CubeSat Flight Software Workshop

Spacecraft Architecture

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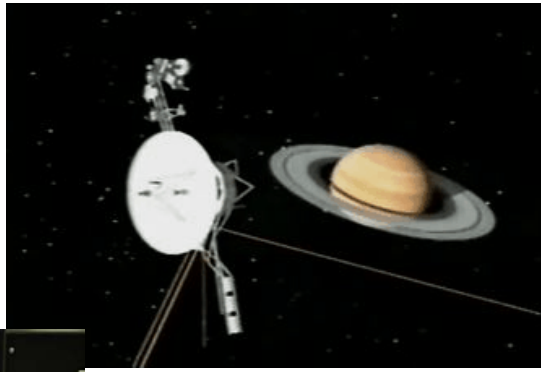
Introduction to Spacecraft Architectures

- Many different kinds of spacecraft
  - Explorers
  - Communications
  - Weather
  - Military
  - Cubesats



Voyager

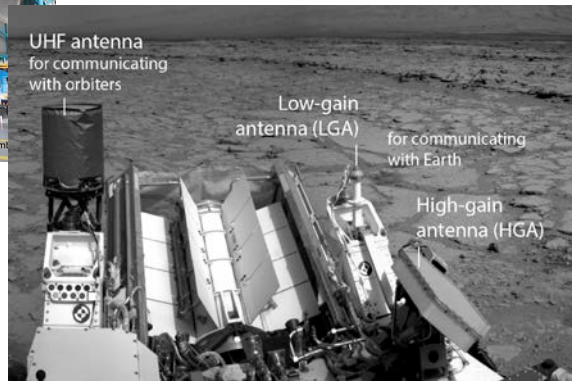
Asteria

Iridium

Spacecraft Subsystems

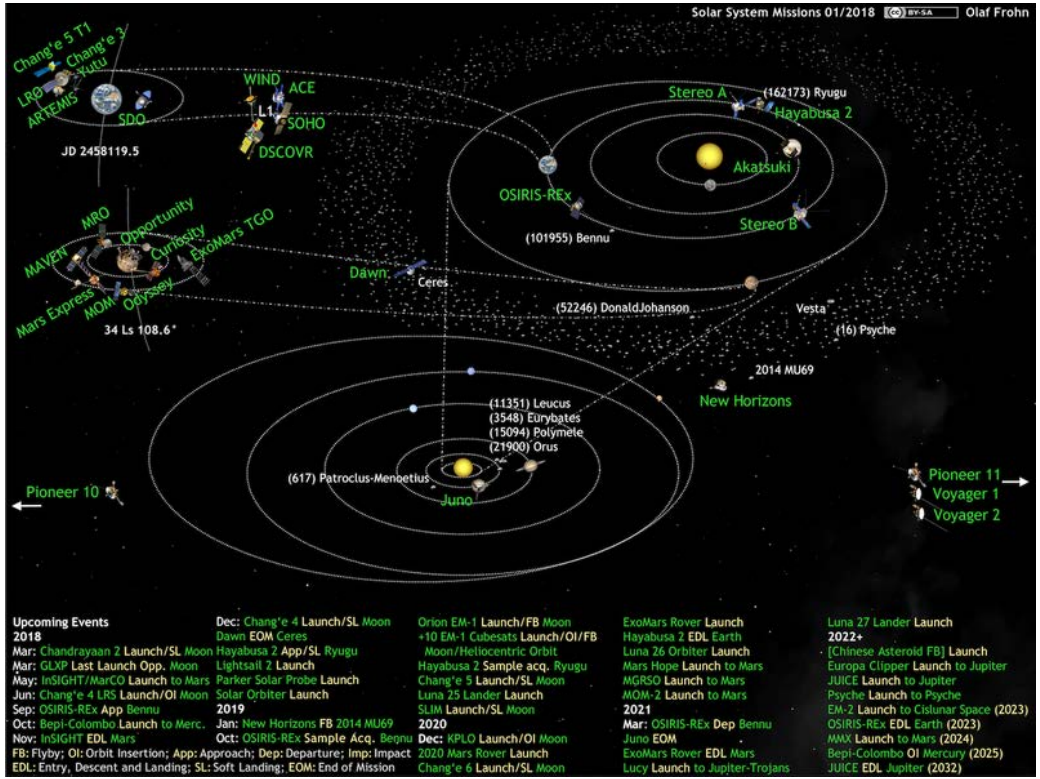
- Propulsion
  - Thrusters (main, RCS)
  - Valves
  - Fuel delivery
- Telecom
  - Data encoding
  - Amplification and transmission
  - Reception
  - Radio Science
  - Antenna system

Saturn V



Curiosity

Active Spacecraft

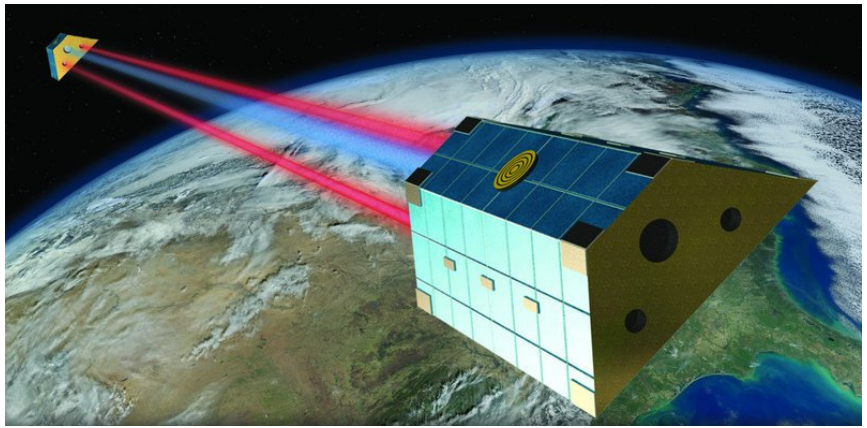


Introduction to Spacecraft Architectures

- Payloads
  - Instruments
  - Radars
  - Experiments

Jason 2

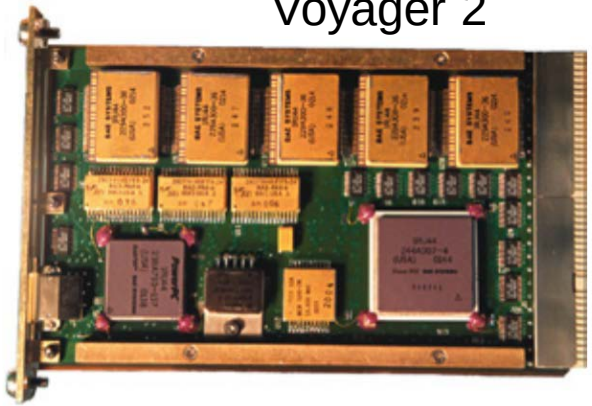
Grace Follow-On



Introduction to Spacecraft Architectures

- Characteristics of Spacecraft
  - Rugged
    - Survive for many years
    - Over-engineered
    - Old but reliable tech
  - Space-worthy
    - Radiation
    - Thermal
    - Power
  - Autonomous
    - Respond to faults
    - Guidance algorithms
    - Research on even more

Voyager 2

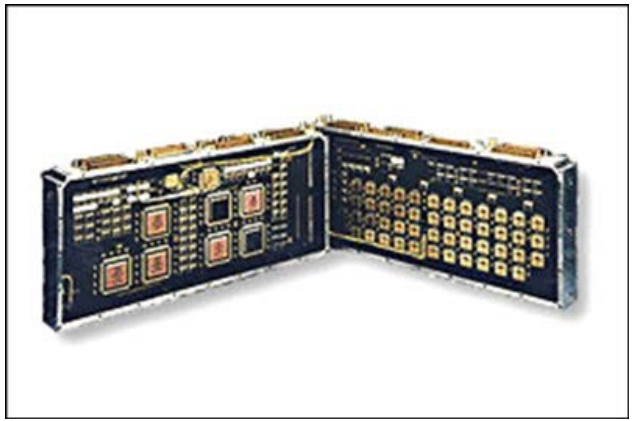


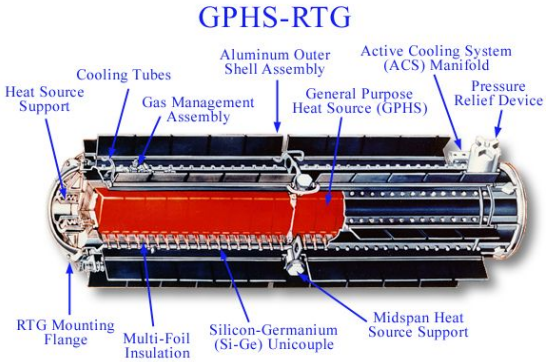
BAE
RAD750

Spacecraft Subsystems

- Command and Data Handling (C&DH)
  - Computer processor(s)
  - Storage
  - Input/Output devices
    - UARTs, SpaceWire, SPI, I2C
  - Communication Busses
    - PCI, AMBA, 1553, VME
- Power
  - Power source
  - Battery system
  - Power switching

Cassini



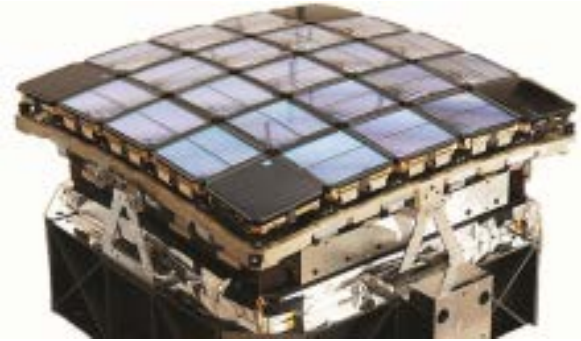


Spacecraft Subsystems

- Mechanical
  - Structure of the system
    - Rigid
    - Articulating
    - Rotating
- Payloads
  - Instruments
  - Sensors
  - Experiments
  - Imagers

Insight

Kepler

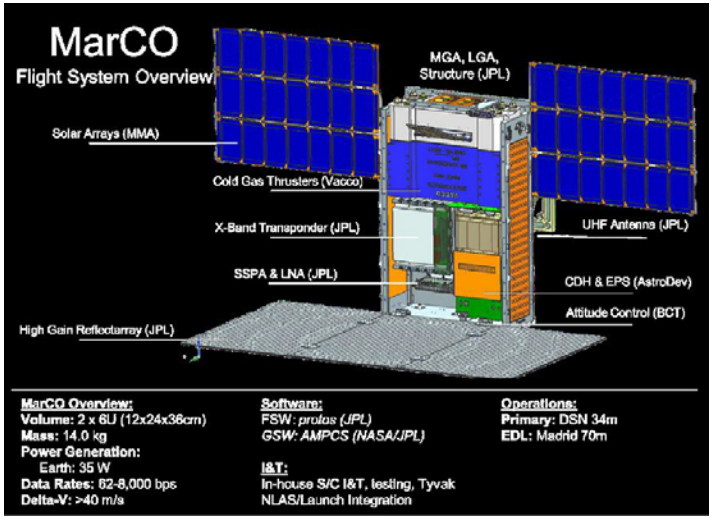


Spacecraft Subsystems – Hardware Layering

Peripheral (Payload, Power, Telecom, etc)

I/O Device

Processor



MarCo Cubesat

References (shortened via bitly.com)

- Voyager - https://bit.ly/2HTD0yK
- Iridium - https://bit.ly/2gFBaUb
- Asteria - https://go.nasa.gov/30TovDQ
- Saturn V - https://bit.ly/2HDOjvZ
- Curiosity - https://bit.ly/2K8dLez
- Active Spacecraft - https://bit.ly/1K61I9C
- Jason 2 - https://bit.ly/2JIDjjh
- Grace Follow-on - https://bit.ly/2HXO3XF
- Voyager 2 - https://bit.ly/2vhOh3q
- BAE RAD750 - https://bit.ly/2JFgM6T
- Cassini C&DH - https://go.nasa.gov/2wlbbtN
- RTG - https://bit.ly/1S8HHVF
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