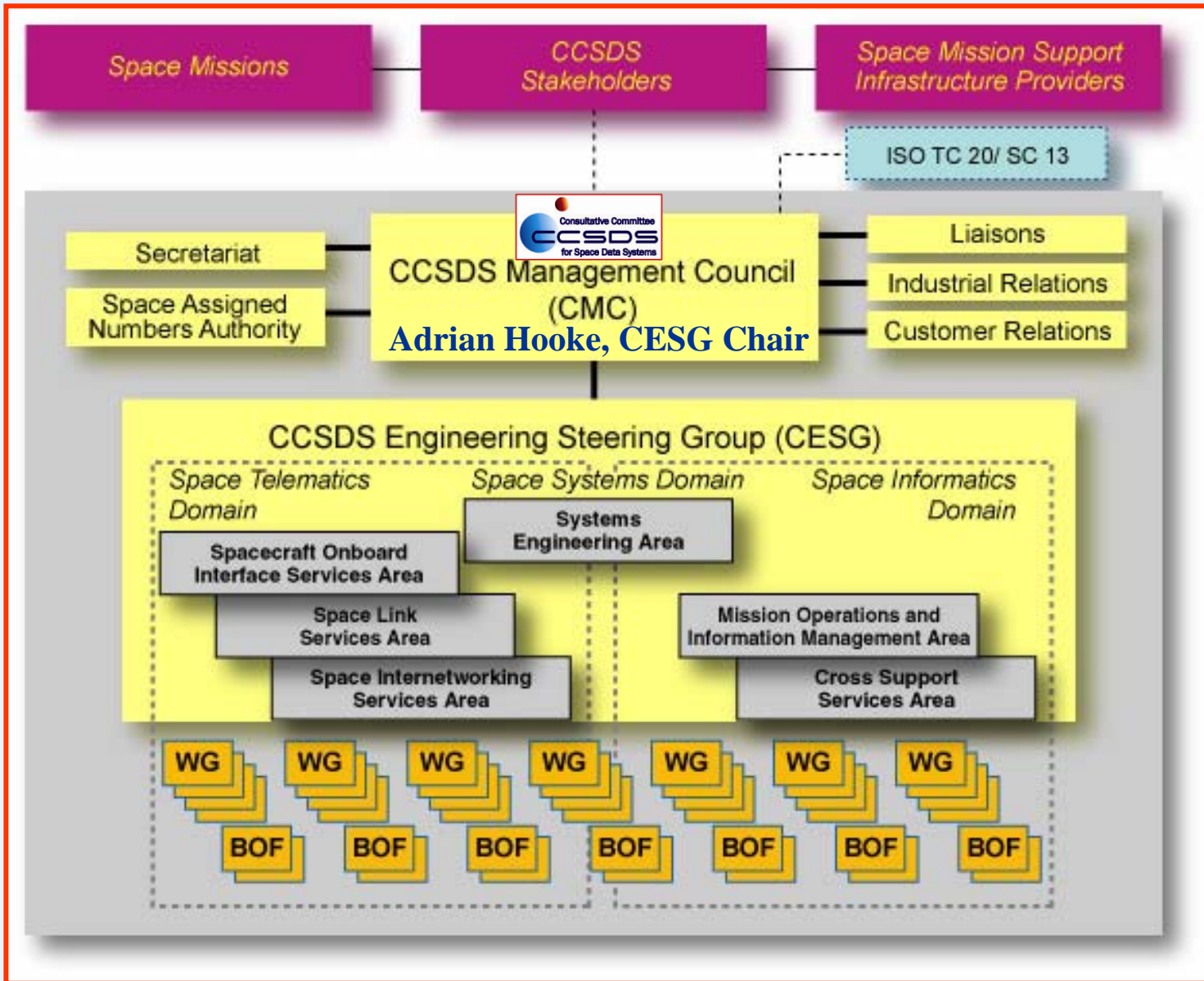


Wireless Communications and Standards Activities in Support of NASA's Exploration Mission

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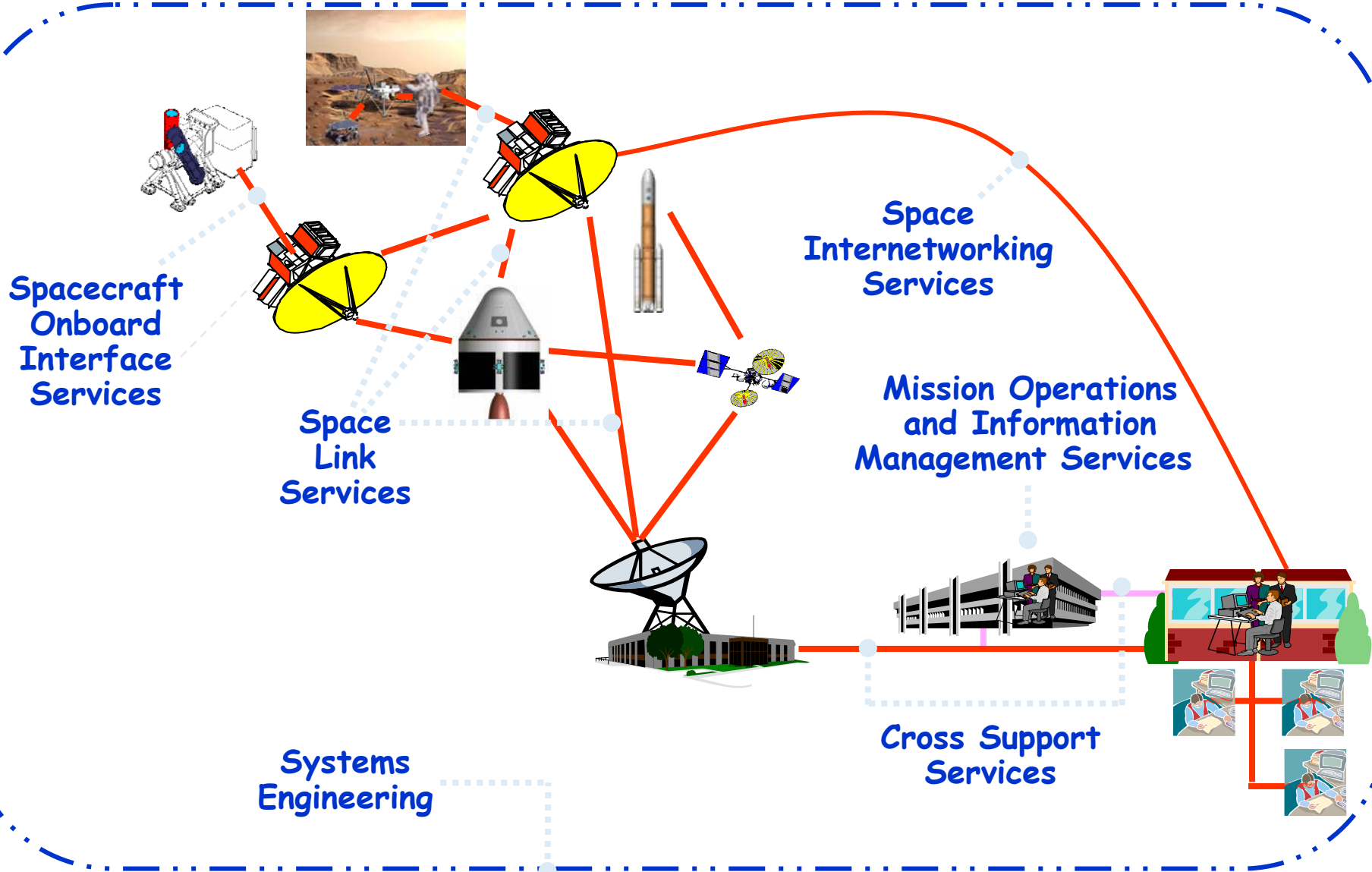
Rodger Magness
ESA/ESTEC
Noordwijk, The Netherlands

Consultative Committee for Space Data Systems (CCSDS)

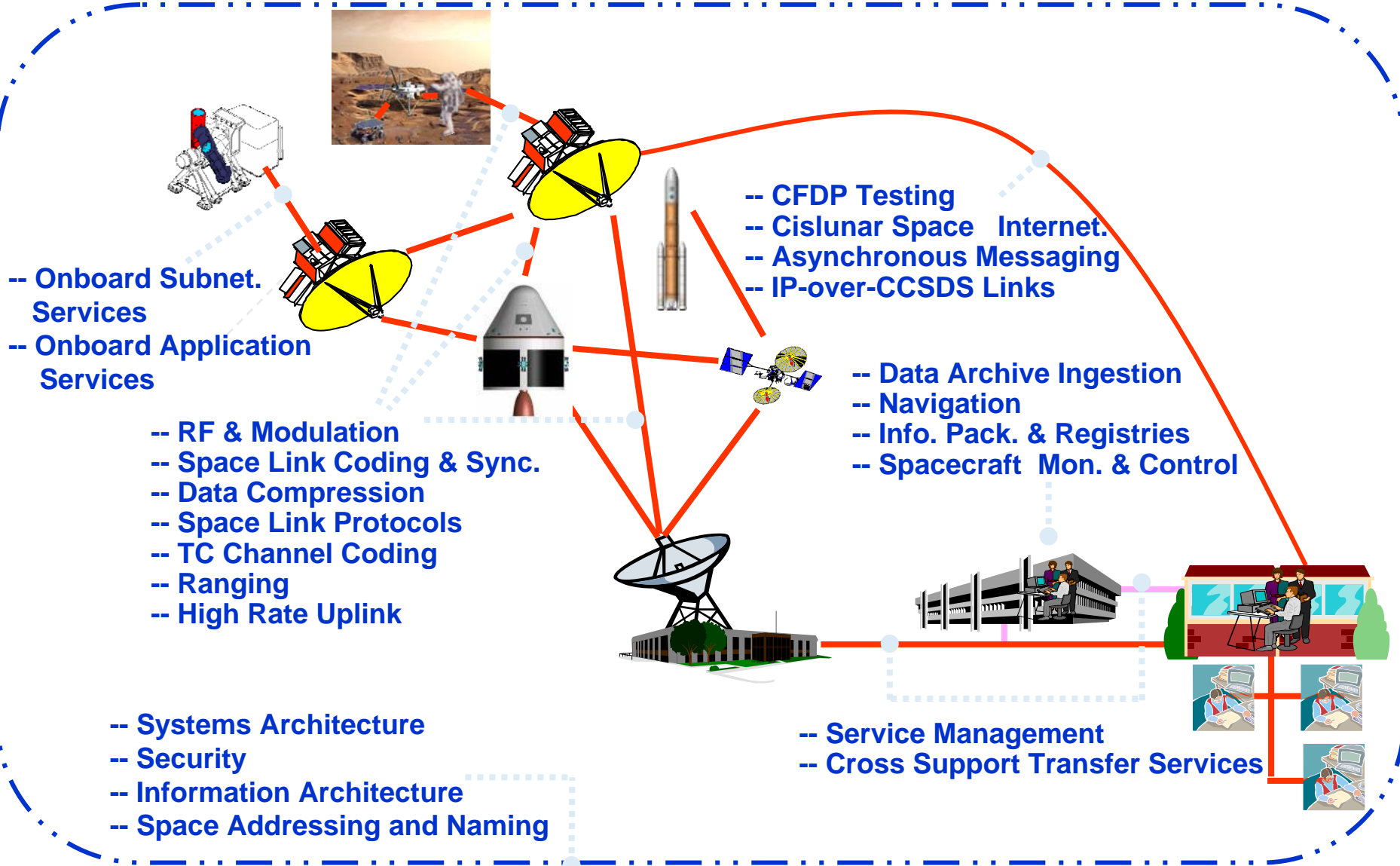


- ASA/Austria
- CAST/China
- CRC/Canada
- CRL/Japan
- CSIR/South Africa
- CSIRO/Australia
- CTA/Brazil
- DSRI/Denmark
- EUMETSAT/Europe
- EUTELSAT/Europe
- FSST&CA/Belgium
- HNSC/Greece
- IKI/Russia
- ISAS/Japan
- ISRO/India
- KARI/Korea
- KFKI/Hungary
- MOC/Israel
- NOAA/USA
- NSPO/Taipei
- SSC/Sweden
- TsNIMash/Russia
- USGS/USA
- NCST/USA

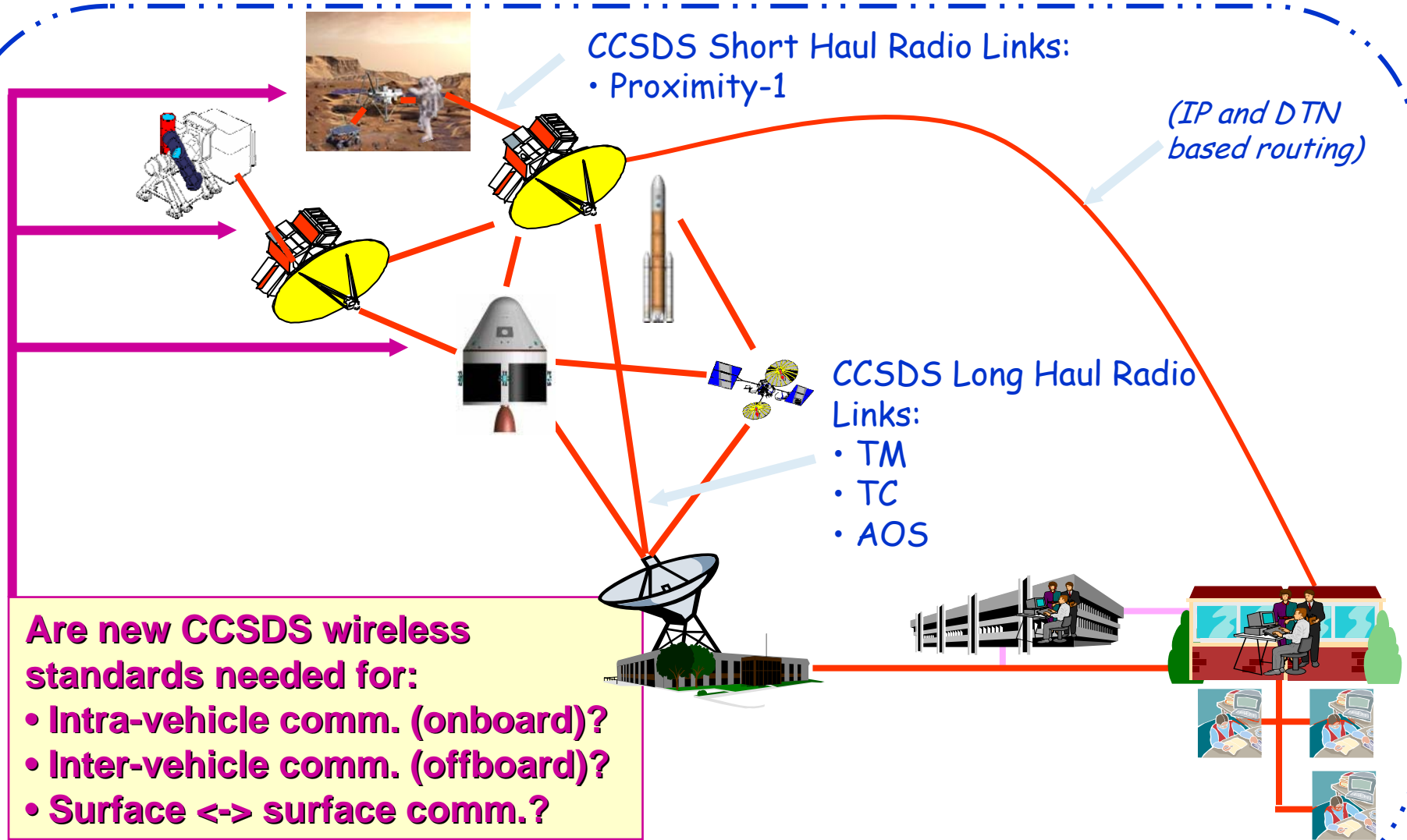
- ASI/Italy
- BNSC/UK
- CNES/France
- CSA/Canada
- DLR/Germany
- ESA/Europe
- INPE/Brazil
- JAXA/Japan
- NASA/USA
- FSA/Russia



CCSDS Technical Context: Twenty Three Active Working Groups



Next Generation CCSDS Wireless Standards?



Wireless BoF / Working Group

- BoF established in 2004 to gauge agencies interest
- Transition to a Working Group underway
- Goal: *Multi-agency standards-based interoperability*
 - Provide the CCSDS development community and participating members with the standards-based resources to achieve interoperable wireless communications
 - Focus includes specific protocol recommendations for anticipated communication scenarios associated with, but not limited to, Lunar, then Martian, exploration activities
 - Enable member agencies to select the best option available for space communications and internetworking, based upon
 - industry-standard evaluation metrics: power expenditure, data rates, noise immunity, and range of communication
 - space system metrics: reliability, availability, maintenance and safety

Goals of the Wireless WG

- Identify *what's* missing in our current international standards for wireless communications
 - Inter-vehicle, intra-vehicle, surface communications
- Identify *where* IEEE-derived standards are appropriate candidates
- Identify *when* we will need the standards
 - Exploration requirements; Advanced AIT system requirements

Design Driving Scenarios – Lunar Outpost and Inter-vehicle communications

- Internal Habitat monitoring
 - Environmental: temp, pressure, humidity, atmospheric...
 - Physiological: exercise, crew health assessment, BP/ECG...
 - Structural: impact and leak detection, stress and strain, seismic...
 - Inventory control and asset tracking
 - Concept of star network topology is important
- Voice, Video, Data distribution



Design Driving Scenarios – Lunar Outpost

- Surface-Surface Links
 - EVA local links with LRV or habitat
 - Crew member tracking/localization
 - LRV-habitat links when LRV is close to habitat
 - Links between independent local systems (habitat, external asset control, LRV environment monitoring)
- Surface-Orbiter Links
 - Habitat-orbiter-Earth; LRV-orbiter-Earth
 - EVA-orbiter links (contingency – includes EVA-orbiter-EVA, EVA-orbiter-Habitat, EVA-orbiter-Earth)
 - Simultaneous habitat, LRV, EVA and robotic links through a relay orbiter, including surface-surface links relayed through the orbiter



Design Driving Scenarios – Inter-vehicle and Assembly, Integration, and Test communications

- Mass savings resulting from a reduction in cable harnessing required for testing
- Simplification of cable and harness manufacturing
- Improved data acquisition as no physical connection to a spacecraft bus is required (which can bias the test data)
- Simplifies structural design since cable runs are reduced
- Allows for late-load payloads and retro-fit activities where modification of existing cabling is impractical



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