



# Drawing System Diagrams

## Lecture 23.02



# Basic Steps



- Identify all major components
  - Derived from your project goal, objectives and requirements
- Identify all interfaces between components
  - These are either relationships or real connections between components
- Produce your drawing
  - Components are labeled boxes
  - Interfaces are arrowed lines keyed to the interface function
  - Keep your layout as straight forward as possible



# Identify Components

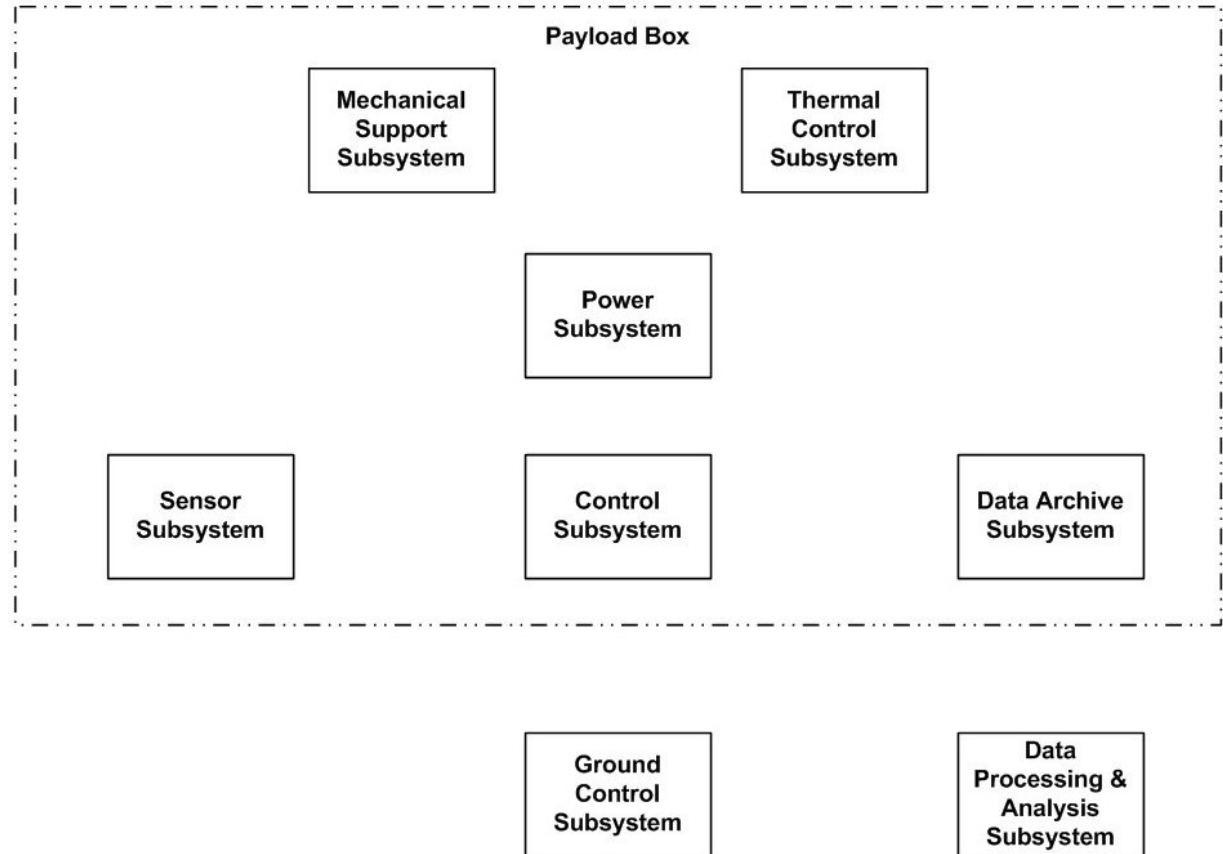
- Components are based upon the project goal, objectives, requirements, and level of detail
- For example, system level (High Level) diagram our components would be our subsystems:
  - Requirement: Measure Something -> **Sensor Subsystem**
  - Requirement: Store Data for analysis -> **Data Archive Subsystem**
  - For your payload to operate by itself during flight you need a **Control Subsystem**
  - Requirement: Provide Payload Power -> **Power Subsystem**
  - Requirement: Maintain payload integrity through flight -> **Mechanical Support Subsystem**
  - Requirement: Maintain components within operating temperature -> **Thermal Control Subsystem**
  - Requirement: Control system from the ground -> **Ground Support Subsystem**
- Different kinds of subsystems may be required based on the goals and objectives of the project



# Example System Level Drawing



- Each sub-system has its own box
- Components are arranged in a way to show their connections to other components
- Components do not need to be drawn in their physical arrangement





# Determine the interfaces



- Interfaces are the “connections” between the components
  - Could be a physical connection (e.g. wire, mechanical)
  - Could be an electrical signal (e.g. Serial, radio signal)
  - Could be a relationship / property (e.g. temperature, light)
  - We do not need to draw every wire (Could use a single line for an SPI interface [4 Wires])
- Each type of interface should be represented by a different kind of line
- Each interface should be labeled according to its specific characteristics
- Arrows on the ends of the line indicate flow
  - For example: Electrical power is usually 1 way, communications are often bidirectional)



# Sample Interface representations



- Interfaces types

- Power



- Data



- Control



- Mechanical



- Thermal



- Interface flow

- To component



- From component

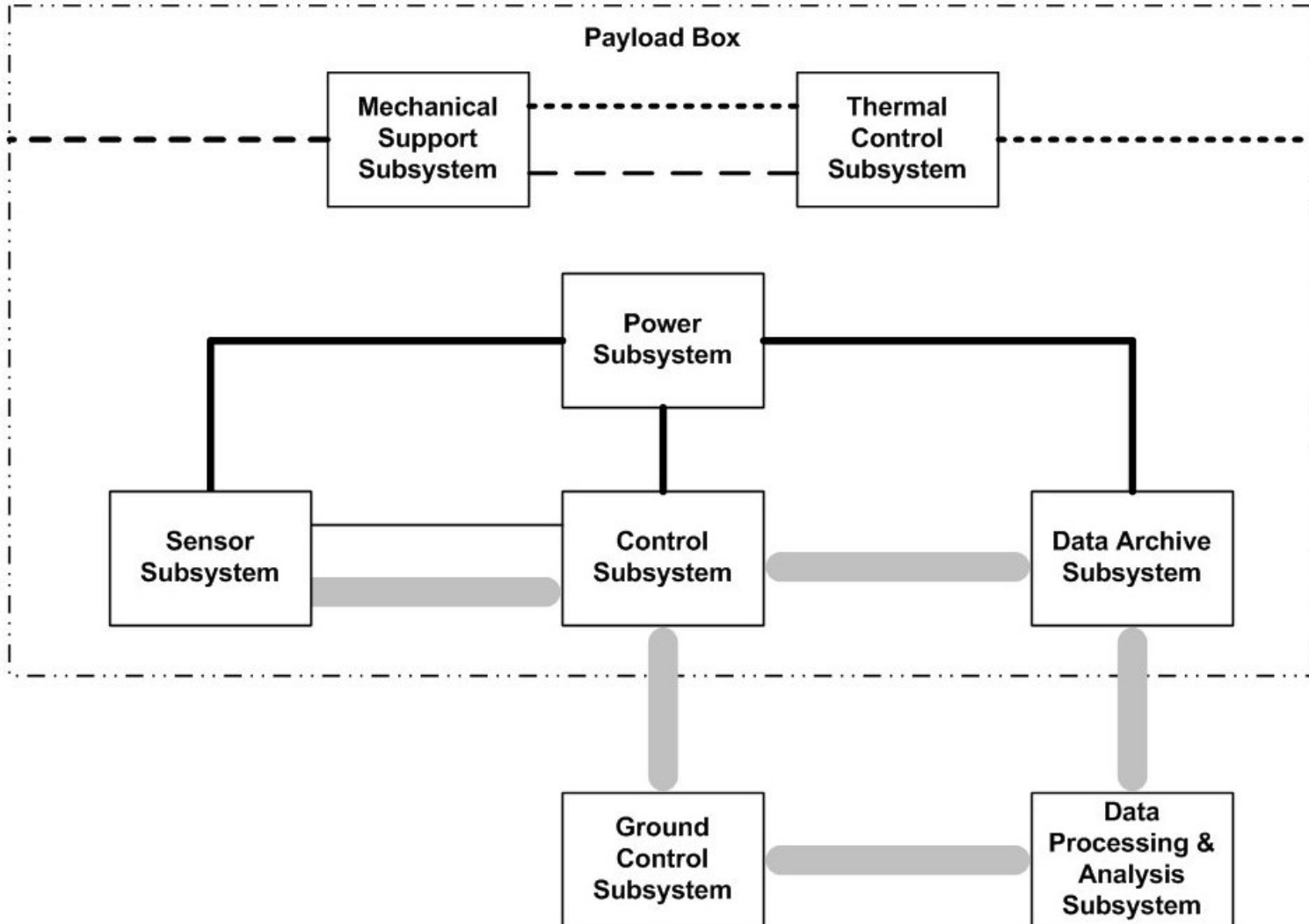


- Bi-directional



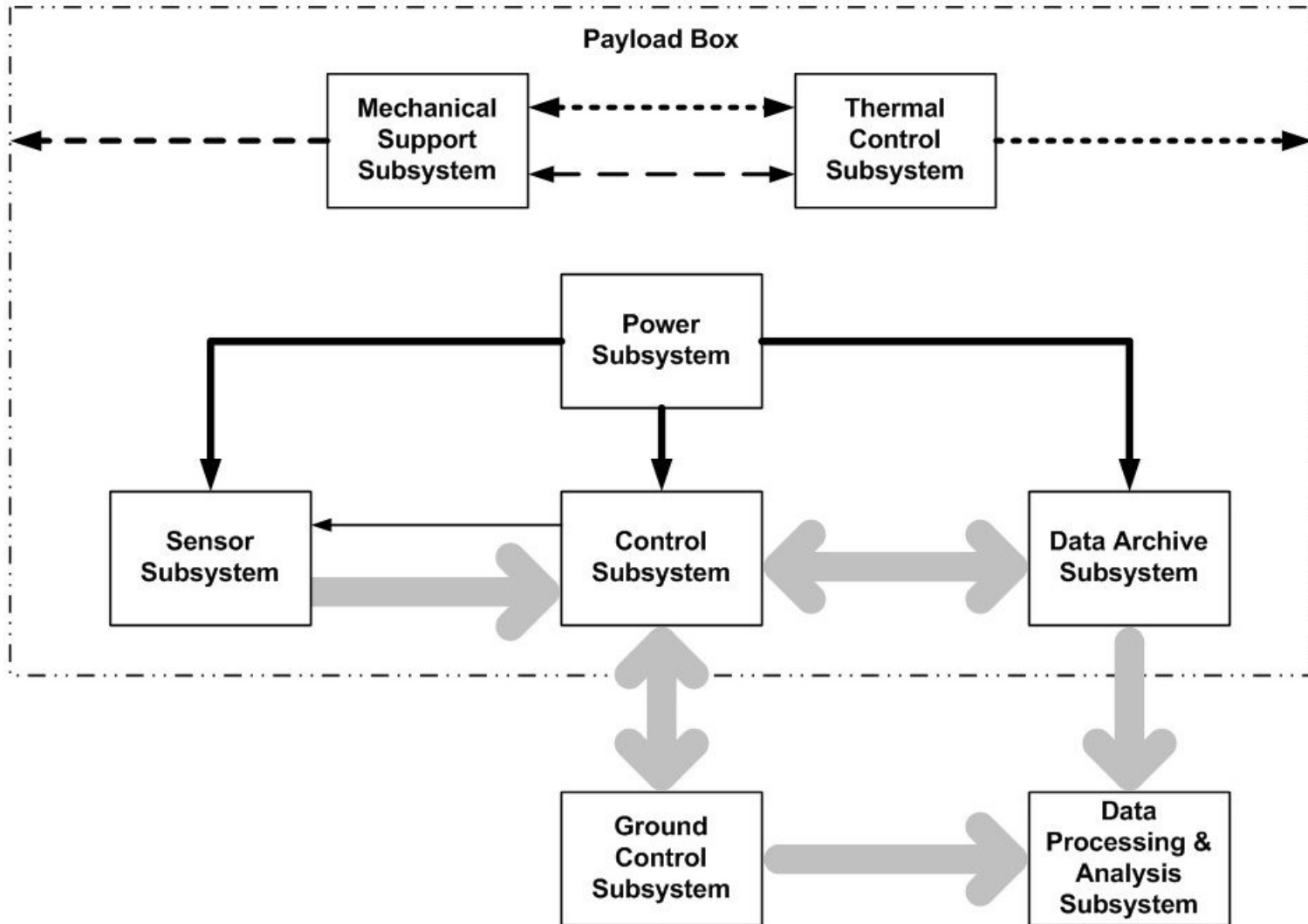


# Add the interfaces



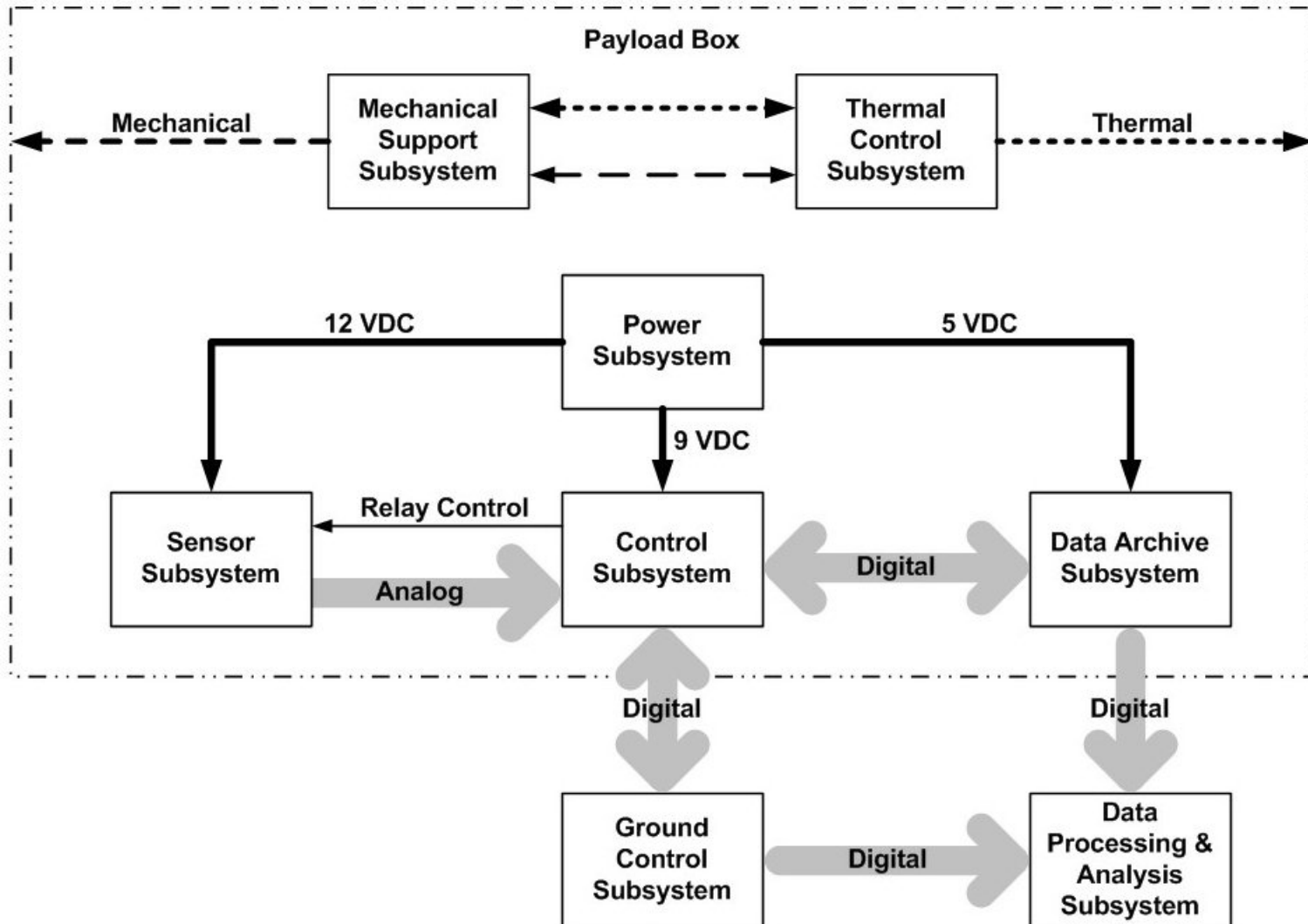


# Indicate the interface flow





# Add labels



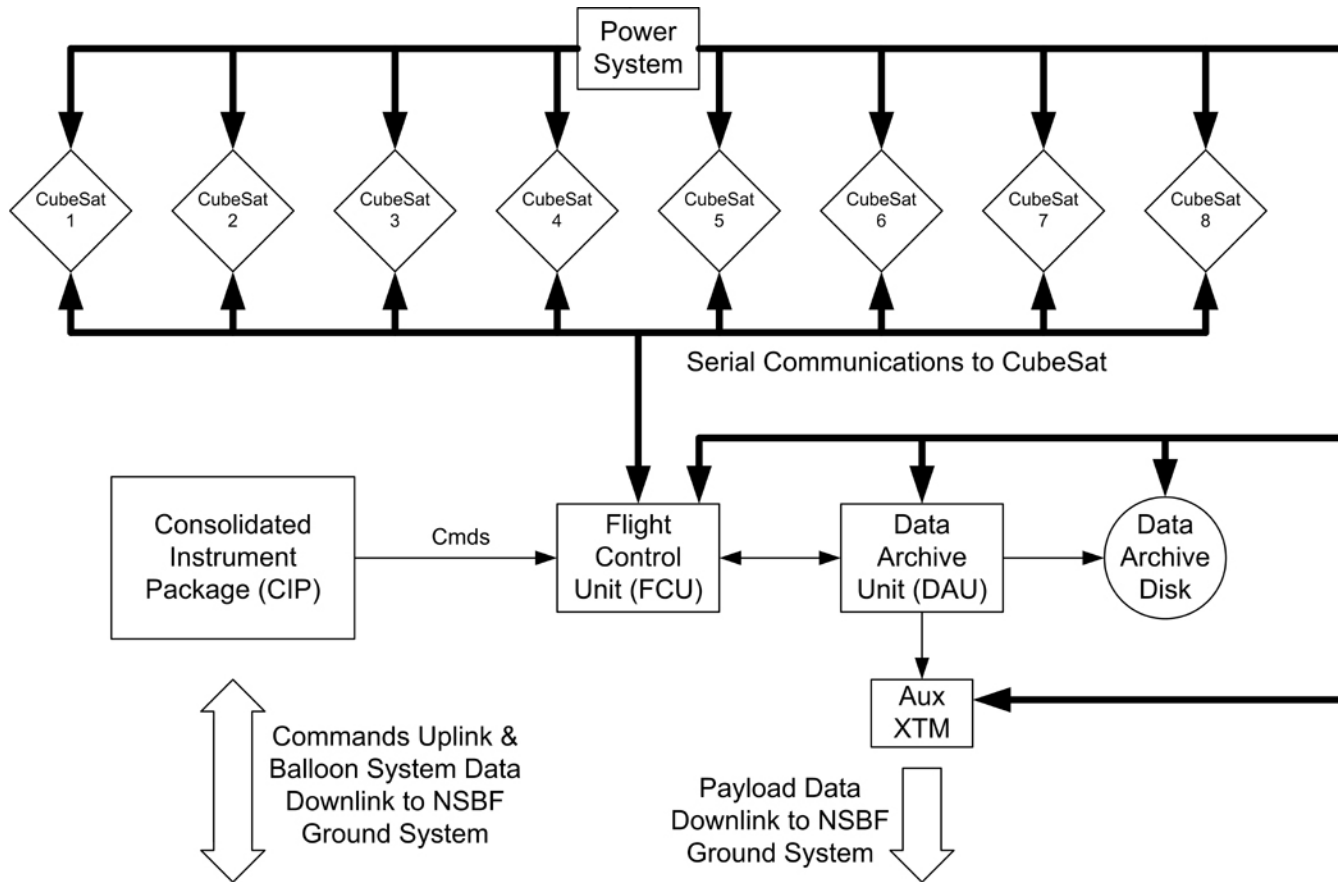


# Detailing Subsystems



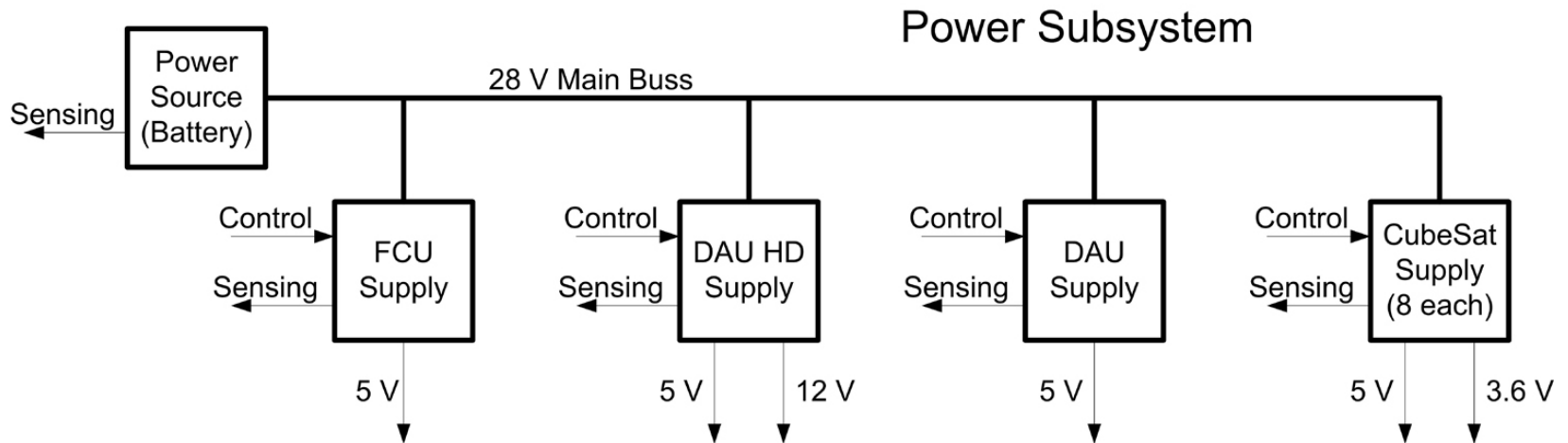
- Remember from System Design, we will have multiple levels of details for system drawings
- Each of the previous subsystems would have more detailed drawings
- As you develop your design and requirements you should develop more detailed system drawings
- System drawing help you identify the interfaces and may point out an interface you have missed
- A good rule of thumb is 3 levels of system diagram in increasing detail
  - High Level System overview
  - Subsystem functional version
  - Refined Subsystem with detailed components and interfaces
- More complex subsystem will may need additional detailed levels and simpler system may not need as many

# System Level Drawing Example

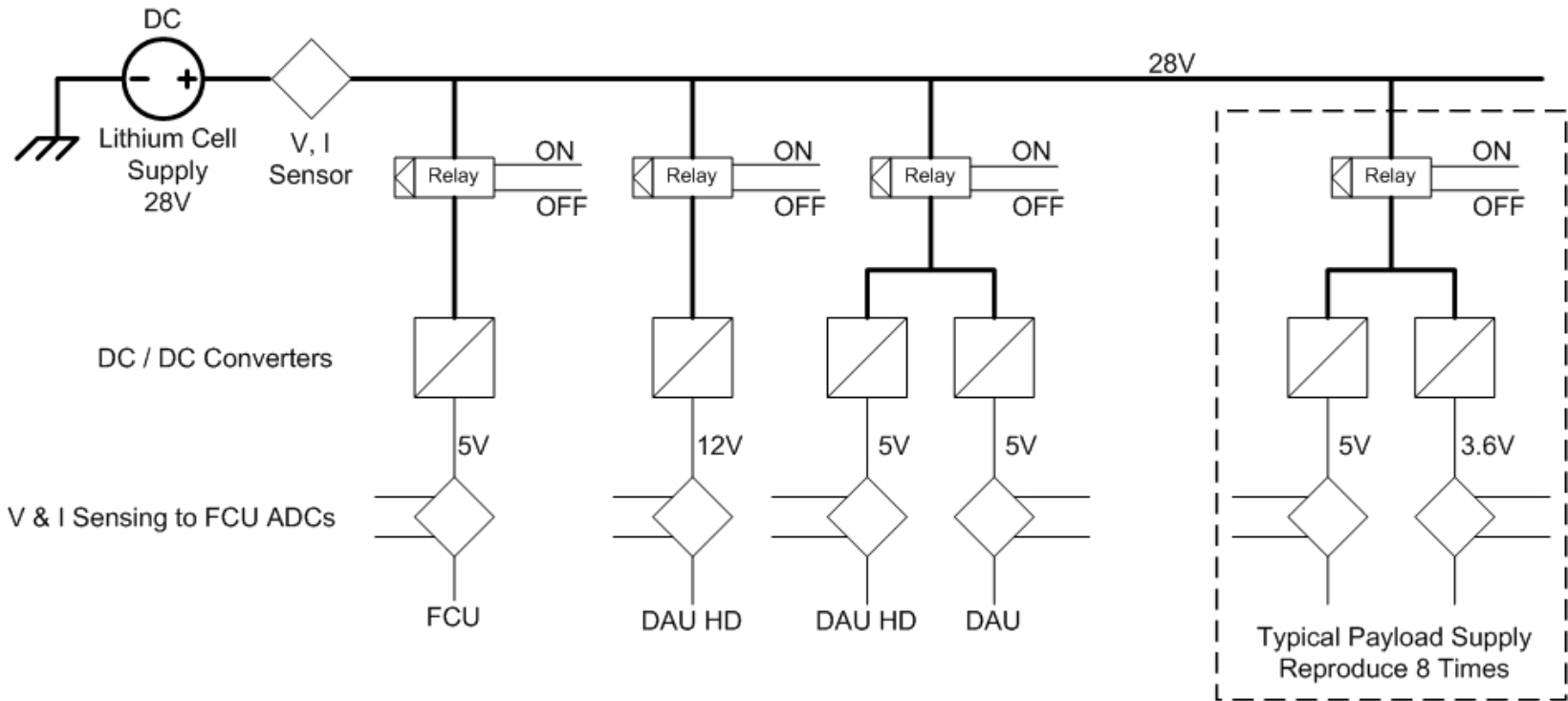




# Subsystem Level Example



# Refined Subsystem Example





# Drawing Readability



- Do not try to squeeze too much information into a single drawing
  - Give subsystems individual drawings
  - Can spread interfaces across multiple drawings
    - Could have multiple versions of the system level diagram for different sets of interfaces
- Show connections to outside systems
  - A control signal coming in a sensor subsystem
  - Do not need to draw the entire control system on the sensor drawing, but would shown in detail where it connected inside the sensor
- Try to vary line style as well as color and include a legend



# Drawing Software



- Microsoft Office Suite: Visio works well
- Google Drawings
- Draw.io
- Choose something with predefined blocks and arrow connectors rather than image editing software.