Writing by design, Part 3
Writing A Good System Design Document

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This week

- Today – Writing a good SDD
- Wednesday at 9 AM, work on SDD
  - Friday 10 AM in FA210
  - Friday 9 AM in ENGR231
- Friday at 9 and 10, work on SDD

What have we written so far?

- We have created portions of a specification
  - What our product has to do…
  - …but not how the product meets the requirement.
  - Specification verbs (shall, should, may, etc.)
  - Supporting artifacts (SBD, DFD, block diagram)
- We have created portions of a Statement of Work
  - What work we have to do to complete our assigned task…
  - …that is, to make a compliant product
  - A schedule (Gantt or Network Diagram or both)
  - Specification verbs
  - But not how our product works

What's next? The System Design Document

- The SDD describes how our design works…
- …and may include design-specific details not previously captured in specifications.
- It does not describe the higher level requirements.
- It does not describe what work we have to do
- It describes our design
- Two different TCU teams would (should?) have different SDDs
- The level of detail is sufficient to either
  - Develop the next level of specifications, or,
  - To get on with implementation

The SDD Artifacts

- System Boundary Diagram
- Data/Control flow diagrams relevant to the level of the SDD
- Mission Scenario Diagram
- Interface matrices relevant to the level of the SDD
- Hardware block diagrams, often annotated with additional detail.
- Descriptions of algorithims
- Key design HW design elements
- Key software design elements

Who is the audience?

- The next team "down"
- Your customer / the next team "up"
- The customer
- Your company's marketing team might use a summary

Typical SDD Outline

- Executive Summary
  - At a high level, what does the device do and how does it work. The audience for this summary is management with some engineering background, but no detailed knowledge of the technology actually being used
- 1 Introduction
  - Document information
  - Brief system overview
  - Design Constraints
    - Things that are beyond the scope of the project, but will impact the ultimate application or use of the device.
  - Document overview
  - Reference Documents

- 2 Operational Concepts
  - Explain the relevant Mission Scenario Diagrams
  - Modes of operation and operating states
  - Operational Environment
    - Where is the system installed, used, stored, etc?
  - Support Environment
    - How is the system maintained, repaired, replaced, etc.?

- 3 System Design
  - System Architecture
  - System Partitioning
    - A description of the Hardware and Software Configuration items (HWCI, SWCI)
  - System External Interfaces
  - System Internal Interfaces
    - HWCI-to-HWCI
    - SWCI-to-SWCI
    - HWCI-to-SWCI
    - SWCI-to-HWCI

- 4 Processing Resources
  - A description of the types of memory used and their allocation to the task(s) at hand
- 5 Specification Allocation/Cross Reference
  - A detailed cross reference of the requirements to the individual CIs that satisfy the requirement
  - REMEMBER TAYLOR'S RULE OF DECOMPOSITION
    - No requirement may be split across CIs
    - An individual CI may satisfy multiple requirements
- Appendices as appropriate
  - Acronyms should be included!!
  - Consider including relevant analyses

Let's Talk about Design Constraints

- What limits your solution space?
  - The user requirements (of course)
  - The operational environment
  - The available funding
  - Product differentiation
  - Technology
  - Intended function
- User requirements are both criteria and constraints
- Your SDD needs to at least mention these

SDD Assignment

- Write and deliver the following SDD segments (1-2 pgs text each. Artifacts may use additional pages.
  - 1 Brief System Overview + other section 1 material to get to 1-2 pages
  - 2 Choose one or more sub-sections to meet 1-2 pgs.
  - 3 Choose either system architecture, system partitioning, or system external interfaces to meet 1-2 pgs.
  - 4 describe the processing resources or hardware resources required in your design
  - 5 Cross reference of FAA / ICAO requirements to HW or SW CIs.
- Each team member writes one section, all work on cross reference. Identify the author of each section, but submit as a team document.