

***CCSDS Space Link Extension (SLE)
Services—A Progress Report***

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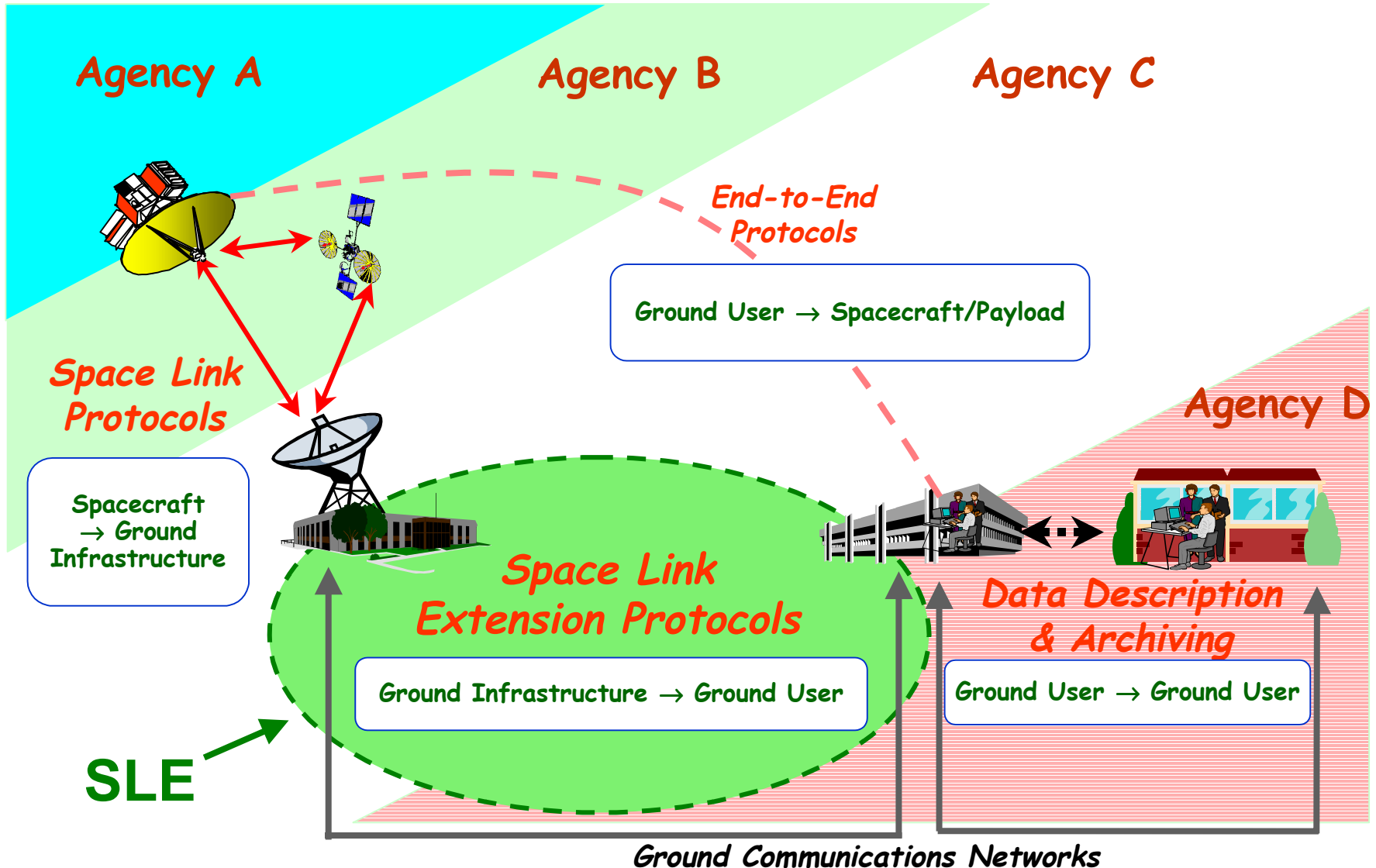
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SLE Progress Report

Overview

- **SLE Background**
 - What is SLE and Why Is It Important?
- **SLE Status**
 - SLE Implementations
 - SLE for Legacy Missions
- **Outlook**
 - Where is SLE Going?
 - SLE Testbed

SLE in Context



What is Space Link Extension (SLE)?

- **SLE services provide space missions with standard, interoperable access to their spacecraft via ground stations around the world**
- **Builds on the widespread adoption of CCSDS space link protocols between ground stations and spacecraft**
 - Supported by 10 national and international space agencies
- **Service-oriented**
 - Defines a standard set of services for data transfer & management
 - Standardizes the functionality of each service
 - Standardizes the interface to each service
 - Hides implementation details
- **Independent of any specific implementation technology**
- **Documented in CCSDS specifications**
 - Transfer Service specifications for telemetry frames (RAF, RCF), and command link transmission units (CLTU)
 - Management Service specification

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SLE Implementations



- **First implementation in support of ESA's INTEGRAL mission**
 - Joint development by NASA/JPL and ESA of SLE Application Program Interfaces (APIs)
 - JPL Implemented SLE RAF, RCF, and CLTU transfer services for Deep Space Network
 - ESA Implemented CCSDS SLE RAF, RCF, and CLTU transfer services in their ground network
 - Successful interoperability tests between JPL and ESA
- **ISAS (Institute of Space and Astronautical Science - Japan)**
 - Developed SLE gateway for interoperability with NASDA, ESA, and NASA
 - Successful interoperability test with JPL
- **BNSC (British National Space Centre U.K.)**
 - Implementing SLE RAF and CLTU transfer services, as well as SLE management services

SLE for Legacy Missions



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- **SLE transfer services can be adapted to support missions that require delivery of TDM or bit-stream data**
 - **Global Science and Technology Inc. (GST) has developed prototype SLE services to support serial bit stream delivery in support of the U. S. Air Force Satellite Control Network (ASFCN)**
 - **The Avtec Inc. SLE CLTU service includes support for synchronous serial bit stream service**
- **NASA, through its CSOC contract, is developing a NASA-wide Ground Data Service Specification to provide CCSDS SLE Services at all NASA and commercial ground tracking stations serving NASA missions**

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Where is SLE Going?

- **JPL plans initial CCSDS SLE deployment by 2003**
- **ESA (European Space Agency) plans full deployment to Ground Station Network in 2003**
- **DLR (Germany) is planning to use CCSDS SLE**
- **CNES (France) is planning several CCSDS SLE Missions**
- **NASDA (Japan) is investigating development of SLE gateway for interoperability with international partners**
- **ASI (Italy) is investigating CCSDS SLE implementation**
- **USAF is considering CCSDS SLE for Air Force Satellite Control Network (ASFCN)**
 - **Would provide interoperability with NASA sites**
- **Use of SLE for SN and GN is being investigated by NASA/GSFC**
- **Many of the Agency activities are carried out through contractors, who may offer commercial SLE products and services**

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SLE Testbed

- **Efforts are underway to establish an SLE testbed to:**
 - **Gain experience and confidence with SLE**
 - **Evaluate SLE adaptations for legacy missions**
 - **Validate interoperability of SLE implementations, including commercial product and services**
 - **Demonstrate potential of SLE to reduce risk and cost for future missions**
- **Potential participants include:**
 - **NASA/JPL**
 - **NASA/GSFC**
 - **NASA CSOC**
 - **USAF AFSCN**
 - **International Agencies**
 - **Commercial vendors**