InterPlanetary Network & Information Systems Directorate

JPL

CCSDS and NASA Standards for Satellite Control Network Interoperability

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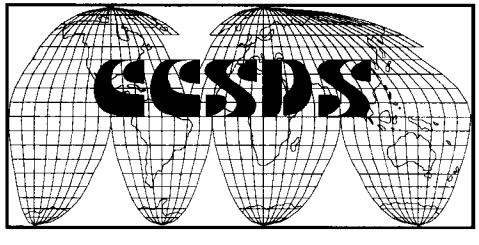
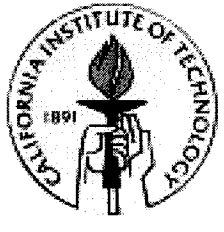




The Fundamental Question

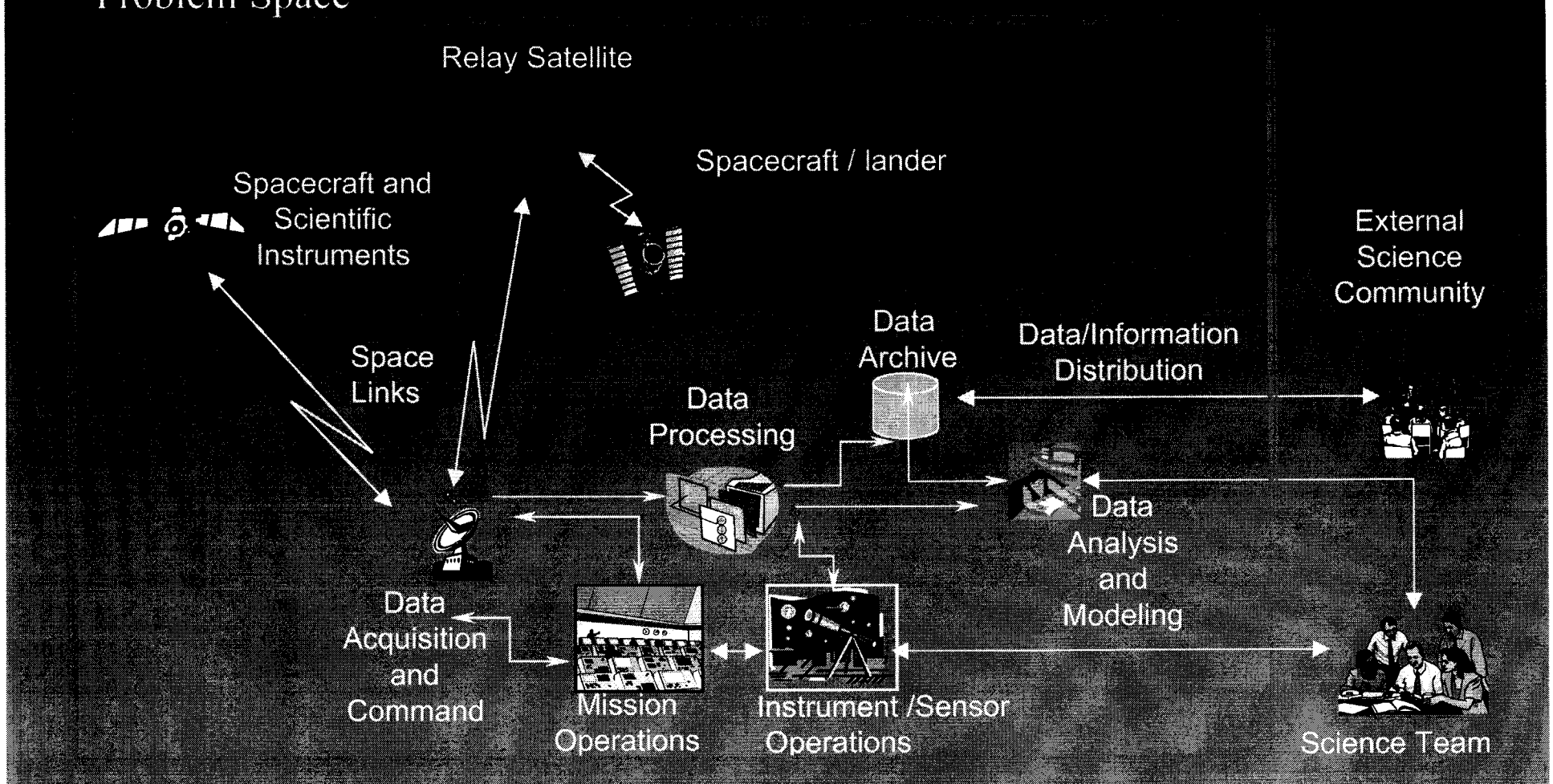
Everyone wants interoperability between satellite control networks, but what will it take to get?

Are there standards and architectures that can meet both military and civil space needs?

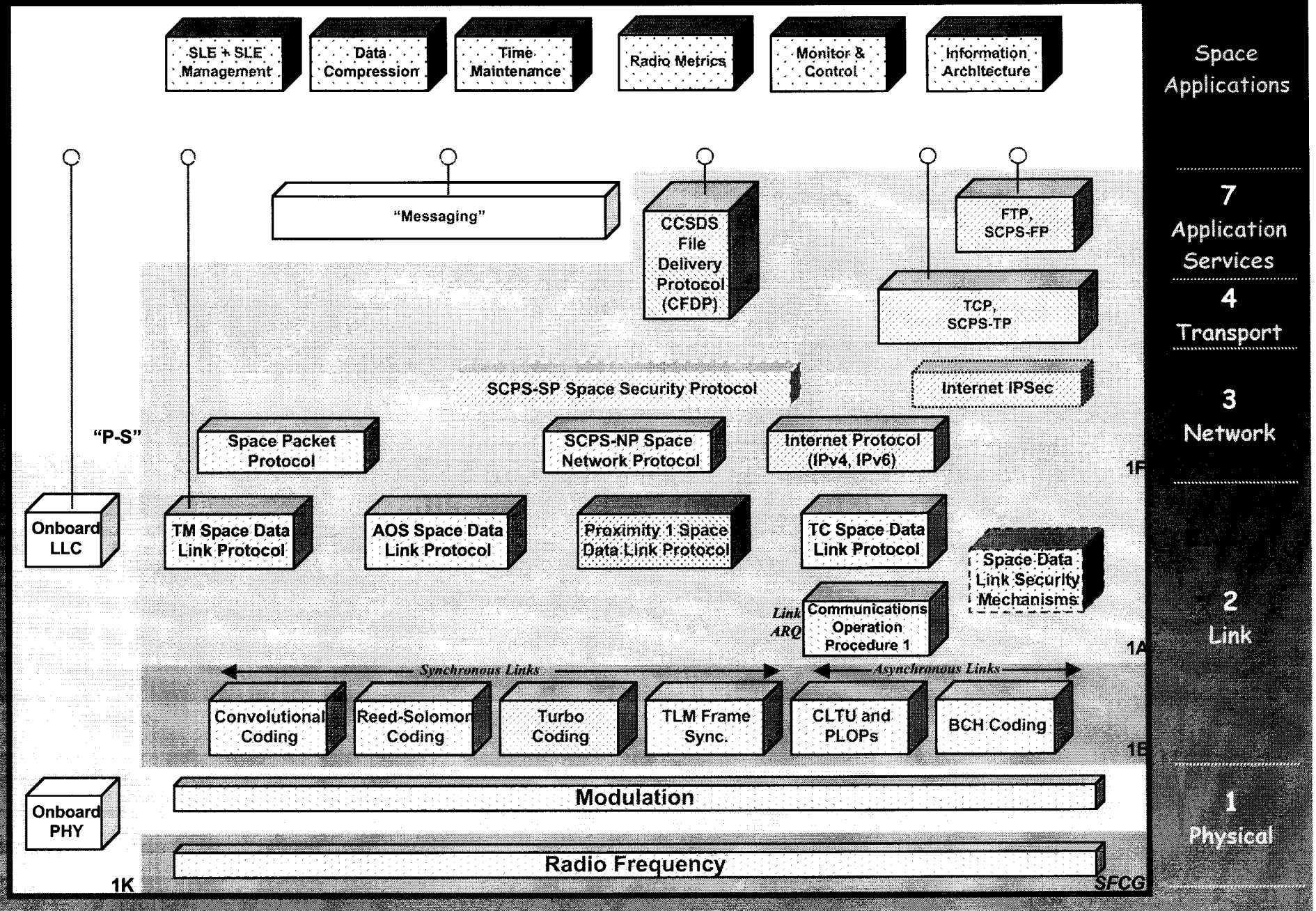
Will they emerge through the invisible hand of the market place, or do we need government planning and direction to achieve interoperability?

Will it bring cost savings or cost increase?\

Space Domain Functional Elements



View of CCSDS Space Communications



Current JPL Program Content FY 02

CCSDS File Delivery Protocol (CFDP)
- Reliable file delivery over disjoint networks

Proximity 1 Link Protocol
- Dynamic link establishment and negotiation

Space Communication Protocol Standard (SCPS)
- Internet protocols augmented for near Earth use in space

Space Link Extension (SLE)
- Transfer services, service requests & management

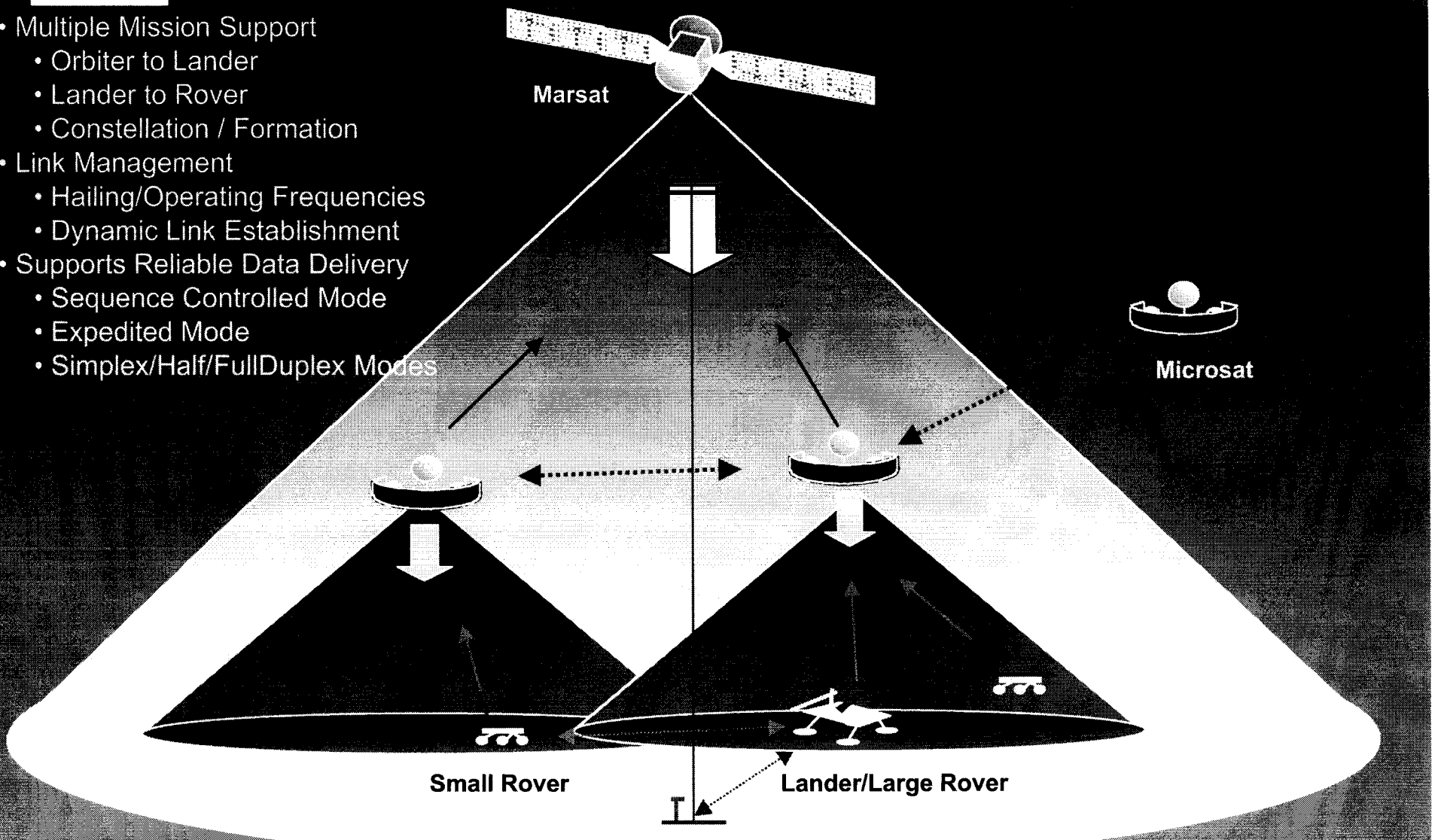
Spacecraft Onboard InterFace (SOIF)
- Message Transfer Layer, inter-S/C mesaging

And several other tasks
- Navigation interchange standards
- Bandwidth & power efficient coding and modulation
- Object Management Group (OMG) Space Domain Task Force
- XML Space Application Study

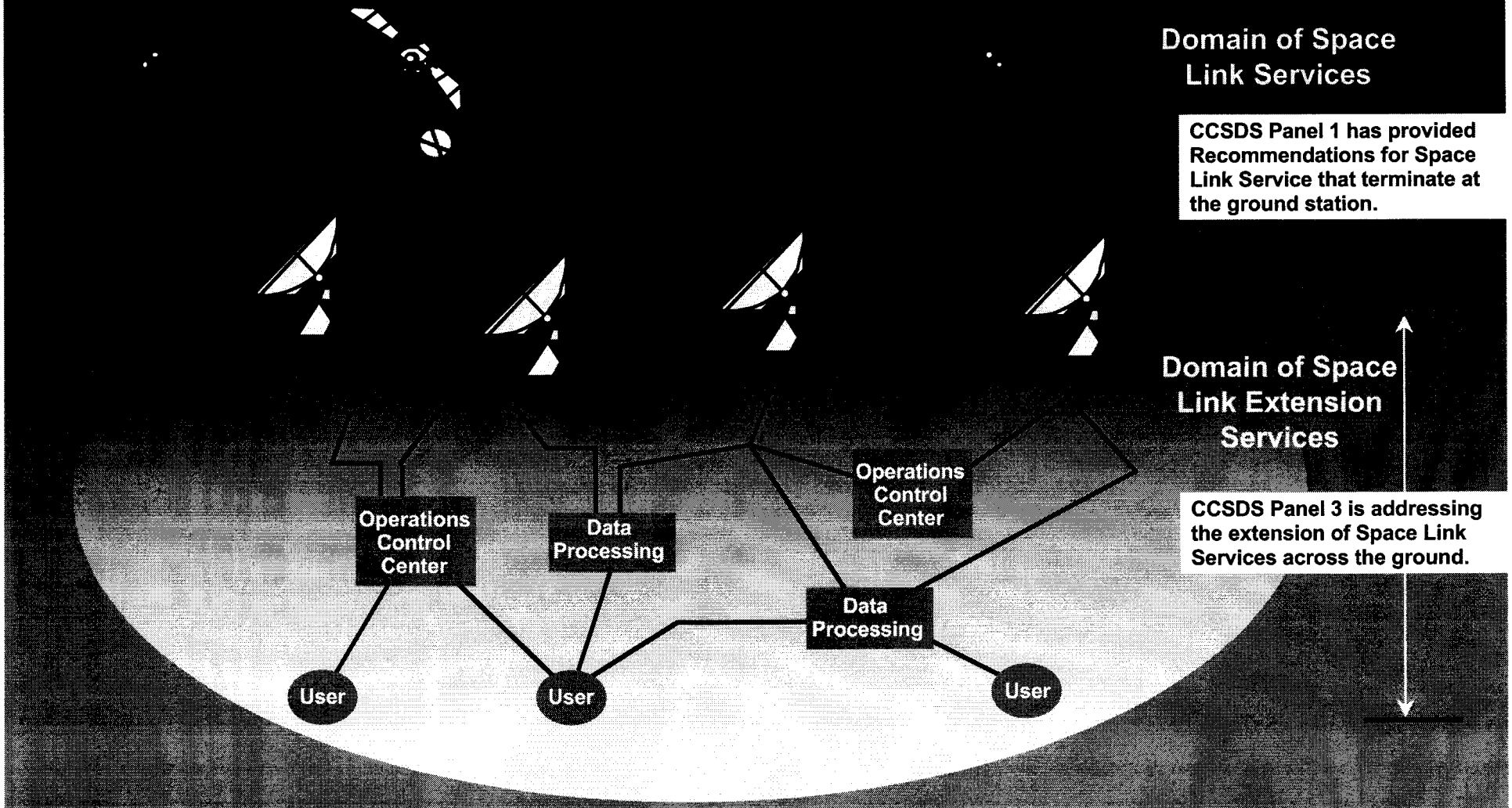
Proximity - 1 Link Protocols

Future Mars Environment

- Multiple Mission Support
  - Orbiter to Lander
  - Lander to Rover
  - Constellation / Formation
- Link Management
  - Hailing/Operating Frequencies
  - Dynamic Link Establishment
- Supports Reliable Data Delivery
  - Sequence Controlled Mode
  - Expedited Mode
  - Simplex/Half/FullDuplex Modes

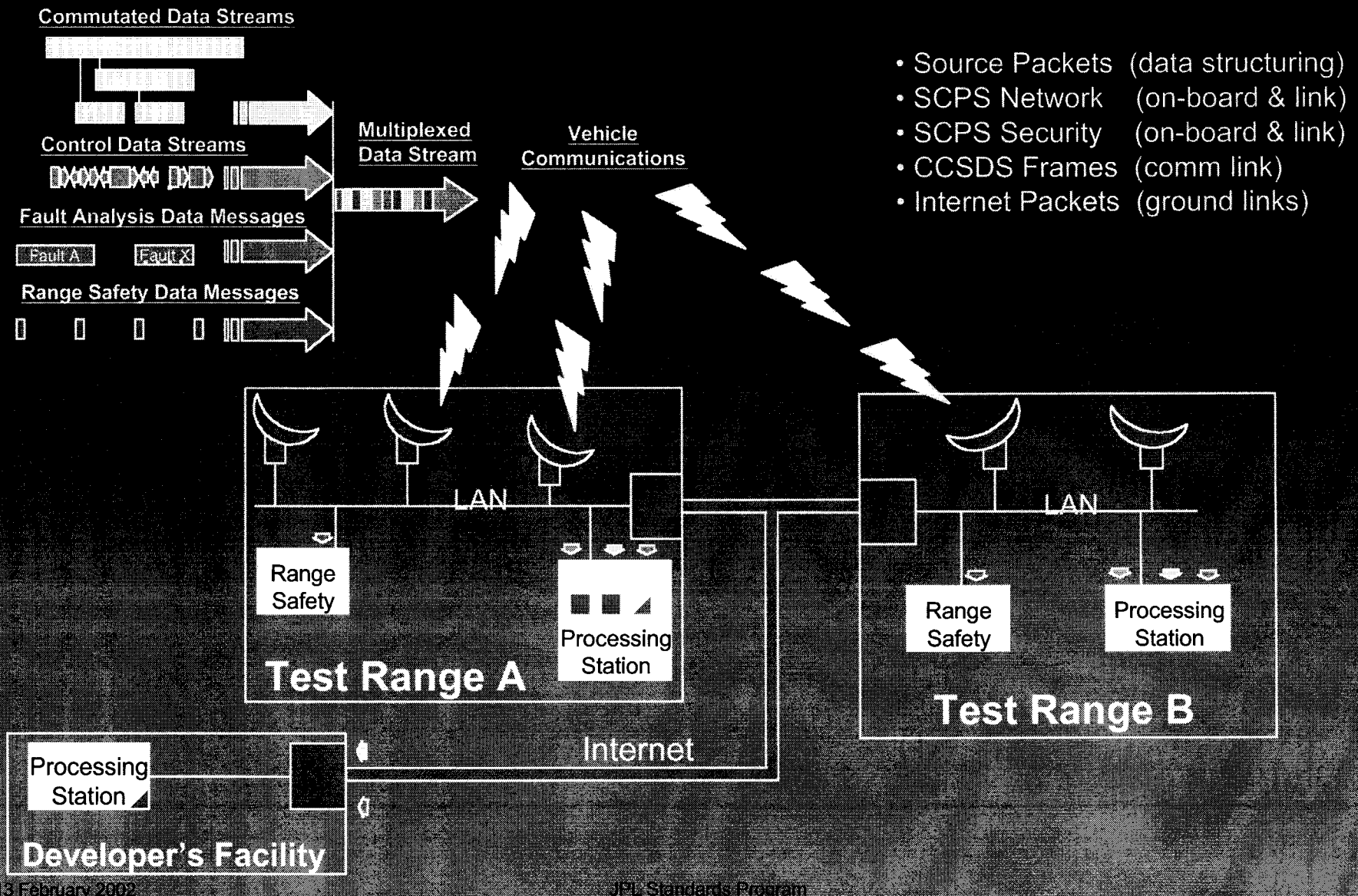


CCSDS Space Link Extension (SLE)
Domain of SLE Services



CCSDS PROTOCOLS

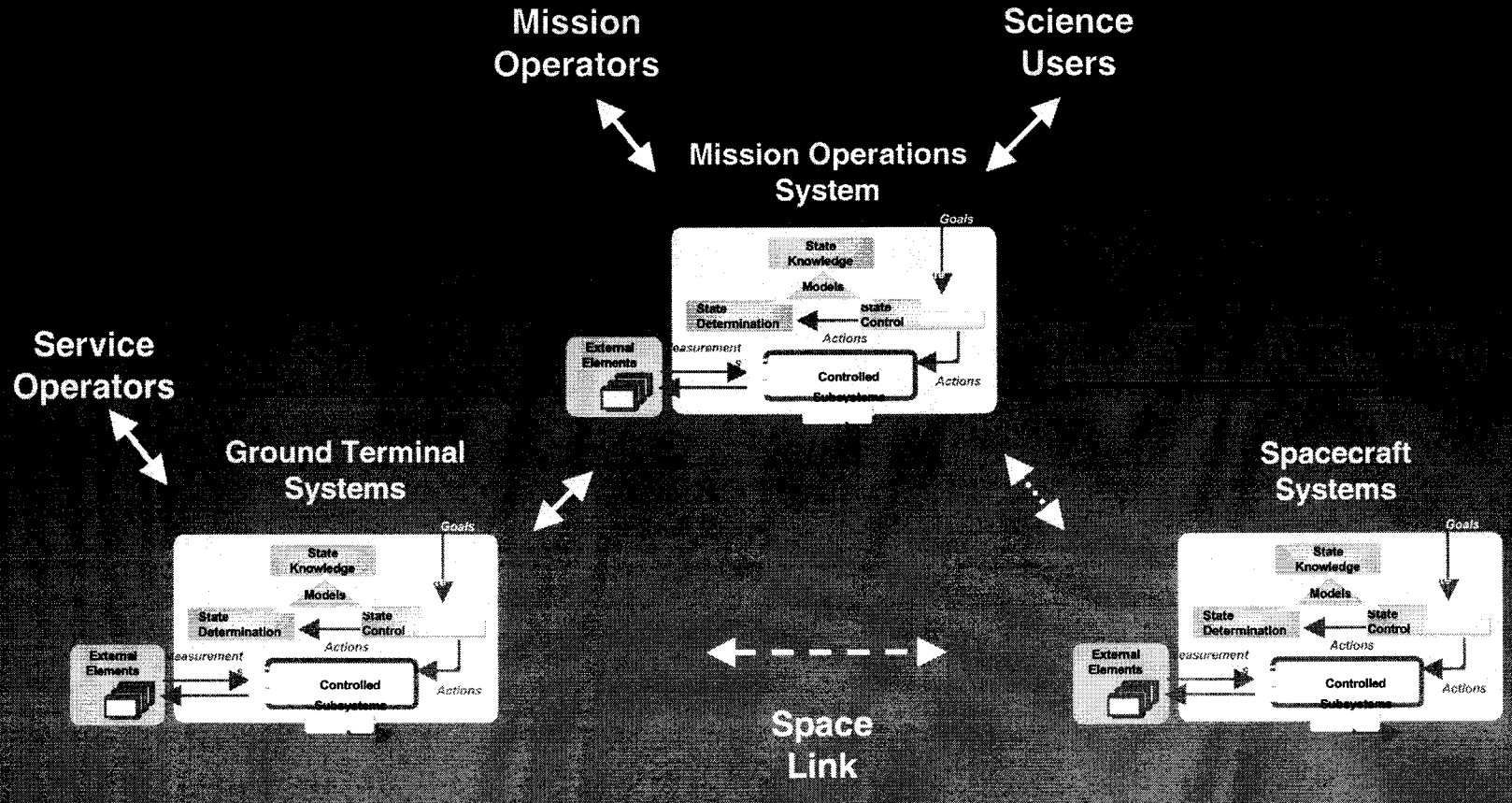
TEST RANGE COMMUNICATIONS



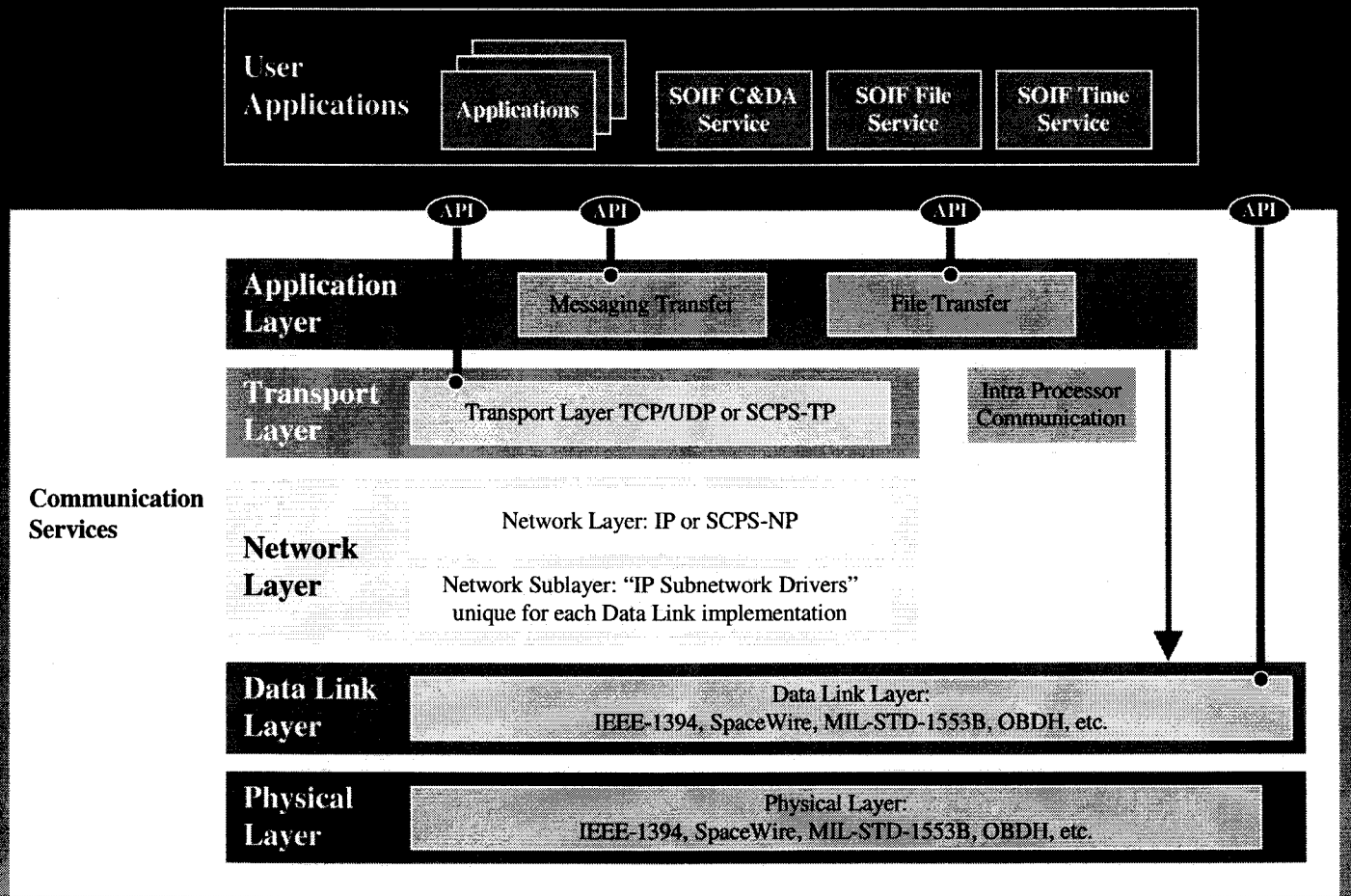
- Source Packets (data structuring)
- SCPS Network (on-board & link)
- SCPS Security (on-board & link)
- CCSDS Frames (comm link)
- Internet Packets (ground links)

CCSDS / OMG

Space Domain Task Force



Spacecraft Onboard Interfaces Layered Implementation



NOTE: No security protocol is shown in order to simplify this diagram

Summary

- NASA interoperability standards for space communications can be applied to military spacecraft and their satellite control networks
- COTS products that implement these standards are available from more than 60 vendors
- New standards that support applications in stressed environments are in development