbar will show up above the Format tab.

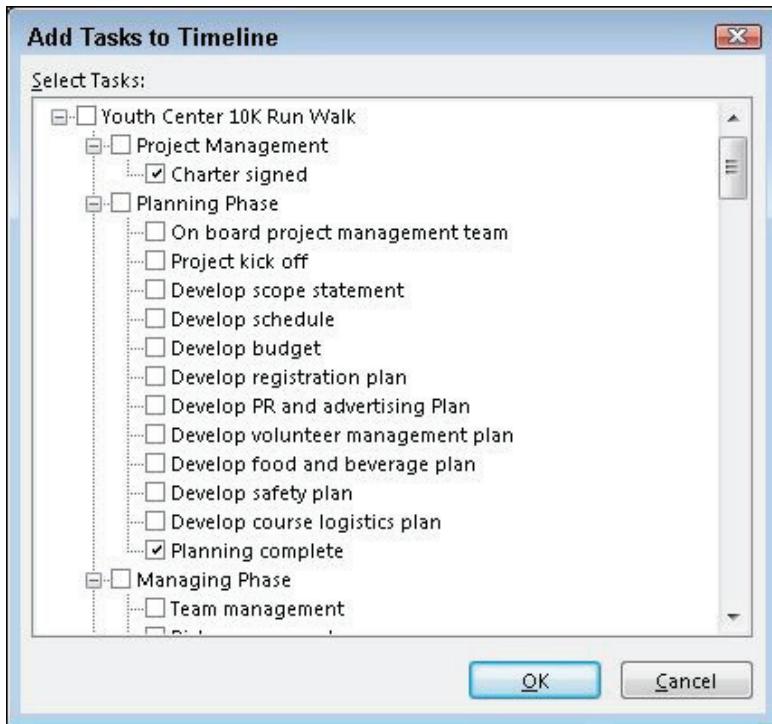
### 2. Click Timeline Tools to show the Timeline Tools toolbar (refer to [Figure 18-15](#)).

### 3. Click Existing Tasks in the Insert group.

The Add Tasks to Timeline dialog box opens, as shown in [Figure 18-17](#), showing an outline of all tasks in the project. You can select as many as you like. They

appear on the Timeline as individual tasks, summary tasks, or milestones, depending on how they're entered in Project.

**4. Click OK.**



**Figure 18-17:** Adding tasks to the Timeline.

You can also add a new task by clicking the Task button in the Insert group to open the Task Information dialog box and then entering the task information, adding the predecessor and successor information, and assigning resources. When you select the Display on Timeline check box, the task appears on the Timeline.

If you want to change the way a task appears on the Timeline, follow these steps:

- 1. Click to select the task.**
- 2. In the Current Selection group, select either Display as Bar to show a bar that indicates the duration or Display as Callout to create a callout box that holds the task information. If you want to remove a task from the Timeline, select Remove from Timeline.**
- 3. Reposition the callout box to improve readability, if you have several tasks close together.**



You can right-click a task and click Add to Timeline to make the task show up on the Timeline.

## ***Customizing the Timeline***

Project lets you customize the Timeline to make it truly fit your needs. For example,

you can freeze the Timeline or move it around so that it focuses on a particular time frame. When you move the timeframe in Timeline, the Gantt chart moves in parallel. To move the Timeline, follow these steps:

1. **Click the Timeline so that the Timeline Tools toolbar appears.**
2. **In the Show/Hide group, select Pan & Zoom.**  
A green frame surrounds the current time frame.
3. **Position the cursor on the edge to drag the time frame to the size you like.**
4. **To shift the time frame to a different one, move the cursor to the top of the frame, wait for the four-way arrow, and drag the green frame to the time frame you want.**

You can also change the date format from the Show/Hide group on the Timeline Tools toolbar. Simply click the down arrow and select the way you want to see the date displayed on the Timeline.

The Timeline can be displayed with details about tasks, such as the task name and dates, or without the detail and just milestones and bars that represent tasks, but no names associated with the tasks. If you want a detailed view, select the Detailed Timeline check box in the Show/Hide group.

## ***Copying the Timeline***

Because that vendor you're trying to coordinate with doesn't use Project, you need to share the graphical Timeline information via another file format. Project builds in the special capability to take a snapshot of the Timeline so that you can paste it into an email message; a presentation; or another program, such as a word processor.

Follow these steps to copy and use the Timeline:

1. **Create the email message or document where you want to use the Timeline image.**
2. **From the Timeline Tools, choose Copy Timeline and then select a format.**  
The available format choices are For E-Mail, For Presentation, and Full Size.
3. **In the program where you want to insert the Timeline, position the cursor where you want the Timeline image to appear.**
4. **Press Ctrl+V.**

The image appears in the message or document.

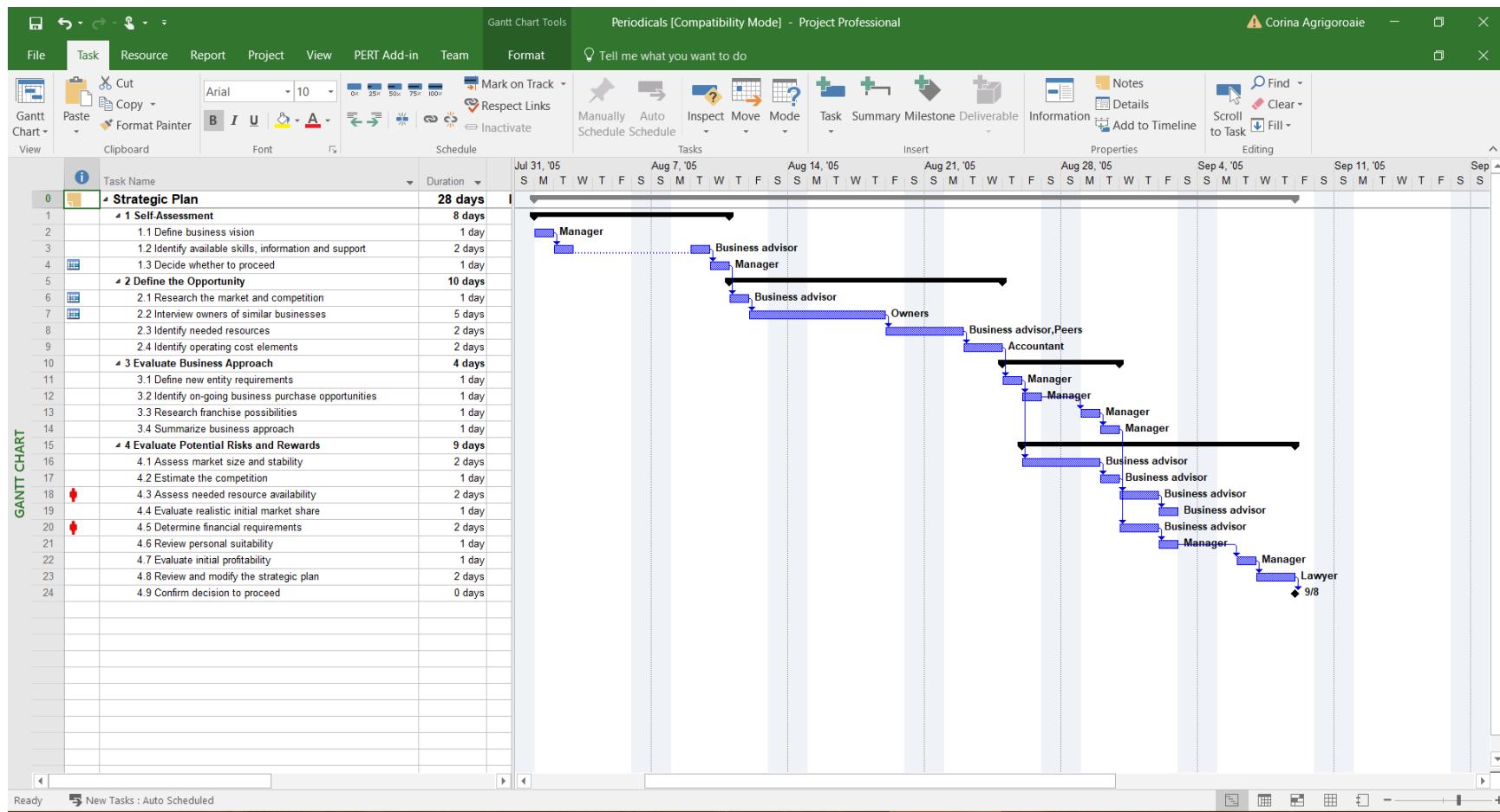
## ***Enhanced Copy and Paste***

Though it has long been possible to copy and paste information to and from Project and other Office applications, sometimes the results were, well, messy. Now, copy-and-paste operations between applications retain much more information. For example, when you copy tasks from Project and paste them into Word or Excel, you automatically see outline-level formatting and column headings. And formatting from information copied from another application into Project is retained. There's no need to reinvent the wheel every time you need to copy data between apps — and that's a sweet, sweet thing.

## Aplicații

Studiati proiectul *Periodicals.mpp* și alegeti o dată de referință (data curentă) între data de începere și data de terminare a proiectului (de exemplu 28 august 2005). Marcați drept complete activitățile până în această dată curentă.

Vizualizați apoi rapoartele descrise în laborator. Salvați în format *pdf* cel puțin 10 rapoarte, dintre care unul personalizat (*custom*) și unul *overbudget*.



Periodicals [Compatibility Mode] - Project Professional

Corina Agrigoroaei

File Task Resource Report Project View PERT Add-in Team Format

Resource Sheet Tools

Network Diagram Gantt Chart Task Usage Calendar Team Planner Resource Usage Resource Sheet Other Views Sort Outline Tables Highlight: [No Highlight] Timescale: Days Filter: [No Filter] Group by: [No Group]

Timeline Details Zoom Entire Project Tasks Split View New Window Arrange All Hide Macros

Task Views Resource Views Data Zoom

	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue	Base	Code	Add New Column
1	Business advisor	Work		B	External	100%	\$30.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
2	Peers	Work		P		100%	\$25.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
3	Lawyer	Work		L		100%	\$150.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
4	Government agency	Work		G	External	100%	\$15.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
5	Manager	Work		M		100%	\$20.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
6	Owners	Work		O		100%	\$300.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
7	Accountant	Work		A		100%	\$18.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
8	Banker	Work		B	External	100%	\$25.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		
9	Information services	Work		I		100%	\$100.00/hr	\$0.00/hr	\$0.00	Prorated	COLEMAN		

RESOURCE SHEET

Ready New Tasks : Auto Scheduled

# Spreading the News: Reporting

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## *In This Chapter*

- ▶ Generating standard reports
  - ▶ Creating custom reports
  - ▶ Dazzling readers with Visual Reports
  - ▶ Adding graphics and formatting to reports
  - ▶ Making printer settings
  - ▶ Sharing a snapshot of the Timeline
  - ▶ Enhancing reports with copy and paste
- 

Here it is — the big payoff. It's your reward for entering all those task names and resource hourly rates, and for tracking activity on dozens of tasks during those late-hour sessions in the first hectic weeks of the project. You're finally ready to print a report or another type of project data, receiving tangible benefits from Project that you can hand out at meetings and show off to impress the boss.

Reports help you communicate information about projects by conveying schedule progress, resource assignments, cost accumulation, and activities that are in progress or scheduled soon. You can take advantage of built-in reports or create new reports to include the data that's most relevant to you. Dashboard Reports and Visual Reports in Project 2016 offer graphical possibilities to help paint a picture of the progress.

Knowing that you want to impress people, Project also makes it possible to apply certain themes, images, shapes, charts, and tables to reports to help make the point.

A report isn't the only tool you use to communicate with. You can customize headers, footers, and legends, and insert graphics into the schedule to make a presentation memorable. Other capabilities, such as customizing and copying Timeline view, enable you to incorporate Project data into reports in other programs.

# Generating Standard Reports

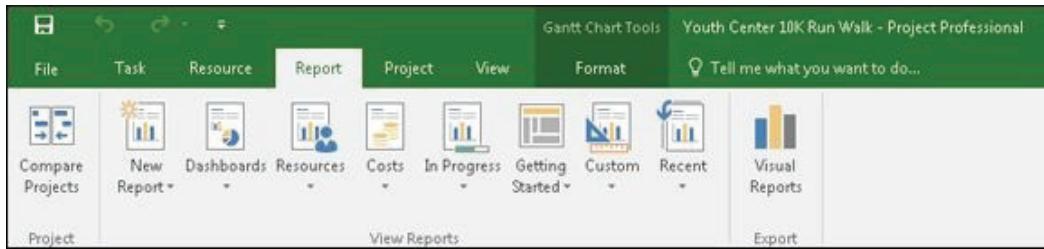
Standard reports are already designed for you, offering numerous choices regarding the information you can include. You do little more than click a few buttons to generate them. Essentially, you select a report category, choose a specific report, and print it. If the plain-vanilla version of a report isn't quite right, you can modify standard reports in a variety of ways.



You can also print any view in Project: Simply press Ctrl+P, and then click Print. The entire project is printed in whichever view is onscreen at the time. Or you can choose File ⇒ Print. In the Print dialog box that appears, you can choose to print only certain pages of the project or only a specific date range from the timescale. Any filter or grouping that you've applied is shown in the printed document.

## What's available

On the Report tab, Project has four standard report categories: Dashboards, Resources, Costs, and In Progress. Each category contains several predesigned reports (as you can see on the Report Ribbon, shown in [Figure 18-1](#)), for a total 16 standard reports.



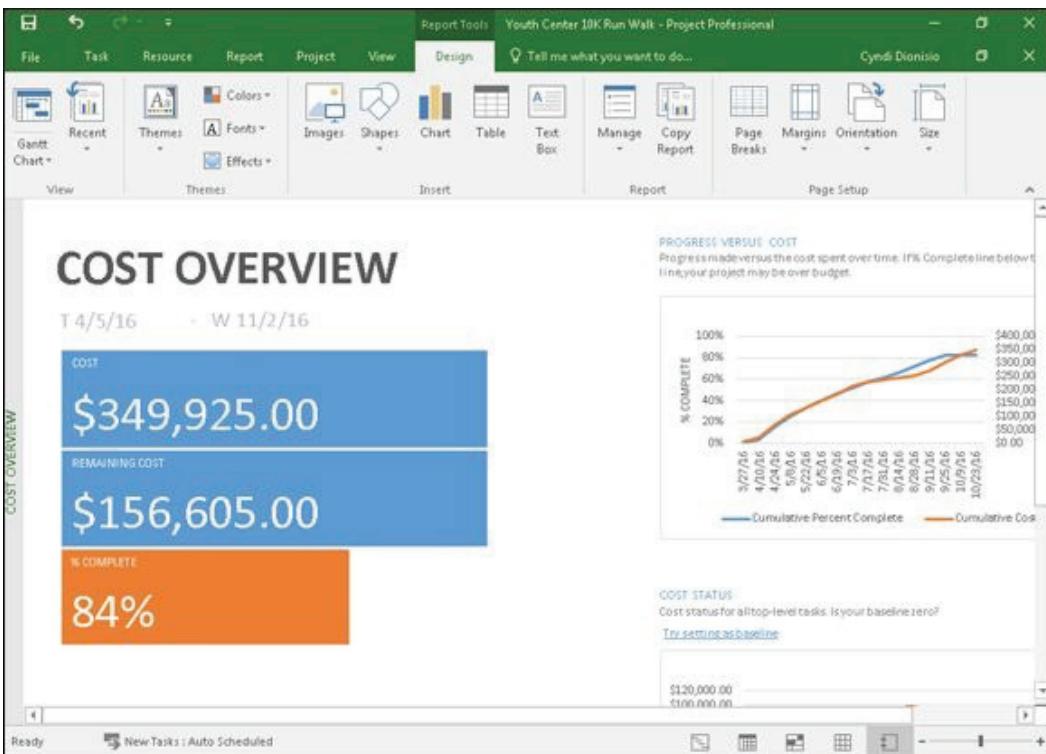
[Figure 18-1:](#) The Report Ribbon.

Standard reports vary in content, format (for example, a table, chart, or a comparison report), and sometimes page orientation (landscape or portrait). You can edit a report to change its name, the period it covers, the table of information it's based on, and the filters applied to it. You can also sort information as you generate the report and add formatting, such as themes, images, and shapes.

## Overviewing the dashboard reports

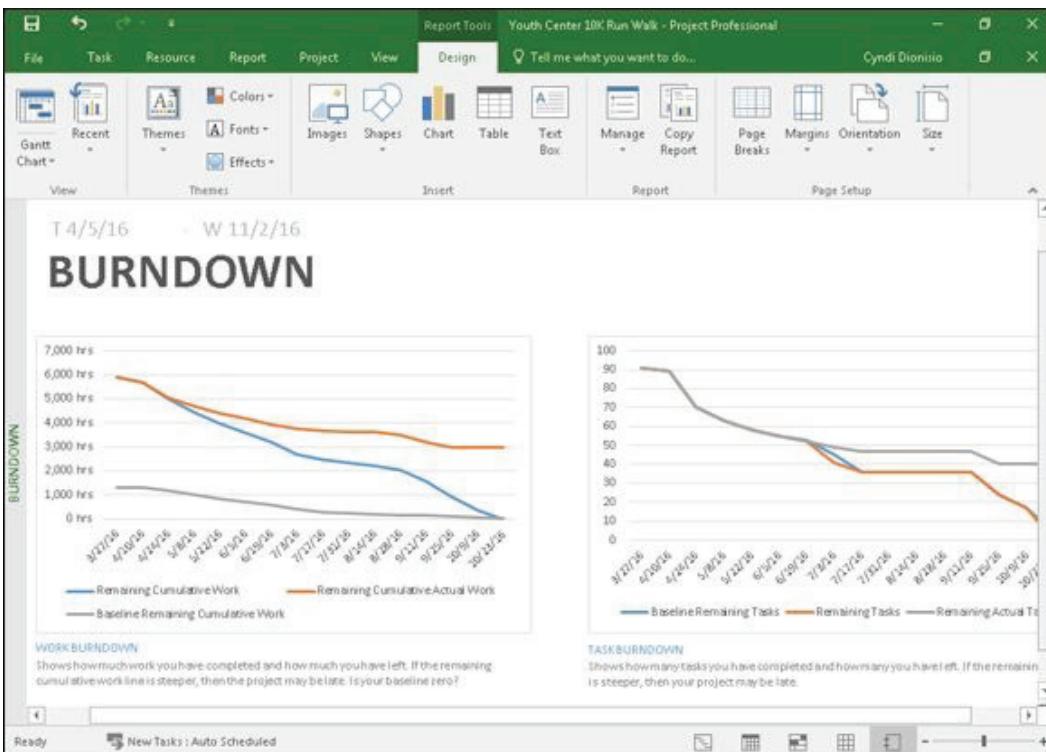
One cool feature in Project 2016 is dashboard reporting. The program has five standard dashboard reports: Burndown, Cost Overview, Project Overview, Upcoming Tasks, and Work Overview.

To see a dashboard report, simply click the Report tab, click the Dashboards down arrow, and select the report you want. [Figure 18-2](#) shows an example of a Cost Overview dashboard report.



**Figure 18-2:** Cost Overview report.

A dashboard report you may not be familiar with is a burndown chart. You use it to compare the amount of work remaining to the baseline work remaining and the number of tasks remaining compared with the baseline remaining tasks. On the burndown chart, you can see the rate of work compared with the planned rate of work to determine whether you're accomplishing work at the same rate as planned. If the number of tasks remaining is higher than the baseline rate, you're in jeopardy of delivering late. [Figure 18-3](#) shows a burndown chart.



**Figure 18-3:** Burndown report.

# **Creating New Reports**

Suppose that the standard report set doesn't have exactly what you want. No problem! The reporting function in Project 2016 makes it a snap to create a new report. Follow these steps:

- 1. From the Report tab, select New Report.**

Select the type of report you want: Blank, Chart, Table, or Comparison.

- 2. When the Report Name dialog box opens, enter a name for the report and click OK.**

A split window opens: The left side holds the report, and the right side holds a Field List.

- 3. In the Select Category section, choose among Time, ID, Name, Resource Names, and Unique ID.**

- 4. From the Select Fields scroll list, check the check box next to the fields you want from the various categories (cost, duration, number, or work).**

- 5. If you want to apply a filter, such as incomplete tasks or active tasks, select one from the Filter drop-down menu.**

- 6. If you want to group information, select the appropriate grouping from the Group By drop-down menu.**

- 7. Select at which level you want to see information reported using the Outline Level drop-down menu — for example, Level 1 (the entire project), Level 2, or Level 3.**

- 8. Choose how to sort the data.**

It's the order in which you want to present it based on the fields you selected in Step 4.

After you create a new report, the report is saved on the Custom Report tab.

## ***Gaining a new perspective on data with visual reports***

Project offers six categories of visual reports and some custom reports that you can build yourself. Some visual reports are based on *time-phased data* (data distributed over time, such as allocations of resource time or costs), and some aren't. Report categories are described in this list:

- ✓ **Task Usage:** Based on time-phased data for tasks, this report category lets you peek at information such as cash flow and earned value over time.
- ✓ **Resource Usage:** Based on time-phased resource data, this type of report includes

resource costs, resource availability, and resource work data.

- ✓ **Assignment Usage:** Also based on time-phased data, this category provides information in areas such as baseline versus actual costs and baseline versus actual work. It also provides an earned value report.
- ✓ **Task Summary, Resource Summary, and Assignment Summary:** These three report categories provide diagram views of a variety of work and cost data. None of these three categories is based on time-phased data.

Use the Visual Reports feature to select the fields you want to view and to modify the reports on the fly.

Additionally, if you enjoy the capabilities offered by pivot table reports in Excel, you'll be glad to know that the same capability is available in Project. Using pivot tables, you can view data from a variety of perspectives beyond the standard Project report capabilities. Pivot tables offer perspectives that are especially useful for data analysis.



All Visual Reports require you to have Microsoft Excel 2010 or higher; some require Visio.

## *Creating a visual report*

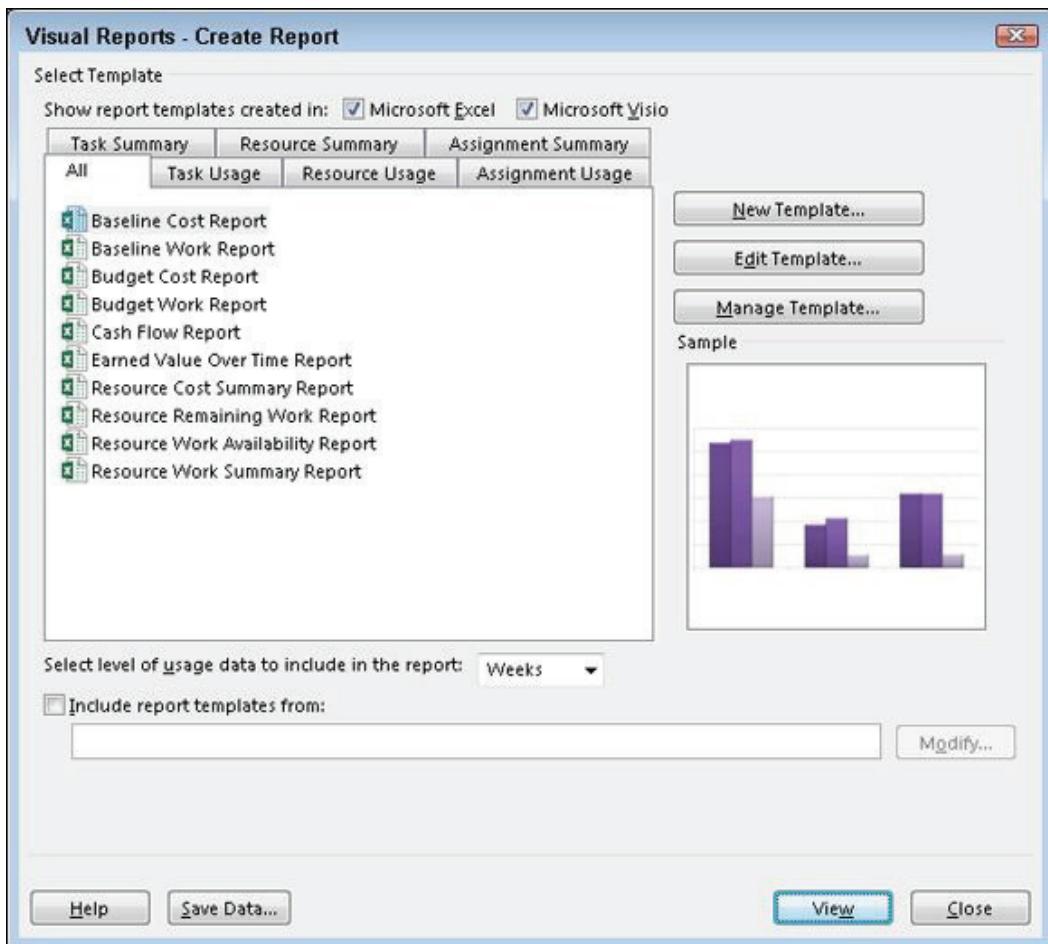
Generating a visual report is simplicity itself. Follow these steps:

1. **From the Report tab, choose Visual Reports Export.**

The Visual Reports – Create Report dialog box appears, as shown in [Figure 18-4](#).

2. **Click the type of report you want from the available tabs.**

3. **Click View.**



**Figure 18-4:** The Visual Reports dialog box.



To customize a visual report, you need to know about pivot tables. Because a discussion of pivot tables in those products is beyond the scope of this book, I heartily recommend *Excel 2016 For Dummies*, by Greg Harvey (Wiley).



You can modify the Visual Reports templates or create your own templates by using the New Template and Edit Template buttons in the Visual Reports dialog box. When you edit a template, you add fields to it or remove fields from it. Creating a new template involves specifying the format (Excel or Visio), choosing the data you want to report on, and selecting fields to include.

# Fine-Tuning a Report

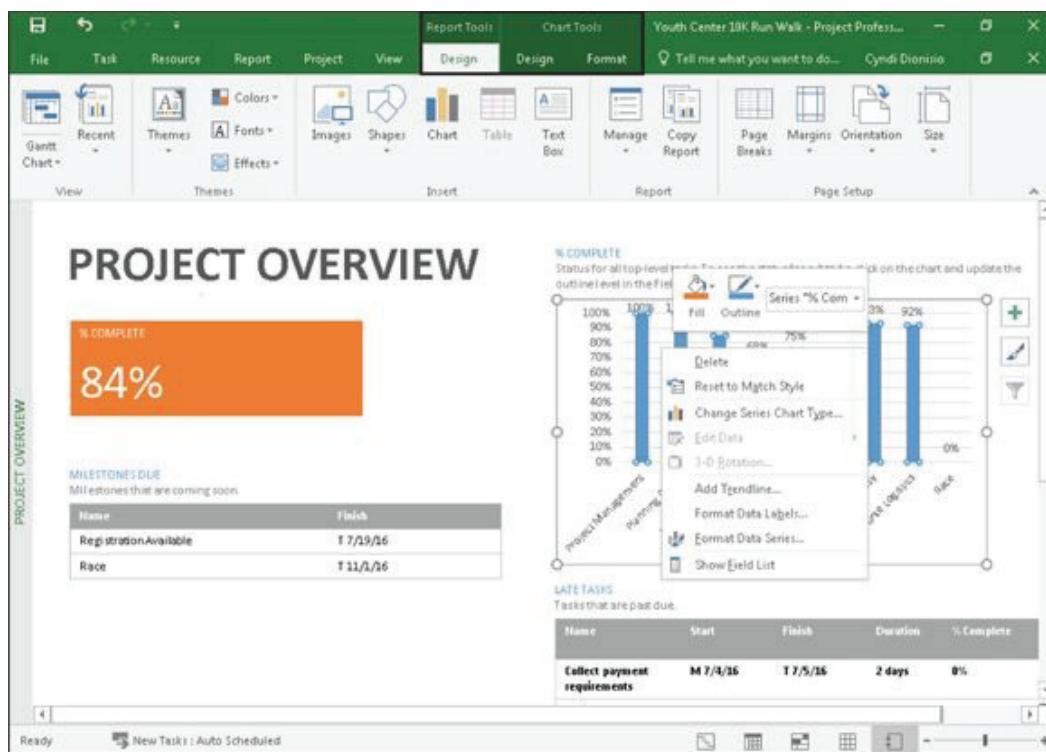
After you have lots of data available to you in Project reports, it would be a shame not to customize the presentation to maximize its impact. Project 2016 helps you create reports that not only show off the information, but also make the information look good!

As soon as you start creating a report, Project opens a new Ribbon, named Report Tools, and shows a Design tab. From this tab, you can work with themes; insert images, shapes, and charts; and work with Page Setup in the print function. Before getting into all the wonderful ways you can make reports attractive, I cover some of the easy ways you can manipulate the information in the reports.

## Dragging, dropping, and sizing

In Project 2016, you can resize and relocate any item on a report by simply clicking the item and then moving it or resizing it. If you want a particular section of the project overview to stand out, enlarge it and shrink the other sections.

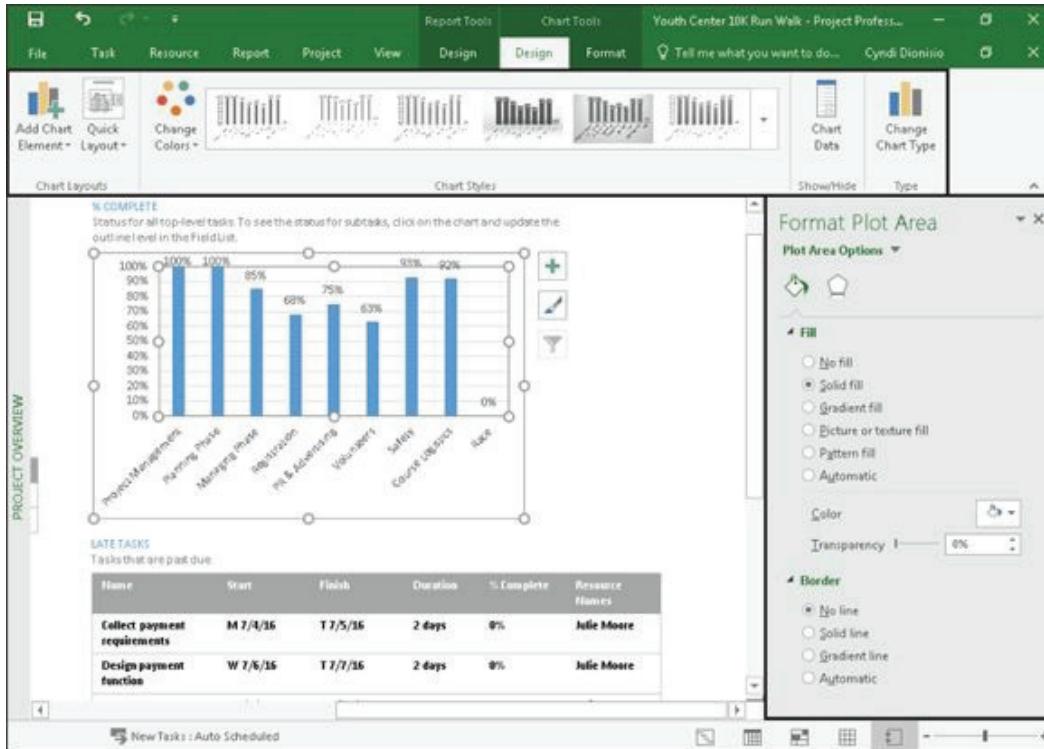
You can also change the way almost any report looks by simply right-clicking and working with the pop-up menus that appear. [Figure 18-5](#) shows the Project Overview Dashboard report with the % Complete section after right-clicking. Notice that you can change its fill, outline, plot area, chart type, and fields. I also drew a box around the Design tab that shows where the Report Tools and Chart Tools are located on the Ribbon.



[Figure 18-5:](#) Changing the report layout.

You can format the data series in the chart by double-clicking a chart section. [Figure](#)

[18-6](#) shows what happens when you double-click the % Complete chart on the Project Overview Dashboard. I've drawn a box around the Ribbon to highlight the fact that you can change the colors, chart data, and chart type. Along the right side of the chart are options to format the plot area by changing the border, color, transparency, width, line format, and dash type.



[Figure 18-6:](#) Changing the report format.

## Looking good!

If you have no creative flair, don't worry — Project does. You can work with the themes that Project provides to present all the reports with flair. From the Report Tools Ribbon on the Design tab, in the Themes group, click Themes. You see 35 different themes that you can apply to reports. Themes include color, type, font, and effect. Play around with a few to find one you like.

If none of the themes works for you, look around on the color, font, and effects drop-down lists until you create *just* the look you're hoping for.

To customize the reports even more, you can add images such as a team logo, shapes, and text boxes. [Figure 18-7](#) shows a portion of a report with a text box and shape added.

# PROJECT OVERVIEW

% COMPLETE

84%

*Yay! We are ahead of  
schedule!*



**Figure 18-7:** Customizing with shapes and text boxes.



Experimenting with customization options can be fun, but as with any other business document, the goal in layout and formatting is readability.

Keep these points in mind when you're formatting Project text:

- ✓ **Font:** Choose simple sans serif fonts, such as Arial. If you're publishing the project on the web, consider using Verdana, which is a font created for readability online.
- ✓ **Color:** You have to consider factors such as whether the printout will be in color or black and white, whether the use of too many colors will become confusing for the reader, and whether certain colors (such as yellow) will be difficult to read.
- ✓ **Font size:** Use a font size that's readable, without making it so big that the taskbar labels become too crowded.
- ✓ **Effects:** Avoid text effects that can make certain text difficult to read (such as bold, italic, or underlining). Use these effects only to call attention to a few elements of the project.

# *Spiffing Things Up*

These days, image is everything. You and the project may be judged to a certain extent by how professional the printed information looks. Even if the project is a million dollars over budget and four months behind, making reports or other printouts look good can make delivering bad news easier to do. You can make the project presentation look good by adding graphics.

Wouldn't the company logo look spiffy in the header of the report? Or a picture of the new product box in Gantt Chart view of the New Product Launch project?

Graphics can add visual information or make the plan just plain look nicer. You can insert graphics in the project file by using one of these three methods:

- ✓ **Cut and paste a graphic from another file.** A graphical image that you cut and paste essentially can't be edited by you in Project.
- ✓ **Insert a link to an existing graphics file.** Linking reduces the Project file.
- ✓ **Embed a graphic.** Embedding lets you edit the content of the graphic in Project, using the tools of an image program such as Paint.

You can't add graphics willy-nilly, however. You can add graphics in only a few places: the chart pane of any Gantt Chart view; a task note; a resource note; or a header, footer, or legend that's used in reports or printouts of views.

For example, you may put pictures of resources in the Resource Note field so that you can remember who's who, or you may include a photo of the corporate headquarters in the header of the report.



Graphics swell the size of the Project file like a sponge in a pail of water. If you're thinking of using a lot of graphics, don't let them detract from the main information in printouts. Or try linking to them instead of inserting them into the file.

If you want to insert an existing graphics file into a Notes box, follow these steps:

1. **Double-click a task in the Gantt Chart view. Then select the Notes tab in the Task Information or Resource Information dialog box.**
2. **Click the Insert Object button.**  
The Insert Object dialog box, shown in [Figure 18-8](#), appears.
3. **Choose the Create from File option.**
4. **Click the Browse button to locate the file.**
5. **To insert to the file, click the Insert button and then click the OK button.**

You may see a warning before you insert an image. If you want to continue, click Yes.

**6. To link the file, select the Link check box next to the Browse button.**

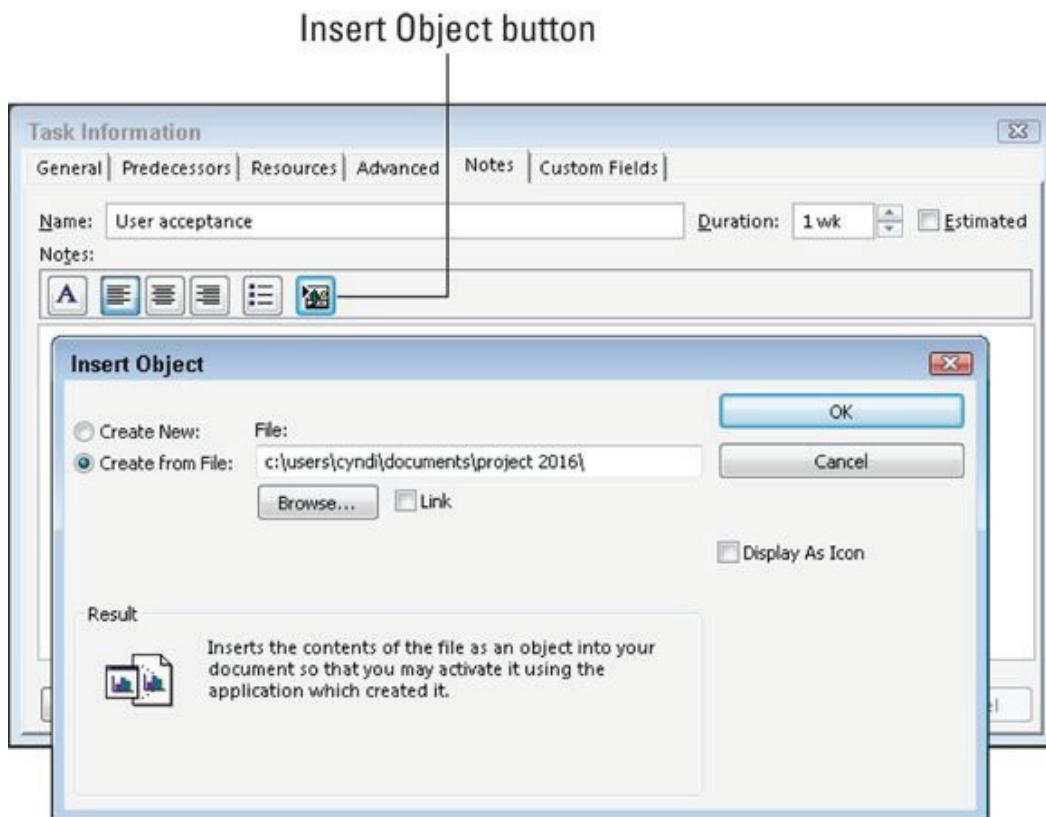
If you don't select this option, the object is embedded in the file.

**7. To insert the object as an icon, select the Display as Icon check box.**



When you display the object as an icon, someone viewing the project on a computer can click the icon to view the picture.

**8. Click the OK button.**



**Figure 18-8:** Browse to locate a file on the network or the hard drive.

If you want to insert an existing graphics file in a header or footer, follow these steps:

**1. Choose File ⇒ Print.**

**2. Click the Page Setup link at the bottom of the page.**

**3. Go to the Header or Footer tab in the Page Setup dialog box.**

**4. Click the Insert Picture button, as shown in [Figure 18-9](#).**

The Insert Picture dialog box appears.

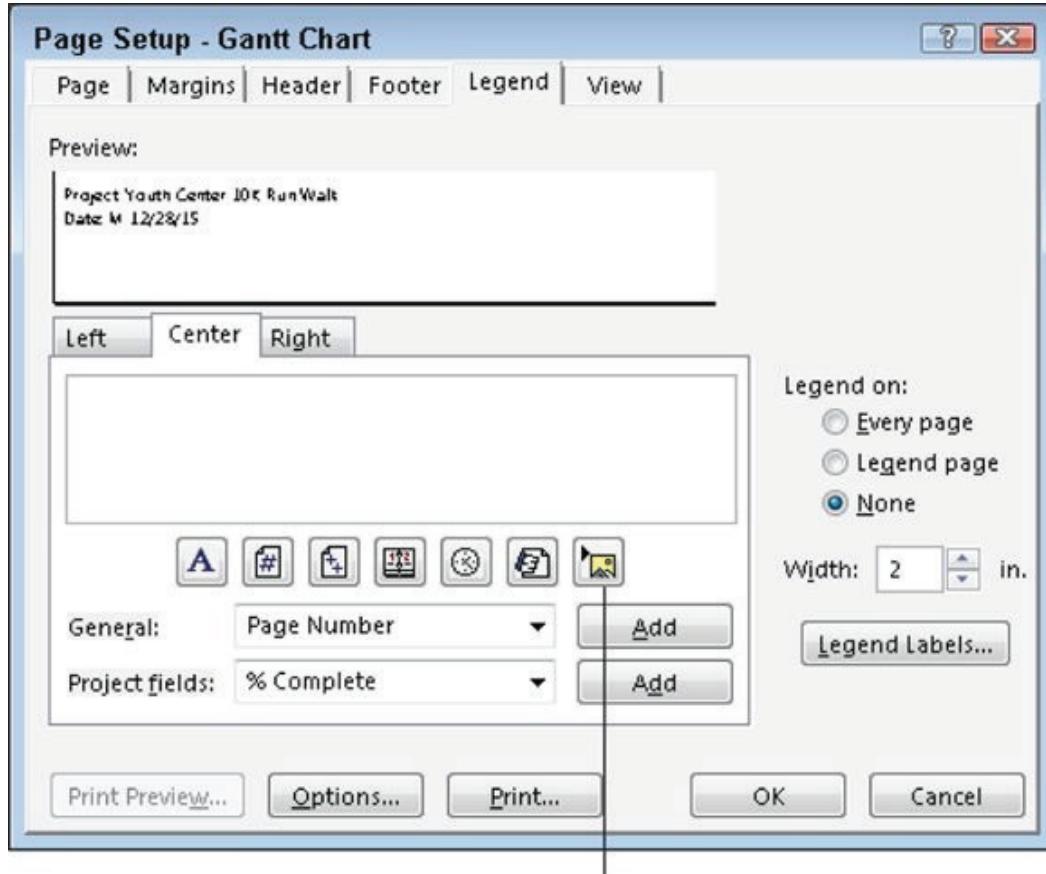
**5. Navigate to the folder that holds the file to insert.**

**6. Click to select the file.**

**7. Click the Insert button.**

The image appears in the header or footer.

**8. Click OK.**



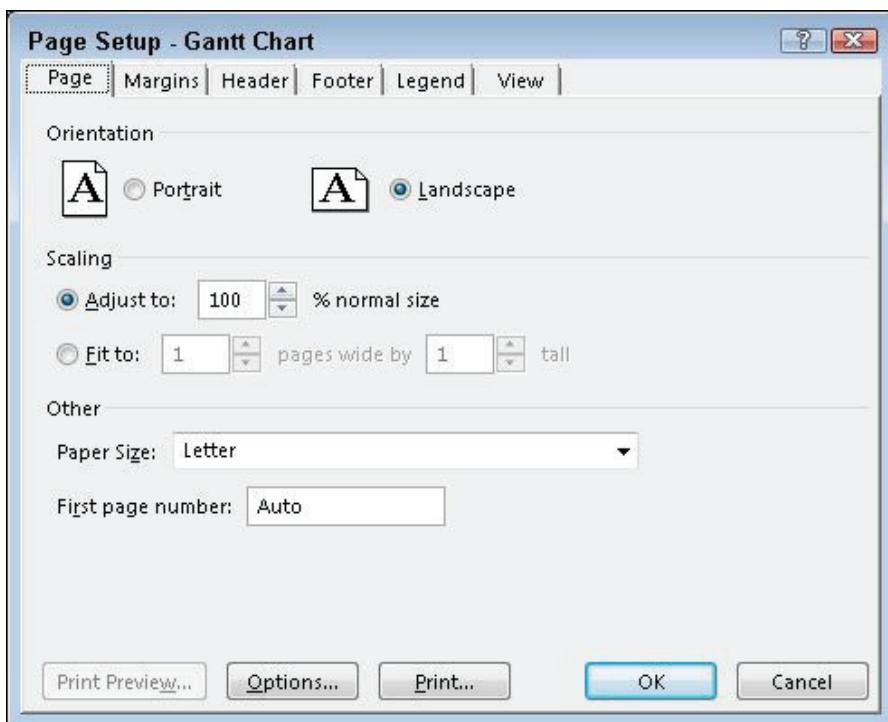
**Figure 18-9:** The Page Setup dialog box.

# Call the Printer!

The proof of the report is in the printing, but you should see to several adjustments before you click the button to print. In Project, it's not only margins or page orientation that you need to set (although you have to set them, too); you can also add useful information to headers and footers and set legends to help readers understand the many bars, diamonds, and other graphical elements that many Project views and reports display.

## Working with Page Setup

The Page Setup dialog box can be used to control printouts of any displayed Project view. You can open this dialog box by choosing File ⇒ Print ⇒ Page Setup. The Page Setup dialog box, as shown in [Figure 18-10](#), contains six tabs.



[Figure 18-10:](#) Page setup.

### Sizing

The Page tab contains several basic page settings that determine the orientation, the paper size, and the way content is scaled to fit the page. By making these settings, you influence how much material can fit on a page and how many pages comprise the document.

You have these choices on the Page tab (refer to [Figure 18-10](#)):

- ✓ **Portrait or Landscape orientation:** You've no doubt already dealt with this choice. Portrait orientation is set up like the *Mona Lisa*, with the short edge of the paper running across the top of the page. In landscape orientation, the long edge of the paper runs across the top instead.

- ✓ **Scaling:** You can use the Adjust To setting, which is based on a percentage of the original size, or the Fit To setting, which gives you some control over scaling to fit to the width of a single page or to the height of a single page.
- ✓ **Other:** This area is a catch-all for two options: Paper Size and First Page Number. All the standard choices for paper size are available in the Paper Size list, including index cards and envelopes. First Page Number can remain as Auto (in which case the first page is numbered 1, the second page is 2, and so on), or you can enter another number there yourself.

## ***Staying within the margins***

I won't bore you by defining a margin. However, I'll remind you that a margin serves the dual purpose of controlling how much information can fit on a page and creating a border of white space that frames the document (making it cleaner-looking and easier to read).

To set margins using the Page Setup dialog box, follow these steps:

- 1. Click the Margins tab.**

As you modify margin settings, the preview shows you where they'll appear on the page.

- 2. Use the arrows to set the top, bottom, left, and right margins.**

Click the up arrow for a wider margin, and click the down arrow for a narrower margin.

- 3. If you want a border that represents the margin, use the Borders Around options.**

You can choose to print a border on every page, on only outer pages (print a border on the first and last pages only — available only when printing in Network Diagram view), or on none of the pages.

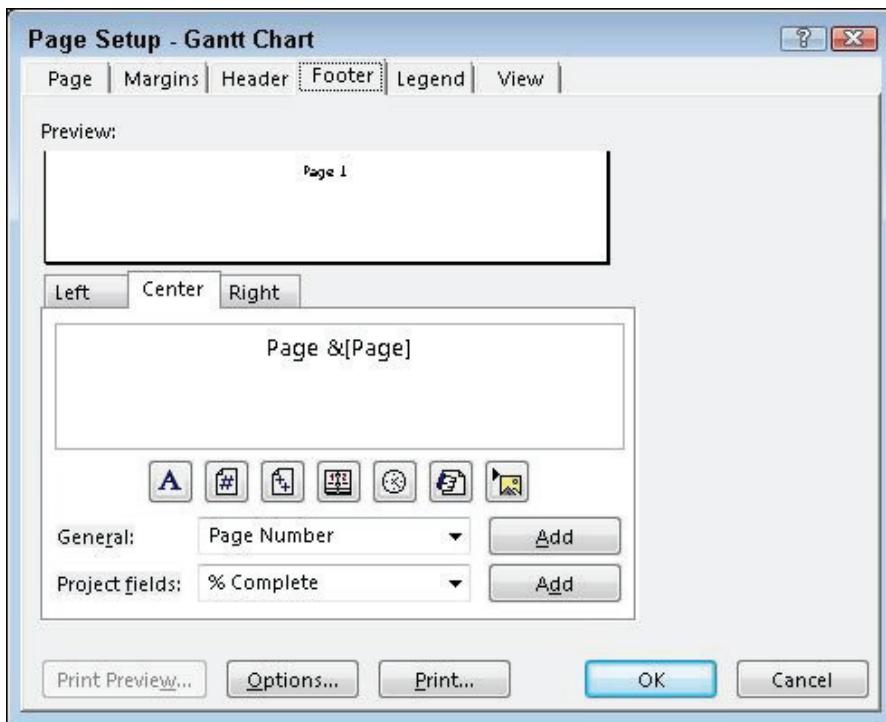


Setting margins to less than  $\frac{1}{4}$  inch (.25") can cut off the printed output, because printers can print only so close to the edge of a page.

## ***Inserting headers and footers***

Throughout the life of a project, you print many versions of the project, many reports, and many types of information using various tables. Headers and footers are useful features to help you, and readers, keep track of all this information.

You can use the Header and Footer tabs of the Page Setup dialog box (see [Figure 18-11](#)) to set and preview header (top) and footer (bottom) contents.



**Figure 18-11:** The Header and Footer tabs are nearly identical.

This list describes the settings you can make on these tabs:

- ✓ **Text location:** Specify that the text you enter will appear to the left, at the center, or to the right of the header or footer by clicking the corresponding tab and then typing the text.
- ✓ **Format text:** Use the tool buttons, or quickly insert such elements as the page number, the date, or a picture file.
- ✓ **Select standard text:** Insert additional text by using these lists:

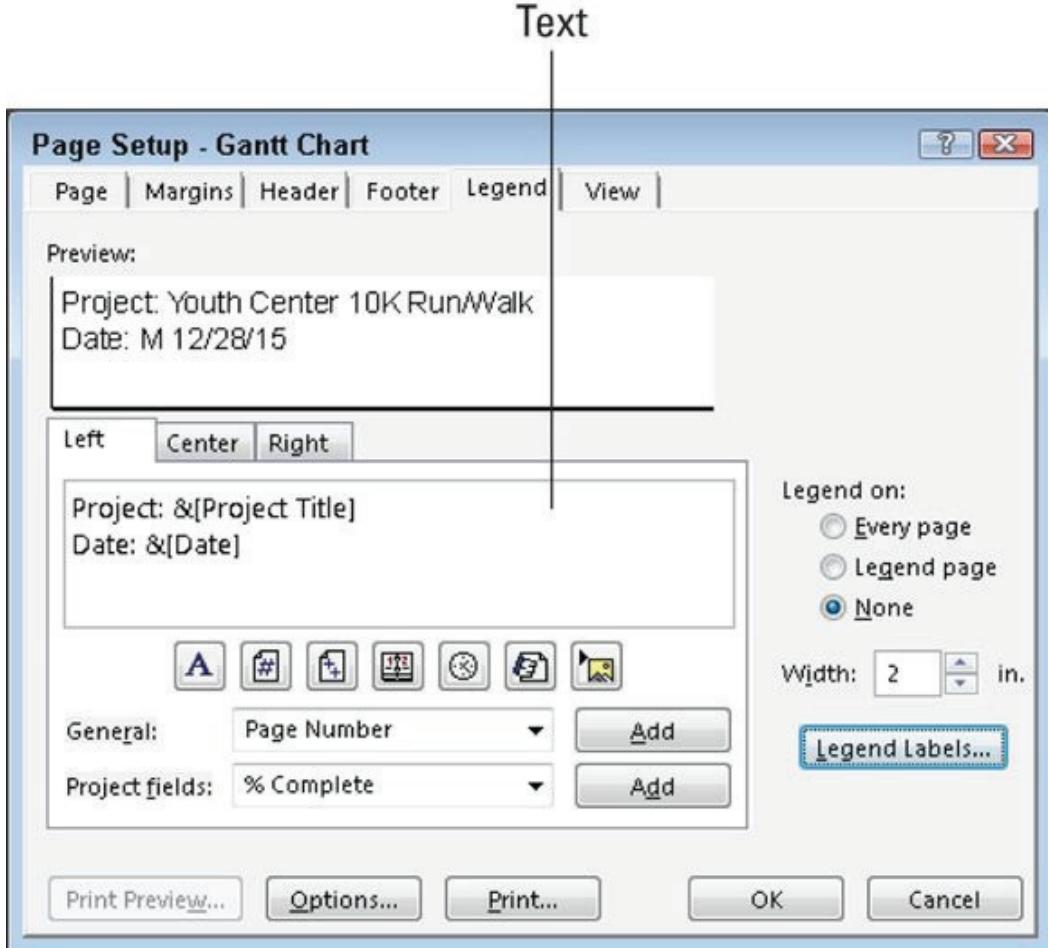
*General:* Includes such options as Total Page Count, Project Title, and Company Name

*Project Fields:* Includes all fields available in Project

You can use these fields to alert readers to important fields to review or to the nature of the printout. To add General or Project Fields items, select them from their respective lists and then click the Add button to add them to the Left, Center, or Right tab.

## Working with a legend

A *legend* acts as a guide to the meanings of various graphical elements, as shown in [Figure 18-12](#). The Legend tab bears a striking resemblance to the Header and Footer tabs except that the legend is generated automatically. All you can specify on this tab is the text that fits in the box to the left of the legend.



**Figure 18-12:** Page setup with legend information.

The Legend tab of the Page Setup dialog box has a few settings that differ from the Header and Footer tabs:

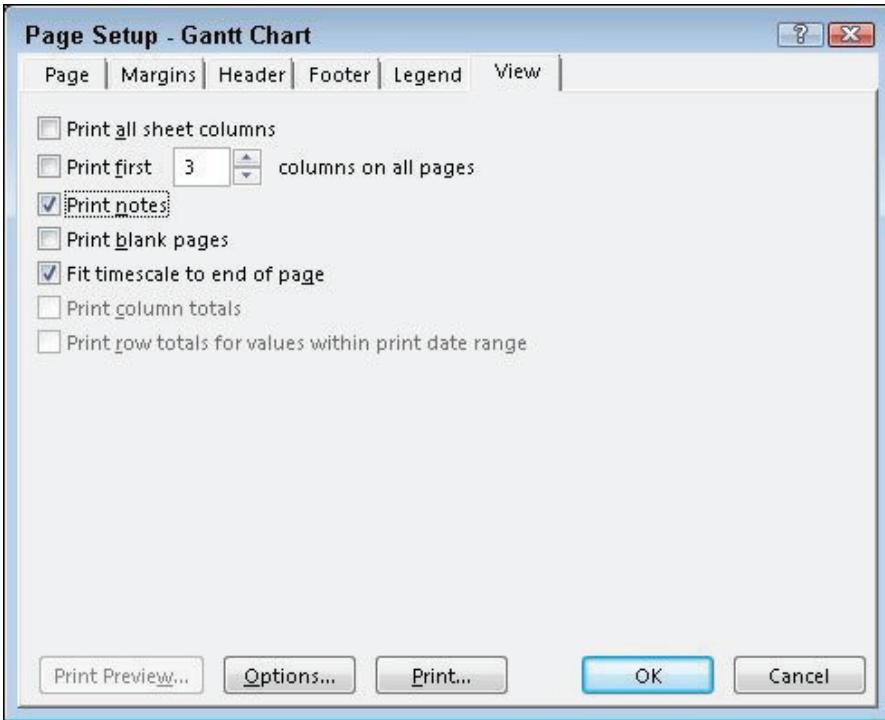
- ✓ You can print the legend on every page or on a separate legend page, or you can decide not to print a legend.
- ✓ You can establish the width of the text area of the legend (the area where you can insert elements such as the page number or the date).
- ✓ You can edit the text font, style, size, and color of the legend by clicking the Legend Labels box.



Unlike a header or footer, where you have to enter something to make anything appear, a legend prints by default. If you don't want a legend to print, click the Legend tab and then set the Legend On option to None.

## **Deciding what to print**

If you're printing a currently displayed view, the View tab of the Page Setup dialog box is available to you, as shown in [Figure 18-13](#).



**Figure 18-13:** The View tab.

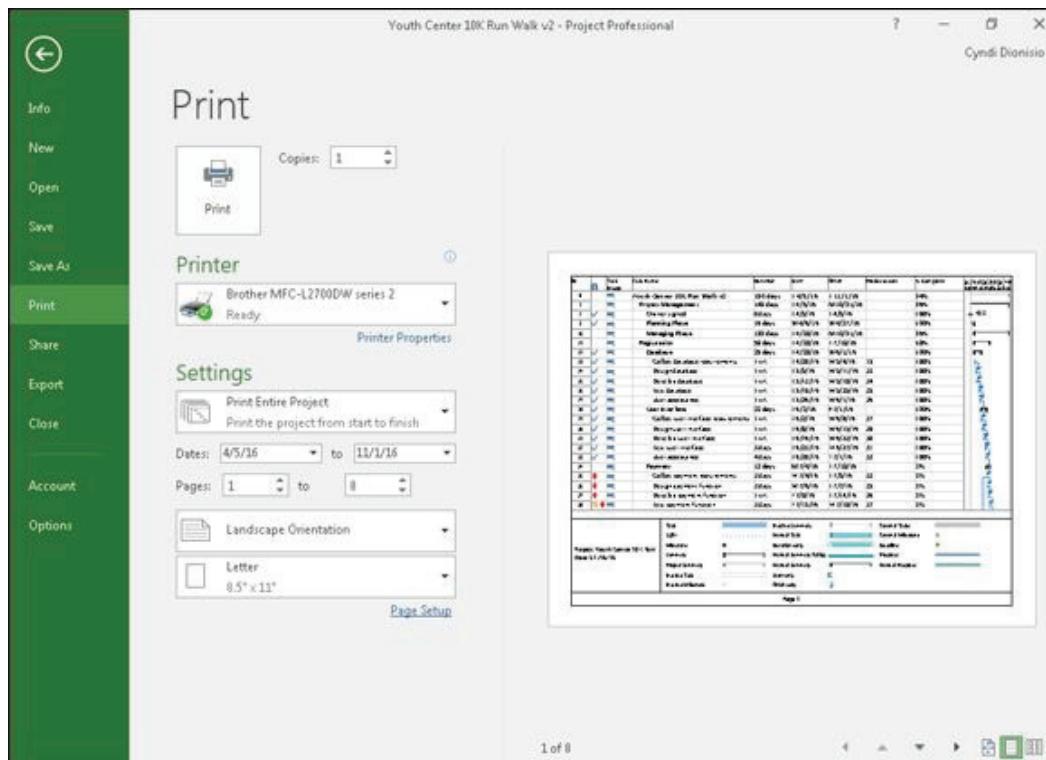
You can make these settings on the View tab:

- ✓ **Print All Sheet Columns:** Prints every sheet column in the view, regardless of whether it's visible onscreen. With this option deselected, only the columns that show in the view are printed.
- ✓ **Print First # Columns on All Pages:** Lets you control a specific number of columns to print.
- ✓ **Print Notes:** Prints every task, resource, and assignment note. These items are printed on a separate Notes page.
- ✓ **Print Blank Pages:** Lets you print blank pages. For example, use this setting to print a page that represents a time in the project when no tasks are occurring. If you want a smaller number of pages in the printout, ignore this setting.
- ✓ **Fit Timescale to End of Page:** Scales the timescale to fit more of the project on the page.
- ✓ **Print Column Totals:** Adds a column that contains column totals. It pertains to printouts of Usage views.
- ✓ **Print Row Totals for Values within Print Date Range:** Adds a column that contains row totals. It pertains to printouts of Usage views.

## **Getting a preview**

Granted, although software print previews aren't quite as exciting as movie previews, they help you make everything look right before you print the project. When you choose a report or choose File ⇒ Print to print a view, the preview automatically

appears in the Backstage. [Figure 18-14](#) has a box around the buttons in the lower-right corner of the preview that enable you to modify the preview so that you can work with the settings more effectively.



[Figure 18-14:](#) Backstage Print view.

You can use the buttons in the Backstage preview to

- ✓ Move around the pages of the report by using the first four arrow buttons and the horizontal and vertical scroll bars
- ✓ View more detail by clicking the Actual Size button and then clicking the report
- ✓ Focus on a single page or all pages in the report by using the One Page and Multiple Pages buttons

**Note:** Always preview the document before printing it to review the number of pages being printed. One click or one instance of zooming in or out can easily double — or cut in half — the number of pages being sent to the printer. You can easily waste paper if you're not careful.

## Printing, at last!

In this section, I describe how to print the document for which you've made all the eye-pleasing settings discussed in this chapter. For this task, you need to make the print settings to the left of the preview in the Backstage, as shown in [Figure 18-14](#).

This list describes the settings you encounter in this area:

- ✓ **The Copies up arrow and down arrow:** Click the Copies up arrow to print more copies, or click the down arrow to print fewer (but not less than 1).

- ✓ **The Printer area:** This area of the dialog box indicates the printer you will use. You can choose a printer from the list and click the Printer Properties link to control printer settings such as color quality and paper source.
- ✓ **The Settings area:** You can print the entire project or select another option from the drop-down list so that you can print specific dates, print specific pages, or print custom dates and pages. The accompanying options change depending on the choice. You also can use the Settings drop-down list to specify whether to print notes, all sheet columns, or only the left column of pages (to print only the leftmost column on every page).
- ✓ **The remaining settings:** These choices control the orientation and paper size, if you didn't make them elsewhere.

After you make all the settings and you're ready to print, simply click the big Print button in the upper-left corner.

# Working on the Timeline

The Timeline gives sort of a 10,000-foot overview of the project schedule. It shows a graphical timeline spanning from the project's start date to its end date, and it highlights the period shown in the main view, such as the time frame shown on the Gantt chart. You can toggle the Timeline on and off as needed. To do so, click the View tab on the Ribbon and select the Timeline check box in the Split View group.

The Timeline even has its own toolbar, Timeline Tools, as shown in [Figure 18-15](#).



[Figure 18-15:](#) The Timeline Tools toolbar.

From the Timeline Tools toolbar, you can format text and dates, format the display of tasks on the toolbar, and copy the Timeline in various presentation formats.

## Adding tasks to the Timeline

You can add summary tasks, detailed tasks, and milestones to the Timeline. For example, the Timeline shown in [Figure 18-16](#) shows milestones, the Volunteers summary task, and a callout for the Obtain City Permits task. Yes, you can do all these wonderful things!



[Figure 18-16:](#) The Timeline, with tasks, summary tasks, and milestones.

You can add information to the Timeline in a number of ways. To add several tasks at a time, follow these simple steps:

### 1. Open the Timeline from the View tab.

Go to the Task Views tool group and click the Timeline view. The timeline will be visible in the chart area, and the Timeline Tools toolbar will show up above the Format tab.

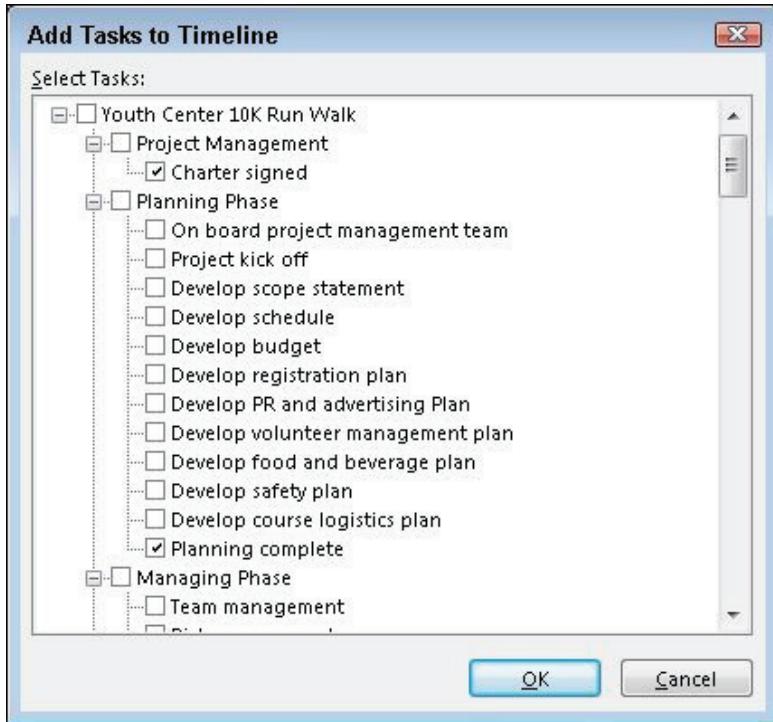
### 2. Click Timeline Tools to show the Timeline Tools toolbar (refer to [Figure 18-15](#)).

### 3. Click Existing Tasks in the Insert group.

The Add Tasks to Timeline dialog box opens, as shown in [Figure 18-17](#), showing an outline of all tasks in the project. You can select as many as you like. They

appear on the Timeline as individual tasks, summary tasks, or milestones, depending on how they're entered in Project.

**4. Click OK.**



**Figure 18-17:** Adding tasks to the Timeline.

You can also add a new task by clicking the Task button in the Insert group to open the Task Information dialog box and then entering the task information, adding the predecessor and successor information, and assigning resources. When you select the Display on Timeline check box, the task appears on the Timeline.

If you want to change the way a task appears on the Timeline, follow these steps:

- 1. Click to select the task.**
- 2. In the Current Selection group, select either Display as Bar to show a bar that indicates the duration or Display as Callout to create a callout box that holds the task information. If you want to remove a task from the Timeline, select Remove from Timeline.**
- 3. Reposition the callout box to improve readability, if you have several tasks close together.**



You can right-click a task and click Add to Timeline to make the task show up on the Timeline.

## ***Customizing the Timeline***

Project lets you customize the Timeline to make it truly fit your needs. For example,

you can freeze the Timeline or move it around so that it focuses on a particular time frame. When you move the timeframe in Timeline, the Gantt chart moves in parallel. To move the Timeline, follow these steps:

1. **Click the Timeline so that the Timeline Tools toolbar appears.**
2. **In the Show/Hide group, select Pan & Zoom.**  
A green frame surrounds the current time frame.
3. **Position the cursor on the edge to drag the time frame to the size you like.**
4. **To shift the time frame to a different one, move the cursor to the top of the frame, wait for the four-way arrow, and drag the green frame to the time frame you want.**

You can also change the date format from the Show/Hide group on the Timeline Tools toolbar. Simply click the down arrow and select the way you want to see the date displayed on the Timeline.

The Timeline can be displayed with details about tasks, such as the task name and dates, or without the detail and just milestones and bars that represent tasks, but no names associated with the tasks. If you want a detailed view, select the Detailed Timeline check box in the Show/Hide group.

## ***Copying the Timeline***

Because that vendor you're trying to coordinate with doesn't use Project, you need to share the graphical Timeline information via another file format. Project builds in the special capability to take a snapshot of the Timeline so that you can paste it into an email message; a presentation; or another program, such as a word processor.

Follow these steps to copy and use the Timeline:

1. **Create the email message or document where you want to use the Timeline image.**
2. **From the Timeline Tools, choose Copy Timeline and then select a format.**  
The available format choices are For E-Mail, For Presentation, and Full Size.
3. **In the program where you want to insert the Timeline, position the cursor where you want the Timeline image to appear.**
4. **Press Ctrl+V.**

The image appears in the message or document.

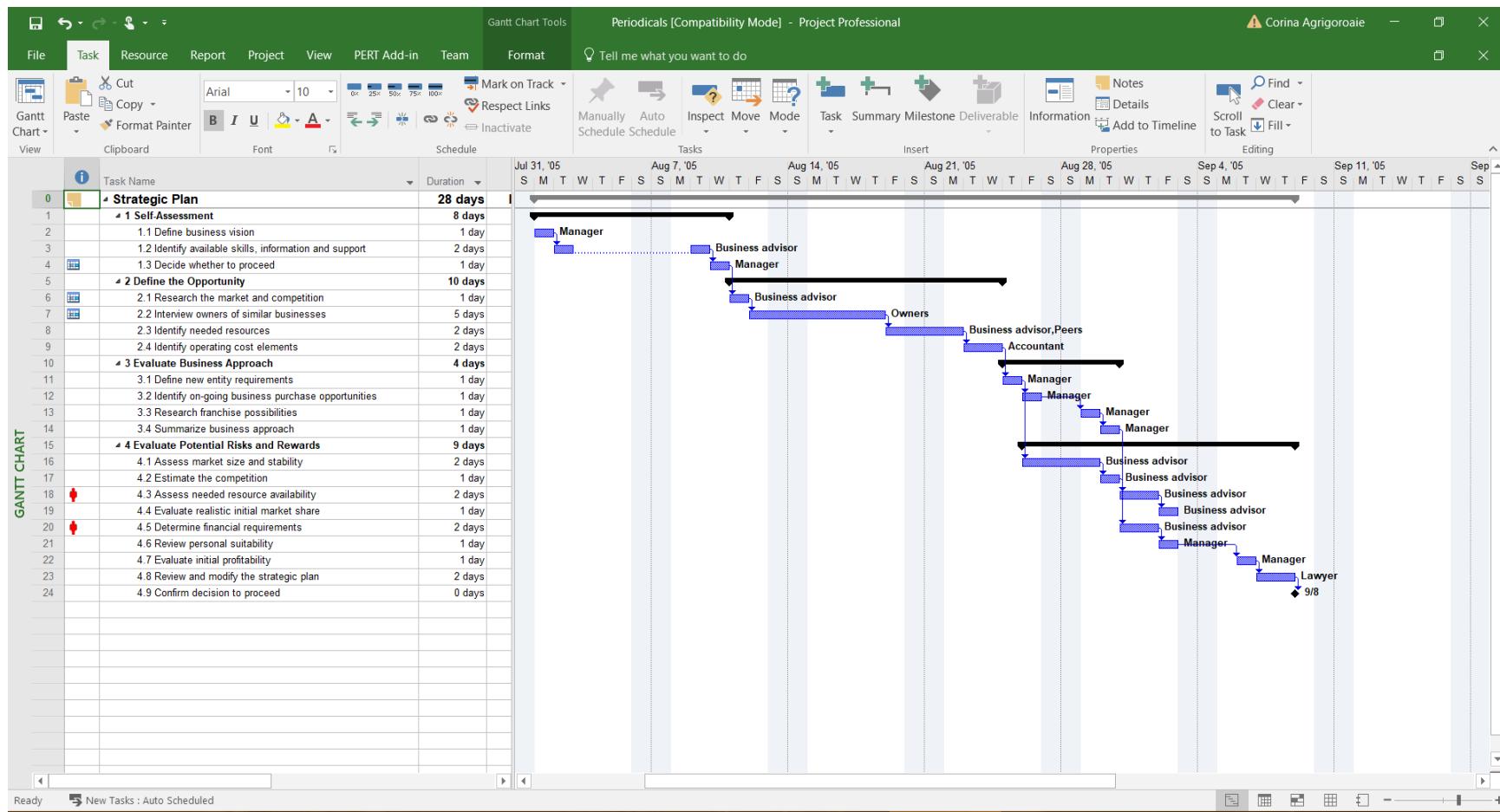
## ***Enhanced Copy and Paste***

Though it has long been possible to copy and paste information to and from Project and other Office applications, sometimes the results were, well, messy. Now, copy-and-paste operations between applications retain much more information. For example, when you copy tasks from Project and paste them into Word or Excel, you automatically see outline-level formatting and column headings. And formatting from information copied from another application into Project is retained. There's no need to reinvent the wheel every time you need to copy data between apps — and that's a sweet, sweet thing.

## Aplicații

Studiati proiectul *Periodicals.mpp* și alegeti o dată de referință (data curentă) între data de începere și data de terminare a proiectului (de exemplu 28 august 2005). Marcați drept complete activitățile până în această dată curentă.

Vizualizați apoi rapoartele descrise în laborator. Salvați în format *pdf* cel puțin 10 rapoarte, dintre care unul personalizat (*custom*) și unul *overbudget*.





## 5. Set up resources

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### In this chapter

- [Set up work resources](#)
  - [Enter the maximum capacity for work resources](#)
  - [Enter work resource pay rates](#)
  - [Adjust working time in a resource calendar](#)
  - [Set up cost resources](#)
  - [Document resources by using notes](#)
- 

### Practice files

For this chapter, use the SimpleSetUpResources practice file from the Project2016SBS\Ch05 folder. For practice file download instructions, see the introduction.

Resources include the people, equipment, and material needed to complete the work of a project. Effective resource management is one of the most significant advantages of using Project 2016 rather than task-focused planning tools such as issue-ticketing systems.

You can manage three types of resources in Project—work resources and two special-purpose resources: cost and material. Work resources include the people and equipment needed to complete the tasks in a project’s plan. Cost resources represent categories of financial costs, derived from specific tasks, that you need to account for in the plan. Examples include categories of expenses like travel and entertainment. Material resources are consumables that get used up as the project proceeds. For example, a construction project might need to track steel or concrete as it is used throughout the project. You will work with material resources in [Chapter 11, “Fine-tune resource and assignment details.”](#)

Setting up resource information in Project takes a little effort, but the time is well spent if your project is primarily driven by time or cost constraints (as nearly all projects are).

This chapter guides you through procedures related to setting up work resources, entering the maximum capacity for work resources, entering work resource pay rates, adjusting working time in a [resource calendar](#), setting up cost resources, and documenting resources by using notes.

### Set up work resources

Work resources are the people and equipment doing the work of the project. Project focuses on two aspects of work resources: their availability and their costs. *Availability* pertains to when specific resources can work on tasks and how much work those resources can perform. *Costs* refer to the financial costs incurred by resources performing work on the project.

In Project, work resource names can refer to specific people or to specific job titles. Use

whatever naming convention makes the most sense to you and to those who will see your plan. The important questions are these: who will see these resource names, and how will they identify the resources? The resource names you choose will appear both in Project and in any resource information shared from Project.

A resource might refer to somebody who is already on staff, or to a position to be filled later. If you have not yet filled all the resource positions required, you might not have the names of specific people to enter. In that case, use descriptive placeholder names or job titles when setting up resources in Project.

Some examples of how you can enter work resource names are listed in the following table.

Work resource	Examples
An individual person identified by name	Jun Cao; Zac Woodall
An individual person identified by job title or function	Publisher; Contract specialist
A group of people who have common skills (when assigning such interchangeable resources to a task, you might not be concerned about who the individual resource is as long as that person has the right skills)	Copyeditors
Equipment	Offset lithography press

Project can help you make smarter decisions about managing resources and monitoring financial costs.

## To enter work resource names

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet** to display the Resource Sheet view.
2. Click an empty cell in the **Resource Name** column.
3. Enter your resource names, pressing the **Enter** key after each one.

Project applies the default Work resource type in the Type field.



You can quickly import resources from your email address book. First, switch to the Resource Sheet view. Then, on the Resource tab, click Add Resources.

## To insert a new work resource within a resource list

1. Display the Resource Sheet view.
2. Click in the cell in the **Resource Name** column where you want to insert the new

resource.

3. On the **Resource** tab, in the **Insert** group, click **Add Resources**, and then click **Work Resource**.

Project inserts a new row with the *<New Resource>* name in the Resource Name column, and renames the subsequent resources.

4. With *<New Resource>* selected, enter the resource name, and then press **Enter**.

## To delete a resource

1. Right-click the resource name, and then click **Delete Resource**.

### Equipment resource considerations

In Project, you set up people and equipment resources in exactly the same way; they are both examples of work resources. However, you should be aware of important differences in how you can schedule these two work resources. Most people resources have a typical working day of 8 hours and usually no more than 12 hours, but equipment resources might have much more varied capacities for work, ranging from short durations (followed by maintenance) to around-the-clock sessions without interruption. Moreover, people resources might be flexible in the tasks they can perform, but equipment resources tend to be more specialized. For example, a content editor for a book project might also act as a copyeditor when required, but a desktop copy machine cannot replace a printing press.

You do not need to track every piece of equipment that will be used in your plan, but you might want to set up equipment resources when:

- Multiple teams or people might need a piece of equipment to accomplish different tasks simultaneously, and the equipment might be overbooked.
- You want to plan and track costs associated with the equipment.

Consider these issues if your plans involve equipment resources.

## Enter the maximum capacity for work resources

Work resources do not have unlimited capacity within the limited duration of a plan, and Project helps you manage this. The Max. Units field represents the maximum capacity of a resource to work on the tasks assigned to that resource. Specifying that a resource has 100% maximum units means that 100 percent of that resource's working time is available to work on assigned tasks in the plan. Project will alert you with an indicator and formatting if you assign the resource to more tasks than the resource can accomplish. For example, a resource will be overallocated if it is assigned to two or more tasks at 100% capacity each and the tasks overlap. 100% is the default Max. Units value for new work resources.

For a resource that represents not a specific person but a category of interchangeable people with a common skill set, you can enter a larger maximum units value to indicate the number of available people. For example, entering a maximum units value of 200%

for such a resource means that you expect two individual people who belong to that resource category to be available to work full time every workday, or four individual people to each work half time, or any equivalent combination.

For a resource that has less than full-time availability, you can enter a smaller maximum units value. For example, entering a maximum units value of 75% for such a resource means that you expect that resource's capacity to be three-quarters of a full-time resource. For a 40-hour work week, this equals 30 hours of capacity. Note that such a part-time working capacity might apply to a part-time worker or to a full-time worker who is allocated to a specific project only part time.

## To adjust a resource's working capacity

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. In the Resource Sheet view click the **Max. Units** field for the resource you want to adjust (the *Max.* portion of the field's column heading might be the only part visible).



### Tip

When you click a numeric value in a field like Max. Units, up and down arrows appear. You can click these to display the number you want, or you can enter the number directly in the field.

3. Enter the new value for the resource. For example, enter **200%** to represent two resources, or enter **50%** for a resource who has only half-time availability.



### Tip

If you prefer, you can display and enter maximum units as partial or whole numbers (such as 0.5, 1, or 4) rather than as percentages (such as 50%, 100%, or 400%). To use this format, on the File tab, click Options. In the Project Options dialog box, click the Schedule tab. Under the Schedule heading, in the Show Assignment Units As A box, click Decimal.

## Enter work resource pay rates

Almost all projects have some financial aspect, and cost limits the scope of many projects. Tracking and managing cost information in Project allows the project manager to answer such important questions as:

- What is the expected total cost of the project based on task durations and resource assignments?
- Is the organization using expensive resources to do work that less expensive resources could do?
- How much money will a specific type of resource or task cost over the life of the

project?

- Is the organization spending money at a rate that it can sustain for the planned duration of the project?

In Project, you can enter standard rates and costs per use for work and material resources, in addition to overtime rates for work resources. Recall that in Project there are three types of resources: work, cost, and material.

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Cost resources do not use pay rates and are described later in this chapter. Material resources are introduced in [Chapter 11, “Fine-tune resource and assignment details.”](#)

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You can enter pay rates with a variety of time bases—per minute, hourly (the default), daily, weekly, monthly, or yearly. You enter rates in the format of *rate/period*—for example, *30/h* for \$30 per hour. Period abbreviations are */m* for minutes, */h* for hours, */d* for day, */w* for week, */mo* for month and */y* for year.

When a work resource has a standard pay rate entered and is assigned to a task, Project calculates the cost of the assignment. Project does so by multiplying the resource's assigned work value by his or her pay rate—both using a common increment of time (such as hours). You can then see the cost per resource, cost per assignment, and cost per task (and also costs rolled up to summary tasks and the entire plan). You will assign resources to tasks in [Chapter 6, “Assign resources to tasks.”](#)

Project handles overtime expenses differently. Project applies the overtime pay rate only when you specifically record overtime hours for an assignment. Project does not automatically calculate overtime hours and associated costs because there's too great of a chance that it would apply overtime when you did not intend it.

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If you work with a large number of resources who have the same standard or overtime pay rates, you can set up Project to apply these pay rates automatically whenever you add a new resource. To do this, on the File tab, click Options. In the Project Options dialog box, click Advanced. Under the heading General Options For This Project, enter the default pay rates you want.

---

You can specify when work resource standard and overtime costs should accrue. The options are at the start of work on a task, at the end of work on the task, or prorated (the default) evenly over the duration of the task.

In addition to or instead of cost rates, a resource can include a set fee that Project applies to each task to which the resource is assigned. This is called a *cost per use*. Unlike cost rates, the cost per use does not vary with the task's duration or amount of work the resource performs on the task.

		Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Use	Accrue	Base
1		Jun Cao	Work		J		100%	\$42.00/hr	\$63.00/hr	\$0.00	Prorated	Standard
2		Sharon Salavarria	Work		S		50%	100.00/wk	\$0.00/hr	\$0.00	Prorated	Standard
3		Toby Nixon	Work		T		100%	700.00/wk	\$0.00/hr	\$0.00	Prorated	Standard
4		Toni Poe	Work		T		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
5		Zac Woodall	Work		Z		100%	\$55.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
6		Copyeditors	Work		C		400%	\$45.00/hr	\$0.00/hr	\$0.00	Prorated	Standard

*View a resource's pay rates and other cost-related details in the Resource Sheet view*

## To enter a standard rate for a resource

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. In the Resource Sheet view, click the **Std. Rate** field for the resource for which you want to set a standard pay rate.  
Depending on the width of the column, you might only see *Std.* in the column heading.
3. Enter a standard rate by using the format of rate/period, such as **30/h**.

## To enter an overtime rate for a resource

1. Display the Resource Sheet view.
2. Click the **Ovt. Rate** field for the resource for which you want to set an overtime pay rate.  
Depending on the width of the column, you might only see *Ovt.* in the column heading.
3. Enter an overtime rate by using the format of rate/period, such as **45/h**.

## To enter a cost per use for a resource

1. Display the Resource Sheet view.
2. In the **Cost/Use** field, enter the value you want.

## Project management focus: Getting resource cost information

Work resources can account for the majority of costs in many projects. To take full advantage of the extensive cost-management features in Project, the project manager ideally should know the costs associated with each work resource. For people resources, it might be difficult to obtain such information. In many organizations, only senior management and human resource specialists know the pay rates of all resources working on a project, and they might consider this information confidential. Depending on your organizational policies and project priorities, you might not be able to track resource pay rates.

If you do include cost details in your plan and this is considered sensitive information, consider requiring a password to open such plans. To set a password, click the File tab and then click Save As. Select the location you want, and in the Save As dialog box, click Tools and then click General Options. In the General Options dialog box, select the password-protection options you want.

Another strategy to consider is to use averaged burdened rates for people resources. A *burdened rate* is a pay rate plus overhead costs per worker. An averaged burdened rate describes everyone in general, but no one in particular.

## Adjust working time in a resource calendar

Project uses different types of calendars for different purposes. [Chapter 3, “Start a new plan,”](#) describes the project calendar, which specifies nonworking days for the entire plan. This topic focuses on resource calendars. A resource calendar controls the working and nonworking times of a specific resource. Project uses a resource calendar to determine when work for a resource can be scheduled. Resource calendars apply only to work resources (people and equipment), not to material or cost resources.

When you initially create resources in a plan, Project creates a resource calendar for each work resource. The initial working-time settings for resource calendars exactly match those of the project calendar, which by default is the Standard base calendar. The Standard base calendar is built into Project and accommodates a default work schedule from 8:00 A.M. to 5:00 P.M., Monday through Friday, with an hour off for lunch each day.

If all the working times of your resources match the working time of the project calendar, you do not need to edit any resource calendars. However, chances are that some of your resources will need exceptions to the working time in the project calendar, such as:

- A flex-time work schedule.
- Vacation time.
- Other times when a resource is not available to work on the project, such as time spent in training or attending a conference.



## Tip

If you have a resource who is available to work on your project only part time, you might be tempted to set the working time of the resource in your project to reflect a part-time schedule, such as 8:00 A.M. to 12:00 P.M. daily. However, a better approach is to adjust the availability of the resource as recorded in the Max. Units field accordingly—in this case, to 50%. Changing the unit availability of the resource keeps the focus on the *capacity* of the resource to work on the project rather than on the specific times of the day when that work might occur. You can set the maximum units for a resource in the Resource Sheet view.

Changes that you make to the project calendar are reflected automatically in resource calendars derived from the same project calendar. For example, in the practice tasks in [Chapter 3](#), “[Start a new plan](#),” you specified a nonworking day for a staff morale event, and Project rescheduled all work to skip that day. Note, however, that after you create a resource calendar exception, that exception is not affected by later changes to the project calendar that cover the same time period.



## Tip

If you find that you must edit several resource calendars in a similar way (to handle a night shift, for example), it might be easier to assign a different base calendar to a resource or collection of resources. This is more efficient than editing individual resource calendars, and you can use the base calendar to make plan-wide adjustments if needed. For example, if your project includes a day shift and a night shift, you can apply the [Night Shift base calendar](#) to resources who work the night shift. You change a base calendar in the Change Working Time dialog box. For collections of resources, you can select a specific base calendar directly in the Base Calendar column on the Entry table in the Resource Sheet view.

## To specify a calendar exception for a work resource

1. On the **Project** tab, in the **Properties** group, click **Change Working Time**.
2. In the **For calendar** box, click the name of the resource whose calendar you want to change.



## Tip

When working in the Change Working Time dialog box, pay close attention to the value in the For Calendar field. It's not difficult to accidentally edit the wrong calendar.

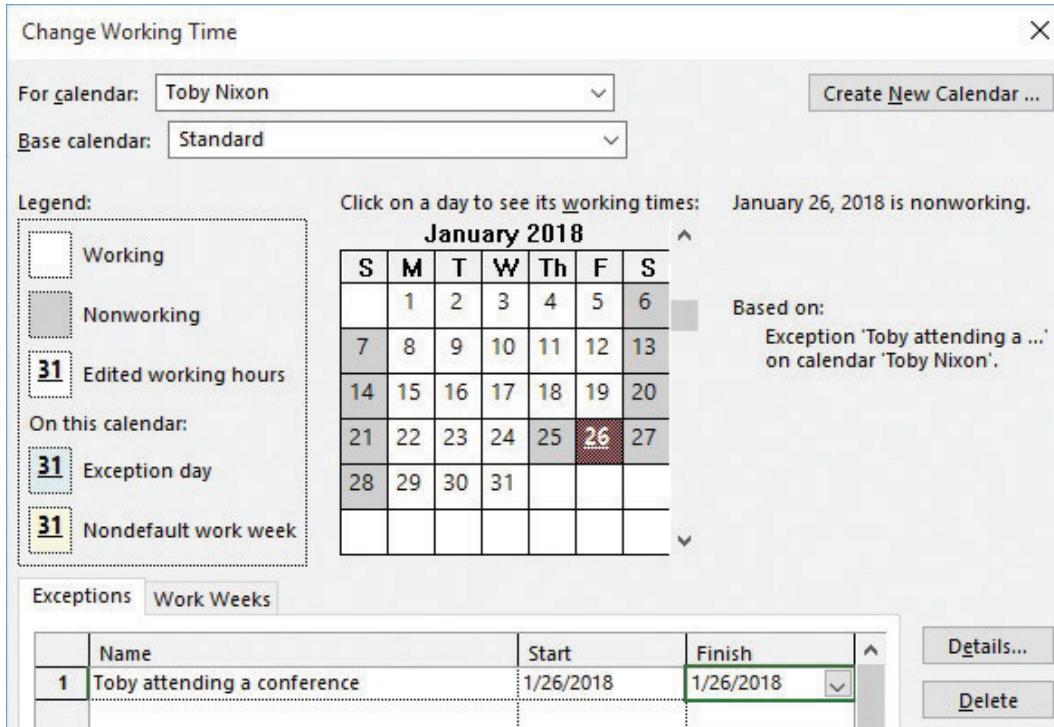
3. In the **Name** field on the **Exceptions** tab in the lower portion of the dialog box, enter a description of the exception.

The description for the calendar exception is a handy reminder for you and others who might view the plan later.

4. In the **Start** and **Finish** fields, enter or select the dates you want.



To set up a partial working-time exception for a resource, such as a portion of a day when a resource cannot work, click Details. In the Details dialog box, you can also create recurring exceptions to the resource's availability.



*Review or create working time calendar exceptions for individual resources in the Change Working Time dialog box*

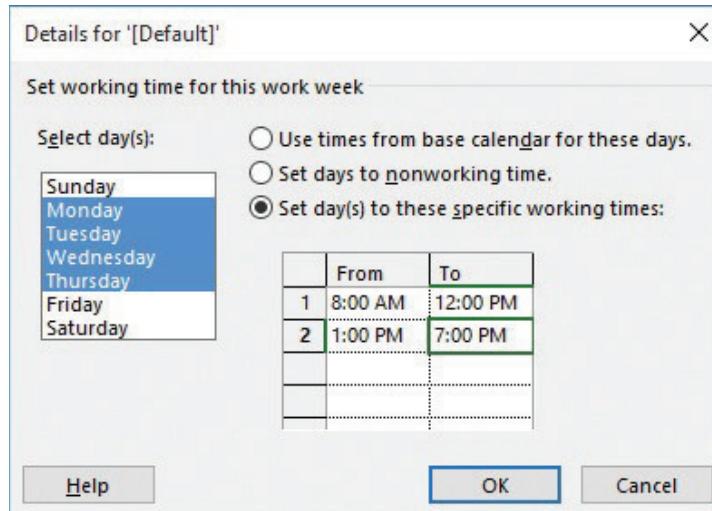
5. Click **OK** to close the Change Working Time dialog box.

## To modify a resource's default working week days and times

1. Display the **Change Working Time** dialog box.
2. In the **For calendar** box, click the name of the resource whose calendar you want to change.
3. Click the **Work Weeks** tab.
4. Click **[Default]** directly under the **Name** column heading, and then click **Details**.
5. Under **Selected Day(s)**, select the day or the days you want to adjust.
6. Do any of the following:
  - To set the full days to nonworking, click **Set days to nonworking times**.
  - To set working times that differ from the base calendar, click **Set day(s) to these**

**specific working times** and then, in the **From** and **To** columns, enter the working times.

- To return to the base calendar working times, click **Use times from base calendar for these days**.



*Create nonstandard work-week schedules in the Details dialog box*

7. After you complete your edits to the work week, click **OK**, and then click **OK** again to close the **Change Working Time** dialog box.



### Tip

You can have a different, non-default working week for a specific time period. For example, you can set up a resource to work four 10-hour days each week for just one month. On the Work Weeks tab, click below [Default], add a name and the start and finish of the period. Then click Details to change the working times and days as described earlier in this procedure.

## To assign a different base calendar to a resource

1. On the **Project** tab, in the **Properties** group, click **Change Working Time**.
2. In the **For calendar** field, select the resource you want.
3. In the **Base calendar** field of the resource, select the base calendar you want.



### Tip

To quickly apply the same base calendar to multiple resources, in the Resource Sheet view, use the Base Calendar field.

## Set up cost resources

Another type of resource you can use in Project is the cost resource. You can use a cost resource to represent a financial cost associated with a task in a plan. Although work resources (people and equipment) can have associated costs (hourly rates and fixed costs per assignment), the sole purpose of a cost resource is to associate a particular type of cost with one or more tasks. Common types of cost resources might include categories of expenses you want to track in a plan for accounting or financial reporting purposes, such as travel, entertainment, or training.

Cost resources do no work and have no effect on the scheduling of a task. The Max. Units, Standard and Overtime pay rate, and Cost Per Use fields do not apply to cost resources. After you assign a cost resource to a task and specify the cost amount per task, you can then see the cumulative costs for that type of cost resource, such as total travel costs in a project.

The way in which cost resources generate cost values differs from that of work resources. When you assign a work resource to a task, the work resource can generate a cost based on a pay rate (such as \$40 per hour for the length of the assignment), a flat per-use cost (such as \$100 per assignment), or both. You set up such pay rates and cost-per-use amounts once for the work resource, as described in the “[Enter work resource pay rates](#)” topic earlier in this chapter. However, you enter the cost value of a cost resource only when you assign it to a task. You do this in the Cost field of the Assign Resources dialog box or in the Cost field of the Task form with the Cost detail shown. This is described in “[Assign cost resources to tasks](#)” in [Chapter 6, “Assign resources to tasks.”](#)

### To add a cost resource

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. In the Resource Sheet view, click in the **Resource Name** column where you want to add the cost resource.
3. On the **Resource** tab, in the **Insert** group, click **Add Resources**, and then click [\*\*Cost Resource\*\*](#).

Project inserts a row for the new cost resource. Project names the new cost resource *<New Resource>*.

4. With **<New Resource>** selected, enter the cost resource name, and then press **Enter**.

## Document resources by using notes

You might recall from [Chapter 4, “Build a task list,”](#) that you can record additional information about a task, resource, or assignment in a note. For example, if a resource has flexible skills that can help the project, it is a good idea to record this in a note. That way, the note resides in the plan and can be easily viewed or printed.

[Chapter 4, “Build a task list,”](#) described creating a task note by clicking the Notes button on the Task tab, in the Properties group. You can enter resource notes in a similar way (by clicking the Notes button on the Resource tab, in the Properties group). Another option is

to enter notes directly in the Resource Form view. The advantage of using the Resource Form is that you can view and edit notes for multiple resources more quickly.

## To enter a note for a resource in the Resource Information dialog box

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. Select a resource name.
3. On the **Resource** tab, in the **Properties** group, click **Notes**.
4. In the **Notes** box, enter a note for the resource.

## To enter a note for a resource by using the Resource Form

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. On the **Resource** tab, in the **Properties** group, click the **Details** button.

In this type of split view, details about the item that is selected in the upper pane (a resource, in this case) appear in the lower pane. You can quickly change the selected resource name in the upper pane by clicking a name directly, or by clicking Previous or Next in the Resource Form.

The Resource Form view can display one of several details; initially, it displays the Schedule details.

3. Click anywhere in the Resource Form view to change the focus to the Resource Form. The label of the Format tab changes to Resource Form Tools.
4. On the **Format** tab, in the **Details** group, click **Notes**.



### Tip

You can also right-click in the gray background area of the Resource Form view and, in the shortcut menu that appears, click Notes.

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The Notes details appear in the Resource Form view.

The screenshot shows the Microsoft Project application interface with the 'Resource' tab selected. The left sidebar displays 'RESOURCE SHEET'. The main area shows a table of resources:

	Type	Details											
	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Use	Accrue			
1	Jun Cao	Work		J		100%	\$42.00/hr	\$63.00/hr	\$0.00	Prorated			
2	Sharon Salavaria	Work		S		50%	100.00/wk	\$0.00/hr	\$0.00	Prorated			
3	Toby Nixon	Work		T		100%	700.00/wk	\$0.00/hr	\$0.00	Prorated			
4	Toni Poe	Work		T		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated			
5	Zac Woodall	Work		Z		100%	\$55.00/hr	\$0.00/hr	\$0.00	Prorated			
6	Copyeditors	Work		C		400%	\$45.00/hr	\$0.00/hr	\$0.00	Prorated			
7	Travel	Cost		T						Prorated			

Below the table, a detailed view for resource 'Sharon Salavaria' is shown:

Name:	Sharon Salavaria	Initials:	S	Max units:	50%	Previous	Next
Costs	Base cal: Standard						
Std rate:	\$1,100.00/w	Per use:	\$0.00	Group:			
Ovt rate:	\$0.00/h	Accrue at:	Prorated	Code:			

At the bottom, a note states: "Sharon's standard pay rate is adjusted for her half-time work schedule."

*This is a great split view for quickly adding, editing, or reviewing resource details like notes*

5. In the **Notes** box, enter the note for the resource.

Notice that as soon as you start typing the note, the Previous and Next buttons change to OK and Cancel.

## 6. Click OK.

## Skills review

In this chapter, you learned how to:

- [Set up work resources](#)
  - [Enter the maximum capacity for work resources](#)
  - [Enter work resource pay rates](#)
  - [Adjust working time in a resource calendar](#)
  - [Set up cost resources](#)
  - [Document resources by using notes](#)



## Practice tasks

The SimpleSetUpResources practice file for these tasks is located in the Project2016SBS\Ch05 folder.



### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Set up work resources

The scenario: At Lucerne Publishing, you have a good start on the new book launch’s task list. You are now ready to set up the work resources needed to complete the new book launch. As with the task list, you expect some future changes to the resource details as you learn more about the project, but you have enough information to get started now. Open the SimpleSetUpResources plan in Project, and perform the following tasks:

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. Enter the following resource names:
  - Jun Cao
  - Sharon Salavaria
  - Toby Nixon
  - Toni Poe
  - Zac Woodall
  - Copyeditors

		Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Use	Accrue	Base
1		Jun Cao	Work		J		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
2		Sharon Salavaria	Work		S		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
3		Toby Nixon	Work		T		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
4		Toni Poe	Work		T		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
5		Zac Woodall	Work		Z		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
6		Copyeditors	Work		C		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard

*The resource names you entered should look like this in the Resource Sheet*

## Enter the maximum capacity for work resources

The scenario: You need to change the default 100% maximum units value for some resources. You learned that the equivalent of four copyeditors will be allocated to the new book launch. You also have one resource in the plan, Sharon Salavaria, who is available for this project half time. Continuing in the SimpleSetUpResources plan, perform the following tasks:

1. Change the Copyeditors resource maximum units value to **400%**.
2. Change Sharon Salavaria's maximum units value to **50%**.

	i	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate
1		Jun Cao	Work		J		100%	\$0.00/hr
2		Sharon Salavaria	Work		S		50%	\$0.00/hr
3		Toby Nixon	Work		T		100%	\$0.00/hr
4		Toni Poe	Work		T		100%	\$0.00/hr
5		Zac Woodall	Work		Z		100%	\$0.00/hr
6		Copyeditors	Work		C		400%	\$0.00/hr

*After customizing the Max Units values for two resources, the Resource Sheet should look like this*

## Enter work resource pay rates

The scenario: You received the pay rates for the work resources involved in the new book launch from your payroll department. These pay rates are a mix of hourly and weekly rates. You need to enter these pay rates in the new book launch's plan. Continuing in the SimpleSetUpResources plan, perform the following tasks:

1. Enter the following pay rates in the Standard (Std.) Rate field.

Resource Name	Standard Rate
Jun Cao	\$42 per hour
Sharon Salavaria	\$1,100 per week
Toby Nixon	\$2,700 per week
Toni Poe	Leave at \$0.00/hr (Toni is the book author, and you're not tracking her rate-based costs in this plan.)
Zac Woodall	\$55 per hour
Copyeditors	\$45 per hour

2. Enter an overtime rate of \$63 per hour for Jun Cao.

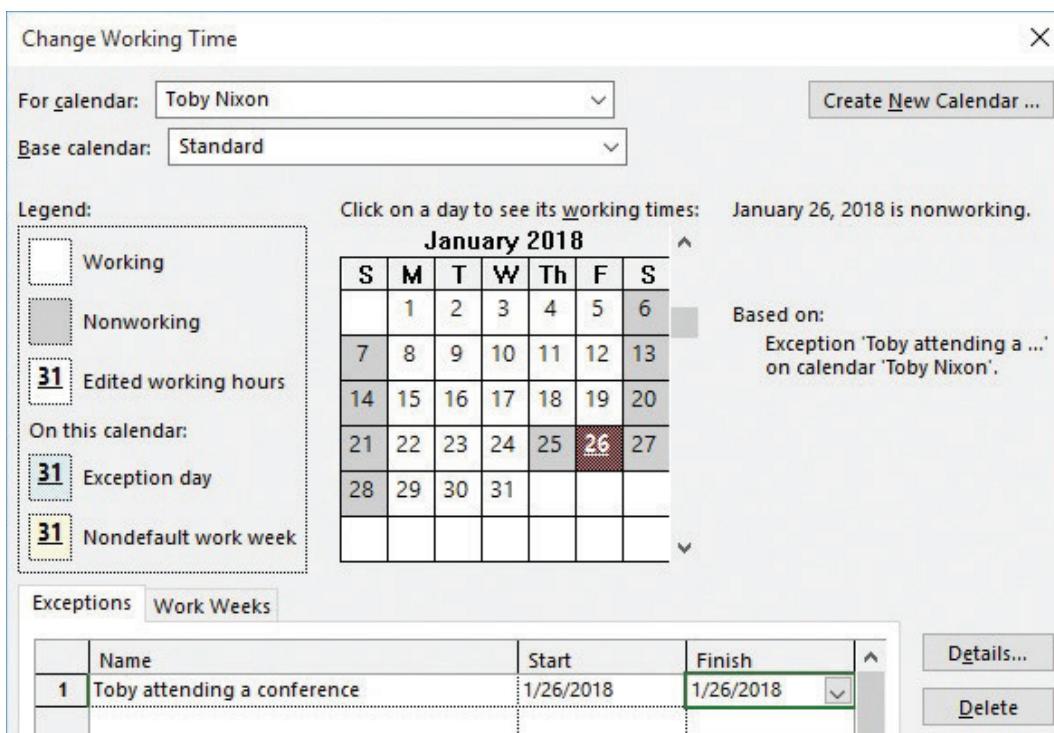
	<b>i</b>	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Use
1		Jun Cao	Work		J		100%	\$42.00/hr	\$63.00/hr	\$0.00
2		Sharon Salavaria	Work		S		50%	100.00/wk	\$0.00/hr	\$0.00
3		Toby Nixon	Work		T		100%	700.00/wk	\$0.00/hr	\$0.00
4		Toni Poe	Work		T		100%	\$0.00/hr	\$0.00/hr	\$0.00
5		Zac Woodall	Work		Z		100%	\$55.00/hr	\$0.00/hr	\$0.00
6		Copyeditors	Work		C		400%	\$45.00/hr	\$0.00/hr	\$0.00

*The Resource Sheet should look like this after entering pay rates*

## Adjust working time in a resource calendar

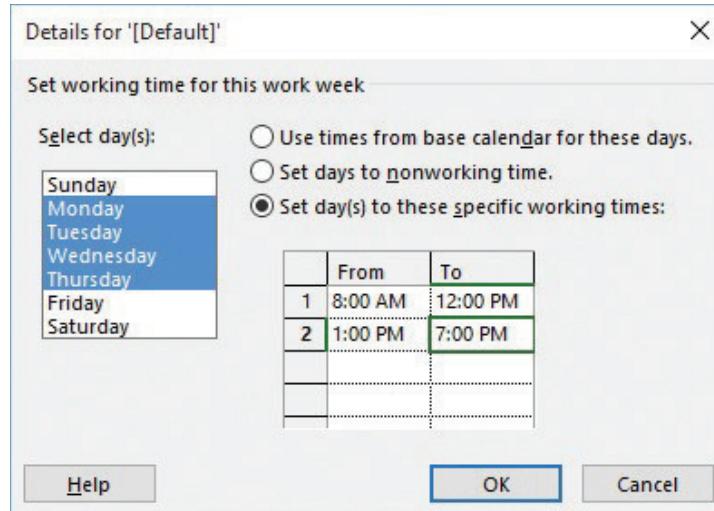
The scenario: You have a couple of working-time updates to make in the new book launch's plan. Toby Nixon has told you he'll be away at a conference, and Jun Cao works a full-time but nonstandard schedule of 10 hours per day, four days per week (a "4-by-10" work schedule). You need to update their resource calendars accordingly. Continuing in the SimpleSetUpResources plan, perform the following tasks:

1. Make January 26, 2018 a nonworking time calendar exception for Toby Nixon. Name the exception **Toby attending a conference**.



*After creating an exception in the Change Working Time dialog box, note the description and formatting of the date in the calendar*

2. For Jun Cao, change the default work week to a "4-by-10" weekly work schedule (that is, 4 days per week, 10 hours per day Monday through Thursday, with Friday off). On the days Jun works, she'll work from 8:00 AM to 7:00 PM with the noon hour off for lunch.



The working time settings for the selected days appear here; to see Friday's nonworking settings, select it

## Set up cost resources

The scenario: For accounting purposes, you need to track travel expenses in the plan. You'll do so via a cost resource. Continuing in the SimpleSetUpResources plan, perform the following task:

1. Create a cost resource named **Travel**.

	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Use	Accrue	Base
1	Jun Cao	Work		J		100%	\$42.00/hr	\$63.00/hr	\$0.00	Prorated	Standard
2	Sharon Salavarria	Work		S		50%	100.00/wk	\$0.00/hr	\$0.00	Prorated	Standard
3	Toby Nixon	Work		T		100%	700.00/wk	\$0.00/hr	\$0.00	Prorated	Standard
4	Toni Poe	Work		T		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
5	Zac Woodall	Work		Z		100%	\$55.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
6	Copyeditors	Work		C		400%	\$45.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
7	Travel	Cost		T							Prorated

Your cost resource should look like this in the Resource Sheet

## Document resources by using notes

The scenario: You collected some resource details that would be valuable to record in the plan. Continuing in the SimpleSetUpResources plan, perform the following tasks:

1. Add this note for Toby Nixon in the **Resource Information** dialog box: **Toby worked on launch campaigns for Toni Poe's previous two books.**

Resource Information

General | Costs | Notes | Custom Fields |

Resource Name:

Notes:

Toby worked on launch campaigns for Toni Poe's previous two books.

Your resource note should look like this in the Resource Information dialog box

2. Use the **Resource Form** to add this note for Sharon Salavaria: **Sharon's standard pay rate is adjusted for her half-time work schedule.**

RESOURCE FORM

Name: <input type="text" value="Sharon Salavaria"/>	Initials: <input type="text" value="S"/>	Max units: <input type="text" value="50%"/>	<input type="button" value="Previous"/>	<input type="button" value="Next"/>
Costs		Base cal: <input type="text" value="Standard"/>		
Std rate: <input type="text" value="\$1,100.00/w"/>	Per use: <input type="text" value="\$0.00"/>	Group:		
Ovt rate: <input type="text" value="\$0.00/h"/>	Accrue at: <input type="text" value="Prorated"/>	Code:		
Sharon's standard pay rate is adjusted for her half-time work schedule.				

*Your resource note should look like this in the Resource Form*



If you want to save your work, remember to save it with a different file name. This will preserve the original practice file for future use.

## 6. Assign resources to tasks

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### In this chapter

- [Assign work resources to tasks](#)
  - [Control work when adding or removing resource assignments](#)
  - [Assign cost resources to tasks](#)
  - [Check the plan after assigning resources](#)
- 

### Practice files

For this chapter, use the practice files from the Project2016SBS\Ch06 folder. For practice file download instructions, see the introduction.

In earlier chapters, you created tasks and resources. You are now ready to assign resources to tasks. An assignment is the matching of a resource to a task to do work. The process of assigning a resource might be called a *task assignment* or a *resource assignment*, depending on the perspective. It is the same thing in either case: a task plus a resource equals an assignment.

---



### Important

When we talk about resources throughout this chapter, we are talking about work resources (people and equipment) unless we specify material or cost resources (see [Chapter 5, “Set up resources”](#)).

---

You do not have to assign resources to tasks in Project 2016; you could work only with tasks. However, when you assign resources to tasks, you can answer questions such as the following: Who should be working on what tasks, and when? Do we have the correct number of resources to accomplish the scope of work that our project requires? Are we expecting a resource to work on a task at a time when that resource will not be available to work? Have we assigned a resource to so many tasks that we have overallocated the resource?

This chapter guides you through procedures related to assigning work and cost resources to tasks.

### Assign work resources to tasks

You might recall from [Chapter 5, “Set up resources”](#), that the capacity of a resource to work is measured in units (a level-of-effort measurement) and recorded in the Max. Units field. The specific assignment of a work resource to a task involves an assignment units value, normally expressed as a percentage. Unless you specify otherwise, Project assigns 100 percent of the units for the resource to the task—that is, Project assumes that all the resource’s work time can be allotted to the task. If the resource has less than 100 percent maximum units, Project assigns the resource’s Max. Units value.

When you assign a work resource to a task, Project uses the resource's assignment units and the task's duration values to calculate the resulting work. If the resource has a pay rate, Project also calculates the resource and task costs for you.

Project calculates work by using this formula:

$$\text{Duration} \times \text{Assignment Units} = \text{Work}$$

Here's a simple example:

$$40 \text{ hours task duration} \times 100\% \text{ assignment units} = 40 \text{ hours of work}$$

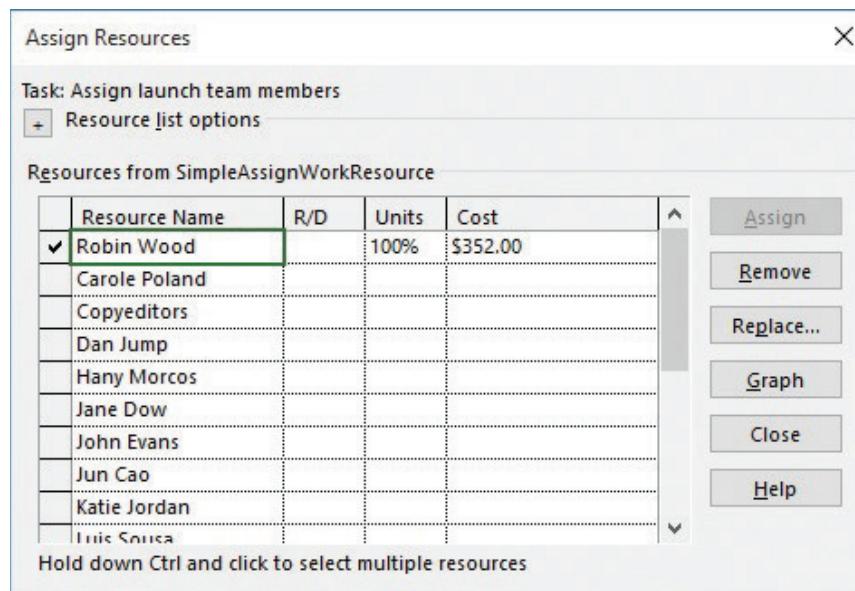
Here's a slightly more complicated example. If you assign two resources to a task that has a three-day duration, the result is:

$$24 \text{ hours (that's three 8-hour days) task duration} \times 200\% \text{ (for two resources) assignment units} = 48 \text{ hours of total work}$$

The 48 hours of work is the sum of each of the two resources' 24 hours of work. In other words, both resources will work full time on the task in parallel for its three-day duration.

After making the initial resource assignment to a task, you have some flexibility in determining how Project should respond when you add subsequent resources to the same task (or remove them). When you add (assign) or remove (unassign) resources, you can tell Project whether you want to change that initial work value and how it might affect other values of assignments and the duration of the task. We'll dive into adding or removing assignments in the "[Control work when adding or removing resource assignments](#)" topic later in this chapter.

There are different ways to assign resources. The Assign Resources dialog box works well in task-centric views like the Gantt Chart, Task Sheet, or Task Usage views.



*Except for assigned resources, which always appear at the top of the list, resources are sorted alphabetically in the Assign Resources dialog box*



## Important

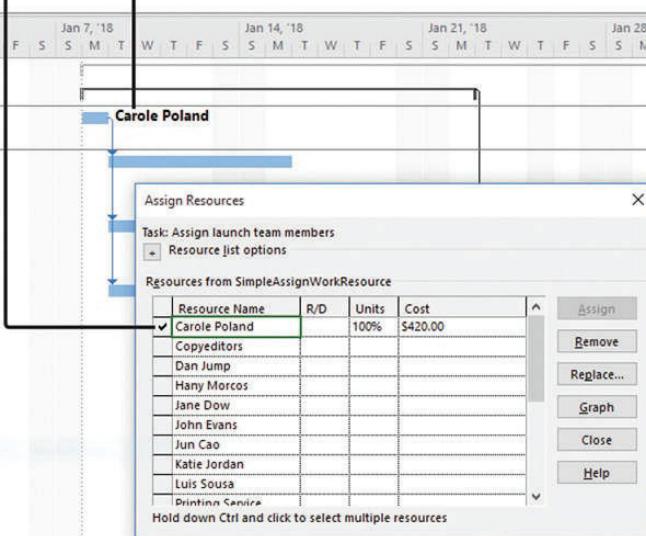
If you are using Project Professional rather than Project Standard, the Assign Resources dialog box and some other dialog boxes will contain additional options relating to Project Server. Throughout this book, we won't use Project Server, so you can ignore these options. For more information about Project Server, see [Appendix C, "Collaborate: Project, SharePoint, and PWA."](#)

After you assign resources, you can see the results of the assignments in a number of ways.

The resource assigned to the selected task has a check mark next to its name in the Assign Resources dialog box

	Task Mode	Task Name	Duration	Start	Finish
0	+	SimpleAssignment: 41 days	Mon 1/8/18	Tue 3/6/18	
1	+	Planning Phase	11 days	Mon 1/8/18	Mon 1/22/18
2	+	Assign launch team members	1 day	Mon 1/8/18	Mon 1/8/18
3	+	Complete author questionnaire	1 wk	Tue 1/9/18	Mon 1/15/18
4	+	Schedule author interviews	1 wk	Tue 1/9/18	Mon 1/15/18
5	+	Design and order marketing material	2 wks	Tue 1/9/18	Mon 1/22/18
6	+	Planning complete!	0 days	Mon 1/22/18	Mon 1/22/18
7	+	Internal Launch Phase	18 days	Tue 1/23/18	Fri 2/16/18
8	+	Kickoff book launch meeting	1 day	Tue 1/23/18	Tue 1/23/18
9	+	Plan author's travel itinerary	3 days	Wed 1/24/18	Mon 1/29/18

The name of the assigned resource appears next to the Gantt bar

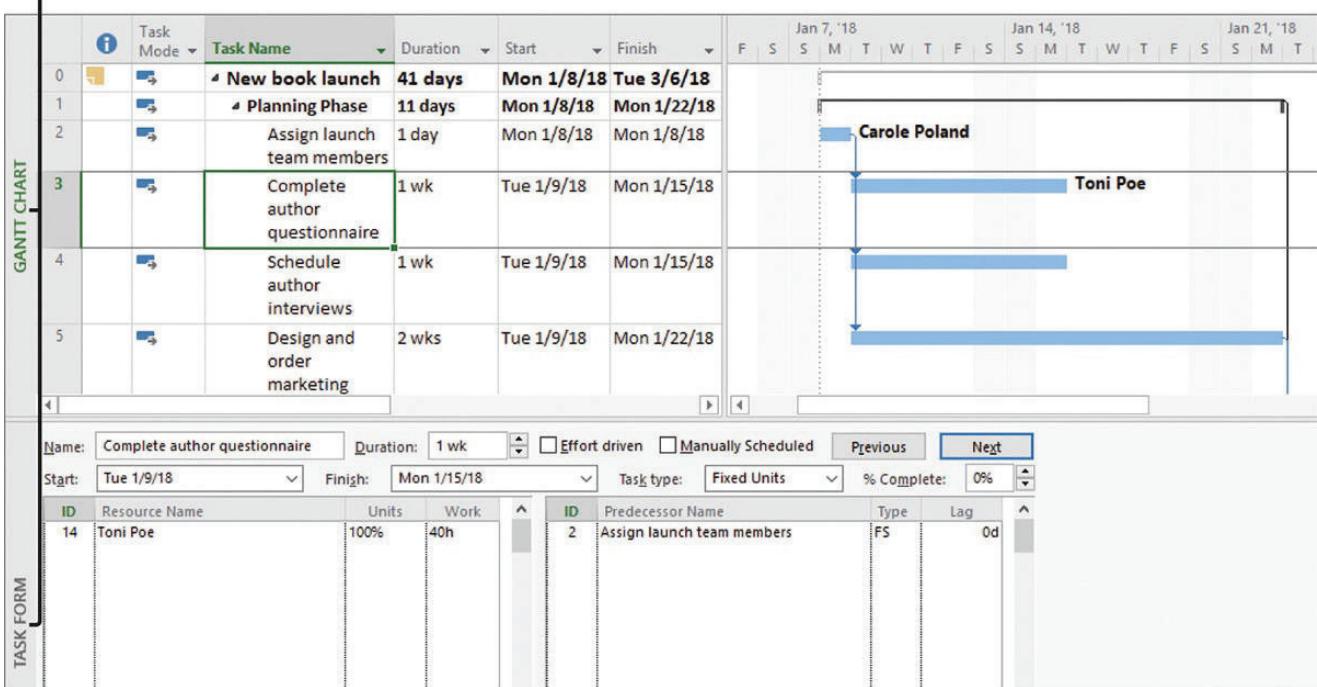


*In the default Gantt Chart view, the names of assigned resources appear next to the Gantt bars of the tasks to which they are assigned*

A cost value and check mark appear next to the assigned resource's name in the Assign Resources dialog box. Project calculates the cost of the assignment (the resource's standard pay rate times the resource's scheduled amount of work on the task) and displays the resulting value in the Cost field of the Assign Resources dialog box.

Another handy view in which you can see assignment details is the Task Form view.

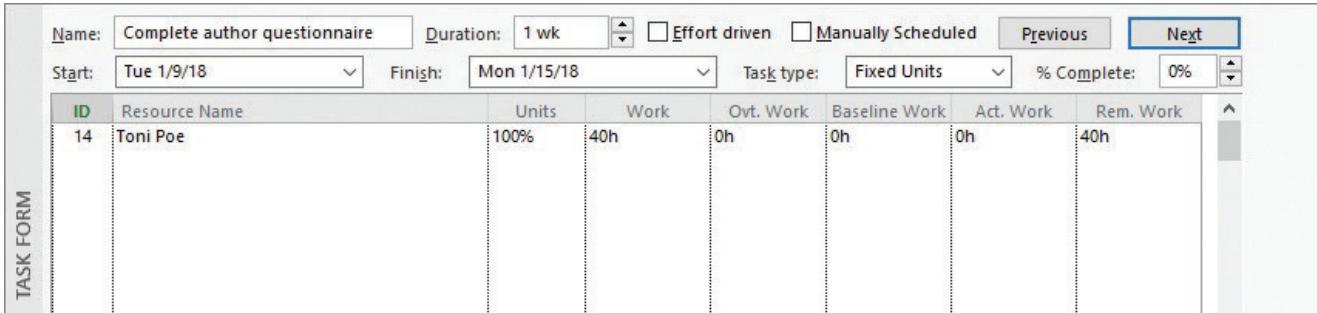
The names of the view or views displayed appear here



In this split view, the Gantt Chart view appears in the upper pane, and below it is the Task Form

If you read [Chapter 5, “Set up resources,”](#) you might recognize that the Task Form is similar to the Resource Form but shows different kinds of information. In this type of split view, information about the item (a task, for example) that is selected in the upper pane appears in the lower pane. The Task Form displays one of several sets of information at a time, which are referred to as *details*.

You can change the displayed details in the Task Form. With the Work details displayed, you can see the essential scheduling values for a task: for example, the values could be one week duration, 40 hours of work, and 100% assignment units.



Change the details option displayed in the Task Form; here Work details are displayed

Another quick way to assign resources is to use the Resource Names column in a Gantt Chart view.

Drag this vertical divider bar to see more or less of the table portion of the Gantt Chart view

The screenshot shows a Microsoft Project Gantt Chart view. On the left, there's a vertical 'GANNT CHART' column. The main area displays tasks from 7 to 17. Task 9, 'Plan author's travel itinerary', is selected and has a blue border. In the 'Resource Names' column for this task, 'Sharon Salavarria[50%]' and 'Toby Nixon' are listed, each with a small blue square icon. To the right of the chart is a resource list window titled 'Resource Names'. It contains a scrollable list of names with checkboxes next to them. Several names have checkboxes checked, while others are empty. The checked names include: Carole Poland, Copyeditors, Dan Jump, Hany Morcos, Jane Dow (which is checked), John Evans, Jun Cao, Katie Jordan, Luis Sousa, Printing Service, Robin Wood, Sharon Salavarria (which is checked), Toby Nixon, Toni Poe, Travel, Vikas Jain, William Flash, and Zac Woodall (which is checked). The date header at the top of the chart shows 'Jan 28, '18' and 'Feb 4, '18'.

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	21, 18	M T W T F S S M T W T F S S M T				
7		Internal Launch Phase	18 days	Tue 1/23/18	Fri 2/16/18	1							
8		Kickoff book launch meeting	1 day	Tue 1/23/18	Tue 1/23/18			Sharon Salavarria[50%]					
9		Plan author's travel itinerary	3 days	Wed 1/24/18	Mon 1/29/18	8							
10		Channel Sales prep	2 wks	Wed 1/24/18	Wed 2/7/18	8							
11		Complete book launch form	2 days	Thu 2/8/18	Fri 2/9/18	10							
12		Prepare book sales kit	1 wk	Thu 2/8/18	Wed 2/14/18	8,10							
13		Distribute internal marketing material	2 days	Thu 2/15/18	Fri 2/16/18	12							
14		Public Launch Phase	12 days	Mon 2/19/18	Tue 3/6/18	7							
15		Author travel and	2 days	Mon 2/19/18	Tue 2/20/18								
16		Author radio interview	1 day	Mon 2/19/18	Mon 2/19/18								
17		Author reading and signing at	1 day	Tue 2/20/18	Tue 2/20/18	16							

You can display the Resource Names list per task, and assign or unassign resources in the list

You select the check boxes of the resources you want to assign to the active task, or clear a check box to unassign a resource.

## To assign a work resource to a task

You can perform the following steps in most task-centric views that include a table. Examples include the Gantt Chart, Task Sheet, and Task Usage views.

1. Click the task to which you want to assign a resource.
2. On the **Resource** tab, in the **Assignments** group, click **Assign Resources**. The Assign Resources dialog box opens. You can drag it anywhere you want on the screen.
3. In the **Resource Name** column in the **Assign Resources** dialog box, click the resource or resources you want to assign, and then click **Assign**.

Or

You can perform the following steps in any task-centric view with the Entry table displayed.

1. Click in the **Resource Names** column for a task, and then click the arrow that appears. A list of resource names appears.



If the Resource Names column is not already visible, in a Gantt Chart view, drag the vertical divider bar to the right.

- 
2. In the list of resource names, select the check box for the resource or resources you want to assign to the selected task, and then press the **Enter** key.
- 



### Tip

In addition to the methods of assigning resources shown here, you can assign resources in the Task Form view and on the Resources tab of the Task Information dialog box, among other places. As you use Project, you'll likely develop your own preference for the way you assign resources.

---

## To view or edit assignment details in the Task Form view

You can perform these steps in the Task Sheet or Task Usage view, or any Gantt chart view.

1. On the **View** tab, in the **Split View** group, select the **Details** check box. Project splits the window into two panes with the Task Form view in the bottom pane.
2. Click anywhere in the Task Form view. With the focus on the Task Form, note that the label of the Format tab changes to Task Form Tools. Now the commands available on the Format tab apply to the Task Form.
3. On the **Format** tab, in the **Details** group, click **Work**. The Work details appear in the Task Form.

## Control work when adding or removing resource assignments

As you saw previously, you define the amount of work that a task represents when you initially assign one or more resources to it. For tasks that are automatically (as opposed to manually) scheduled, Project gives you an option that allows you to control how it should calculate work on a task when you assign additional resources to or unassign resources from the task.

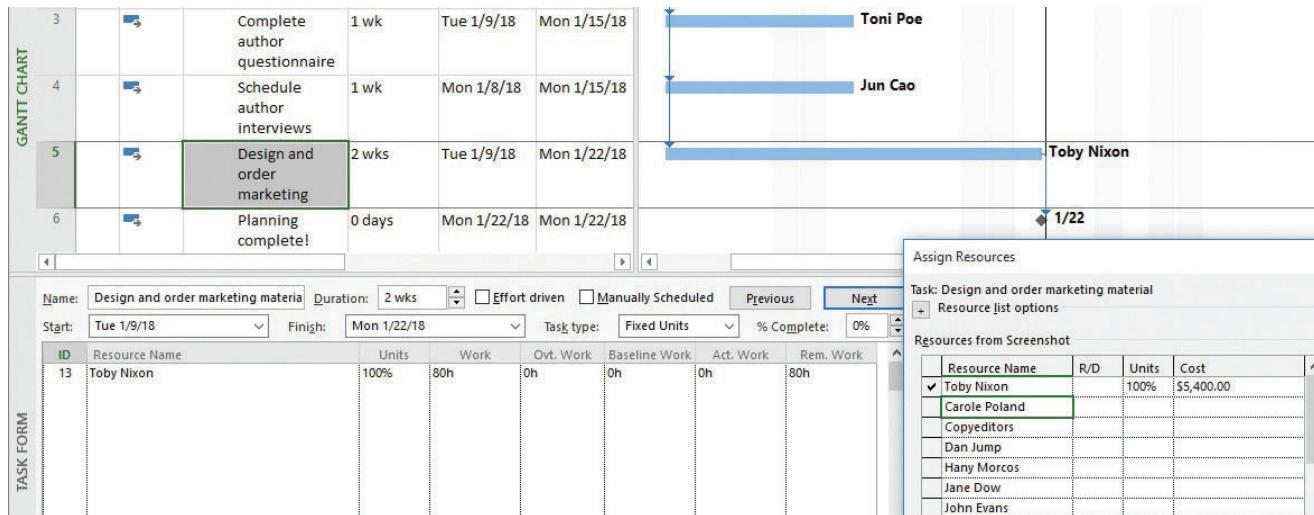
This option is called [effort-driven scheduling](#), and when it is in effect, it works like this:

- The work of a task remains constant as you assign or unassign resources.
- As more resources are assigned to a task, its duration decreases. The total work remains the same and is distributed among the assigned resources.
- Similarly, as resources are unassigned from a task, its duration increases. The total work remains the same and is distributed among the remaining assigned resources.

You have flexibility in how you apply effort-driven scheduling. By default, effort-driven scheduling is disabled for all tasks you create in Project. You can turn on effort-driven scheduling for an entire plan or just specific tasks. You can also use the options in an Actions list (described later in this topic) to control how Project should recalculate work on a task immediately after assigning or unassigning a resource.

Let's walk through an example of how effort-driven scheduling works. We've included the Task Form view in our example because it's a convenient way to see assignment units,

work, and duration values.

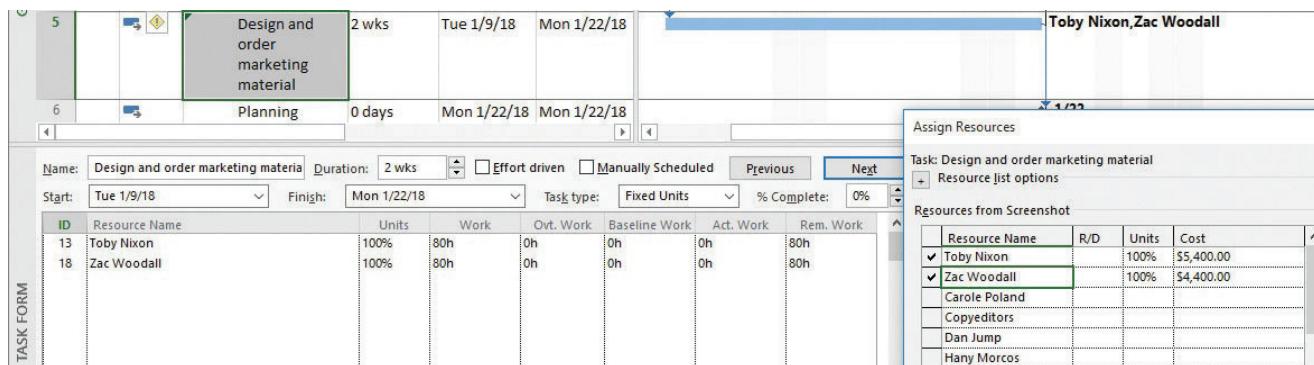


*To better see how effort-driven scheduling affects assignment units, work, and duration values, display the Task Form*

Initially, Toby is assigned to task 5. A quick check of the assignment calculation looks like this:

$80 \text{ hours (the same as 10 days, or two weeks)} \times 100\% \text{ of Toby's assignment units} = 80 \text{ hours of work}$

Toby needs some help with this task, so you add Zac to the task.



*With effort-driven scheduling turned off, assigning an additional resource to a task results in more work and the same duration*

Because effort-driven scheduling is turned off for this task, Project adds more work to this task and updates the assignment values:

$80 \text{ hours (the same as 10 days, or two weeks)} \times 200\% \text{ (that is, the sum of Toby's and Zac's assignment units)} = 160 \text{ hours of work}$

You use the Actions list to control how Project schedules the work on a task when adding or removing resources. Note the small green triangle in the upper-left corner of the name of task 5. This is a graphical indicator that an action is now available. Until you perform another action, you can use the Actions list to choose how you want Project to handle the additional resource assignment.



## Tip

Actions indicators appear immediately after you perform certain actions such as assigning or unassigning resources in task-centric views that include tables. You can perform some of the same actions in the Task Forms, but doing so does not trigger the Actions indicators.

The small triangle in the upper-left corner of the field indicates that the Actions list is available.

Click it to see the available options.

A screenshot of the Microsoft Project application. A task named "Design and order marketing materia" is selected. In the upper-left corner of the task's duration field (which shows "2 wks"), there is a small yellow triangle with a black exclamation mark inside. An arrow points from the text "Click it to see the available options." to this triangle. A tooltip appears, stating: "You added resources to this task. Do you want to:" followed by three options:

- Reduce duration but keep the same amount of work.
- Increase the amount of work but keep the same duration.
- Reduce the hours resources work per day (units), but keep the same duration and work.

Below the task details, the Task Form is visible, showing the following information:

Name:	Design and order marketing materia	Duration:	2 wks	Effort driven	Manually Scheduled	Previous	
Start:	Tue 1/9/18	Finish:	Mon 1/22/18	Task type:	Fixed Units	% Complete:	
ID	Resource Name	Units	Work	Ovt. Work	Baseline Work	Act. Work	Rem.
13	Toby Nixon	100%	80h	0h	0h	0h	80h
18	Zac Woodall	100%	80h	0h	0h	0h	80h

*The Actions indicator appears immediately after you change resource assignments*

You can use these options to choose the scheduling result that you want. You can adjust the task's duration, the resources' work, or the assignment units.

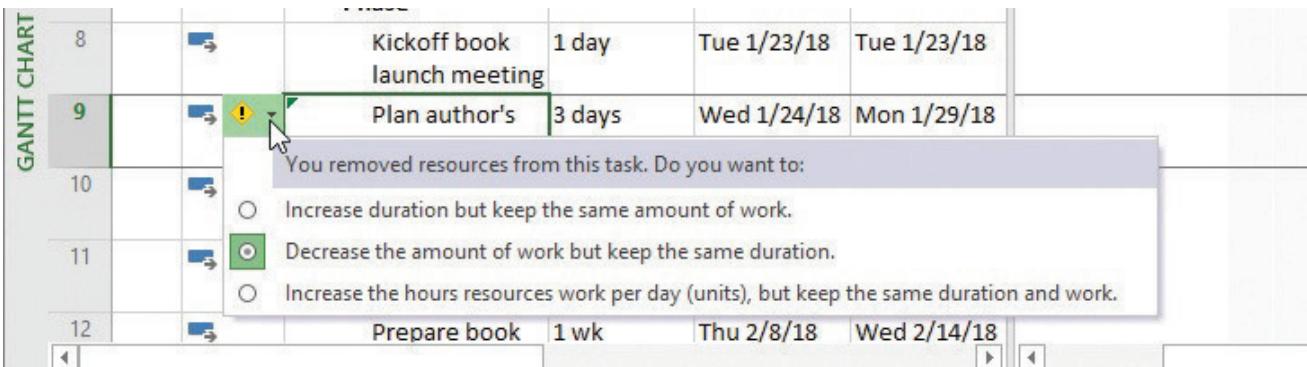


## Tip

You will see other Actions indicators while using Project. They generally appear when you might otherwise ask yourself, “Hmm, why did Project just do that?” (such as when a task’s duration changes after you assign an additional resource).

The Actions list gives you the chance to change how Project responds to your actions.

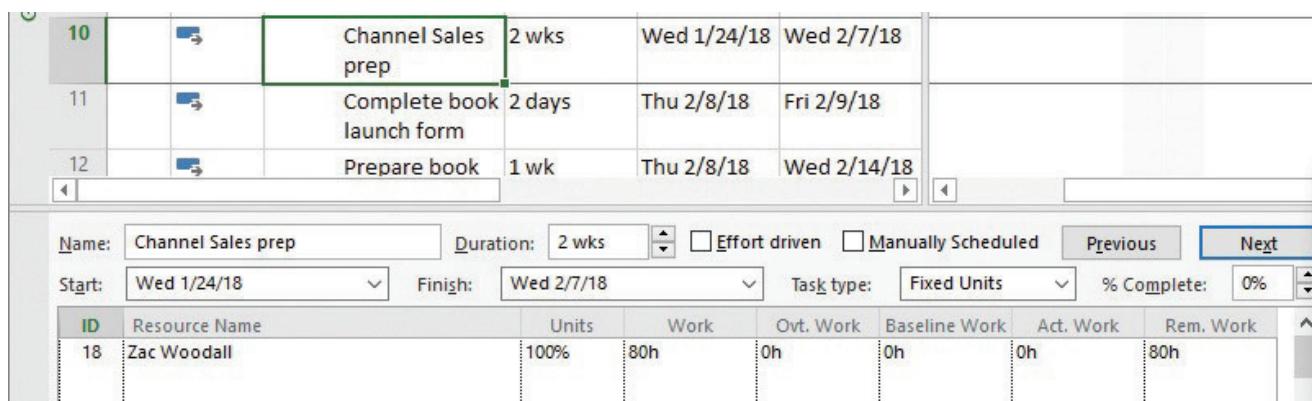
When a task has multiple resources assigned and you unassign one from the task, you can also use the Actions list to instruct Project how to schedule the remaining resource assignments on the task.



*Use the Actions list to control how Project reschedules the remaining assignments when you unassign a resource from a task*

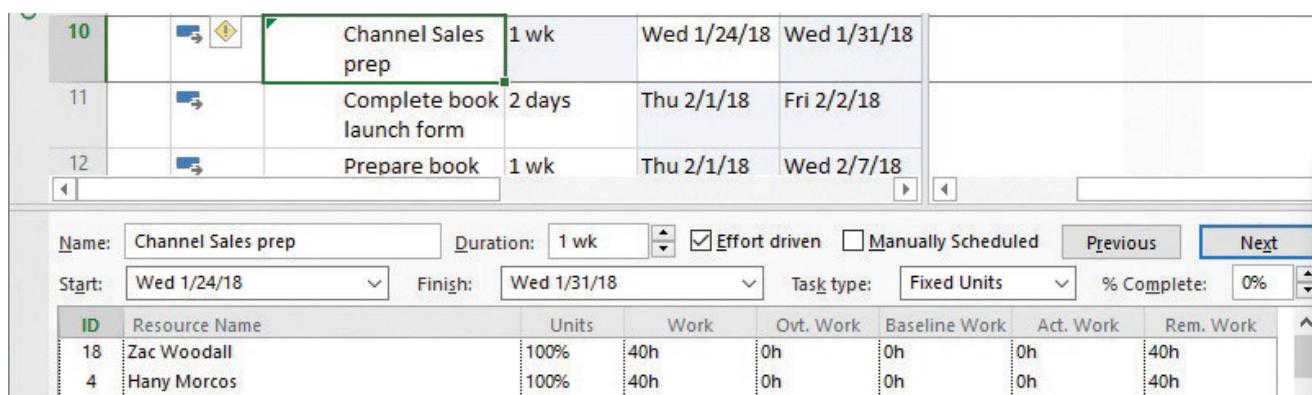
So far, we've focused on adjusting duration and work values as you add or remove resources from tasks. You can also change the default setting for a task such that as you add resources to the task, its work is unchanged and duration is decreased.

Let's return to our effort-driven scheduling example. Currently, just Zac is assigned to task 10, and it has a two-week duration. Notice in the Task Form that currently effort-driven scheduling is off for this task.



*The Task Form also conveys the selected task's effort-driven scheduling status*

When effort-driven scheduling is turned on and another resource is assigned to the task, note the result.



*When effort-driven scheduling is enabled, assigning an additional resource to a task has a different result*

The task 10 duration is reduced from two weeks to one week. The total work on the task remains 80 hours, but now it is split evenly between Zac and Hany. If this wasn't the

scheduling result you wanted, you could use the Actions list to change how Project responds to the additional resource assignment.

The order of your actions matters when effort-driven scheduling is enabled. If you initially assign two resources to a task with a duration of three days (equal to 24 working hours), Project schedules each resource to work 24 hours, for a total of 48 hours of work on the task. However, you might initially assign one resource to a task with a duration of 24 hours and later add a second resource. In this case, effort-driven scheduling will cause Project to schedule each resource to work 12 hours in parallel, keeping the total of 24 hours of work on the task. Remember that when it's turned on, effort-driven scheduling adjusts the task duration only if you add or remove resources from a task.

### Project management focus: When should effort-driven scheduling apply?

You should consider the extent to which effort-driven scheduling should apply to the tasks in your projects. For example, if one resource should take 10 hours to complete a task, could 10 resources complete the task in 1 hour? How about 20 resources in 30 minutes? Probably not—the resources would likely get in each other's way and require additional coordination to complete the task.

No single rule exists about when you should apply effort-driven scheduling and when you should not. As the project manager, you should analyze the nature of the work required for each task in your project and use your best judgment.

## To change the schedule result when you assign an additional resource to a task

You can perform these steps in any task-centric view that includes a table. Examples include the Gantt Chart, Task Sheet, and Task Usage views.

1. Select a task that already has a resource or resources assigned.
2. In the **Assign Resources** dialog box, click the resource you want, and then click **Assign**.
3. Click the **Actions** button that appears just to the left of the task name, and then select the schedule result you want.



When you make changes to assignments in the Resource name column, you will also see the Actions button. You will only see this on automatically scheduled tasks.

## To change the schedule result when you remove a resource from a task

These steps apply as long as at least one resource remains assigned to the task. You can perform these steps in any task-centric view that includes a table.

1. Select a task that has multiple resources assigned.

2. In the **Assign Resources** dialog box, click the assigned resource you want, and then click **Remove**.
3. Click the **Actions** button that appears just to the left of the task name, and then select the schedule result you want.



### Tip

If you unassign all resources from a task, the Actions button will not appear. That's because the Actions button applies only when a task has work, and work is the result of assigning a resource to the task.

## To manage effort-driven scheduling for a specific task or tasks

1. Select the task or tasks you want.
2. On the **Task** tab, in the **Properties** group, click **Information**.
3. On the **Advanced** tab of the **Task Information** dialog box, select or clear the **Effort Driven** check box.

## To turn on effort-driven scheduling for all new tasks in a plan

1. On the **File** tab, click **Options**.
2. In the **Project Options** dialog box, click **Schedule**.
3. Under **Scheduling Options For This Project**, select the **New Tasks Are Effort Driven** check box.

## Assign cost resources to tasks

Recall from [Chapter 5, “Set up resources,”](#) that a cost resource is used to represent a financial cost associated with a task in a project. Cost resources might include categories of expenses you want to budget and track for accounting or financial reporting purposes.

Cost resources do not incur assignment units, so they do no work and have no effect on the scheduling of a task. In fact, the cost value derived from assigning a cost resource to a task will remain the same regardless of any changes made to the scheduling of the task, such as work resources being assigned or unassigned, or the task’s duration changing.

Broadly speaking, the costs that tasks can incur include:

- Work resource costs, such as a person’s standard pay rate times the amount of work that person performs on the task.
- Cost resource costs, which are fixed dollar amounts you enter when assigning the cost resources to a task.

The costs derived from cost-resource assignments represent planned costs. (Indeed, you should consider all costs that Project has calculated so far in the schedule to be planned costs, such as those resulting from work-resource assignments to tasks.) Later, you can enter actual costs if you want to compare them with the budget.

## To assign a cost resource to a task

1. In a task-centric view that includes a table, click the task to which you want to assign a cost resource. Examples include the Gantt Chart, Task Sheet, and Task Usage views.
2. On the **Resource** tab, in the **Assignments** group, click **Assign Resources**. The Assign Resources dialog box opens. You can drag it anywhere you want on the screen.
3. In the **Assign Resources** dialog box, click the **Cost** field for the cost resource you want to assign, and then enter a cost value for that assignment.

## Check the plan after assigning resources

After you create a task list and assign resources to tasks, your plan contains a large number of details. Some of these details will be critical to the success of your plan, but they might not be visible in the view you have displayed. This topic illustrates several ways of seeing a plan's key indicators.

There are many ways you can see key indicators of a plan in Project. These indicators can help answer such questions as the following:

- Who is assigned to do what work in the plan?
- How long will it take to complete the project?
- How much will it cost?

For many projects, the answers to these questions are likely to change as time passes. For this reason, it's a good practice to quickly be able to show current project status. This can keep you, the project manager, informed, and it can also be useful information for the resources performing the work, the project's sponsors, and other stakeholders.



In addition to the views and features described in this topic, the Timeline, Project Summary task, and Project Statistics dialog box are all great places to see the key indicators of a plan. These features were introduced in [Chapter 4, “Build a task list.”](#)

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After resources have been assigned to tasks in a plan, two common questions that might come up are, “How much will this cost?” and “Who’s doing what work, and when?” In this topic, we’ll introduce features that help answer these questions. Because these are such important questions for successful project management, we’ll return to these and related features frequently in later chapters.

First, let’s focus on costs. We’ll switch to a Task Sheet view with the Cost table displayed. Sheet views are handy when you want to focus on the content of the table and don’t need to see a chart.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
TASK SHEET	0 ▾ New book launch	\$0.00	Prorated	\$19,740.00	\$0.00	\$19,740.00	\$0.00	\$19,740.00
	1 ▾ Planning Phase	\$0.00	Prorated	\$11,900.00	\$0.00	\$11,900.00	\$0.00	\$11,900.00
	2 Assign launch te	\$0.00	Prorated	\$420.00	\$0.00	\$420.00	\$0.00	\$420.00
	3 Complete autho	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	4 Schedule autho	\$0.00	Prorated	\$1,680.00	\$0.00	\$1,680.00	\$0.00	\$1,680.00
	5 Design and ord	\$0.00	Prorated	\$9,800.00	\$0.00	\$9,800.00	\$0.00	\$9,800.00
	6 Planning compl	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	7 ▾ Internal Launch Ph	\$0.00	Prorated	\$7,040.00	\$0.00	\$7,040.00	\$0.00	\$7,040.00
	8 Kickoff book lau	\$0.00	Prorated	\$650.00	\$0.00	\$650.00	\$0.00	\$650.00
	9 Plan author's tra	\$0.00	Prorated	\$2,640.00	\$0.00	\$2,640.00	\$0.00	\$2,640.00
	10 Channel Sales p	\$0.00	Prorated	\$3,750.00	\$0.00	\$3,750.00	\$0.00	\$3,750.00
	11 Complete book	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	12 Prepare book sa	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	13 Distribute inter	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	14 ▾ Public Launch Pha	\$0.00	Prorated	\$800.00	\$0.00	\$800.00	\$0.00	\$800.00
	15 ▾ Author travel ar	\$0.00	Prorated	\$800.00	\$0.00	\$800.00	\$0.00	\$800.00
	16 Author radio	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	17 Author readii	\$0.00	Prorated	\$800.00	\$0.00	\$800.00	\$0.00	\$800.00

*Displaying the Task Sheet view with the Cost table displayed is a good way to see cost details per task, and rolled up to summary tasks and to the project summary task*

The Cost table includes various cost values for each subtask. These subtask cost values roll up to their summary tasks, and ultimately all cost values roll up to the project summary task.

To shift focus from a task-centric to a resource-centric view of costs, use the Cost table in the Resource Sheet view.

	Resource Name	Cost	Baseline	Variance	Actual Cost	Remaining
1	Carole Poland	\$420.00	\$0.00	\$420.00	\$0.00	\$420.00
2	Copyeditors	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3	Dan Jump	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
4	Hany Morcos	\$1,550.00	\$0.00	\$1,550.00	\$0.00	\$1,550.00
5	Jane Dow	\$2,640.00	\$0.00	\$2,640.00	\$0.00	\$2,640.00
6	John Evans	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
7	Jun Cao	\$1,680.00	\$0.00	\$1,680.00	\$0.00	\$1,680.00
8	Katie Jordan	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
9	Luis Sousa	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
10	Printing Service	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
11	Robin Wood	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
12	Sharon Salavarria	\$110.00	\$0.00	\$110.00	\$0.00	\$110.00
13	Toby Nixon	\$5,940.00	\$0.00	\$5,940.00	\$0.00	\$5,940.00
14	Toni Poe	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
15	Travel	\$800.00	\$0.00	\$800.00	\$0.00	\$800.00
16	Vikas Jain	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
17	William Flash	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
18	Zac Woodall	\$6,600.00	\$0.00	\$6,600.00	\$0.00	\$6,600.00

RESOURCE SHEET

*Displaying the Resource Sheet view with the Cost table displayed is a good way to see cost details per resource*

This view displays the total costs per resource, based on the resource's pay rates, cost per use, and specific assignments.

Project includes many ways of answering the "Who does what, when?" question. A handy view for this purpose is the Task Usage view with the Summary table displayed.

	Task Mode	Task Name	Duration	Start	Finish	% Comp	Cost	Work	Details	S	Jan 7, '18
										S	M
0	➡	▫ New book launch	36 days	Mon 1/8/18	Tue 2/27/18	0%	\$19,740.00	396 hrs	Work	S	10h
1	➡	▫ Planning Phase	11 days	Mon 1/8/18	Mon 1/22/18	0%	\$11,900.00	248 hrs	Work		10h
2	➡	▫ Assign launch team	1 day	Mon 1/8/18	Mon 1/8/18	0%	\$420.00	8 hrs	Work		8h
		Carole Poland		Mon 1/8/18	Mon 1/8/18		\$420.00	8 hrs	Work		8h
3	➡	▫ Complete autho	1 wk	Tue 1/9/18	Mon 1/15/18	0%	\$0.00	40 hrs	Work		
		Toni Poe		Tue 1/9/18	Mon 1/15/18		\$0.00	40 hrs	Work		
4	➡	▫ Schedule autho	1 wk	Mon 1/8/18	Mon 1/15/18	0%	\$1,680.00	40 hrs	Work		2h
		Jun Cao		Mon 1/8/18	Mon 1/15/18		\$1,680.00	40 hrs	Work		2h
5	➡	▫ Design and ord	2 wks	Tue 1/9/18	Mon 1/22/18	0%	\$9,800.00	160 hrs	Work		
		Toby Nixon		Tue 1/9/18	Mon 1/22/18		\$5,400.00	80 hrs	Work		
		Zac Woodall		Tue 1/9/18	Mon 1/22/18		\$4,400.00	80 hrs	Work		
6	➡	Planning compl	0 days	Mon 1/22/18	Mon 1/22/18	0%	\$0.00	0 hrs	Work		
7	➡	▫ Internal Launch Ph	13 days	Tue 1/23/18	Fri 2/9/18	0%	\$7,040.00	140 hrs	Work		
8	➡	▫ Kickoff book lau	1 day	Tue 1/23/18	Tue 1/23/18	0%	\$650.00	12 hrs	Work		
		Sharon Salavaria		Tue 1/23/18	Tue 1/23/18		\$110.00	4 hrs	Work		
		Toby Nixon		Tue 1/23/18	Tue 1/23/18		\$540.00	8 hrs	Work		
9	➡	▫ Plan author's tra	6 days	Wed 1/24/18	Thu 2/1/18	0%	\$2,640.00	48 hrs	Work		
		Jane Dow		Wed 1/24/18	Thu 2/1/18		\$2,640.00	48 hrs	Work		

*The Task Usage view groups the assigned resources below each task and shows you, among other things, assignment details rolled up per task*

The pivot of this view is the Resource Usage view with the Summary table applied.

Resource Usage	Resource Name	Group	Max. Units	P%	Std. Rate	Ovt. Rate	Cost	Work	Jan 21, '18			
									Details	S	M	T
	Unassigned		100%	0%	\$0.00/hr	\$0.00/hr	\$0.00	0 hrs	Work			
	Planning corr		100%				\$0.00	0 hrs	Work			
	Complete book		100%				\$0.00	0 hrs	Work			
	Prepare book		100%				\$0.00	0 hrs	Work			
	Distribute int'l		100%				\$0.00	0 hrs	Work			
	Author radio		100%				\$0.00	0 hrs	Work			
	Distribute ad's		100%				\$0.00	0 hrs	Work			
	Distribute book		100%				\$0.00	0 hrs	Work			
	Coordinate mktg		100%				\$0.00	0 hrs	Work			
	Launch public rel		100%				\$0.00	0 hrs	Work			
	Launch social media		100%				\$0.00	0 hrs	Work			
	Launch comp		100%				\$0.00	0 hrs	Work			
1	Carole Poland		100%	100%	100.00/wk	\$0.00/hr	\$420.00	8 hrs	Work			
	Assign launch		100%				\$420.00	8 hrs	Work			
2	Copyeditors		400%	0%	\$45.00/hr	\$0.00/hr	\$0.00	0 hrs	Work			
3	Dan Jump		50%	0%	\$75.50/hr	\$0.00/hr	\$0.00	0 hrs	Work			
4	Hany Morcos		100%	100%	550.00/wk	\$0.00/hr	\$1,550.00	40 hrs	Work			
	Channel Sales		100%				\$1,550.00	40 hrs	Work			
5	Jane Dow		100%	100%	\$55.00/hr	\$0.00/hr	\$2,640.00	48 hrs	Work			
	Plan author's		100%				\$2,640.00	48 hrs	Work			
6	John Evans		100%	0%	780.00/wk	\$0.00/hr	\$0.00	0 hrs	Work			
7	Jun Cao		100%	100%	\$42.00/hr	\$63.00/hr	\$1,680.00	40 hrs	Work			
	Schedule auto		100%				\$1,680.00	40 hrs	Work			

The Resource Usage view groups the assigned tasks below each resource and shows you, among other things, assignment details rolled up per resource

The Resource Usage view groups the assigned tasks below each resource—this is the same assignment information as is shown in the Task Usage view, but grouped by resources rather than tasks. The two usage views give you insights into who does what work, and when. You'll work with them frequently in later chapters.

## To check the plan's costs per task

- On the **View** tab, in the **Task Views** group, click **Other Views**, and then click **Task Sheet**.
- On the **View** tab, in the **Data** group, click **Tables**, and then click **Cost**. The Cost table appears, replacing the Entry table.

## To check the plan's costs per resource

- On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
- On the **View** tab, in the **Data** group, click **Tables**, and then click **Cost**. The Cost table appears, replacing the Entry table.

## To see resource assignment and other details grouped by task

- On the **View** tab, in the **Task Views** group, click **Task Usage**. The Task Usage view appears.
- On the **View** tab, in the **Data** group, click **Tables**, and then click **Summary**. The Summary table appears, replacing the Entry table.

## To see task assignment and other details grouped by resource

1. On the **View** tab, in the **Resource Views** group, click **Resource Usage**. The Resource Usage view appears.
2. On the **View** tab, in the **Data** group, click **Tables**, and then click **Summary**. The Summary table appears, replacing the Entry table.

## Skills review

In this chapter, you learned how to:

- [Assign work resources to tasks](#)
- [Control work when adding or removing resource assignments](#)
- [Assign cost resources to tasks](#)
- [Check the plan after assigning resources](#)



### Practice tasks

The practice files for these tasks are located in the Project2016SBS\Ch06 folder.



#### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Assign work resources to tasks

The scenario: At Lucerne Publishing, you are ready to make the initial resource assignments in the new book launch plan. Because you previously accounted for the pay rates of work resources, you also want to see the initial cost and duration calculations of the plan for later comparison. Open the SimpleAssignWorkResource plan in Project, and then perform the following tasks:

1. Check the plan’s initial values via the Task Usage view with the **Summary** table visible.

	Task Mode	Task Name	Duration	Start	Finish	% Comp	Cost	Work	Details	S
TASK USAGE	0	↳ New book launch	41 days	Mon 1/8/18	Tue 3/6/18	0%	\$0.00	0 hrs	Work	
	1	↳ Planning Phase	11 days	Mon 1/8/18	Mon 1/22/18	0%	\$0.00	0 hrs	Work	
	2	Assign launch team	1 day	Mon 1/8/18	Mon 1/8/18	0%	\$0.00	0 hrs	Work	
	3	Complete author questionnaire	1 wk	Tue 1/9/18	Mon 1/15/18	0%	\$0.00	0 hrs	Work	
	4	Schedule author interviews	1 wk	Tue 1/9/18	Mon 1/15/18	0%	\$0.00	0 hrs	Work	
	5	Design and order marketing material	2 wks	Tue 1/9/18	Mon 1/22/18	0%	\$0.00	0 hrs	Work	
	6	Planning completion	0 days	Mon 1/22/18	Mon 1/22/18	0%	\$0.00	0 hrs	Work	
	7	↳ Internal Launch Phase	18 days	Tue 1/23/18	Fri 2/16/18	0%	\$0.00	0 hrs	Work	
	8	Kickoff book launch	1 day	Tue 1/23/18	Tue 1/23/18	0%	\$0.00	0 hrs	Work	
	9	Plan author's travel	3 days	Wed 1/24/18	Mon 1/29/18	0%	\$0.00	0 hrs	Work	
	10	Channel Sales prep	2 wks	Wed 1/24/18	Wed 2/7/18	0%	\$0.00	0 hrs	Work	
	11	Complete book design	2 days	Thu 2/8/18	Fri 2/9/18	0%	\$0.00	0 hrs	Work	
	12	Prepare book samples	1 wk	Thu 2/8/18	Wed 2/14/18	0%	\$0.00	0 hrs	Work	
	13	Distribute interviewers	2 days	Thu 2/15/18	Fri 2/16/18	0%	\$0.00	0 hrs	Work	

In the Task Usage view with the Summary table displayed, the project summary task conveys some of the plan's essential details

Note the current duration of 41 days and zero work and cost, visible for the project summary task. After you assign work and cost resources, you'll check these values again.

2. Switch back to the Gantt Chart view, and then use the **Assign Resources** dialog box to assign Carole Poland to task 2, *Assign launch team members*.

After you assign Carole, note the resulting assignment cost value in the Assign Resources dialog box.

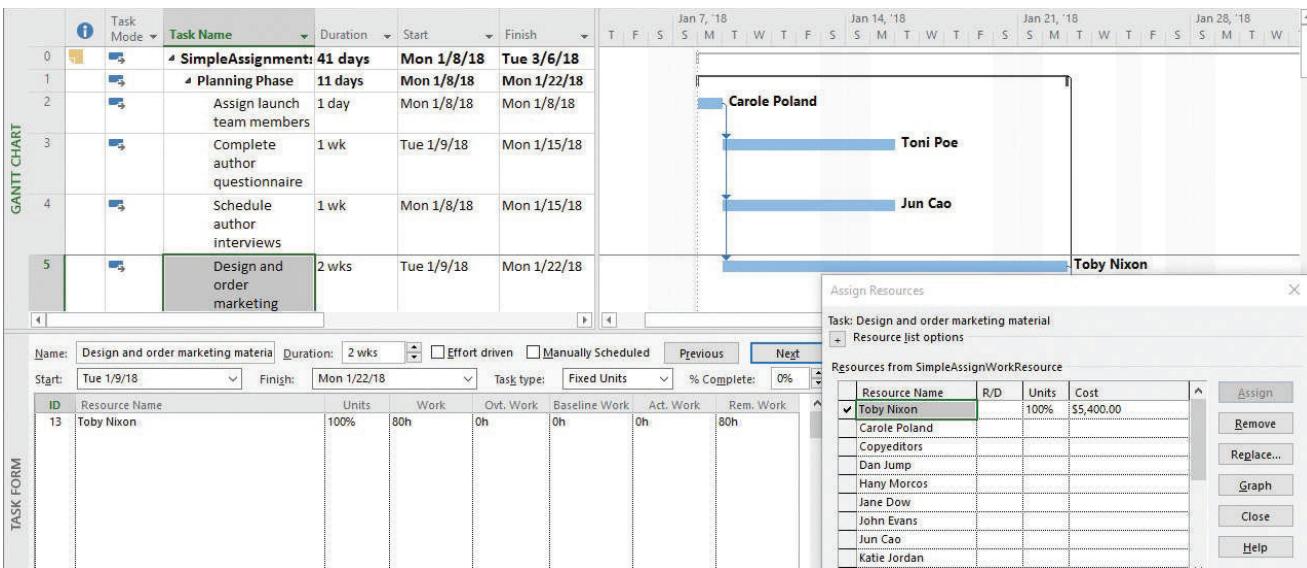
3. Use the same technique to assign Toni Poe to task 3, *Complete author questionnaire*.

Because Toni has no pay rate, her resulting assignment cost is zero.

4. Display the Task Form view with **Work** details.

5. Assign the following resources to tasks. As you do so, note the **Duration**, **Units**, and **Work** values in the **Task Form** (recall that these are the three essential variables for assignment calculations).

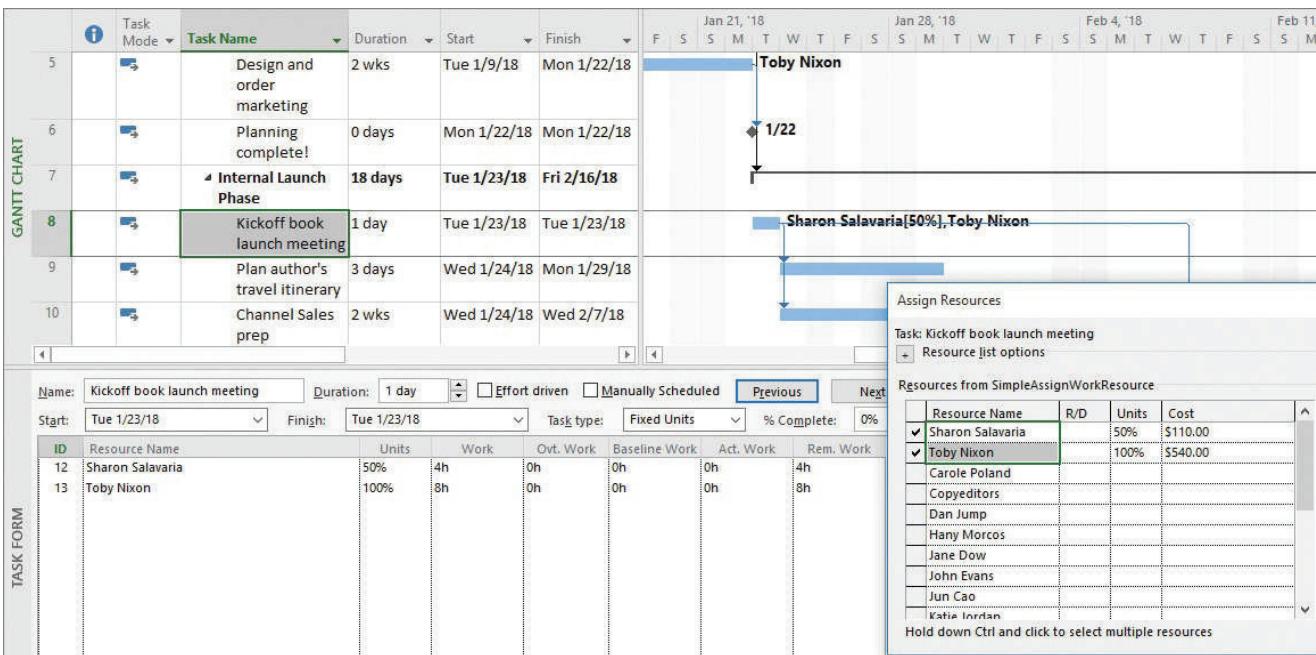
For this task	Assign this resource
4, Schedule author interviews	Jun Cao
5, Design and order marketing material	Toby Nixon



In the Task Form, keep your eye on the selected task's duration, assignment units, and work values as you assign more resources to the task

Next, you will assign two resources to a single task.

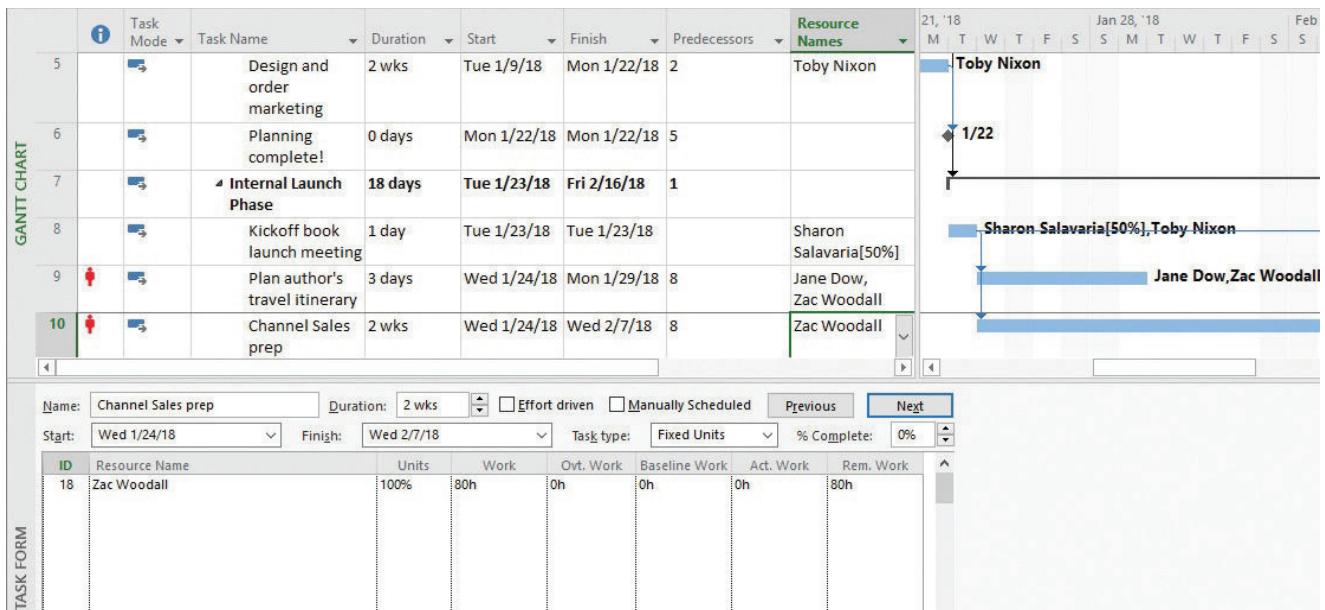
## 6. Use the **Assign Resources** dialog box to simultaneously assign Sharon Salavarria and Toby Nixon to task 8, *Kickoff book launch meeting*.



Between the Gantt Chart view, Assign Resources dialog box, and Task Form, Project provides multiple ways to display task assignments' schedule details

Recall from [Chapter 5, “Set up resources,”](#) that Sharon has a 50% Max. Units value to account for her half-time availability. As a result, Project assigned her at 50% units. Project accounted for this assignment units value when it calculated the task's resulting work value.

7. Use the **Resource Names** column to simultaneously assign Jane Dow and Zac Woodall to task 9, *Plan author's travel itinerary*.
8. Assign Zac Woodall to task 10, *Channel Sales prep*.



The Resource Names column conveys some of the same assignment details as does the Assign Resources dialog box

## Control work when adding or removing resource assignments

The scenario: Some time has passed since you made the initial resource assignments for the new book launch plan. You received some feedback from the assigned resources that require some adjustments to assignments. As you make these adjustments, you will control how the revised assignments should affect the tasks. Open the SimpleAssignControlWork plan, and then perform the following tasks:



### Important

The following tasks refer to the Task Form, which is a convenient way of seeing the results of actions. However, don't perform the tasks directly in the Task Form; doing so does not display the Actions button and the options it provides you.

1. Use the **Assign Resources** dialog box to add Zac Woodall to task 5 so that both Zac and Toby are assigned.
2. Use the **Actions** button to verify that assigning Zac will increase work but not change the task's duration.

You can see this result in the Task Form: Zac was assigned the additional work, and task 5's duration was not changed.

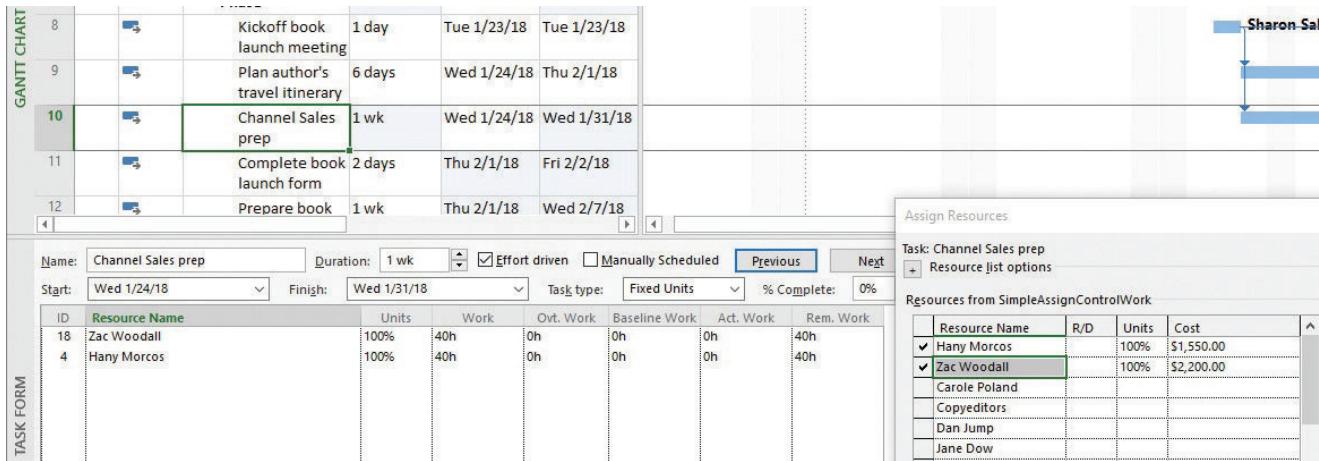
3. Remove Zac's assignment from task 9, *Plan author's travel itinerary*.

4. Use the **Actions** button to increase the duration of the task but keep the same amount of work on the task.

Again, you can see the result of the assignment change in the Task Form.

5. Use the **Task Information** dialog box to turn on effort-driven scheduling for task 10, *Channel Sales prep*.

6. Assign Hany Morcos to the task. Verify that the task's duration is reduced and that the total work is split between the two assigned resources, Hany and Zac.

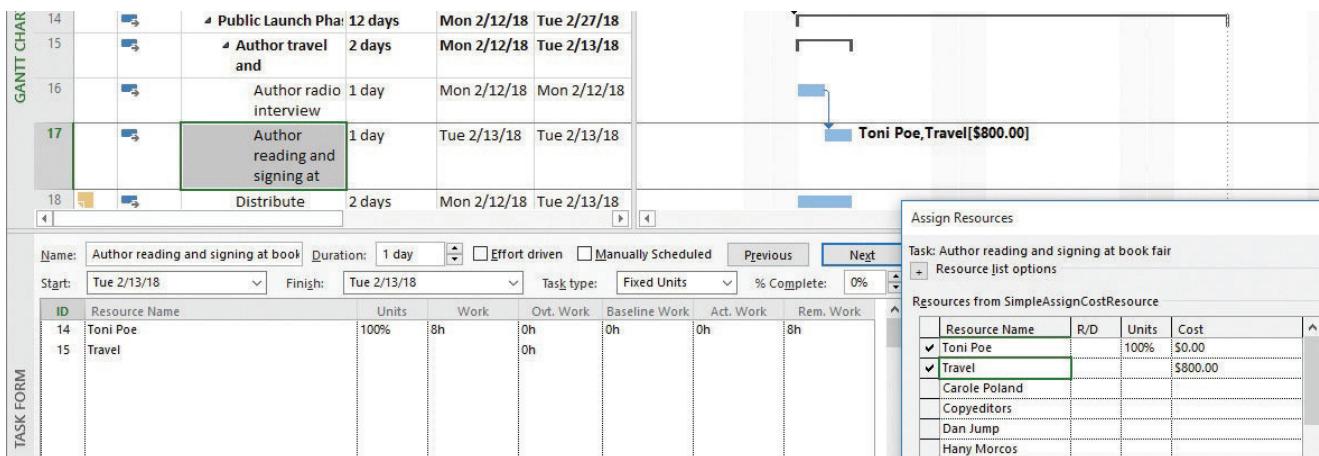


By using the options available from the Actions button, you can control how Project recalculates task durations and work values when you change resource assignments

## Assign cost resources to tasks

The scenario: You want to enter planned travel costs for a task in the new book launch plan. This task requires air travel by the children's book author, Toni Poe, and you allocated \$800 in anticipation of this expense. Open the SimpleAssignCostResource plan, and then perform the following tasks:

1. In the **Assign Resources** dialog box, assign the cost resource named *Travel* to task 17; specify an **\$800** cost to the assignment.



As you can see in the Gantt Chart view and Task Form, assigning a cost resource has no effect on the scheduling of the task

Note that the task has the same duration of one day, and Toni Poe has the same units and work values as before. Assigning the cost resource affected only the cost incurred by this task; the cost resource assignment had no impact on the scheduling of the task.

Recall that Toni Poe is the author of the children's book and has no pay rate in the plan, so her assignment cost is zero.

## 2. Close the **Assign Resources** dialog box.

### Check the plan after assigning resources

The scenario: It's time to explore the results of the resource assignments you've made. Open the SimpleAssignCheckPlan plan, and then perform the following tasks:

1. Display the Task Usage view with the Summary table. If necessary, drag the divider bar to the right to display the Work column.

	Task Mode	Task Name	Duration	Start	Finish	% Comp	Cost	Work	Details	S	S	M
TASK USAGE	0	▪ New book launch	36 days	Mon 1/8/18	Tue 2/27/18	0%	\$19,740.00	396 hrs	Work			10h
	1	▪ Planning Phase	11 days	Mon 1/8/18	Mon 1/22/18	0%	\$11,900.00	248 hrs	Work			10h
	2	▪ Assign launch team	1 day	Mon 1/8/18	Mon 1/8/18	0%	\$420.00	8 hrs	Work			8h
		Carole Polai		Mon 1/8/18	Mon 1/8/18		\$420.00	8 hrs	Work			8h
	3	▪ Complete author's bio	1 wk	Tue 1/9/18	Mon 1/15/18	0%	\$0.00	40 hrs	Work			
		Toni Poe		Tue 1/9/18	Mon 1/15/18		\$0.00	40 hrs	Work			
	4	▪ Schedule author's bio	1 wk	Mon 1/8/18	Mon 1/15/18	0%	\$1,680.00	40 hrs	Work			2h
		Jun Cao		Mon 1/8/18	Mon 1/15/18		\$1,680.00	40 hrs	Work			2h
	5	▪ Design and order book	2 wks	Tue 1/9/18	Mon 1/22/18	0%	\$9,800.00	160 hrs	Work			
		Toby Nixon		Tue 1/9/18	Mon 1/22/18		\$5,400.00	80 hrs	Work			
		Zac Woodal		Tue 1/9/18	Mon 1/22/18		\$4,400.00	80 hrs	Work			
6	▪ Planning completed	0 days		Mon 1/22/18	Mon 1/22/18	0%	\$0.00	0 hrs	Work			
7	▪ Internal Launch Phase	13 days		Tue 1/23/18	Fri 2/9/18	0%	\$7,040.00	140 hrs	Work			
8	▪ Kickoff book launch	1 day		Tue 1/23/18	Tue 1/23/18	0%	\$650.00	12 hrs	Work			
	Sharon Sala			Tue 1/23/18	Tue 1/23/18		\$110.00	4 hrs	Work			
	Toby Nixon			Tue 1/23/18	Tue 1/23/18		\$540.00	8 hrs	Work			
9	▪ Plan author's travel	6 days		Wed 1/24/18	Thu 2/1/18	0%	\$2,640.00	48 hrs	Work			
	Jane Dow			Wed 1/24/18	Thu 2/1/18		\$2,640.00	48 hrs	Work			

*Check the plan's key indicators on the project summary task in the Task Usage view*

Note the duration value of the project summary task: 36 days. At the start of the Practice Tasks section, the plan's duration was 41 days. This shorter duration you see now is the result of assignment changes you made earlier.

Note the project summary task's total cost value: \$19,740. This cost value is the sum of the work-resource assignments plus the one cost resource assignment you previously made.

2. Display the Resource Usage view with the Summary table.

Resource Usage	Resource Name	Group	Max. Units	Pct	Std. Rate	Ovt. Rate	Cost	Work	Details	S	Jan 21, '18
			100%	0%	\$0.00/hr	\$0.00/hr	\$0.00	0 hrs	Work	S	M
	Unassigned		100%	0%	\$0.00/hr	\$0.00/hr	\$0.00	0 hrs	Work		
	Planning corr		100%				\$0.00	0 hrs	Work		
	Complete book		100%				\$0.00	0 hrs	Work		
	Prepare book		100%				\$0.00	0 hrs	Work		
	Distribute int'l		100%				\$0.00	0 hrs	Work		
	Author radio		100%				\$0.00	0 hrs	Work		
	Distribute ad's		100%				\$0.00	0 hrs	Work		
	Distribute book		100%				\$0.00	0 hrs	Work		
	Coordinate nr		100%				\$0.00	0 hrs	Work		
	Launch public		100%				\$0.00	0 hrs	Work		
	Launch social		100%				\$0.00	0 hrs	Work		
	Launch comp		100%				\$0.00	0 hrs	Work		
1	Carole Poland		100%	100%	100.00/wk	\$0.00/hr	\$420.00	8 hrs	Work		
	Assign launch		100%				\$420.00	8 hrs	Work		
2	Copyeditors		400%	0%	\$45.00/hr	\$0.00/hr	\$0.00	0 hrs	Work		
3	Dan Jump		50%	0%	\$75.50/hr	\$0.00/hr	\$0.00	0 hrs	Work		
4	Hany Morcos		100%	100%	550.00/wk	\$0.00/hr	\$1,550.00	40 hrs	Work		
	Channel Sale:		100%				\$1,550.00	40 hrs	Work		
5	Jane Dow		100%	100%	\$55.00/hr	\$0.00/hr	\$2,640.00	48 hrs	Work		
	Plan author's		100%				\$2,640.00	48 hrs	Work		
6	John Evans		100%	0%	780.00/wk	\$0.00/hr	\$0.00	0 hrs	Work		
7	Jun Cao		100%	100%	\$42.00/hr	\$63.00/hr	\$1,680.00	40 hrs	Work		
	Schedule auto		100%				\$1,680.00	40 hrs	Work		

*It's handy to switch between the Task Usage and Resource Usage views; both views show you assignment details, but grouped in different ways*

This view organizes assignment-level details per resource. The Summary table conveys assignment cost and work values rolled up per resource.

# 10. Fine-tune task details

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## In this chapter

- [Enter deadline dates](#)
  - [Enter fixed costs](#)
  - [Create a recurring task](#)
  - [View the plan's critical path](#)
  - [Schedule summary tasks manually](#)
- 

## Practice files

For this chapter, use the FineTuneTasks practice file from the Project2016SBS\Ch10 folder. For practice file download instructions, see the introduction.

In this chapter, you continue the deep dive into task-management features that you began in the previous chapter. This chapter focuses on specific features you can apply to individual tasks.

This chapter guides you through procedures related to entering deadline dates, entering fixed costs, creating a recurring task, viewing the plan's critical path, and scheduling summary tasks manually.

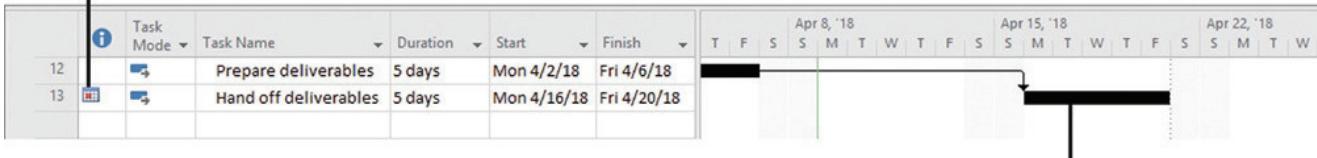
## Enter deadline dates

One common mistake made by new Project users is to place semi-flexible or inflexible constraints on too many tasks in their plans. Such constraints severely limit your scheduling flexibility. (If you need a refresher on task constraints, see “[Control task scheduling by using constraints](#)” in [Chapter 9, “Fine-tune task scheduling.”](#))

In many cases, setting a deadline date for a task is a better choice. When you set a deadline for a task, you identify the latest date by which you want the task to be completed. The deadline date itself does not constrain the scheduling of the task. Project displays a deadline symbol on the chart portion of a Gantt chart view. If the task's finish date moves past its deadline date, a missed deadline indicator (a red exclamation point) appears in the Indicators field for that task. When you spot the missed deadline indicator, you can take corrective steps.

Here's an example of how you might use a deadline rather than a constraint. Assume that you have a five-day task that you want completed by April 20. If you enter a Must Finish On constraint on the task and set it to April 20, Project will move the task out so that it will indeed end on April 20.

Pointing to the constraint indicator displays constraint details



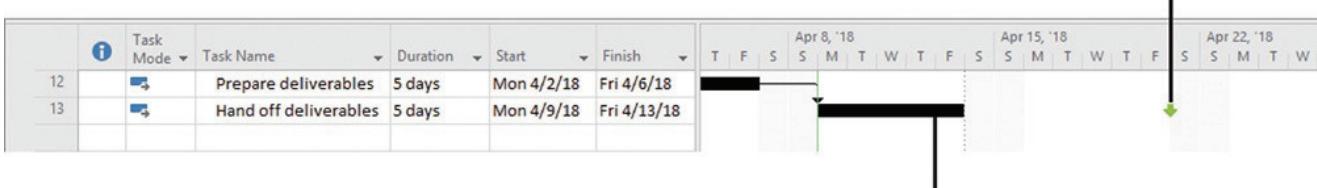
This task has a Must Finish On constraint, so Project schedules it to end on the specified date, but no earlier

*When the constraint is applied to task 13, Project keeps the finish-to-start task relationship with its predecessor but reschedules the task to honor its constraint type and date*

Even if the task could be completed earlier, Project will not reschedule it to start earlier. In fact, by applying that constraint, you have *increased* the risk for this task. If the task is delayed for even one day for any reason (if a required resource is sick, for example), the task will miss its planned finish date.

A better approach to scheduling this task is to use the default As Soon As Possible constraint and then enter a deadline of April 20.

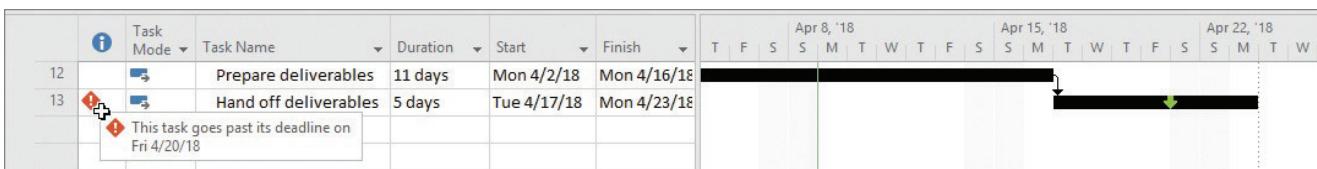
The deadline indicator appears on a Gantt chart



When an As Soon As Possible constraint is applied,  
the task starts earlier and leaves some time  
between its finish date and the deadline date

*The deadline date lets you keep track of the important target finish date, but gives you greater scheduling flexibility*

Now the task has the greatest scheduling flexibility. It might be completed well before its deadline, depending on resource availability, predecessor tasks, and whatever other scheduling issues apply. If the scheduled completion of the task moves past its deadline date, Project will display the missed deadline indicator in the Indicators column.



*The missed deadline indicator appears if the task's finish date is scheduled after the deadline date*

You can then take corrective action to pull in the task's finish date prior to its deadline.

## To set a deadline date on a task

1. Select the task for which you want to set a deadline.

- 
2. On the **Task** tab, in the **Properties** group, click the **Information** button to open the Task Information dialog box, which contains details about the currently selected task.
- 



### Tip

Double-clicking a task name is a quick way to open the Task Information dialog box.

---

3. Click the **Advanced** tab, and then in the **Deadline** field, enter or select the date you want.
  4. Click **OK** to close the Task Information dialog box.
- 



### Tip

You can also change an existing deadline date by dragging the deadline indicator in the chart portion of a Gantt chart view.

---

## To remove a deadline date

1. Select the task that has a deadline date applied.
2. On the **Task** tab, in the **Properties** group, click the **Information** button.
3. In the **Task Information** dialog box, click the **Advanced** tab.
4. Clear the **Deadline** field.

## Enter fixed costs

For plans in which you must track a budget or financial costs, you might need to work with several different sources of costs. These include costs associated with resources, in addition to costs associated directly with specific tasks.

For many plans, financial costs are derived mainly from costs associated with work resources (people and equipment) or with material resources. To handle costs of similar types for which you want to track aggregate sums (travel is one example in many plans), Project supports cost resources. (If you need a refresher on cost resources, see [Chapter 5, “Set up resources.”](#))

However, you might occasionally want to associate a cost with a task that is not tied to resources or work and is not something you want to aggregate across the plan as a cost resource. In such cases, apply a fixed cost to the task. A fixed cost is a specific monetary amount budgeted for a task. It remains the same regardless of the task’s duration and any costs of resources that could be assigned to it.

The following are common examples of fixed costs in plans:

- A setup fee, charged in addition to a per-day rental fee, for a piece of equipment

■ A building permit

If you assign resources with pay rates, assign cost resources, or add fixed costs to a task, Project adds all of these costs together to determine the task's total cost. For example, consider a final review task whose total cost is the sum of a work resource assignment's cost plus a fixed cost. The resource costs are derived from the resource pay rates times the resources' assignments to the task.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Details	M	T	W
21	↳ 2nd Pages review	\$0.00	Prorated	\$7,575.00	\$0.00	\$7,575.00	Work	16h	24h	24h
22	↳ Proof and review	\$0.00	Prorated	\$1,550.00	\$0.00	\$1,550.00	Work	4h		
	Hany Morcos			\$1,550.00	\$0.00	\$1,550.00	Work	4h		
23	↳ Send proofed pages to Production	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	Work	0h		
	Hany Morcos			\$0.00	\$0.00	\$0.00	Work	0h		
24	↳ Final review	\$175.00	End	\$6,025.00	\$0.00	\$6,025.00	Work	12h	24h	24h
	Carole Poland			\$2,100.00	\$0.00	\$2,100.00	Work	4h	8h	8h
	Hany Morcos			\$1,550.00	\$0.00	\$1,550.00	Work	4h	8h	8h
	Jane Dow			\$2,200.00	\$0.00	\$2,200.00	Work	4h	8h	8h
25	↳ Design book's companion website	\$0.00	Prorated	\$2,800.00	\$0.00	\$2,800.00	Work	8h		

The total cost breakdown is clearly shown in the Task Usage view with the Cost table displayed

You can specify when fixed costs should accrue, as follows:

- **Start** The entire fixed cost is scheduled for the start of the task. When you track progress, the entire fixed cost of the task is incurred as soon as the task starts.
- **End** The entire fixed cost is scheduled for the end of the task. When you track progress, the entire fixed cost of the task is incurred only after the task is completed.
- **Prorated (default accrual method)** The fixed cost is distributed evenly over the duration of the task. When you track progress, the plan incurs the cost of the task at the rate at which the task is completed. For example, if a task has a \$100 fixed cost and is 75 percent complete, the plan has incurred \$75 against that task.

When you plan a project, the accrual method you choose for fixed costs determines how those costs are scheduled over time. This can be important in anticipating budget and cash-flow needs. By default, Project uses the prorated accrual method for fixed costs, but you can change that to match your organization's cost accounting practices.

## To enter a fixed cost amount and accrual method

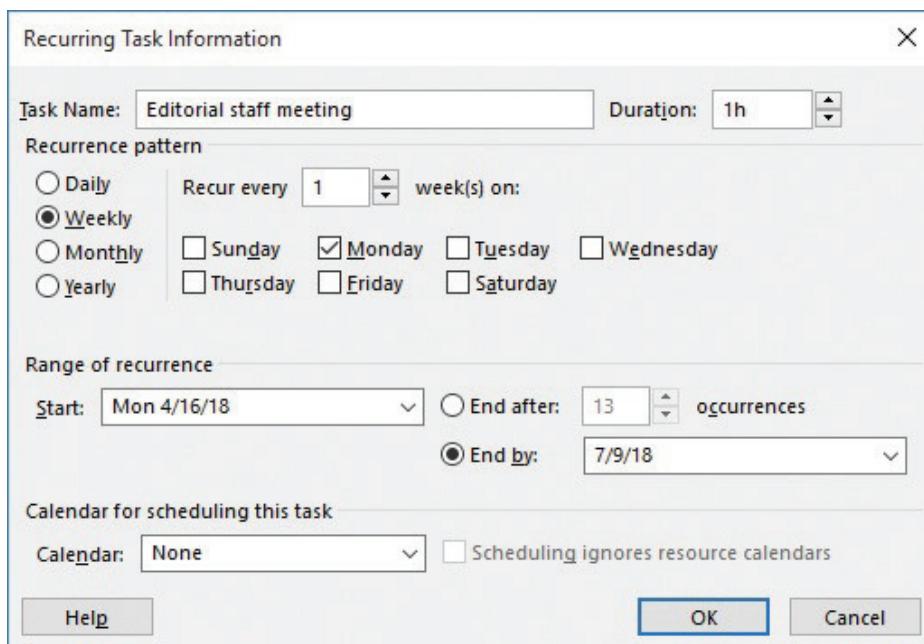
1. On the **View** tab, in the **Task Views** group, select any task-centric view that includes a table, such as the Gantt Chart, Task Sheet, or Task Usage view.
2. On the **View** tab, in the **Data** group, click the **Tables** button, and then click **Cost**.
3. In the **Fixed Cost** field, enter the fixed cost amount you want.
4. In the **Fixed Cost Accrual** field, click the accrual method you want.

## Create a recurring task

Many projects require repetitive tasks, such as attending team meetings, creating and publishing status reports, or running quality-control inspections. Although it is easy to overlook the scheduling of such events, you should consider accounting for them in your plan. After all, team meetings and similar events that indirectly support the project require time from resources, and such events take time away from your resources' other assignments.

To help account for such events in your plan, create a recurring task. As the name suggests, a recurring task is repeated at a specified frequency such as daily, weekly, monthly, or yearly. When you create a recurring task, Project creates a series of tasks with Start No Earlier Than constraints, effort-driven scheduling turned off, and no task relationships defined.

Recurring tasks in Project are similar to recurring appointments in calendar programs such as Microsoft Outlook. When you set up a recurring task, you set its recurrence pattern (for example, daily or once per week) and the applicable timespan or number of occurrences.



*Setting up a recurring task in Project is similar to setting up a recurring meeting in a calendar program*

You also can assign resources and perform other task-centric activities with recurring tasks.

All occurrences of a recurring task are organized under a single summary recurring task. As with a regular summary task, the duration of a summary recurring task spans the earliest start to latest finish date of the individual occurrences of the recurring task. Each occurrence of the recurring task is sequentially numbered. Initially, the recurring task is displayed in expanded form.

**GANTT CHART**

	Task Mode	Task Name	Duration	Start	Finish		Apr 15, '18	S M T W T F S	Apr 22, '18	S S M T W T F S	Apr 29, '18	S S M T W T F S
0		↳ Children's book schedule	159.5 days	Mon 4/9/18	Fri 11/16/18							
1	⟳	↳ Editorial staff meeting	60.13 days	Mon 4/16/18	Mon 7/9/18							
2		Editorial staff meeting 1	1 hr	Mon 4/16/18	Mon 4/16/18							
3		Editorial staff meeting 2	1 hr	Mon 4/23/18	Mon 4/23/18							
4		Editorial staff meeting 3	1 hr	Mon 4/30/18	Mon 4/30/18							
5		Editorial staff meeting 4	1 hr	Mon 5/7/18	Mon 5/7/18							
6		Editorial staff meeting 5	1 hr	Mon 5/14/18	Mon 5/14/18							
7		Editorial staff meeting 6	1 hr	Mon 5/21/18	Mon 5/21/18							
8		Editorial staff meeting 7	1 hr	Mon 5/28/18	Mon 5/28/18							
9		Editorial staff meeting 8	1 hr	Mon 6/4/18	Mon 6/4/18							
10		Editorial staff meeting 9	1 hr	Mon 6/11/18	Mon 6/11/18							
11		Editorial staff meeting 10	1 hr	Mon 6/18/18	Mon 6/18/18							
12		Editorial staff meeting 11	1 hr	Mon 6/25/18	Mon 6/25/18							
13		Editorial staff meeting 12	1 hr	Mon 7/2/18	Mon 7/2/18							
14		Editorial staff meeting 13	1 hr	Mon 7/9/18	Mon 7/9/18							
15		↳ Acquisition	28 days	Mon 4/9/18	Wed 5/16/18							

*Individual occurrences of a recurring task are sequentially numbered (you may need to widen the Task Name column to see the full task names)*

You can collapse the summary recurring task to save screen space. When you do, the summary recurring task is presented a little differently than a regular summary task.

	Task Mode	Task Name	Duration	Start	Finish		Apr 15, '18	S M T W T F S	Apr 22, '18	S S M T W T F S	Apr 29, '18	S S M T W T F S
0		↳ Children's book schedule	159.5 days	Mon 4/9/18	Fri 11/16/18							
1	⟳	↳ Editorial staff meeting	60.13 days	Mon 4/16/18	Mon 7/9/18							
15		Acquisition	28 days	Mon 4/9/18	Wed 5/16/18							
16		Manuscript received	0 days	Mon 4/9/18	Mon 4/9/18							

*The summary recurring task shows each occurrence of the recurring task rather than a regular summary Gantt bar*

Here are a few other things to keep in mind when working with recurring tasks:

- By default, Project schedules a recurring task to start at the plan's default start time. If you want to schedule a recurring task to start at a different time, enter that time along with the start date in the Start box of the Recurring Task Information dialog box. For example, if you want the recurring staff meeting to be scheduled for 10:00 A.M. starting on April 16, 2018, you would enter *4/16/18 10 AM* in the Start box.
- You can set a recurring task to end either after the number of occurrences you specify or on a specific date. If you schedule a recurring task to end on a specific date, Project suggests the current project end date. If you use this date, be sure to change it manually if the project end date changes later.
- If you want to assign the same resources to all occurrences of a recurring task (or remove them from the recurring task), use the Assign Resources dialog box to assign them to the recurring summary task. Don't enter resource names in the Resource Name field of the summary recurring task. Doing so assigns the resources to the summary recurring task only and not to the individual occurrences.
- You can assign resources to all occurrences of the summary recurring task, to a specific occurrence, or a combination.

## To create a recurring task

1. Display a task-centric view, such as a Gantt chart.
2. Select the task above which you want to insert the recurring task.

3. On the **Task** tab, in the **Insert** group, click the **Task** arrow (not the button), and then click **Recurring Task** to open the Recurring Task Information dialog box.
4. In the **Task Name** field, enter the recurring task's name.
5. In the **Duration** field, enter the duration of each occurrence of the recurring task.
6. Under **Recurrence pattern**, specify how often the task should repeat.
7. Under **Range of recurrence**, specify a start date. For the end date, you can specify either a specific number of occurrences or an end date.
8. Under **Calendar for scheduling this task**, if you want the recurring task to use a specific base calendar, select that calendar. If you want the selected calendar to override resource calendars so that assigned resources are scheduled to the recurring tasks at times they might not normally work, select the **Scheduling ignores resource calendars** check box.
9. Click **OK**.



### Tip

To edit a recurring task, double-click the summary recurring task's name to open the Recurring Task Information dialog box. Then make your changes.

---

## To assign resources to a recurring task

1. Select and expand the summary recurring task.
2. On the **Resource** tab, in the **Assignments** group, click the **Assign Resources** button.
3. In the **Assign Resources** dialog box, select the resources you want to assign to the recurring task. To select multiple resources, hold down the **Ctrl** key while selecting additional names.
4. Click **OK**.

## To assign resources to a specific occurrence of a recurring task

1. Expand the summary recurring task to show its occurrences.
2. Select the specific occurrence to which you want to assign a resource.
3. On the **Resource** tab, in the **Assignments** group, click the **Assign Resources** button.
4. In the **Assign Resources** dialog box, select the resources you want to assign to the recurring task's occurrence. To select multiple resources, hold down the **Ctrl** key while selecting additional names.
5. Click **OK**.

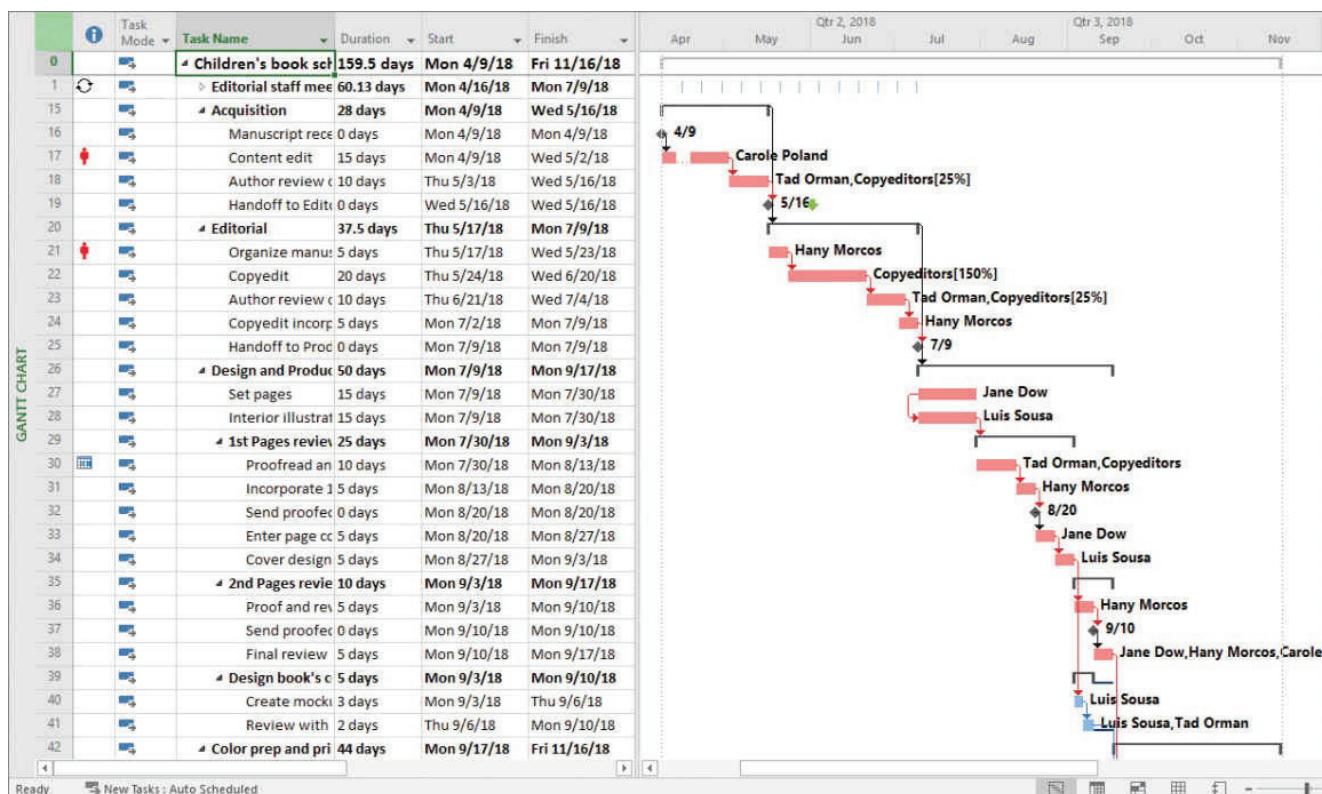
## View the plan's critical path

A critical path is the series of tasks that will push out the plan's end date if any of those tasks are delayed. The word *critical* in this context has nothing to do with how important these tasks are to the overall plan. It refers only to how their scheduling will affect the plan's finish date. However, the plan's finish date is of great importance to most projects. If you want to shorten the duration of a plan to bring in the finish date, you must begin by shortening (also referred to as *crashing*) the critical path.

Over the life of a project, the plan's critical path is likely to change from time to time as tasks are completed ahead of or behind schedule. Schedule changes, such as changing task relationships or durations, can also alter the critical path. In fact, Project automatically recalculates the critical path in response to schedule changes even if you never display the critical path.

One key to understanding the critical path is to understand slack, also known as *float*. There are two types of slack: free and total. The amount of time a task can be delayed before it delays another task is referred to as *Free slack*. Total slack is the amount of time a task can be delayed before it delays the completion of the plan. (Note that after a task on the critical path is completed, it is no longer critical because it cannot affect the plan's finish date.)

A task is on the critical path if its total slack is less than or equal to a certain threshold—by default, if its slack is zero days (you can adjust this threshold if you want). In contrast, *noncritical tasks* have slack, meaning that they can start or finish earlier or later within their slack time without affecting the completion date of the plan.



As this Gantt chart view is formatted, both the tasks on the critical path (in red) and the free slack of noncritical tasks are displayed



## Tip

The Task Path feature introduced in [Chapter 9](#), “[Fine-tune task scheduling](#),” distinguishes between the selected task’s predecessor and successor relationships. The critical path, in contrast, applies to whatever sequence of linked tasks in a plan drives the plan’s finish date.

Working with the critical path is the most important way to manage a plan’s overall duration. Checking the critical path and, when necessary, shortening the overall duration are important project management skills.

Here are a couple of other things to keep in mind when working with the critical path:

- Critical tasks and free slack are represented in the chart portion of the Detail Gantt view, and you can also see the values of free and total slack in the Schedule table. You can apply the Schedule table to any Gantt chart or Task Sheet view.
- Another way to identify the tasks on the critical path is to select Critical in the Highlight or Filter box on the View tab, in the Data group.



## Tip

To learn more about the critical path, click the Tell Me box at the top of the Project window, and in the Search box, enter [\*critical path\*](#).

### To display the plan’s critical path

1. On the **Format** tab, in the **Bar Styles** group, select the **Critical Tasks** check box. Project applies red formatting to the critical tasks’ Gantt bars.



## Tip

You can adjust the Gantt chart’s timescale to see more or less of the plan by clicking the Zoom In or Zoom Out command in the lower-right corner of the screen.

### To display slack for noncritical tasks

1. On the **Format** tab, in the **Bar Styles** group, select the **Slack** check box. Project draws slack lines from the finish dates of the Gantt bars of the noncritical tasks.

### To change the slack threshold for a task to be considered critical

By default, Project defines a task as critical if it has zero slack. However, you can change the amount of slack required for a task to be considered critical. You might do this, for example, if you want to more easily identify tasks that are within one or two days of affecting the project’s finish date.

1. Click the **File** tab to display the Backstage view, and then click **Options**.
2. In the **Project Options** dialog box, click **Advanced**.
3. On the **Advanced** page, in the **Tasks Are Critical If Slack Is Less Than Or Equal To** box in the **Calculation options of this project** section, enter the number of days you want.

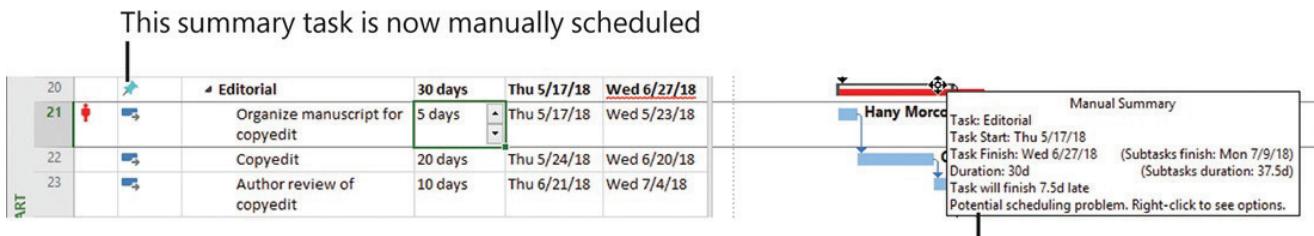
## Schedule summary tasks manually

In [Chapter 4, “Build a task list,”](#) you worked with summary tasks and subtasks. Recall that the default behavior of Project is to automatically calculate a summary task’s duration as the span of time between the earliest start and latest finish dates of its subtasks. For this reason, Project sets summary tasks as automatically scheduled—their durations are automatically determined by their subtasks, regardless of whether those subtasks are manually or automatically scheduled (or are a mix of both).

There might be times, however, when you want to directly enter a duration value for a summary task that is independent of its calculated duration as determined by its subtasks. For example, a summary task might represent a phase of work for which you want to allocate 60 working days and compare that duration with the calculated duration determined by the subtasks (their durations, task relationships, and other factors). This is especially likely during the initial planning of a plan, when you might need to account for the gap between how long you’d like a phase of work to take and its duration as determined by its subtasks.

Fortunately, you can enter any duration you want for a summary task. When you do so, Project switches the summary task from automatic to manually scheduled and reflects both durations as separate parts of the summary task’s Gantt bar. The upper bar represents the duration of the manually scheduled task, and the lower bar represents the automatically scheduled duration.

It’s useful to compare the duration of a manually scheduled task and its new finish date with the automatically scheduled duration and finish date as determined by the subtasks of the summary task. You can also point to the summary task’s Gantt bars in the chart portion of a Gantt chart view. The ScreenTip that appears includes these and other values.



This ScreenTip provides details of the manual summary task

*Use the ScreenTips for both parts of the Gantt bar of a manually scheduled summary task to view important scheduling details*

When you enter a duration for a manually scheduled summary task, Project makes the following adjustments to the schedule:

- The summary task is switched from automatically scheduled (the default for

summary tasks) to manually scheduled. Note the pin icon in the Task Mode column that reflects the task's scheduling status.

- Project draws two Gantt bars for the summary task. The upper bar represents the duration of the manually scheduled task, and the lower bar represents the automatically scheduled duration.
- Project draws a red squiggly line under the new finish date to flag it if there is a potential scheduling conflict.
- Project reschedules the summary task's successor tasks based on the summary task's manually entered duration.

Setting a manually scheduled duration for a summary task is a good way to apply a *top-down* focus to a plan. You can, for example, introduce some slack or buffer to a phase of work by entering a manually scheduled duration for the summary task that is longer than its calculated duration. Conversely, you can enter a preferred manually scheduled duration that is shorter than the scheduled duration of a summary task to give the assigned resources a more aggressive target to work toward.

## To enter a manually scheduled duration on a summary task

1. In the **Duration** field of a summary task, enter the manually scheduled duration value you want.

## To see the manually and automatically scheduled durations and other details on a summary task

1. Point to the upper or lower part of the summary task's Gantt bar. Project displays different ScreenTips for each part of the Gantt bar: the lower bar, which represents the summary task as it is automatically scheduled; and the upper bar, which represents it as it is manually scheduled.

## To convert a manually scheduled summary task back to an automatically scheduled summary task

1. Click the **Task Mode** field of the summary task, and then click the arrow that appears.
2. In the list, click **Auto Scheduled**.

## Skills review

In this chapter, you learned how to:

- [Enter deadline dates](#)
- [Enter fixed costs](#)
- [Create a recurring task](#)
- [View the plan's critical path](#)
- [Schedule summary tasks manually](#)



## Practice tasks

The FineTuneTasks practice file for these tasks is located in the Project2016SBS\Ch10 folder.



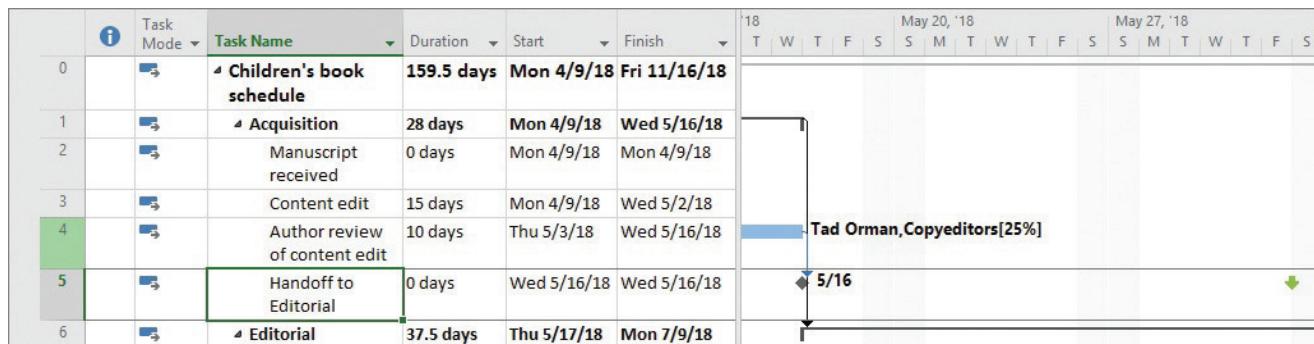
### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Enter deadline dates

The scenario: At Lucerne Publishing, the publisher has directed that the acquisition tasks for the new children’s book should not slip past a certain date. You’d like to flag this date without unduly restricting your scheduling flexibility in the plan. Open the FineTuneTasks plan in Project, and perform the following task:

1. Set a deadline date of **6/1/18** on task 5, *Handoff to Editorial*. This task is a milestone marking the end of the acquisition phase of the new book project.



*Task 5 is a milestone task that signifies the scheduled completion of a major phase of work—a good candidate for a deadline date*

## Enter fixed costs

The scenario: You’ve learned that the generating of page proofs by the color-setting services firm will cost \$500. You’d like to schedule this expense to accrue when the color-setting services firm completes the task. Continuing in the FineTuneTasks plan, perform the following tasks:

1. Enter a fixed cost of **\$500** on task 30, *Generate proofs*.
2. Set the fixed cost to accrue at the end of the task.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	W	T	F	S	S	M	T	W	T	F	S
28	Color prep and printing	\$0.00	Prorated	\$810.00	\$0.00	\$810.00											
29	Send to color house	\$0.00	Prorated	\$310.00	\$0.00	\$310.00											
30	Generate proof	\$500.00	End	\$500.00	\$0.00	\$500.00											
31	Print and ship	\$0.00	Prorated	\$0.00	\$0.00	\$0.00											

The Cost table is a handy place to enter a fixed cost on a task

## Create a recurring task

The scenario: The new children's book project requires a weekly status meeting involving some, but not all, of the resources working on the project. You'd like this recurring status meeting to have visibility in the plan. Continuing in the FineTuneTasks plan, perform the following tasks:

1. Insert a new recurring task named **Editorial staff meeting** so that it appears above task 1, *Acquisition*. The recurring task should have a one-hour duration every Monday, starting on April 16, 2018, and ending by July 9, 2018.
2. Assign the following resources to the summary recurring task:
  - Carole Poland
  - Hany Morcos
  - Jun Cao

	Task Mode	Task Name	Duration	Start	Finish	Apr 15, '18	S	S	M	T	W	T	F	S	Apr 22, '18	S	S	M	T	W	T	F	S	Apr 29, '18	S	S	M	T	W	T	F	S	May 6, '18	S	S	M	T	W
0		Children's book schedule	159.5 days	Mon 4/9/18	Fri 11/16/18																																	
1	⟳	Editorial staff meeting	60.13 days	Mon 4/16/18	Mon 7/9/18																																	
2		Editorial staff meeting 1	1 hr	Mon 4/16/18	Mon 4/16/18																																	
3		Editorial staff meeting 2	1 hr	Mon 4/23/18	Mon 4/23/18																																	
4		Editorial staff meeting 3	1 hr	Mon 4/30/18	Mon 4/30/18																																	
5		Editorial staff meeting 4	1 hr	Mon 5/7/18	Mon 5/7/18																																	
6		Editorial staff meeting 5	1 hr	Mon 5/14/18	Mon 5/14/18																																	
7		Editorial staff meeting 6	1 hr	Mon 5/21/18	Mon 5/21/18																																	
8		Editorial staff meeting 7	1 hr	Mon 5/28/18	Mon 5/28/18																																	
9		Editorial staff meeting 8	1 hr	Mon 6/4/18	Mon 6/4/18																																	
10		Editorial staff meeting 9	1 hr	Mon 6/11/18	Mon 6/11/18																																	
11		Editorial staff meeting 10	1 hr	Mon 6/18/18	Mon 6/18/18																																	
12		Editorial staff meeting 11	1 hr	Mon 6/25/18	Mon 6/25/18																																	
13		Editorial staff meeting 12	1 hr	Mon 7/2/18	Mon 7/2/18																																	
14		Editorial staff meeting 13	1 hr	Mon 7/9/18	Mon 7/9/18																																	
15		Acquisition	28 days	Mon 4/9/18	Wed 5/16/18																																	

Although you assigned resources to the summary recurring task, their names appear next to each occurrence of the recurring task

3. Collapse the summary recurring task.

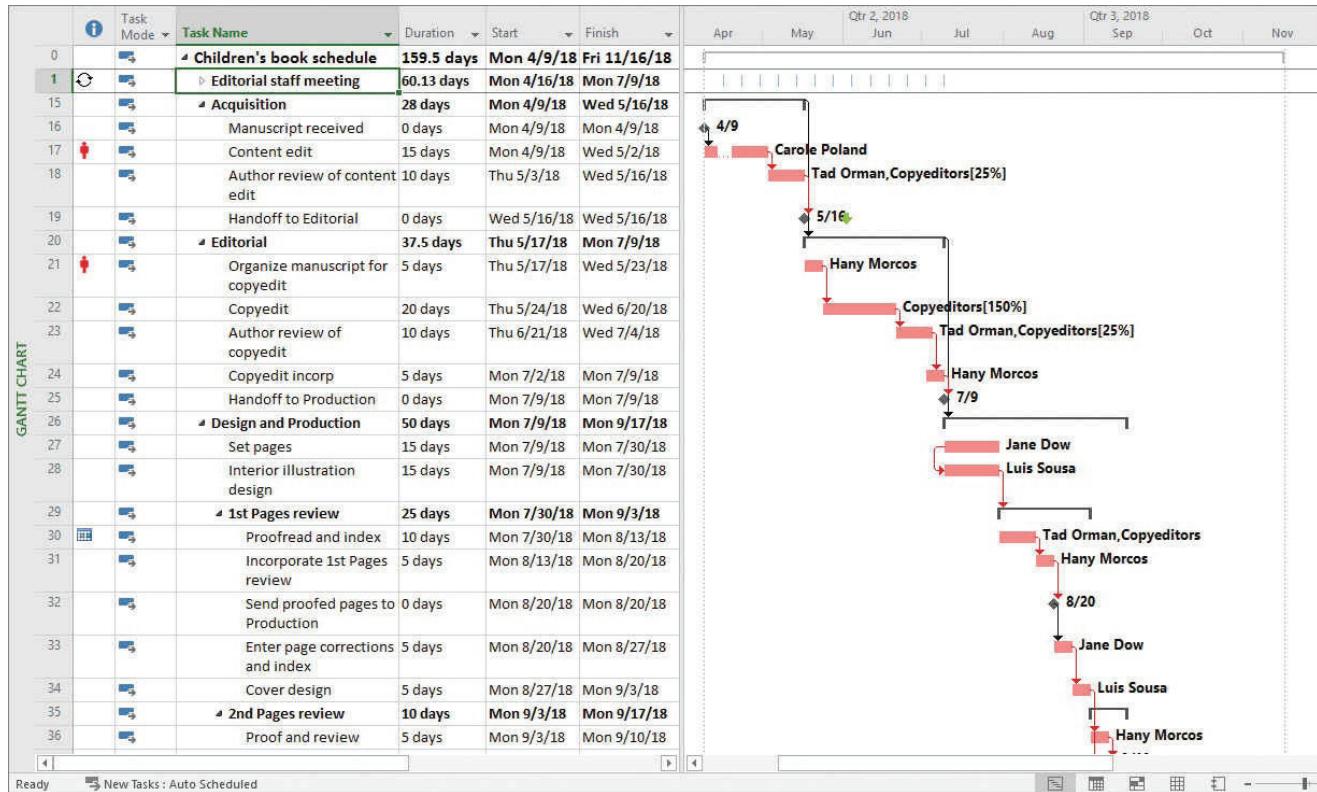
	Task Mode	Task Name	Duration	Start	Finish	Apr 15, '18	S	S	M	T	W	T	F	S	Apr 22, '18	S	S	M	T	W	T	F	S	Apr 29, '18	S	S	M	T	W	T	F	S	May 6, '18	S	S	M	T	W
0		Children's book schedule	159.5 days	Mon 4/9/18	Fri 11/16/18																																	
1	⟳	Editorial staff meeting	60.13 days	Mon 4/16/18	Mon 7/9/18																																	
15		Acquisition	28 days	Mon 4/9/18	Wed 5/16/18																																	
16		Manuscript received	0 days	Mon 4/9/18	Mon 4/9/18																																	
17		Content edit	15 days	Mon 4/9/18	Wed 5/2/18																																	
18		Author review of content edit	10 days	Thu 5/3/18	Wed 5/16/18																																	

The summary recurring task's Gantt bar shows each occurrence of the recurring task but hides the names of assigned resources; this is handy for seeing just when the recurring task will occur

## View the plan's critical path

The scenario: You are frequently asked when the new children's book project will be completed. You can quickly see the project's overall duration and finish date in Project, but occasionally you need to show a project stakeholder the project's critical path, because that sequence of tasks drives the project's duration. One way to see the critical path is to format critical tasks. Continuing in the FineTuneTasks plan, perform the following tasks:

1. Display critical tasks in the plan.



*With critical path formatting applied, it's easier to see the chain of tasks that is driving the plan's finish date*

2. Turn off the critical tasks formatting.

## Schedule summary tasks manually

The scenario: The publisher has challenged the team to aim for a 30-working-day duration for the Editorial phase of the new children's book project. You'll enter a manual duration on the Editorial summary task and later compare that duration with the automatically scheduled duration provided by Project. Continuing in the FineTuneTasks plan, perform the following tasks:

1. Enter a 30-day duration on summary task 20, *Editorial*. Entering a duration value for the summary task switches it to be manually scheduled.
2. Check task 20's updated schedule details in each of its Gantt bar's ScreenTips.

The screenshot shows a Microsoft Project interface. On the left, a Task List view displays tasks 20 through 23. Task 21, 'Editorial', is highlighted and selected. In the center, a Gantt chart shows a single horizontal bar for task 21, labeled 'Hany Morco'. A tooltip titled 'Manual Summary' is displayed over the Gantt bar, providing the following details:

- Task: Editorial
- Task Start: Thu 5/17/18
- Task Finish: Wed 6/27/18 (Subtasks finish: Mon 7/9/18)
- Duration: 30d (Subtasks duration: 37.5d)
- Task will finish 7.5d late
- Potential scheduling problem. Right-click to see options.

*When working with manually scheduled summary tasks, note the pin indicator (which indicates that the task is manually scheduled) and the two parts of the Gantt bar, each of which can display a helpful ScreenTip*

## Aplicație

Într-un laborator se realizează 10 experimente științifice, urmate de valorificarea rezultatelor. Sunt folosite următoarele resurse umane, care se pot introduce în fereastra *Resource Sheet*:

- 3 cercetători: C1, C2, C3 (salariu 65 lei/oră, *Standard rate*)
- 4 laboranți: L1, L2, L3, L4 (salariu 40 lei/oră, *Standard rate*)

Pe lângă resursele umane, se folosesc și resurse materiale. Cheltuielile pentru **substanțele** necesare experimentelor dintr-o zi sunt de 50 de lei. Cheltuielile pentru **birotică** și alte materiale sunt de 300 de lei, o singură dată. Pentru resursele materiale, costurile sunt de tip *Cost/use*.

Planificarea proiectului presupune următoarele activități:

- Întâlnirea inițială de planificare a proiectului – **4 ore, tot personalul**
- Faza de documentare
  - Căutarea pe Internet a bibliografiei – **1 zi, 1 cercetător**
  - Căutarea la bibliotecă a bibliografiei – **1 zi, în paralel cu căutarea pe Internet, 1 cercetător**
  - Citirea, trierea și clasificarea materialului bibliografic – **3 zile, toți cercetătorii**
- Faza de experimentare: **în fiecare zi de luni până joi, 10 zile, după documentare**
  - Pregătirea aparaturii necesare – **1 oră, 1 laborant**
  - Pregătirea substanțelor necesare – **1 oră, 1 laborant**
  - Realizarea experimentului – **4 ore, 1 cercetător și 2 laboranți**
  - Întâlnire **în fiecare zi** pentru analiza rezultatelor din ziua respectivă și planificarea pentru ziua următoare – **2 ore, 2 cercetători: cel care a coordonat experimentul din ziua respectivă și cel care va coordona experimentul de a doua zi**
- Întâlnire la finalul primei săptămâni pentru analiza rezultatelor – **4 ore, tot personalul**
- Întâlnire finală pentru analiza rezultatelor – **4 ore, toți cercetătorii**
- Valorificarea rezultatelor prin realizarea unui articol legat de experiment
  - Realizarea graficelor necesare și interpretarea acestora – **1 zi, 1 cercetător**
  - Scrierea articolului – **4 zile, poate începe în paralel cu realizarea graficelor, 2 cercetători.**

Dacă nu se specifică altfel, dependențele sunt de tip *Finish-to-Start*. Activitățile sunt de tip *Fixed Duration*.

La acest proiect, un laborant poate lucra cel mult 14 ore pe săptămână iar un cercetător cel mult 20 de ore. Nimeni nu poate lucra mai mult de 8 ore pe zi. Întâlnirile se consideră ore lucrante. Satisfacerea constrângerilor privind numărul maxim de ore lucrante pe zi, respectiv pe săptămână, se poate verifica în fereastra *Resource Usage*.

Să se realizeze un plan de lucru cu duratele și dependențele specificate care să folosească în mod optim resursele disponibile.

## 9. Fine-tune task scheduling

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### In this chapter

- [See task relationships by using Task Path](#)
  - [Adjust task link relationships](#)
  - [Control task scheduling by using constraints](#)
  - [Interrupt work on a task](#)
  - [Adjust working time for individual tasks](#)
  - [Control task scheduling by using task types](#)
  - [See task schedule details by using the Task Inspector](#)
- 

### Practice files

For this chapter, use the practice files from the Project2016SBS\Ch09 folder. For practice file download instructions, see the introduction.

In Part 3, “[Advanced scheduling techniques](#),” you’ll complete a full project life cycle (planning, tracking progress, and responding to variance) as you did in Part 2, “[Simple scheduling basics](#).” In Part 3, however, you dive deeper into the Project 2016 feature set to handle more complex needs. This chapter and [Chapter 10, “Fine-tune task details,”](#) introduce you to a broad feature set that focuses on a deeper level of task management. This chapter focuses on core task scheduling features, including task links, constraints, and task types.

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#### Tip

As you fine-tune a schedule, watch for blue highlighting to appear on changed values throughout a plan immediately after you make a change to a calculated value for a task, resource, or assignment. This automatic change highlighting helps you identify the impact of adjusting task relationships (or any other action that causes a date change in a plan) on the schedule. Change highlighting remains visible until you perform another editing action or save the file.

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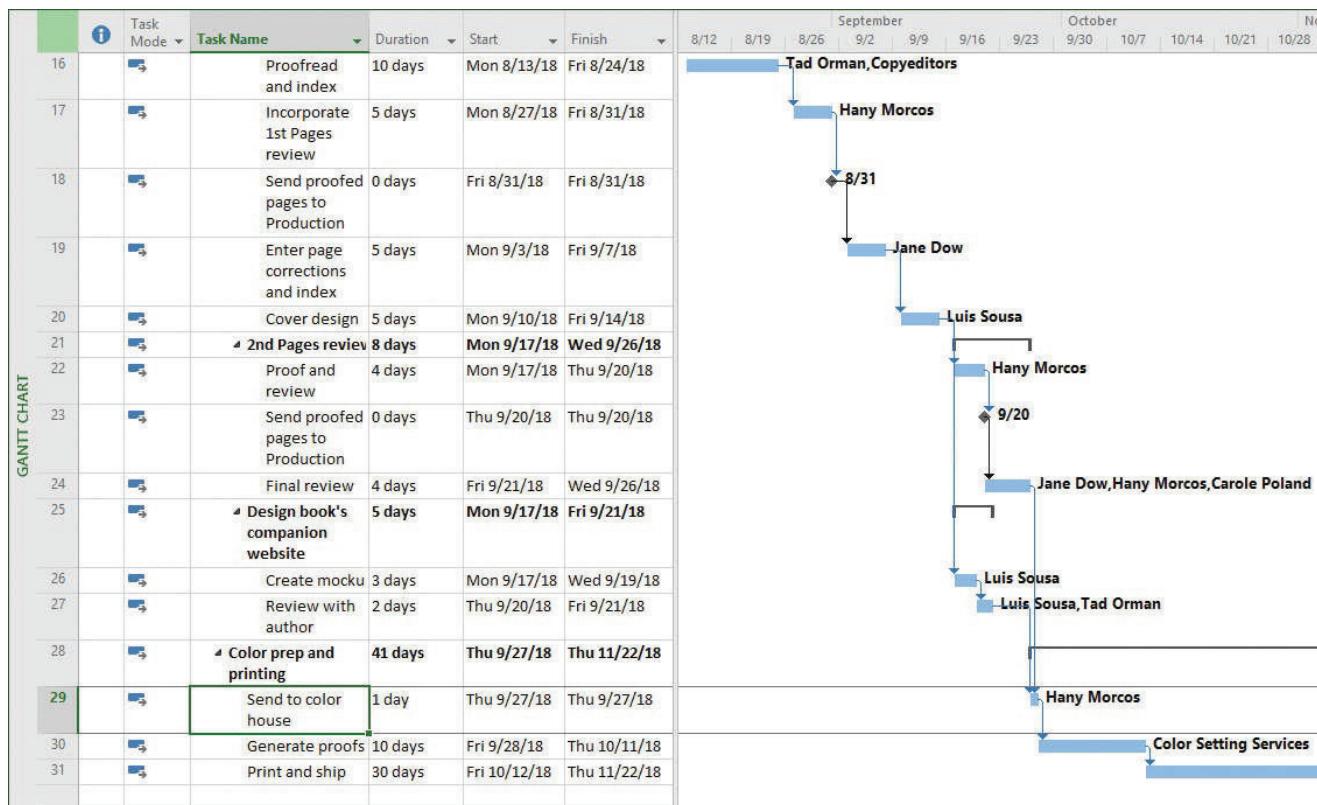
This chapter guides you through procedures related to seeing task relationships by using Task Path, adjusting task link relationships, controlling task scheduling by using constraints, interrupting work on a task, adjusting working time for individual tasks, controlling task scheduling by using task types, and seeing task schedule details by using the Task Inspector.

## See task relationships by using Task Path

When fine-tuning task relationships, you need to keep track of the predecessor tasks that affect the scheduling of their successor tasks. In complex plans, visually identifying predecessor and successor relationships is not always easy. This is especially true when a single task has multiple predecessors or successors.

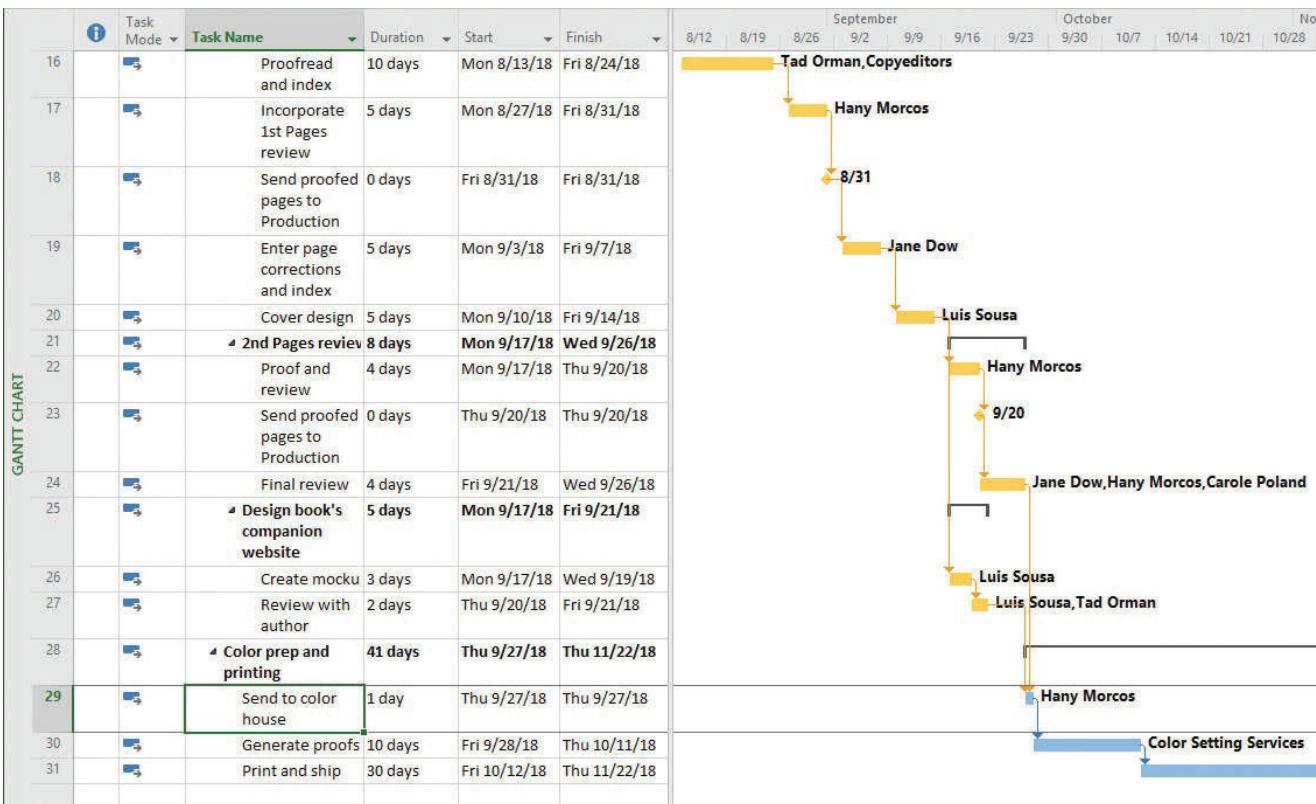
The Task Path feature applies color formatting to the Gantt bars of the selected task's predecessor and successor tasks. Task Path can also distinguish a task's driving predecessors (the predecessor tasks that directly determine, or drive, the start date of the task) from that task's other predecessors. (Predecessor tasks that can slip without rescheduling their successor tasks are said to have slack, which is described in detail in [Chapter 10, “Fine-tune task details.”](#)) The Task Path feature can also do the same for driving successor tasks.

The distinct color highlighting applied to driving predecessor and successor tasks is especially useful when you're focused on managing the overall duration of a sequence of linked tasks. Without Task Path formatting applied, it can be difficult to determine the path of related tasks on a Gantt chart.



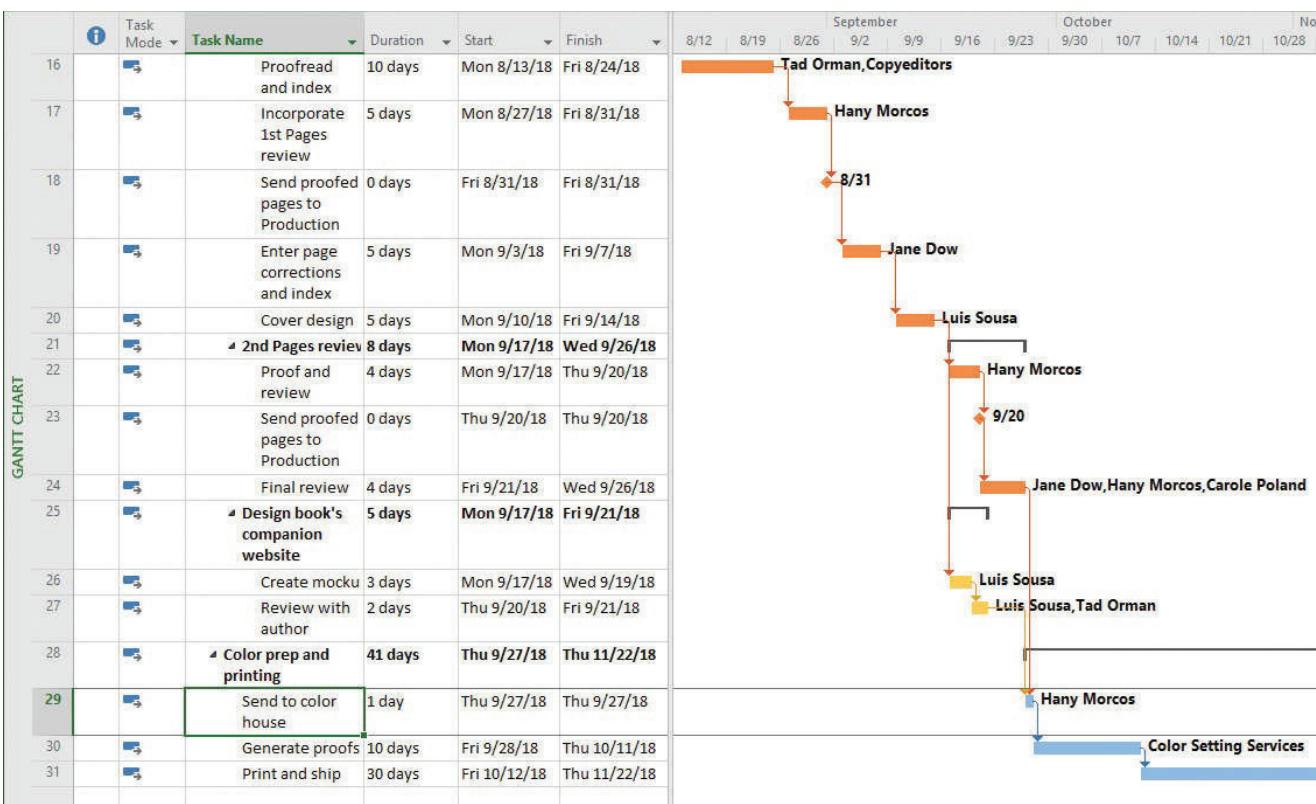
*In this Gantt chart view, all tasks have the same bar and link colors, regardless of predecessor and successor task relationships*

To identify the chain of a task's predecessor tasks, turn on Task Path predecessor formatting.



*Task Path formatting applies a gold highlight to the Gantt bars of task 29's predecessor tasks*

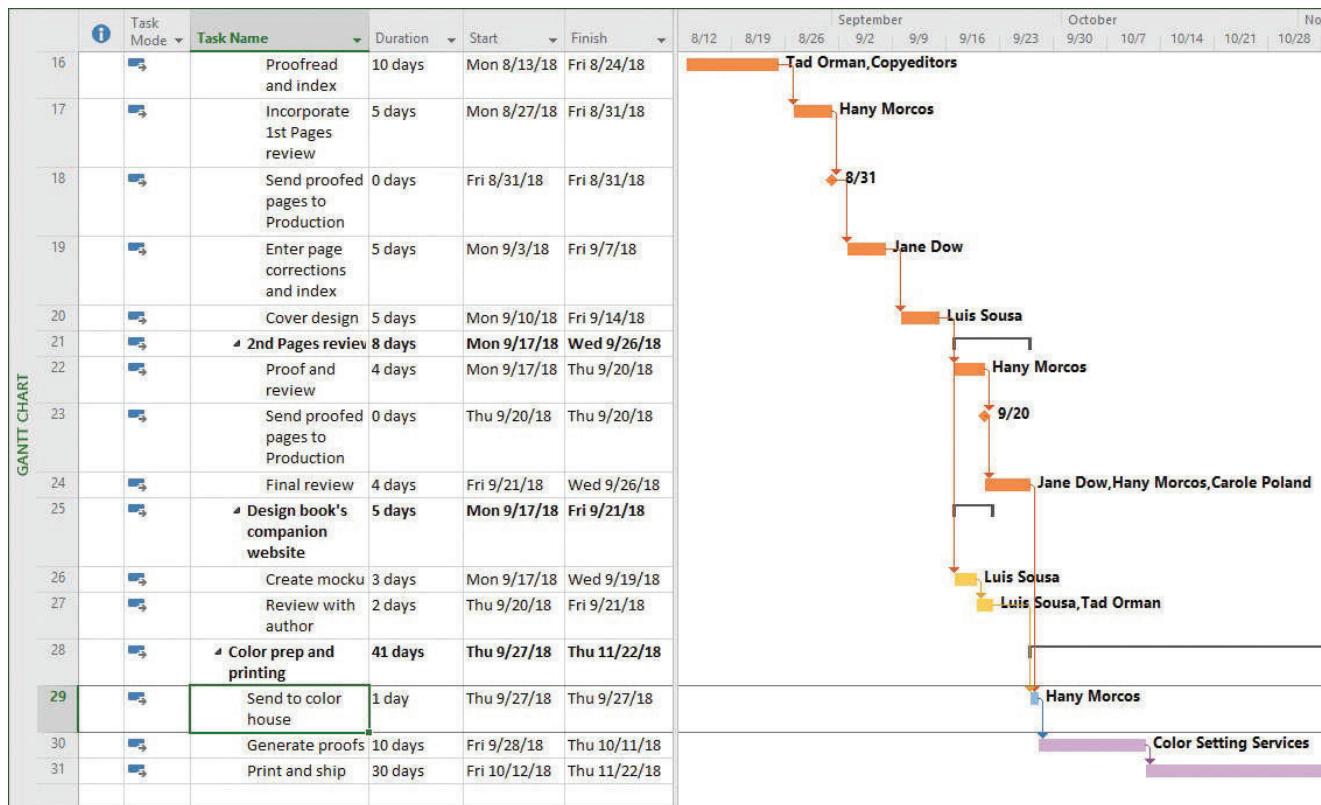
A task can have a long chain of predecessor tasks, but which of these directly drive the scheduling of the task? Task Path can visually distinguish these driving predecessors, too.



*Task Path formatting applies a dark orange highlight to the Gantt bars of task 29's driving predecessor tasks*

Some predecessor tasks directly drive the scheduling of a task and are its driving predecessors. Other predecessor tasks might have some amount of slack between them and the selected task. With the Task Path highlighting applied, you can more easily see which tasks are currently determining the scheduling of the selected task. Any schedule changes to these driving predecessor tasks will affect the selected task.

In addition to predecessor highlighting, you can also use Task Path to highlight the selected task's successor tasks.



*Task Path formatting applies a light purple highlight to the Gantt bars of task 29's successor tasks*

Project applies a light purple highlight formatting to the Gantt bars of a task's successor tasks.

## To apply Task Path formatting to a task's predecessor or successor tasks

1. In a Gantt chart view, click a task name.
2. On the **Format** tab, in the **Bar Styles** group, click the **Task Path** button, and then click the options you want.

## To turn off Task Path formatting

1. On the **Format** tab, in the **Bar Styles** group, click the **Task Path** button, and then click **Remove Highlighting**.

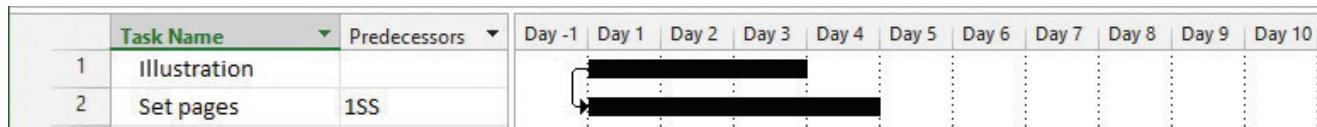
## Adjust task link relationships

You might recall from [Chapter 4](#), “Build a task list,” that there are four types of task dependencies, or relationships:

- **Finish-to-start (FS)** The finish date of the predecessor task determines the start date of the successor task.
- **Start-to-start (SS)** The start date of the predecessor task determines the start date of the successor task.
- **Finish-to-finish (FF)** The finish date of the predecessor task determines the finish date of the successor task.
- **Start-to-finish (SF)** The start date of the predecessor task determines the finish date of the successor task.

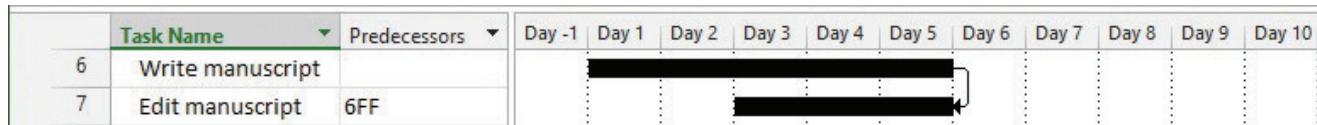
When you link tasks in Project by using the Link Tasks button on the Task tab, in the Schedule group, those tasks are given a finish-to-start relationship by default. This is fine for many tasks, but you will most likely change some task relationships as you fine-tune a plan. The following are some examples of tasks that require relationships other than finish-to-start:

- You can start setting pages as soon as you start illustration work on a book project (a start-to-start relationship). This reduces the overall time required to complete the two tasks, because they are completed in parallel.



*With a start-to-start relationship, the start date of the predecessor task determines the start date of the successor task*

- Planning the editorial work for a book can begin before the manuscript is complete, but it cannot be finished until the manuscript is complete. You want the two tasks to finish at the same time (a finish-to-finish relationship).



*With a finish-to-finish relationship, the finish date of the predecessor task determines the finish date of the successor task*

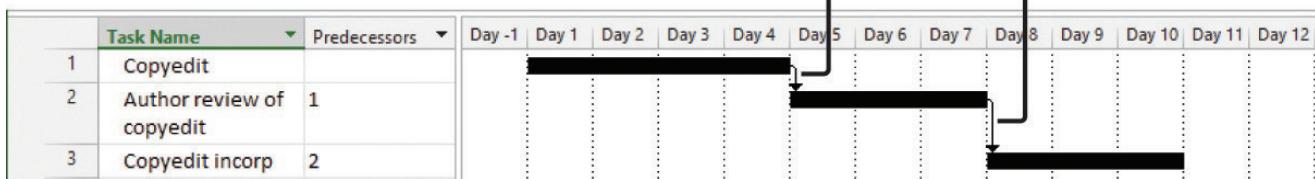
Task relationships should reflect the sequence in which work should be performed. After you have established the correct task relationships, you can fine-tune your schedule by entering overlap ([lead time](#)) or delay ([lag time](#)) between the finish or start dates of predecessor and successor tasks.

When two tasks have a finish-to-start relationship:

- Lead time causes the successor task to begin before its predecessor task concludes.
- Lag time causes the successor task to begin sometime after its predecessor task concludes.

Here's an example of how lead and lag time affect task relationships. Assume that you initially planned three tasks—copyedit, author review, and copyedit incorporation—by using Project's default finish-to-start relationships.

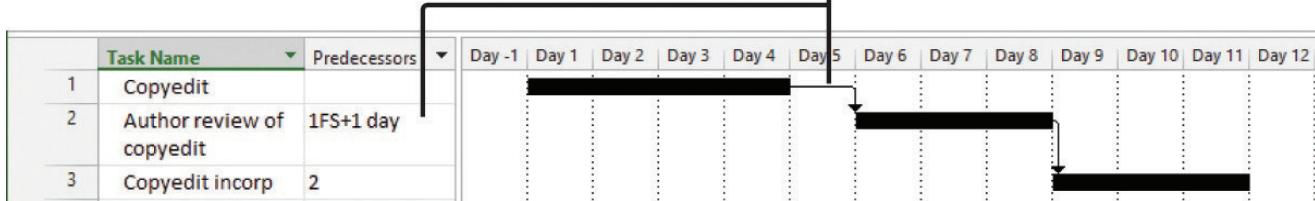
Initially, the tasks are linked with finish-to-start relationships, so the successor task is scheduled to begin when the predecessor task finishes



*Project's default task relationship is finish-to-start (FS)*

Before task 2 can begin, you need to allow an extra day for the copyedited manuscript to be shipped to the author. You do not want to add a day to the duration of task 1, because no real work will occur on that day. Instead, you enter a one-day lag between tasks 1 and 2.

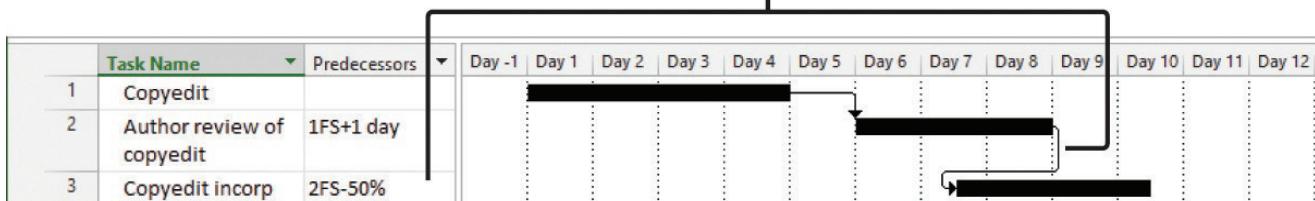
This lag time delays the start of the successor task by one day



*To add a delay between the end of the predecessor and the start of the successor, add lag time to the relationship*

However, task 3 can start as soon as task 2 is halfway completed. To make this happen, you would enter a 50-percent lead time between tasks 2 and 3.

This lead time schedules the successor task to start before the predecessor task finishes



*To add overlap between the end of the predecessor and the start of the successor, add lead time to the relationship*

You can enter lead and lag time as units of time, such as two days, or as a percentage of the duration of the predecessor task, such as 50 percent. Lag time is entered in positive units and lead time in negative units (for example,  $-2d$  or  $-50\%$ ). You can apply lead or lag time to any type of task relationship: finish-to-start, start-to-start, or any other type.



## Tip

Adjusting relationships between tasks and entering lead or lag times where appropriate are excellent techniques to fine-tune task relationships so that you get the results you want. However, Project cannot automatically make such schedule adjustments for you. As a project manager, you must analyze the sequences and relationships of your tasks and use your best judgment when making such adjustments.

Some places in which you can enter lead or lag time include the Task Information dialog box (available from the Task tab), the Predecessors column in the Entry table, the Task Form (which you can display by clicking the Details command on the View tab, in the Split View group), and the Task Dependency dialog box (which you can open by double-clicking a link line between Gantt bars).

### To change the type of task relationship between tasks

1. Select a successor task that you want to change.
2. On the **Task** tab, in the **Properties** group, click the **Information** button to open the Task Information dialog box, which contains details about the currently selected task.



## Tip

Double-clicking a task name is a quick way to open the Task Information dialog box.

3. Click the **Predecessors** tab.
4. On the **Predecessors** tab, in the **Type** column for the predecessor task, select the relationship type you want between the tasks, and then click **OK**.
5. Click **OK** to close the Task Information dialog box.

### To add lead or lag time between linked tasks

1. Select the successor task to which you want to add lead or lag time.
2. On the **Task** tab, in the **Properties** group, click the **Information** button.
3. In the **Task Information** dialog box, click the **Predecessors** tab, and then do either of the following:
  - In the **Lag** field for a predecessor task, enter the lag value you want. Lag values are entered as negative lag values. Lag can be a number of working days (for example,  $-2d$ ) or a percentage of the duration of the predecessor task (for example,  $-25\%$ ).
  - In the **Lag** field for a predecessor task, enter the lead value you want. Lead values

are entered as positive values. Lag can be a number of working days (for example,  $3d$ ) or a percentage of the duration of the predecessor task (for example,  $50\%$ ).

# Control task scheduling by using constraints

Every task that you enter into Project has some type of constraint applied to it. A constraint determines the degree to which an automatically scheduled task can be rescheduled. You can manage the constraint details of automatically scheduled tasks. When working with a manually scheduled task, however, you cannot change the constraint type or set a constraint date. The reason is that Project does not schedule manually scheduled tasks, so constraints have no effect. For more information about manually scheduled tasks versus automatically scheduled tasks, see [Chapter 4](#), “[Build a task list](#).”

There are three categories of constraints:

- **Flexible constraints** Project can change the start and finish dates of a task. Project's default constraint type causes tasks to start as soon as possible. This type of flexible constraint is called *As Soon As Possible*, or ASAP for short. No constraint date is associated with flexible constraints. Project does not display any special indicator in the Indicators column for flexible constraints.
  - **Semi-flexible constraints** With this type of constraint, a task has a start or finish date boundary. However, within that boundary, Project has the scheduling flexibility to change the start and finish dates of a task. For example, consider a task that must finish no later than June 22, 2018, but that could finish before this date. Semi-flexible constraints are sometimes called *soft constraints* or *moderate constraints*. When a semi-flexible constraint has been applied to a task, Project displays a special constraint indicator (which looks like a calendar) in the Indicators column.
  - **Inflexible constraints** With this type of constraint, a task must begin or end on a certain date. For example, you can specify that a task must end on November 16, 2018. Inflexible constraints are sometimes called *hard constraints*. When an inflexible constraint has been applied to a task, Project displays a constraint indicator in the Indicators column. You can point to a constraint indicator to display the constraint details in a ScreenTip.

Point to the constraint indicator in the Indicators column to see the constraint type and date

12		↳ Design and Production	49.5 days	Wed 6/27/18	Tue 9/4/18	
13		Set pages	15 days	Wed 6/27/18	Wed 7/18/18	Jane Dow
14		Interior illustration design	15 days	Wed 6/27/18	Wed 7/18/18	Luis Sousa
15		↳ 1st Pages review	25 days	Fri 7/20/18	Thu 8/23/18	
16	+	Proofread	10 days	Fri 7/20/18	Thu 8/2/18	
17		This task has a 'Start No Earlier Than' constraint on Fri 7/20/18.	5 days	Fri 8/3/18	Thu 8/9/18	
		1st Pages review				

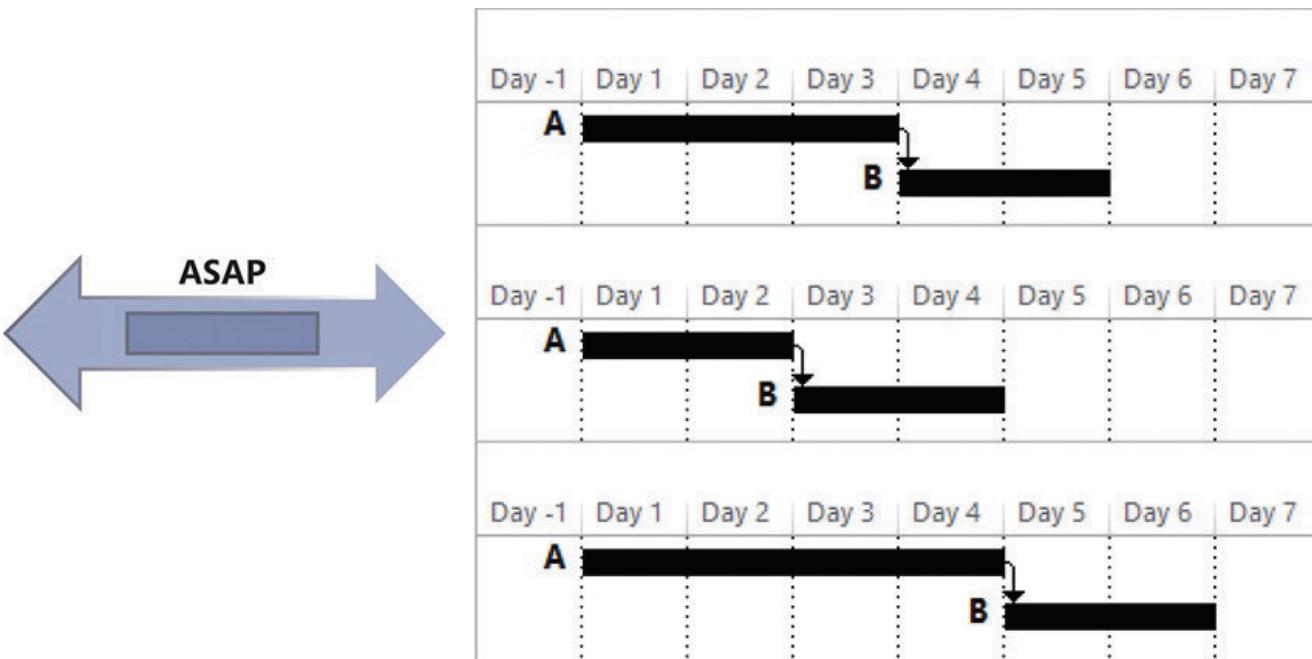
*Use the ScreenTip to get the constraint's details*

In total, there are eight types of task constraints, as described in the following table.

Constraint category	Constraint type	Description
Flexible	As Soon As Possible (ASAP)	Project schedules a task to occur as soon as it can occur. This is the default constraint type applied to all new tasks when you are scheduling from the project's start date. There is no constraint date for an ASAP constraint.
	As Late As Possible (ALAP)	Project schedules a task to occur as late as it can occur. This is the default constraint type applied to all new tasks when you are scheduling from the project's finish date. There is no constraint date for an ALAP constraint.
Semi-flexible	Start No Earlier Than (SNET)	Project schedules a task to start on or after the constraint date you specify. Use this constraint type to ensure that a task will not be scheduled to start before a specific date.
	Start No Later Than (SNLT)	Project schedules a task to start on or before the constraint date you specify. Use this constraint type to ensure that a task will not start after a specific date.
Semi-flexible	Finish No Earlier Than (FNET)	Project schedules a task to finish on or after the constraint date you specify. Use this constraint type to ensure that a task will not finish before a specific date.
	Finish No Later Than (FNLT)	Project schedules a task to finish on or before the constraint date you specify. Use this constraint type to ensure that a task will not finish after a specific date.
Inflexible	Must Start On (MSO)	Project schedules a task to start on the constraint date you specify. Use this constraint type to ensure that a task will start on an exact date.
	Must Finish On (MFO)	Project schedules a task to finish on the constraint date you specify. Use this constraint type to ensure that a task will finish on an exact date.

These three constraint categories have different effects on the scheduling of tasks:

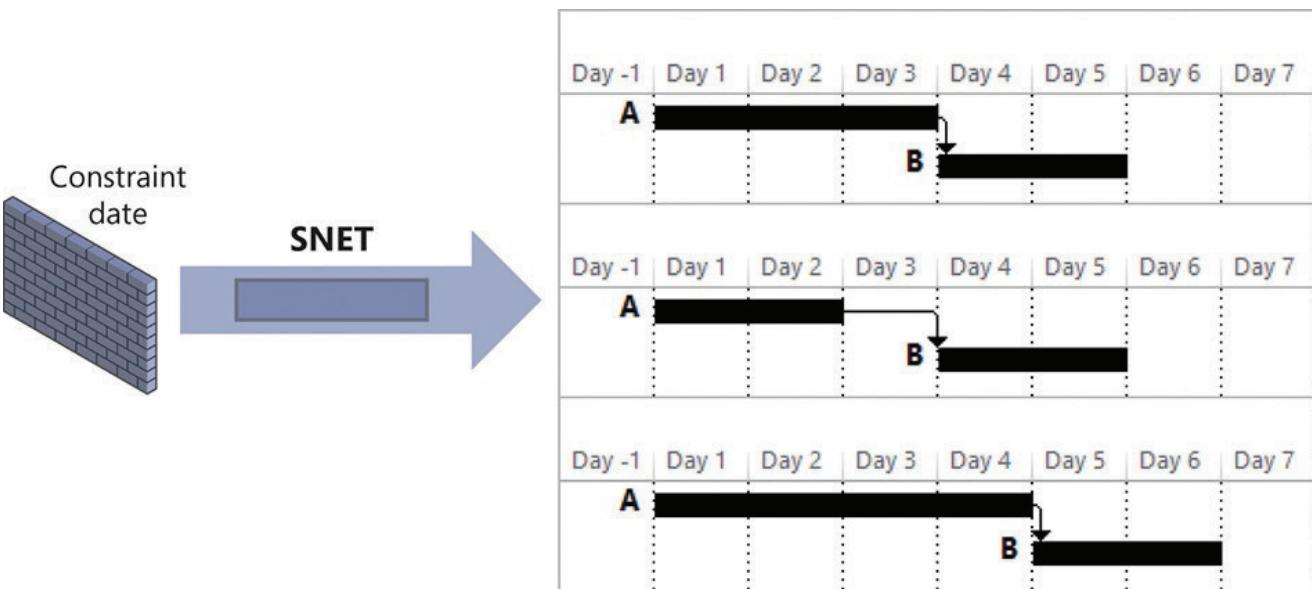
- **Flexible constraints** These constraints, such as As Soon As Possible (ASAP), allow tasks to be scheduled without any limitations other than their predecessor and successor relationships, and the project's start date (for ASAP task constraints) or finish date (for As Late As Possible [ALAP] task constraints). No fixed start or end dates are imposed by these constraint types. Use these constraint types whenever possible.



*The As Soon As Possible (ASAP) constraint gives you the maximum scheduling flexibility*

For example, consider a schedule in which tasks A and B are linked and task B has an ASAP constraint applied. As the duration of task A shrinks or grows, the start date of task B is automatically adjusted accordingly.

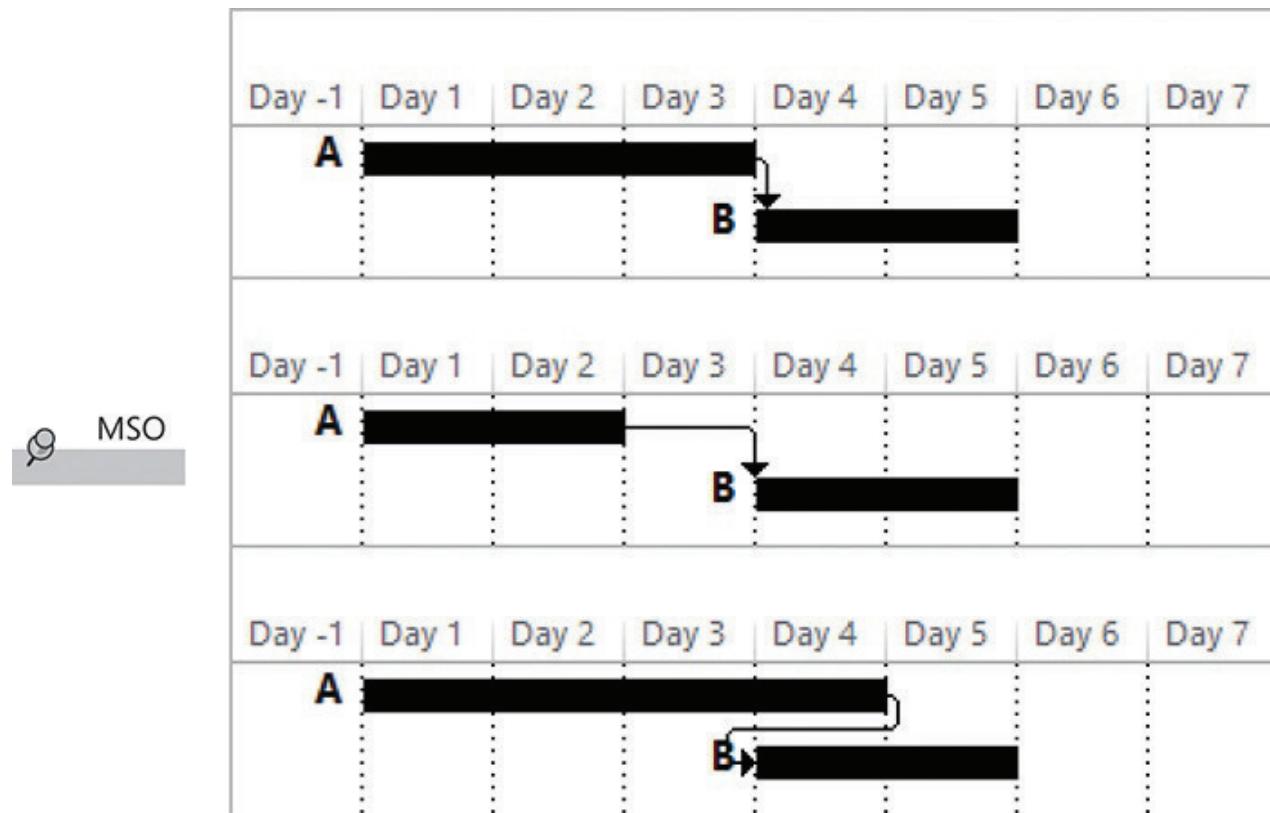
- **Semi-flexible constraints** These constraints, such as Start No Earlier Than or Start No Later Than (SNET or SNLT), limit the rescheduling of a task within the date boundary you specify.



*The Start No Earlier Than (SNET) constraint limits your scheduling flexibility starting at the constraint date*

With an SNET type of constraint, tasks A and B are linked and task B has an SNET constraint set to day 4. If task A's duration decreases, the start of task B is unaffected. However, if task A's duration extends, Project adjusts task B's start date automatically.

- **Inflexible constraints** These constraints, such as Must Start On (MSO), prevent the rescheduling of a task. Use these constraint types only when absolutely necessary.



*A Must Start On (MSO) constraint “pins” the start date of a task to a specific date, with no scheduling flexibility*

In this example, tasks A and B are linked and task B has an MSO constraint set to day 4. If task A’s duration decreases or increases, the start of task B is unaffected.

The type of constraint you apply to the tasks in your plans depends on what you need from Project. You should use inflexible constraints only if the start or finish date of a task is fixed by factors beyond the control of the project team. Examples of such tasks include handoffs to clients and the end of a funding period. For tasks without such limitations, you should use flexible constraints. Flexible constraints provide the most discretion in adjusting start and finish dates, and they allow Project to adjust dates if your plan changes. For example, if you used ASAP constraints and the duration of a predecessor task changes from four days to two days, Project adjusts, or *pulls in*, the start and finish dates of all successor tasks. However, if a successor task has an inflexible constraint applied, Project cannot adjust its start or finish dates.

Here are a few other things to keep in mind when applying constraints to tasks:

- Entering a finish date for a task (for example, in the Finish column) applies a Finish No Earlier Than constraint to the task.
- Entering a Start date for a task (for example, in the Start column) or dragging a Gantt bar directly on the Gantt chart applies a Start No Earlier Than constraint to the task.
- In many cases, entering a deadline date is a preferable alternative to entering a semi-

flexible or inflexible constraint. You will work with deadline dates in [Chapter 10](#), “[Fine-tune task details](#).”

- Unless you specify a time, Project schedules a constraint date’s start or finish time by using the Default Start Time or Default End Time value that is set on the Schedule tab of the Project Options dialog box. (To open this dialog box, click the File tab to display the Background view, and then click Options.) The default start time is 8:00 A.M. If you want a constrained task to be scheduled to start at a different time, enter that time along with the start date. For example, if you want to schedule a task to start at 10:00 A.M. on July 19, 2018, enter *7/19/18 10AM* in the Start field.
- If you must apply semi-flexible or inflexible constraints to tasks in addition to task relationships, you might create what is called [negative slack](#). For example, assume that you have a successor task that has a finish-to-start relationship with its predecessor task. If you enter a Must Start On constraint for the successor task earlier than the finish date of the predecessor task, this results in negative slack and a scheduling conflict. By default, the constraint date applied to the successor task overrides the relationship. However, if you prefer, you can set Project to honor relationships over constraints. To do so, in the Project Options dialog box, on the Schedule tab, clear the Tasks Will Always Honor Their Constraint Dates check box.
- If you must schedule a project from a finish date rather than a start date, some constraint behaviors are different. For example, the As Late As Possible constraint type, rather than As Soon As Possible, becomes the default for new tasks. You should pay close attention to constraints when scheduling from a finish date to make sure that you create the effect you intend.

## To apply a task constraint

1. Select the name of the task to which you want to apply a constraint.
- 



### Important

The task must be automatically scheduled; task constraints do not apply to manually scheduled tasks.

---

2. On the **Task** tab, in the **Properties** group, click the **Information** button.
- 



### Tip

Double-clicking a task name is a quick way to open the Task Information dialog box.

---

3. In the **Task Information** dialog box, click the **Advanced** tab.
4. In the **Constraint Type** box, select the constraint type you want.
5. All constraint types except As Soon As Possible and As Late As Possible require a

constraint date. In the **Constraint Date** box, enter or select the date you want, and then click **OK**.

## To remove a task constraint

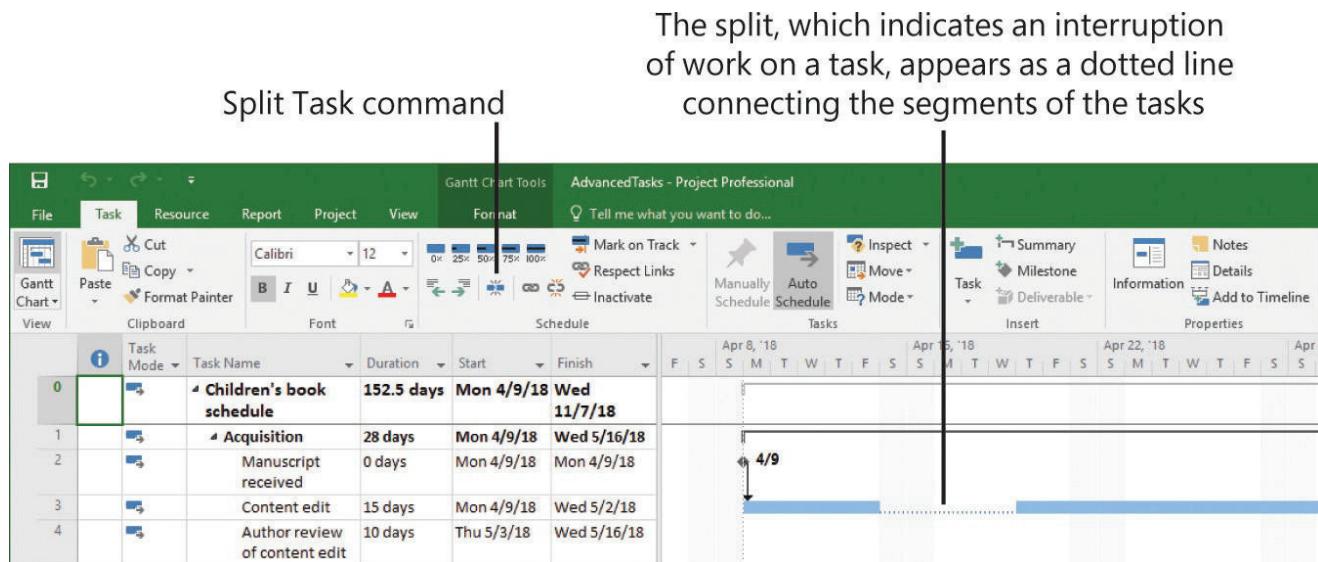
1. Select a task that has had a constraint applied.
2. On the **Task** tab, in the **Properties** group, click the **Information** button.
3. In the **Task Information** dialog box, click the **Advanced** tab.
4. In the **Constraint Type** box, select **As Soon As Possible** or (if scheduling from the project finish date) **As Late As Possible**.

## Interrupt work on a task

When initially planning project tasks, you might know that work on a certain task will be interrupted. Rather than listing a task twice to account for a known interruption in work, you can split the task into two or more segments. The following are some reasons why you might want to split a task:

- You anticipate an interruption in a task. This might be the case, for example, if the facility where a task must be performed will not be accessible midway through the task's duration.
- A task is unexpectedly interrupted. After a task is underway, a resource might have to stop work on the task because some other issue has taken priority. After the other issue is resolved, the resource can resume work on the task.

You drag the mouse pointer within a Gantt bar to split the task into multiple segments.



After you split a task, Project draws a dotted line between the two segments of the task in Gantt chart views.

Here are a few other things to keep in mind when splitting tasks:

- You can drag a segment of a split task either left or right to reschedule the split.

- The time of the task split, represented by the dotted line, is not counted in the duration of the task. No work occurs during the split.
- You can hide the dotted line between segments if you want, by clearing the Show Bar Splits check box in the Layout dialog box. (You can access this dialog box by clicking the Layout button in the Format group on the Format tab.)
- If the duration of a split task changes, the last segment of the task is increased or decreased accordingly.
- If a split task is rescheduled (for example, if its start date changes), the entire task is rescheduled, splits and all. The task keeps the same pattern of segments and splits.
- Resource leveling or manually [contouring](#) assignments over time can cause tasks to split. You will contour assignments in [Chapter 11, “Fine-tune resource and assignment details,”](#) and level resources in [Chapter 12, “Fine-tune the Project plan.”](#)

## To split a task into multiple segments

1. If the task's Gantt bar is not visible in the chart portion of the Gantt chart view, select the task name and then, on the **Task** tab, in the **Editing** group, click **Scroll to Task**.
2. On the **Task** tab, in the **Schedule** group, click the **Split Task** button (which looks like a broken Gantt bar) to display a ScreenTip and change the mouse pointer to task-splitting mode.
3. Move the mouse pointer over the Gantt bar of the task (but don't click) until the start of the split you want appears in the ScreenTip.
4. Click, and then drag the mouse pointer to the right until the start date that you want for the new segment appears in the ScreenTip. Release the mouse button.



### Tip

If you initially don't get the result you want, you can undo the split (press **Ctrl+Z**) and try again.

---

## To reschedule the second segment of a split task

1. Drag the second or later segment of the task to the new start date that you want.



### Tip

If you drag the first segment of a split task, you will reschedule the entire task and introduce an SNET constraint on the task. To adjust the split between the first and second segments of a split task, drag the second segment, not the first.

---

## To rejoin two segments of a split task

1. Drag one segment of the task until it touches the other segment.

## Adjust working time for individual tasks

Occasionally you might want a specific task to occur at a time that differs from the working time of the project calendar. Or perhaps you want a task to occur at a time outside of the assigned resource's normal working time, as determined by the resource's calendar. To accomplish this, you apply a task calendar to such tasks. As with the project calendar, you specify which base calendar to use as a task calendar. Here are some examples of when you might need a task calendar:

- You are using the Standard base calendar as your project calendar, with 8:00 A.M. to 5:00 P.M. as your normal working hours, and you have a task that must run overnight.
- You have a task that must occur on a specific weekday.
- You have a task that must occur over a weekend.

Project treats tasks differently from resources, in that it does not create calendars as you create tasks. (If you need a refresher on resource calendars, see [Chapter 5, “Set up resources.”](#)) When you need a task calendar, you assign a base calendar to the task. This base calendar might be one that is provided with Project or a new base calendar that you create.



### Tip

One benefit of creating a new calendar by copying the Standard base calendar is that all the working-day exceptions from the Standard calendar that you have already entered, such as holidays, will also appear in the new calendar. Any future changes made to either calendar do not affect the other calendar, however.

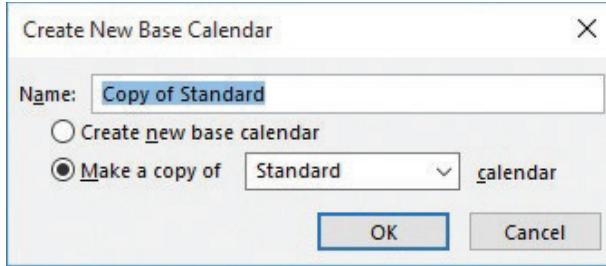
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For tasks that have both a task calendar and resource assignments, Project schedules work during the working times that are common between the task calendar and resource calendars. If there is no common working time, Project alerts you when you apply the task calendar or assign a resource to the task.

When you apply a task calendar to a task, you can choose to ignore resource calendars for all resources assigned to the task. Doing so causes Project to schedule the resources to work on the task according to the task calendar and not their own resource calendars (for example, to work 24 hours per day).

### To create a new base calendar

1. On the **Project** tab, in the **Properties** group, click the **Change Working Time** button to open the Change Working Time dialog box.
2. In the **Change Working Time** dialog box, click **Create New Calendar** to open the Create New Base Calendar dialog box.

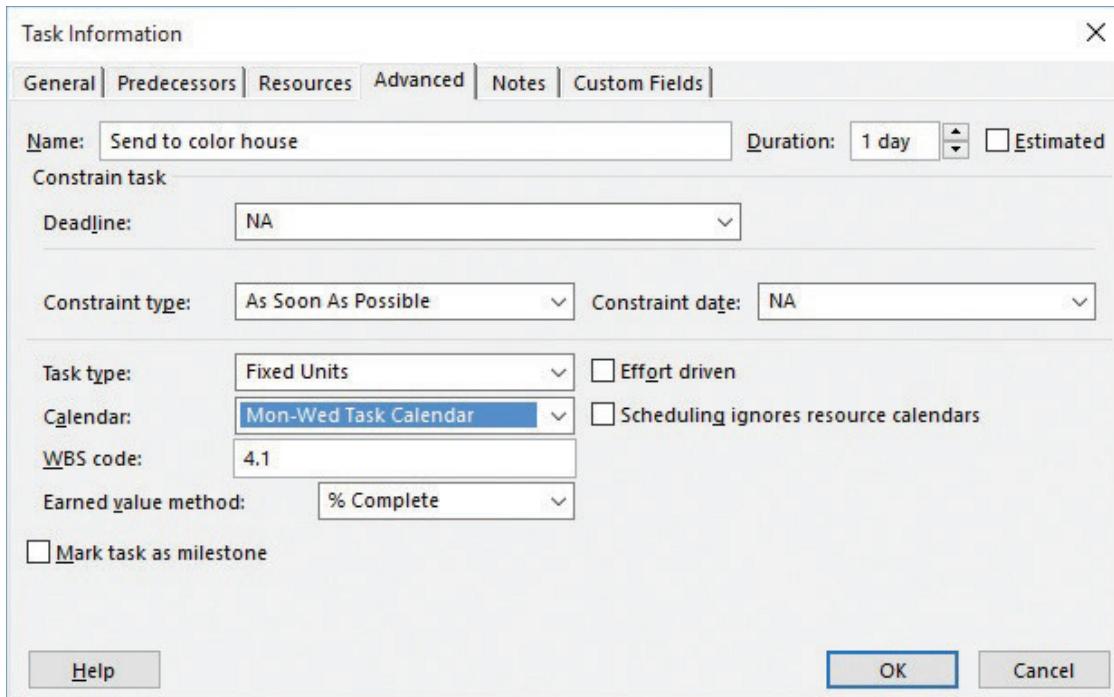


*When creating a new base calendar, give it a name that will make sense to anyone who works with it*

3. In the **Name** box, enter the name of the new base calendar, and then do either of the following:
  - To create a new calendar with Monday–Friday, 8:00 A.M.–5:00 P.M. working times, click **Create new base calendar**.
  - To create a new calendar that initially matches an existing base calendar, click the **Make a copy of** option and then select the base calendar you want from the list.
4. Click **OK**.
5. To enter the working-time details for this new calendar, in the **Change Working Time** dialog box, on the **Exceptions** and **Work Weeks** tabs, enter the specific working time exceptions or global changes you want for this calendar.
6. Click **OK** to close the **Change Working Time** dialog box.

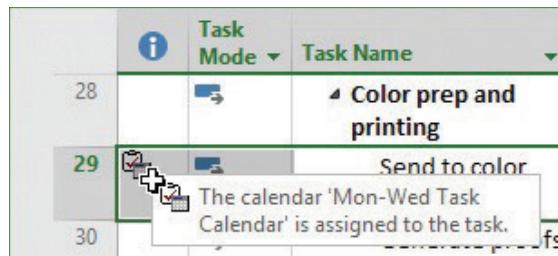
## To apply a base calendar to a task

1. Select the name of the task to which you want to apply the base calendar.
2. On the **Task** tab, in the **Properties** group, click the **Information** button to open the Task Information dialog box.
3. Click the **Advanced** tab.
4. In the **Calendar** box, select the base calendar from the list of available base calendars.



Use the *Calendar* field in the Task Information dialog box to apply a base calendar to a task

5. Click **OK** to close the dialog box. Project applies the base calendar to the task; for this task, the base calendar is its task calendar. A calendar icon appears in the Indicators column, reminding you that this task has a task calendar applied to it.
6. To see the calendar details, point to the calendar icon. A ScreenTip appears, showing the calendar details.



Use the ScreenTip to see the calendar's name

## Control task scheduling by using task types

You might recall from [Chapter 6, “Assign resources to tasks,”](#) that Project uses the following formula to calculate a task’s work value:

$$\text{Duration} \times \text{Assignment Units} = \text{Work}$$

Each value in this formula corresponds to a task type. A task type determines which of the three values remains fixed if the other two values change. You can change a task’s type to better control its scheduling as you change its work, duration, or assignment units values.

The default task type is [fixed units](#): If you change a task’s duration, Project will recalculate work. Likewise, if you change a task’s work, Project will recalculate the duration. In either case, the units value is not affected.

The two other task types are *fixed duration* and *fixed work*. For these task types, when Project responds to schedule changes, it records the highest units value per assignment in a field called Peak.

For a fixed-work task:

- You can change the assignment units value and Project will recalculate the duration.
- You can change the duration value and Project will recalculate peak units. The assignment units value is not affected.



### Important

You cannot turn off effort-driven scheduling for a fixed-work task. If you need a refresher on effort-driven scheduling, see “[Control work when adding or removing resource assignments](#)” in [Chapter 6, “Assign resources to tasks.”](#)

For a fixed-duration task:

- You can change the assignment units value and Project will recalculate work.
- You can change the work value and Project will recalculate peak units. The assignment units value is not affected.



### Important

You cannot change the task type of a manually scheduled task; the effect of changing the task type on the scheduling of a task as described here applies only to automatically scheduled tasks. If you need a refresher on manually scheduled tasks, see [Chapter 4, “Build a task list.”](#)

You can change a task type at any time. Note that characterizing a task type as *fixed* does not mean that its duration, assignment units, or work values are unchangeable. You can change any value for any task type.

Which is the right task type to apply to each of your tasks? It depends on how you want Project to schedule that task.

		... and you change the		
		Duration	Assignment units	Work
If the task type is ...	Fixed duration	Work	Work	Peak
	Fixed units	Work	Duration	Duration
	Fixed work	Peak	Duration	Duration

... then Project recalculates

*This table summarizes the effects of changing any value for any task type; it works like a multiplication table*

Changing a task type has no immediate effect on a plan. To better see the effect of task

types, let's look at an example of how task types determine how tasks are rescheduled in response to a change in duration, work, or assignment units.

Consider the new book plan, which can be shown in a customized Task Usage view (with the addition of the Peak field), and with the Task Form visible. With this view combination you can see work, duration, assignment units, and Peak values. This example focuses on task 8, *Copyedit*. Its task type is fixed units, the default task type.

The screenshot shows a split-screen view of Microsoft Project. The top half is the 'Task Usage' view, which lists tasks by ID, name, mode, duration, peak, start, and finish dates. Task 8, 'Copyedit', is selected and highlighted with a green border. The bottom half is the 'Task Form' view, which provides detailed information for the selected task. In the Task Form, the 'Name' is 'Copyedit', 'Duration' is '15 days', and 'Task type' is 'Fixed Units'. The 'Resource Name' is 'Copyeditors' with 'Assignment Units' at 200% and 'Work' at 240 hours. The 'Peak' value is also listed as 200%. The 'Start' date is 'Thu 5/24/18' and the 'Finish' date is 'Wed 6/13/18'.

*In this customized split view, you can see the selected task's work, duration, assignment units, and Peak values*

### Assignment units, Peak, and the assignment calculation

In early versions of Project, it was possible that a resource's initial assignment units value would change, and this led to unexpected results with regard to the assignment calculation. This behavior changed starting with Project 2010. Project now tracks both the assignment units value and a calculated value called *Peak*.

Project uses the assignment units value when initially scheduling or later rescheduling a task, but it reports a resource's maximum assignment units value as Peak. Peak is the assigned resource's highest calculated assignment units value subsequent to the initial assignment calculation. Here's one example: If you initially assigned a resource at 100% assignment units to a one-day, fixed-unit task, Project used that value to initially calculate 8 hours of work. However, if you then recorded 10 hours of actual work on the task, versions of Project prior to 2010 would have recalculated the assignment units to be 120% to keep the assignment calculation accurate. If you then added more work or changed the duration of the task, Project would have scheduled the task by using the 120% assignment units value—probably not the result you'd want. Project 2010 and later, however, record the 120% peak value, and if you subsequently add work or change the duration of the task, Project uses the original assignment units value of 100% rather than the peak value of 120% to reschedule the task.

Task 8, with the default task type of Fixed Units, has a total work value of 240 hours, a resource assignment units value of 200% (that's the equivalent of two full-time copyeditors), and a duration of 15 days. When we increase the task's duration to 20 days, we can observe the effects on the other values.

After the task's duration is changed to 20 days, Project increases the work to 320 hours. Change highlighting is applied to the Work and Finish date values.

	Task Mode	Task Name	Work	Duration	Peak	Start	Finish	Details	T	W	T	F
6	Normal	Editorial	500 hrs	37.5 days		Thu 5/17/18	Mon 7/9/18	Work	8h	8h	16h	16h
7	Normal	Organize manus.	40 hrs	5 days		Thu 5/17/18	Wed 5/23/18	Work	8h	8h		
		Hany Morcc	40 hrs		100%	Thu 5/17/18	Wed 5/23/18	Work	8h	8h		
8	Normal	Copyedit	320 hrs	20 days		Thu 5/24/18	Ned 6/20/18	Work			16h	16h
		Copyeditors	320 hrs		200%	Thu 5/24/18	Wed 6/20/18	Work			16h	16h

Below the Task Usage table is a Task Form for the task "Copyedit". The "Duration" field is set to "20 days". The "Work" field is set to "320 hrs". The "Peak" field shows "200%". The "Start" field is "Thu 5/24/18" and the "Finish" field is "Wed 6/20/18". The "Task type" is "Fixed Units". The "% Complete" field is "0%".

*With a fixed-units task type, a change to duration causes Project to recalculate work*

As expected, the assignment units values were not changed with this fixed-units task type.

Now let's look at what happens when we start with the original 15-day duration task and 240 hours of work, but this time make it a fixed-duration task and change its work value. After we change the task's work to 320 hours, Project updates Peak units but keeps the duration the same.

	Task Mode	Task Name	Work	Duration	Peak	Start	Finish	Details	T	W	T	F
6	Normal	Editorial	500 hrs	32.5 days		Thu 5/17/18	Mon 7/2/18	Work	8h	8h	21.33h	21.33h
7	Normal	Organize manus.	40 hrs	5 days		Thu 5/17/18	Wed 5/23/18	Work	8h	8h		
		Hany Morcc	40 hrs		100%	Thu 5/17/18	Wed 5/23/18	Work	8h	8h		
8	Normal	Copyedit	320 hrs	15 days		Thu 5/24/18	Ned 6/13/18	Work			21.33h	21.33h
		Copyeditors	320 hrs		267%	Thu 5/24/18	Wed 6/13/18	Work			21.33h	21.33h

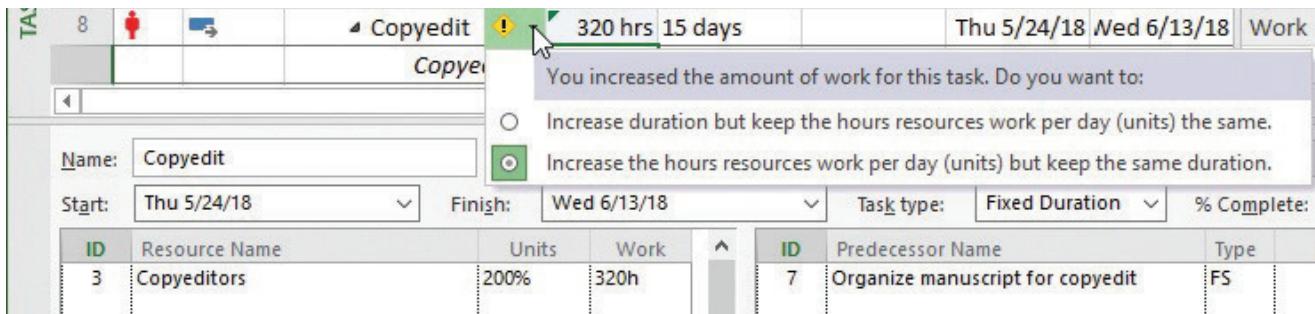
Below the Task Usage table is a Task Form for the task "Copyedit". The "Duration" field is set to "15 days". The "Work" field is set to "320 hrs". The "Peak" field shows "267%". The "Start" field is "Thu 5/24/18" and the "Finish" field is "Wed 6/13/18". The "Task type" is "Fixed Duration". The "% Complete" field is "0%".

*With a fixed-duration task type, a change to work causes Project to recalculate Peak units*

The copyeditors' increased peak units value of 267% appears in the Peak field. This value accounts for the schedule change while Project preserves the original assignment units value of 200%, as shown in the Task Form.

Changing a task's default task type lets you “lock in” how Project will handle one of the three assignment calculation variables as either of the other two variables changes.

However, you always have the final word on how a task responds to changed assignment calculation variables via the Actions button. (If you need a refresher on the Actions button, see [Chapter 6, “Assign resources to tasks.”](#))



*Regardless of the task's type, you can fine-tune how Project responds to a scheduling adjustment by using the Actions button*

As you fine-tune your plans in Project, you might find times when a quick adjustment to Project's response to a schedule change via the Actions button is sufficient. At other times, you might choose to change a task type to more consistently control how Project will handle its scheduling.

### Task types and effort-driven scheduling

Many people misunderstand task types and effort-driven scheduling and conclude that these two issues are more closely related than they really are. Both settings can affect your schedule. Although the effect of a task type applies whenever you edit a task's work, duration, or unit values, effort-driven scheduling affects your schedule only when you're assigning or removing resources from tasks. For more information about effort-driven scheduling, see [Chapter 6, “Assign resources to tasks.”](#)

### To view or change a task's task type

1. Select the name of the task whose task type you want to change. The task must be automatically scheduled; task types do not apply to manually scheduled tasks.
2. On the **Task** tab, in the **Properties** group, click the **Information** button.
3. In the **Task Information** dialog box, click the **Advanced** tab.
4. In the **Task Type** field, do either of the following:
  - Note the current task type.
  - Select the new task type that you want.
5. Click **OK** to close the Task Information dialog box.

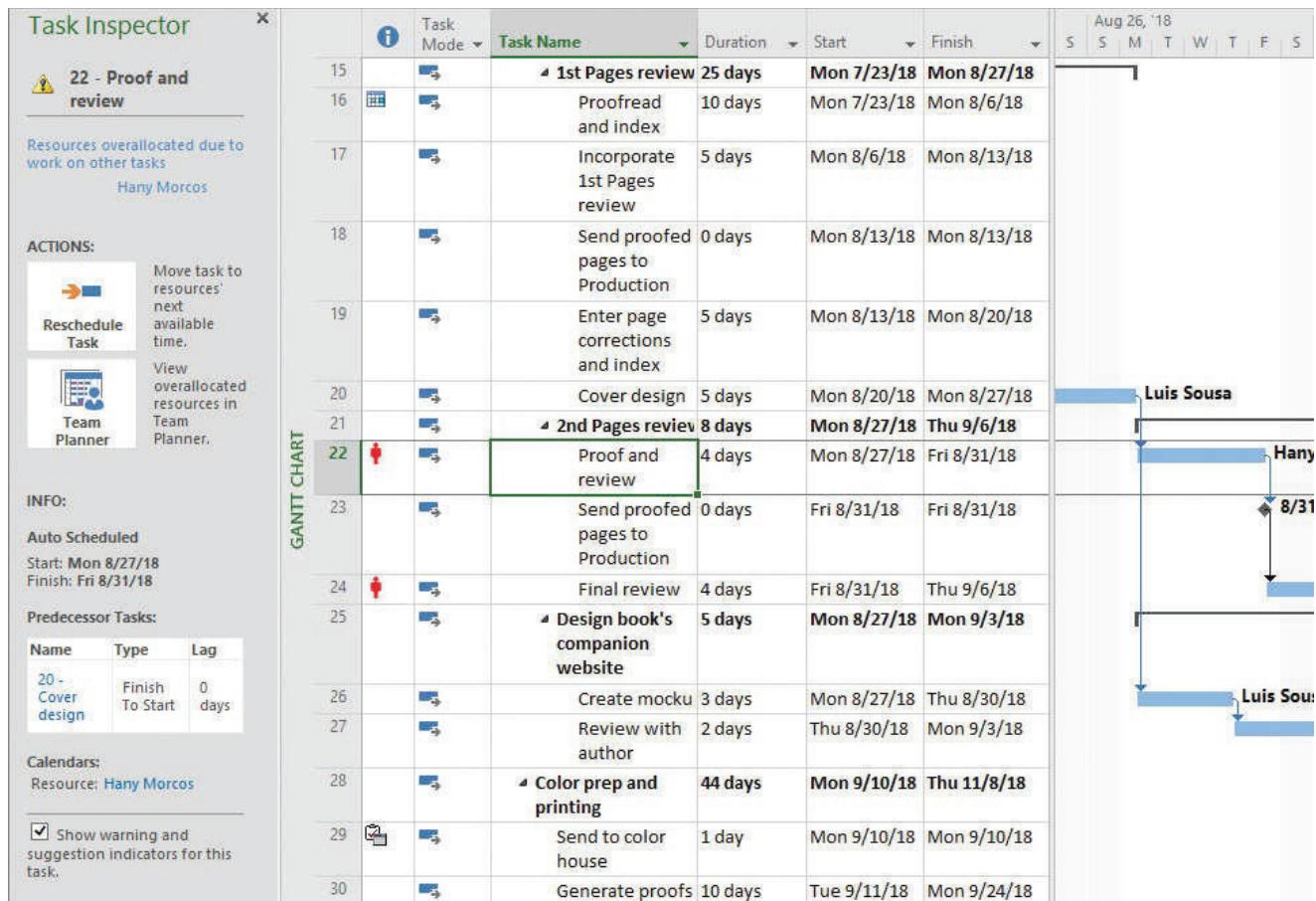


#### Tip

You can also view the task type in the Task Form. When your plan is in a task-focused view, display the Task Form by clicking Details on the View tab, in the Split View group.

## See task schedule details by using the Task Inspector

The Task Inspector is a pane you can display in Project that succinctly reveals the scheduling factors that affect the selected task. These factors include predecessor task relationships, resource calendars, task calendars, or a combination of factors. In some cases, the Task Inspector includes options to resolve schedule issues such as resource overallocation.



The Task Inspector pane displays details about the selected task, in addition to options under Actions to address schedule problems

For example, consider a task, *Proof and review* (task 22), whose predecessor is task 20, *Cover design*. The Task Inspector pane shows that Project has proposed two actions to resolve the resource overallocation: *Move task to resources' next available time*, and *View overallocated resources in Team Planner*.

You can click most items in the Task Inspector that are displayed in blue to get details about those items. For example, you can click the assigned resource's name under Calendars to see that resource's calendar. You do not need to display the Task Inspector to change task details, but it can be a handy tool.

## To display schedule details of a task in the Task Inspector pane

1. Display a task-centric view such as a Gantt chart view.
2. On the **Task** tab, in the **Tasks** group, click the **Inspect** button to open the Task Inspector pane.

3. Click a task. In the Task Inspector pane, you can view the scheduling factors affecting the selected task.

## Skills review

In this chapter, you learned how to:

- [See task relationships by using Task Path](#)
- [Adjust task link relationships](#)
- [Control task scheduling by using constraints](#)
- [Interrupt work on a task](#)
- [Adjust working time for individual tasks](#)
- [Control task scheduling by using task types](#)
- [See task schedule details by using the Task Inspector](#)



### Practice tasks

The practice files for these tasks, ViewTaskPath and ScheduleTasksAdvanced, are located in the Project2016SBS\Ch09 folder.



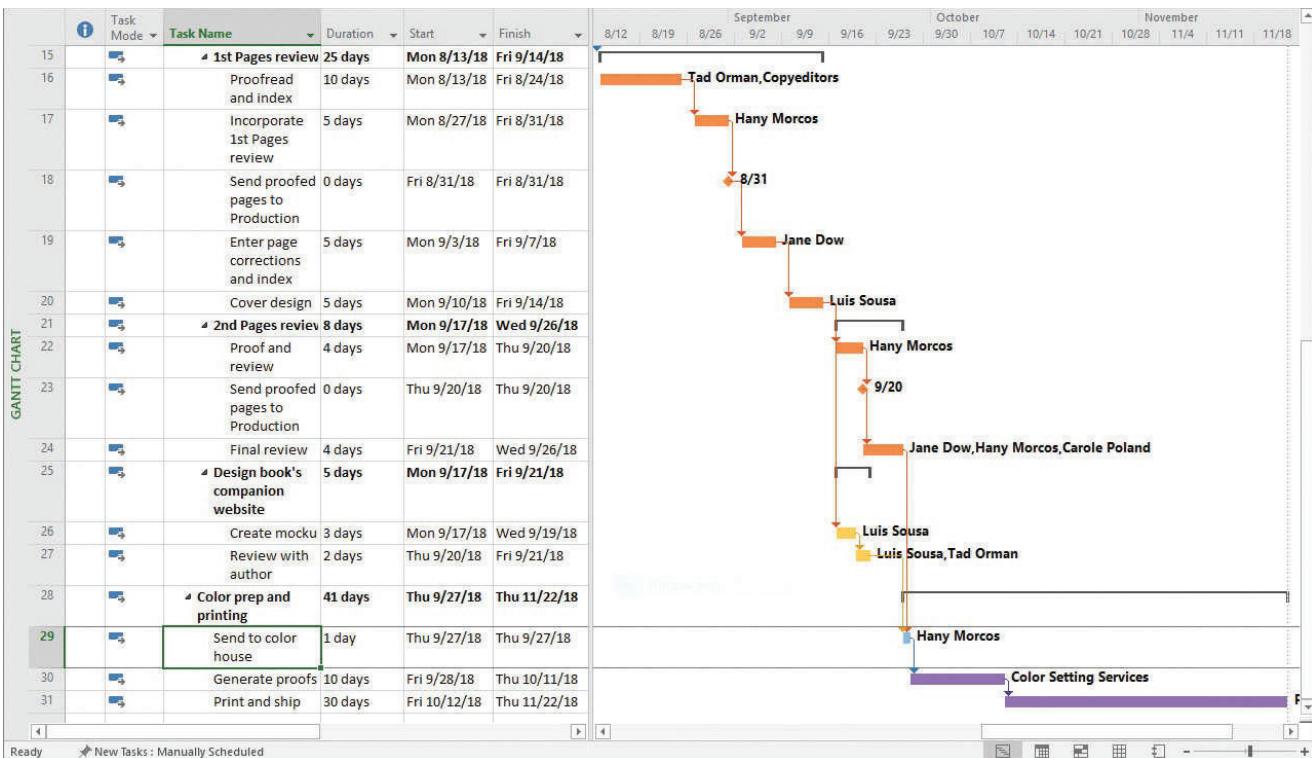
#### Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## See task relationships by using Task Path

The scenario: At Lucerne Publishing, at an upcoming team meeting, you'd like to demonstrate some of the more complex task dependencies in a new children's book plan. Open ViewTaskPath, and perform the following tasks:

1. Apply the **Task Path** command to task 29, *Send to color house*. First highlight the predecessors, then the driving predecessors, then the successors, and finally, the driven successors tasks.



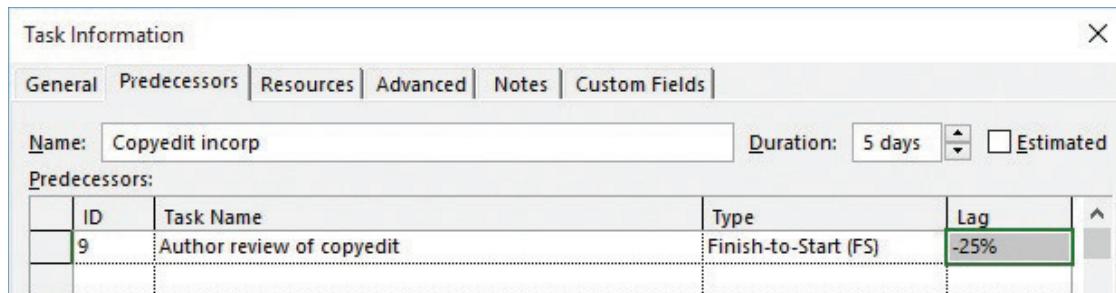
*With Task Path highlighting applied, you can more clearly distinguish task relationships in a Gantt chart view*

2. Remove the Task Path highlighting.
3. Close the **ViewTaskPath** practice file.

## Adjust task link relationships

The scenario: Editorial and design work on a new children's book is about to begin. At this stage, you have an initial plan with task names, durations, relationships, and resource assignments. Now you want to fine-tune those task relationships. Open **ScheduleTasksAdvanced**, and perform the following tasks:

1. Add lag between task 31, *Print and ship*, and its predecessor, task 30, *Generate proofs*, so that task 31 starts three working days after task 30 finishes.
2. Overlap task 10, *Copyedit incorp*, with its predecessor, task 9, *Author review of copyedit*, when task 9 is at the 25 percent remaining point of its duration. Hint: Remember that lag is entered as negative lead time.



*Project treats a negative lag value as lead time*

3. Change the task relationship between task 14, *Interior illustration design*, and its

predecessor, task 13, *Set pages*, to start-to-start (SS).

	Task Mode	Task Name	Duration	Start	Finish	
9		Author review of copyedit	10 days	Mon 6/11/18	Fri 6/22/18	
10		Copyedit incorp	5 days	Wed 6/20/18	Wed 6/27/18	
11		Handoff to Production	0 days	Wed 6/27/18	Wed 6/27/18	
12		Design and Production	48 days	Wed 6/27/18	Mon 9/3/18	
13		Set pages	15 days	Wed 6/27/18	Wed 7/18/18	
14		Interior illustration design	15 days	Wed 6/27/18	Wed 7/18/18	
15		1st Pages review	25 days	Wed 7/18/18	Wed 8/22/18	

This is what finish-to-start with lead time and start-to-start task relationships look like in a Gantt chart view

## Control task scheduling by using constraints

The scenario: A task in the new children's book plan cannot start quite as early as you had expected. Tad Orman, the children's book author, needs to proofread his book—this work is accounted for in task 16, *Proofread and index*. However, Tad has informed you that because of his travel schedule, he will be unable to start his review before July 20—later than currently scheduled. Continuing in the ScheduleTasksAdvanced plan, perform the following tasks:

1. Apply a Start No Earlier Than (SNET) constraint of **7/20/18** to task 16, *Proofread and index*.
2. Point to the icon in the **Indicators** column to see the constraint details in a ScreenTip.

12			Design and Production	49.5 days	Wed 6/27/18	Tue 9/4/18	
13			Set pages	15 days	Wed 6/27/18	Wed 7/18/18	Jane Dow
14			Interior illustration design	15 days	Wed 6/27/18	Wed 7/18/18	Luis Sousa
15			1st Pages review	25 days	Fri 7/20/18	Thu 8/23/18	
16			Proofread	10 days	Fri 7/20/18	Thu 8/2/18	
17			1st Pages review	5 days	Fri 8/3/18	Thu 8/9/18	

After applying the SNET constraint, point to the constraint indicator to see its details

## Interrupt work on a task

The scenario: You've learned that work on a task in the new children's book plan will be interrupted. You'd like to account for this in the plan by recording the interruption, during which no work should be scheduled, but keep the assigned work values on the task unchanged. Continuing in the ScheduleTasksAdvanced plan, perform the following task:

1. Split task 3, *Content edit*, so that its first segment runs through the end of the day on Friday, April 13, and its second segment begins on Thursday, April 19.

The screenshot shows the Microsoft Project Task Usage view. A task named "Content edit" (Task ID 3) has been split into two segments. The first segment, from Monday, April 9, 2018, to Wednesday, April 11, 2018, is highlighted in blue. A dotted line connects this segment to the second segment, which starts on Thursday, April 12, 2018, and ends on Friday, April 13, 2018. The Gantt chart on the right shows the timeline from April 8 to April 15, 2018, with the split task clearly visible.

	Task Mode	Task Name	Duration	Start	Finish	1, '18 M T W T F S	Apr 8, '18 S M T W T F S	Apr 15, '18 S M T W T F S
0	➡	Children's book schedule	152.5 days	Mon 4/9/18	Wed 11/7/18			
1	➡	Acquisition	28 days	Mon 4/9/18	Wed 5/16/18			
2	➡	Manuscript received	0 days	Mon 4/9/18	Mon 4/9/18			
3	➡	Content edit	15 days	Mon 4/9/18	Wed 5/2/18			
4	➡	Author review of content edit	10 days	Thu 5/3/18	Wed 5/16/18			
5	➡	Handoff to Editorial	0 days	Wed 5/16/18	Wed 5/16/18			

*The segments of a split task are connected by a dotted line*

## Adjust working time for individual tasks

The scenario: You need to record that a task in the new children's book project has a more restrictive working time than the rest of the tasks. The plan includes a task for the handoff of final book proofs to a color-setting services firm, which then prepares the book for commercial printing. However, this firm only does this type of work Mondays through Wednesdays. Continuing in the ScheduleTasksAdvanced plan, perform the following tasks:

1. Create a new base calendar named **Mon-Wed Task Calendar**. Set its weekly work settings so that Monday, Tuesday, and Wednesday are normal workdays, but Thursday and Friday (and weekends) are nonworking days.
2. Apply the Mon-Wed Task Calendar base calendar to task 29, *Send to color house*.

The task calendar causes Project to reschedule the task to the next available working day, which is the following Monday. A calendar icon appears in the **Indicators** column, reminding you that this task has a task calendar applied to it.

3. Point to the calendar icon in the **Indicators** column to see the task's calendar details in a ScreenTip.

The screenshot shows the Microsoft Project Task Usage view. Task 29, "Send to color," has a calendar icon in the Indicators column. A ScreenTip is displayed, showing the message: "The calendar 'Mon-Wed Task Calendar' is assigned to the task." The Gantt chart on the right shows the task starting on Monday, September 10, 2018, and ending on Monday, September 10, 2018, with the name "Hany Morcos" written next to it.

	Task Mode	Task Name	Duration	Start	Finish	Sep 9, '18 T F S	S M T W T F S
28	➡	Color prep and printing	44 days	Mon 9/10/18	Thu 11/8/18		
29	➡	Send to color	1 day	Mon 9/10/18	Mon 9/10/18		
30	➡	The calendar 'Mon-Wed Task Calendar' is assigned to the task.	fs 10 days	Tue 9/11/18	Mon 9/24/18		Hany Morcos
31	➡						

*After applying the base calendar to the task, point to the calendar indicator to see its name*

## Control task scheduling by using task types

Scenario: The default task type of Fixed Units works for most of the tasks in the new book plan. However, there is a task for which you'd like to keep the duration fixed. Continuing in the ScheduleTasksAdvanced plan, perform the following tasks:

1. Display the Task Usage view with the Task Form, and then click task 24, *Final*

review, in the Task Usage view.

The screenshot shows two views side-by-side. The left view is the 'Task Usage' view, which lists tasks by ID, name, mode, work, duration, start, finish, and details. Task 24, 'Final review', is selected and highlighted in green. The right view is the 'Task Form' view, which provides detailed scheduling information for the selected task. In the Task Form, Task 24 is set to 'Fixed Duration' with a duration of 4 days. The 'Work' field is currently set to 96 hrs 4 days. Below the form, resource assignments show three resources (Jane Dow, Hany Morcos, Carole Poland) assigned with 100% units each, totaling 300% units. The 'Predecessor Name' for Task 24 is listed as 'Send proofed pages to Production'.

*This split view includes the selected task's essential scheduling values, in addition to its task type*

You can see that task 24 is set to Fixed Units and has a total work value of 96 hours, a resource assignment units total value of 300%, and a duration of 4 days.

2. Change task 24 to **Fixed Duration** and then, in the Task Usage view, increase total work to **120** hours.

The screenshot shows the same two views as before, but now Task 24 has been changed to 'Fixed Duration'. In the Task Form, the 'Work' field is now set to 120 hrs 4 days. The resource assignments remain the same: Jane Dow, Hany Morcos, and Carole Poland, each assigned 40 hours. The 'Predecessor Name' for Task 24 is still listed as 'Send proofed pages to Production'.

*After adding work to the fixed-duration task, note the schedule changes and light-blue change highlighting*

As expected, the duration didn't change, but the total work increased. Consequently, the assigned resources are overallocated; their Peak units (not visible in this view, but see the next set of practice tasks) are now 125 percent each. The resources can handle this level of overallocation for this task.

## See task schedule details by using the Task Inspector

The scenario: You'll use the Task Inspector to investigate some questions that came up at the team meeting about what's driving the scheduling of a couple of tasks. Continuing in the ScheduleTasksAdvanced plan, perform the following tasks:

1. Ensure that task 24, *Final review*, is still selected in the Task Usage view, and then display the Task Inspector to view additional information about this task.

You can see some of the details, including the peak units based on adding additional work on the task in the previous practice task. Notice that Project is giving you additional actions that you can take to resolve the overallocation of those resources who are working beyond their capacity. As the project manager, you are aware of this situation and will work with the affected resources accordingly.

The screenshot shows the Microsoft Project Task Inspector dialog box. The Task Usage view displays a list of tasks with columns for Task Name, Work, Duration, Start, Finish, Details, F, S, and a date header. Task 24, 'Final review', is selected and highlighted with a green border. The Task Form view shows detailed information for task 24, including its name, duration (4 days), start date (Fri 8/31/18), finish date (Thu 9/6/18), task type (Fixed Duration), and % Complete (0%). It also lists its predecessor, 'Send proofed pages to Production'. The Actions pane on the left offers three options: 'Increase Duration', 'Reduce Work', and 'Assign Resource'. The INFO section provides auto-scheduling details and predecessor tasks. A New Tasks button is located at the bottom.

Use the Task Inspector to see details and troubleshoot scheduling issues for the selected task

2. Click task 22, *Proof and review*, and review details about this task.

Project indicates that there is a resource, Hany Morcos, who is overallocated due to work on other tasks. Task 22 ends on the same day Hany starts work on task 24, causing her overallocation; again, she is aware of this overallocation and what needs to be done to manage the work on that day.

**Task Inspector**

**22 - Proof and review**

Resources overallocated due to work on other tasks: Hany Morcos

**ACTIONS:**

- Move task to resources' next available time.
- Reschedule Task
- View overallocated resources in Team Planner.

**INFO:**

Auto Scheduled  
Start: Mon 8/27/18  
Finish: Fri 8/31/18

Predecessor Tasks:

Name	Type	Lag
20 - Cover design	Finish To Start	0 days

Calendars:  
Resource: Hany Morcos

Show warning and suggestion indicators for this task.

**TASK USAGE**

ID	Task Name	Work	Duration	Start	Finish	Details	F	S	Sep 2, '18
20	Jane Dow	40 hrs		Mon 8/13/18	Mon 8/20/18	Work			
	↳ Cover design	40 hrs	5 days	Mon 8/20/18	Mon 8/27/18	Work			
	Luis Sous	40 hrs		Mon 8/20/18	Mon 8/27/18	Work			
21	↳ 2nd Pages revie	152 hrs	8 days	Mon 8/27/18	Thu 9/6/18	Work	19h		
22	↳ Proof and revi	32 hrs	4 days	Mon 8/27/18	Fri 8/31/18	Work	4h		
	Hany Mo	32 hrs		Mon 8/27/18	Fri 8/31/18	Work	4h		
23	↳ Send proofer	0 hrs	0 days	Fri 8/31/18	Fri 8/31/18	Work	0h		
	Hany Mo	0 hrs		Fri 8/31/18	Fri 8/31/18	Work	0h		
24	↳ Final review	120 hrs	4 days	Fri 8/31/18	Thu 9/6/18	Work	15h		
	Jane Dow	40 hrs		Fri 8/31/18	Thu 9/6/18	Work	5h		
	Hany Mo	40 hrs		Fri 8/31/18	Thu 9/6/18	Work	5h		
	Carole Pc	40 hrs		Fri 8/31/18	Thu 9/6/18	Work	5h		

**TASK FORM**

ID	Resource Name	Units	Work	ID	Predecessor Name	Type	Lag
5	Hany Morcos	100%	32h	20	Cover design	FS	0d

In the Actions area, the Task Inspector pane includes remedies to some scheduling problems such as overallocated resources (note that the Team Planner feature shown here is available in Project Professional only, not Project Standard)

3. In the Task Inspector, click the resource name **Hany Morcos** to view her resource calendar.
4. Close the **Change Working Time** dialog box, and then close the Task Inspector.

# 11. Fine-tune resource and assignment details

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## In this chapter

- [Change resource availability over multiple date ranges](#)
  - [Work with multiple resource pay rates](#)
  - [Change resource pay rates over different date ranges](#)
  - [Delay the start of assignments](#)
  - [Apply contours to assignments](#)
  - [Create and assign material resources](#)
  - [View resource capacity](#)
  - [Adjust assignments in the Team Planner view \(Project Professional only\)](#)
- 

## Practice files

For this chapter, use the practice files from the Project2016SBS\Ch11 folder. For practice file download instructions, see the introduction.

Because work resources (people and equipment) are often the most expensive part of a project, understanding how to make the best use of resources' time is an important project management skill. In this chapter, you use a variety of advanced Project 2016 features relating to resources—their availability, assignments to tasks, and resulting costs. Project Professional users also use the Team Planner view to manage assignments (this feature is not available in Project Standard).

This chapter guides you through procedures related to changing resource availability over multiple date ranges, working with multiple resource pay rates, changing resource pay rates over different date ranges, delaying the start of assignments, applying contours to assignments, creating and assigning material resources, viewing resource capacity, and adjusting assignments in the Team Planner view (Project Professional only).

## Change resource availability over multiple date ranges

One of the values that Project stores for each work resource is the resource's maximum units value. This is the maximum capacity of a resource to accomplish tasks. A resource's working-time settings (recorded in the individual resource's calendar) determine when work assigned to a resource can be scheduled. However, the resource's capacity to work (as defined by the resource's maximum units value) determines the extent to which the resource can work within those hours without becoming overallocated. A resource's maximum units value does not prevent a resource from becoming overallocated, but Project will indicate when the resource's assignments exceed the resource's maximum units capacity.



## See Also

For a refresher on resource capacity, see [Chapter 5, “Set up resources.”](#)

You can specify that a resource’s maximum units value be adjusted from one date range to another. Changing a resource’s availability over time enables you to control exactly what a resource’s maximum units value will be at any time. For example, you might have two copyeditors available for the first eight weeks of a project, three for the next six weeks, and then two for the remainder of the project. Or you might have a compositor who is normally available at 100 percent capacity reduced to just 50 percent capacity for six weeks, and then returned to full capacity.

You customize a resource’s availability in the Resource Information dialog box. You do so by specifying maximum units per date range in the Resource Availability table in the dialog box. When *NA* (for *not applicable*) appears at the beginning of the first date range, it means that the resource has no specific start date for their availability. When it is at the end of the final date range, it means that the resource has no specific end date. Every resource’s initial availability is unspecified, or *NA*.

Resource Information

General | Costs | Notes | Custom Fields

Resource name:	Copyeditors	Initials:	C																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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## To customize a resource's availability over time

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**. In the Resource Sheet view, you can see and edit resources' maximum units values. The maximum units values displayed here normally apply to the full duration of the project.
2. In the **Resource Name** column, click the name of a resource whose maximum units value you want to vary at different times.
3. On the **Resource** tab, in the **Properties** group, click **Information** to display the Resource Information dialog box. If the **General** tab is not visible, click it.



### Tip

Here are a couple of shortcuts for quickly displaying the Resource Information dialog box. When you are in a resource-centric view such as the Resource Sheet, right-click the Resource Name and, on the shortcut menu, click Information. Or double-click a resource name. Double-clicking a resource name also works in the Assign Resources dialog box when you are in a task-centric view such as a Gantt chart.

4. Under **Resource Availability**, in the first row of the **Available From** column, leave **NA** (not applicable).
5. In the **Available To** cell in the first row, enter or select the end date of the first date range you want.
6. In the **Units** cell in the first row, enter a maximum units value for the first date range.
7. Enter the values for the second date range. In the **Available From** cell in the second row, enter or select the start date of the second date range.
8. Do either of the following:
  - If you plan to set up a third or additional date range, in the **Available To** cell in the second row, enter or select the end date of the second date range you want. Then repeat steps 7 and 8 for subsequent date ranges.
  - If the second date range is the last one you want to set up, leave the **Available To** cell in the second row blank. (Project will insert *NA* for you.)

You can later add additional date ranges with unique maximum units values. Just leave the final Available To field blank.

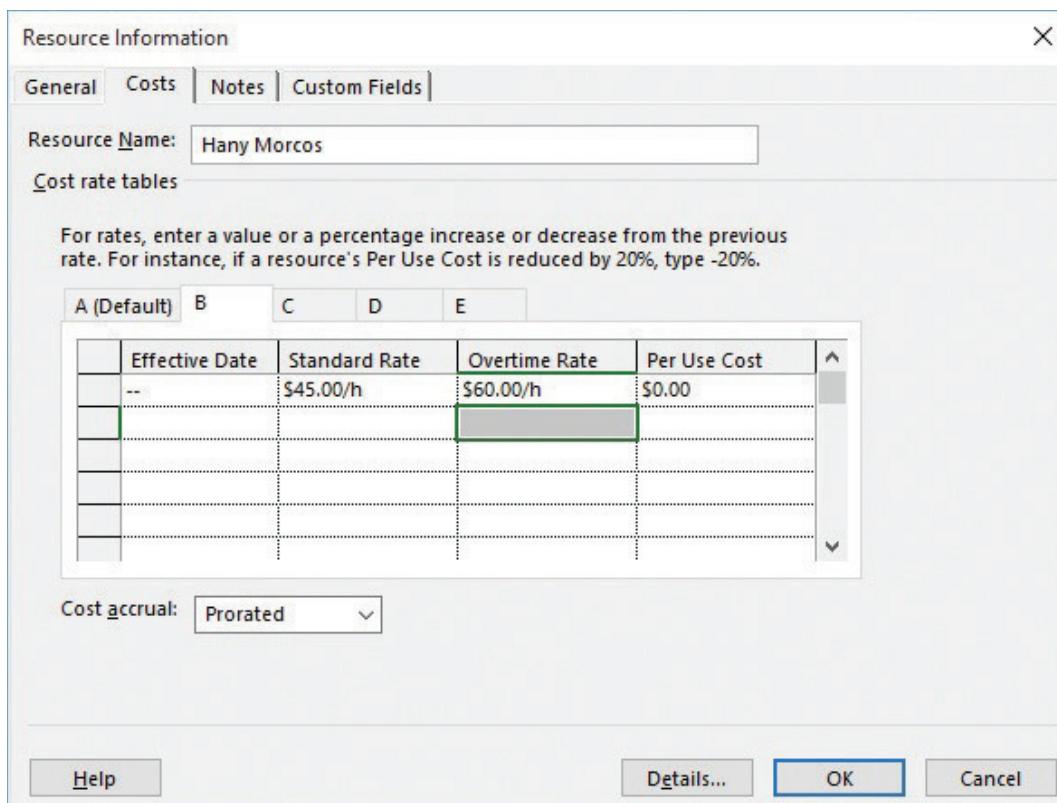
9. Click **OK** to close the Resource Information dialog box.

## Work with multiple resource pay rates

Some resources might perform different tasks with different pay rates. You can set up different pay rates for the same resource, and then specify which rate to use per assignment (you'll do so later in this chapter).

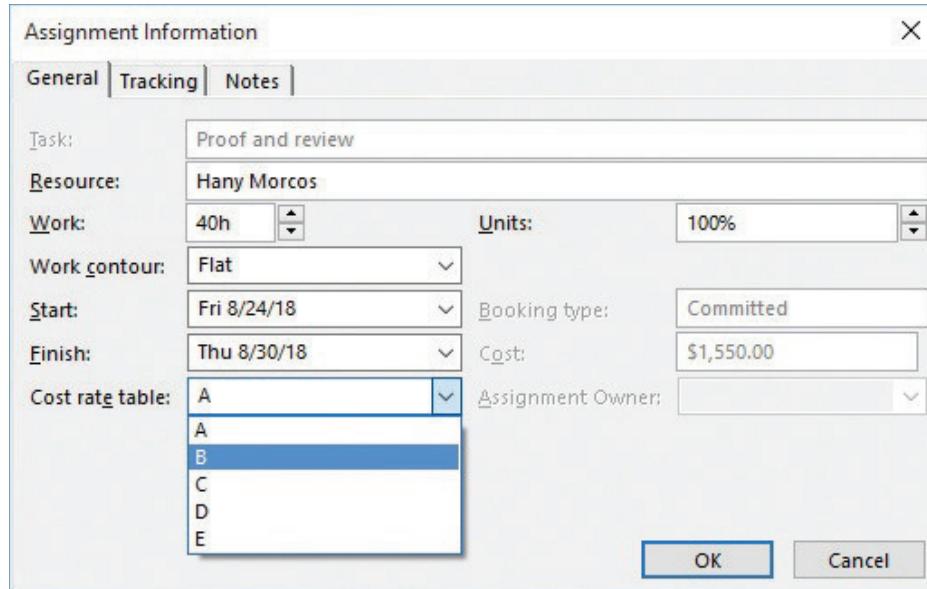
For example, in the new children's book project, the project editor could also serve as a content editor. Because the costs for project editor and content editor are different, you can set up two cost rate tables for the resource (additionally, a cost rate table can include a standard pay rate and an optional overtime rate, and even a per-use cost). Then, after you assign the resource to tasks, you specify which pay rate should apply.

Each work or material resource can have up to five different pay rates, each recorded in a cost rate table. You set up pay rates in the cost rate tables on the Costs tab of the Resource Information dialog box. The default rate table (the rate Project applies unless you specify another one) is on tab A. If you completed the practice tasks in [Chapter 5, “Set up resources,”](#) you might recognize the pay rates you initially entered for resources. You can create up to four additional rate tables on tabs B through E.



*Create up to five different cost rate tables (including standard and overtime rates, and per-use cost) on the Costs tab of the Resource Information dialog box*

When you assign a resource with one or more pay rates to a task, Project initially uses cost rate table A by default. However, you can specify that another rate table should be used. You do so on the General tab of the Assignment Information dialog box.



*After setting up multiple cost rate tables for a resource, you can pick which table to use for individual assignments*

## To create an additional cost rate table for a resource

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. In the Resource Sheet view, click a resource name.
3. On the **Resource** tab, in the **Properties** group, click **Information** to open the Resource Information dialog box.
4. Click the **Costs** tab.
5. In the **Cost rate tables** area, click the **B C, D, or E** tab.
6. In the **Standard Rate** and **Overtime Rate** fields, enter the pay rate values you want. In addition to or instead of pay rates, you can also enter a value in the **Per Use Cost** field.
7. Click **OK** to close the Resource Information dialog box.

## To change the cost rate table to be applied to an assignment

1. Do either of the following:
  - On the **View** tab, in the **Task Views** group, click **Task Usage**.
  - On the **View** tab, in the **Resource Views** group, click **Resource Usage**.
 As with other assignment-level activities, you can perform this procedure in either view.
2. Select the assignment you want to edit.
3. On the **Format** tab, in the **Assignment** group, click **Information** to open the Assignment Information dialog box. Click the **General** tab if it is not already selected.
4. In the **Cost Rate Table** box, select a cost rate table, and then click **OK** to close the

## Assignment Information dialog box.

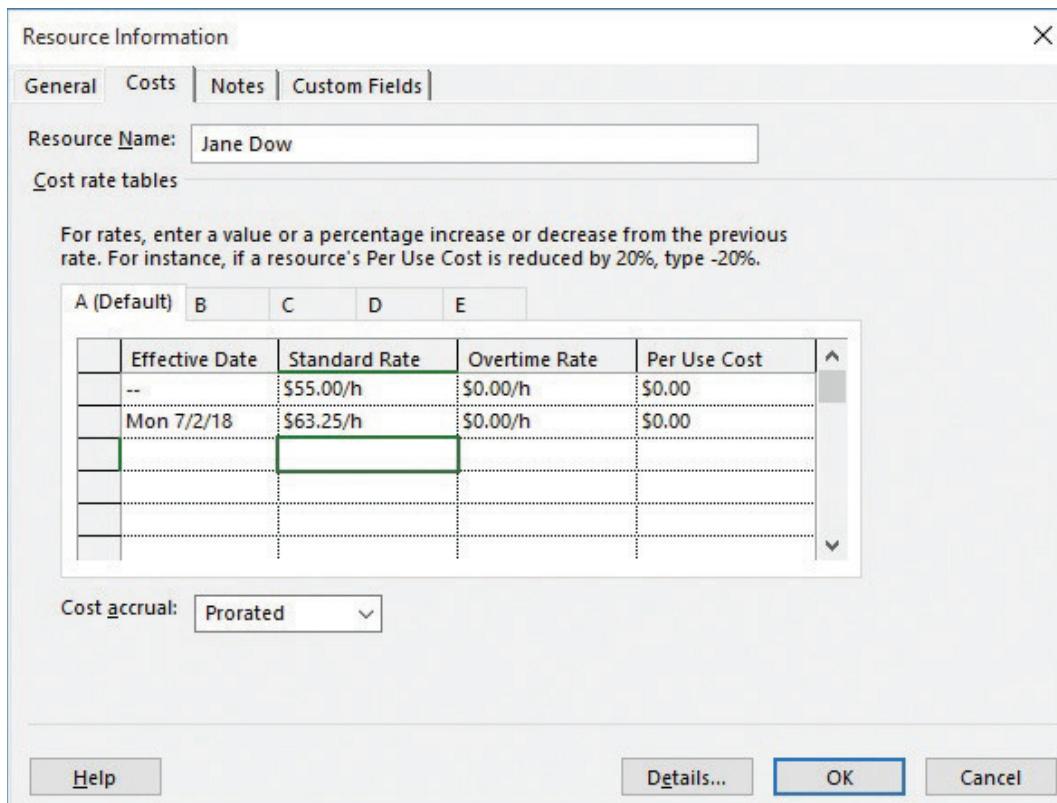


If you frequently change cost rate tables for assignments, you will find it quicker to display the Cost Rate Table field directly in the Resource Usage or Task Usage view. To do so, display the right edge of the table portion of a usage view, click Add New Column, and then select Cost Rate Table.

## Change resource pay rates over different date ranges

When you set up pay rates for a resource, Project uses those rates for the duration of the plan. However, you can change a resource's rates to be effective as of the dates you choose. For example, you could initially set up a resource with a standard rate of \$40 per hour, and plan to raise the resource's standard rate to \$44 per hour six months later.

You set up the effective date of each pay rate on the Costs tab of the Resource Information dialog box, which was introduced in the previous topic.



*The Effective Date determines when a resource's pay rate is applied to work the resource performs*

Project uses pay rates when calculating resource costs based on when the resource's work is scheduled. You can assign up to 25 pay rates to be applied at different times in each of a resource's five cost rate tables.

You can use a couple of different formats to enter the additional pay rates; Project is flexible. You can:

- Enter a pay rate as a specific dollar value.
- Enter a percentage change from the previous rate. Enter a positive percentage value (for example 5%) for an increase. Enter a negative percentage (for example, -3%) for a decrease. Project calculates the new rate, and it replaces the percentage value you entered.

For example, in the Resource Usage view, you might see the cost of a resource's assignment change midway through the assignment when the effective date of a new pay rate applies.

		Resource Name	Work	Details	Jul 1, '18							
					W	T	F	S	S	M	T	W
6		Jane Dow	200 hrs	Work		8h	8h			8h	8h	8h
				Cost	\$440.00	\$440.00			\$506.00	\$506.00	\$506.00	\$506.00
		Set pages	120 hrs	Work		8h	8h			8h	8h	8h
				Cost	\$440.00	\$440.00			\$506.00	\$506.00	\$506.00	\$506.00
		Enter page cc	40 hrs	Work								
				Cost								
		Final review	40 hrs	Work								
				Cost								

*The Effective Date for Jane Dow's new pay rate occurred midway through her assignment to the Set Pages task; the resulting change in cost is shown.*

## To set up a different resource cost rate to apply later

- On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
- In the Resource Sheet view, click a resource name.
- On the **Resource** tab, in the **Properties** group, click **Information** to open the Resource Information dialog box.
- Click the **Costs** tab. If you've set up multiple cost rate tables, click the tab of the cost rate table you want to change. Leave the resource's original pay rate as-is for the first row; you will enter the upcoming effective date and pay rate in the second row.
- In the **Effective date** cell in the second row, enter or select a date, and then enter the new pay rates. The new rates can include standard or overtime rates and per-use cost value. If you want to add multiple future pay rate changes, enter them in chronological order on subsequent rows.
- Click **OK** to close the Resource Information dialog box.

## Delay the start of assignments



Tip

So far in this chapter, we've focused on resource details. For the remainder of the chapter, the focus shifts to fine-tuning assignment details.

If more than one resource is assigned to a task, you might not want all the resources to

start working on the task at the same time. You can delay the start of work for one or more resources assigned to a task.

Let's look at a specific example. The new children's book plan includes a task to which both a copyeditor and the book author, Tad Orman, are assigned. The intent of this task is that the author will review the edits made to his book manuscript, and shortly afterward, the copyeditor will begin to incorporate the author's feedback.

	Task Mode	Task Name	Work	Duration	Start	Finish	Details	W	T	F	S	May 6, '18	S	M	T	W	T	F
0	➡	↳ Children's book scrl, 859 hrs 160 days?	Mon 4/9/18	ri 11/16/18			Work	8h	16h	16h			19h		16h	16h	16h	16h
1	⌚	↳ Editorial staff mee	39 hrs	60.13 days	Mon 4/16/18	Mon 7/9/18	Work						3h					
15	➡	↳ Acquisition	280 hrs	28 days	Mon 4/9/18	Ned 5/16/18	Work	8h	16h	16h			16h		16h	16h	16h	16h
16	➡	Manuscript rece	0 hrs	0 days	Mon 4/9/18	Mon 4/9/18	Work											
17	🔴	↳ Content edit	120 hrs	15 days	Mon 4/9/18	Wed 5/2/18	Work	8h										
	➡	Carole Polari	120 hrs		Mon 4/9/18	Wed 5/2/18	Work	8h										
18	➡	↳ Author review c	160 hrs	10 days	Thu 5/3/18	Ned 5/16/18	Work		16h	16h			16h		16h	16h	16h	16h
		Copieditors	80 hrs		Thu 5/3/18	Wed 5/16/18	Work		8h	8h			8h		8h	8h	8h	8h
		Tad Orman	80 hrs		Thu 5/3/18	Wed 5/16/18	Work		8h	8h			8h		8h	8h	8h	8h
19	➡	↳ Handoff to Edit	0 hrs	0 days	Ned 5/16/18	Ned 5/16/18	Work											

*Here's what the assignments initially look like in the Task Usage view*

Right now, both resources have work that is assigned to them throughout the duration of the task, but you'd like to delay the start of the copyeditor's work by two working days. You do so in the assignment-level Start field.

After changing the start date of the copyeditor's assignment, you can see the later start of the copyeditor's work on the task accounted for in the timephased portion of the view.

*The duration of this task has increased because the work  
is scheduled over a longer period of time*

	Task Mode	Task Name	Work	Duration	Start	Finish	Details	W	T	F	S	May 6, '18	S	M	T	W	T	F
0	➡	↳ Children's book scrl, 859 hrs 160 days?	Mon 4/9/18	ri 11/16/18			Work	8h	8h	8h			19h		16h	16h	16h	16h
1	⌚	↳ Editorial staff mee	39 hrs	60.13 days	Mon 4/16/18	Mon 7/9/18	Work						3h					
15	➡	↳ Acquisition	280 hrs	30 days	Mon 4/9/18	Fri 5/18/18	Work	8h	8h	8h			16h		16h	16h	16h	16h
16	➡	Manuscript rece	0 hrs	0 days	Mon 4/9/18	Mon 4/9/18	Work											
17	🔴	↳ Content edit	120 hrs	15 days	Mon 4/9/18	Wed 5/2/18	Work	8h										
	➡	Carole Polari	120 hrs		Mon 4/9/18	Wed 5/2/18	Work	8h										
18	➡	↳ Author review c	160 hrs	12 days	Thu 5/3/18	Fri 5/18/18	Work		8h	8h			16h		16h	16h	16h	16h
		Copieditors	80 hrs		Mon 5/7/18	Fri 5/18/18	Work		0h	0h			8h		8h	8h	8h	8h
		Tad Orman	80 hrs		Thu 5/3/18	Wed 5/16/18	Work		8h	8h			8h		8h	8h	8h	8h
19	➡	↳ Handoff to Edit	0 hrs	0 days	Fri 5/18/18	Fri 5/18/18	Work											

*Here's what the assignments look like after the copyeditor's start date for the assignment has been adjusted*

The other resource assigned to the task is not affected. Note that the total work of this task did not change, but its duration did—the finish date moved out two working days.

## To delay the start of a resource assignment on a task

1. On the **View** tab, in the **Task Views** group, click **Task Usage**. The Task Usage view groups the assigned resources below each task. It's a useful view for this activity.
2. In the **Start** field of the resource assignment you want to delay, enter or select a new start date.



## Tip

If you want an assignment to start at a specific time in addition to on a specific date, you can specify the time in the Start field. For example, if you want the resource's assignment to start at 1:00 P.M. on May 1, 2018, enter *5/1/18 1:00 PM*. Otherwise, Project uses the default start time. To change the default start time, enter the value you want in the Default Start Time field on the Schedule page of the Project Options dialog box.

## Apply contours to assignments

In the Resource Usage and Task Usage views, you can see exactly how each resource's assigned work is distributed over time. In addition to viewing assignment details, you can change the amount of time a resource works on a task in any given time period. There are various ways to do this:

- Apply a predefined work [contour](#) to an assignment. Predefined contours generally describe how work is distributed over time in terms of graphical patterns. For example, the Bell predefined contour distributes less work to the beginning and end of the assignment and distributes more work toward the middle. If you were to graph the work over time, the graph's shape would resemble a bell.

	Task Mode	Task Name	Work	Duration	Details	Aug 26, '18							Sep 2, '18						
						T	F	S	S	M	T	W	T	F	S	S	M		
40		▲ Create mockup	48 hrs	6 days	Work		9.12h			11.52h	15.37h	7.37h	3.52h	1.12h					
		Hany Morcos	24 hrs		Work		1.12h			3.52h	7.37h	7.37h	3.52h	1.12h					
		Luis Sousa	24 hrs		Work		8h			8h	8h								
41		▲ Review with author	32 hrs	2 days	Work													16h	

This assignment has a bell-shaped contour applied; note the contour indicator in the Indicators column

- Edit the assignment details directly. For example, in the Resource Usage or Task Usage view, you can change the assigned work values directly in the timescaled grid.

	Task Mode	Task Name	Work	Duration	Details	Aug 26, '18							Sep 2, '18						
						T	F	S	S	M	T	W	T	F	S	S	M		
40		▲ Create mockup	42 hrs	6 days	Work		9.12h			5.52h	15.37h	7.37h	3.52h	1.12h					
		Hany Morcos	24 hrs		Work		1.12h			3.52h	7.37h	7.37h	3.52h	1.12h					
		Luis Sousa	18 hrs		Work		8h			2h	8h								
41		▲ Review with author	32 hrs	2 days	Work					2h								16h	

This assignment has been directly edited in the timephased portion of the Task Usage view; note the indicator

- Edit work values at the task level. When you change a work value at the task level, Project adjusts the resulting work value per assignment in accordance with each assigned resource's units value. For example, assume that on a specific day, two resources were assigned four hours each to a task that had a total work value of eight hours. If you then change the total work on the task for that day to 12 hours, Project will increase the work per resource from four to six hours.

		Task Mode	Task Name	Work	Duration	Details	T	F	S	S	M	T	W	T	F
38		➡	Final review	68 hrs	5 days	Work		16h			16h	4h	16h	16h	
		⬇	Carole Poland	17 hrs		Work		4h			4h	1h	4h	4h	
		⬇	Hany Morcos	17 hrs		Work		4h			4h	1h	4h	4h	
		⬇	Jane Dow	34 hrs		Work		8h			8h	2h	8h	8h	
39		➡	Design book's companion website	74 hrs	8 days	Work	3.52h	1.12h			16h	16h			

The total work was edited for the task, and Project updated the assigned resources' individual work values according to their assignment units values; note the indicators

How you contour or edit an assignment depends on what you need to accomplish.

Predefined contours work best for assignments in which you can predict a likely pattern of effort—for example, a task that requires gradual ramp-up time might benefit from a back-loaded contour to reflect the likelihood that the resource will work the most toward the end of the assignment.

Here are a few more things to note about contouring assignments:

- Depending on the task type, applying a contour to an assignment might cause the overall duration of the task to be extended. Applying a contour to a fixed-duration task will not affect its duration. When you apply a contour to a fixed-duration task, Project recalculates the resource's work value so that the resource works less in the same time period. For a fixed-work or fixed-unit task, however, the duration will be affected. If you do not want a contour to extend a task's duration, change the task type (on the Advanced tab of the Task Information dialog box) to Fixed Duration before applying the contour.
- You can split a task in the Gantt Chart view to account for an interruption in the task, as you saw in [Chapter 9](#), “[Fine-tune task scheduling](#).” You can also split a task in the Task Usage view by entering 0 work values in the task’s row in the timephased grid for the date range that you want. To preserve the total work on the task, you should add the same amount of work to the end of the task that you subtracted with the split. For example, assume that a task starts on Monday and has eight hours of total work per day for four days. Its work pattern (in hours per day) is 8, 8, 8, and 8. You interrupt work on the task on Tuesday and then add those eight hours to the end of the task (in this case, on Friday). The new work pattern would be 8, 0, 8, 8, and 8.
- When editing values in the timephased grid, you can work with the cells similar to how you might work in a Microsoft Excel worksheet—you can drag values and use the AutoFill handle to copy values to the right or down.

## To apply a predefined work contour to an assignment

1. Do either of the following:

- On the **View** tab, in the **Task Views** group, click **Task Usage**.
- On the **View** tab, in the **Resource Views** group, click **Resource Usage**.

Both of these views show assignment-level work values per time period, such as daily or weekly. The Task Usage view groups assignments per task, whereas the Resource Usage view groups assignments per resource.

- 
2. Click the assignment to which you want to apply a predefined contour.
- 



### Tip

The next two steps are not required, but they can help you see the result of applying a work contour.

---

3. On the **View** tab, in the **Zoom** group, click the arrow next to the **Timescale** box and click the smallest unit of time (such as Days) that you want displayed in the right side of the usage view.
4. On the **Task** tab, in the **Editing** group, click **Scroll to Task**.
5. On the **Format** tab, in the **Assignment** group, click **Information**. The Assignment Information dialog box opens.
6. Click the **General** tab if it is not already selected.
7. Click the arrow to display the options in the Work Contour box. These are all predefined work contours; some of the names of the contours are graphical representations of a resource's work over time with that contour applied.
8. Select the contour pattern you want, and then click **OK** to close the Assignment Information dialog box. Project applies the contour to the selected assignment. If the timescaled work values are visible, you should see the updated work values per time period. You will also see a contour indicator in the Indicators column.

## To manually edit work per time period for an assignment

1. Do either of the following:
  - On the **View** tab, in the **Task Views** group, click **Task Usage**.
  - On the **View** tab, in the **Resource Views** group, click **Resource Usage**.
2. If the assignment values you want to edit are not visible, select the resource's name in the **Task Name** column.
3. On the **Task** tab, in the **Editing** group, click **Scroll to Task**.
4. On the **View** tab, in the **Zoom** group, click the arrow next to the **Timescale** box and click the smallest unit of time (such as Days) that you want displayed in the right side of the usage view.
5. In the timescaled grid in the right pane of the usage view, edit the assignment values you want. These appear in the details row labeled **Work**.

## Create and assign material resources

Material resources are consumables that you use up as the project proceeds. For example, on a construction project, material resources might include nails, lumber, and concrete. You work with material resources in Project to track a fixed quantity or a rate of consumption of the material resource and its associated costs. Unlike with work resources, maximum units values do not apply to cost and material resources, because neither type performs work.

Although Project is not a complete system for tracking inventory, it can help you stay better informed about how quickly your project is consuming material resources, and at what cost. Let's look at an example.

The Material field applies only  
to material resources

	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Use	Accrue	Base
16	Travel	Cost		T						Prorated	
17	Vikas Jain	Work		V		100%	\$22.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
18	William Flash	Work		W		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
19	Zac Woodall	Work		Z		100%	\$55.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
20	Advance proofs	Material	copies	AP			\$15.00		\$0.00	Prorated	

Note the unique value in the Material field for material resources

This example is of a material resource named *Advance proofs*. This resource has a Material label named *copies*. Copies are the unit of measure of this material resource; other types of material resources would have different labels. A liquid material resource might be labeled (and measured) in gallons or liters, for example. This material resource has a per-unit cost of \$15. In other words, each copy of an advance proof used in the project costs the plan \$15.

Assigning a material resource to a task is similar to assigning work resources, but with some important differences. When you assign a material resource to a task, you specify the unit quantity for the task. Project then calculates the cost of the material resource assignment as the per-unit cost you specified times the number of units on the assignment.

Recall that material resources are used up or “consumed” as a project progresses. Common material resources you might find on a construction project, for example, include lumber and concrete.

When you assign a material resource to a task, its label value appears in the Units column

Assign Resources

Task: Final review

+ Resource list options

Resources from AdvancedAssignments

	Resource Name	R/D	Units	Cost
✓	Advance proofs		20 copies	\$300.00
✓	Carole Poland		50%	\$1,050.00
✓	Hany Morclos		50%	\$775.00
✓	Jane Dow		100%	\$2,530.00
Color Setting Services				
Copyeditors				
Dan Jump				
John Evans				
Jun Cao				
Katie Jordan				

Assign   Remove   Replace...   Graph   Close   Help

Hold down Ctrl and click to select multiple resources

With material resource assignments, “units” refers to the quantity of the material resource assigned; this appears as the material resource label throughout Project

When assigning a material resource, you can handle consumption and cost in one of two ways:

- **Assign a fixed consumption rate** This means that, regardless of the duration of the task to which the material resource is assigned, an absolute quantity of the resource will be used. For example, pouring concrete for a house foundation requires a fixed amount of concrete no matter how long it takes to pour it. Project multiplies the unit cost of this resource by the number of units assigned to determine the total cost.
- **Assign a variable-rate quantity** Project adjusts the quantity and cost of the resource as the task’s duration changes. A variable consumption rate means that the quantity of the material resource consumed depends on the duration of the task. When operating a generator, for example, you will consume more fuel in four hours than in two, and you can determine an hourly rate at which you consume the fuel. You enter a variable consumption rate in units per time period; for example, you enter “2/h” to record the consumption of two gallons of fuel per hour. After you enter a variable consumption rate for a material resource’s assignment, Project calculates the total quantity of the material resource consumed based on the task’s

duration.

The advantage of using a variable rate of consumption is that the rate is tied to the task's duration. If the duration changes, the calculated quantity and cost of the material resource will also change. When you need this level of cost tracking for a material resource, use a variable consumption rate.

## To set up a material resource

1. On the **View** tab, in the **Resource Views** group, click **Resource Sheet**.
2. In the **Resource Sheet**, click the row where you want to insert a new material resource.
3. On the **Resource** tab, in the **Insert** group, click **Add Resources**, and then click **Material Resource**. Project inserts a new row for the material resource.
4. Enter a name for the material resource.
5. In the **Material Label** field, enter the name of the unit of measure of the material resource.
6. In the **Std. Rate** field, enter the per-unit cost of the material resource, and then press **Enter**.

## To assign a material resource to a task

1. In a task-centric view, such as the Gantt Chart, select the name of the task to which you want to assign the material resource.
2. On the **Resource** tab, in the **Assignments** group, click **Assign Resources** to open the Assign Resources dialog box.
3. Do either of the following:
  - To assign a [fixed consumption rate](#), in the **Units** field for the material resource, enter or select the quantity of the material resource you want to assign.
  - To assign a variable consumption rate, in the **Units** field for the material resource, enter the variable consumption rate in units per time period. For example, enter  $2/h$  to set a consumption rate of two units of the material resource per hour.

## View resource capacity

Recall that the amount of time that a resource is able to work on tasks in a project is called the resource's *maximum capacity*; in Project, this is measured in units. By default, such units are presented as a percentage value, with 0% meaning no capacity and 100% meaning the full or maximum capacity of a single resource with the normal working schedule of 40 hours per week. In Project, a resource's maximum capacity to do work is tracked as the resource's maximum units (labeled Max. Units) value.

Even experienced project managers have been known to overestimate resource capacity for the people allocated to work on a particular project. This can lead to unhappy resources and problems during the execution of a project, especially when the project manager has also underestimated the amount of work required to complete the tasks in the

project. There are many legitimate reasons to expect some variability with task work estimates—especially in the initial planning stage of a project. This topic introduces some useful tools in Project that can help you better see and understand resource capacity.

Viewing the working capacity per resource gives you a better understanding of overall capacity for your project. This, in turn, can help inform you and the project's stakeholders about any adjustments you might be able to make to the scope of the project to better match the capacity of the team (or adjustments you can make to the team's capacity to better match project scope). Normally, you can expect one of the following conditions for resource capacity:

- Planned work is less than the working capacity of the team. You might be able to use some portion of your resources' time for other projects or to do more work on this project.
- Planned work exceeds the working capacity of the team. You might need to reduce the scope of work or add more resources.
- Planned work is approximately equal to the working capacity of the team.



### Tip

This approach to understanding project scope and resource capacity is explored further in [Appendix A, “A short course in project management.”](#)

A customized Resource Usage view is a great view in which to see resource capacity.

Resource Usage		Resource Name	Work	Details		Apr 15, '18									
				M	T	W	T	F	S	S	M	T	W	T	F
		Unassigned	0 hrs	Rem. Avail.	8h	8h	8h	8h	8h		8h	8h	8h	8h	8h
1	1	Carole Poland	157 hrs	Rem. Avail.	0h	0h	0h	0h	0h		7h	8h	8h	0h	0h
2	2	Color Setting Ser	80 hrs	% Alloc.	150%	100%	100%	100%	100%		13%	0%	0%	100%	100%
3	3	Copyeditors	360 hrs	Rem. Avail.	16h	16h	16h	16h	16h		16h	16h	16h	16h	16h
4	4	Dan Jump	0 hrs	% Alloc.							16h	16h	16h	16h	16h
5	5	Hany Morcos	353 hrs	Rem. Avail.	0h	8h	8h	8h	8h		7h	8h	8h	8h	8h
6	6	Jane Dow	200 hrs	% Alloc.	100%						13%				
7	7	John Evans	0 hrs	Rem. Avail.	8h	8h	8h	8h	8h		8h	8h	8h	8h	8h
8	8	Jun Cao	13 hrs	% Alloc.							8h	8h	8h	8h	8h

*This customized Resource Usage view shows individual resource capacity and assigned allocation at a glance*

In the Resource Usage view, the left pane organizes tasks under the resources to which the tasks are assigned. The right pane shows assignment and other values organized on the timeline. A handy customization is to show only the Remaining Availability and Percent Allocation details; hide resource assignments, and set the view's zoom level to whatever incremental time period your team normally plans for, such as weekly or monthly.



## Tip

In this topic, we've focused on resource capacity as shown in the Resource Usage view. Other Project features that help you see and manage resource capacity include the Resource Graph view (available from the Other Views menu in the Resource Views group on the View tab) and the two resource-focused reports (available from the Resources menu in the View Reports group on the Report tab).

## To view resource capacity per time period

1. On the **View** tab, in the **Resource Views** group, click **Resource Usage**.
2. On the **Format** tab, in the **Details** group, click **Add Details** to open the Detail Styles dialog box.
3. In the **Available Fields** list, select **Percent Allocation**, and then click **Show**.
4. Select **Remaining Availability**, click **Show**, and then click **OK** to close the dialog box. To further simplify the view, also perform the following steps.
5. On the **Format** tab, in the **Details** group, clear the **Work** check box. Project hides the Work details, leaving the Percent Allocation and Remaining Availability details visible.
6. Click the **Resource Name** column heading.
7. On the **View** tab, in the **Data** group, click **Outline**, and then click **Hide Subtasks**. Project hides assignments, leaving only the resource rows visible.
8. On the **View** tab, in the **Zoom** group, in the **Timescale** box, click the time period you want. Use whatever time period your team normally focuses on; daily or weekly might be a good level of focus for resource availability.

## Adjust assignments in the Team Planner view (Project Professional only)



## Important

The Team Planner view is available only in Project Professional, not in Project Standard. If you have Project Standard, you can skip this topic.

By now you've seen how to work in the Task Usage and Resource Usage views to accomplish detailed tasks like manually contouring resource assignments. Another view that can help give you insights into tasks, resources, and assignments is the Team Planner view.

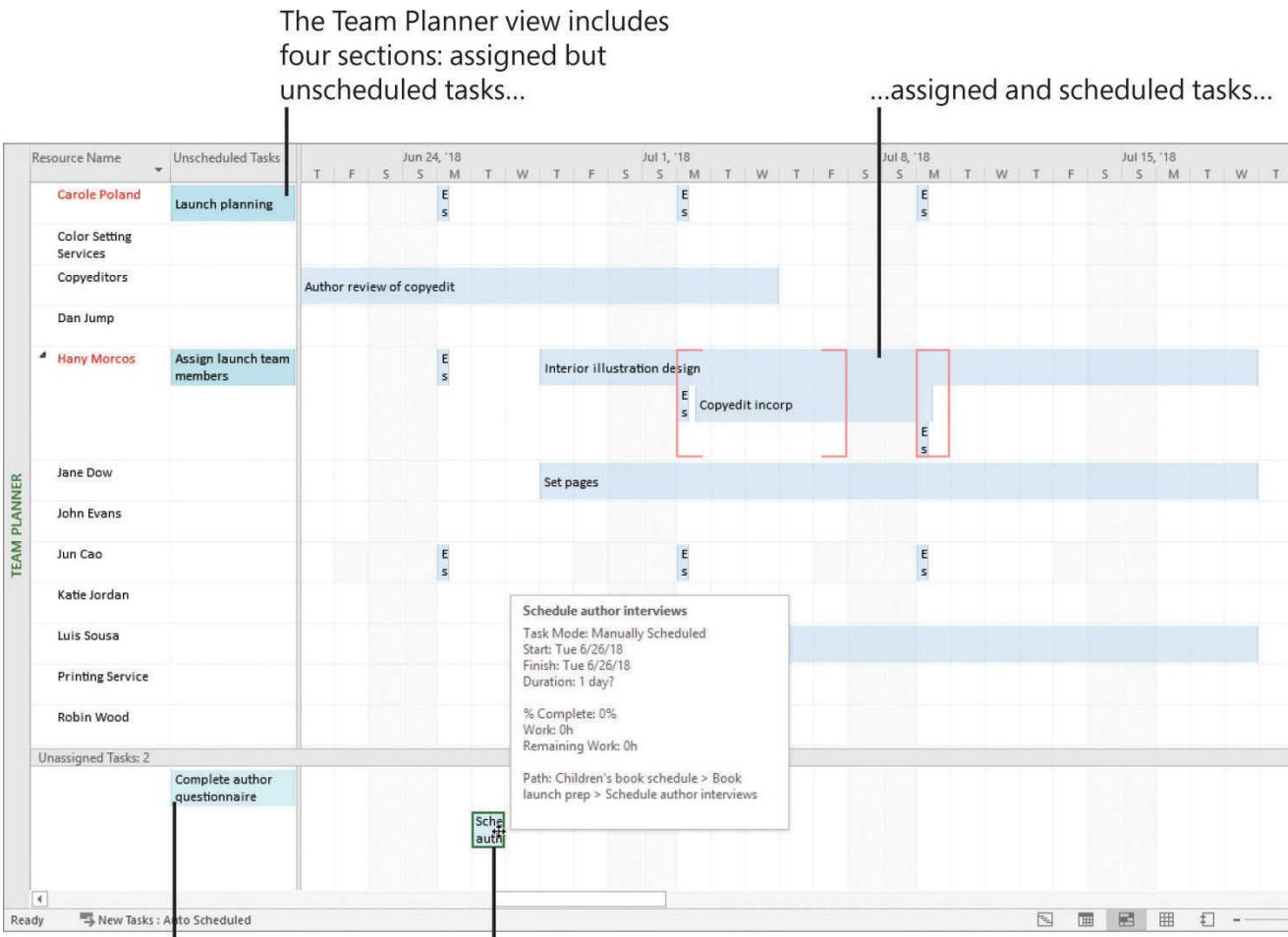
In the Team Planner view, tasks are organized by the resource to which they are assigned (as in the Resource Usage view) and any unassigned tasks are also visible. Both assigned and unassigned tasks might be either:

- **Scheduled tasks** These tasks are scheduled for a specific time period and displayed

in the Team Planner view at a specific point in time.

■ **Unscheduled tasks** These tasks are manually scheduled.

The Team Planner view supports a simple drag-and-drop method of rescheduling or reassigned tasks.



*When working in the Team Planner view, use the ScreenTips to see the full names and other details of visible tasks*

What makes the Team Planner unique is its support for drag-and-drop scheduling and other means of handling assignments:

- Drag tasks to assign, reassign, reschedule, or unschedule them.
- Right-click an assigned task and reassign it to another resource.

The Team Planner view supports many of the view adjustment and navigation techniques you use elsewhere in Project. These include:

- Using the Scroll To Task button (on the Task tab, in the Editing group) to horizontally scroll the timescale portion of the view to display task assignments (bars).
- Displaying ScreenTips to see the full name and other details for tasks that might not be fully visible in a Team Planner task bar.
- Making timescale adjustments by using the Timescale box (on the View tab, in the Zoom group).
- Displaying overallocated resource names in red.



## Important

Dragging an automatically scheduled task horizontally will apply a Start No Earlier Than (SNET) constraint. The Team Planner describes the constraint in the task bar's ScreenTip, and you will see the constraint's indicator in Gantt chart views.

## To assign and schedule unassigned tasks

1. On the **View** tab, in the **Resource Views** group, click **Team Planner** to display the Team Planner view.



## Tip

You can also click the Team Planner view shortcut on the status bar, in the lower-right corner of the Project window.

2. Drag a task and drop it into a resource's row, at the start date you want. The task you drag can be from the unassigned and unscheduled tasks corner in the lower-left corner, or from the unassigned but scheduled corner in the lower-right. The task is assigned and scheduled but remains a manually scheduled task until you switch it to be automatically scheduled.



## Tip

You can also assign but not schedule a task by dragging it to a resource's Unscheduled Tasks column.

## To schedule assigned but unscheduled tasks

1. In the Team Planner view, drag a task from the Unscheduled Tasks column of the view and drop it into a resource's row, at the start date you want. The task is assigned and scheduled but remains a manually scheduled task until you switch it to be automatically scheduled.

## To reassign a task from one resource to another

1. In the Team Planner view, right-click the assigned task and, on the shortcut menu that appears, click **Reassign To**. Then select the resource to whom you want to assign the task.



## Tip

You can also reassign tasks by dragging them from one resource to another. To better control the scheduling of tasks when you reassign them this way, set the timescale to daily (to do this, click Days in the Timescale box in the Zoom group on the View tab).

## Skills review

In this chapter, you learned how to:

- [Change resource availability over multiple date ranges](#)
- [Work with multiple resource pay rates](#)
- [Change resource pay rates over different date ranges](#)
- [Delay the start of assignments](#)
- [Apply contours to assignments](#)
- [Create and assign material resources](#)
- [View resource capacity](#)
- [Adjust assignments in the Team Planner view \(Project Professional only\)](#)



## Practice tasks

The practice files for these tasks, FineTuneResources and FineTuneAssignments, are located in the Project2016SBS\Ch11 folder.



## Important

If you are running Project Professional with Project Web App/Project Server, take care not to save any of the practice files you work with in this book to Project Web App (PWA). For more information, see [Appendix C, “Collaborate: Project, SharePoint, and PWA.”](#)

## Change resource availability over multiple date ranges

The scenario: At Lucerne Publishing, you secured additional copyediting capacity for a portion of the duration of the new children’s book plan. You need to record this in the plan. Open the FineTuneResources plan in Project, and then perform the following task:

1. Customize the copyeditors’ resource availability. Set the time periods as follows:
  - The first time period should end on **5/3/18** at **200%** maximum units.

- The second period should start on **5/4/18** and end on **6/3/18** at **300%** maximum units.
  - The third period should start on **6/4/18** at **200%** maximum units; keep *NA* for the end of the period.

**Resource Information**

General | Costs | Notes | Custom Fields |

Resource name:	Copyeditors	Initials:	C
Email:		Group:	
Logon Account...		Code:	
Booking type:	Committed	Type:	Work
Default Assignment Owner:		Material label:	
		<input type="checkbox"/> Generic	<input type="checkbox"/> Budget
		<input type="checkbox"/> Inactive	

**Resource Availability**

	Available From	Available To	Units
	NA	5/3/2018	200%
	5/4/2018	6/3/2018	300%
	6/4/2018	NA	200%

**Change Working Time ...**

Help Details... OK Cancel

*The copyeditors' availability should look like this; note where the NA values appear*

## Work with multiple resource pay rates

The scenario: Hany Morcos is currently assigned to task 36, *Proof and review*, as a content editor rather than in her default role of project editor. You will set up and apply a different pay rate to account for her content editor role on this task. Continuing in the FineTuneResources plan, perform the following tasks:

1. Create an additional cost rate for Hany Morcos by using cost rate table B. Set her additional standard pay rate to \$45 per hour and her overtime rate to \$60 per hour.

Enter Hany Morcos's second cost rate in the table on tab B

2. Display the **Cost** table in the Task Usage view. You can more easily see the change in the assignment cost in this table.
  3. Apply the cost rate table B to Hany Morcos's assignment to task 36, *Proof and review*.

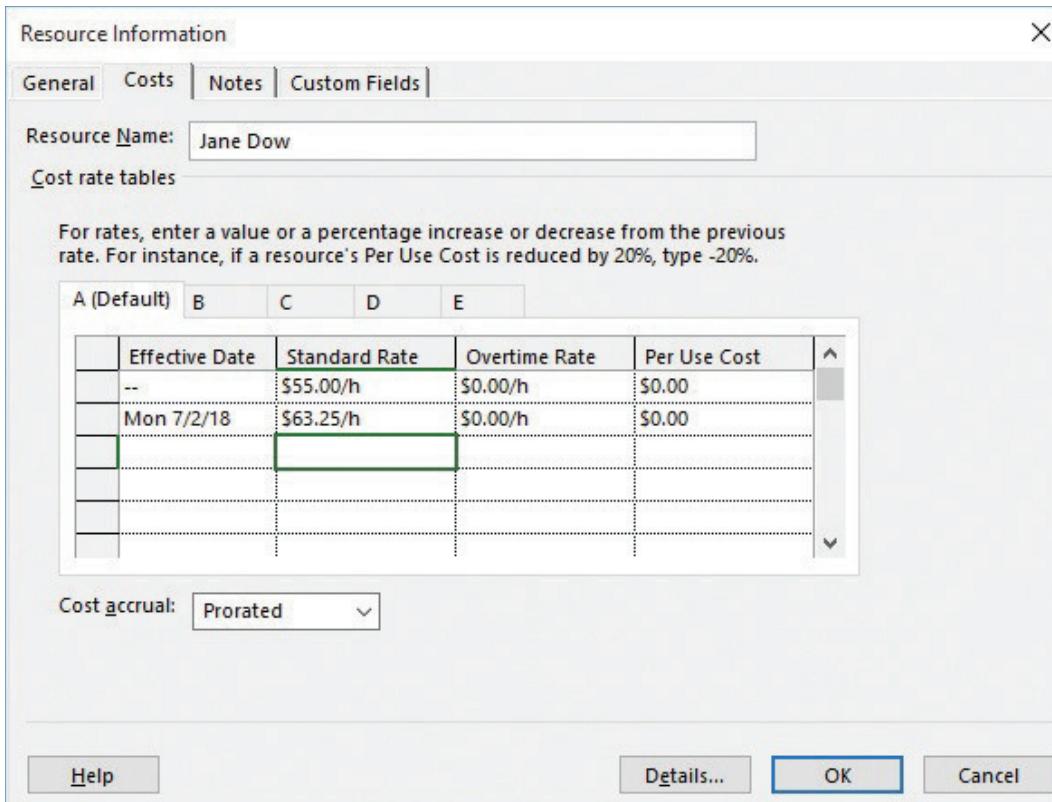
	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Details	F	S	Aug 26, '18
										S
										M
35	▲ 2nd Pages review	\$0.00	Prorated	\$7,650.00	\$0.00	\$7,650.00	Work	8h		
36	▲ Proof and rev	\$0.00	Prorated	\$1,800.00	\$0.00	\$1,800.00	Work	8h		
	Hany Mo			\$1,800.00	\$0.00	\$1,800.00	Work	8h		
37	▲ Send proofed	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	Work			
	Hany Mo			\$0.00	\$0.00	\$0.00	Work			

*After you apply rate table B, Hany Morcos's updated assignment cost should change from \$1,550 to \$1,800*

## Change resource pay rates over different date ranges

The scenario: You anticipate one of your resources who is working on the new children's book plan to receive a pay raise during the book plan's duration. To keep the plan's cost calculations accurate, you need to account for this pay raise. Continuing in the FineTuneResources plan, perform the following task:

1. Enter a pay rate increase for Jane Dow in the default cost rate table A. The effective date is **7/2/18** and the standard rate increase is **15%**.



The additional cost rate values apply only after the Effective Date arrives

## Delay the start of assignments

The scenario: The new children's book plan includes a task to which both a copyeditor and the book author, Tad Orman, are assigned. Right now, both resources are assigned work throughout the duration of the task, but you'd like to delay the start of the copyeditor's work by two working days. Open the FineTuneAssignments plan in Project, and then perform the following task:

1. In the Task Usage view, delay the start of the copyeditors' assignment on task 18, *Author review of content edit*, to **5/7/18**.

	Task Mode	Task Name	Work	Duration	Start	Finish	Details	W	T	F	S	May 6, '18	S	M	T	W
0	✉	Children's book sct	1,859 hrs	160 days?	Mon 4/9/18	ri 11/16/18	Work	8h	8h	8h			19h		16h	16h
1	⌚	Editorial staff mee	39 hrs	60.13 days	Mon 4/16/18	Mon 7/9/18	Work							3h		
15	✉	Acquisition	280 hrs	30 days	Mon 4/9/18	Fri 5/18/18	Work	8h	8h	8h				16h	16h	16h
16	✉	Manuscript rece	0 hrs	0 days	Mon 4/9/18	Mon 4/9/18	Work									
17	✖	Content edit	120 hrs	15 days	Mon 4/9/18	Wed 5/2/18	Work	8h								
		Carole Polan	120 hrs		Mon 4/9/18	Wed 5/2/18	Work	8h								
18	✉	Author review c	160 hrs	12 days	Thu 5/3/18	Fri 5/18/18	Work		8h	8h			16h	16h	16h	
		Copieditors	80 hrs		Mon 5/7/18	Fri 5/18/18	Work		0h	0h			8h	8h	8h	
		Tad Orman	80 hrs		Thu 5/3/18	Wed 5/16/18	Work		8h	8h			8h	8h	8h	
19	✉	Handoff to Editi	0 hrs	0 days	Fri 5/18/18	Fri 5/18/18	Work									

The copyeditors' assignment to task 18 should look like this after editing

## Apply contours to assignments

The scenario: One of the resources working on the new children's book tells you that she knows from past experience that the daily work pattern she expects on one of her tasks doesn't match the task as it is currently scheduled. You want to update the plan to more accurately model the expected work contour on this assignment. You also have another assignment that requires an adjustment. Continuing in the FineTune-Assignments plan, perform the following tasks:

1. In the Task Usage view, apply a back-loaded work contour to Carole Poland's assignment to task 38, *Final review*.

	Task Mode	Task Name	Work	Duration	Start	Finish	Details	Sep 2, '18							
								F	S	S	M	T	W	T	F
35	➡	2nd Pages revie	112 hrs	10 days	Fri 8/24/18	Thu 9/6/18	Work	12.5h			13.5h	14.5h	15.5h	16h	
36	🔴	Proof and rev	40 hrs	5 days	Fri 8/24/18	Thu 8/30/18	Work								
		Hany Ma	40 hrs		Fri 8/24/18	Thu 8/30/18	Work								
37	➡	Send proofed	0 hrs	0 days	Thu 8/30/18	Thu 8/30/18	Work								
		Hany Ma	0 hrs		Thu 8/30/18	Thu 8/30/18	Work								
38	➡	Final review	72 hrs	5 days	Fri 8/31/18	Thu 9/6/18	Work	12.5h			13.5h	14.5h	15.5h	16h	
	📊	Carole Po	12 hrs		Fri 8/31/18	Thu 9/6/18	Work	0.5h			1.5h	2.5h	3.5h	4h	
		Hany Ma	20 hrs		Fri 8/31/18	Thu 9/6/18	Work	4h			4h	4h	4h	4h	
		Jane Dow	40 hrs		Fri 8/31/18	Thu 9/6/18	Work	8h			8h	8h	8h	8h	
39	➡	Design book's c	80 hrs	5 days	Fri 8/24/18	Thu 8/30/18	Work								

After applying the back-loaded contour to this assignment, note the contour indicator in the Indicators column—point to it to see details about the contour in a ScreenTip

Because task 38 is a fixed-duration task, Project recalculated the assignment-level work but did not change the task's duration.

2. Manually edit Hany Morcos's assignment to task 38, *Final review*. Change her assignment on Wednesday and Thursday, September 5 and 6, 2018, from 4 hours to 8 hours each.

	Task Mode	Task Name	Work	Duration	Start	Finish	Details	Sep 2, '18							
								F	S	S	M	T	W	T	F
35	➡	2nd Pages revie	120 hrs	10 days	Fri 8/24/18	Thu 9/6/18	Work	12.5h			13.5h	14.5h	19.5h	20h	
36	🔴	Proof and rev	40 hrs	5 days	Fri 8/24/18	Thu 8/30/18	Work								
		Hany Ma	40 hrs		Fri 8/24/18	Thu 8/30/18	Work								
37	➡	Send proofed	0 hrs	0 days	Thu 8/30/18	Thu 8/30/18	Work								
		Hany Ma	0 hrs		Thu 8/30/18	Thu 8/30/18	Work								
38	➡	Final review	80 hrs	5 days	Fri 8/31/18	Thu 9/6/18	Work	12.5h			13.5h	14.5h	19.5h	20h	
	📊	Carole Po	12 hrs		Fri 8/31/18	Thu 9/6/18	Work	0.5h			1.5h	2.5h	3.5h	4h	
	📊	Hany Ma	28 hrs		Fri 8/31/18	Thu 9/6/18	Work	4h			4h	4h	8h	8h	
		Jane Dow	40 hrs		Fri 8/31/18	Thu 9/6/18	Work	8h			8h	8h	8h	8h	
39	➡	Design book's c	80 hrs	5 days	Fri 8/24/18	Thu 8/30/18	Work								

Hany Morcos's edited assignment should look like this

## Create and assign material resources

The scenario: The advance proofs of the new children's book are the consumable resource that interests you most. These are high-fidelity mockups of the new book that are created before the book is commercially printed. Because the advance proofs are expensive to produce, you'd like to account for their costs in the plan. To do so, you need to create and assign a material resource. Continuing in the FineTuneAssignments plan, perform the following tasks:

1. Create a material resource named **Advance proofs** with the material label of **copies**, the initials **AP**, and a standard rate of **\$15** at the bottom of the resource list. This is the per-unit cost of this material resource; put another way, each copy of an advance

proof costs \$15.

	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt.	Cost/Unit	Accrue	Base
16	Travel	Cost		T						Prorated	
17	Vikas Jain	Work		V		100%	\$22.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
18	William Flash	Work		W		100%	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
19	Zac Woodall	Work		Z		100%	\$55.00/hr	\$0.00/hr	\$0.00	Prorated	Standard
20	Advance proofs	Material	copies	AP				\$15.00		\$0.00	Prorated

The material resource you set up should look like this

2. In the Gantt Chart view, open the **Assign Resources** dialog box.
3. Assign the material resource *Advance proofs* to task 38, *Final review*. Specify **20** units.

The screenshot shows the Microsoft Project interface. On the left, the Gantt Chart view displays a timeline from Sep 9, '18 to Sep 23, '18. Task 38, 'Final review', is selected and expanded, showing its sub-tasks: 'Design book's companion website' (5 days), 'Create mockup' (3 days), 'Review with author' (2 days), 'Color prep and printing' (50 days), 'Send to color house' (1 day), 'Generate proofs' (10 days), 'Print and ship' (30 days), and 'Book launch prep' (1 day?). Task 38 has a duration of 5 days, starting on Fri 8/31/18 and ending on Thu 9/6/18. Task 38 is assigned to three resources: Jane Dow, Hany Morcos [50%], and Carole Poland [50%]. A material resource, 'Advance proofs [20 copies]', is also assigned. On the right, the 'Assign Resources' dialog box is open for Task 38. It lists the assigned resources: Advance proofs (20 copies), Carole Poland (50%), Hany Morcos (50%), and Jane Dow (100%). Other resources listed include Color Setting Services, Copyeditors, Dan Jump, John Evans, Jun Cao, and Katie Jordan. Buttons for Assign, Remove, Replace, Graph, Close, and Help are visible.

When assigning a material resource, note the Units and Cost values in the Assign Resources dialog box

## View resource capacity

The scenario: At this point in the planning for the new children's book project, you've set up an initial task list and initial resource details. Now you'll examine resource capacity in detail. Continuing in the FineTuneAssignments plan, perform the following tasks:

1. In the Resource Usage view, show only the Percent Allocation and Remaining Availability details.
2. Hide the assignments under the resource names.
3. Zoom the timescale to days.

Resource Usage	Resource Name	Work	Add New Column ▾	Details	Apr 8, '18							Apr 15, '18						
					F	S	S	M	T	W	T	F	S	S	M	T	W	
					Rem. A	8h			8h	8h	8h	8h	8h		8h	8h	8h	
1	Carole Poland	149 hrs		% Allo	Rem. A	8h			0h	0h	0h	0h	0h		7h	8h	8h	
2	Color Setting Ser	80 hrs		% Allo	Rem. A			150%	100%	100%	100%	100%			13%	0%	0%	
3	Copyeditors	360 hrs		% Allo	Rem. A	16h			16h	16h	16h	16h	16h		16h	16h	16h	
4	Dan Jump	0 hrs		% Allo	Rem. A	16h			16h	16h	16h	16h	16h		16h	16h	16h	
5	Hany Morcos	361 hrs		% Allo	Rem. A	4h			4h	4h	4h	4h	4h		4h	4h	4h	
6	Jane Dow	200 hrs		% Allo	Rem. A	8h			0h	8h	8h	8h	8h		7h	8h	8h	
7	John Evans	0 hrs		% Allo	Rem. A			100%	8h	8h	8h	8h	8h		8h	8h	8h	

This customized Resource Usage view gives you at-a-glance insight into the workload and availability of each resource

## Adjust assignments in the Team Planner view (Project Professional only)

The scenario: You have found the Team Planner view to be especially helpful when reviewing assignments with resources working on the new children's book plan. You've identified some assignment issues you need to address, and you will do so in the Team Planner view. Continuing in the FineTuneAssignments plan, perform the following tasks:

1. Display the Team Planner view.
2. Drag Carole Poland's unscheduled task, *Launch planning*, in Carole's row so that the task start date is Monday, August 13, 2018.
3. Drag the name of Hany Morcos's unscheduled task, *Assign launch team members*, to Carole Poland's row so that the task start date is Tuesday, August 14, 2018.
4. Drag the first unassigned task, *Complete author questionnaire*, to Hany Morcos's row so that the task start date is Monday, August 20, 2018.

**TEAM PLANNER**

Resource Name	Unscheduled Tasks	Aug 12, '18					Aug 19, '18					Aug 26, '18					Sep 2, '18									
		S	S	M	T	W	F	S	S	M	T	W	F	S	S	M	T	W	F	S	S	M	T	W	F	
Carole Poland				Laun	Assi																				Final review	
Color Setting Services				plan	laun																					
Copyeditors																										
Dan Jump																										
Hany Morcos										Com	auth					Proof and review									Final review	
Jane Dow																	Create mockup									Final review
John Evans																										
Jun Cao																										
Katie Jordan																										
Luis Sousa										Cover design						Create mockup			Review with							
Printing Service																										
Unassigned Tasks: 1																										
	Schedule author interviews																									

After assignment changes have been made, the Team Planner view should look like this

## **Aplicații**

1. Studiați activitățile proiectului *CMSProjectPlan.mpp*, care are scopul de a dezvolta un Sistem de Gestire a Conținutului (“Content Management System”, CMS). Modificați tipul activităților de învățare pentru a avea durată fixă.

2. Scurtați timpul de execuție al proiectului utilizând următoarele informații:

- în echipa de implementare se adaugă o nouă persoană, Mary;
- activitățile din primele faze ale proiectului, definirea cerințelor, a planului managerial și învățarea tehnologiilor nu pot fi scurtează;
- și Mary trebuie să învețe tehnologiile alături de ceilalți membri ai echipei (activitățile vor dura însă la fel de mult);
- Robert și Mary sunt dispuși să lucreze suplimentar 4 ore pe săptămână;
- dacă este necesar, schimbați ordinea unor activități, adăugați constrângeri și dependențe, păstrând logica dezvoltării proiectului;
- adăugați resurse la toate activitățile (pentru fiecare activitate minim o persoană);
- adăugați resurse pentru faza de testare: 2 persoane din echipa de implementare, în afară de Mary și Robert, plus o nouă persoană, George, care lucrează part-time (50%).

3. În urma modificărilor, cu câte zile se scurtează timpul de execuție al proiectului? Care sunt compromisurile făcute?