Developing Layout from Concepts

- System form grows from;
  - Connections between components,
  - Relationships (including proximity) with other components and devices,
  - Relationships with users (operators, service, etc.)
System and Component Layout

How to begin

• Once again, consider function(s)

• Define subsystems by function performed
  Names are not critical
  For your understanding only

• Consider spatial relationships for subsystems/components
  between components, with users, etc.

• Sketch relationships and proximities
System and Component Layout

• Consider constraints to components and subsystems

Size envelope
  What is physical envelope available?
  Is size/space limited?
  Is movement required?

What is the operating environment?

Relationship with fixed or unalterable components
  Purchased components
  Existing interfacing systems
  Is design a retrofit?
System and Component Layout

- Consider constraints to subsystems and components

Relationship with user
  - Contact clearances, safety

Optical paths

Do constraints change with varying operational steps?
• Initially, spatial constraints apply to entire system.
• As design evolves, constraints between components emerge.
• Use bubble or block diagrams to show
  Relationships
  Connectivity's
  Access
  Avoidance
Considerations when performing layout

• Attachments / Mountings
  fasteners, welded, adhesive, etc.
  attachment surfaces (sufficient size, accuracy)

• Forces applied
  how are forces applied?
  where are forces applied?

• Motions required
  what is type of motion?
    sliding
    rotating
  use of linkages
Consider Component Relationships

- Component to Component
- Component to System/Layout Boundary
- Component to User
Relationships
Component to Component

• Close/contact
  Linked or attached
  Direct flow of Energy, Information, Mass/Material

• Near
  Components have related function(s)
  Components have common maintenance requirements
  Components share attachment/mounting

• Far (distant or barrier)
  Components have conflicting functions
  Possibility of contamination exists
  Thermal, vibrational issues exist
Near Proximity

Distant (barrier)
Relationships
Component to Layout Boundary

- **Flow of information**
  - Controls
  - Service

- **Flow of energy**
  - Power I/O
  - Heatsink
  - Ventilation

- **Flow of mass**
  - Consumables (materials used in operation)
  - Items which system operating upon (e.g. CD in CD drive)
Flow of Mass

Distant (barrier)

Flow of Information
- Human Factors/Ergonomics
  - Operation of device
  - Maintenance of device

Negative effects of operation
  - Noise
  - Vibration
  - Heat/Odor
Example: Water Quality Buoy