Spacecraft Architecture

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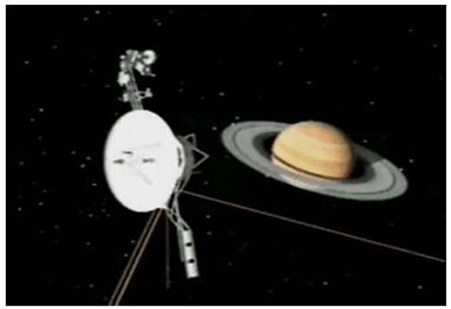
Introduction to Spacecraft Architectures

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



Voyager

Asteria

Iridium

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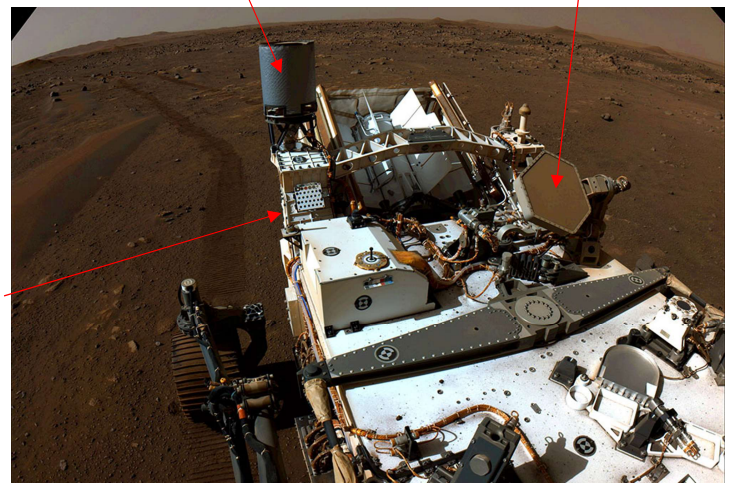
Spacecraft Subsystems

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

Saturn V



Perseverance Rover

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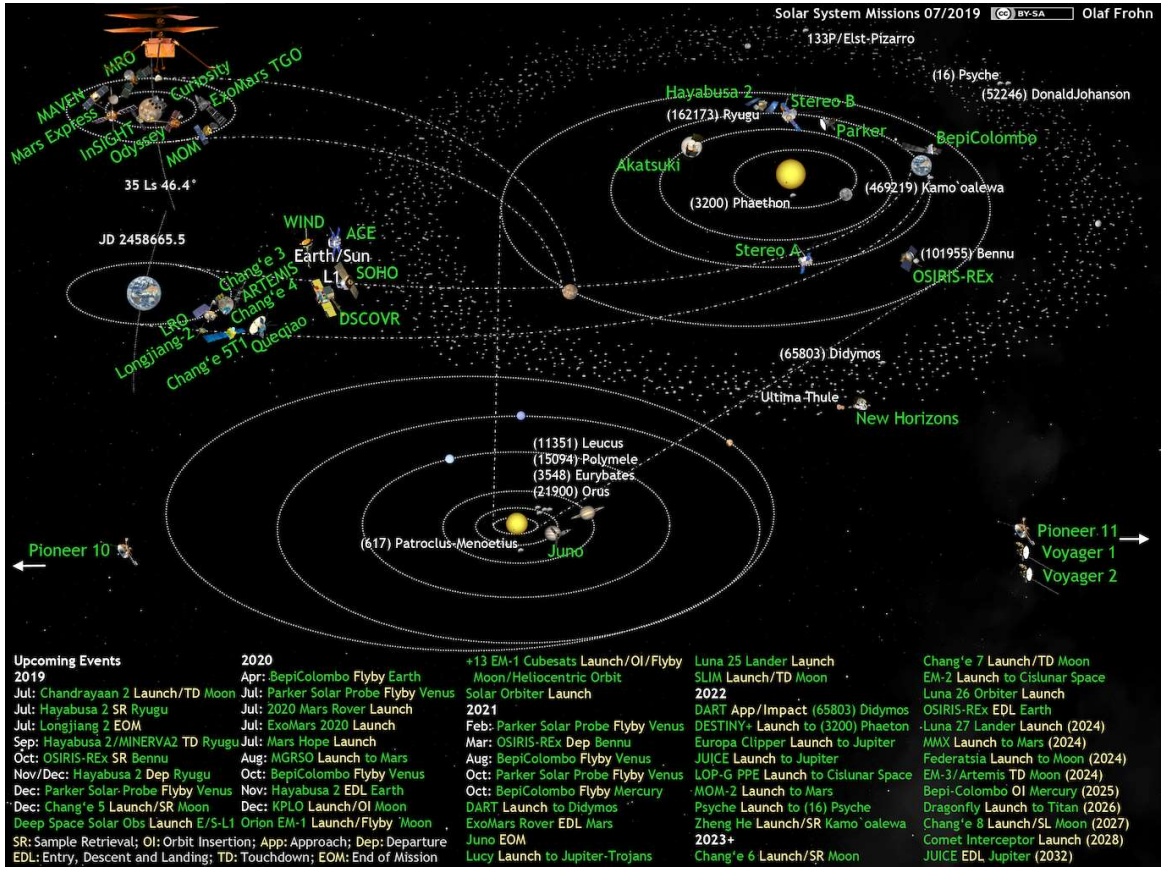
Active Spacecraft



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Other Spacecraft Architectures

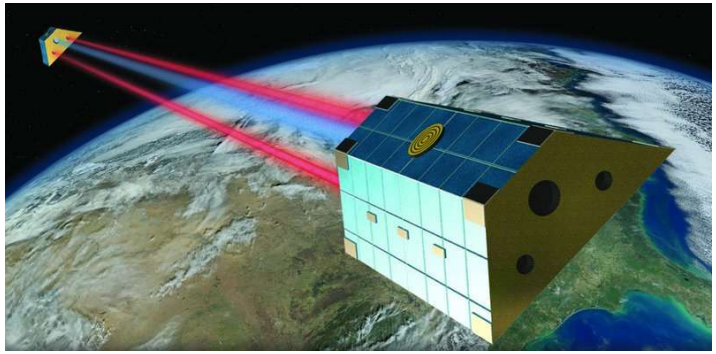
- Payloads
  - Instruments
  - Radars
  - Experiments
- Deployables
  - Aerial Vehicles
  - Rovers

Ingenuity

Jason 2

Cadre

Grace Follow-On



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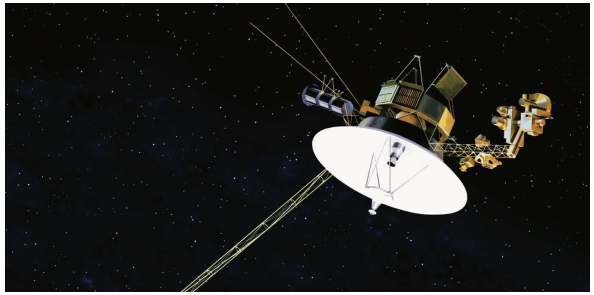
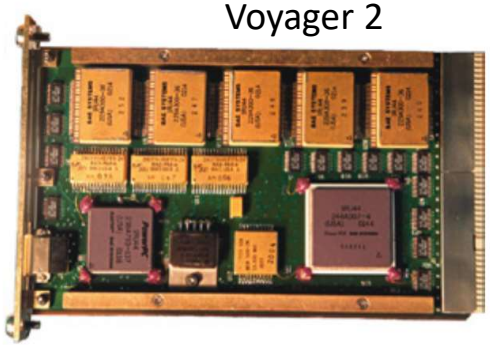
Spacecraft Characteristics

- 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

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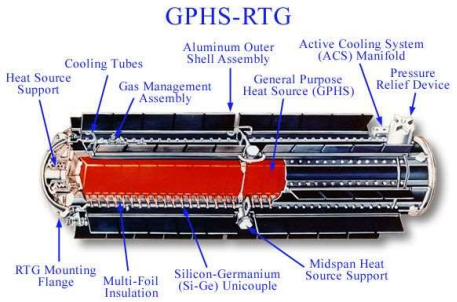
Spacecraft Subsystems

- 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 Flight Computer

Ingenuity Avionics



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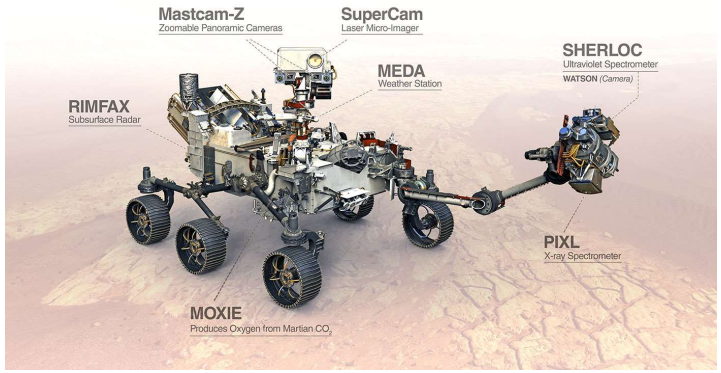
Spacecraft Subsystems

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

Insight

Perseverance



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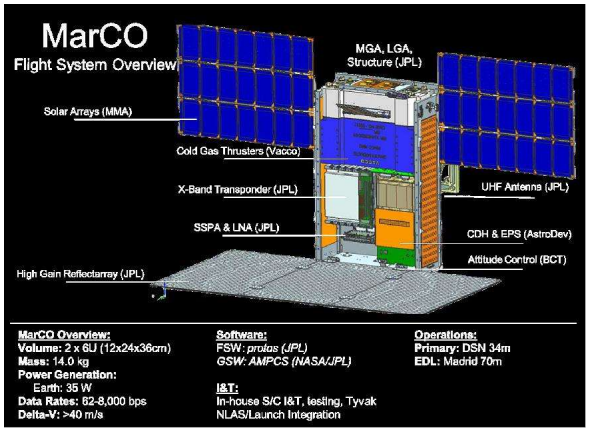
Spacecraft Subsystems – Hardware Layering

Peripheral
(Payload, Power, Telecom, etc)

I/O
Device

Processor



MarCo Cubesat

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References (shortened via bitly.com)

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- Saturn V - https://bit.ly/2HDOjvZ
- Perseverance - https://go.nasa.gov/3V8zN36
- 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
- Insight - https://abcn.ws/2RadqsM
- Kepler - https://bit.ly/2EAwkoc
- MarCo - https://go.nasa.gov/2WtrAuN

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