GSAW 2000
Breakout Session 3
Summary

Satellite Control Architectures & Interoperability
Promise and Problems

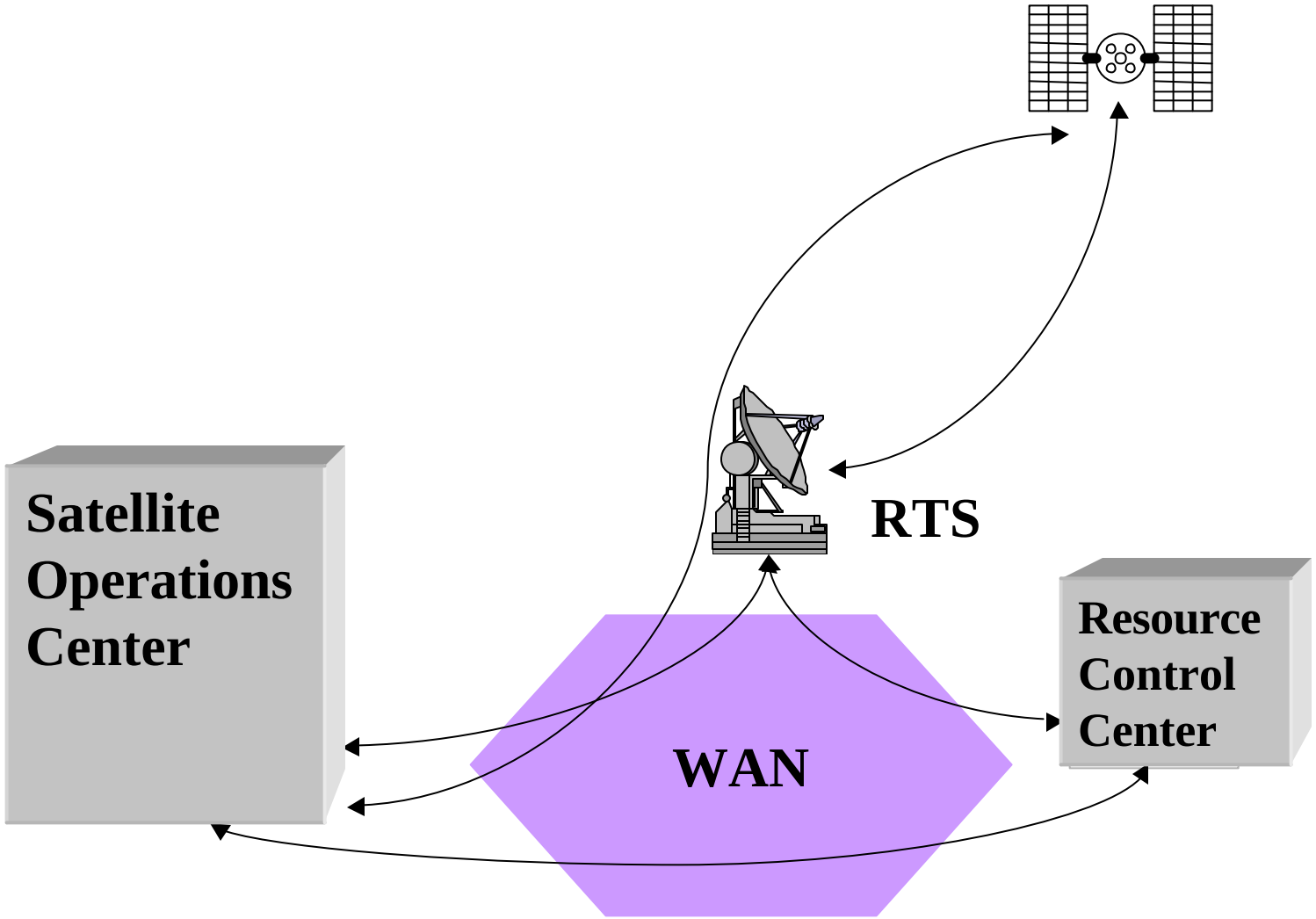
Carl Sunshine

Breakout Session Three Participants

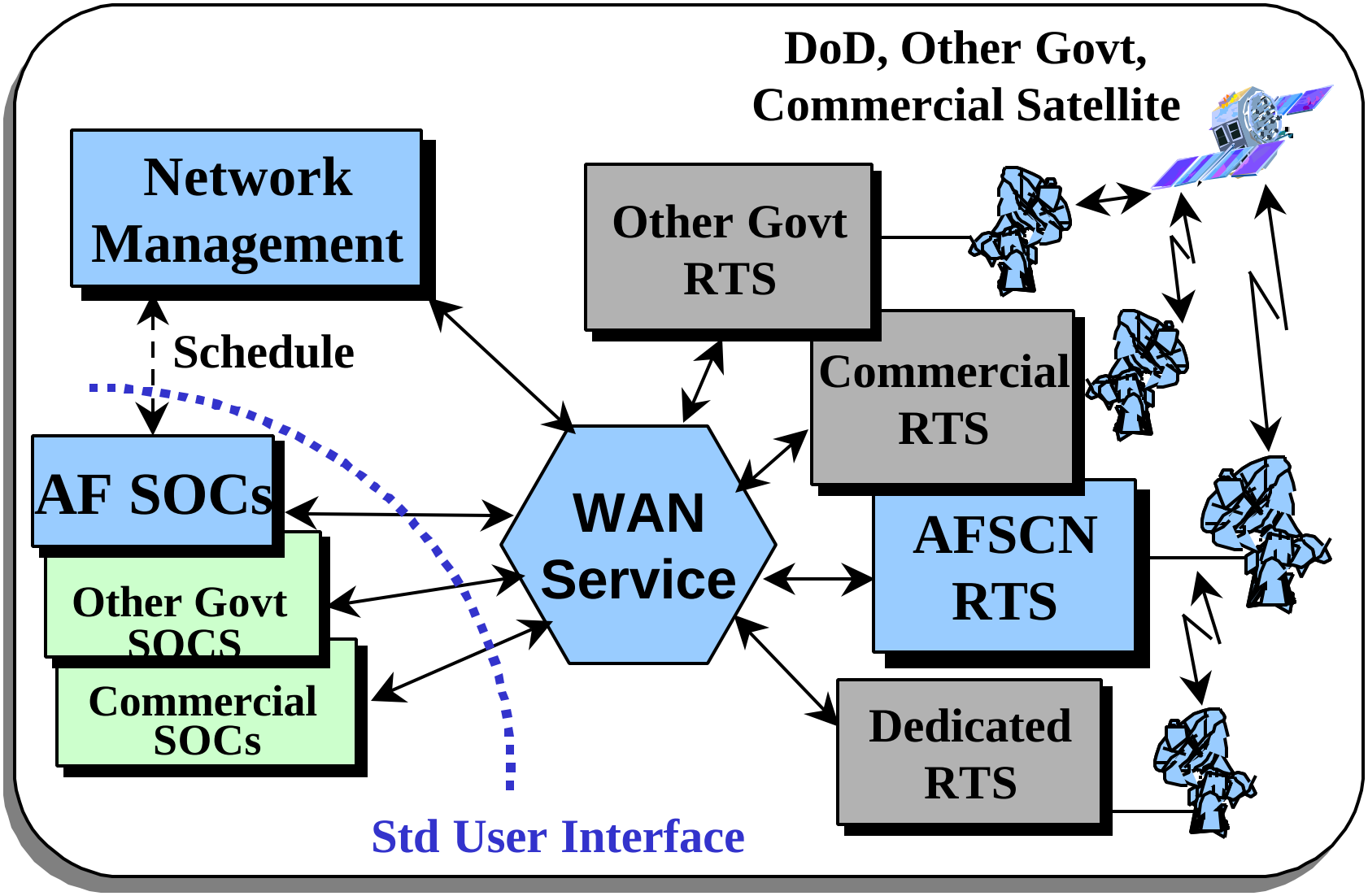
- **Morris Brill, TRW**
  - **Enterprise Approaches to Integrating Satellite Systems**
- **Bryant Cruse, Altair Aerospace**
  - **Evolving Standards and Profiles**
- **Carl Sunshine, The Aerospace Corp**
  - **Air Force Satellite Control Network Future Architecture**
- **Greg Hollister, Universal Space Network**
  - **Universal Space Network**
- **Dan Heimerdinger, NASA CSOC**
  - **The Business of Space**

- **Tien Nguyen, Aerospace**
  - **Facilitator**

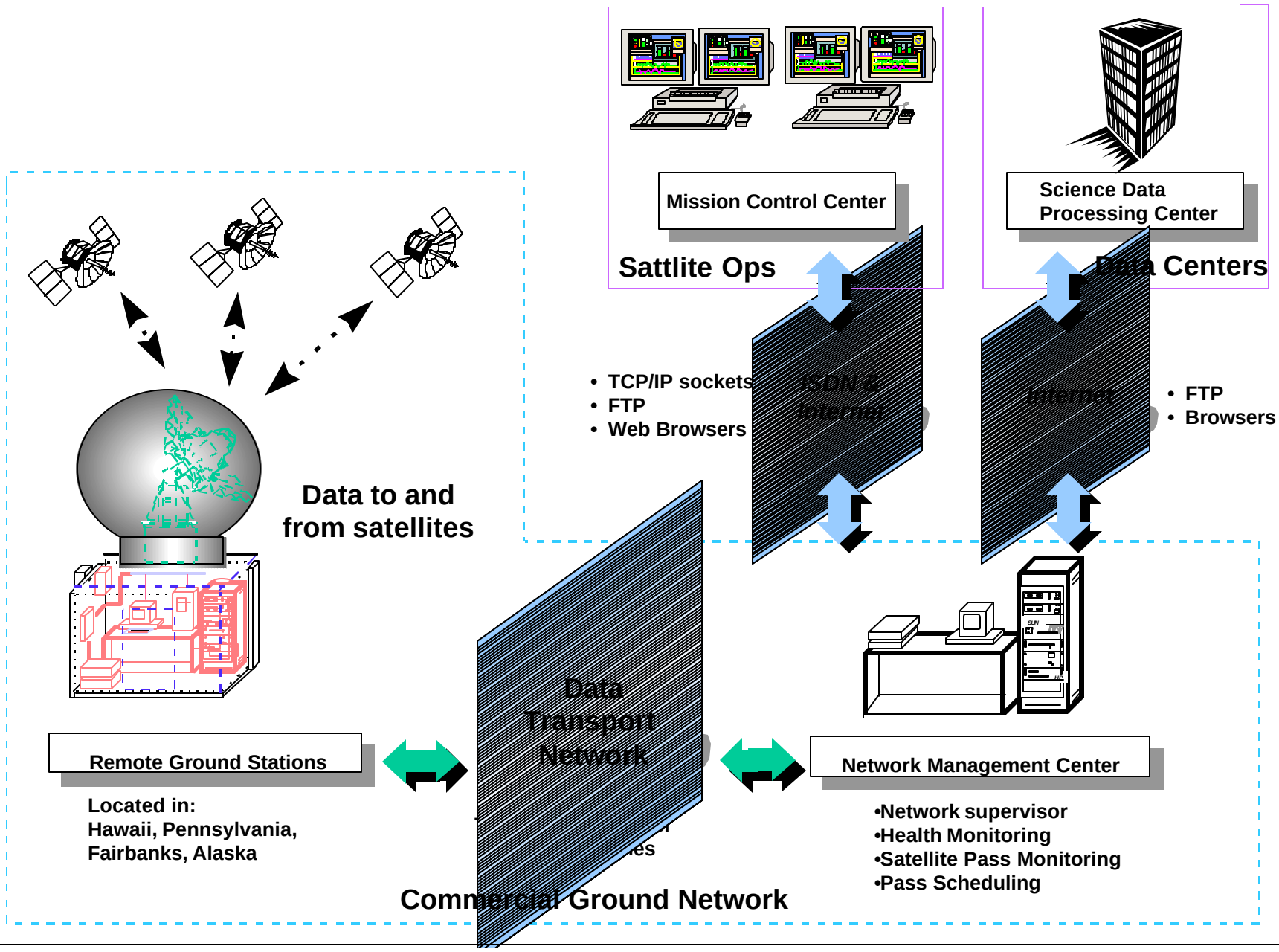
Satellite Control System Components and Interfaces



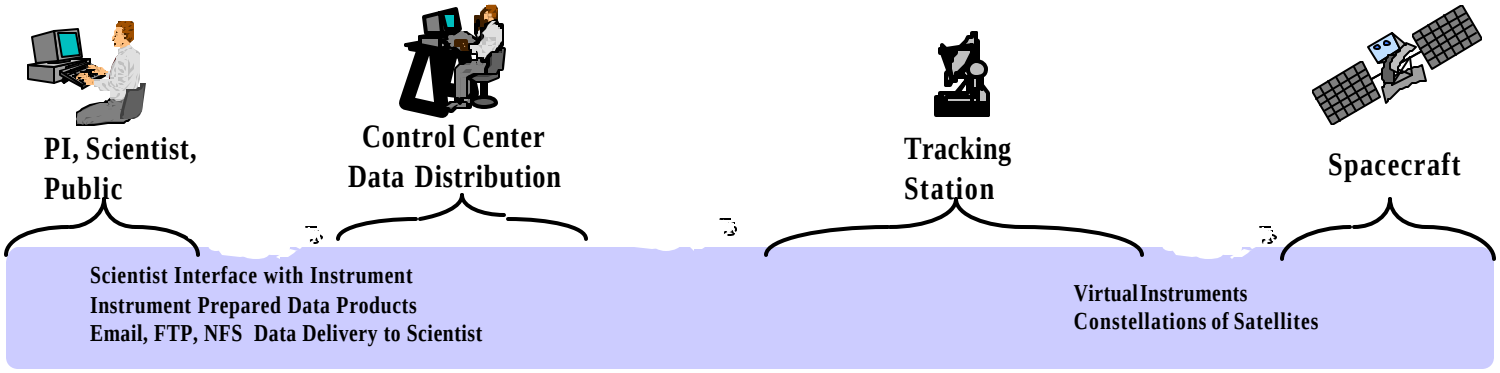
Future National SCN Architecture

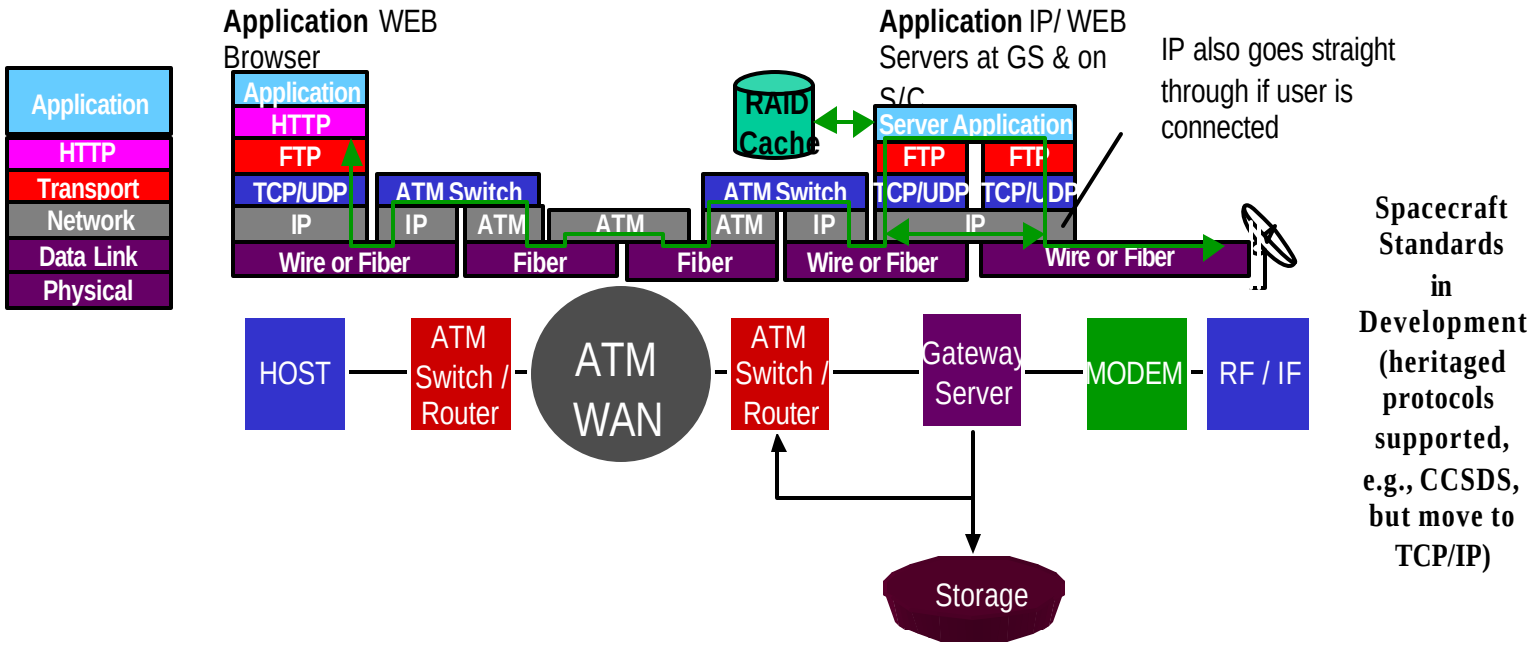


Universal Space Network Architecture



NASA CSOC Architecture





Summary Notes

- Architecture alternatives
  - Network connects users, RTSs, management center
  - Users connect to central node, or direct to RTSs
  - Real-time telemetry delivery, or store-and-forward
- Scheduling
  - Complex for high utilization, multiple priorities
  - Simple for low, steady utilization, simple priorities
  - Charging allows market forces to simplify scheduling
    - Users more selective when they have to pay
    - Providers can add capacity as demand/income increases

Summary Notes (cont'd)

- Use of Internet protocols
  - Many use TCP/IP for ground transport
    - Considering extension into space (SCPS)
  - Some use of WWW for user interface
  - Interest in XML for data bases, telemetry formats
- Unique military concerns
  - Accurate time tagging of data encrypted in space
  - Greater interest in anomaly resolution (expensive space assets)
  - Need for assured access (also for man in space)
- Are vendors interested in standards/interoperability?
  - Yes if it gains market share (e.g., RTS works with SOC systems)
  - No if vendor is dominant, or an integrator
  - Sentiment that market place will determine what succeeds

Summary of Panelist Presentations

- Morris Brill (TRW)-Enterprise Approaches to Integrating Satellite System:
  - Enterprise utilizes Commercial Market Place Layering with 3 layers: Space Applications, Knowledge Management Systems, and Enterprise Management Systems (least developed in the market)
  - These layers are connected together through a Shared Enterprise Services, which have no standards
- Bryant Cruse (Altair)-Object Oriented (OO) Software:
  - OO software is modular, easy to replace, and suitable for plug-and-play
  - Needs more work on standards for S/W
  - IP should work for space: need to optimize the IP attributes for best results

Summary of Panelist Presentations (Cont'd)

- Carl Sunshine (Aerospace)-Future AFSCN Architecture
  - Future AFSCN architecture consists of new interoperable RTSs, centralized scheduling, interconnected by standard WAN service:
    - Standards and protocols are the key!
    - Identified 3 key interfaces for interoperability: SOC to RTS, space link, SOC to resource management
  - Future architecture is similar to commercial approaches
    - More emphasis on resource management, RTS control
  - Also similar to CCSDS standards

Summary of Panelist Presentations (Cont'd)

- Greg Hollister (Universal Space Network)- Universal Space Network (USN):
  - USN provides plug-and-play TT & C, Launch, early orbit communications services, data download through owned and collaborative ground stations:
    - Approximately 9 locations around the globe with S/X/Ku/SGLS by the end of Summer 2000
  - Real time TT&C services, except for high data rate
  - Centralized approach through Network Management Center:
    - Users connect via internet or ISDN connection

Summary of Panelist Presentations (Cont'd)

- Dan Heimerdinger (NASA/Consolidate Space Operation Contract (CSOC)) - The Business of Space
  - Reduce cost of ops and management of NASA's ground systems
    - Near term emphasis on: ground network, deep space network, and wide area network
    - Goal is to obtain "wholesale" satellite contact services
    - Buy ID/IQ capacity: price per pass or price per minute Streamlined acquisition and management process
  - Challenges:
    - Unified operations concept: Behavior Modification of users
    - Heritage (legacy) programs
    - Migration towards globally dispersed network of networks: driven by industry standards
  - Bottom line: Migration towards standardized services:
    - Ground communication standards
    - Internet and commercially driven standards