Chapter 3

Start a Project

Creating New Projects

One of the very first things you need to do to create a project is to choose an approach.

There are several methods to select from when creating a new schedule sing Microsoft Project 2013. You may start a project schedule with a blank template or use an existing template. If you have a task list started in Excel, Outlook, Word and SharePoint, these task lists may be added to a new project schedule. Below are listed some of the suggested methods for initiating a new project schedule.

- Blank – clean schedule
- New From Existing – copy from existing schedule
- New From Excel – importing information from Excel
- New From SharePoint Tasks List – shortcut to bring SharePoint tasks into your schedule
- Get Started Wizard – guided approach with visuals to help individuals feel more comfortable working in a schedule
- Template – public or private pre-built schedules that can be used as examples

If you do not have Internet access, you may not have all of these choices. Many templates are available from the Microsoft site and are not included with the software when installed.

Office 365 or cloud users may have different choices depending on their organization's configuration.

How to Start a New Project Schedule

1. Click the File tab
2. Click **New**
3. Click the desired item from the previews
4. If needed, click **Create** to obtain a copy of that item to start your schedule

Templates available are simply examples and may not map to your organization's project management practices. Be sure to review the templates for modifications that you might need to make.

Saving a project

Saving a project is all about storing a project for quick and easy retrieval. You may choose to store your project on your computer, on a network location, or on a cloud storage solution. As each organization's configuration is different, we will focus on the procedures for saving to your local computer.

How to Save a New Project

1. Click the **File** tab
2. Click **Save** or **Save As**
3. Click **Computer**
4. Click **Browse**
5. Navigate to the desired folder
6. Enter the desired name for the schedule
7. Click **Save**

The folder you just used with be available under Recent Folders to simplify this process for future new projects.

When making changes to the same project, you can use the Save icon on the Quick Access Toolbar as a fast method to ensure your project changes are being captures.

Save or Save As, Share and Export

Save As

Table 3.1 Share Options from the File Tab

Share Option	Feature
Sync with Sharepoint Site	Save file to an existing Sharepoint site

Table 3.1 Share Options from the File Tab

Share Option	Feature
Email	Will send the currently opened MS Project file as an attachment in an email

Table 3.2 Export Options from the File Tab

Export	Feature
Create PDF/XPS Document	Using the current view a PDF of the view will be created and saved to disk
Save Project as File	This feature will allow for: • Saving into earlier version formats of MS Project files • Saving templates • Saving data to Excel, XML or another type format. This option will also start the MS Project Export Wizard where data for exporting maybe selected.

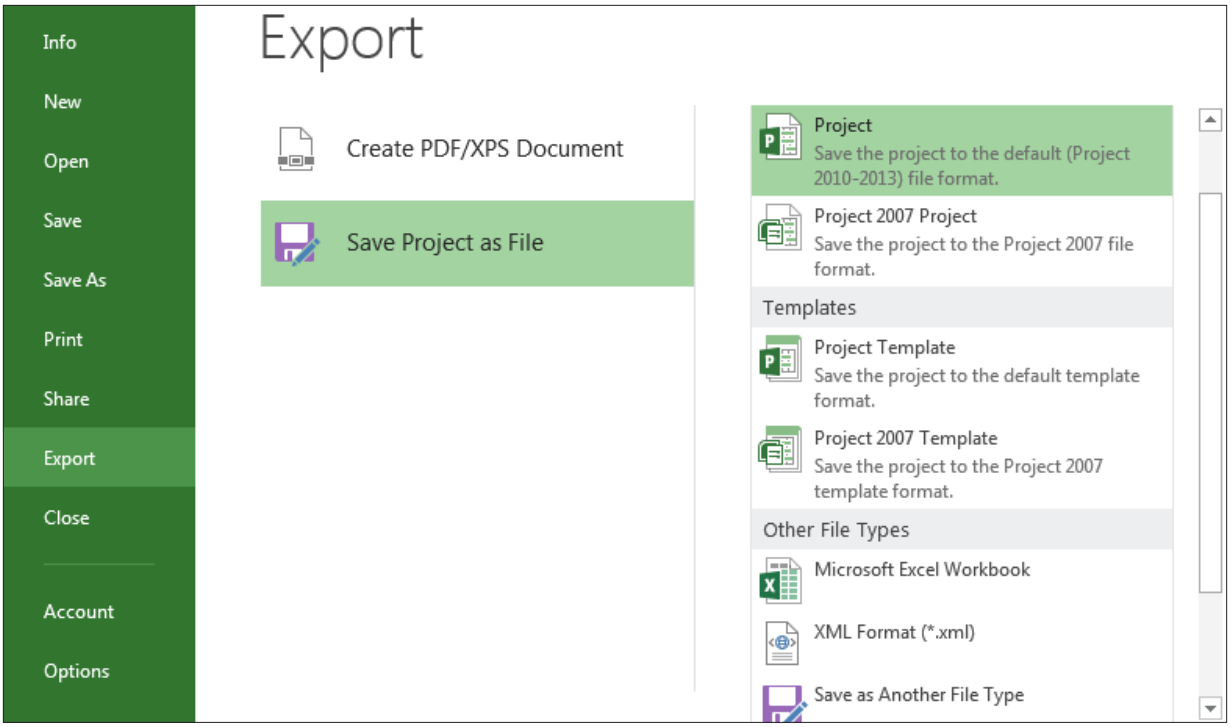


Figure 3-1 Export Project

To email the current open file as an attachment in an email:

- Click on File → Share → Email → Send as Attachment

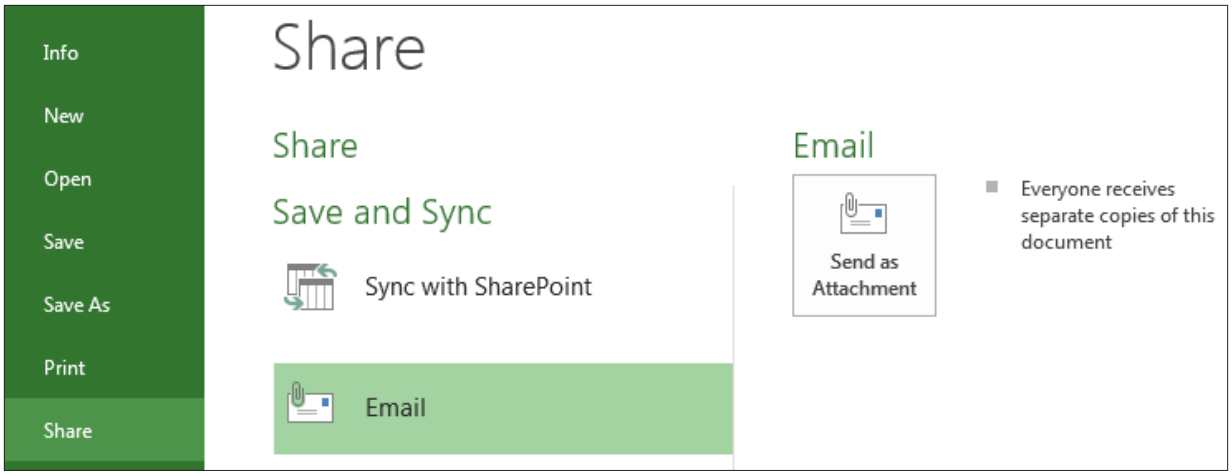


Figure 3-2 Share Email

MS Outlook will open with the file as an attachment. Select the email address, complete the email information and click **Send**.

Opening a Project

Since opening projects is such a frequent task, you should take advantage of quick methods to do this. The following steps will help you optimize your environment for speedy retrieval of projects.

How to Open a Project

1. Click the **File** tab
2. Click **Open**
3. Click **Computer**
4. Click **Browse**
5. Navigate to the desired folder
6. Select the name for the schedule
7. Click **Open**

Click Recent Projects to quickly retrieve a project you have previously opened.

Pin a project to the top of the recent project list is you anticipate you will be using it on a regular basis.

Adding the Open button to the Quick Launch bar will save time.

Creating a New Project

When Project 2013 is initiated, a new blank project schedule will automatically appear.

To create a blank project schedule:

- Click **File → New**

Backstage choices shown below will give you an array of choices of where to begin a new project schedule. As you click the various choices, options

and additional data will appear on the right side of the view.

- Double clicking **Blank project** or click **Blank project** and click **Create** will result in creating a blank project file
- **Recent Templates**: Create a project from a recently used template
- **My templates**: Template created my you and saved to your desktop
- **New from an existing project**: Use an existing project schedule to create a new project
- **New project from Excel workbook**: Columns in the Excel workbook will be mapped to fields within Project 2013. The import process is discussed in the next lesson.
- **New from Sharepoint task list**: Project 2013 Professional only. Tasks will be imported using the URL and security of the Sharepoint site.
- **Office.com templates**: Create a new project from a template that would be downloaded from Office.com on-line

If the Quick Access Bar was customized to add the New button, pressing that button will create a new project schedule

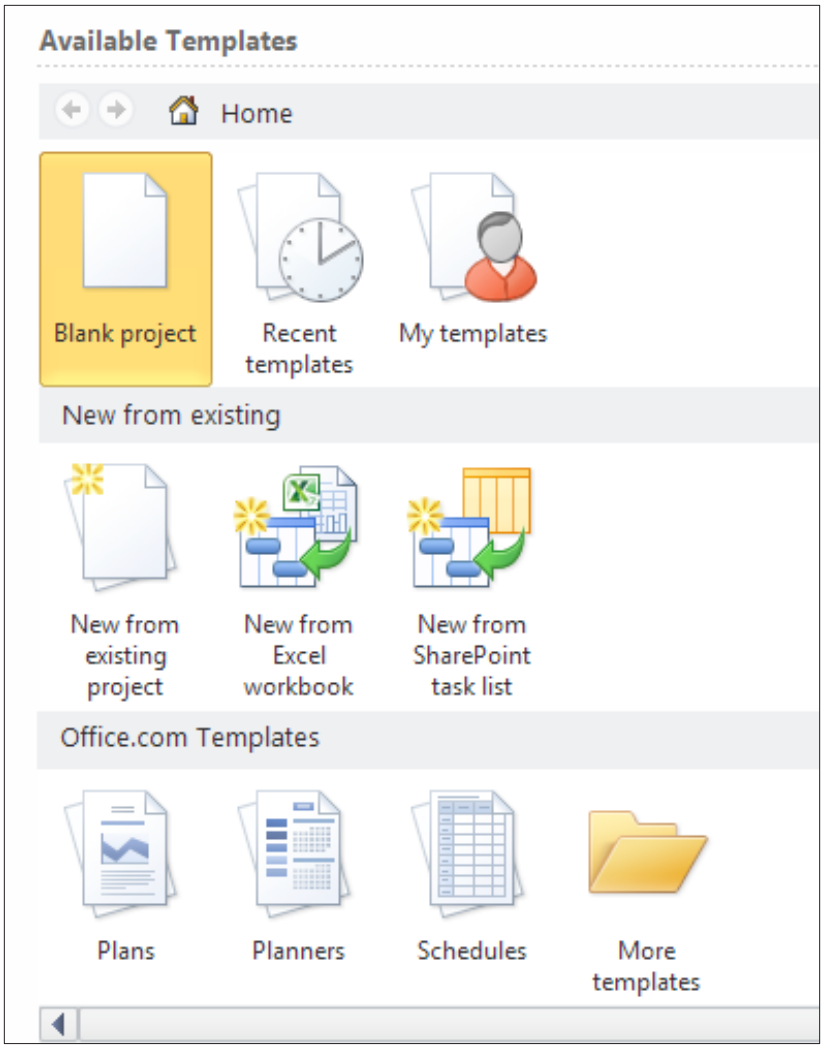


Figure 3-3 View for selecting how to create a new project.

Creating a Project from an Excel Workbook

A project schedule can be created using an Excel Workbook task list. Keep in mind that the fields or columns that are being imported from Excel will be mapped to fields or columns within Project 2013. Pre-planning to know which Excel fields should be mapped to which Project 2013 fields would be helpful.

To create a project schedule from an Excel Workbook:

1. Click **File → New → New From Excel Workbook**
2. Navigate to the Excel file that contains the tasks to be imported into the schedule, click **Open**
3. Project 2013 Import Wizard will start running – Click **Next**
4. Select whether to use a new map that will be created or an existing Project import map. For this example we will create a new map. Click the radio button next the **New Map** and click **Next**
5. Import can start a new project file, append to the end of an existing project file or merge the data using a merge field. In this example we will create a new project schedule. Click **As a new project** and click **Next**.
6. When the data is brought into Project 2013, select if the data is to be mapped to the Task fields, Resource fields or Assignment fields. Click **Tasks**.
7. If the originating Excel file contains header or title information, click **Import includes Headers**. The system will remove this row (the first line only) as the header row. Click **Next**
8. The Task Mapping form will be used to view some of the data and map which Excel fields will be imported into which Project 2013 fields. Pull down the values in the **Select worksheet name** option and select the sheet name in Excel that contains the data to be imported. After the choice has been made, the data from the sheet will be available for viewing.
9. In the example below, the duration field from the Excel Workbook was able to be automatically mapped to the duration field in Project 2013. However, the Task Name field could not find a match. The correct

field name for the task name field in Project 2013 is “Name”. Click the red error message (**not mapped**) and select the field name of **Name**. Repeat for other fields to be imported. Not all fields are required during the import process which allows the user to pick and choose which ones are appropriate to the schedule. Click **Next** to continue after all columns have been mapped.

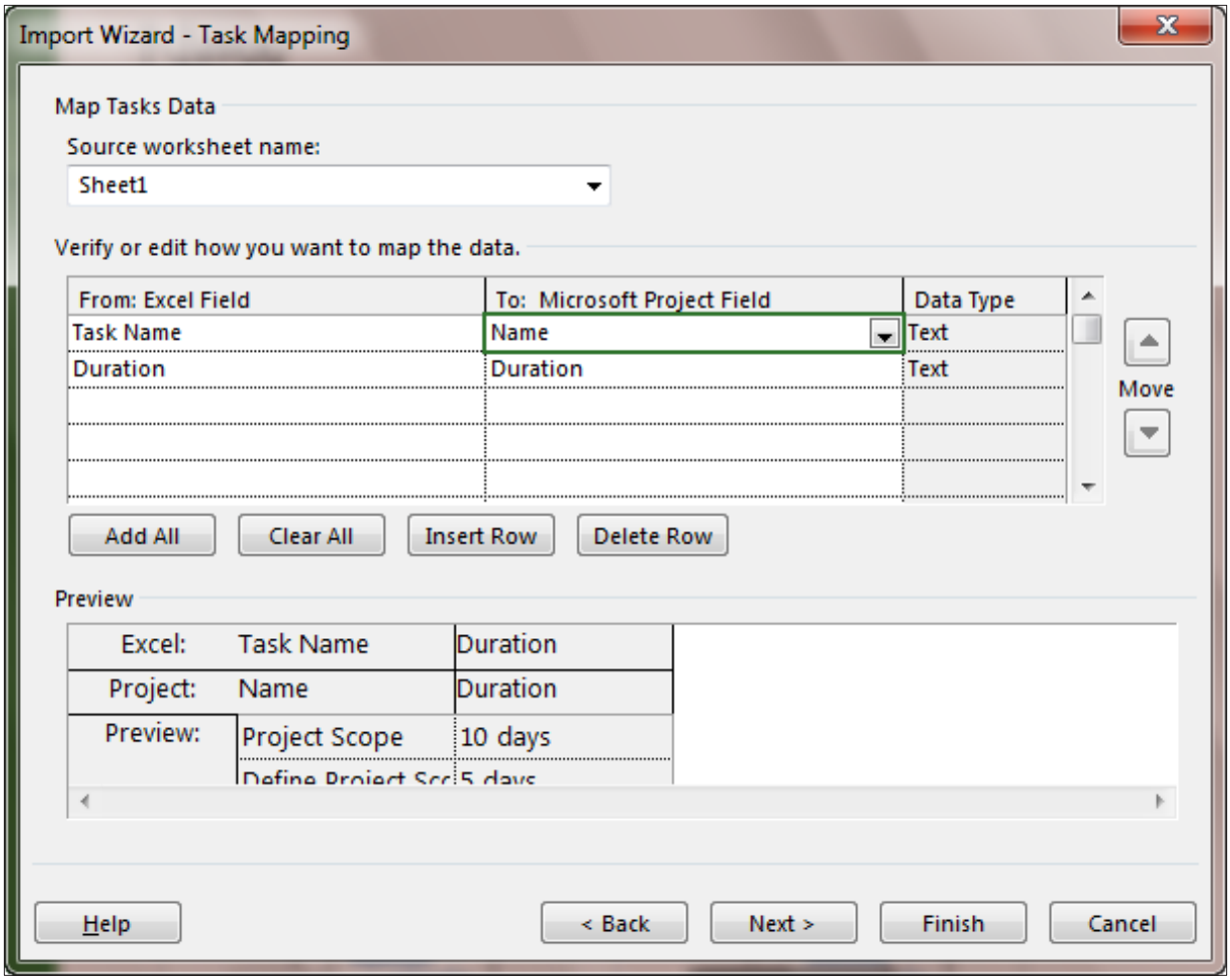


Figure 3-4 Mapping that is created in the Import Wizard.

10. The next step offers the option to save the map for future reuse.
    a. To skip saving the map, click **Next**.
    b. To save the map, click **Save Map** and give the map a name. Click **Finish** to start the import.

11. The new Project 2013 schedule will open with the columns imported.

Creating a Project from a SharePoint Task List

Project 2013 Professional allows for creating a new project by importing a task list from a SharePoint site. The user must have appropriate permissions to the access the SharePoint site and the URL path to insert into the form directing Project 2013 Pro to the location of the task list.

To import tasks from a SharePoint task list into Project 2013 Professional:

1. Click **File** → **New** → **New** from SharePoint Task List

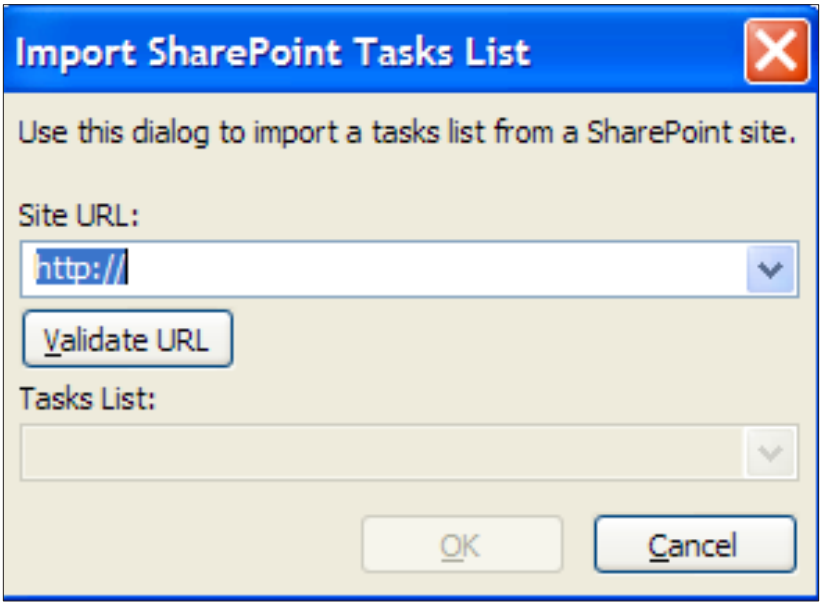


Figure 3-5 Enter the URL for the existing SharePoint site that contains a task list to import into the open project schedule.

2. Enter the **URL** in the form as shown above and click **Change to Check Address**. A list of all the task lists included in the SharePoint site will be displayed. Select the appropriate list and click **OK**.

The list will be imported from the SharePoint site.

This feature is available in MS Project 2013 Professional version only.

Saving the Schedule

Project 2013 provides multiple file formats for a project schedule. The steps to save a file are very similar to other MS Office files.

To save the Project 2013 schedule:

1. Click **File → Save as → select file location**
2. Enter the file name in the File Name area
3. Click **Save** to complete the save. The file will be given a Project 2013 default file extension of .mpp

There is also an option to save the Project 2013 schedule in an alternative file format. Some of the formats are:

- MS Project 2007
- MS Project 2000-2003
- MS Project template 2013 - .mpt file extension
- MS Project template 2007 - .mpt file extension
- MS Excel
- PDF Files (.pdf)
- XPS Files (*.xps)
- XML Format (*.xml)
- CSV (Comma delimited) (*.csv)
- Text (Tab Delimited) (.txt)
- Excel Workbook (.slsx)
- Excel Binary Workbook (*.slsb)

- Excel 97-2003 (.xls)

Save As

The Save As view, located in the backstage area in Project 2013, has been enhanced and provides more functionality for the user. From the backstage view these options are an easy method of saving projects to disk as well as sharing projects schedules with others users. Options have been added to sync a project with a Sharepoint site and to save a project to a Skydrive site.

To navigate to the options available for Save As:

- Click **File → Save As → select one of the options offered**

The right side of the screen will change as options are selected

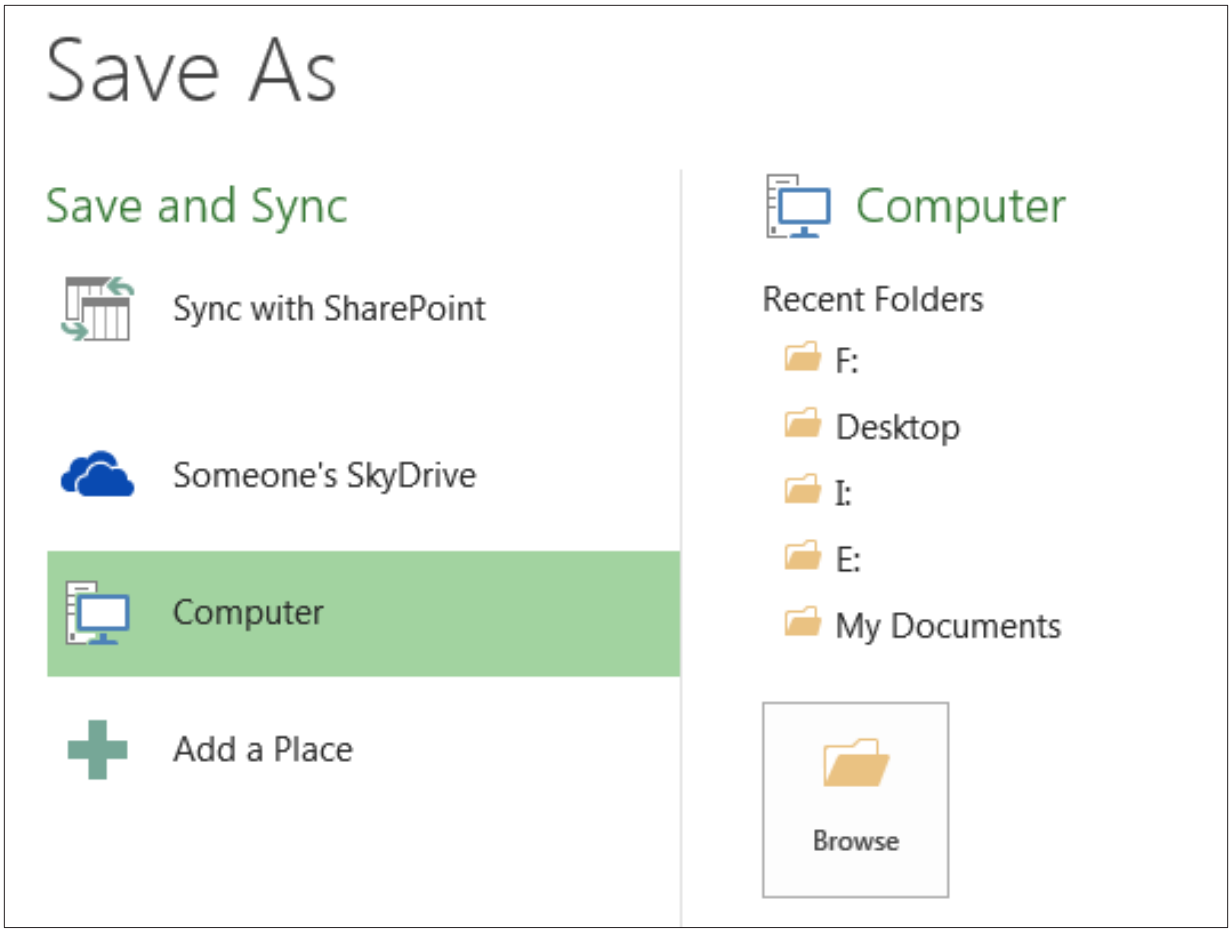


Figure 3-6 Save As options.

Table 3.3 Save Options from the File Tab

Save or Save as Option	Features
Sync with Sharepoint Site	Save file to an existing Sharepoint site
Some's Skydrive	Save file to your Skydrive or a site you have access to

Table 3.3 Save Options from the File Tab

Save or Save as Option	Features
Computer	Save file to location on a disk drive A list of recently used locations will be displayed
Add a Place	Add other locations such as Cloud or Office 365

Calendar Overview

Calendars in Project 2013 will determine when a task may be scheduled within the project schedule. It will also influence what defines a day, a week and a month within the project schedule. The calendars will also work hand-in-hand with the calendar options to determine when and how the tasks will be scheduled. Having the correct calendar applied to the project schedule before tasks are entered is essential for project scheduling success.

In this lesson we will explore:

1. How calendars work in Project 2013
2. How to Set Working Hours and Days
3. How to Set Non-Working Hours and Days
4. How to Set Calendar Options

How Calendars Work in Project 2013?

There are several types of calendars within the Project 2013 system. The following are definitions of available calendars:

- **Project Calendar**: The project calendar is the calendar assigned to a project and it defines the project working and non-working days. The default name for the Project Calendar is “Standard”.
- **Resource Calendar**: Each resource will have its own calendar which may be based off of a base calendar or the project calendar. Unique resource calendars may also be created.
- **Task Calendar**: A task calendar is assigned to a task to allow for the scheduling of that task in a unique timeframe. For example: tasks which have to occur on a weekend.

How the calendars are used by the software:

A task will be scheduled based on the Project calendar until a resource is assigned to the task. At that time, the Resource calendar will control the scheduling of the tasks. Unless – there is a task calendar assigned to a task which will override the Project calendar and the Resource calendars.

When a project schedule is created, a default calendar of "Standard" is applied to the schedule. This is called the Project Calendar for the project. The default values on the Standard calendar are: Monday through Friday which are working days, and working time is 8:00 am to 12:00 pm and 1:00 pm to 5:00 pm daily. No holidays are indicated on the calendar. The Standard calendar is also the calendar that will be viewed in the background of the Gantt Chart views. The Calendar Options work hand in hand with the Project Calendar to determine number of hours in a day or week and these values should be in sync with one another. The Calendar options will be discussed in the next section.

By default, 2 additional calendars are included with MS Project 2013: a 24 hour calendar and a Night Shift calendar. Either of these may be used as Project, Resource or Task calendars.

FAQ's

Q: Why are there no holidays on the calendars?

A: This is an international program. Holidays vary from country to country.

Q: Is there the ability to add holidays to a calendar the way they can be added in Outlook?

A: No – this is not a capability of the software.

Q: Do I have to recreate the calendar for each project?

A: No – calendars may be created and saved through the Organizer to use in future projects. The Organizer will be covered later in this chapter.

The default calendar name for the system is “Standard”. If a different calendar name is selected, each Gantt view will also require changing because the calendar which is viewed Gantt Chart views are set to display the Standard calendar. This change can be made by right clicking in the Gantt view and select Non-working time and changing to the calendar to be seen in the view. Most users keep the Standard calendar because of ease of use.

Setting Working Hours and Days

After the project file has been created, decide what the working days (business days) of the project schedule will be. Decide also, how many hours will make up a working day and what times the hours will be. By default, the working days of the calendar are Monday through Friday and the working time is 8:00 am to 12:00 pm and 1:00 pm to 5:00 pm daily or 8 hours working per day.

To Change the Working Hours of all Days on a Calendar:

1. Click **Project → Change Working Time**
2. Check to ensure the calendar you wish to change is displayed in the **For calendar** list
3. Click **Work Weeks** near the bottom of the dialogue box

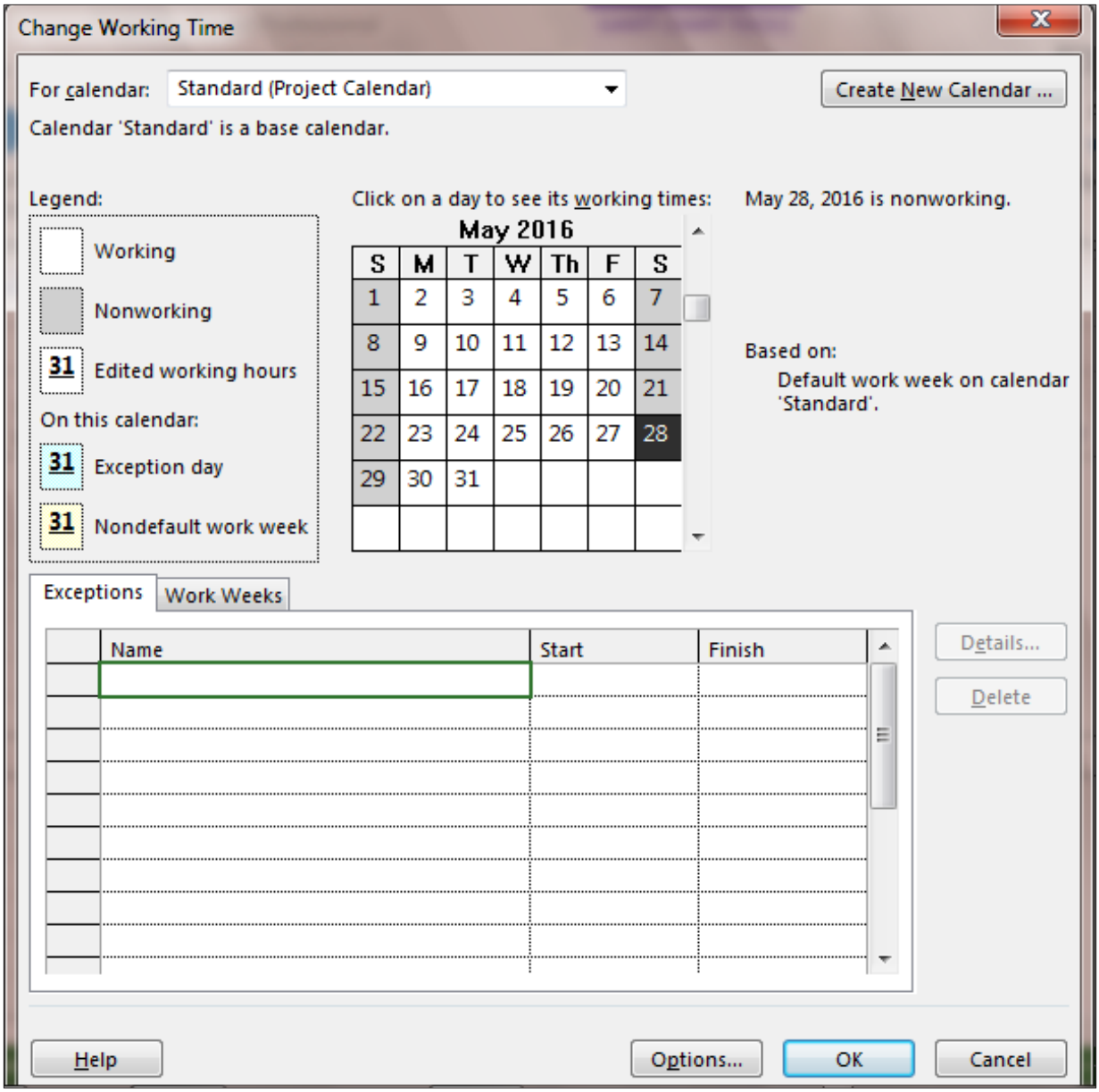


Figure 3-7 Change working time box used to change the working time of a selected calendar.

1. After clicking on the **Work Weeks** tab, the word **Default** should be highlighted. Click the **Details** button to the right of the form

2. Click **Monday**, press and hold the **shift** key and click on **Friday**. All of the working days will be selected
3. Click the **3rd radio button, Set day(s) to these specific working times**
4. You will see the standard working times. Make changes to reflect the new values
5. Click **Enter** or **Tab** to move away from the value you have changed
6. Click **OK** to close the form

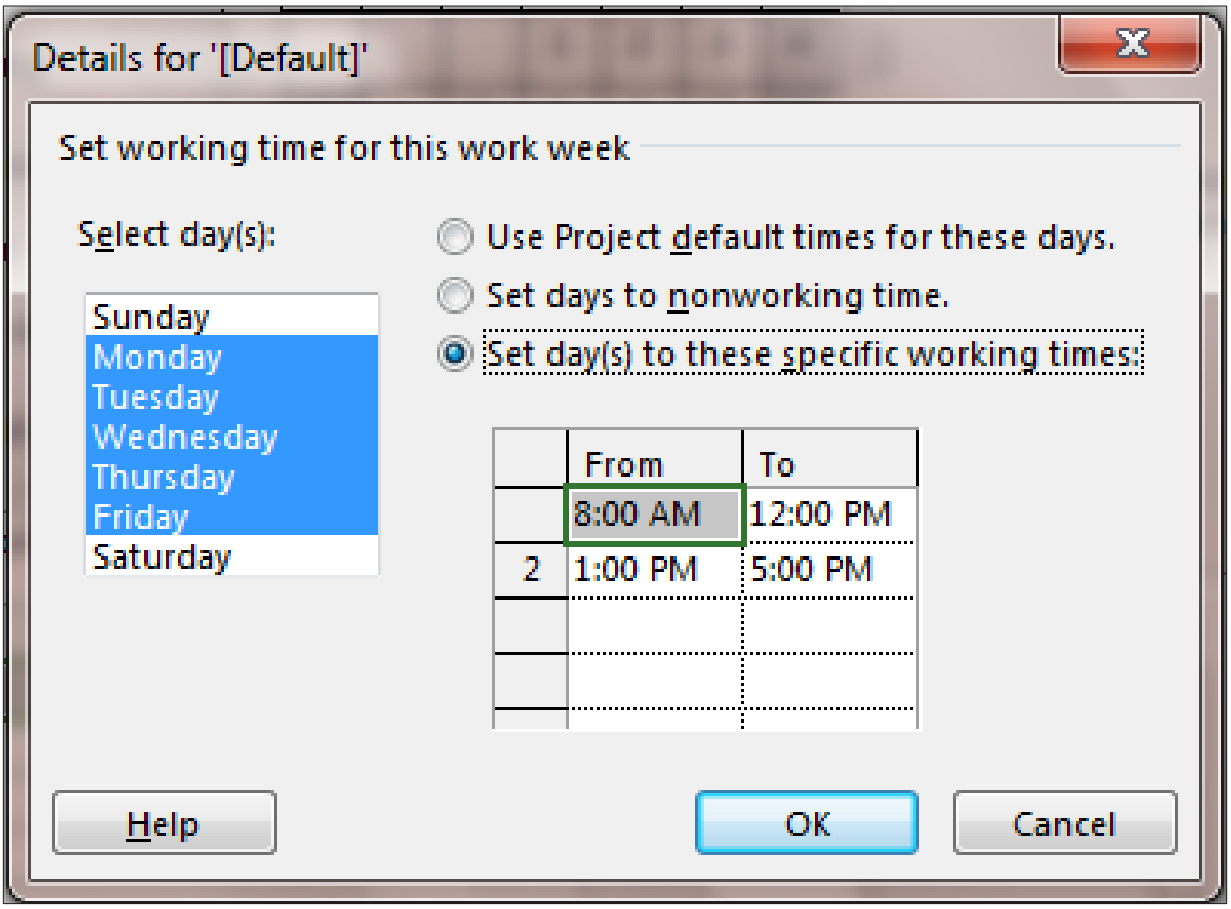


Figure 3-8 Change the time details of a selected day or group of days.

Military time is valid when entering hour values. To change 5:00 pm to 4:00 pm to shorten the work day, simply enter **16** where 5:00 pm is located and click **Enter** or **Tab** and 4:00 pm will appear.

Setting Non-Working Hours and Days

Non-working time is defined in the MS Project 2013 as days where work will not be planned or performed. Examples are: national and organizational holidays, training days, company shutdowns, summer hours, etc. Adding these non-working days and times to the project calendar will prevent tasks being scheduled on this non-working days.

How to Create a Non-working Day for a Calendar

1. Click **Project → Change Working Time**
2. Check to ensure sure that the calendar you wish to change is displayed in the **For Calendar** field
3. Click **Exceptions** tab near the bottom of the dialogue box

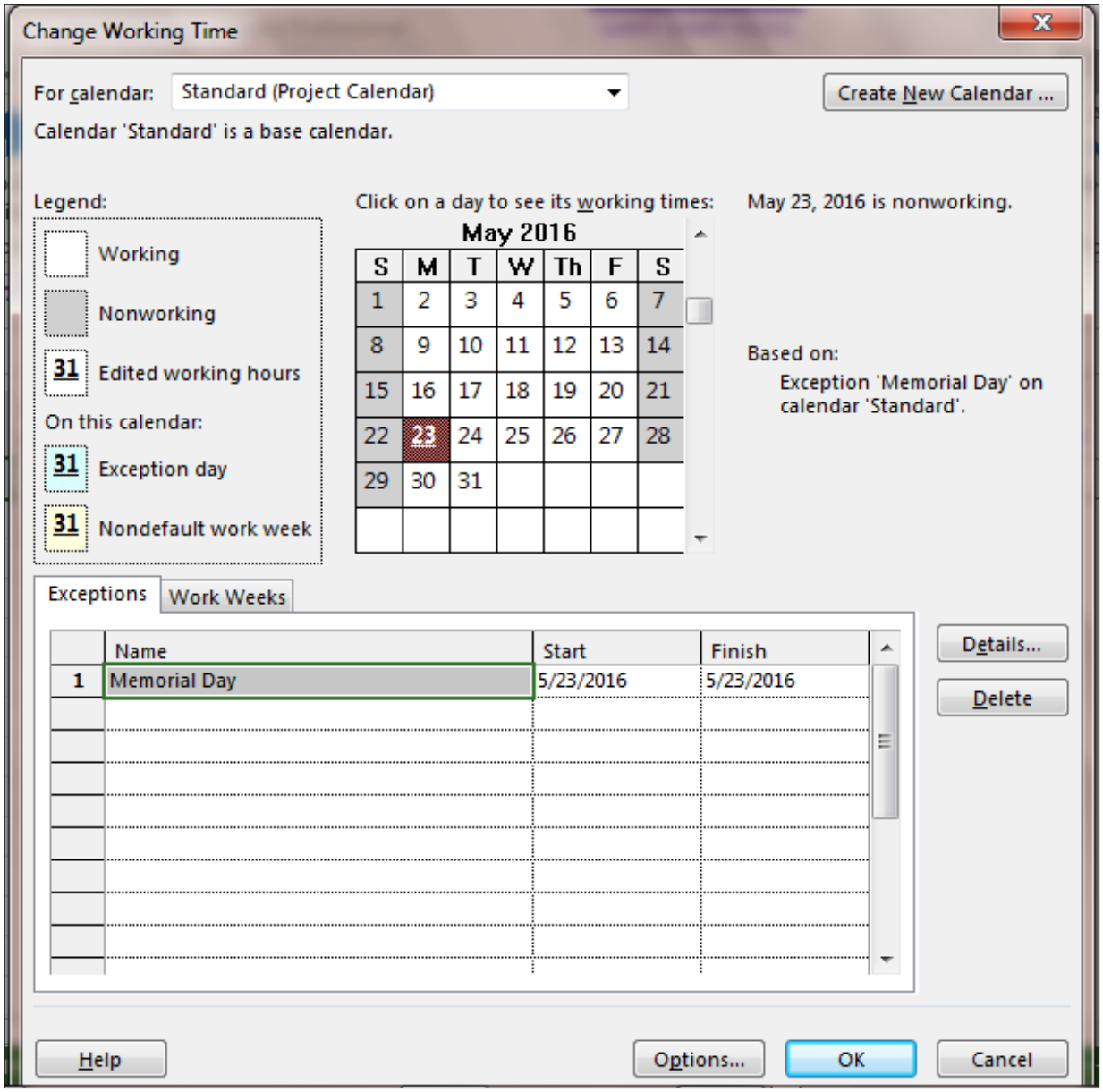


Figure 3-9 The Exceptions list is used to enter holidays or days that will be non-working days for the project.

4. In this example, we will set May 23, 2016 as a non-working day. Move the slider on the right side of the calendar down until **April 2011** is displayed in the calendar

5. Click **May 23, 2016**
6. Click in the name field and enter a reason for the non-working day, i.e.: Company holiday
7. Click **Enter**
8. Repeat for additional non-working days. See the result below

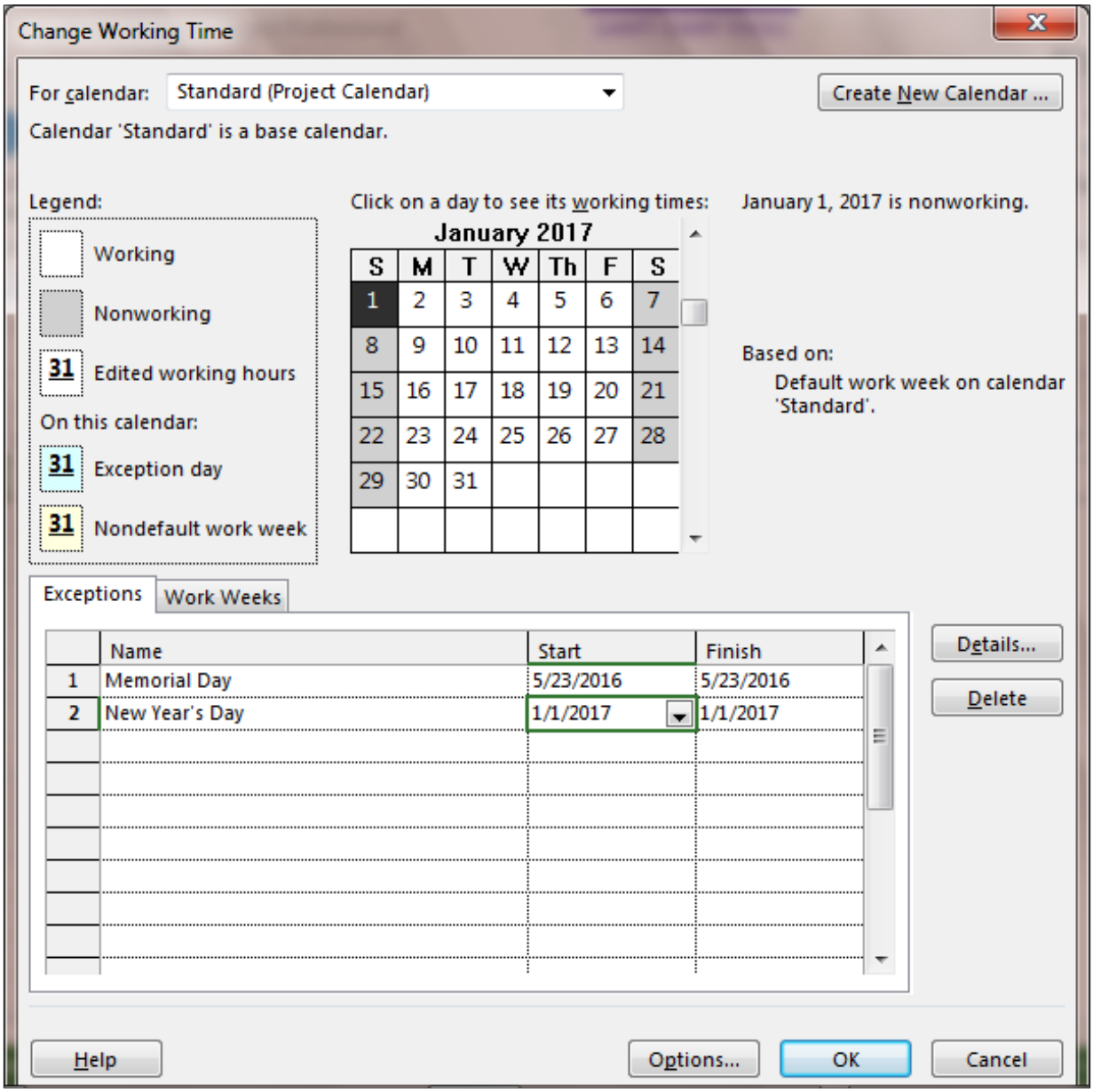


Figure 3-10 Change the working hours and days.

To Create a Recurring Non-working Day for a Calendar:

1. Click **Project → Change Working Time**
2. Check to make sure that the calendar you wish to change is showing in the **For calendar** field
3. Click **Exceptions** the tab near the bottom of the dialogue box
4. In this example, we will set January 1 (New Year's Day) as a recurring non-working day. Move the slider on the right side of the calendar down until **January 2017** is displayed on the calendar
5. Click **January 1, 2017**
6. Click in the first open line in the **Name** field and enter **New Year's Day** for the non-working day
7. Click **Enter**
8. Click back on the words **New Year's Day** and then click on the **Details** button to the right of the form
9. Click **Yearly**
10. Click on January 1
11. Enter the start date
12. Enter a recurrence value or an End by date
13. Click **OK** to close box
14. Check for the recurrence values in the Exceptions line for New Year's Day.

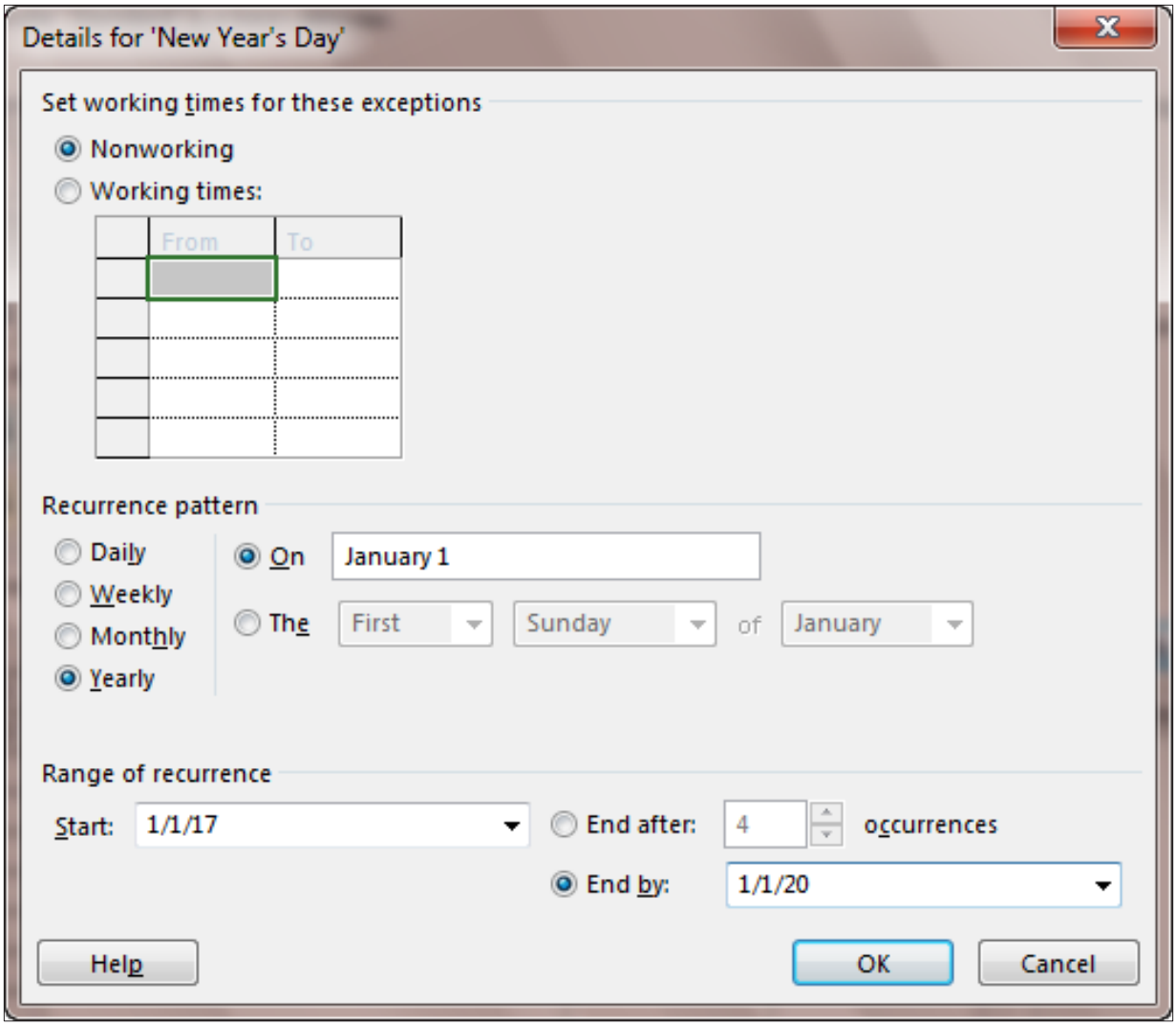


Figure 3-11 Recurring holiday values on calendar

Setting Calendar Options

The Calendar options work hand in hand with the project calendar to determine how tasks will be scheduled. It is imperative that the calendar options match the project calendar to create a consistency in the scheduling values for tasks and assignment values.

To access the Calendar options:

Click **File → Options → Schedule**

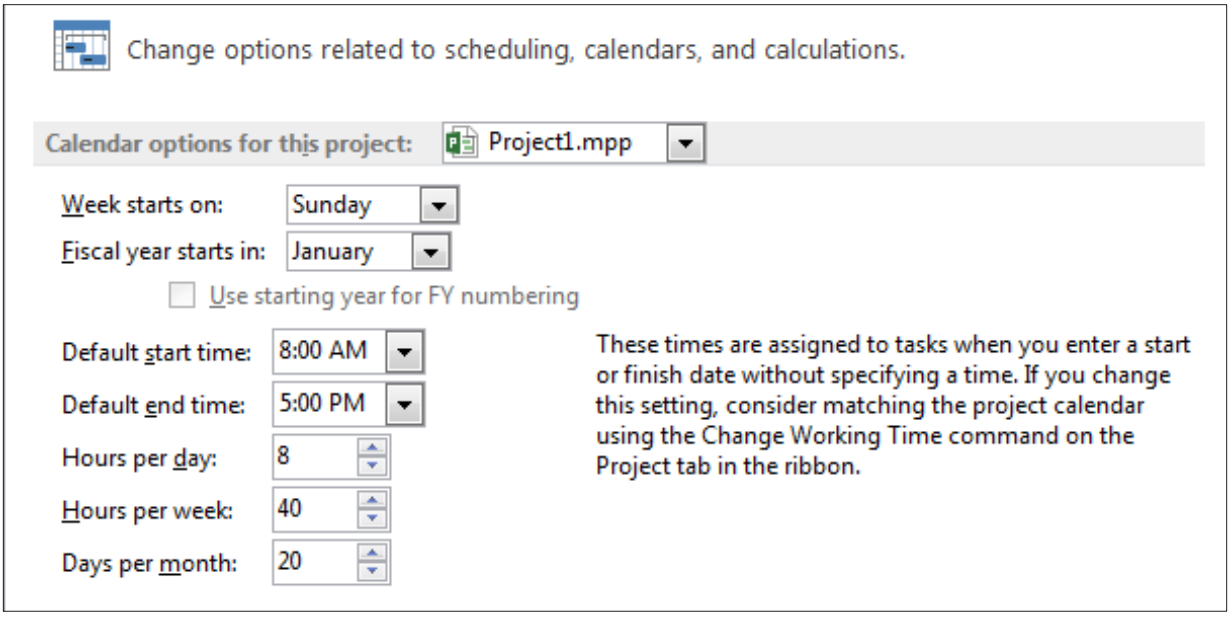


Figure 3-12 Calendar options should be adjusted if the calendar times are changed.

What the options mean:

- **Calendar options for this project**: option to select whether your option choices for the calendar will be held within an individual project or if they will be applied to all new projects.

- **Week starts on**: this choice will affect what is assigned and viewed as the first day of the week. The day chosen will be reflected on the Gantt Chart, Resource Usage, Task Usage and other calendar views.
- **Fiscal Year starts in**: if using this option, select which month will be the start of the fiscal year.
- **Default start and end times**: these values should match the time values on the project calendar. Assigning the project calendar will be discussed in the next lesson. The times stated here will be used to schedule tasks when time is not specified for a task. It will also be used to schedule tasks that do not use relationships. For example: if recurring tasks are created, the tasks will always be scheduled at the start time represented in this option.
- **Hours per day**: when 1 day of work is scheduled, how many hours should 1 day consist of?
- **Hours per week**: when 1 week of work is scheduled, how many hours should 1 week consist of?
- **Days per month**: when 1 month of work is scheduled, how many days should 1 month consist of?

Saving the Calendar

In Project 2013, the calendar that was just created is known as a “custom object”. Custom or customized objects may be saved for use in the project the object was created in and used in other projects as well. To save objects the Organizer is used. When Project 2013 was installed on your system, a file named Global.mpt was created. The Organizer is the function that will copy objects into the Global.mpt as well as between project schedules. Calendars are only one of many object types that may be customized and saved for use in other project schedules.

To save the customized calendar, the object must be copied using the Organizer.

To copy a New Base Calendar into the Global.mpt:

1. Click **File → Info → Organizer**
2. Click the **Calendars** tab
3. Click **Standard** to the right and click **<<Copy**
4. An error message will appear: “Do you want to replace the Standard in ‘Global.mpt’ with the Standard from ‘<project name.’ Indicate “Yes.”
5. Click **Cancel** to close the box

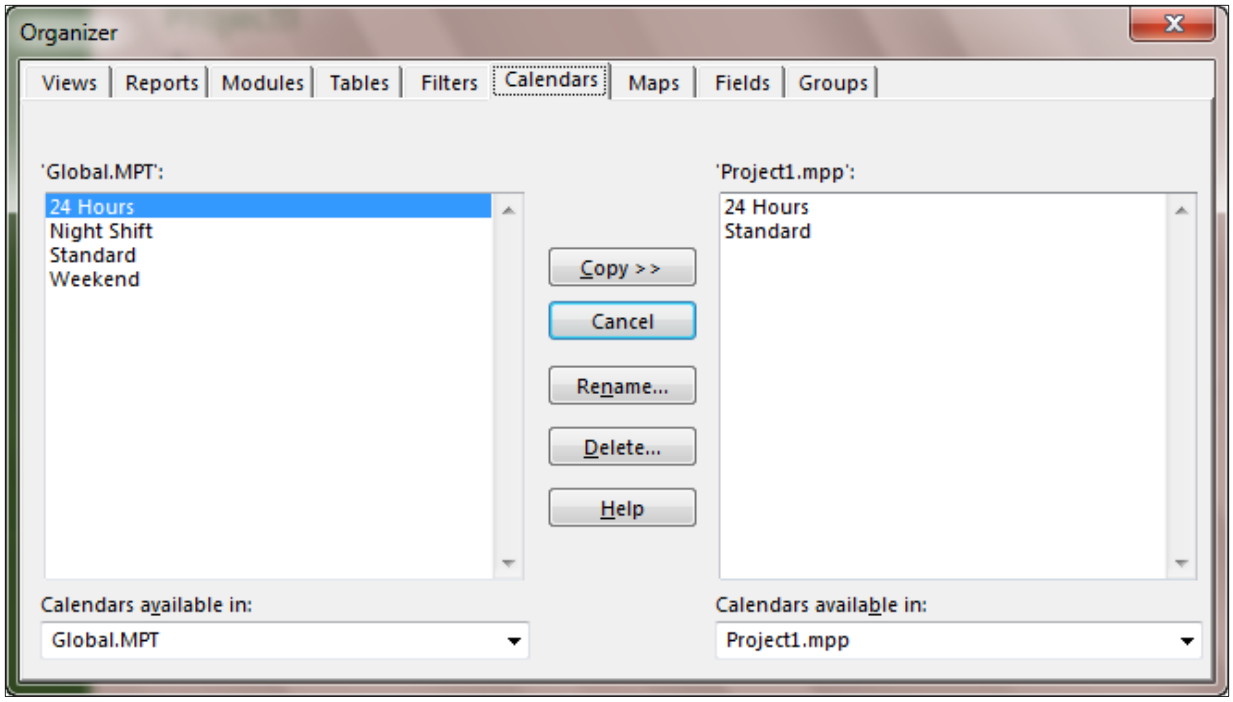


Figure 3-13 Use the Organizer to copy the updated calendar into your local Global.mpt file.

The Calendar will be copied into your local Global.mpt.

Project Information

The project information that should be entered before proceeding with project schedule development is the project start or project finish date as well as indicating which calendar will be used as the project calendar. This information is entered through the Project Information box.

To navigate to the Project Information dialogue box:

Click Project → Project Information

Deciding whether to enter the Project Start date or the Project Finish date will take some consideration. There are pros and cons to either choice:

FAQ: Should I enter a project start and finish date?

Answer: Project 2013 will accept either the start or the finish date but not both.

Entering a start date will indicate that you are planning your schedule as forward scheduling. This will result in:

- All tasks will be scheduled As soon as possible
- The work of the project will determine the project ending date
- You will have a date to manage your project to and know when you are on time or late with the progress of the project

Entering a finish date will indicate that you are planning your schedule as backward scheduling. This will result in:

- All tasks will be scheduled As late as possible
- The ending date of the project will be locked to a date on the calendar
- You might be planning a project where each task will be required to be completed as planned to achieve the ending date goals.

The most used planning method is that projects are planned from the project start date.

Project Calendar: The default calendar is “Standard”. Whatever calendar is selected will become the scheduling calendar for the project. All tasks will be scheduled using this calendar until a resource is assigned to the task.

Click **OK** to close the box.

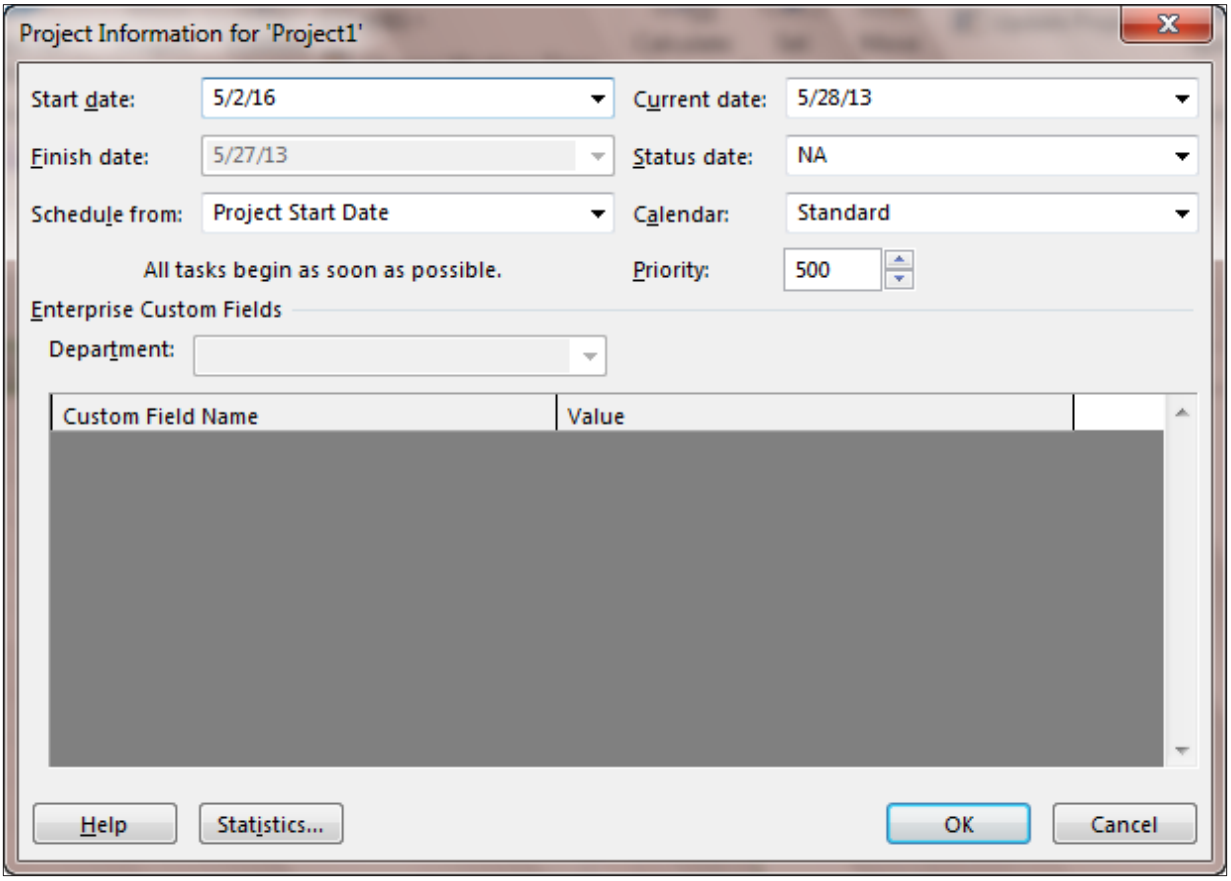


Figure 3-14 Project Information box.

Most project managers have definite deadlines. Consider planning the schedule from ending date to get the schedule short term goals, deadlines and milestone dates. Then switch the project to the start date to manage. Reset the constraints to as soon as possible to enable the schedule to include slack and aid in schedule management.

Options

The last action you should be before entering your first task is to set some of the options to match the requirements of your project.

Options are flexible in that they can be applied per unique project or to all new projects created on your computer. In this section we will discuss the options that will affect scheduling. These options are in addition to the calendar options discussed earlier in this chapter.

General vs Per Project Options

General options are options which affect how the installation of Project 2013 on a desktop will operate. Per Project options are options that will apply to a unique project. You may optionally apply the per project options to all new projects.

Display options are options that will help the user interface with Project 2013 software. The options selected are unique to each user and are a personal preference. These options do not have an influence on the ability to create a project schedule.

To navigate to General options:

Click **File → Options → General**

In the Project view section, the user may select the default view for usage of Project 2013 and the date format for dates for reports and views (tables).

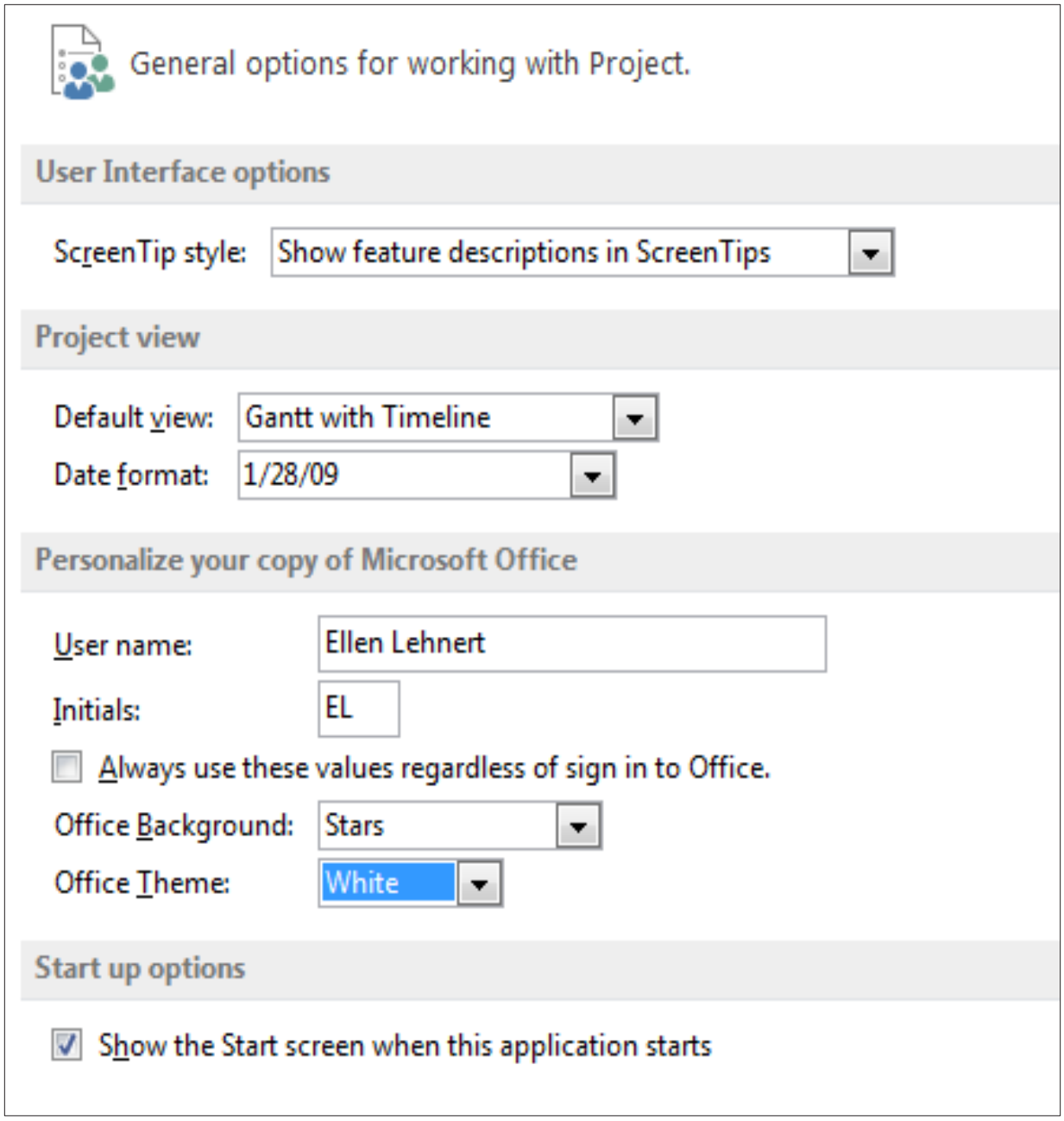


Figure 3-15 General Options view.

To navigate to Display options:

Click **File** → **Options** → **Display**

These options refer to which elements should be viewed on the screen. These options will control which indicators are shown in the indicator column, currency values and if the Entry bar is visible or not.

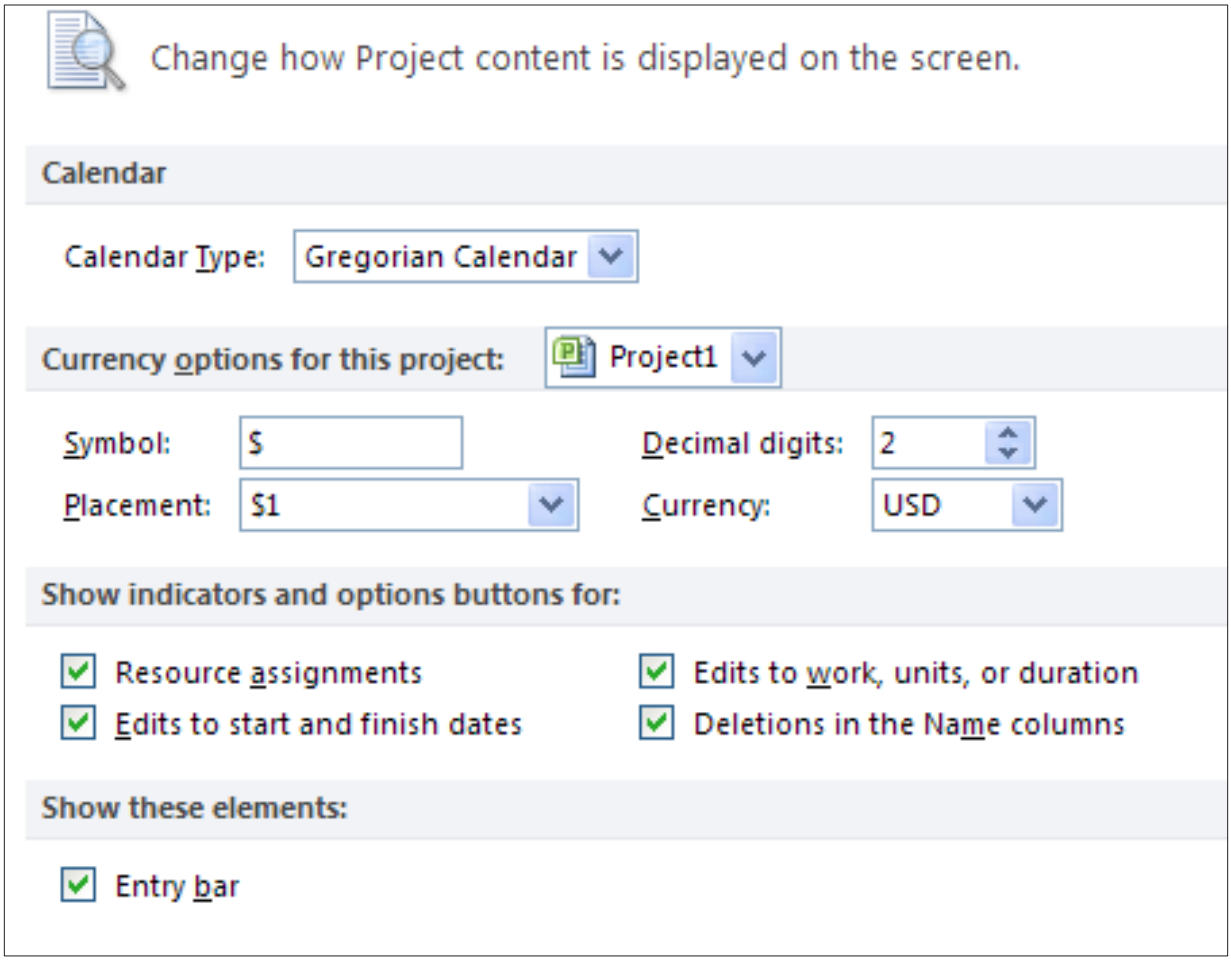


Figure 3-16 Display options view.

Additional display options are available at:

Click **File** → **Options** → **Advanced**

Some of the options that should be considered are:

- **Show this number of recent documents** – optional number, list will show in the Recent tab in the backstage
- **Automatically add new views, tables, filters and groups to the global** - recommended
- **Settings for duration label values** – Minutes, Days, etc. - may alter as needed
- **Show project summary task** – recommended

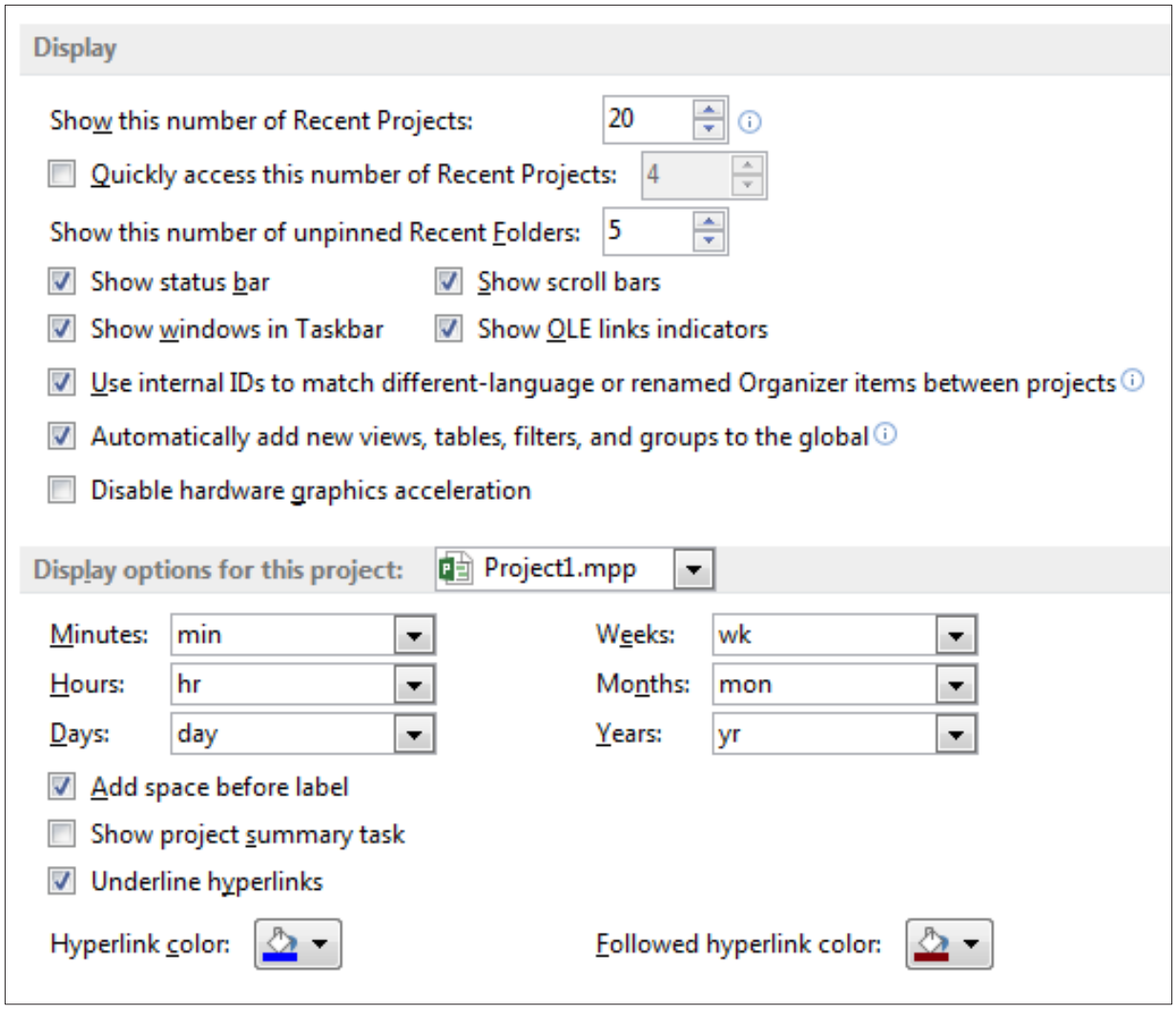


Figure 3-17 These display options are in the Advanced options section.

Each project schedule has the ability to contain a Project Summary task. The Project Summary task is a zero level task that will serve as a constant grand total for the project schedule. The setting in the above option may be used to turn on the project summary task by default for all projects.

To turn on the Project Summary task:

Click **Task** → **Gantt Chart**

Click **Format** → **Project Summary Task** (on the right side of the ribbon)

Scheduling Options

To understand the Scheduling options it would be helpful to review some of the scheduling terms the options are referring to.

MS Project 2013's schedule engine it is using the terms "Duration" and "Work" which is fundamental to understanding project scheduling.

Definitions

- **Duration**:
  - Is a length of time i.e.: a day, a week, or a month
  - It is the amount of actual time that will pass before a task is completed
- **Work**:
  - Is the quantity of work that occurs i.e.: 8 hours in one day, 40 hours in a week
  - It is the amount of work (effort or man hours) which a resource(s) will work to complete the task

It is very helpful within an organization to have a standard for these terms. IE: All work will be planned in hours and all durations will be planned in days.

Effort-driven scheduling

Tasks have the option of being scheduled using Effort-driven scheduling. Effort-driven scheduling is defined as when more workers are added to a task, the effort (or work) will be divided across the workers.

For example: A project has a task called “Moving Boxes”. The work of the task is to move 100 boxes from location A to B. If one person moves the boxes, it will take 10 hours of duration moving 10 boxes per hour. However, if 2 people move the boxes it will take 5 hours, 3 people can accomplish this task in one-third of the original time, etc.

With effort-driven scheduling the duration of the task will shorten when more workers are added because the work is divided over the resources.

Understanding Task Types

Each task will be assigned a task type when the task is added to the schedule. Task types work hand-in-hand with the effort-driven option discussed above. Task types will determine how a task is scheduled and will have an effect on the assignment of the resources to the task. Task types are considered unique per task and may be set on a task by task basis.

The option - setting is to establish the default task type you would like each task to acquire when it is entered. Task types may be changed to match the needs of the tasks at a later point in time.

MS Project 2013 allows for the following 3 task types:

- **Fixed Duration**: A fixed duration task is a task created with a fixed length of time. Fixed Duration tasks are also tied to dates.

Example: This training class. When the time scheduled for this class is over, the work of the class is completed.

- **Fixed Units**: Units means quantity of a resource. Fixed Units means that the resource assignment quantity is fixed for the task. Using this task type will result in the quantity of the units assigned to a task coupled with the availability of the resource to determine the scheduling of the task.

  Example: If you assign a resource to a 5 day, 40 hour task at 100% of their effort the task will be completed in 5 days working 8 hours per day. If you assign a resource to the same task with 50% of their effort, the task will be worked 4 hours per day and will be scheduled for 10 days of duration. The 100% and 50% are the resource units.
- **Fixed Work**: The work of the task is fixed. Fixed work tasks, by default, are also effort-driven. The more resources assigned to the task, the less time the task will take to be complete. Fixed work tasks will be scheduled based on the quantity of the units of the resources assigned to the task and their availability based on their resource calendar.

  Example: If a task called “Plan event“ will take 80 hours of work to complete, the work will be completed in 2 weeks with 1 full time resource. If a second resource is added full time, the task will be completed in 1 week dividing the work between the 2 resources. Each resource would have performed 50% of the work. As resources are added to the task, the duration of the task is reduced.

Task type, Effort-driven combinations

When task types are coupled with the effort-driven option, the scheduling engine allows for the following task type, effort-driven combinations:

- Fixed Duration, Effort-driven on
- Fixed Duration, Effort-driven off
- Fixed Units, Effort-driven on
- Fixed Units, Effort-driven off
- Fixed Work, Effort-driven on

The project options will allow for setting a default that each task will be assigned when the task is entered. It should be noted that each task is different and unique. The default should be considered a starting point.

This is a brief introduction to this topic. Detailed coverage of task types and effort driven settings with assignments will be addressed throughout Chapter 8, *Work Assignments*.

Scheduling Options

Scheduling options are per project options which establish the defaults how a project will be scheduled. These options are unique per project and should be checked before entering tasks into a project schedule. These options also may be changed at any time over the life of the project schedule.

To set the scheduling options:

Click **File → Options → Schedule**

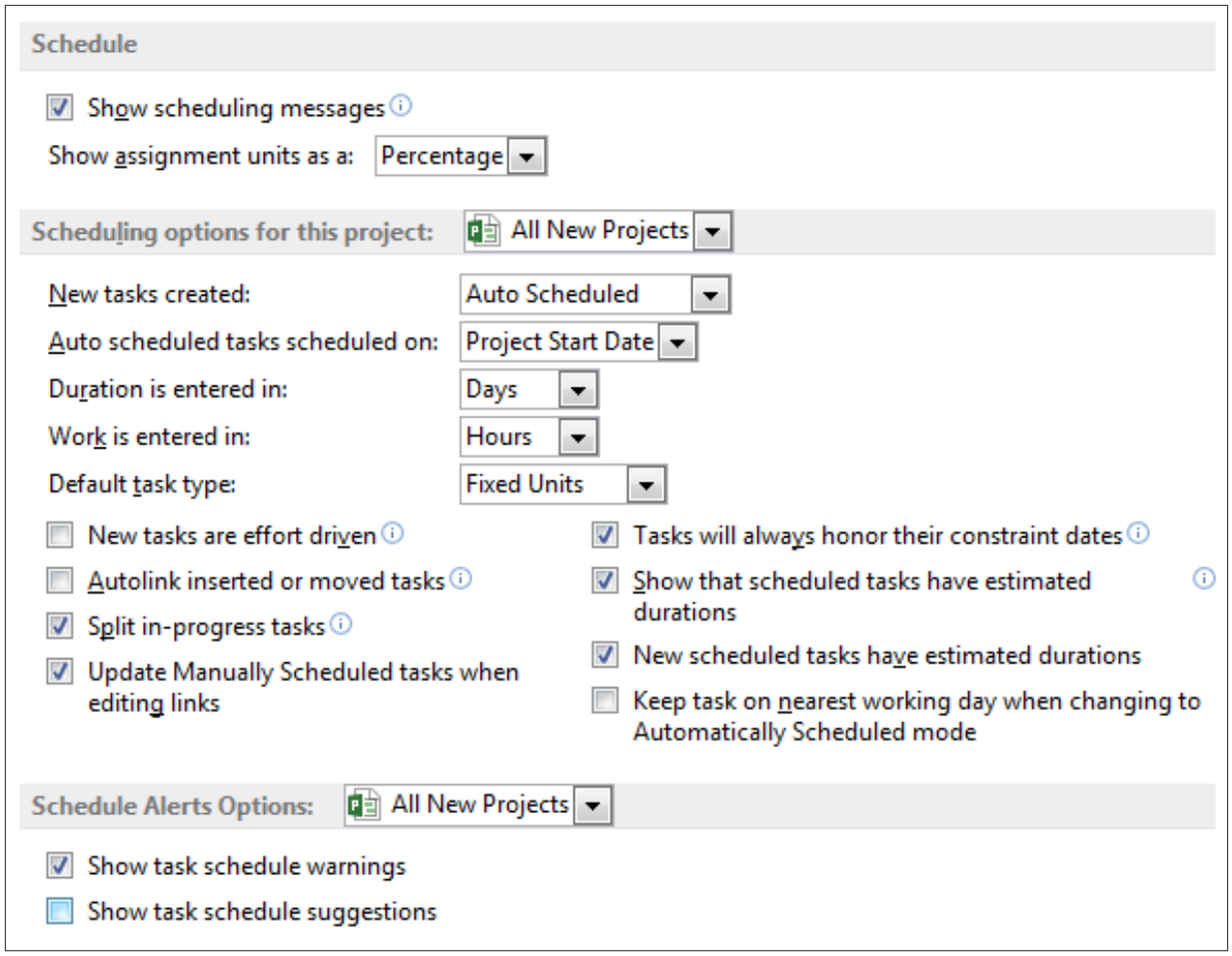


Figure 3-18 Schedule options.

- **Show scheduling messages**: gives the scheduler error messages concerning scheduling inconsistencies and warnings.
- **Show assignment units as a**: options are percentage or decimal. This is user preference. It may be changed at any time without affecting the schedule.
- **Scheduling options for this project**: options that can be assigned to a specific project or all projects.
- **New tasks created**: manually scheduled or automatically scheduled. This is the default value and may be adjusted per task.
  - **Manually scheduled**: tasks will be entered without a start or finish date and without task duration. All values are entered manually.

  - **Auto scheduled**: tasks will be entered with a default duration of 1 day and a start and finish date.
- **Auto scheduled tasks scheduled on**: project state date or current date. If you are managing a long project it might be easier to change this option for all new tasks to start on the current date.
- **Duration is entered in**: minutes, hours, days, weeks, months
- **Work is entered in**: minutes, hours, days, weeks, months
- **Default task type**: Fixed Units, Fixed Duration, or Fixed Work
- **New tasks are effort driven**: check for yes
- **Update Manually Scheduled tasks when updating links**: when tasks are manually scheduled should the project schedule successor tasks based on relationship links

It is a good idea within an organization to establish a standard for Duration and Work. When duration is discussed or appears on a report it will be easier for stakeholders to understand that duration always means hours or the value that works for the specific project. If you have a 3 year project, you probably will not be planning work at the hour level so weeks might be the duration standard.

Chapter 4

Task Development

Project Life Cycle Approach to Scheduling

There are many different planning or scheduling methodologies for project management. In the 20+ years of using technologies that support scheduling, planning and resource demand and capacity planning, we the authors have experienced and heard that Project is not a good tool for certain types of lifecycle planning.

This is clearly untrue. If you think about what scheduling technologies are, they are simply relational databases. It is the approach of how you setup, layout or build a schedule or project plan that makes it better or worse.

Yes some tools have pre-built views, reports or are tended to be used in certain industries (like construction), but that has been a product of the history or length of these technologies and the need for that type of tool. For example it really has only been in the last 20 years that IT or system or software development has really exploded. In comparison engineering or construction projects have been ongoing for centuries.

What we hope you learn from this section is that it is up to you and how you would like to organize, view, track, report and manage a schedule that determines it's ability to support you in the Project Lifecycle that you are using.

Remember MS Project is a relational database, just like almost every other scheduling tools (some are just flat files, like Excel), but for our discussion today, we are only considering true scheduling technologies.

Where MS Project has grown and overshadowed every other scheduling tool out there by volume of purchases, is the simplicity, flexibility and ease of use that the tool provides to its user.

With a little thought you can make Project behave and support any lifecycle methodology approach to scheduling. Whether Scrum, SDLC, Lean, Waterfall, etc. you have the same functional components for managing a project. Namely the following:

- Fields (native and custom)
- Sorting Capabilities
- Grouping
- Filtering
- Views & Reports

Remember, demand, work, deliverables, tasks, activities are all the same object. A task is a row that has data and meta-data associated to it. That means you can have a column for your task that identifies it's properties. For example a task about "rollout training for end users" can be organized by phase, type of work (training), by department who will deliver it, even by the skillset needed.

As you will see in the next few sections, you can take that activity or task and organize it any way you like, it still represents demand, work or something that has a typical time-phased activity that needs to be scheduled.

We hope you open your mind and think about using Project in many different lifecycle planning and managing approaches and find the combination that works best for you and the projects that you are managing.

WBS Scheduling Approach

The concept behind Work Breakdown Structure (WBS) scheduling is to arrange work packages or work elements (tasks) into a grouping of activities that have a common element to them. For example, documentation tasks may occur across the entire project, but are grouped, estimated and planned and in many cases invoiced in common location within the schedule.

Work Breakdown Structure (WBS) is a tool / methodology that defines a project grouping of a project's discrete work elements (tasks) in a way that helps organize and define the total work scope of the project.

In using a WBS to define a project schedule, (a project schedule is the series of activities (time-phased or calendar based) that links the tasks to be done with the resources that will do that work, the project manager must have a work breakdown structure (WBS) and estimates. The project schedule is part of the project plan (not the whole plan, but an artifact of the project plan).

A great value that a WBS creates is it allows you to organize and decompose a larger set of tasks into smaller subset of related activities. Remember that this is an exercise that isn't about sequencing, but more focused on establishing tasks and estimates.

The advantage of using a WBS is that you can quickly get to a proper level of detail (the proper level will be dependent upon the needs / culture of the Project Manager, the Organization or the work being planned.

A common misunderstanding is that a project schedule has to stay lined out or organized in this manner. While it may be easier to see organized types of work, it becomes more difficult to manage the related work activities.

Remember that Project is a relational database and we can group tasks quickly and efficiently based upon simple common fields or values within the project tasks (i.e. a custom column).

Key Benefits of WBS Scheduling

- Organizing Key Activities, Deliverables by Functionality or Activity Type
- Excellent approach to working with a team to map out key work activities
- Break out Larger work deliverables into manageable and assignable work
- Easy to see all like work grouped or in a localized area
- Fast References to work that can be collapsed by section
- Typically aligned with a BOM or SOW/Contract deliverables for billing

In Project, you may require that your WBS be related to Accounting or

Other Tracking Systems. If your project would benefit from having detailed WBS codes that are made up of specific lengths, sequences, or sets of numbers and letters, you can define a single custom WBS code mask (code mask: The format that you define for a work breakdown structure (WBS) code or a custom outline code. The mask specifies the sequence and number of letters or numbers required for each level and the symbol separating the levels.) for the project. (No project can have more than a single custom code mask.) The custom WBS code is recorded in the WBS field.

As with outline numbers, each level of a custom WBS code represents an outline level (outline level: The number of levels that a task is indented from the top level of the outline. You can indent tasks up to 65,000 levels in Project.) in the task list. You can use a unique format for each level of the code, and each level is listed in the code according to the hierarchy of tasks, summary tasks, and subtasks.

So clearly you have room to grow, organize your project schedule.

Below is an example of a Project Schedule Organized in a Work Breakdown Structure format. The overall concept is that WBS is about work activities.

Resource Name	Work	Details	Jun '14					
			11	18	25	1	8	15
Name: Amy McKay	**128 h**	Work	16h	24h	16h	36h	8h	28h
3 Renovation	**128 h**	Work						
3.1 Construction	**128 h**	Work						
3.1.1 Carpentry	**128 h**	Work	16h	24h	16h	36h	8h	28h
Strip walls	*16 h*	Work	16h					
Remove asbestos in ceiling	*40 h*	Work		24h	16h			
Asbestos removal inspection	*4 h*	Work				4h		
Frame new walls	*16 h*	Work				16h		
Put up dry wall	*16 h*	Work				16h		
Plaster	*8 h*	Work					8h	
Install new cabinets	*4 h*	Work						4h
Paint cabinets	*4 h*	Work						4h
Lay new flooring	*8 h*	Work						8h
Install appliances	*8 h*	Work						8h
Carpentry Inspection	*4 h*	Work						4h
Name: Bob Siclari	**56 h**	Work					40h	16h
3 Renovation	**56 h**	Work						
3.1 Construction	**56 h**	Work						
3.1.5 Plumbing	**56 h**	Work					40h	16h
Install pipes	*40 h*	Work					40h	
Install sink and faucets	*8 h*	Work						8h
Connect appliances	*4 h*	Work						4h
Plumbing Inspection	*4 h*	Work						4h

Figure 4-1 WBS Methodology Scheduling Approach.

We encourage you the reader to try using a WBS to help map out key deliverables and activities. What is wonderful about Project 2013 is that there are a myriad of different tools you can plan and organize your project in and then simply by using the Rich Copy/Paste features and the manual scheduling, to drop that in and begin the estimating, linking and establishing a dynamic schedule. By leveraging the simplistic approach of a WBS, you can rapidly build a schedule, feel confident that you have not missed key planning tasks and activities and then sequence the work, establishing relationships between your dependent tasks.

Agile Methodology Scheduling Approach

As mentioned above, Agile, Scrum or other Agile approaches to project scheduling take on a more iterative approach and feel.

A common misconception is that MS Project cannot handle this or isn't designed for this. This is clearly not the case. Remember Project is a database and can be laid out to sort, group, filter and organize work into views based upon data at the task level.

In today's ever growing IT or software development world, the work is in many times iterative, however that is not limited to just IT work. In engineering projects, in many cases there are series of design / builds (30%, 60% and 90%) cycles of work that touches or retouches pieces of project work.

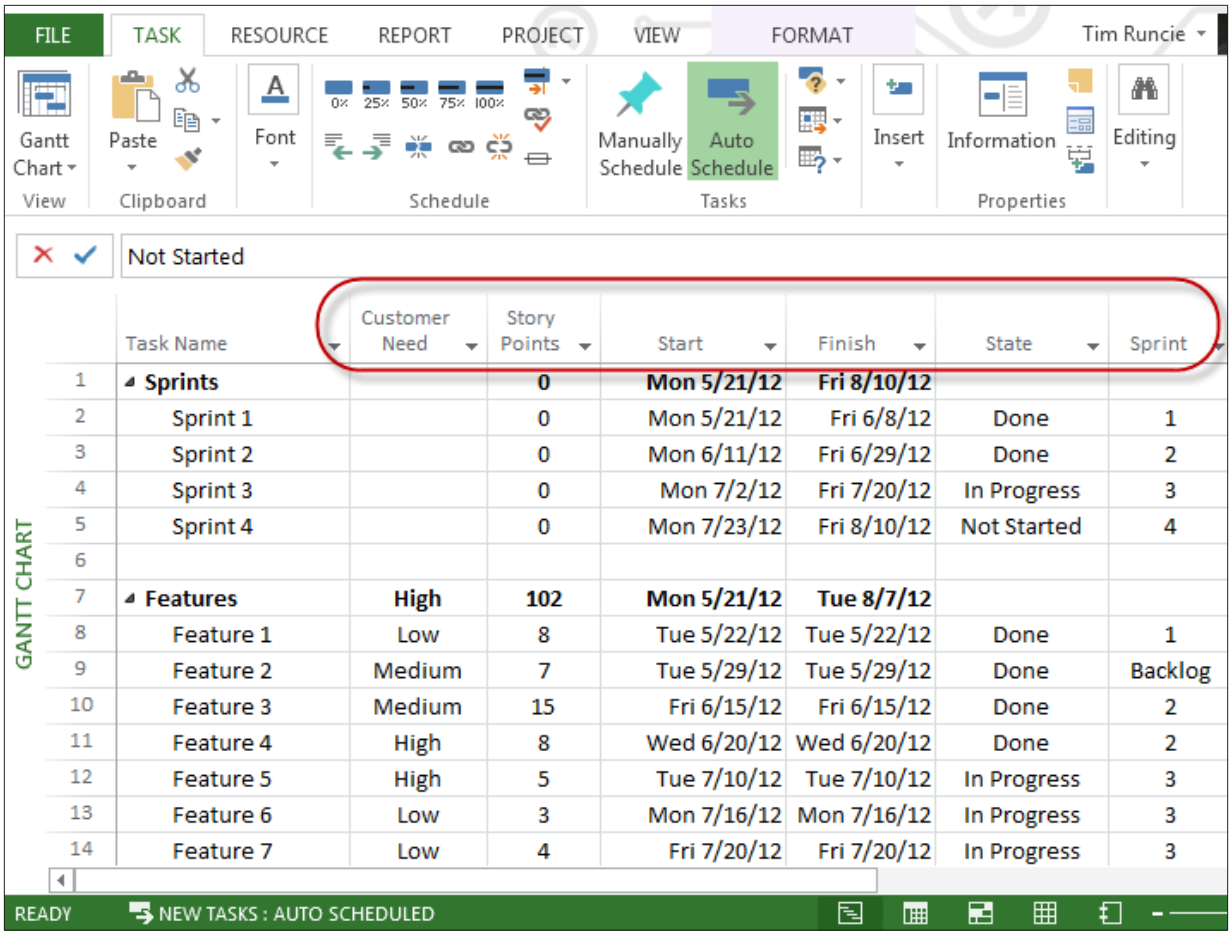
What is nice about using iterative planning and scheduling approaches (Agile) is that you can break apart the work by features and activities relating to these feature sets that need completed.

Key Benefits of Agile Scheduling

- Highly Iterative and easily to clone sections that dynamically build off of each other
- Burn Down Charts, Views, Sprints and Groupings allow for Easy to follow Work Deliverables
- Manual Scheduling and Integration with other Scheduling Tools (Team Foundation Server)
- Provides a way for work to be broken up into iterative (Sprints) and aligned with key categories or summary activities (such as a Software Development Lifecycle (SDLC).

In the example below, we illustrate lining out the key features (un-named),

but essentially the tasks that need to be managed based upon the Sprint, priority, customer need, etc.

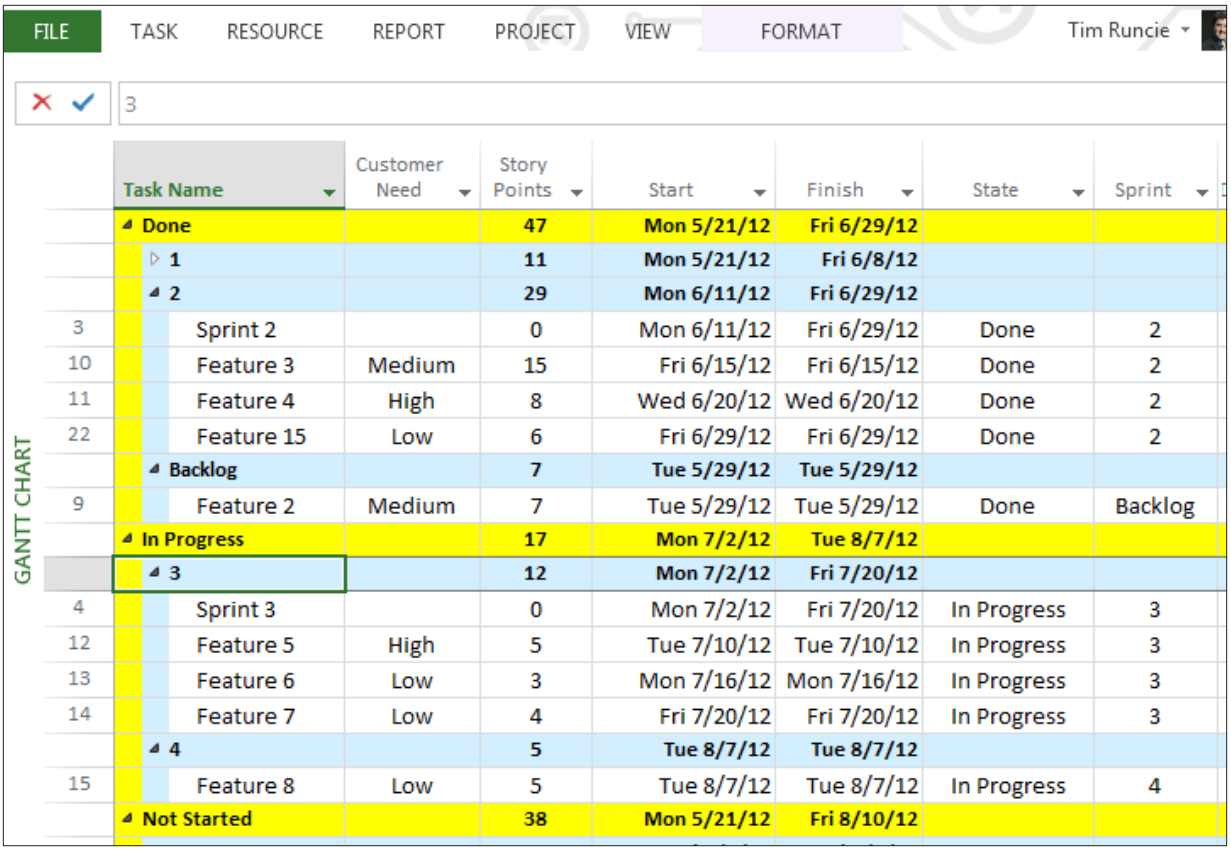


	Task Name	Customer Need	Story Points	Start	Finish	State	Sprint
1	**Sprints**		**0**	**Mon 5/21/12**	**Fri 8/10/12**		
2	Sprint 1		0	Mon 5/21/12	Fri 6/8/12	Done	1
3	Sprint 2		0	Mon 6/11/12	Fri 6/29/12	Done	2
4	Sprint 3		0	Mon 7/2/12	Fri 7/20/12	In Progress	3
5	Sprint 4		0	Mon 7/23/12	Fri 8/10/12	Not Started	4
6							
7	**Features**	**High**	**102**	**Mon 5/21/12**	**Tue 8/7/12**		
8	Feature 1	Low	8	Tue 5/22/12	Tue 5/22/12	Done	1
9	Feature 2	Medium	7	Tue 5/29/12	Tue 5/29/12	Done	Backlog
10	Feature 3	Medium	15	Fri 6/15/12	Fri 6/15/12	Done	2
11	Feature 4	High	8	Wed 6/20/12	Wed 6/20/12	Done	2
12	Feature 5	High	5	Tue 7/10/12	Tue 7/10/12	In Progress	3
13	Feature 6	Low	3	Mon 7/16/12	Mon 7/16/12	In Progress	3
14	Feature 7	Low	4	Fri 7/20/12	Fri 7/20/12	In Progress	3

Figure 4-2 Agile Methodology Scheduling Approach.

In the next example, we use project's fields that to group by a Burn Down view, showcasing features, sprints and key work that is being managed, by simply grouping by the state of the work (done, in progress, backlog, etc.).

Remember you can quickly and efficiently embed these as tables or views in project to quickly re-organize the schedule back into any manner of layout (WBS, Waterfall, etc.) as desired.



	Task Name	Customer Need	Story Points	Start	Finish	State	Sprint
	Done		**47**	**Mon 5/21/12**	**Fri 6/29/12**		
	1		**11**	**Mon 5/21/12**	**Fri 6/8/12**		
	2		**29**	**Mon 6/11/12**	**Fri 6/29/12**		
3	Sprint 2		0	Mon 6/11/12	Fri 6/29/12	Done	2
10	Feature 3	Medium	15	Fri 6/15/12	Fri 6/15/12	Done	2
11	Feature 4	High	8	Wed 6/20/12	Wed 6/20/12	Done	2
22	Feature 15	Low	6	Fri 6/29/12	Fri 6/29/12	Done	2
	Backlog		**7**	**Tue 5/29/12**	**Tue 5/29/12**		
9	Feature 2	Medium	7	Tue 5/29/12	Tue 5/29/12	Done	Backlog
	In Progress		**17**	**Mon 7/2/12**	**Tue 8/7/12**		
	3		**12**	**Mon 7/2/12**	**Fri 7/20/12**		
4	Sprint 3		0	Mon 7/2/12	Fri 7/20/12	In Progress	3
12	Feature 5	High	5	Tue 7/10/12	Tue 7/10/12	In Progress	3
13	Feature 6	Low	3	Mon 7/16/12	Mon 7/16/12	In Progress	3
14	Feature 7	Low	4	Fri 7/20/12	Fri 7/20/12	In Progress	3
	4		**5**	**Tue 8/7/12**	**Tue 8/7/12**		
15	Feature 8	Low	5	Tue 8/7/12	Tue 8/7/12	In Progress	4
	Not Started		**38**	**Mon 5/21/12**	**Fri 8/10/12**		

Figure 4-3 Agile Methodology Grouping

Waterfall (Project Lifecycle by Phase) Scheduling Approach

While we can write an entire chapter on just the Waterfall approach to planning and scheduling, we want to introduce the idea of waterfall planning activities that follow a lifecycle, phases, stages and time lapsed series of work activities.

This is very common in planning. Do note that in some portions of a project schedule, there are iterative or agile activities. These can be embedded and managed within on overall waterfall project schedule.

Waterfall scheduling methodology is a very popular version for the systems development lifecycle model for software development. The waterfall model defines a development method that is linear and sequential, with tasks following each other leading to a deliverable or a milestone for each phase of development. The overall concept that time phased work flows forward. Once a phase of development is completed, the development proceeds to the next phase and there it is not revisited.

The advantage of waterfall development is that it allows for work to be segmented and managed by functional groups, departments. A schedule can be set with deadlines for each stage of development and a product can proceed through the development process similar to an assembly line, and theoretically, be delivered on time. Development moves through phases, typically from concept, through design, implementation, testing, installation, troubleshooting, and ends up at operation and maintenance. In most waterfall planning, the phases of development proceed in strict order, without any overlapping or iterative steps.

The disadvantage of waterfall development is that it does not allow for much reflection or revision and if there are iterations that need to revisit or retouch work, the planning layout has to be handled differently. A good example is that once an application is in testing, it is very difficult to go back and change something that was not well-thought out in the concept stage. Other approaches or supplemental approaches to the waterfall methodology include joint application development (JAD), rapid application development (RAD),or sometimes JRAD, Joint Rapid Application Development, to update, fix and address product or solution defects.

Key Benefits of Waterfall Scheduling

- Easy to Organize and Visualize planning and managing of project work activities
- It can and is used for System or Software Development
- Works well for assigning large work to different groups to manage and hand off
- Lays out timeline planning for deliverable driven planning
- Project goes through distinct lifecycle, from requirements to design, implementation, testing and deployment

Below is an example of a Waterfall scheduling, also organized by a phased lifecycle. Remember that Waterfall organizes tasks that traditionally have a path or predecessor / successor process and unfold linearly.

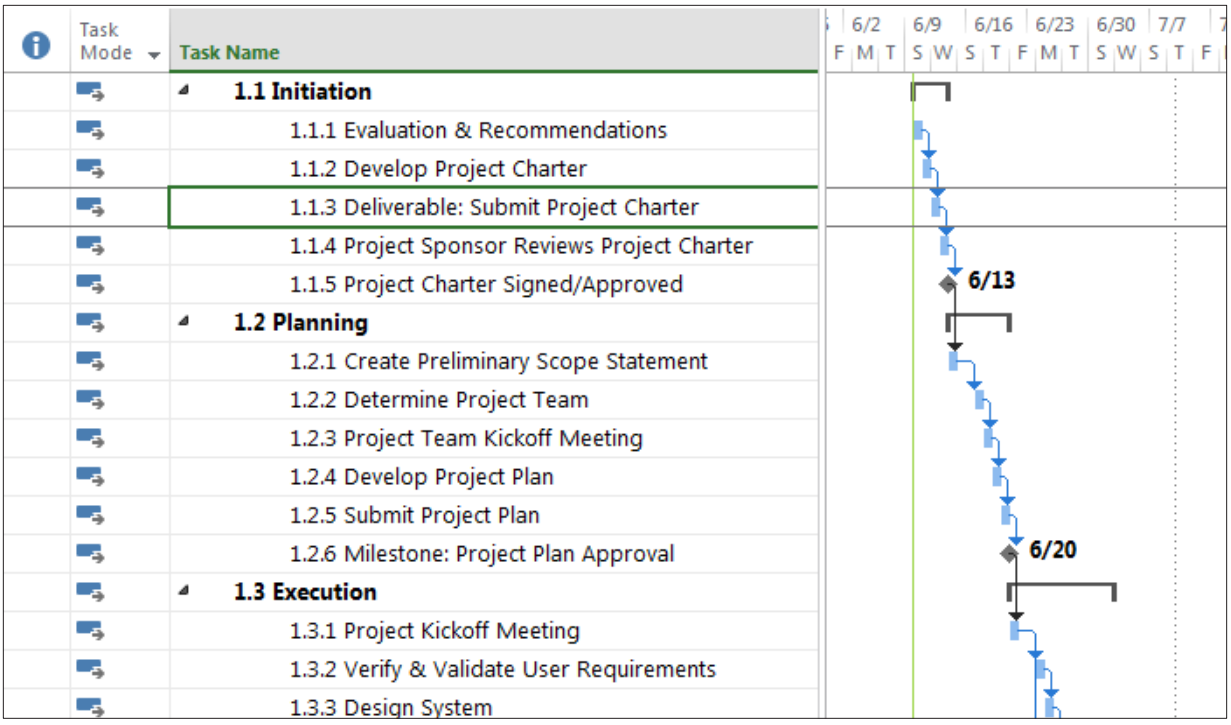


Figure 4-4 Waterfall Methodology Scheduling Approach

Creating the Work Breakdown Structure

Once the tasks of the project are established, the next step is to enter the tasks into the project schedule and create a WBS structure. Entering tasks may be a manual keying process or they may be imported from a SharePoint list (Project 2013 Pro only), an Excel workbook, an Outlook task list or a Word document. Tasks may also be copy and pasted into project schedules. This lesson addresses the manual entering of tasks into the project schedule.

In this lesson, we will discuss:

- WBS
- Entering tasks
- The Task Information Form
- Outlining tasks into a WBS Hierarchy
- Displaying WBS code values
- Customizing WBS code numbers
- Manual vs Automatic

Overview of Work Breakdown Structure

The next step in creating a project schedule is to enter the tasks for the project. What work should be planned and how should the tasks be organized? The Work Breakdown Structure or WBS is the task list for the project. How the WBS is structured will have influence reports that are generated from the schedule and ease of managing the schedule. These questions and others need to be answered in order to create a project schedule that will help you manage your projects.

What is a Work Breakdown Structure or WBS?

Simple projects like packing for a trip might not need a plan to accomplish the project. When packing, most people will make of list of the items to pack. Everything on the list is added to the suitcase and the project is completed. Not all projects are this simple.

Larger projects like building a house will require more planning and detail to accomplish the goals of the project. More tasks will be required, more detail and organization to the detail. More data will be accumulated regarding how the project was performed. To accomplish these types of projects, a work breakdown structure or WBS will be required.

The WBS is a hierarchical structure much like an outline list. This structure will contain the work of the project. When developing a WBS the total work of the project is divided into chucks of work. The larger chucks are subdivided into smaller chucks. After the work is divided it is then organized into a hierarchical structure. Within the structure some tasks will serve as titles, some tasks will be goal points and others will contain task work details .

Consider the WBS of a project the same as the foundation for a building. Without a stable foundation the building will not be stable. Having a stable or well-planned WBS will be an asset to the performance of a project. Having an unstable WBS may adversely affect the management of the project schedule.

Task Categories

When building a WBS using MS Project 2013 there are 4 categories of tasks available to use. The categories are:

Project Summary Task: This is a task that will provide title and a grand total for the project. It is the top level task (level 0) and it can be turned on and off as needed.

Summary Tasks: These tasks are section titles that will also provide subtotals throughout the project.

Tasks or Detail Tasks: These are work tasks within the project. Work tasks will carry the work and duration for the project as well as costs. Resources or workers will be assigned to this task category and tracking will occur for these tasks.

Milestones: Milestones are points in time. They become the goal points within the project and can provide high level timeline reports.

Entering Tasks

Entering tasks into Project 2013 is as easy as typing the task name into the Task Name field. When entering a new task, keep in mind that data is being populated in an array of fields for that row; several hundred fields will be created and some populated. After tasks are entered they may be moved, deleted, or copy/pasted to other areas of the schedule. It is also recommended that the Project Summary Task be turned on to aid in schedule development.

To turn on the Project Summary task:

- Click on **Format → Project Summary Task** (In the show/hide section on the right)
- Click the **check box** to turn on

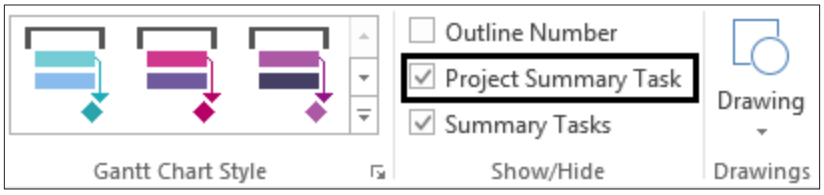


Figure 4-5 Project Summary Task

To enter a new task:

- Click the **Task Name** field on the row you would like to enter and type the task name.

To move a task to another location in the schedule:

- Left Click on the task number (ID) in the left column. Hold the click down and wait for the 4 way arrow to appear and drag to the task to the new location. (Works well when the new location can be seen on the screen)

  OR
- Click on the **task number** of the task you wish to move
- Click **copy** (or cut)
- Scroll to the new location
- Click **Paste** – Project 2013 will insert the pasted task

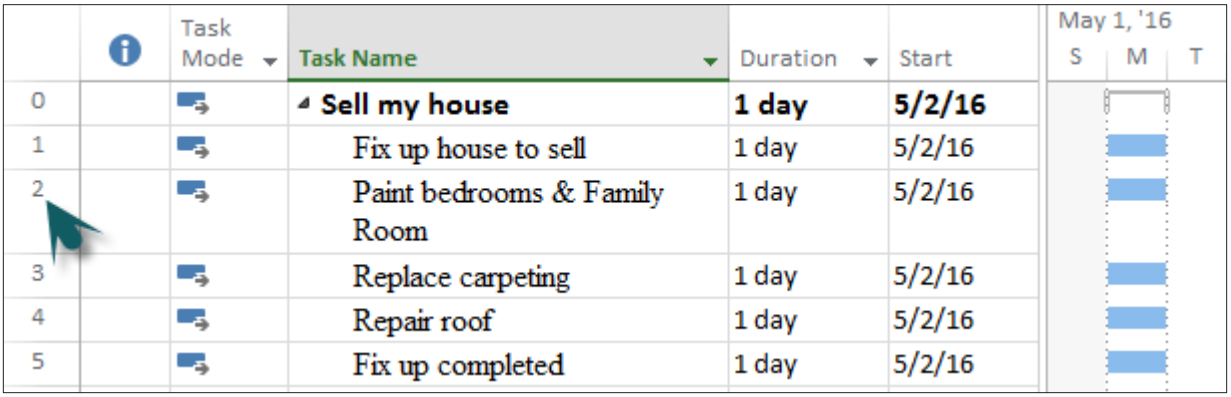


Figure 4-6 Task number

Entering blank lines to receive the moved tasks is not necessary. The schedule will insert the lines and move tasks down to accommodate the moved tasks.

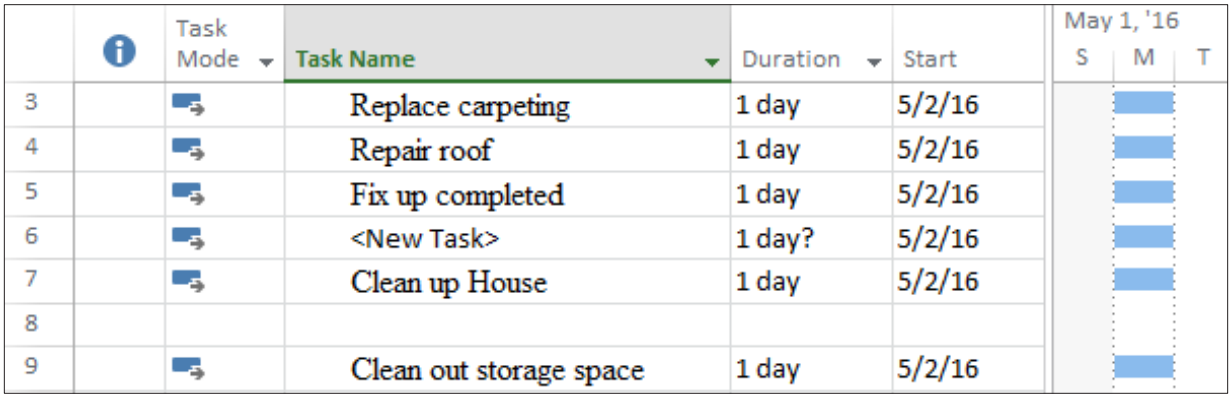
To add blank lines schedule between existing tasks:

- Right click on the **task** below the location of the new task to be inserted

- Click **Task → Task** – a blank row will be created above the task selected

  OR
- Click on a task
- Click **Insert** key on the keyboard

In the view below task 6 was entered using the Task → Task insert method. Note the default data and `<New Task>` name entered. Task 8 was the result of clicking the `Insert` key on the keyboard.



	Task Mode	Task Name	Duration	Start
3		Replace carpeting	1 day	5/2/16
4		Repair roof	1 day	5/2/16
5		Fix up completed	1 day	5/2/16
6		<New Task>	1 day?	5/2/16
7		Clean up House	1 day	5/2/16
8				
9		Clean out storage space	1 day	5/2/16

Figure 4-7 Task 6 was created by clicking on the "Clean Up House" task and click on the Insert → Task button on the Task ribbon. Task 8 was created by clicking on the "Clean out storage space" task clicking the `Insert` key on the keyboard.

To delete tasks from the schedule:

- Right click the task to be deleted
- Click **Delete Task** option

  OR
- Click the task to be deleted
- Click the **`Delete`** key on the keyboard

If you have clicked anywhere within the task row and deleted the task a Smart Tag will appear to ask if you want to clear the field or delete the task.

In the view below the result of clicking on the Smart Tag (the X with the down arrow) is shown. Make your selection from the choices in the box below.

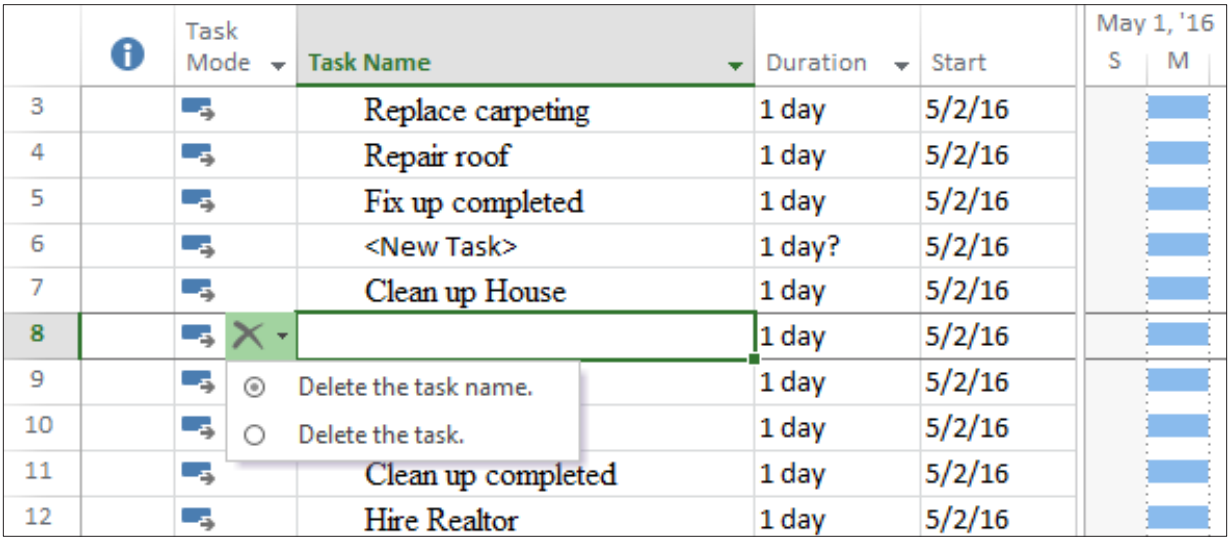


Figure 4-8 Smart tag asking the user to select if the task name should be cleared or the entire task deleted.

Moving and Copying Tasks

If you want to create a task that is similar to an existing task, you can copy the existing task and then modify the copy.

To copy a task:

1. Select the entire row of the task you want to copy by clicking on its ID field. If you only want to copy one field, such as the task name, select only that field.
2. In the **Task** Tab, **Clipboard** group, click **Copy**. Project copies the task to the Clipboard.
3. Select the task below the line the task will be inserted.
4. In the **Task** tab, **Clipboard** group, click **Paste**.

Keyboard shortcuts **Ctrl+C** (copy) and **Ctrl+V** (paste) will work as well.

You can also copy a single cell of data, rather than the entire task row.

Be aware that when you paste the contents of a single field, Project overwrites the contents of the field into which you paste. If you paste the single field into a blank row, Project creates a new task.

To move a task:

1. Click the ID number of the task to select the entire row.
2. Drag the entire task to the new location, between two existing tasks.

If you drag the contents of a single field to another field, Project overwrites the contents of the field.

If you move a task that is within a series of tasks that are linked sequentially, Project automatically adjusts the link relationships of the remaining tasks to reflect the new task order. Project does this only if the current task is linked to the task directly above and below. The moved task will maintain the original link to predecessors. Linking to a new series will need to be done manually.

Task Information Form

The Task Information box is a source of easy access for some of the frequently used fields on the task side of the data for a Project 2013 project schedule. Data entered in the form is the same as entering data into a column in a table for a task. Using this box is a quick and easy way to view and maintain task information.

To access the Task Information Form:

- Double click an **task data** field within a task

  OR
- Click on a **task**
- Task **ribbon** → **Information**

The form below will appear:

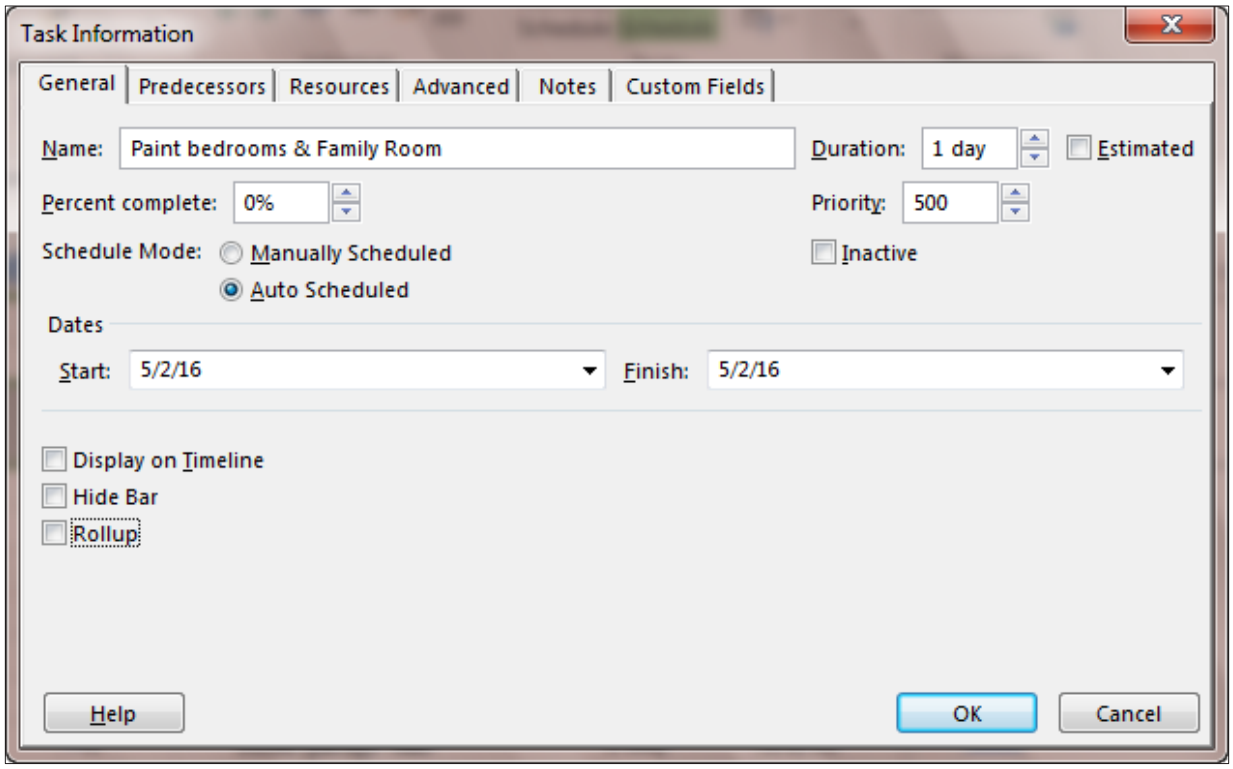


Figure 4-9 Task info box

The form contains several tabs of information, grouped by subject. Each tab will allow access to the Task name, Duration and Estimated flag.

General tab: contains Name, Duration, Percent complete, Priority, Schedule Mode, Inactive, Start and Finish dates, Display on Timeline, Hide Bar and Rollup.

Predecessors: contains information concerning task relationships.

Resources: contains information concerning resources assigned to the task.

Advanced: contains information concerning Deadlines, Constraints, Task Types, Task Calendars, Effort-driven flag, WBS number and Milestone flag for the task.

Notes: general notes area for the task

Custom fields: If task level custom fields (user-defined) were created for the project, they would be accumulated and accessible through this area.

Data may be changed in multiple tasks at the same time. Select the tasks to be changed and then click on the Information icon on the Task bar. The box that appears is called the Multiple Task Information box. Make the changes and click OK to update.

		Task Mode	Task Name	Duration	Start	May 1, '16 S M
0			**Sell my house**	**1 day**	**5/2/16**	
1			Fix up house to sell	1 day	5/2/16	
2			Paint bedrooms & Family Room	1 day	5/2/16	
3			Replace carpeting	1 day	5/2/16	
4			Repair roof	1 day	5/2/16	
5			Fix up completed	1 day	5/2/16	

Figure 4-10 Select multiple tasks

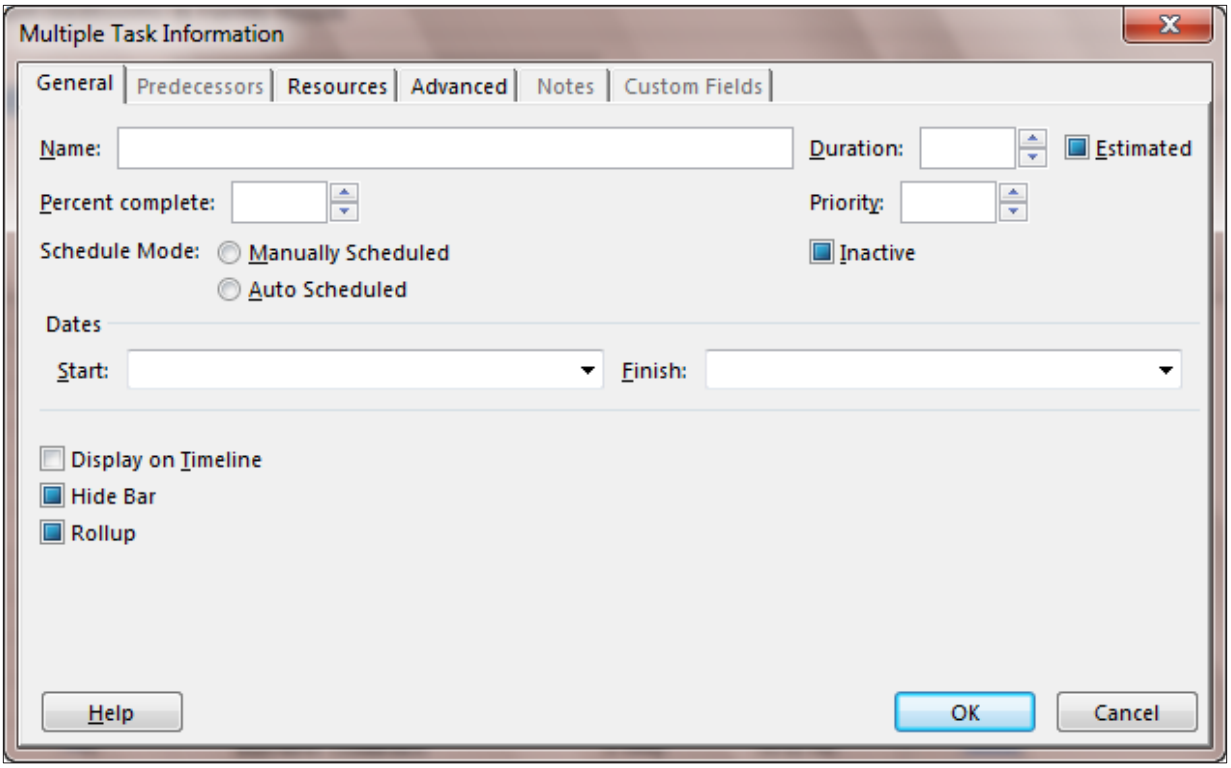


Figure 4-11 Multiple task info box

Selecting multiple tasks and then clicking on the Information icon will allow for values to be changed for all of the selected tasks.

Outlining Tasks into a Hierarchy

Once tasks are entered, the WBS outline structure may be created. To create the outline structure, tasks will be indented or outdented. These buttons are located on the Task ribbon in the schedule section and are the green arrows in the lower left corner. The indent button is pointing to the right. The outdent button is pointing to the left. See below:

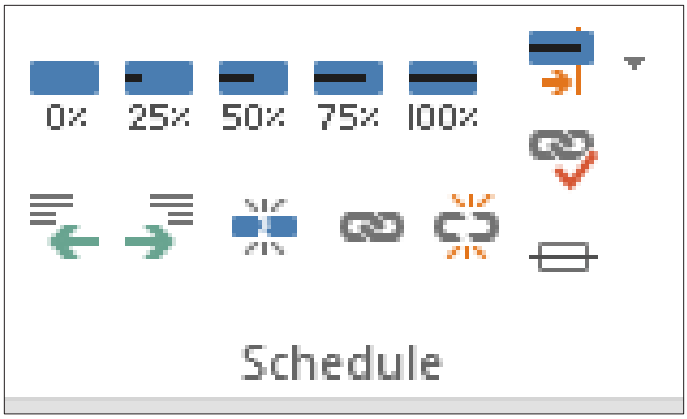


Figure 4-12 Schedule section of Task ribbon bar. Outdent is in the lower left corner, arrow pointing to the left. Indent has the Arrow pointing to the right.

To indent a task:

- Click the task to be indented
- Click the **indent** (pointing right green arrow)

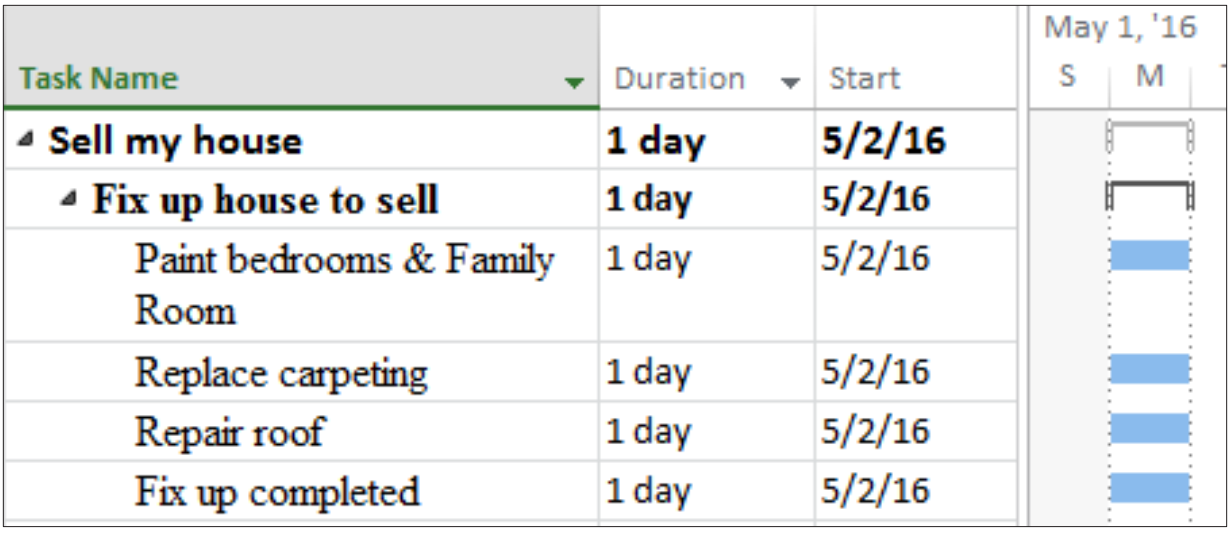
  OR
- Place the mouse pointer over the task and a horizontal arrow will appear. Left click and drag the task to the right

To outdent a task or remove an indention:

- Click the task to be outdented
- Click the **outdent** (left pointing green arrow)

  OR
- Place the mouse pointer over the task and a horizontal arrow will appear. Left click and drag the task to the left

When a task has an indented task below it, the task becomes a summary task. Summary tasks are represented as black bars on the Gantt chart as shown below:



Task Name	Duration	Start
Sell my house	**1 day**	**5/2/16**
Fix up house to sell	**1 day**	**5/2/16**
Paint bedrooms & Family Room	1 day	5/2/16
Replace carpeting	1 day	5/2/16
Repair roof	1 day	5/2/16
Fix up completed	1 day	5/2/16

Figure 4-13 The task named "Fix up house to sell" became a Summary task when all of the tasks below it were indented. Note the summary task formatting on the Gantt Chart.

Indenting and outdenting can be confusing. At times it is difficult to achieve the desired structure results.

When indenting, work from the top down. When outdenting, work from the bottom up.

To see the levels of the WBS:

Project Summary tasks and Summary Tasks will have a small box to the left of the summary task name as seen in the screen above.

- Click the **plus** sign + to expand tasks
- Click the **minus** sign – to collapse tasks

Use the Outline button to jump to a level of detail:

Click on **View** → **Outline**:

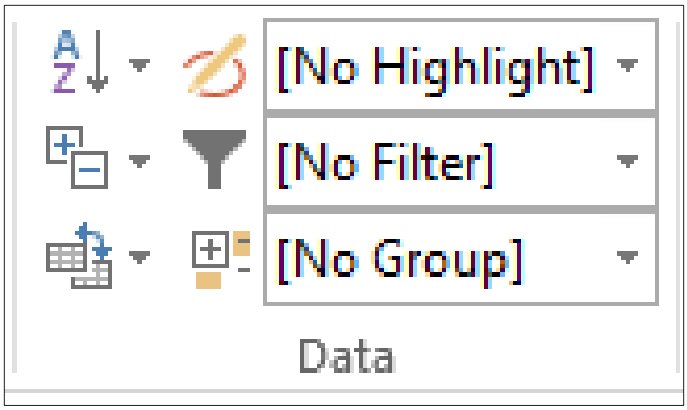


Figure 4-14 The Outline button is in the Data section of the View ribbon bar. Use this button to view various levels of the WBS.

When the **Outline** down arrow is clicked, the following choices appear:

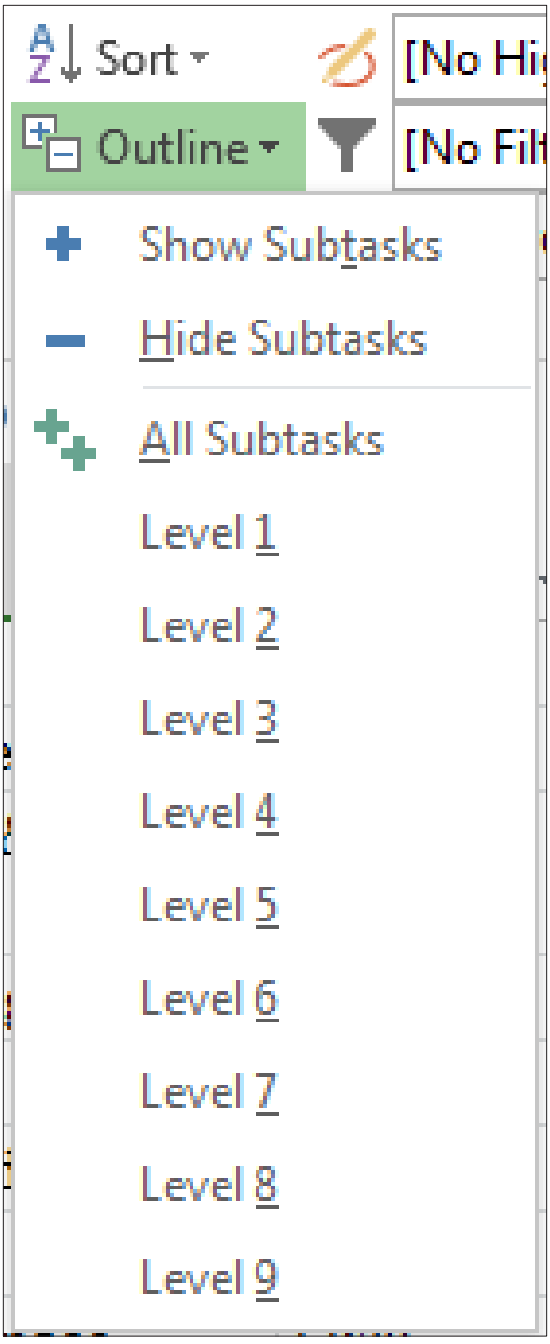


Figure 4-15 Clicking on the Outline button will reveal choices for selecting the outline detail level to view.

The following image shows a view of a collapsed WBS – **Outline level 1** was selected. Note the rolled up view of the tasks:

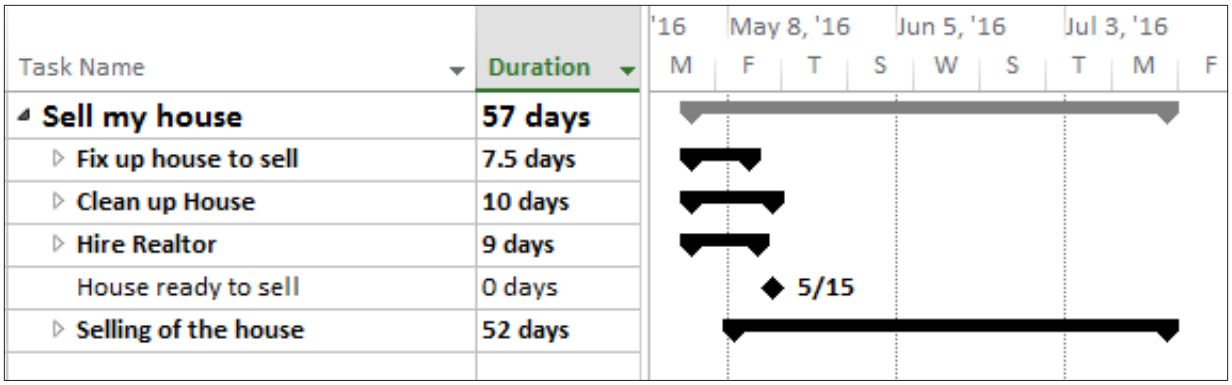


Figure 4-16 The result of selecting Outline 1 which will collapse the detail to the highest level

The following image shows a view of an expanded outline WBS – **All Sub-tasks** was selected:

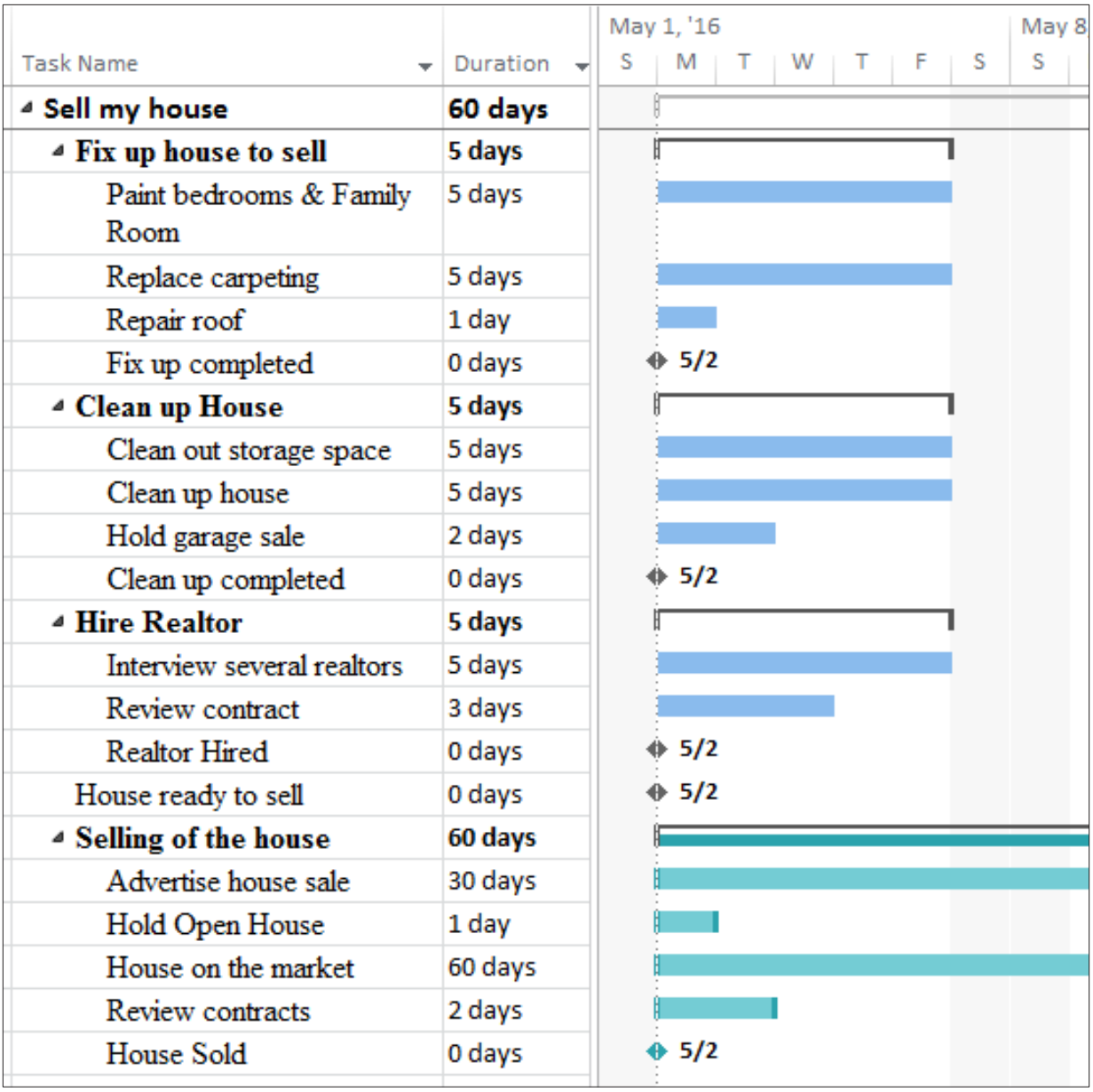


Figure 4-17 All tasks

Clicking **Project Summary** task and then **Hide Subtasks** will collapse the project down to just the Project Summary task.

If the outline is collapsed, clicking **All Subtasks** will show all tasks at all

levels of the WBS.

The outline list offers the option to create up to 9 WBS levels. There are many more levels available in Project 2013 but it is advised that WBS levels should not exceed 5. The more WBS levels there, the more confusing and cumbersome a WBS may become.

Displaying Outline Numbers & WBS

As the WBS structure is created, an automatic numbering sequence is also created within the task list. The numbers represent where in the WBS structure the tasks reside. This is a unique numbering scheme and numbers are automatically reassigned as tasks are moved around the WBS structure. There are default number values and customized WBS number values. In this lesson, we will address the standard WBS values; the following lesson will address the customized values available.

To view insert the WBS column into a table:

- In the Gantt chart view right click on a column heading. To Insert a column into a table, right click on the column header to the right of where you would like the inserted column to be located. After the column is inserted it may be moved to an alternate location if needed.
- Select Insert Column
- Click the W key on the keyboard
- Select "WBS"
- Click OK

Below is an example of WBS numbering schema:

WBS	Task Name
0	**Sell my house**
1	**Fix up house to sell**
1.1	Paint bedrooms & Family Room
1.2	Replace carpeting
1.3	Repair roof
1.4	Fix up completed
2	**Clean up House**
2.1	Clean out storage space
2.2	Clean up house
2.3	Hold garage sale
2.4	Clean up completed
3	**Hire Realtor**
3.1	Interview several realtors
3.2	Review contract
3.3	Realtor Hired
4	House ready to sell
5	**Selling of the house**
5.1	Advertise house sale
5.2	Hold Open House
5.3	House on the market
5.4	Review contracts
5.5	House Sold

Figure 4-18 The WBS column is displaying the system assigned WBS numbers associated with the tasks.

Because automatic WBS numbers are updated as tasks are moved or added to the WBS, it is not recommended that these numbers be used as a task tracking number. If a task tracking number is desired, consider using the field called "Unique ID". This field is the order, in which tasks were added to the schedule and they will always be unique and will not be duplicated within a schedule.

Collapsing and Expanding the Outline

One of the main benefits of outlining is that you can control the level of detail that Project displays. For example, if you want to inform upper management about the status of your project, they may not be interested in the daily tasks, only the major phases. You can collapse the outline to display only summary tasks, you can expand the outline to display all of the tasks, or you can display the subtasks for some summary tasks, but not for others.

There are carat symbols to the left of the Summary task names. Clicking on these symbols will allow for expansion or collapsing of the WBS. If the carat is black and pointing down (◢), that means all of the tasks are expanded for that summary grouping. If the carat is clear and pointing to the right (▷), the summary grouping is collapsed.

To collapse the schedule outline:

1. Select the desired Summary task.
2. Click the ◢ to the left of the Summary task.

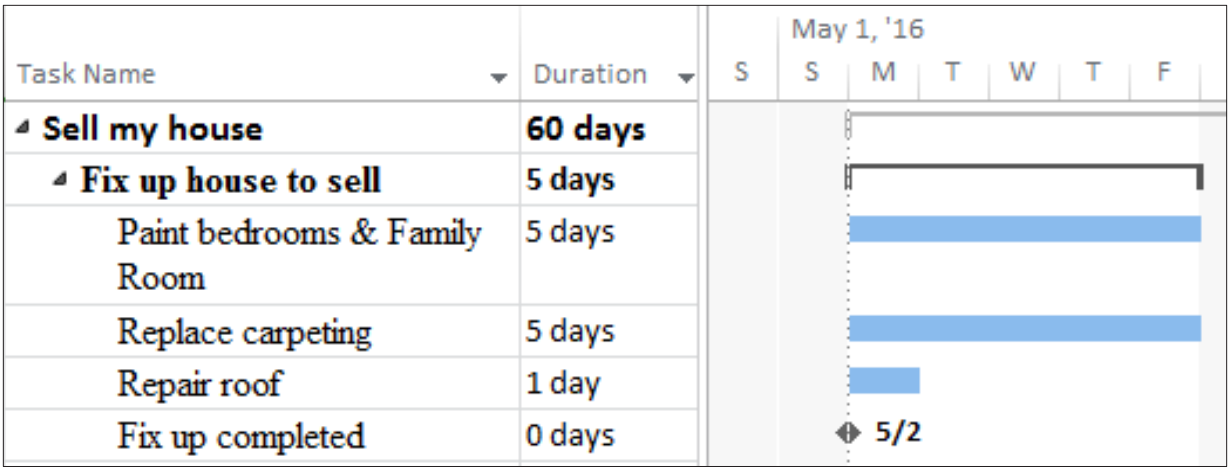


Figure 4-19 Expanded task details

To expand the schedule outline:

1. Select the desired Summary task.
2. Click the plus (+) sign icon to the left of the Summary task.

Figure 4-20 Collapsed task detail

Customizing WBS Codes

The user has the option of customizing WBS numbers using a **Code Mask** and values entered by the user. When this option is evoked, additional options to re-number the WBS, enforce value uniqueness and optionally generate WBS numbers become available. The customized number values are helpful when manging multiple projects or if there is a need to reference numbers unique to a project schedule. They are also helpful if using templates that result in frequently used task names. These codes could indicate which tasks are members of which project schedules and where the tasks are located within the project schedule.

To customize the WBS numbers:

- Project → WBS button → Define

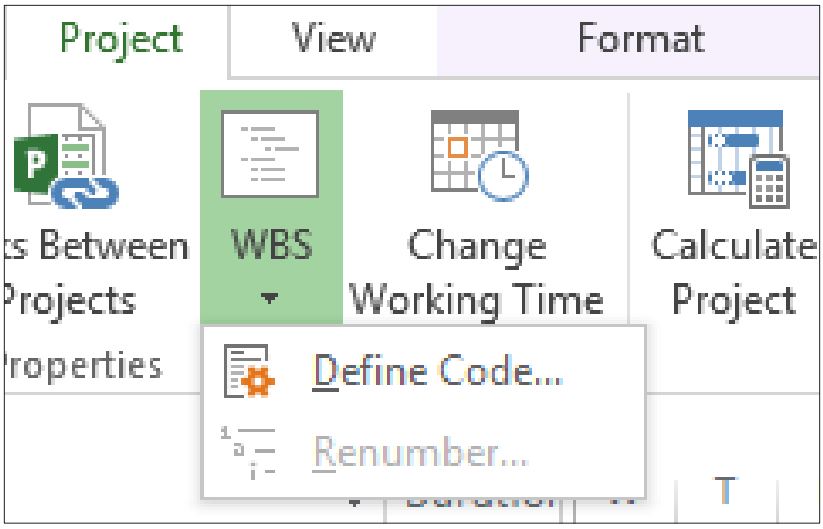


Figure 4-21 WBS define code box

- **Project Code Prefix**: use this value to enter a code that will represent an abbreviation that applies to all WBSs for the project schedule.
- **Sequence**: select the data type for the Code Mask to be created (i.e.: Numbers, Uppercase letters, lower case letters or numbers)
- **Length**: number of values for the length of the value
- **Separator**: Character symbol - . , - + or /

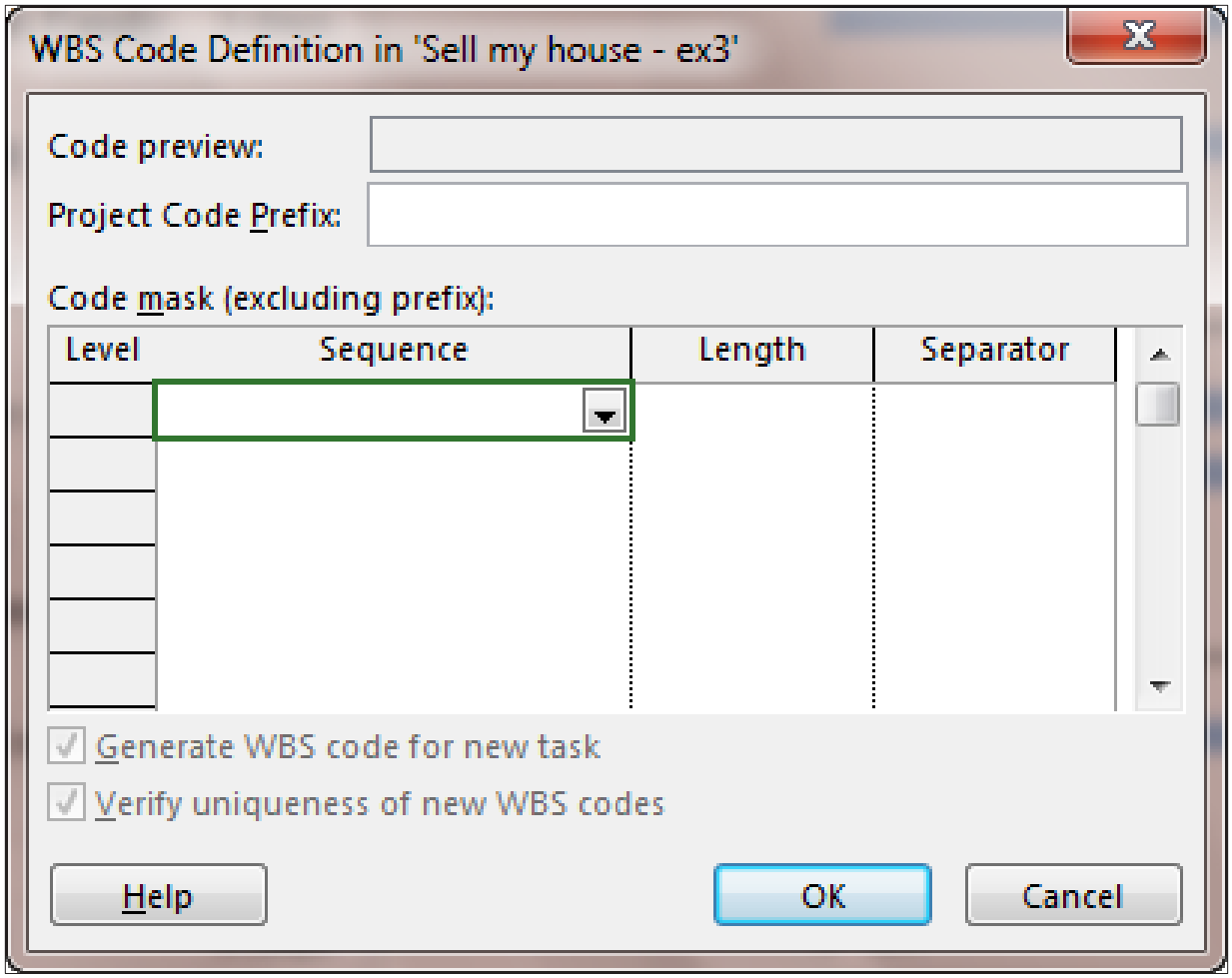


Figure 4-22 Use the above form when defining a customized WBS code for your project schedule

Select as many lines as necessary to create your “Code Mask” and click **OK**

Below is an example of a customized mask for WBS codes:

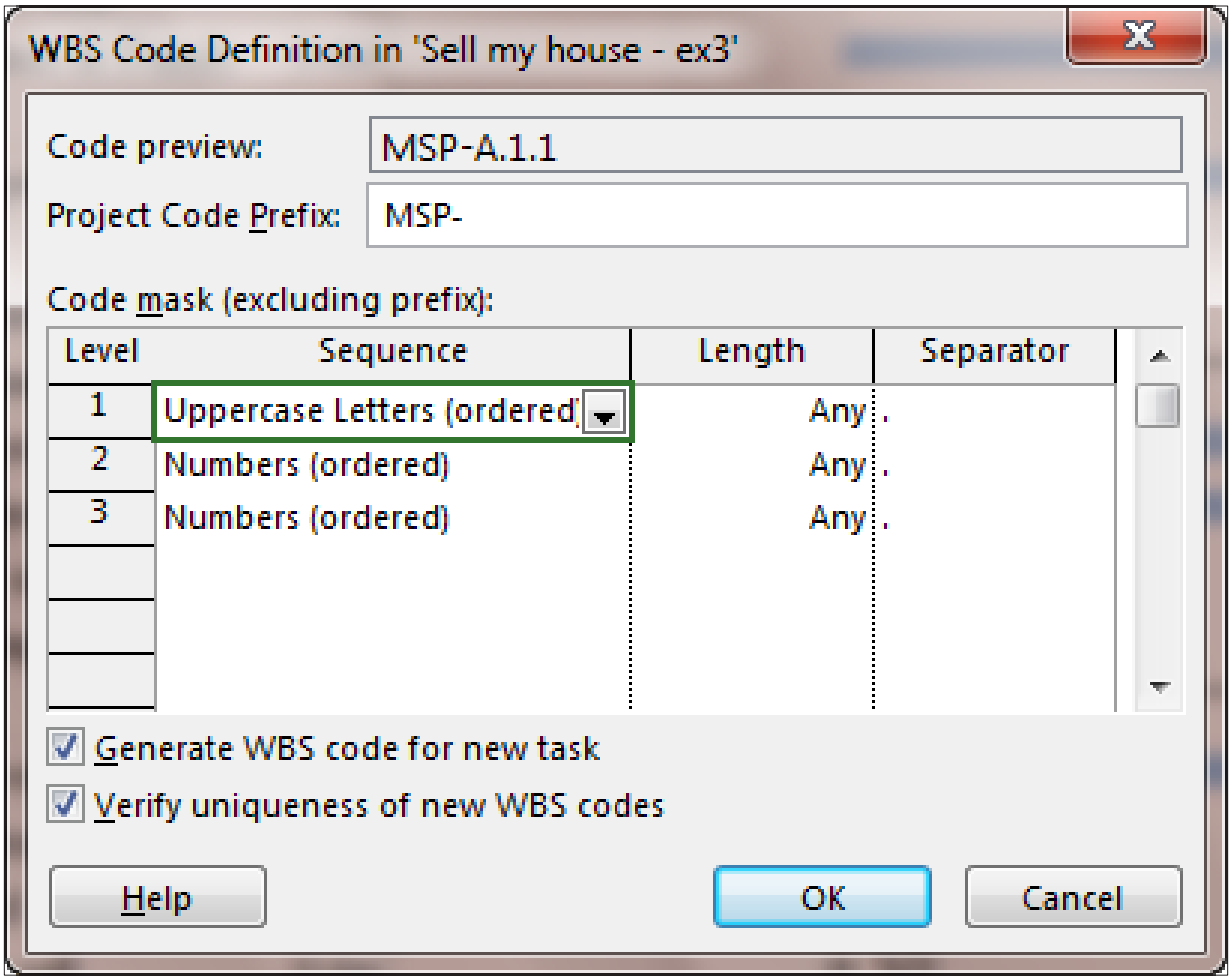


Figure 4-23 Example of customized WBS code mask

Below is the result of the customized WBS values:

		WBS	Task Name	Start	Finish	Baseline Star
0		MSP-	**Software Development visual reports**	1/16/13	7/5/13	1/1
1		MSP-A	**Scope**	1/21/13	2/19/13	1/1
2		MSP-A-1	Determine project scope	1/21/13	1/25/13	1/1
3		MSP-A-2	Secure project sponsorship	1/25/13	2/5/13	1/2
4		MSP-A-3	Define preliminary resources	2/10/13	2/19/13	1/3
5		MSP-A-4	Secure core resources	1/21/13	1/29/13	1/1
6		MSP-A-5	Scope complete	2/19/13	2/19/13	2/
7		MSP-B	**Analysis/Software Requirements**	2/15/13	3/19/13	2/
8	✓	MSP-B-1	Conduct needs analysis	2/15/13	2/28/13	2/
9	✓	MSP-B-2	Draft preliminary software specifications	3/1/13	3/6/13	2/1
10	✓	MSP-B-3	Develop preliminary budget	3/6/13	3/11/13	2/1
11	✓	MSP-B-4	Review software specifications/budget	3/11/13	3/12/13	2/2

Figure 4-24 Display of view containing customized WBS values

When a **Code Mask** is created, the options to **Generate a new WBS** for a new task and **Verify uniqueness of new WBS codes** become available.

To renumber the tasks based on the mask values:

- Project → WBS → Renumber

Renumbering may be applied to selected tasks only or the entire project.

Be aware:

To remove a mask: delete lower level entries first and work upwards to higher levels.

After removing the mask, the WBS will not revert back to an unformatted state but will remain as the settings for the customized mask.

If WBS values are turned on as part of the task name the original non-formatted value appears and not the customized value. To turn on the WBS value as part of the task name:

From the Gantt Chart click: View → Outline number

The WBS numbers are shown below included with the task names:

WBS	Task Name	Duration
MSP-	**Sell my house**	**60 days**
MSP-A	**1 Fix up house to sell**	**5 days**
MSP-A.1	1.1 Paint bedrooms & Family Room	5 days
MSP-A.2	1.2 Replace carpeting	5 days
MSP-A.3	1.3 Repair roof	1 day
MSP-A.4	1.4 Fix up completed	0 days
MSP-B	**2 Clean up House**	**5 days**
MSP-B.1	2.1 Clean out storage space	5 days
MSP-B.2	2.2 Clean up house	5 days
MSP-B.3	2.3 Hold garage sale	2 days
MSP-B.4	2.4 Clean up completed	0 days
MSP-C	**3 Hire Realtor**	**5 days**
MSP-C.1	3.1 Interview several realtor	5 days
MSP-C.2	3.2 Review contract	3 days
MSP-C.3	3.3 Realtor Hired	0 days

Figure 4-25 WBS numbers included as part of the task name.

Guidelines for Creating a WBS

By following some guidelines for creating your Work Breakdown Structure, you can achieve a more effective and manageable project schedule. The WBS's purpose is to help manage a project schedule. When created without guidelines, the project schedule is in danger of becoming another project.

- The WBS is not a to-do list. Are you managing tasks or are you managing a to–do checklist? Usually, tasks or deliverables are entered into the project schedule. Checklists or Work Breakdown Structure dictionaries which contain more detail of how to accomplish the tasks are kept in another location such as a Word Document, Excel Workbook or SharePoint list.
- Identify deliverables within the WBS. Work from deliverable to deliverable in the development of the schedule.
- Break the deliverables into assignable work. When the task is at too high a level, establishing the work, assignments, order and relationships between tasks becomes more difficult.
- Establish a standard design for each section of work. An example of this would be:

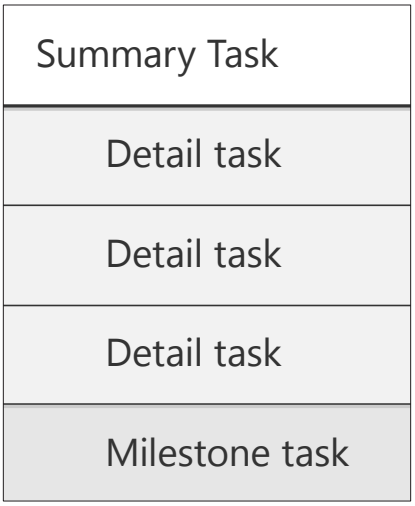


Figure 4-26 Standard design example

Using this format will allow for creating high level reports (Milestone reports) easily as well as moving sections of deliverables around easily.

- A naming standard for naming tasks is helpful and establishes consistency:
  - **Summary tasks**: these names should be nouns that describe the work to be completed in the section of work.

    Examples: Location, Network design, Clean-up, Foundations, Development, Requirements. Training, Pilot, Unit Testing
  - **Detail tasks**: should be action verbs and a noun which describes the work that is to be completed for the task.

    Examples: Build test database, Review requirements, Develop preliminary budget, Create training materials, Modify code
  - **Milestones**: should be used as goal dates within a project schedule. Naming standards for milestones should be past-tense adverbs.

    Examples: Development completed, Vendors contracted, New Facility Opened, Software selected, Integration testing completed
- Every summary task should have at least two subtasks. Detail tasks and milestones can be in the WBS without being part of a summary task grouping.
- Establish maximum and minimum lengths of duration for tasks. Create a rule of thumb based on the length of each project. For example: If you have a 6 month project no task should be less than 1 day and no task will be longer than 2 weeks. Use the rule as a guide for estimating task lengths. If tasks are too long, break the work down further.
- Decide if you will be creating a WBS in the rolling wave approach. The rolling wave approach is used for schedules managing software development or any schedule where all of the details of the project are not known at the beginning of the project. Consider creating place holders for future phases of the project and elaborate the work one phase at a time.
- Deliverables: Completing a section of work means that the deliverable of that section has been accepted. Create a task for the delivery of the deliverable and create a milestone to represent the acceptance of the deliverable. The two are rarely occur at the same time.
- Level of detail. The WBS may contain as many levels of detail as you need but best practices suggest that the higher the level number the more complex the schedule becomes. Recommendations suggest that the detail is manageable using five or less levels.

- If too much detail is put into the project schedule, the schedule will become a project unto itself. The more tasks, the more work.
- Use the WBS to help manage the scope of your project. If the task isn't in the project, consider it out of scope. When you enter tasks into the project schedule, ask yourself if the task is necessary.
- When planning the WBS think about just the work of the project. Many project managers like to start thinking about who will do the work and when. It is a good idea to focus on the work of the project only and think of the work as the "what" of the project. The "who" and "when" will come as the project schedule develops.
- Having the project team or the top level resources help build the WBS for a project is a win-win for the project:
  - Increases resource buy in
  - Encourages resource contribution
  - Many eyes looking at problems from different angles
  - Less probability of missing tasks
  - Encourages team building

Milestones

A milestone is a check point in your project. It is a status, not a task which means that it has no duration and no resources are needed. For example, an approval or sign-off before the project can proceed and the completion of a stage of the project are both milestones. To Project, a milestone is a task with a zero duration.

To enter a milestone, use the following steps:

1. Insert a new task, or click the Task Name of a blank task.
2. Type the name for the milestone in the **Task Name** field and press the **Tab** key.
3. Type "**0**" in the Duration field, and press the **Enter** key.

Milestones are denoted in the Gantt Chart as a diamond symbol, rather than a bar (since the milestone has no duration).

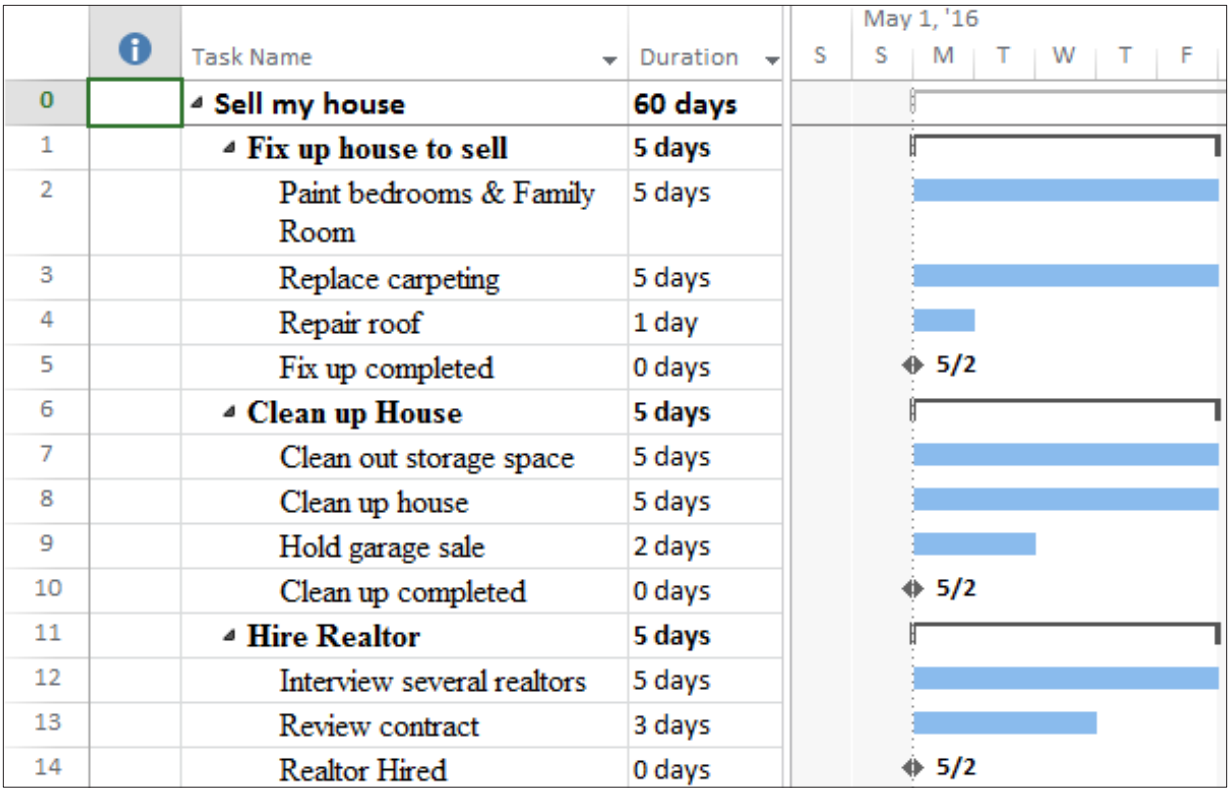


Figure 4-27 In this view tasks 5, 10 and 14 are milestones. They have a zero duration and a milestone icon on the Gantt chart.

Manual vs Automatic

Project 2013 provides two scheduling methods for creating project schedules. The methods are the traditional or automatic scheduling and manual scheduling.

Traditional or Automatic Scheduling

This scheduling method was used in prior versions of MS Project and is contained in Project 2013. After tasks are entered relationships or dependencies are created between the tasks. The task durations with their relationships established the timeline for the schedule. This scheduling method allows for bottom up scheduling where the sum of the detail tasks establishes the time line for the project.

Manual Scheduling

Manual scheduling allows for top-down scheduling where summary tasks may be added first and the details of the project work is completed later. It also permits more unknowns during scheduling process and the ability to complete the details when known. Tasks do not have to contain relationships and scheduling dates may be entered.

Project scheduling mode will be selected on a task by task basis. Manually

scheduled tasks and automatic scheduled tasks may be mixed within the same project schedule. Each task will contain a column called **task mode** which will establish the scheduling mode assigned to a task.

When to Use Manual vs. Automatic Scheduling

Manual vs. automatic scheduling usage will deliver very different results. The amount of information concerning the project that is available to the scheduler when the schedule is created might lend the scheduler to select one method over the other when creating the initial schedule. It may be advantageous to use both scheduling methods within a schedule switching between scheduling methods when needed.

Use Manual Scheduling When

- Minimal information is available about the project and you need to put your ideas (tasks and durations) into an initial schedule.
- Tasks are assigned to specific dates and you are not comfortable with the schedule moving as other tasks are entered or as resources are assigned.
- Using top-down planning – entering duration values for summary tasks followed by detail tasks and milestones to complete the work of the summary tasks.
- Using free form planning of tasks and durations to produce a Gantt chart.
- Need to build a rough schedule for a future project
- Relationships between tasks are not known.

Use Automatic Scheduling When

- More complete information is known about the goals of the project.
- Using bottom up planning. Enter the summary tasks and create WBS structure. The detail tasks within the summaries will calculate the duration of the summary tasks.
- You want the schedule to be dynamic. Tasks will be adjusted reacting to changes within the schedule.
- You want the scheduling engine to calculate dates in the schedule.
- Resource allocations, resource assignments based on hours, earned value and more accurate metrics are needed.

Consider Using a Combination of Both Methods When

- Initial planning may be in manual mode. As decisions are made and more detail is known, tasks may be converted to automatic mode.
- Consider converting to automatic mode when project execution begins. This may be done for the entire project, by phase or range of tasks.

Change to Auto Schedule

The column or field in Project 2013 that determines which scheduling mode a task will be scheduled by is called “Task Mode”. By default, you will see this field on the Entry table of the Gantt Chart. This column may be added to any task table.

Setting the automatic or manual scheduling mode may be accomplished in several ways:

To set the scheduling mode for a project or for all future projects:

- **File → Options → Schedule**

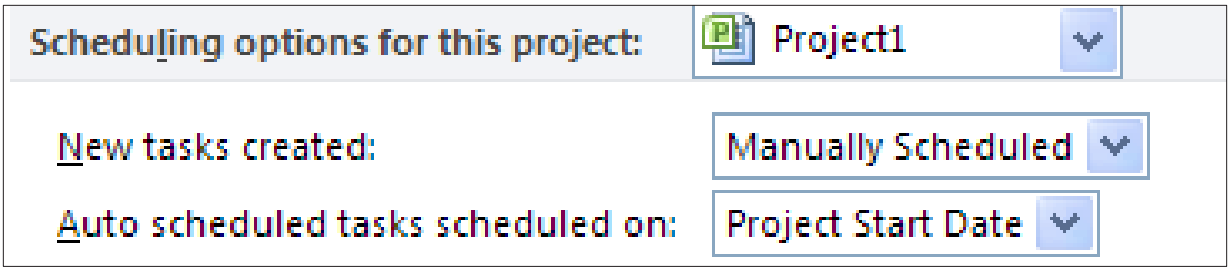


Figure 4-28 Task Schedule Options from the Project Options Dialog Box.

After several tasks are entered you may decide to switch to a different scheduling mode for the addition of future tasks for the project. This can be done quickly using the choice option at the bottom left hand corner of the Gantt Chart view which is shown below. Changing this option will not affect existing tasks in the schedule; it will only affect future added tasks. Click on the button highlighted below for the option to change scheduling modes:

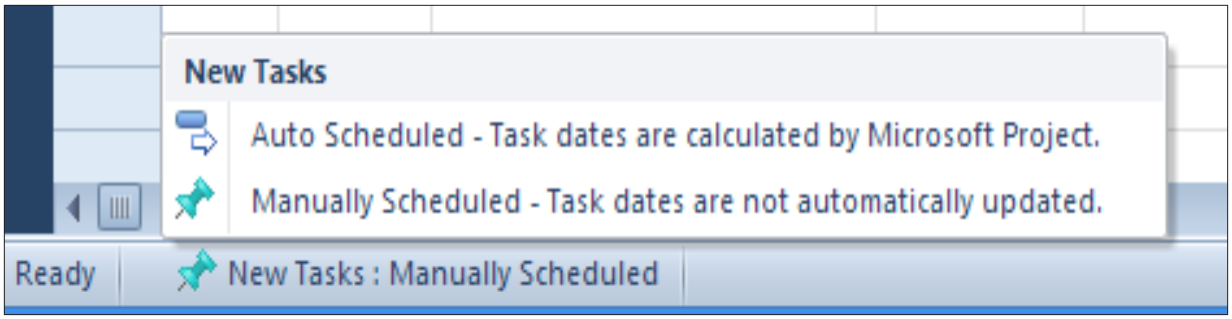


Figure 4-29 Task Schedule Options from the Status Bar.

The default Entry Table for the Gantt Chart includes the "Task Mode" column inserted to the left of the Task Name column. This column may be inserted into any table as needed.. The indicators in this column indicate the scheduling mode for the task. In the view below the automatically scheduled tasks have a icon and the manually scheduled tasks have a icon in the Task Mode column. Hover your mouse pointer over the icon and the scheduling mode description will appear. Clicking on the icon will allow for scheduling mode changes per task. Note the different Gantt bar formats for manual v automatically scheduled tasks.

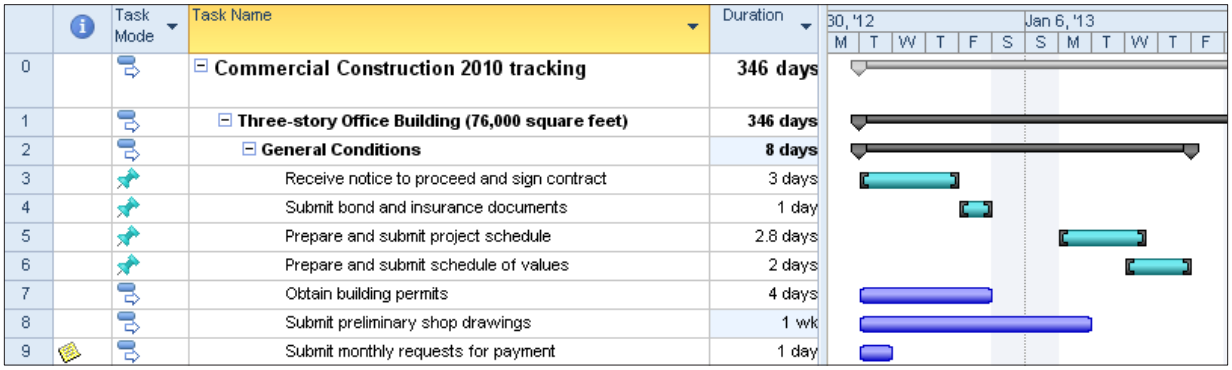


Figure 4-30 Gantt Chart View Showing the Task Mode Column in the Entry Table.

To change the scheduling mode from the Task ribbon:

- Click task to be changed
- Click **Task → Manual Schedule** or **Automatic Schedule**

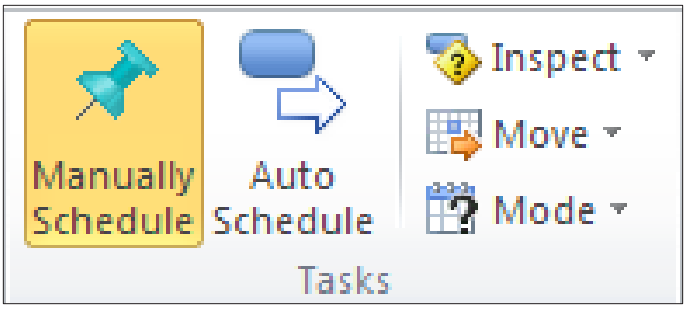


Figure 4-31 Task Schedule Options from the Task Tab on the Ribbon.

Another way to change the scheduling mode is to double clicking a task to open the Task Information dialogue box. An option is located on the General tab to change the scheduling mode. The options are highlighted in the view below.

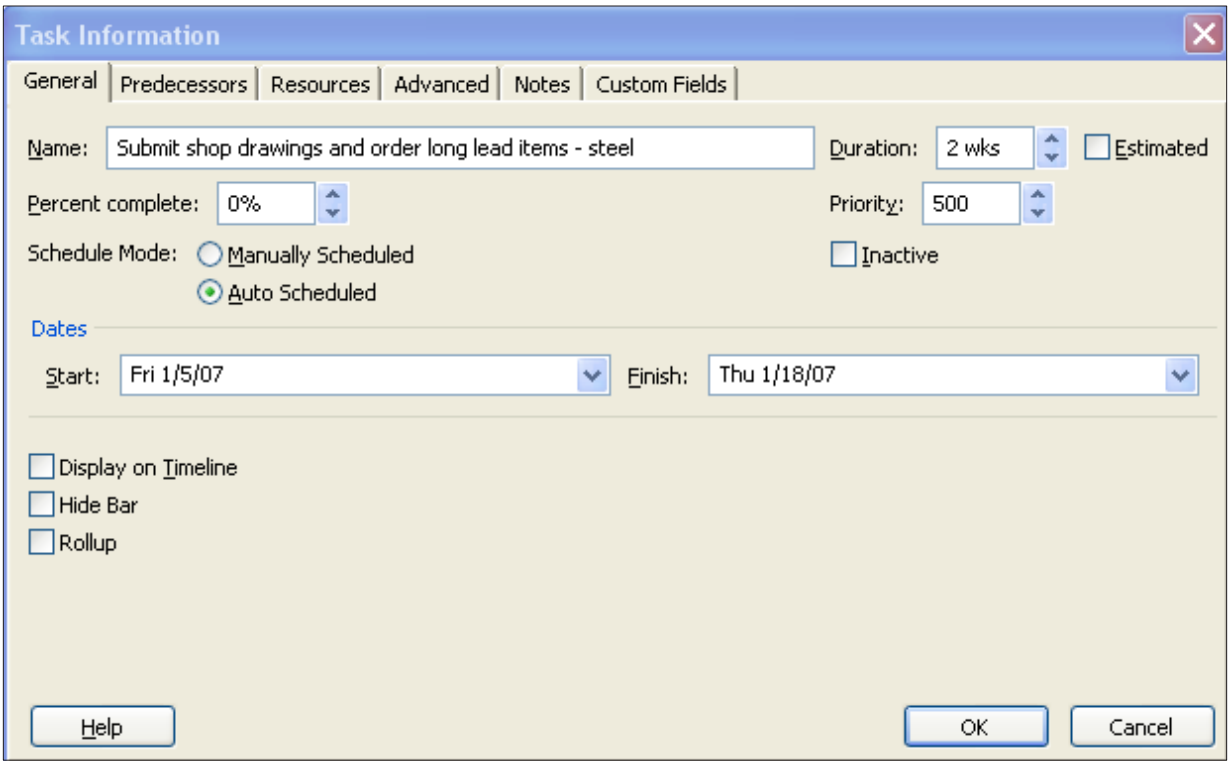


Figure 4-32 Task Schedule Options from the Task Information Dialog Box.

Key Points to Remember

- Project is capable of handling any scheduling methodology, not just traditional waterfall
- The ability to sort, group, filter creates a powerful solution for a project manager or scheduler looking to map demand (work) and integrate that with capacity (resource capability) planning
- Project 2013 has new reporting capabilities that give you efficient review of planning or actual work
- Regardless of your scheduling or methodology preference, using manual, or automatic scheduling gives control of the work planning to the end user. Leveraging a layout approach (Agile, Waterfall, SDLC, WBS, etc.) is up to the end user how they want to sort, group or view the information

Chapter 5

Estimating, Linking and Lead and Lag

Overview of Estimating

Estimating is the ability to make an educated guess as to the duration, work or duration and work of a task. Project Management is both an art and a science. Estimating tasks durations and work draw on the project managers skills and experience during the estimation process. Estimates take into consideration factors such as resource skill, history, and experience. In this lesson we take a look at estimating duration and work.

How Project 2013 Defines and Calculates Work and Duration

It would be helpful to understand the formula that will be driving the scheduling of the tasks before you enter your estimates:

Work = Duration * Units (quantity of a resource)

OR

Duration = Work / Units (quantity of a resource)

Estimating Techniques

- **Top down estimating**: used when performing the same types of projects frequently. Top-down estimating allows for estimating the length of a phase. The details for tasks will follow. Manual scheduling mode in Project 2013 allows for this type of estimating model. You can use this method when you do not have a lot of information about the project but would like to start getting something down while working toward a project schedule.
- **Bottom up estimating**: estimating each task work package or deliverable of the project (this could be at the task level) will allow for the accumulated roll up of the values to create the length of the project. The roll up will accumulate at the summary task levels as totals for duration, work and cost. In turn, the summary tasks will roll up to the project summary task for a grand total for the project.

What to Estimate?

- Estimate duration (length of time) in minutes, hours, days, months, etc.
- Estimate work (amount of work) in minutes, hours, days, months, etc.
- Estimate duration and work in minutes, hours, days, months, etc.

To create a consistency within an organization it is recommended that a estimating standard be established. Most scheduler's estimate work in hours and duration is days. Longer projects might be estimated using work in days and duration is weeks. Having a standard will help create a consistency across an organization.

Where Do the Estimates Come From?

Estimates may come from the project manager, team members, subject matter experts, stakeholders, historic data, experience, etc.

How Do You Get Good Estimates?

Ask the right people: look for the most experienced person in a specific skill area. Chances are, they have worked a project similar to or have actually performed the work in the past. These types of people can be invaluable to a project manager for estimating.

Ask the performing resource: if you are lucky enough to know who your resources will be for the project, the performing resource is always the best source for an estimate. However, how you ask the resource for the estimate will make a difference. If you ask for an estimate, most people are thinking about fitting the work into their current workload. Framing the question from the point of view that the project will be worked some time in the future will result in a more accurate response. They should only consider how long (or how much work) it would take to perform the task regardless of the specific timeframe.

Ask more than one person: seeking various points of view for estimates will help define what the best estimate is. Project 2013 has an add-in feature called **PERT** which allows for 3-point estimates for task durations. The 3 points are pessimistic, most likely and optimistic. These values are entered into a formula that will result in an estimated duration of a task. The result will be three Gantt Charts: Pessimistic, Optimistic and Most likely. Using the **PERT** 3 point estimating tool might be more work be it could give you a more accurate overall duration estimate.

Subject Matter Experts: always a good source for advice.

Padding, slack, and time reserve should be included in any schedule. Every organization and project management methodology has its own approach. The important point is that extra time should be built into all schedules to help manage the inevitable contingencies that will occur during the performance of all projects. If padding, slack or time reserves are not included in the planning, the schedule will not be realistic and will result in a reduced probability of completing the project as planned.

If the work is increased to allow for contingencies, the cost will also increase. Consider increasing duration which will extend the length of time and not necessarily effect cost.

Estimating for Unknown Resources

Most project managers plan the work for a project and find out what specific resources will perform the tasks in the future. Tasks might require a specific skill level but the quality of the unfamiliar resource is unknown. How do you plan for unknown resources?

When estimating tasks, consider estimating a task for a senior level resource or a junior level resource:

- The senior level person would accomplish the task faster and would cost more.
- The junior level resource would cost less but needs more time and training.

Outsourcing resources: although there is a quantity of highly qualified contract resources, the recommendation is to estimate these tasks at the junior level. You will need to account for learning curve, assimilation into your organization and ramp up. The project manager might request a

specific skill level but it is unknown whether or not that skill will be available when the project requires it.

As mentioned earlier, the PERT estimating method could give a 3 point duration estimate. Using PERT will result in 3 different reports; an optimistic Gantt Chart, a pessimistic Gantt Chart and an expected Gantt Chart. The PERT estimating module is an add-in in Project 2013 and is available at no cost as a download from Microsoft.

Entering Estimates

The Entry table of the Gantt chart is designed for easy entry of task estimates. Adding the work column to the view will enable adding Work estimates.

To insert the work column in to the Entry table of the Gantt Chart view:

1. **Tasks → Gantt Chart** (the default value will be the Entry table)
2. Right click on the column heading **Start**
3. Select Insert Column
4. Click on the "**W**" key on the keyboard
5. Click on **Work**

For each task enter:

- A duration value
- A work value
- A duration and a work value

Valid entry values:

- 1m = 1 minute
- 1h = 1 hour
- 1d = 1 day

- 1w = 1 week
- 1mo = 1 month
- 1 y = 1 year

Abbreviations of the time values may be customized in the Schedule options:

File → Options → Advanced → Display options for this project

Duration entries will be scheduled as work days as defined by the project calendar.

Physical days (actual day count including non-working days) may also be achieved by using the **Elapsed** time. By placing an “E” in front of the letter in the duration field, the value will be scheduled in physical number of days. For example: 13 ed = 13 physical days.

In the example below note:

- Task 1 – 5 business days
- Task 2 – 1 day, 40 hours of work
- Task 3 – 5 days, 20 hours of work
- Task 4 – 5 edays – elapsed time or physical days

Note the scheduling difference:

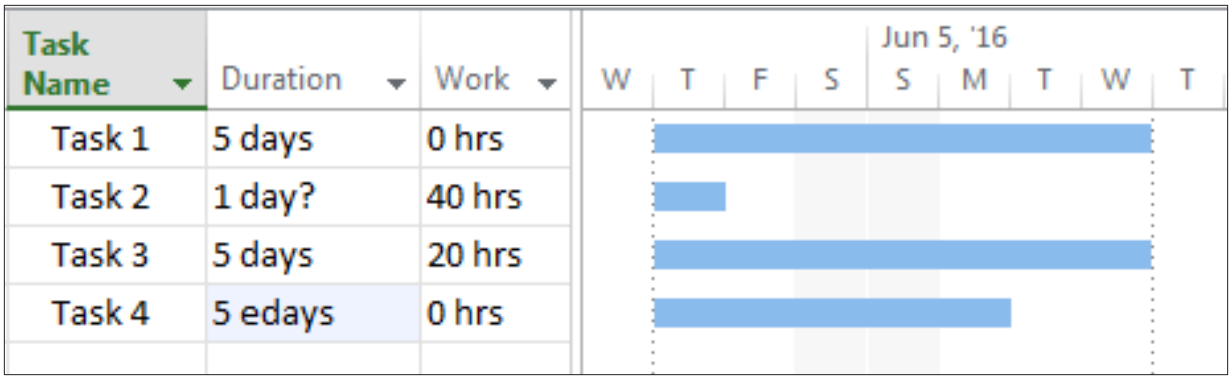


Figure 5-1 After inserting the Work column into the table, enter Duration, Work or Duration and Work.

Other helpful information:

- When task durations are entered, a "?" will be added within the duration field. This "?" represents that the task information has not been finalized and considered estimated. This indicator is optional and may be turned off at **File → Options → Schedule** and un-checking the following options:
  - Show that scheduled tasks have estimated durations
  - New scheduled tasks have estimated durations
- Manual scheduling mode for a task has the benefit of not requiring values in duration, start and finish columns. Text may be added as a note to the scheduler. If the task mode is changed to automatic scheduling, the text will be lost and, the software will enter a valid values. Scheduling modes are discussed in *Manual vs Automatic* on page 152. In the view below note the values in the duration, start and finish columns for Task 5:

Figure 5-2 Task 5 is an example of a Manual Scheduled task. Task 6 is an Automatic scheduled task.

Inserting **Effort-driven** and **Type** columns will allow for setting these values for each task as well. As discussed in *Options* on page 100, each task will be unique in the nature of the work to be performed. As a result, these settings should be adjusted to determine what task type and effort-driven values are appropriate for a task.

Concept of the Scheduling Engine

Dynamic scheduling is the use of task relationships and dependencies to drive the sequence and ultimately the timing of the schedule. Project's scheduling engine supports dynamic scheduling in automatic scheduling mode.

This means that as you make adjustments to certain tasks as the project progresses Project automatically recalculates the effect on subsequent tasks. This will also show the project manager if the overall schedule is extended and provide analysis opportunity to monitor if the change creates multiple critical paths, potential resource constraints, and so on.

Project will also highlight those tasks affected by a change so the project manager can easily see the ripple effect of the current proposed task changes. As changes are made Project 2013 can aid the scheduler to view What if analysis to analyze multiple scenarios for task adjustments to the schedule.

If constraints (which will be discussed in *Constraints* on page 192) are utilized to lock in task dates, the dates will disable Project's built-in scheduling engine and a project manager will not be able to see the effects downstream in the schedule. Maintaining this dynamic visibility is vital in effectively and pro-actively managing a schedule. This is why it is a best practice to not use constraints, unless necessary and appropriate to.

Sequencing

Project 2013 calculates the duration of a project based on task durations and how task dependencies are created between tasks. Establishing the order of the tasks is called Sequencing. Sequencing is concerned with establishing the order tasks should or could be performed. Arranging tasks in the most efficient order for the project is not an easy exercise. Sometimes, the order of the tasks is very evident and at other times, more complicated. The task sequencing order is more up to the scheduler and needs to be focused on what is right for a specific project.

For example, the following tasks are tasks that someone would do when they come home after work and before they go to bed:

1. Arrive Home
2. Eat Dinner
3. Walk the dog
4. Run an errand
5. Read the mail
6. Clean up the dinner dishes
7. Cook dinner
8. Go to Sleep
9. Get the mail
10. Watch the news

Take a minute to write down the numbers of the tasks above in the order you would perform these tasks. If you have some post-it notes you can write the task names on the notes and move the notes around to achieve the sequencing order.

Did you notice that some tasks have a forced relationship?

- You can’t eat dinner until you have cooked dinner.
- You can’t read the mail until you get the mail.

Other relationships will work in a more random order:

- Run the errand.

- Watch the news.

Try this exercise again taking into consideration that you have a second person helping you achieve these tasks.

What you might have noticed this time you sequenced the tasks:

- The project took a shorter length of time.
- The work was divided over the workers.
- Some tasks were performed with the people working together and others were performed by only one worker.

Compare your task list to others in the class. You might see that the work will get done but others have a different option as to the order the tasks will be completed. Is one list more right than another list?

What you are seeing that the art of project management. Projecting what will work best for a given situation is derived from experience, opinion and the workers performing the tasks. MS Project provides task relationships to support task sequencing which is discussed in the next section.

Creating Task Dependencies

Once the tasks are entered in to the project schedule, the next step is to consider in what order the tasks should be performed. Many tasks will have a flexible order and others will have a forced order of performance. Establishing the order of the tasks is one of the factors that will help calculate the timeline of the project schedule. A dependency is the name given to the relationship established between the tasks used to establish the order of tasks. If dependencies are not created, Project 2013 will not be able to accurately predict and adjust dependent future tasks based on completed work.

Task Dependency Types

Project 2013 allows for 4 types of task dependencies. These dependencies establish the order that the tasks will be performed. Dependencies may also be referred to as links, relationships or relationships between tasks. The result of creating task relationships is a network of related tasks establishing a time line. When referring to linked tasks the following terms will apply:

- A task that has a relationship directly before a task is known as a predecessor task
- A task that has a relationship directly after a task is known as a successor task

In the view below there are 4 tasks. The relationships are established as link lines between tasks.

- The predecessor task or task that comes before the is the Paint bedrooms and Family Room task.

- The successor task or task that comes after Replace carpeting task is the Repair roof task.

Pointing to a link line between tasks will display information regarding the task relationships. View below the displayed box below which is showing the details of the relationship between the Repair roof task and the Fix up completed task.

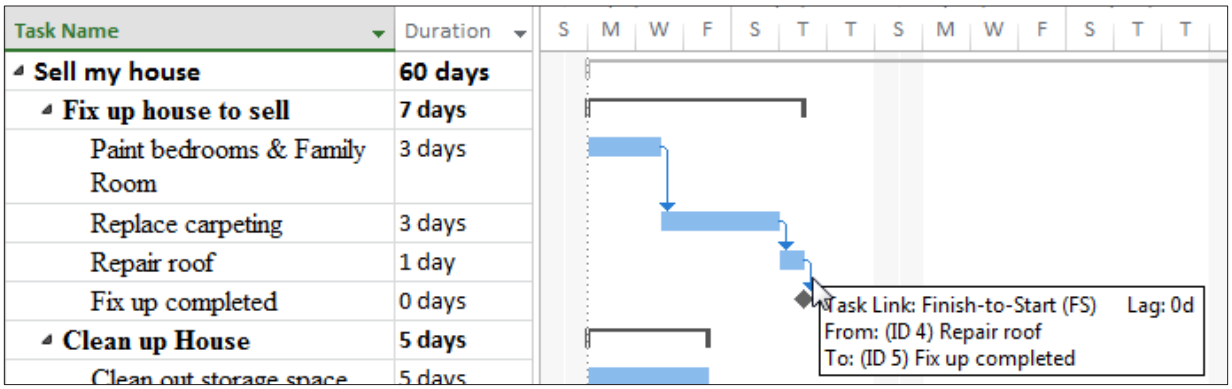


Figure 5-3 View of linked task dependencies.

Not all dependencies are the same. Some tasks will start at the same time where others might be scheduled one after the next. To facilitate scheduling needs, there are 4 dependency types which are:

- Finish-to-start
- Start-to-start
- Finish-to-finish
- Start-to-finish

The details of each of the relationship types is described below:

- Finish-to-Start (FS)
  - Default dependency for the Project 2013
  - Task 1 must complete before Task 2 can begin
  - This relationship type creates a waterfall effect
    - Example: Drive to the restaurant, then eat dinner
      Build a wall then paint the wall

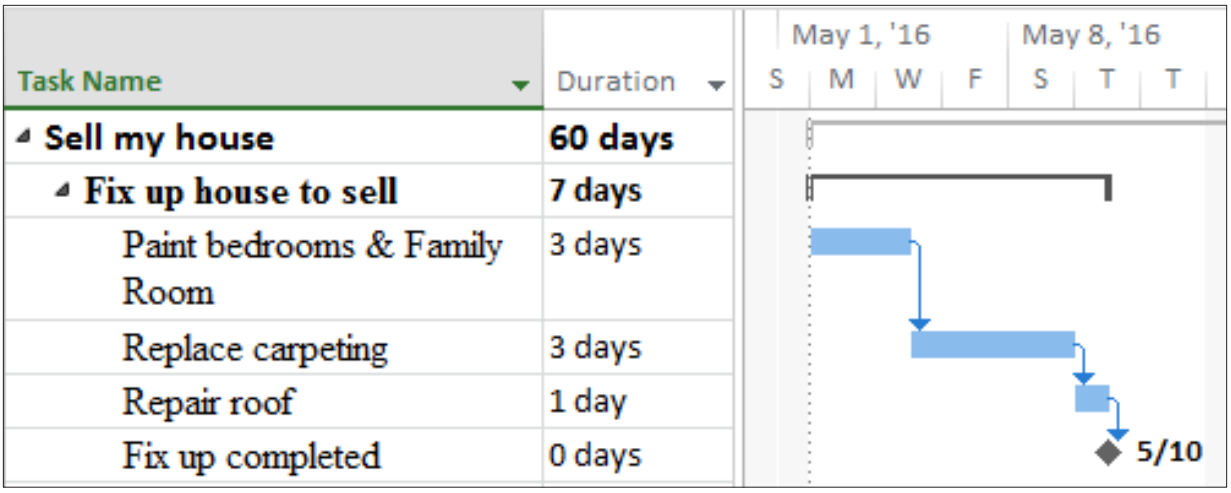


Figure 5-4 This is an example of a Finish-to-Start relationship.

- Start-to-Start (SS)
  - Tasks that are scheduled to start at the same time
    - Example: You can start to clean out the Storage space at the same time you have the painters painting the bedroom and family room.

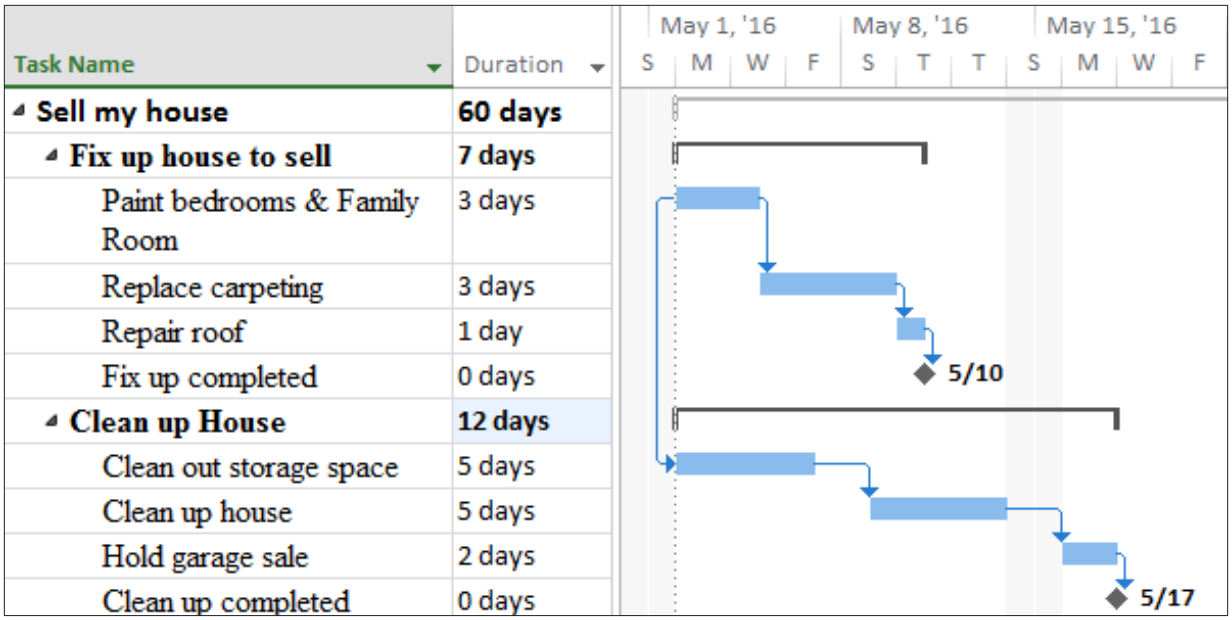


Figure 5-5 Tasks Paint bedrooms & Family room is related Start-to-Start with Clean out storage space.

- Finish-to-Finish (FF)
  - Tasks that are scheduled to finish at the same time but not required to start at the same time.
    - Example: The section of work below can all start when the previous section is completed. These tasks will start at different times, but they all need to be completed by the same point in time.

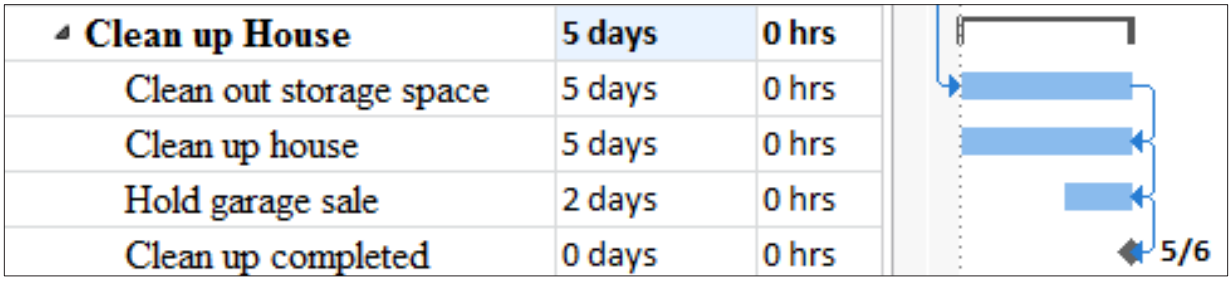


Figure 5-6 The tasks above are in a Finish-to-Finish relationship.

- Start-to-Finish (SF)

- The start date of the predecessor task will determine the finish date of the successor task.
- This is the least used dependency type and rarely used.
- Example: When the new software module comes on line, the old software will be taken off line

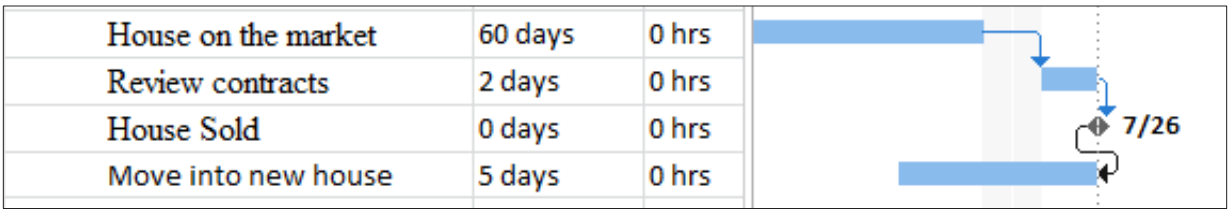


Figure 5-7 Example of Start-to-Finish relationship.

Task Relationships and Manually Scheduled Tasks

When working with manually scheduled tasks, errors might result using dependencies. A warning is viewed when tasks are linked and dates are entered into the start or finish columns. The calculation of the project duration might not match the duration calculated when the entered dates are taken into consideration. Below is an example of an error created when the duration entered for a manually scheduled summary task is smaller than the sum of the detail tasks contained in the summary grouping. Note the bar below the summary task brackets is longer than the brackets and there are dots around the Gantt bar for the House on the market task. There are also squiggly lines under the Finish dates for the tasks.

Add the File Creating and Modifying Dependency Types

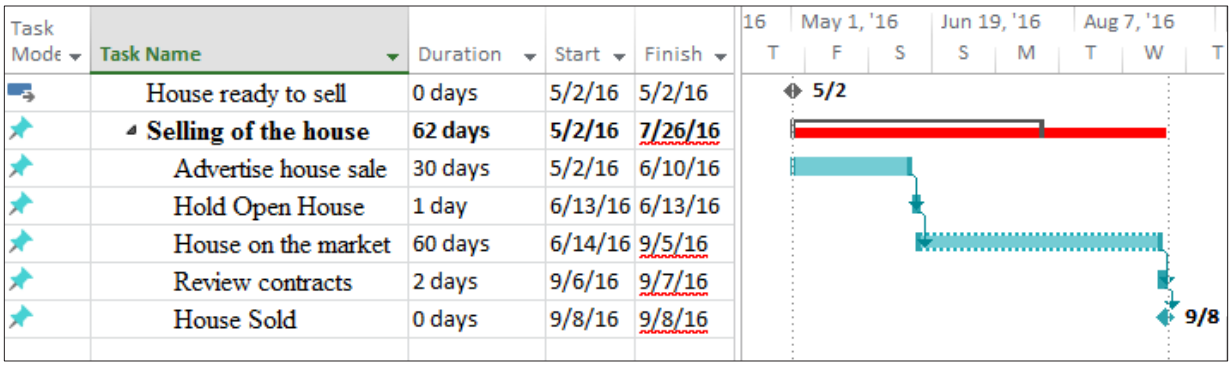


Figure 5-8 Manually scheduled tasks displaying error message.

To correct this type of error, Project 2013 has a feature called Task Inspector. Right click on the red error line and following choices appear. Select the Fix in Task Inspector option and correction choices are displayed.

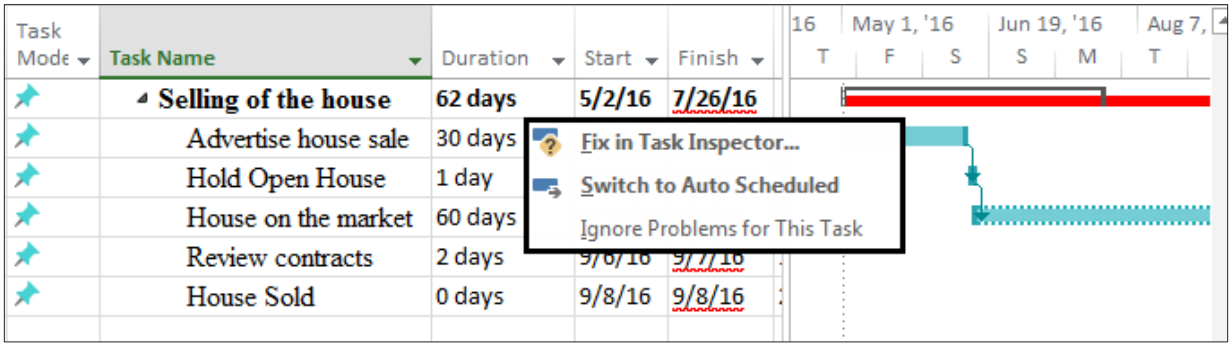


Figure 5-9 Error displayed on Manually scheduled task. Right click on error to display resolution options.

Below is the result of clicking on the Fix in Task Inspector option for the task. Note the error message is no longer visible and the task in error has been rescheduled.

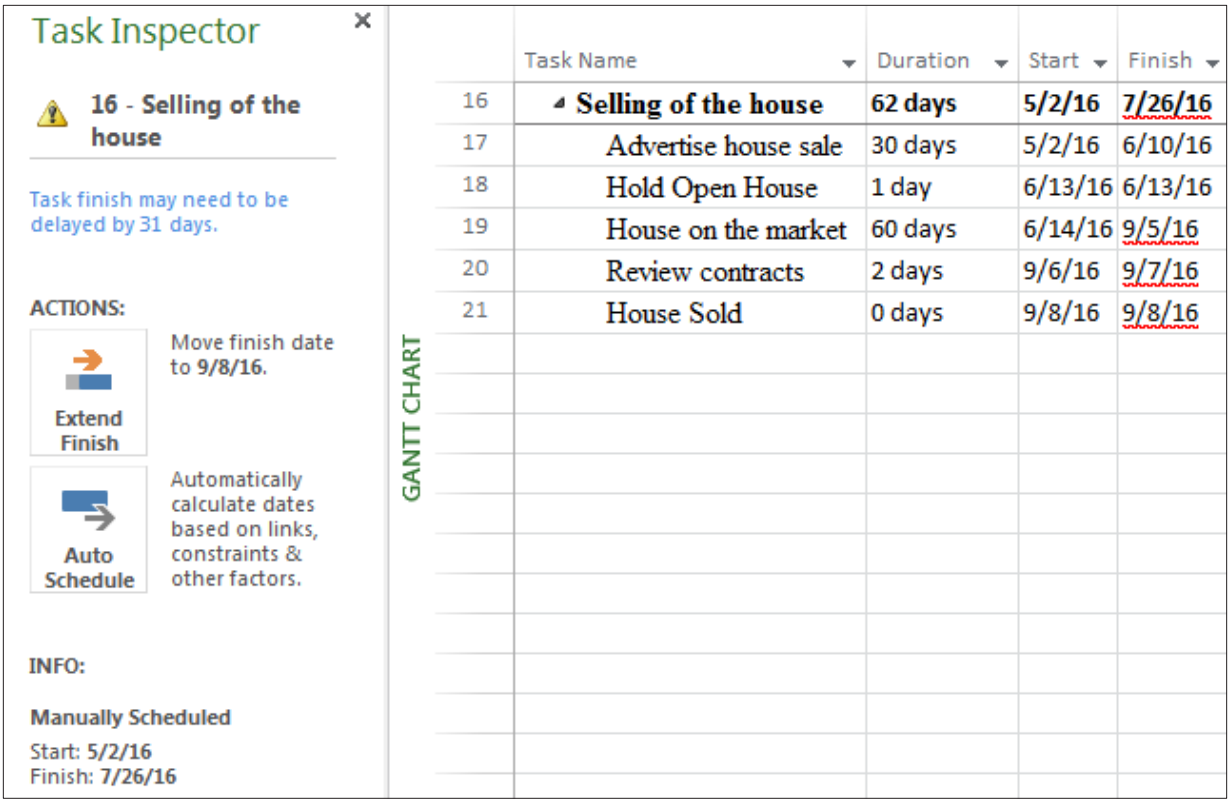


Figure 5-10 Options to resolve the error offered in Task Inspector.

Task Inspector will be discussed in *Methods for Resolving Resource Conflicts* on page 296.

Best Practices for Using Dependencies

Relationship between tasks will allow you to create network of related tasks. The network will show order the tasks will occur. Below are some best practices which should be considered when creating relationships:

- All tasks should have both a predecessor and a successor. The timeline for the project is based on task duration and relationships. If tasks are not linked in the network of tasks, their duration will not be accounted for within the timeline. Making sure all task durations are accounted for will avoid surprises at the end of a project.
- When creating dependencies or relationships, apply the rule – *because I can, is it a good idea?* Do not link every task to every other task.
- Think about what task pushes or influences another task. If a task is late, what other tasks will be affected? Link only tasks with a direct affect on a successor task. Ask yourself what needs to be completed before you can do the next step and if it is late, which tasks will be affected.
- Link detailed tasks and milestones only. The completion of tasks will push the milestones or the short term goals. Linking summary tasks means that an entire section of work must be completed before the next section may be started. Ask yourself if that is true for your situation before linking at the summary level. Linking summary tasks is not recommended.
- Tasks should always be linked to push milestones. For example: define what the definition of "project completed" is. The multiple parallel paths that must be completed to conclude the project should all be linked to the ending milestone. If any of the parallel paths takes longer than planned, the milestone date will be pushed out in time.

  In the example below "Paint bedrooms & Family Room" is the starting task for the project. All 3 sections of work can start when the project starts. All 3 sections must be completed before the house is ready to sell. If any of the sections take longer, each section has the ability to push the ending milestone or when the house is ready to sell. The longest of the parallel paths will be considered the critical path or the project section that determines the timeline of the project.

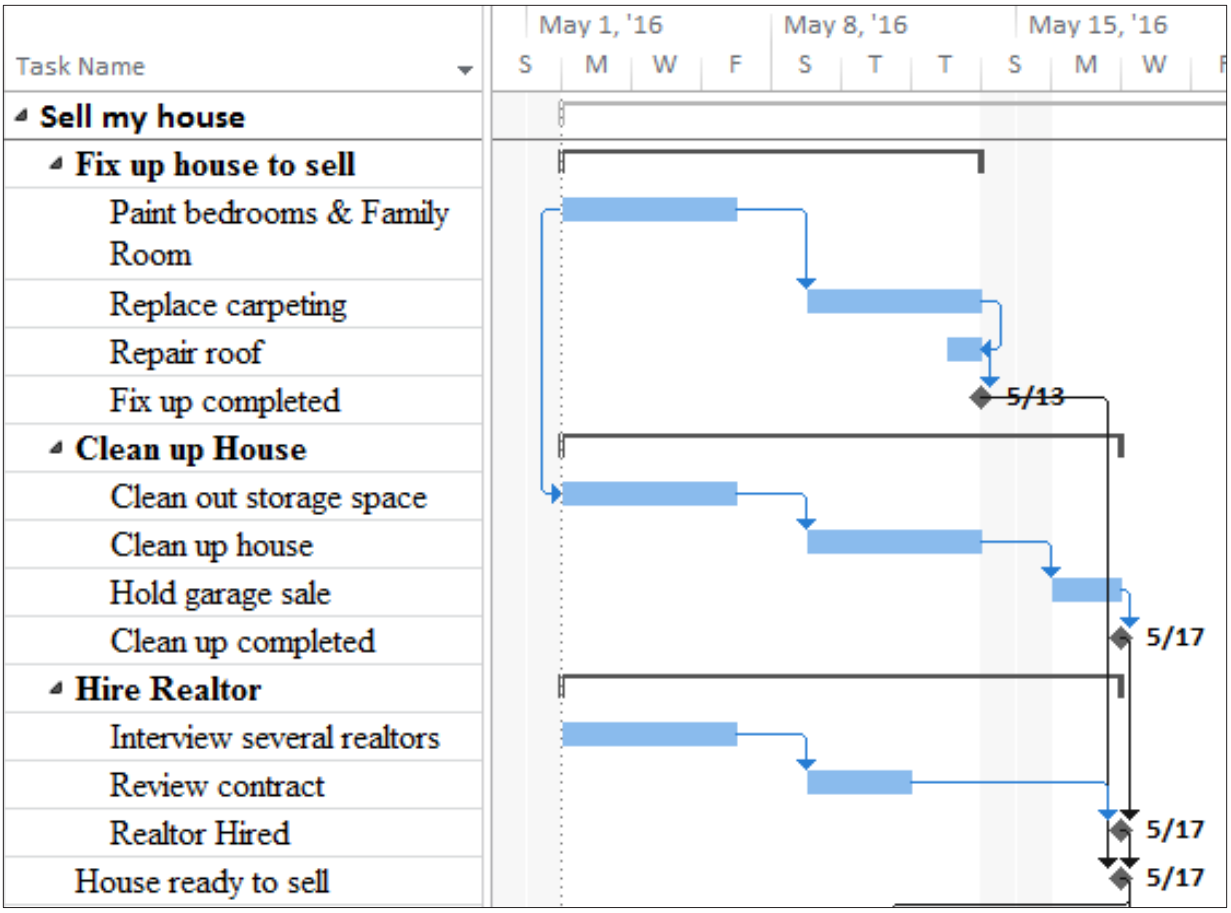


Figure 5-11 Example of multiple parallel paths pushing an ending milestone.

- Create as many parallel paths as possible to shorten the schedule. Use of the Start-To-Start and Finish-To–Finish relationships will help create parallel paths and shorten the project time line. Be aware, however, just because you can schedule tasks in parallel, you might not have the resources to perform the work and which could result in extending the timeline.
- Do not link tasks based on a resource. Some people will plan tasks to occur at specific times because they think that a resource will be available at that time. Chances are the expected resources will not be available at the planned point in time because other tasks for that resource have changed. Plan the schedule for the work required and

plan/arrange for required resources as the time draws nearer to when the task will be performed.

- Links may be external to the project. Project 2013 will allow dependencies to exist in other projects that are linked to tasks in your project. This is similar to links in Excel. In Excel, if links between files are created and the files are relocated, the links will be broken. Project 2013's links between project files will work the same way.

Project 2013 also offers the option for tasks that are moved or added to the schedule to automatically link in a Finish-to-Start relationship or not be linked at all. This is a personal preference and may be applied to a specific project or all projects viewed on your desktop.

To view or change this option: **File → Options → Schedule**

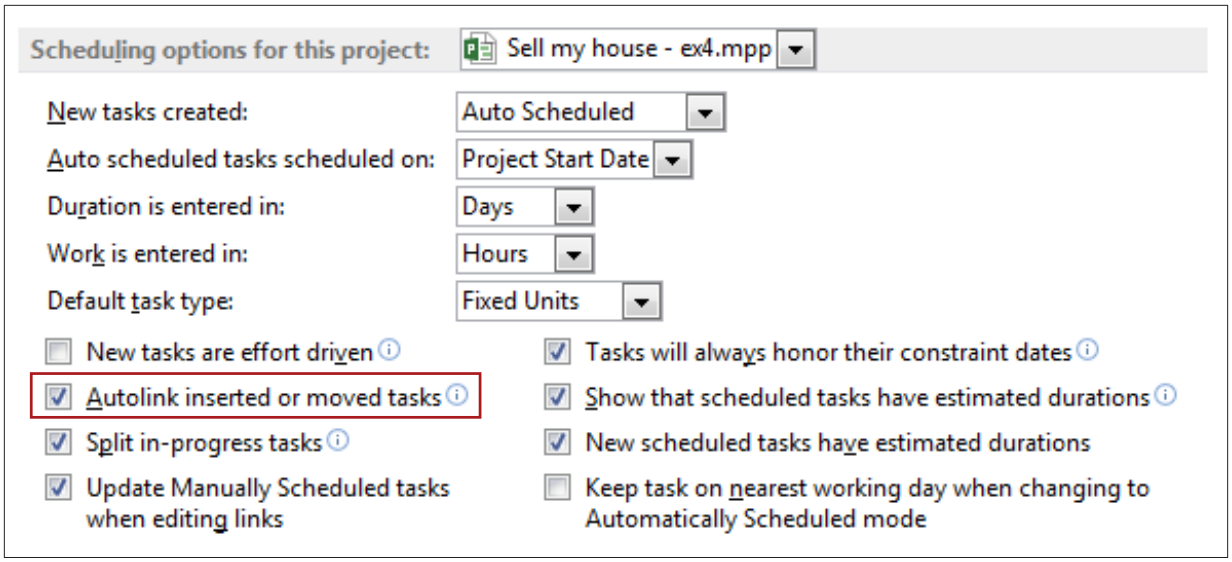


Figure 5-12 Scheduling options.

Lead & Lag

Relationships between tasks are not always absolutely defined as described with relationships. Allowing for Lead and Lag time will help refine a schedule to bring it more in line with the actual timeline for the project. Lead and Lag time will allow for wait time between tasks and overlap of task activities.

In this section we will discuss:

1. What is Lag time?
2. What is Lead time?
3. Best Practices for using Lead and Lag time

What is Lag Time?

Lag time is used to provide wait time between tasks. The time will be expressed in business days or valid project calendar working time. Lag time should be used to extend the timeline of the project when only duration needs to be added to a schedule and will not add work or cost. For example: New concrete is poured and you must wait 6 days before you can drive on it. The time must occur but no work or cost is added to the task. A dependency must first exist between tasks before Lag time can be created.

To create Lag time:

Double click the relationship line between tasks where you would like to add the lag time. The task dependency dialog box below will appear. In the illustration below, there are 2 tasks. After the Paint bedrooms and Family Room task is completed you decide that you would like to wait 3 days for the paint to dry before Replacing the Carpeting.

To add Lag time between tasks:

1. Double click on the link line between tasks. The Task Dependency Box will be displayed.
2. Add time to the **Lag** box.
3. Click **OK**.

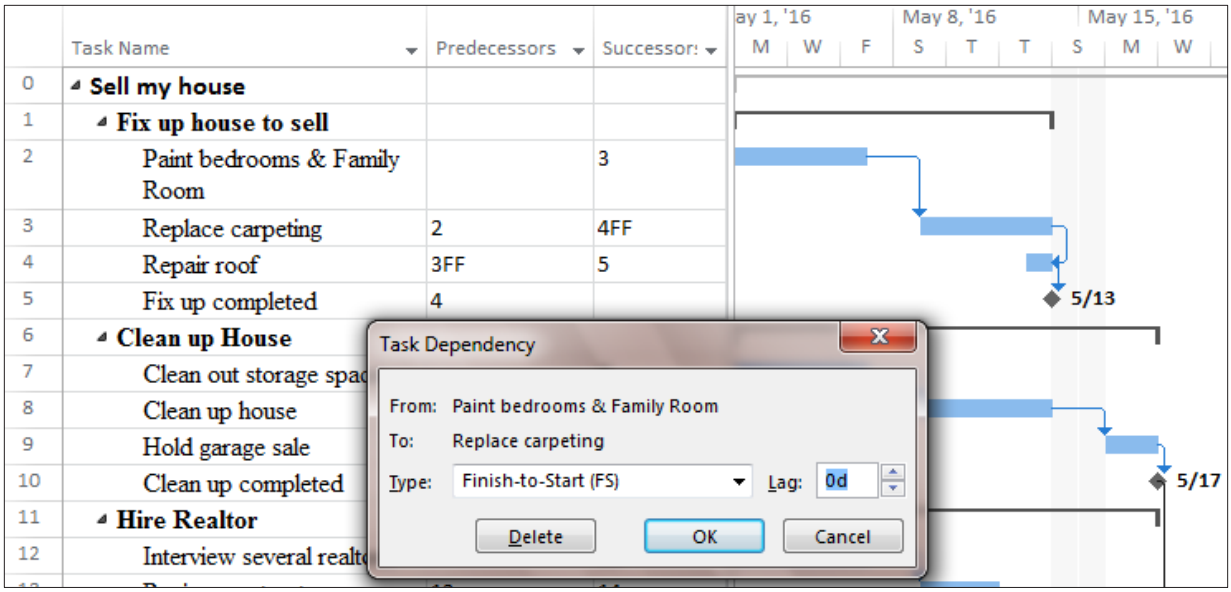


Figure 5-13 Task Dependency box before lag time is added.

The result of adding a 3 day lag is displayed below. Note the values in the predecessor and successor columns. If you would prefer, you can type these values in and not enter lag using the Task Dependency box.

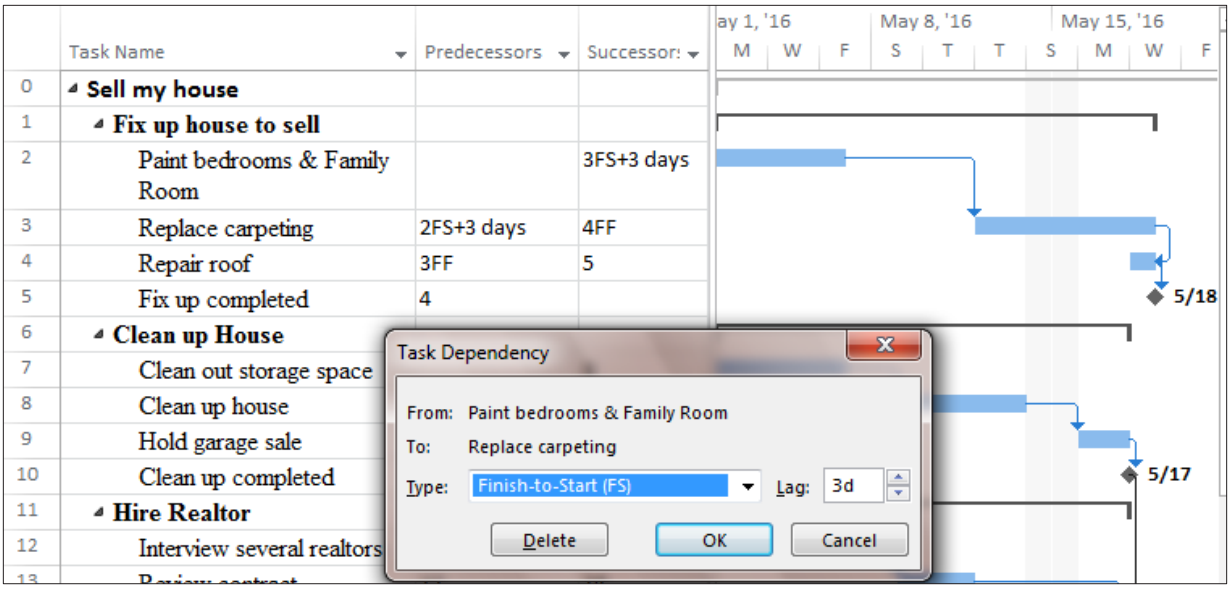


Figure 5-14 Task dependency box with 3 day lag time added.

Lag time may also be expressed as a percentage of the duration of the predecessor task. Order equipment is a 5 day task. 50% Lag would mean that the length of the lag time would be 2.5 days or half of the 5 days duration of the Order equipment task.

What is Lead Time?

Lead time shortens the time line of the project. Consider tasks that do not need to be 100% completed before the successor task can start. Lead time is a good tool to help refine the schedule when trying to cut time from a timeline. Project 2013 does not have a field or box called Lead time. Instead, to create Lead time negative Lag time is entered.

To create Lead time:

The view below is showing that Task 7 “Clean out storage space” should be completed before starting Task 8 “Clean up house.” Each task will take 5 days for a total duration of 10 days plus weekend time to complete this work. If other resources were available to help clean the house, this task could start earlier and save total time to complete both tasks.

Below is a view of the tasks before lead time is entered. Note the total duration for the 2 tasks and the milestone ending date of 5/17.

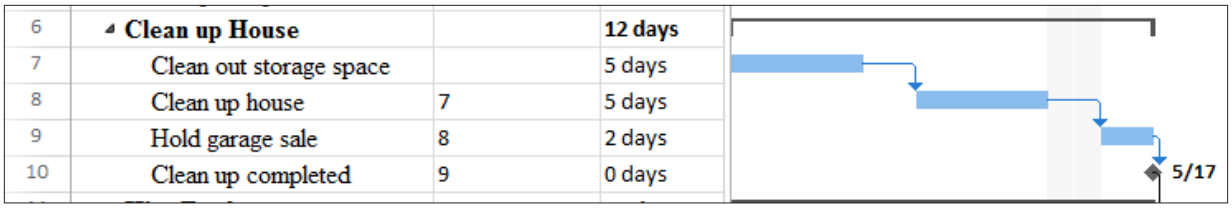


Figure 5-15 Tasks without Lead time.

To enter Lead time between two tasks:

- Double click the relationship line between tasks where lead time is to be added.
- Enter “**–3d**” in the Lag field value
- Click OK to close the box

Below is the result of adding lead time between two tasks. Note the overlap of tasks and the total scheduling time has been shortened. Note the value in the predecessor column and in the Lag box in the Task Dependency box. Compared to the view without lead time, the milestone for this group of work is now scheduled 5 days sooner.

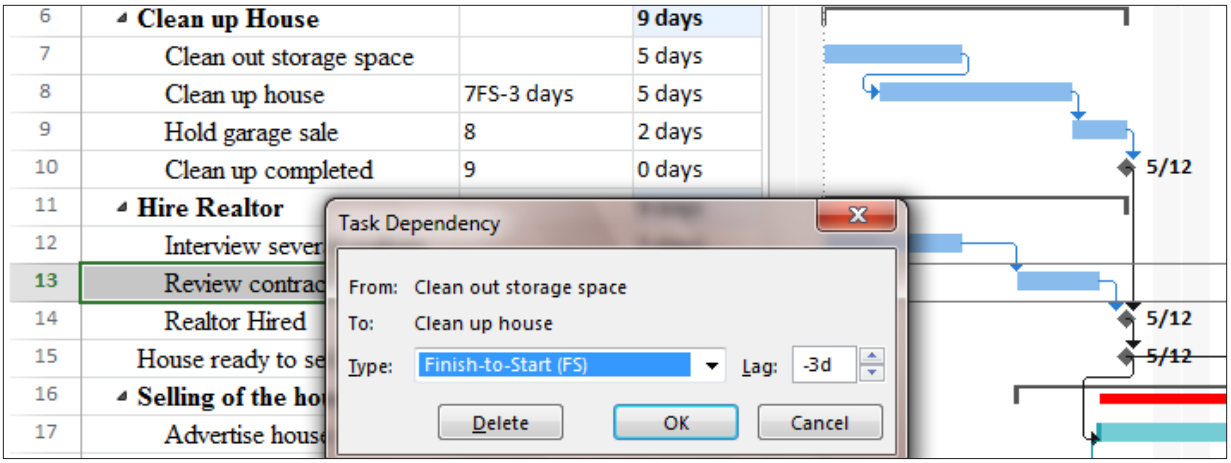


Figure 5-16 Tasks with Lead time

Lead time can also be expressed in percentages. The advantage to using percentages is if the predecessor task length changes, the successor task will automatically adjust its starting date.

For example:

- Task A is 10 days long and has a Finish-to-start relationship with Task B with -50% lead time
- Task B will is scheduled to start when Task A has 5 days of work completed
- Task A is taking longer than expected and is now scheduled to take 15 days
- Task B will be rescheduled to start when Task A has 7.5 days of work 7.5 days of work is scheduled to be completed.

A -50% would move the successor task to the left 50% of the duration of the predecessor task. The diagram below demonstrates the result of applying -50% for Lead time to the relationship between these two tasks.

To enter Lead time between two tasks as a percentage value:

- Double click the relationship line between tasks where lead time is required.
- Enter “-50%” in the Lag field value

- Click OK to close the box

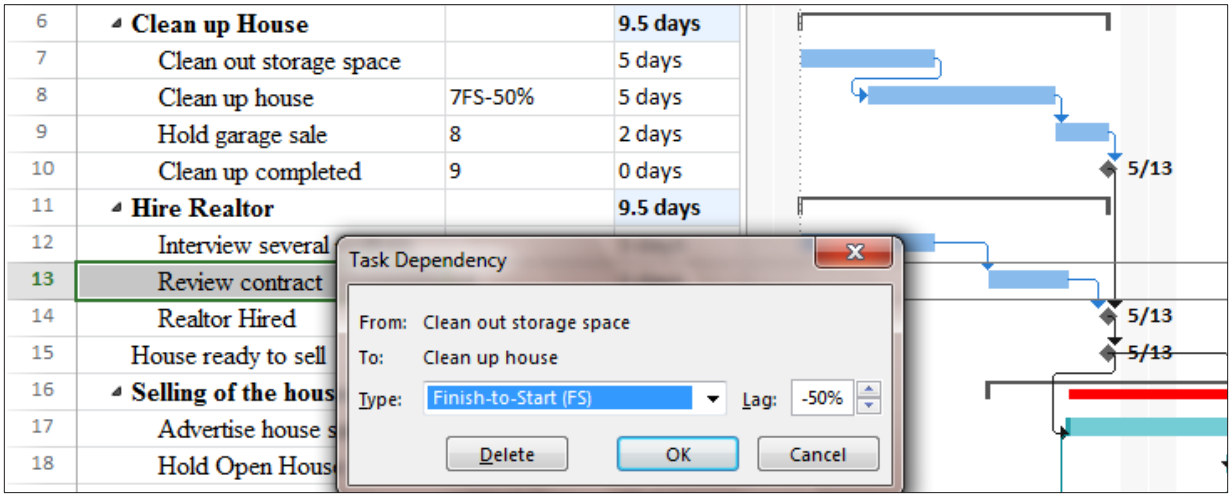


Figure 5-17 Lead time entered in a percentage.

Best Practices Using Lead and Lag Time

Best practices for the use of **Lag** time in a project schedule. Add Lag time when:

- Time must go by without a work or cost applied to the time. Lag is considered to be wait time like a delivery of equipment or concrete hardening.
- You would like to add slack into the schedule to extend the timeline to allow for possible contingencies during project execution.
- You would like to add wait or cushion time between phases of a project
- You would like to add wait time between parallel sections of a project to allow others to catch up.

- Lag time may also be expressed in elapsed time to allow nights and weekends to be included
- Planning the work for a factory crew. For example: the crew needs to be at work for 9 hours but 8 of that is actual work. The remaining hour is meal and breaks. Use Lag to extend the time for the work of the crew to accommodate breaks.

Use lead time when the schedule needs to be shortened. More resources will be needed to accomplish the tasks. Lead time can increase risk of re-work and could increase cost for tasks.

Best practices for the use of **Lead** time in a project schedule:

- Piece work – when X number of items or time has been completed, giving the completed work to the next group to start their work.
- Testing – when X percentage of the testing is completed and successful, giving the completed work to the next group to start their work.
- When it is not necessary for the predecessor task to achieve 100% completion before starting the successor task.

Inactivate Tasks

When developing a schedule or even after a schedule is being executed, you may have portions of the schedule that may be optional or you may be looking for ways to run a scenario which leaves out a portion of the schedule from the scheduling engine. Choosing to inactivate a collection of tasks is a way to temporarily or permanently remove tasks from the rest of the schedule, but still leave the information about those tasks intact so you can reactivate them at a later time as desired, or keep this inactive data for historical purposes. This feature saves time over having to delete and re-enter task information. All tasks by default are active unless you make them inactive.

This feature is in Project Professional 2013 only.

To inactivate a task:

1. Select the task(s).
2. On the **Task** tab, **Schedule** group, click **Inactivate**.

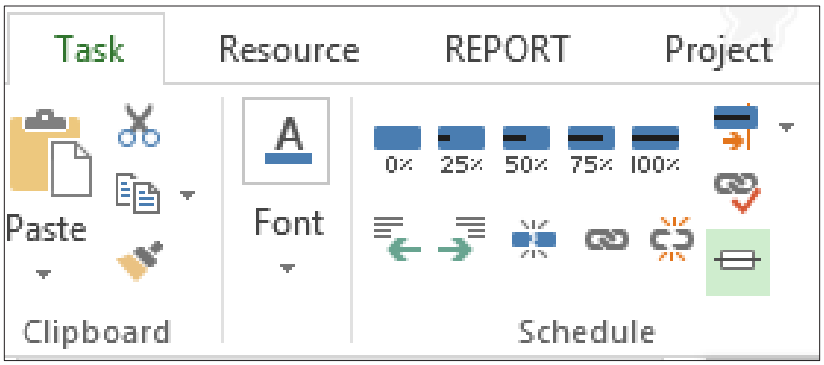


Figure 5-18 Section of the Task ribbon with Inactivate button.

In the view below all of the tasks are active:

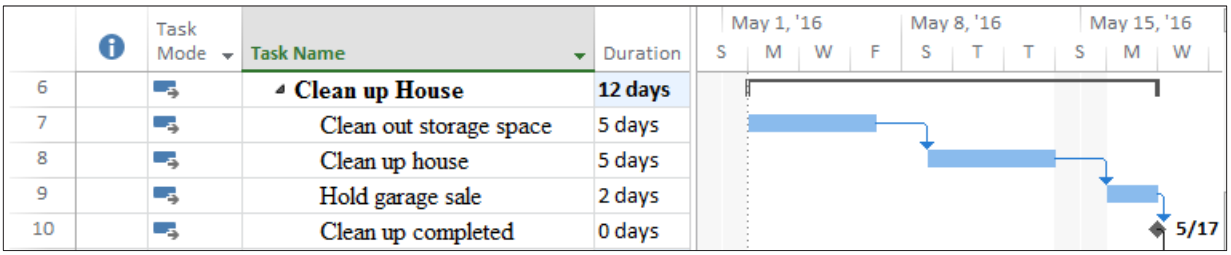


Figure 5-19 View of active tasks.

It has been decided that the "Clean the House" task is not needed for the project schedule. In the view below you will see the result of adjusting this task to inactive status. Notice the changes to the schedule. The "Clean up House" task has a line through its' name and is shadowed formatted. The task bar for the task is clear and the predecessor task has been re-scheduled to accommodate for the inactivated task.

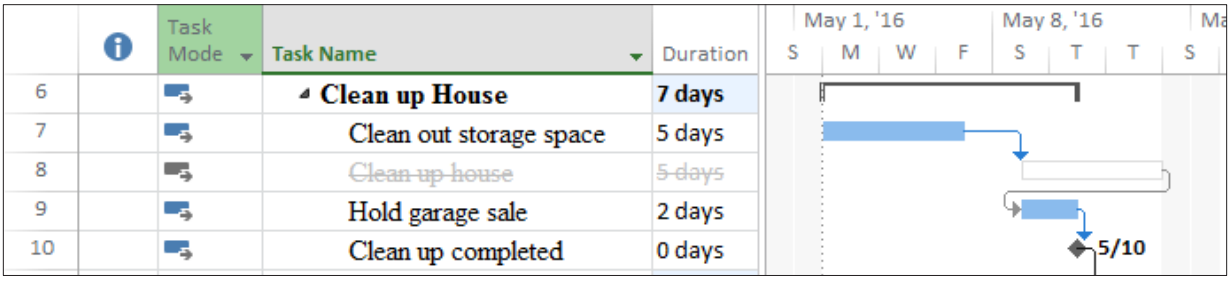


Figure 5-20 Inactivated tasks

If you made a mistake and accidentally inactivate the wrong task(s), simply click **Inactivate** again to make them active.

This feature is especially useful when you are struggling with test/retest cycles. Simply inactivate the extra cycles until they are needed.

Inactive tasks are a great way to include contingency actions which only apply if a planned risk actually manifests itself in the future.