Eating the Elephant One Bite at a Time
What is a System Hierarchy?

- An organization of the work required to complete a project
- Contains all the work items
  - Hardware
  - Software
  - Documentation
- Top down structure
- Lowest level maps to a knowledgeable person
System Hierarchy Structure
Hierarchical Level Names

<table>
<thead>
<tr>
<th>Hierarchical Level Name</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Mission</td>
<td>Needs + objectives + required operations</td>
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<tr>
<td>System</td>
<td>Total System = SC + LV + GSE + Comm + ....</td>
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<td>Segment</td>
<td>Flight = SC Bus + Instruments + LV + ....</td>
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<tr>
<td>Element</td>
<td>Spacecraft = structure + power + GNC + ....</td>
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<tr>
<td>Subsystem</td>
<td>Power = solar arrays + electronics + batteries +....</td>
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<td>Component</td>
<td>Solar Arrays = solar cells + interconnects + ....</td>
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<td>Part</td>
<td>Solar Cells</td>
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System Hierarchy Example – Space Shuttle

Tier 0
System

Tier 1
Segment

Tier 2
Element

Tier 3
Subsystem
The WBS is a hierarchical breakdown of the work necessary to successfully complete a project.

- An aid in defining and assigning the work
- Helps to avoid leaving out tasks

Communicates the work and processes involved to execute the project.

The Project Manager and project team use the WBS to develop the project schedule and resource requirements.

At the lowest level are products assigned to an engineer.
AggieSatX Phase A Work Breakdown Structure  
Aero 401
WBS Example:
Organizing a White Water Canoe Trip (1/4)
Organizing a White Water Canoe Trip (3/4)

- **Arrange Travel**
  - Schedule Flts
  - Rent Van
  - Reserve Hotel
  - Return Flts

- **Get Equipment**
  - Contact Outfitter
  - Bring Sleeping Bags
  - Bring Fishing Gear
  - Bring Lights and Waterproof Matches

- **Plan Meals**
  - Bring Cooking Gear
  - Freeze Dried Food
  - Call Caterer?

- **Prepare Budget**
  - Pick Budget Person
  - Get Deposits
  - Keep Receipts
  - Pay for Supplies
  - Close Out Trip

- **Plan for Emergencies**
  - Emerg. #s
  - Contact At Outfitter
  - Bring Flares
  - Bring First Aid Kits

- **Plan Activities**
  - Bring Cards
  - Bring Joke Book
  - Bring Scotch
Organizing a White Water Canoe Trip (4/4)

- **Arrange Travel**
  - Schedule Flts
  - Rent Van
  - Reserve Hotel
  - Return Flts

- **Get Equipment**
  - Contact Outfitter
    - Rent Canoes
    - Rent Tents
  - Rent Canoes
  - Rent Tents
  - Bring Sleeping Bags
  - Bring Fishing Gear
  - Bring Lights and Waterproof Matches

- **Plan Meals**
  - Bring Cooking Gear
  - Freeze Dried Food
  - Prepare 7 Breakfasts
  - Prepare 7 Lunches
  - Prepare 7 Dinners
  - Call Caterer?

- **Prepare Budget**
  - Pick Budget Person
  - Get Deposits
  - Keep Receipts
  - Pay for Supplies
  - Close Out Trip

- **Plan for Emergencies**
  - Emerg. #s
  - Contact At Outfitter
  - Bring Flares
  - Bring First Aid Kits

- **Plan Activities**
  - Bring Cards
  - Bring Joke Book
  - Bring Scotch
Exercise: Create a WBS

- You and your friends want to have a party on your deck.
- You have no deck.
- Create a Work Breakdown Structure that specifies the work needed to be done to build a deck.
- Two levels of activity is enough.
What is a Gantt Chart?

- Simply a graphic schedule

- Vertically
  - List the tasks that need to be accomplished

- Horizontally
  - Show how long each task takes
  - Show when it should be completed
  - Usually, these are estimates and will be adjusted as the project proceeds

- Start at completion and work your way back to the start
  - Working backwards will tell you how much time you have for each task
    - Giving more time to one task, takes it away from another
    - Try to include some “pad”; i.e., time that isn’t scheduled for any particular task
    - Pad can be part of one big task or spread out among all tasks.

- Balancing the schedule is an art!
Example Gantt Chart

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