A-7E Case Study
CSSE 574: Session 8, Part 6

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This discussion

- A case history
  - Ch 3 in Bass, *et al’s 2nd Edition* (see link).

- An example of what I’m looking to hear you do next week, from one of the other case histories in Bass:
  - Your choice
  - Figure about 5 - 10 min to describe
  - Invent a slide to talk from and turn in
  - Try to stimulate class discussion
  - Hit main points about arch problems
  - Write a 1-page description to turn in
A7E - Acknowledgements

Some of the material in these slides is taken from *Software Architecture in Practice, 2nd edition* by Bass, Clements, Kazman.

Outline

- History of A-7E Project
- Decomposition Structure
- Uses Relation
- Process Structure
Naval Research Laboratory

David Parnas

Kathryn Britton

Paul Clements

David Weiss
A-7E History

- Software Cost Reduction (SCR)
  - Information hiding
  - Requirements discovery
  - Reference Architecture
  - Software Architecture and Design
  - Partial implementation
A-7E Avionics

- **Sensors**
  - air probe
  - radar

- **Displays**
  - map
  - heads-up

- **Input**
  - joystick
  - keypad
Module Guide

- Provides decomposition structure of software architecture
- Describes information hiding modules
- Purposes:
  - avoid duplication and gaps
  - achieve separation of concerns
  - help maintainer find modules affected by a change request
Decomposition Goals

- Each module should be simple enough to understand fully
- Change in implementation of a module should not affect other modules
- Ease of making change related to likelihood of need for change
Decomposition Structure

- Hardware-Hiding Module
- Behavior-Hiding Module
- Software Decision Module
  - Application Data Type Module
  - Data Banker Module
  - Filter Behavior Module
  - Physical Models Module
  - Software Utility Module
  - System Generation Module
Uses Relation

- Similar to "calls" relation
- Allowed-to-use relation defined in advance to partition programming

<table>
<thead>
<tr>
<th>Using procedure</th>
<th>Used procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended Computer</td>
<td>(none)</td>
</tr>
<tr>
<td>Device Interface</td>
<td>EC.DATA, EC.PGM, ...</td>
</tr>
<tr>
<td>Air Data Computer Func.</td>
<td>DB.DI.ADC, DI.ADC, ...</td>
</tr>
</tbody>
</table>
Layers Implied by Uses Relation

<table>
<thead>
<tr>
<th>Function Driver, Shared Services</th>
<th>Software Utilities</th>
<th>Physical Models, Filter Behavior, Data Banker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Application Data Type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extended Computer</td>
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</tbody>
</table>
Process Structure

- Cooperating Sequential Processes
  - synchronization via shared data
- Types of processes:
  - periodic
  - demand-driven
- Offline scheduling
Process Consequences

- Thread structure identified
- Re-entrant procedures identified
- Most-often invoked procedures identified
- Mutual exclusion identified