Consultative Committee for Space Data Systems (CCSDS): Standards Development and Infusion

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Consultative Committee for Space Data Systems (CCSDS)

- **Founded in 1982 by the major space agencies of the world, the CCSDS is a multi-national forum for the development of communications and data systems standards for spaceflight.**
- **ISO "duality" relationship began in 1990**
- **Today, leading space communications experts from 27 nations collaborate in developing the most well-engineered space communications and data handling standards in the world.**
- ***The goal is to enhance governmental and commercial interoperability and cross-support, while also reducing risk, development time and project costs.***
- **More than 900 space missions have chosen to fly with CCSDS-developed standards, and the number continues to grow.**

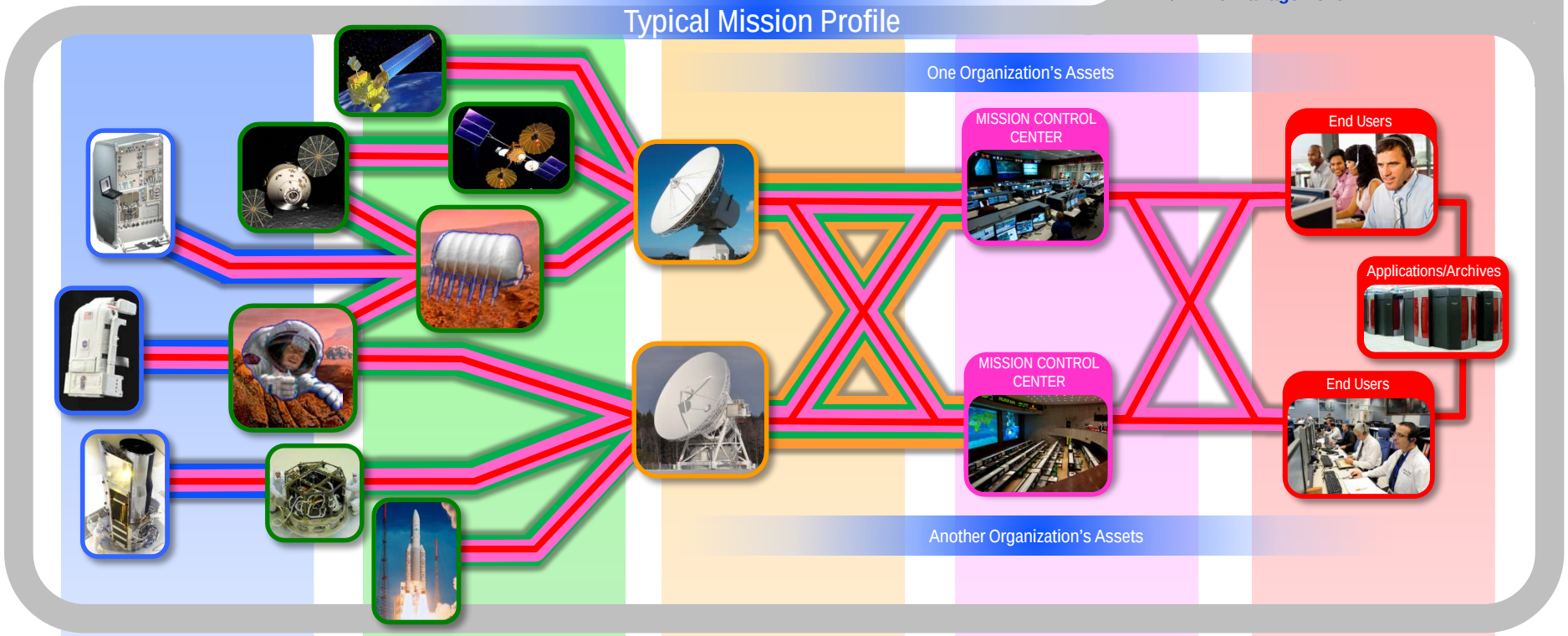
CCSDS Overview End-to-End Architecture

Six Technical Areas, Twenty-Three Teams

- Working Group (producing standards)
- Birds-Of-a-Feather stage (pre-approval)
- Special Interest Group (integration forum)

Systems Engineering

- Systems Architecture
- Security
- Delta-DOR
- Time Management



Spacecraft Onboard Interface Services

- Onboard Wireless
- Application Supt Services (incl. Plug-n-Play)
- Subnetwork Services

Space Link Services

- RF Modulation
- Space Link Coding & Sync.
- Multi/Hyper Data Compress.
- Space Link Protocols
- Space Data Link Security
- Optical Comm

Cross Support Services

- CS Service Management
- CS Transfer Services.

Space Internetworking Services

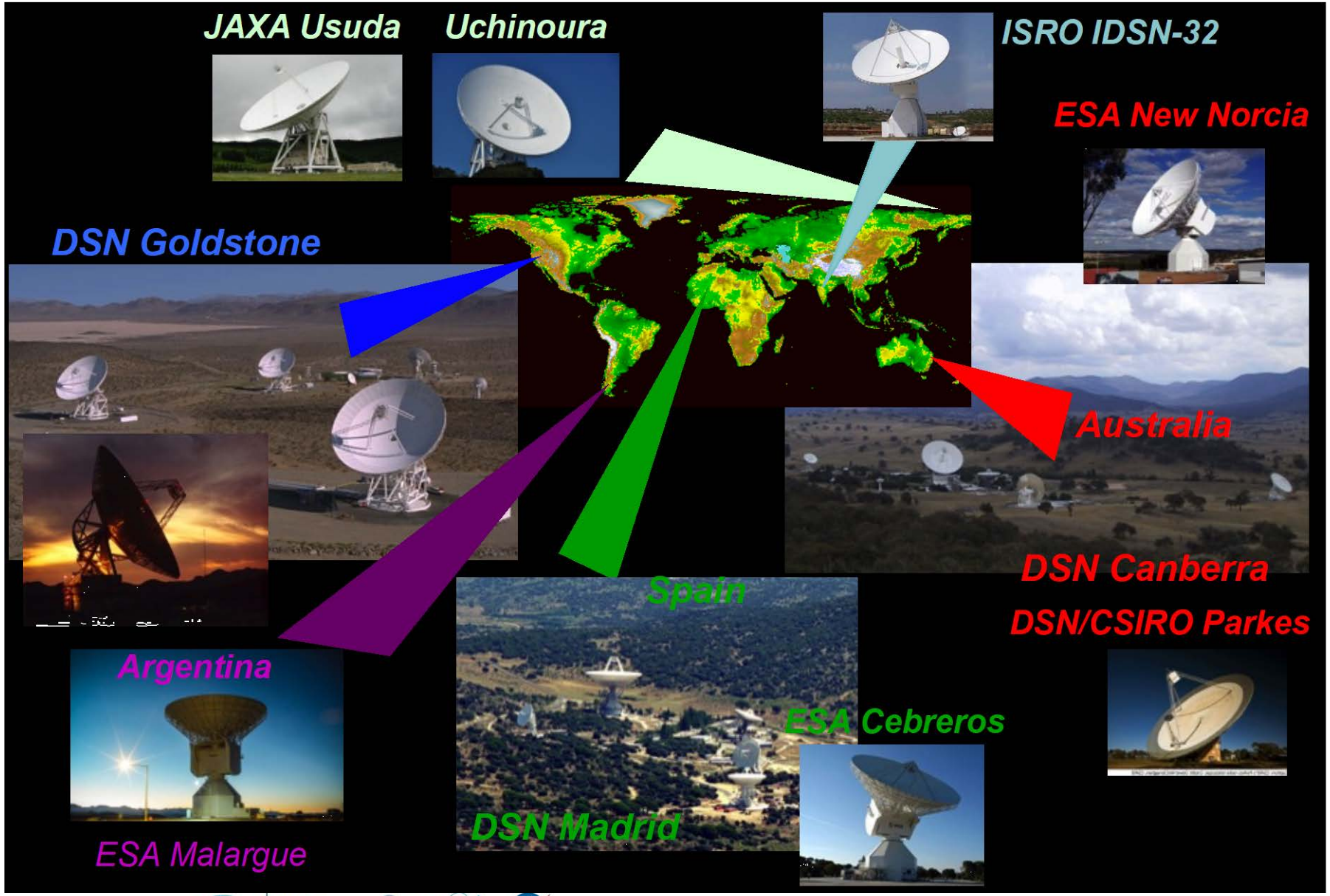
- Motion Imagery & Apps
- Delay Tolerant Networking
- Voice
- CFDP Revisions

Mission Ops & Info Mgt Services

- Data Archive Ingestion
- Navigation
- Spacecraft Monitor & Control
- Mission Planning & Scheduling

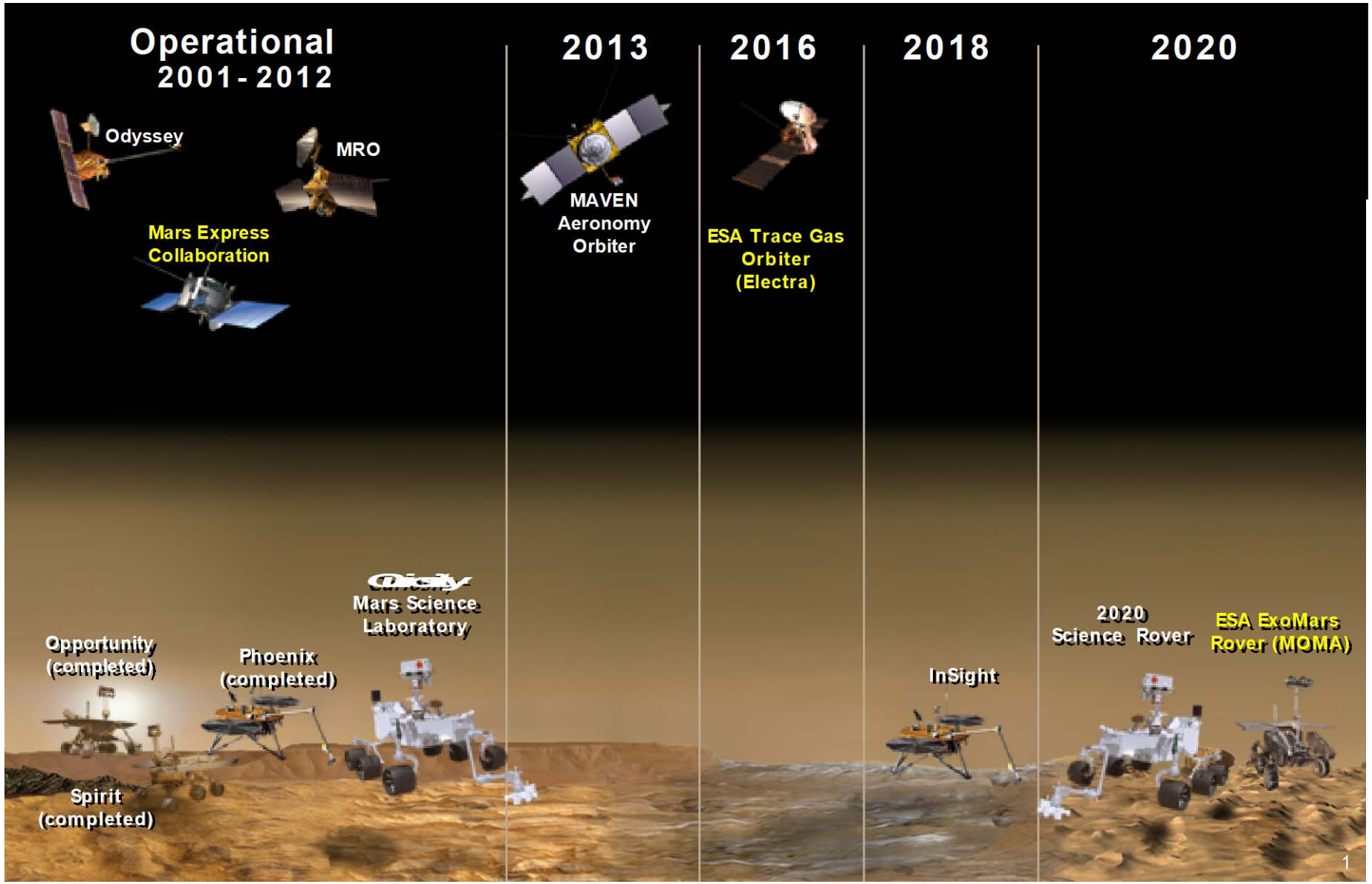
Cross-Support—A Standards-Based Global Coalition

- We used to have distinct ground equipment to support each mission—made cross-support and redundancy a problem
- Standards now allow each Agency's ground stations to easily support missions from other Agencies
- Allows "newcomers" to integrate quickly
- Increases global coverage and redundancy



Mars Relays—The Beginning of the Solar System Internet

- Almost all data brought back from Mars these days comes to Earth via relays orbiting Mars
- Use of standards allows relays from multiple Agencies to communicate with rovers from multiple Agencies
- Interoperability moving beyond comm to mission ops and spacecraft onboard interfaces



Final Thoughts

- Standards must evolve to keep pace with technological innovation and new use cases
- Must be an efficient process—can't take too long to develop
- Chicken & Egg—when is the right time to standardize?
- How to coordinate industry standards activities with CCSDS & vice versa?
  - Adopt & adapt commercial standards as appropriate for our operating environment (e.g., 802.11 in space)
  - IETF & CCSDS and DTN
  - Object Management Group relationship
- Good for both users and providers
  - Users have a choice—can negotiate for best price, best coverage, etc.
  - Providers can compete for a larger market with easy transitions
- Infusion, infusion, infusion