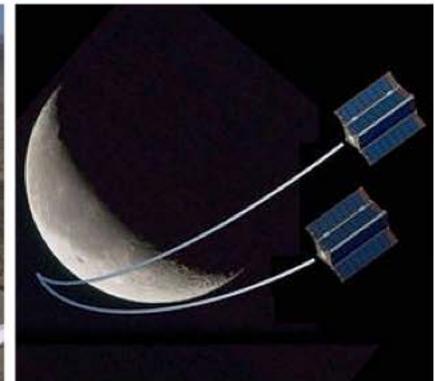
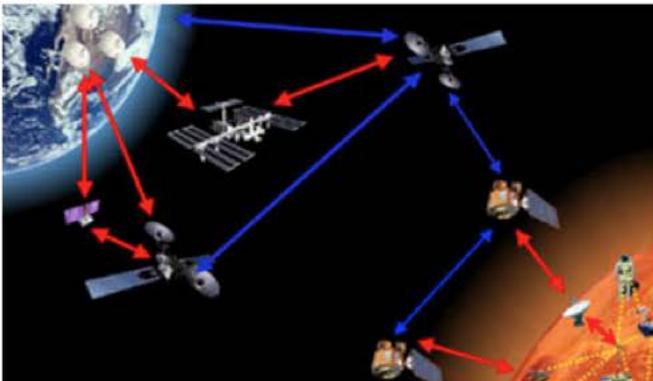
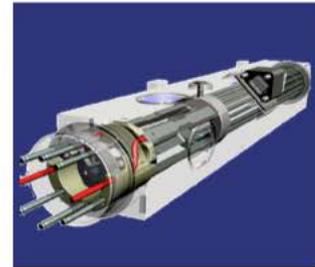
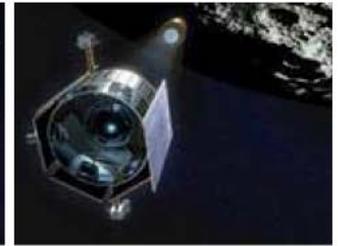
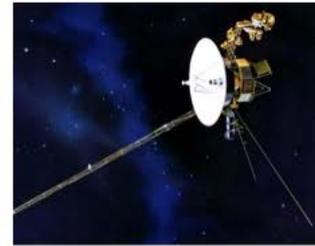


Introduction to the DSN and its Operations

Al Bhanji
DSN Project Manager

Wayne Sible
DSN Deputy Project Manager

Jeff Berner
DSN Chief Engineer





Agenda

- **DSN Overview**
- **The Future**
- **Short Video on the “Day in the life of the DSN”**



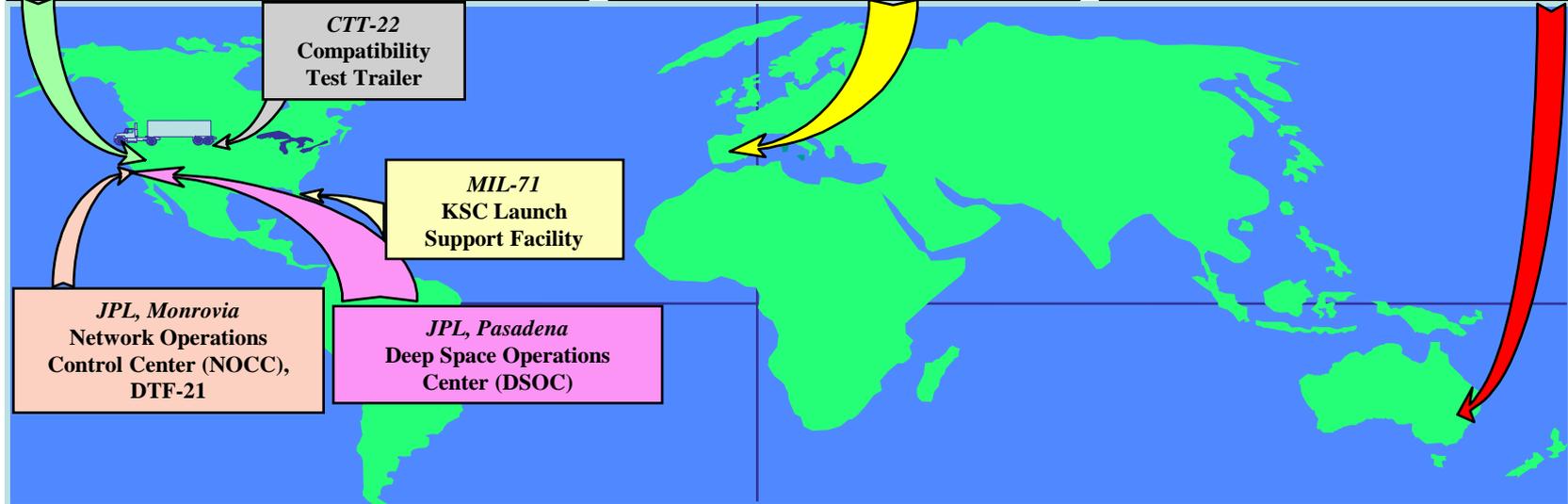
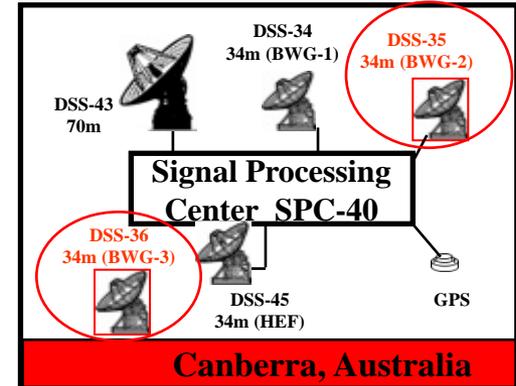
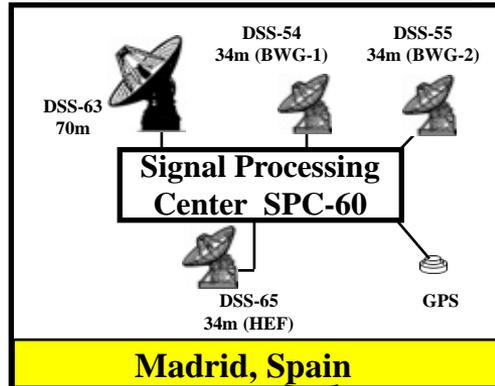
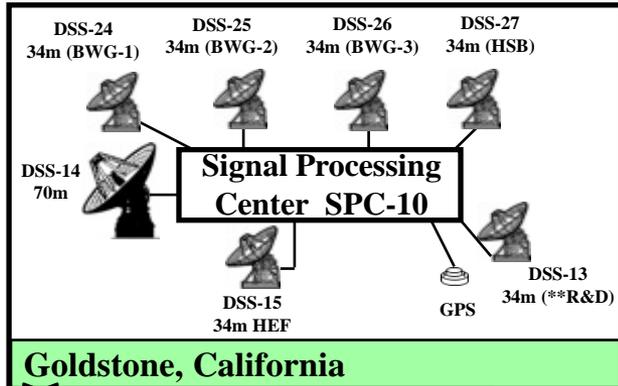
The Deep Space Network

- NASA's Deep Space Network (DSN) was established in December 1963 (50 years ago!) to provide a communications infrastructure for all of NASA's robotic missions beyond geostationary orbit. It is the largest and most sensitive scientific telecommunication system in the world. Some of the missions supported includes:
 - FOR NASA: Surveyor, Ranger, Mariner, Pioneer, Viking, Voyager, Magellan, Galileo, Mars Pathfinder, Cassini, Deep Space 1, MER, MGS, Mars Odyssey, Spitzer, Stardust, MRO, Phoenix, Deep Impact, MSL, JUNO, DAWN
 - FOR OTHER SPACE AGENCIES: Ulysses, SOHO, Planet-C, Mars Express, Rosetta, MOM
- Besides DSN's prime responsibility of telecommunications for NASA and international Missions, it also supports scientific investigations through radio astronomy, radio science, and radar activities
- The Deep Space Network Project Office at JPL handles programmatic management of the DSN and is also responsible for the engineering and operations of the DSN



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DSN Facilities





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International Partnerships



- **NASA/JPL depends upon international partnerships and contracts to successfully operate the DSN worldwide.**
 - **Goldstone and Pasadena Operations are contracted to ITT Exelis**
 - **Canberra is managed by the Commonwealth Scientific Industrial Research Organization (CSIRO)**
 - **Madrid is managed by the Instituto Nacional de Tecnica Aeroespacial (INTA) who in turn contract to Ingeniería de Sistemas para la Defensa de España (ISDEFE)**



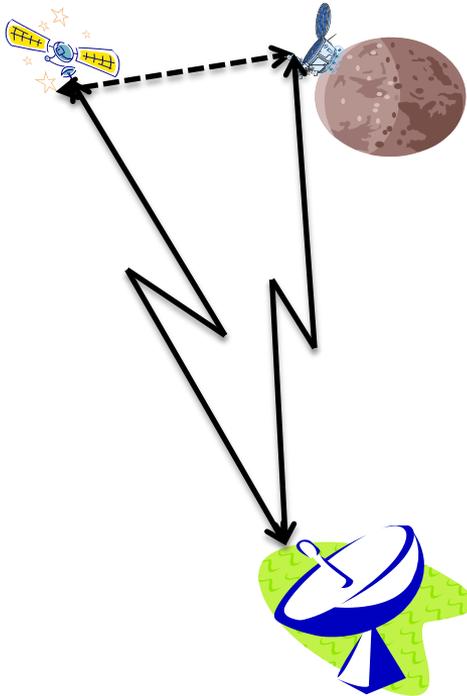


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Interplanetary Network Directorate Functions of the Deep Space Network



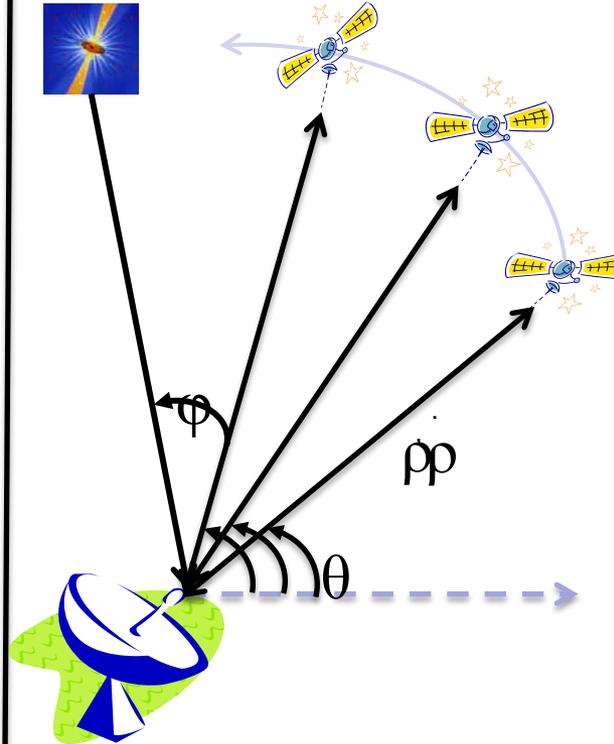
Telecommunication



Uplink (Command): 20KW Transmitters; S-band (2 GHz) and X-band (8 GHz); Data Rates from 10 bps to 10 Kbps

Downlink (Telemetry): S-band (2 GHz), X-band (8 GHz), Ka-band (26 or 32 GHz); Data Rates from 10 bps to 6.6 Mbps

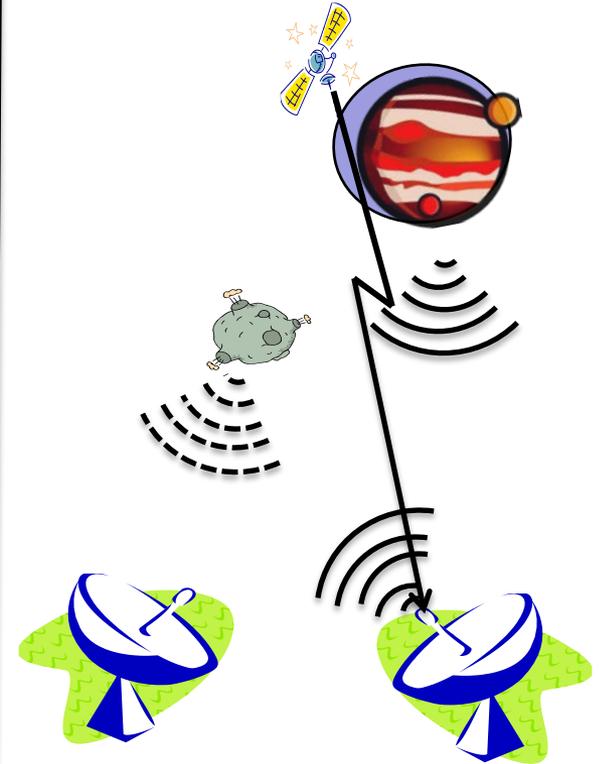
Tracking



Collect multiple data types used for orbit determination:

- Range
- Doppler
- Angles
- Delta-DOR
- Very Long Baseline Interferometry (VLBI)

Science



Radar: Bouncing a radio signal off a celestial body and processing the received reflected signal

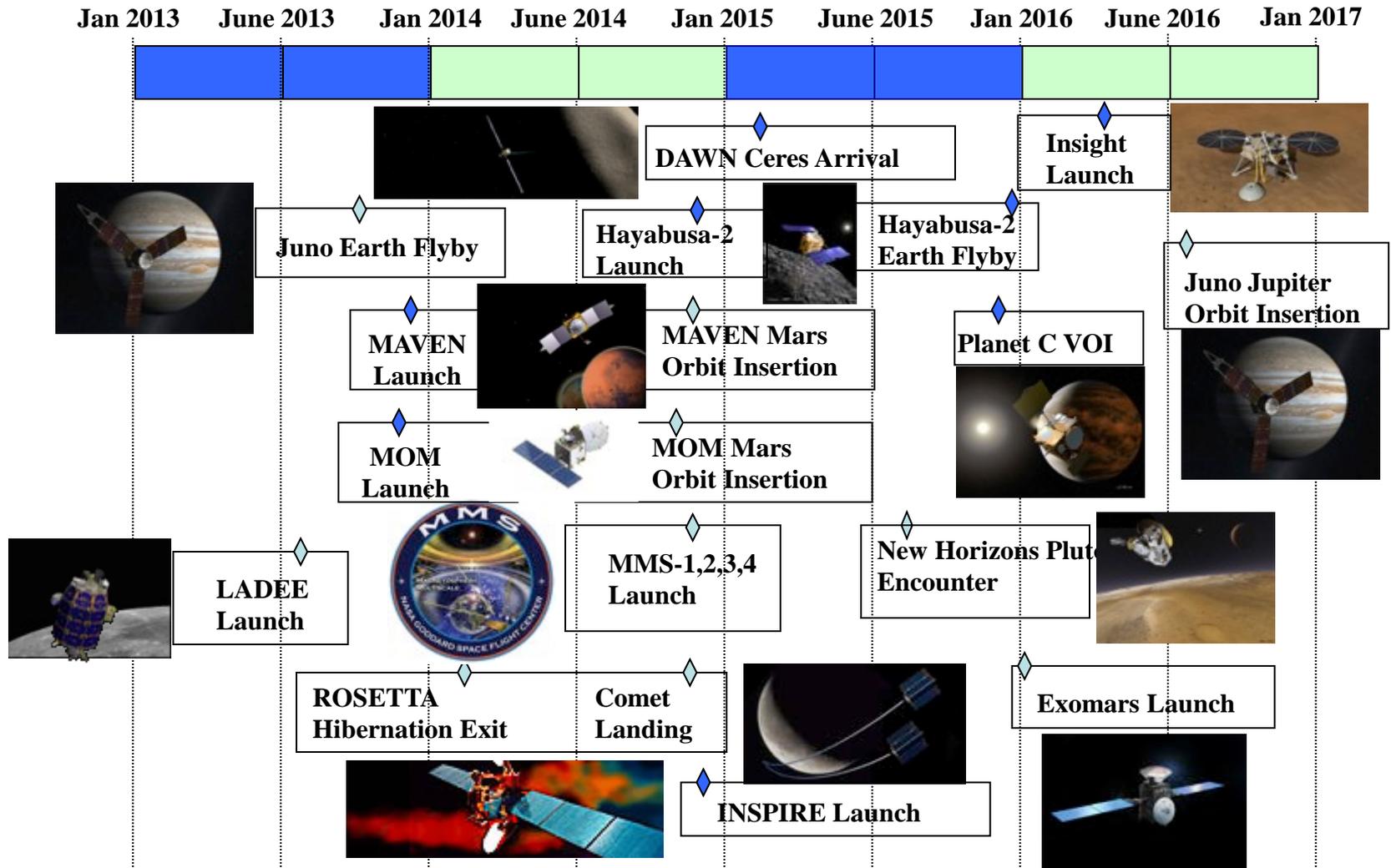
Radio Science: Observations of changes in a spacecraft radio signal as it passes through a planetary atmosphere

Radio Astronomy: Observations of naturally occurring radio emissions



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Major Upcoming Mission Events





The Future

What plans and challenges are ahead?

Reducing costs:

- One operator controlling multiple antennas
- Standardized maintenance across the world
- Web based data interfaces

Improving performance:

- Higher data rates for both uplink and downlink
- Error correcting coding for the uplink
- New error correcting codes for the downlink
- New antennas, operated singly or as an array

Adding new capabilities:

- Higher frequency bands
- Wider bandwidth RADAR capability
- Optical data downlinks (using RF antenna)

For half a century the DSN has been a cornerstone of deep space scientific achievement and has been an enabler of new technology and capabilities...that has also changed our daily lives on Earth!!!



A day in the life of DSN....enjoy!!!



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A Short Video...

