Abstract

The presentation explains fundamental concepts of and approach to system partitioning.
Partitioning is Applied Recursively

![Diagram showing recursive partitioning](image)
Software plus Hardware Decomposition

applications
view PIP adjust view TXT

services
viewport menu

toolboxes
audio video TXT etc.

driver
drivers scheduler

hardware	
frame-buffer MPEG DSP

signal processing subsystem
domain specific
generic

systems
networking file-system

OS
CPU RAM etc

control subsystem
Guidelines for Partitioning

the part is cohesive
  functionality and technology belongs together
the coupling with other parts is minimal
  minimize interfaces
the part is selfsustained for production and qualification
  can be in conflict with cost or space requirements
clear ownership of part
  e.g. one department or supplier
How much self-sustained?

- control SW
- application SW
- HMI SW
- control electronics
- control interface
- cooling
- EMC shielding
- main function
- qualification support
- adjustment support
- power stabilization
- power conversion
- power distribution
- production support
- mechanical package

How self sustained should a part be?  

trade-off:

- cost/speed/space optimization
- logistics/lifecycle/production flexibility
- clarity
Decoupling via Interfaces

- Part e.g. pipe
- Hydrocarbon interface
- Power interface e.g. CAN
- Control interface
- Part e.g. pressure and flow regulator
- Mechanical mounting interface
- Other part with same interfaces can replace original
- Part e.g. pipe
The Ideal Modularity

The system is composed by using standard interfaces and a limited catalogue of variants (e.g., cost performance points).
Example Physical Decomposition and Visualization

1. Fluidic subsystem
2. Chamber
3. Bottom chuck
4. Process power supply
5. Electronics infrastructure
6. Base frame + x, y, θ stage
7. ZUBA
8. Optics stage control
9. Vision control
10. Covers and hatches
11. Cabling
12. Ventilation air flow
13. Contamination evacuation
14. Machine control
15. "Remote" electronics rack

Integration of systems engineering fundamentals: partitioning and interfaces.
Example Work Breakdown Structure

**TIP:NBE R1**

- **scanning**
  - preparation
  - xDAS
  - reconstruction

- **viewing**
  - xFEC
  - run time
  - algorithms

- **database**
  - hardware
  - viewing
  - database

- **computing**
  - database engine
  - clinical
  - bulk data
  - import
  - export

- **system**
  - host
  - OS
  - foundation classes
  - integration
  - alfa test
  - beta test
  - conf man

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**Legend**

- project
- segment
- make SW
- make HW
- buy SW
- buy HW
- system

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Example SW plus HW Decomposition

- **Applications**
  - View
  - PIP
  - Adjust
  - View TXT
  - Viewport
  - Menu
  - Audio
  - Video
  - TXT
  - Etc.

- **Driver**
  - Tuner
  - Frame-buffer
  - MPEG
  - DSP
  - Drivers
  - Scheduler
  - Signal processing subsystem
  - Domain specific

- **Services Toolboxes**
  - Browse
  - Networking
  - File-system
  - OS
  - CPU
  - RAM
  - Etc.
  - Control subsystem
  - Generic

- **Hardware**