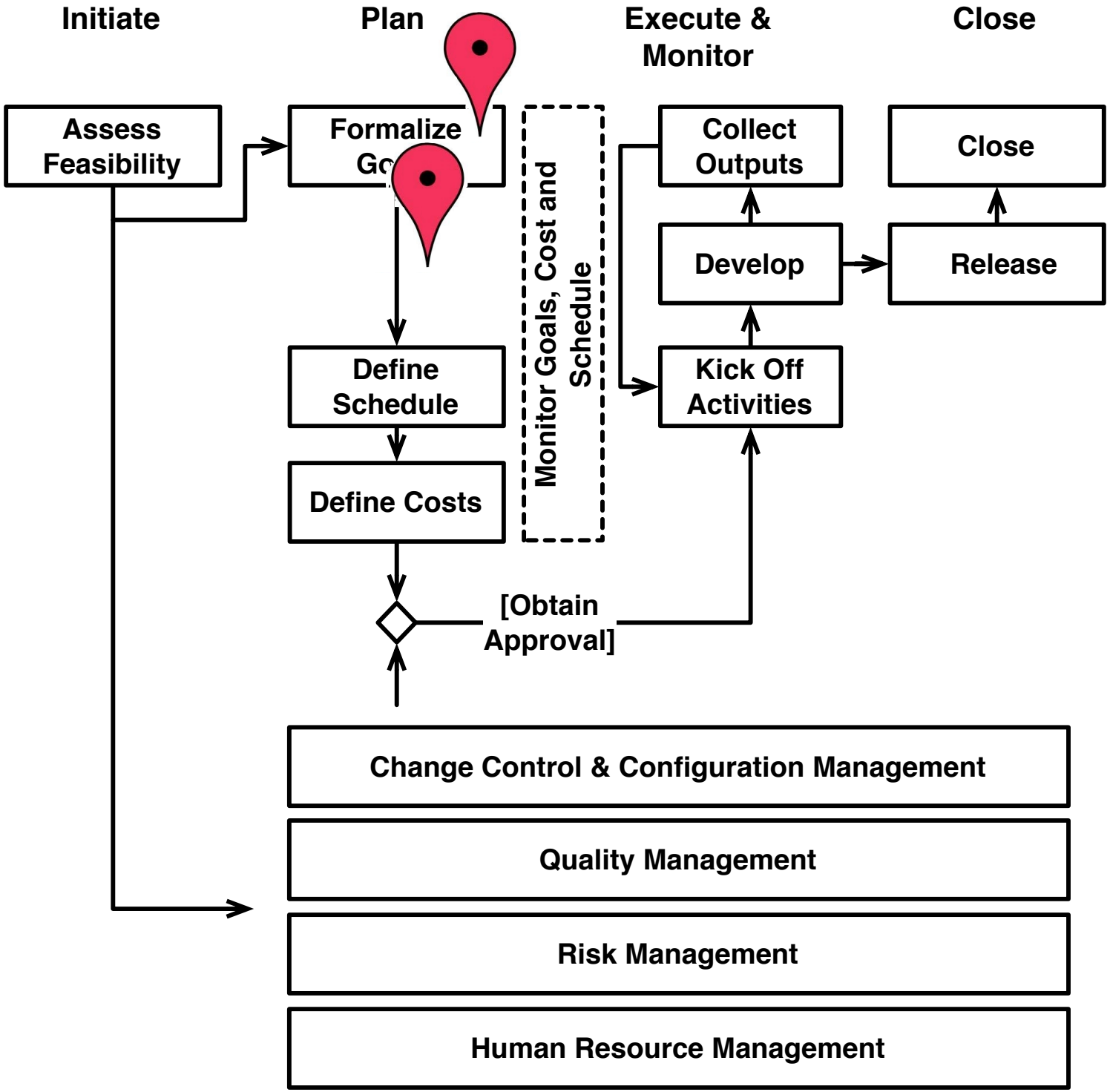
Deciding the work to be Performed (Work Breakdown Structure)

Goals of the Unit

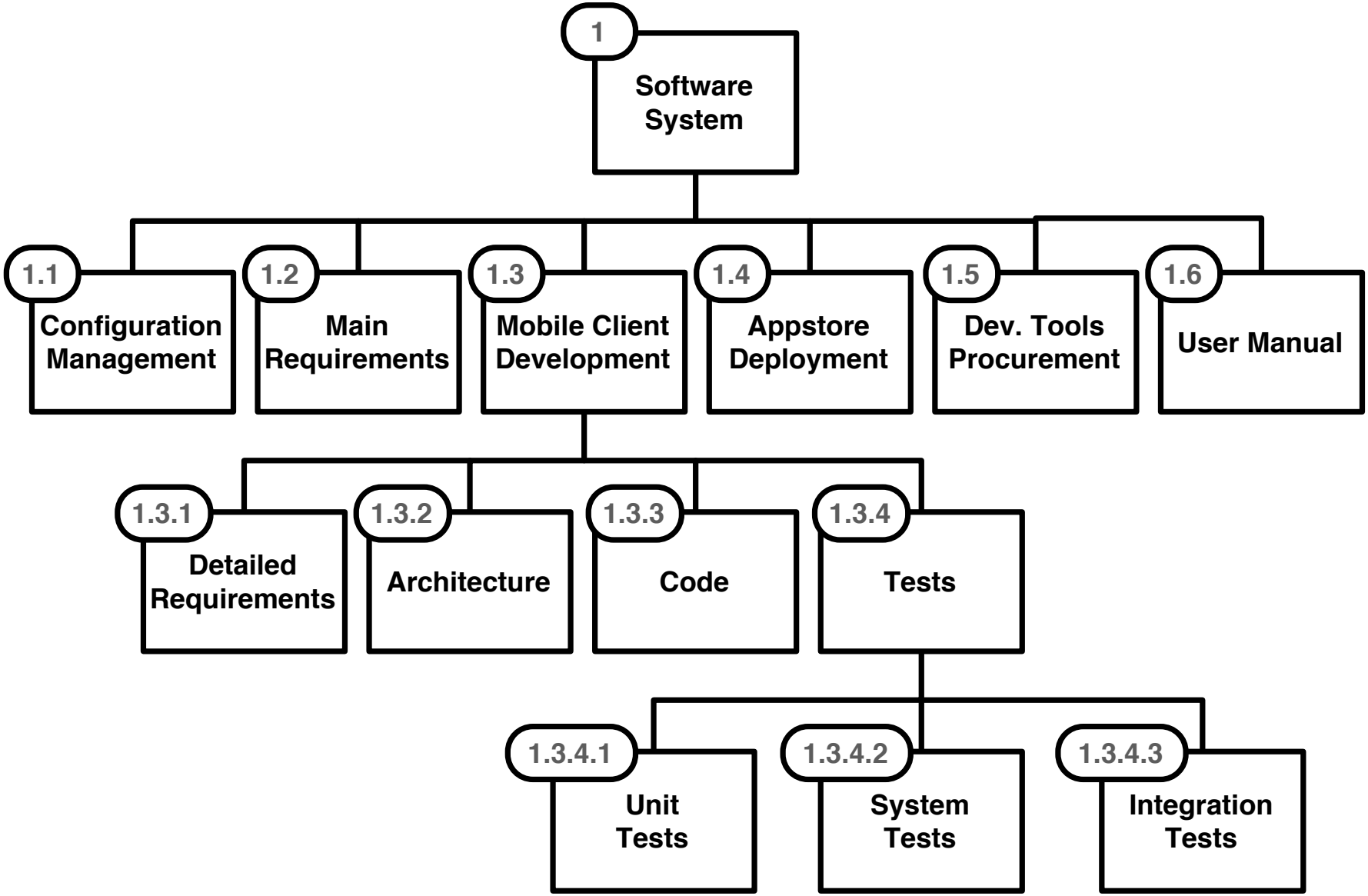
- Understanding the transition from project goals to the project schedule
- Introducing the Work Breakdown Structure notation


Initiate
Plan
Execute & Monitor
Close
Assess Feasibility
Formalize Go
Define Schedule
Define Costs
[Obtain Approval]
Monitor Goals, Cost and Schedule
Collect Outputs
Develop
Kick Off Activities
Close
Release
Change Control & Configuration Management
Quality Management
Risk Management
Human Resource Management

What is a WBS?

A **Work Breakdown Structure** (WBS for short) is a (deliverable-oriented) hierarchical decomposition of the work to be executed by the project team to accomplish projects objectives and create the required deliverable

WBS Example


1
Software System
1.1
Configuration Management
1.2
Main Requirements
1.3
Mobile Client Development
1.4
Appstore Deployment
1.5
Dev. Tools Procurement
1.6
User Manual
1.3.1
Detailed Requirements
1.3.2
Architecture
1.3.3
Code
1.3.4
Tests
1.3.4.1
Unit Tests
1.3.4.2
System Tests
1.3.4.3
Integration Tests

WBS: Remarks

- Two formats
  - Graphical tree (Vision, Graffle, LibreOffice, ...)
  - Textual outline (MS Word, Text Editor, Outliner, ...)
- Uses a decimal numbering system to identify elements (Ex: 3.1.5)
- Shows “is contained in” relationships
- Does not show dependencies nor durations

Why is it useful?

- A WBS establishes the basis for:
  - **Defining the work to be performed** in a project
  - Showing how various **activities are related to the project objectives**
  - Establishing a **framework for defining, assigning, and monitoring work and costs**
  - Identifying the **organizational elements** responsible for accomplishing the work

WBS Rules of the Thumb

- Everything (and nothing else) is in place:
  - **The 100% rule:** make sure all work items are there (product oriented WBS are better suited for this kind of rule)
  - **The ME rule (Mutually Exclusive rule):** make sure there are no overlaps in the definition of the elements (see coupling, below)
  - **No need to make it balanced**: all paths do not have to go to the same level
- Quality of the WBS is high (*)
  - **Coherence:** tasks within a work package should have the same goal;
  - **Coupling:** work package dependencies should be minimised, so that team members can work independently;
  - **Continuity:** production work packages should be full-time to maximise efficiency;
  - **Cost:** bottom level work packages should require between one man- week and one man-month of effort.

(*) Criteria taken from the ESA standards for software development

When do you stop?

- Simple answer: at the **work-package** level (which, btw, could be composed of more elementary activities, which, however, you do not want to trace)
- However: how big is a work-package?
  - According to “DOD and NASA Guide to PERT COST”: leaves of the WBS should be no more than 3 months of work or $100.000 of expenditure
  - According to other standards: 1-2 weeks for 1-2 people
- Mind you though, the level of details depends on the size of the project...

WBS Types (1/3)

- Product WBS
  - It develops according to the structure of the outputs that need to be produced
  - It can start from a Product Breakdown Structure, when defined
- Process WBS
  - It develops according to the phases in which a project is organized
  - For instance: Requirements, Analysis, Design, Testing
- Hybrid WBS: both of the above
  - It mixes process and product
  - For instance: life-cycle phases at higher levels; component at lower levels

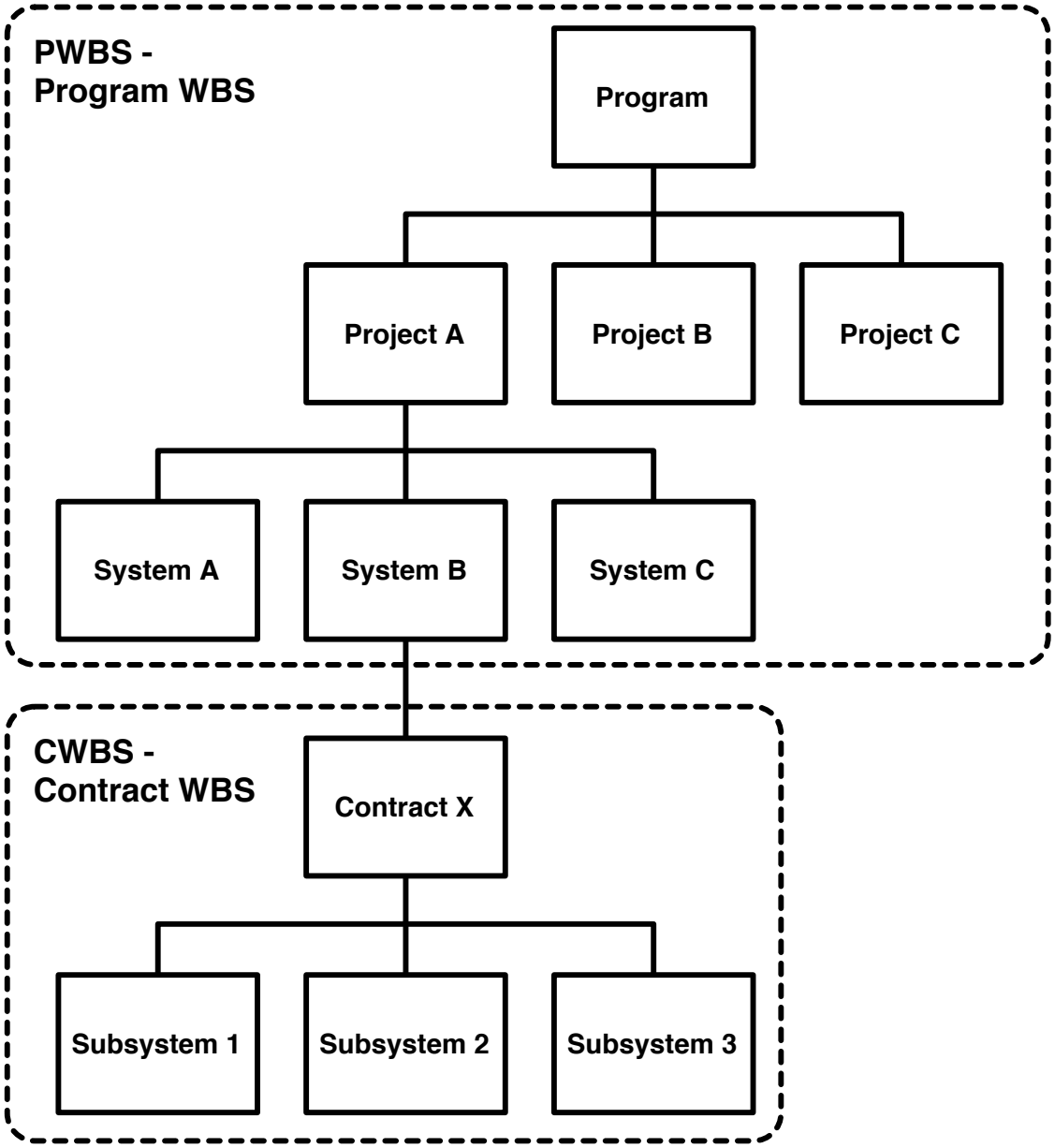
WBS Types (2/3)

- Organizational WBS and Geographical WBS
  - Higher levels are organizational units
  - Lower levels collect the work which is under the responsibility of a Unit.
  - Can be useful for highly cross-functional projects
- Geographical WBS
  - Higher levels are geographically distributed teams (e.g. NY team, Trento Team)
  - Lower levels collect the work under the responsibility of a team

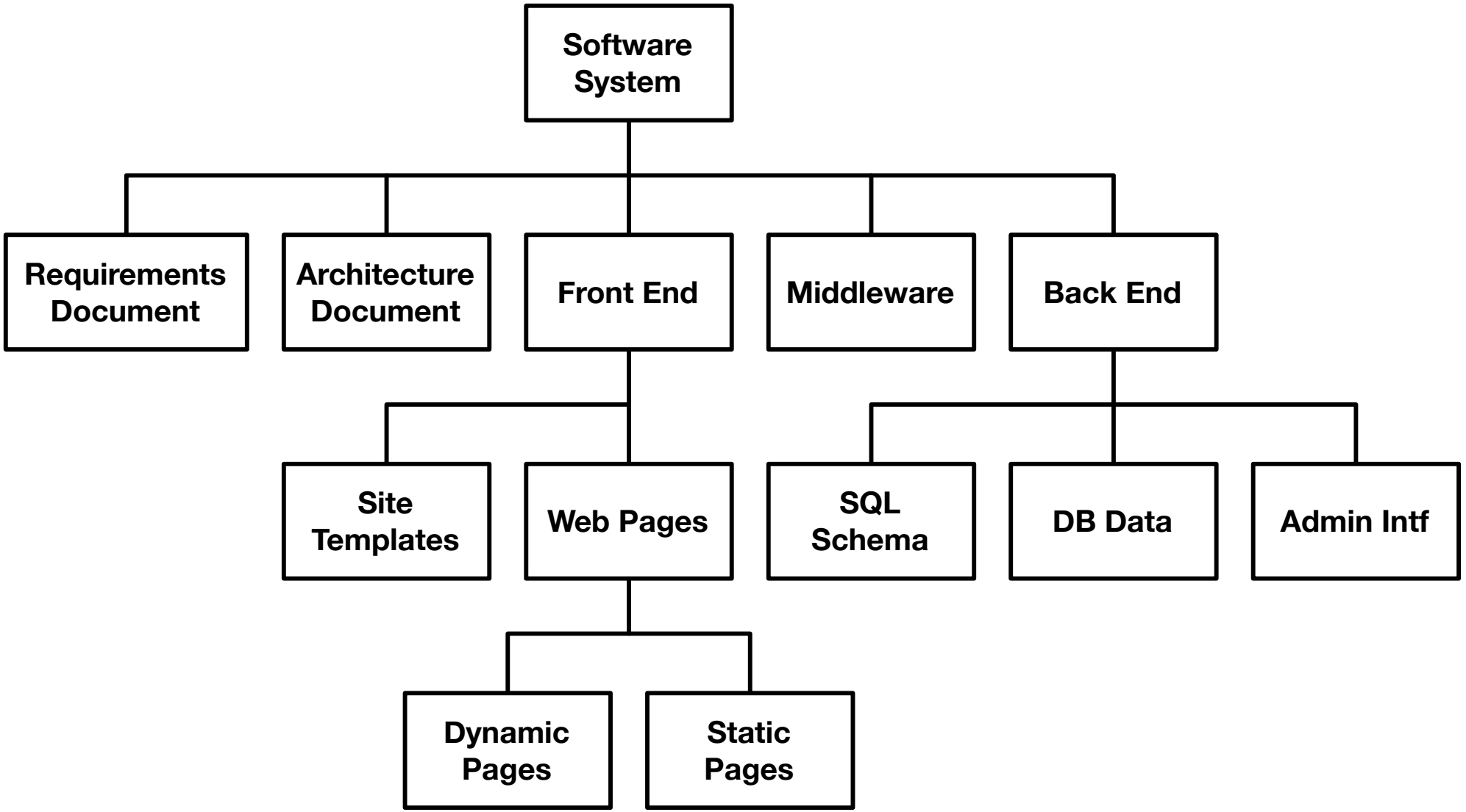
- Remarks: according to the PMBOK, these are not WBS's. In any case, they are less commonly used.

WBS Type (3/3)

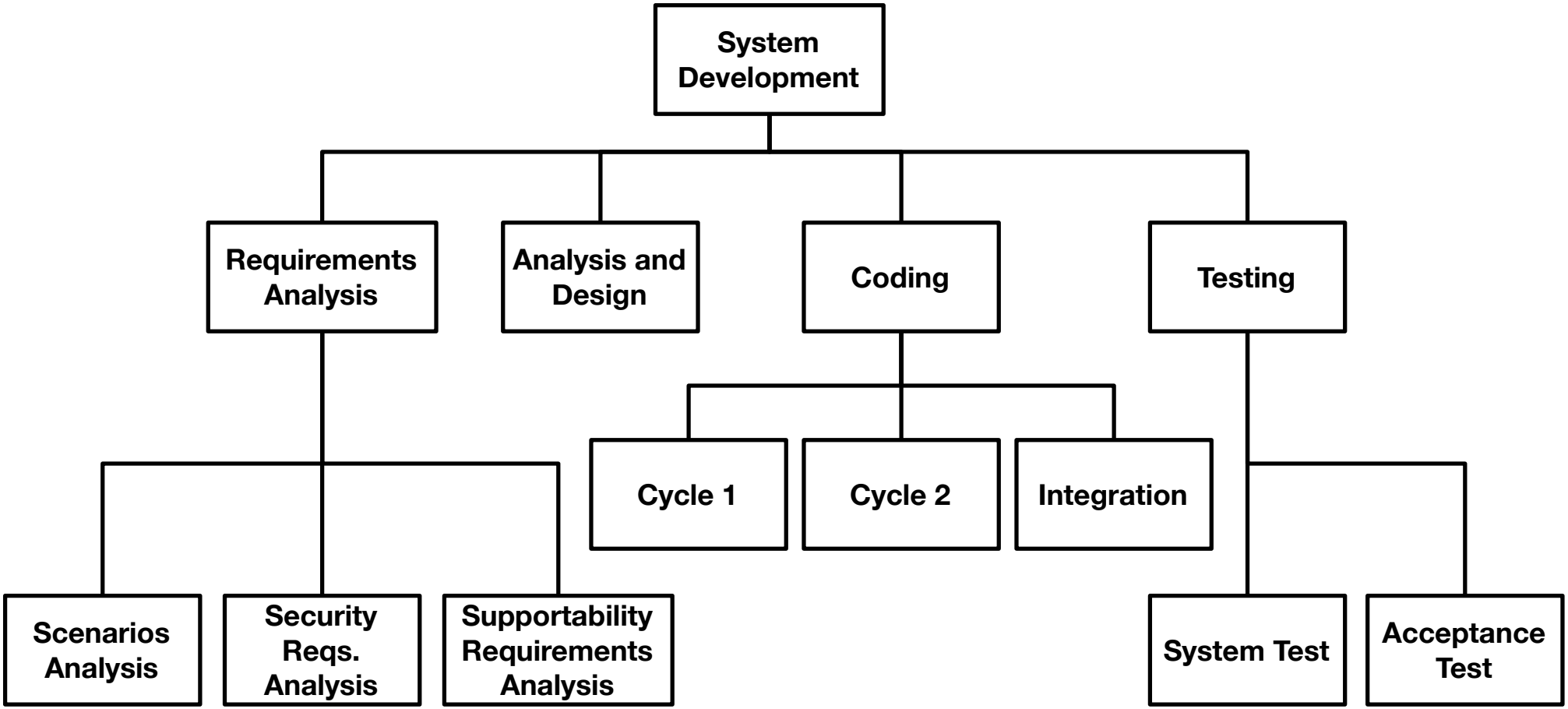
- **PWBS:** Program (project) WBS, used to coordinate all projects (systems)
- **CWBS:** Contract WBS, basis for subcontracting system development
- (Used by NASA)



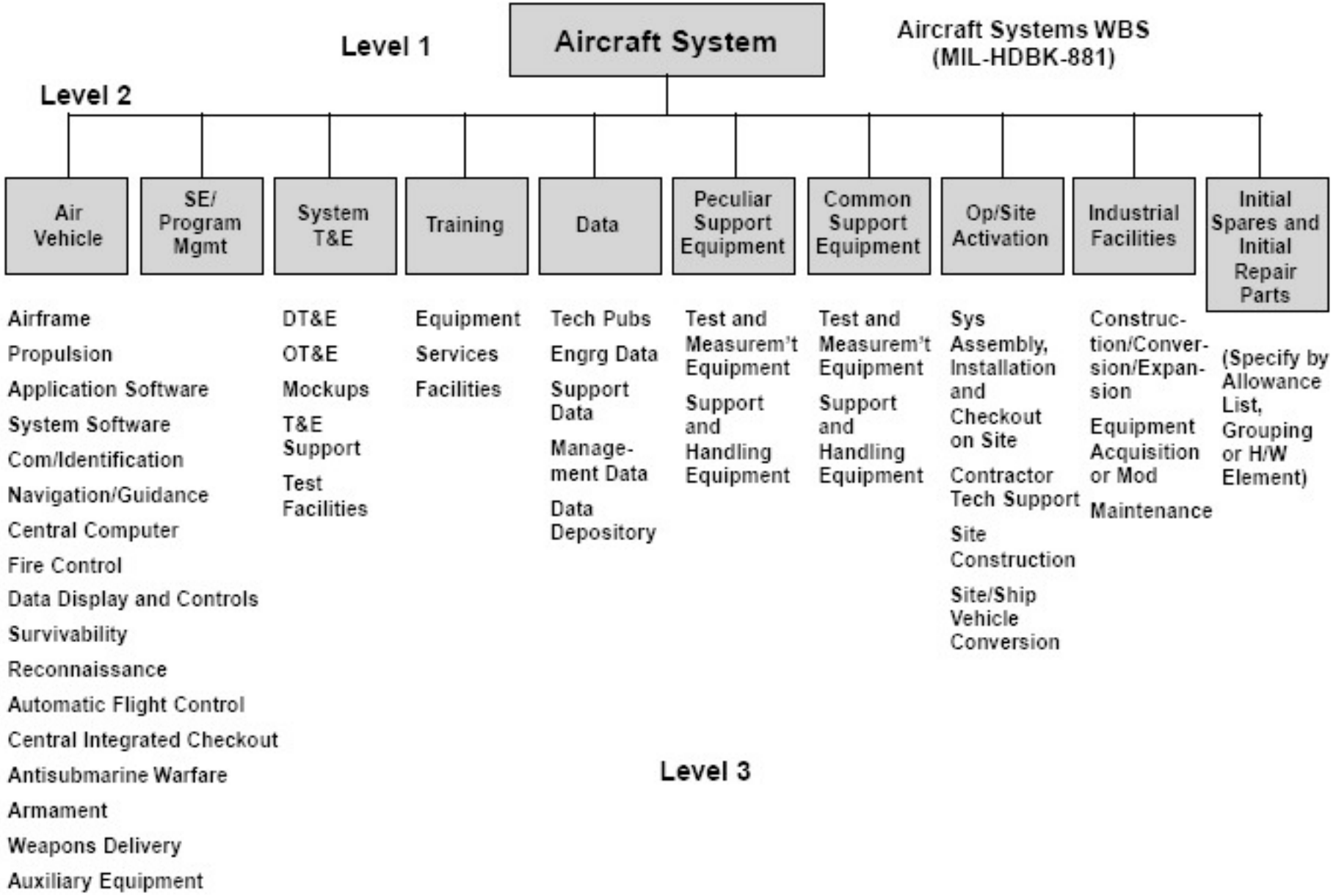
Product WBS Example



Process WBS Example



WBS Example (MIL-HDBK-881)



WBS Dictionary

- A WBS dictionary helps further specify the entries of a WBS
- It might contain title, number, detailed description of the element, quantities, associated work, contractual items
- Rules of the thumb:
  - it can be done for each entry in the tree.
  - follow the definition: increase the details as you move down the tree
  - a good practice is doing it for the leaves (work-packages)

WBS Dictionary

Work package number	1	**Start date or starting event:**	Month 1								
Work package title	Case Study Requirements and Experimentation Site Assessment										
Activity type	RTD										
Participant number	1	2	3	4	5	6	7	8			
Participant short name	P1	P2	P3	P3	P4	P5	P6	P7			
Person-months per participant	1	0	0	9	6	0	2	0			
Objectives											
Description of work	Task 1. Task 2. ...										
Deliverables	D1.1. D1.2.										
Milestones	M1.1. M1.2.										