Remote Instrumentation
AMPATH
Astronomy Working Group

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- Changed my presentation!
- What I've talked endlessly about in the past is operational!
  - But no demo at the podium

- Common thing in the conference: Everyone needs to talk about …..
- Need an inexpensive (maybe even cheap) and adaptable tool
- Intuitive, easy to use without training

What I Plan to Discuss = Operations = Voice & Collaboration Tools

Science Operations

Science Operations

Support Operations

Measuring Devices

Measuring Devices

<u>Support Operations</u>

- Planning and Coordination of Operation in Real-time and Non-RT
- Data Acquisition and Processing
- Data Backup and Storage
- Networking
- Trouble Resolution

Scientific Analysis Tools

Scientific Analysis Tools

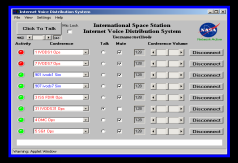
- Apply to your operation
  - Science operation = voice loop/conference
    - Planning next episode… = voice loop/conference
    - Re-planning = voice loop/conference = voice loop/conference
    - Science analysis and trouble resolution = voice loop/conference
  - Complexity: Instrument operation X # of instruments X # of locations = voice loop/conference
    - Engineering = voice loop/conference
    - Software = voice loop/conference
    - Trouble resolution = voice loop/conference
  - Network operation X # of networks = voice loop/conference

Required Remote Instrumentation Services

- Networking
  - Wide Area Networking: connectivity to your instrument
  - Local Area Networking: Connect the “first mile and last mile”
  - International WAN: connectivity worldwide
- Telemetry (data) management: receive, **process**, store and display your data
- Commanding: if required, to change an instrument state
- Voice: if required, to coordinate ops and science activities
- Video: either part of telemetry stream or can be addressed in the future using IVoDS like infrastructure
- Planning: enabled using Internet Voice/video teleconferencing
- Web Based Telemetry Server: not generally required for science operations but is needed for effective outreach
- Security

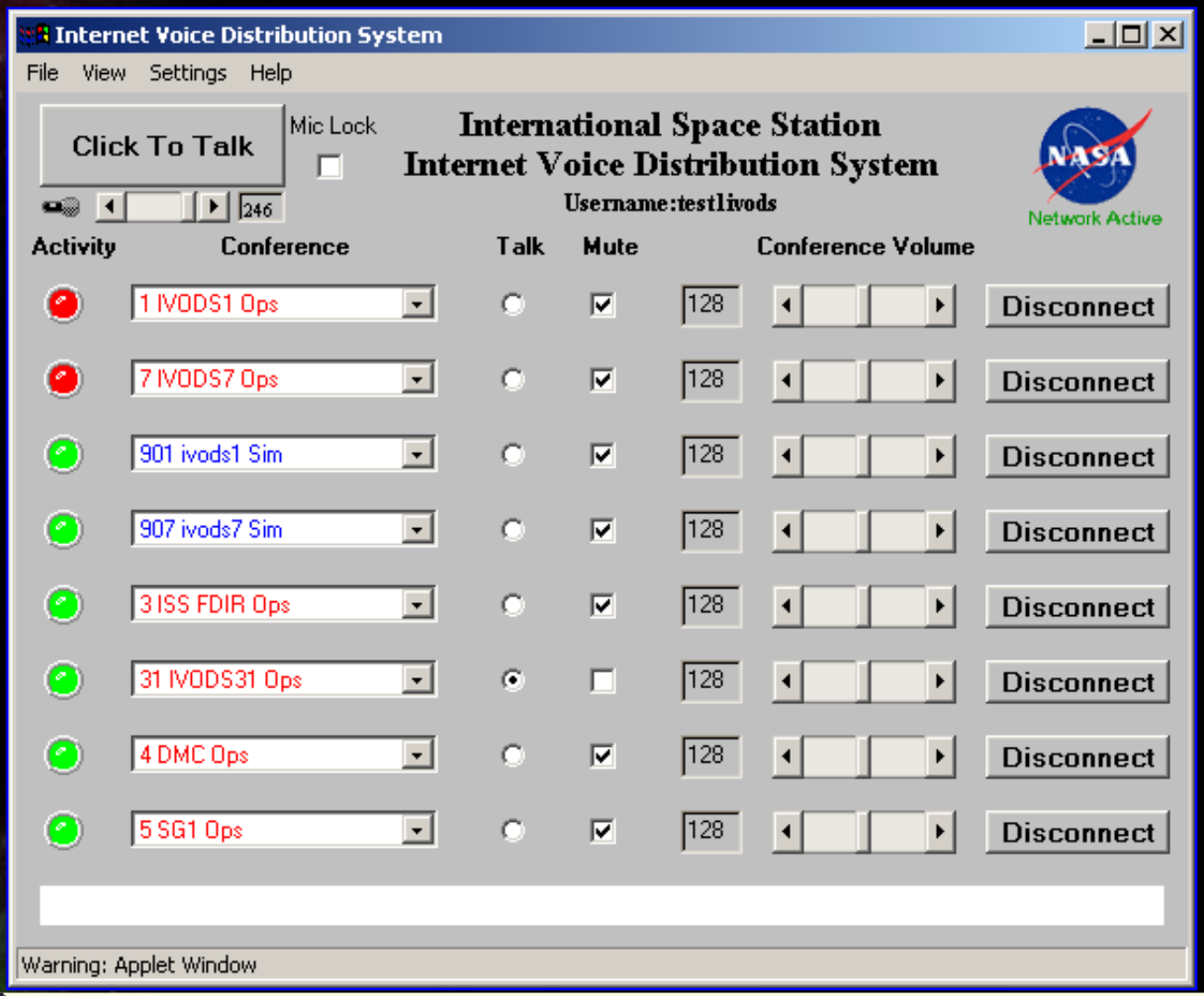
Status of Remote Instrumentation Services for the International Space Station

- Networking
  - Wide Area Networking – Abilene ====>in the future: Grids
    - Status: Abilene operational, Space based science grid in planning
- Telemetry management – Telescience Resource Kit (TReK)
  - Status: Operational
- Commanding – TReK
  - Status: Operational
- Voice – Internet Voice Distribution Systems (IVoDS)
  - Status: Operational



- Web Based Server - EZStream® (Commercial product not supporting ISS but funded by NASA)
- Security – In place

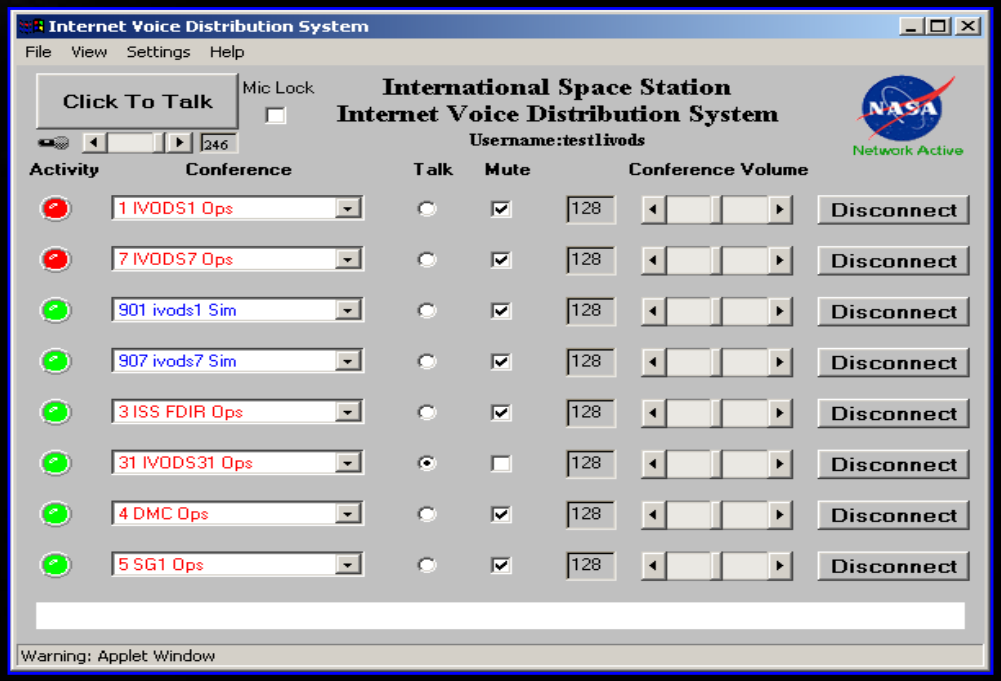
- TReK and IVoDS are operational systems that can be used in total, or in part, for almost any type of instrumentation application at very little cost
  - Especially effective if there are layers of operations
- EZStream® is a commercial product developed under a NASA Small Business Innovative Research contract and is operational
- What follows are the uses of TReK and IVoDS in the International Space Station science operation


Internet Voice Distribution System
File View Settings Help
Click To Talk
Mic Lock
246
International Space Station
Internet Voice Distribution System
Username:testlivods
Network Active
Activity
Conference
Talk
Mute
Conference Volume
1 IVODS1 Ops
7 IVODS7 Ops
901 ivods1 Sim
907 ivods7 Sim
3 ISS FDIR Ops
31 IVODS31 Ops
4 DMC Ops
5 SG1 Ops
128
Disconnect
Warning: Applet Window

Internet Voice Distribution System Benefits

- Pros:
  - Low cost to implement a standalone system
  - End user cost for client and hardware virtually “free”
  - System and hardware is standards and COTS based, however not VoIP (First Virtual Communications formerly CuSeeMe)
  - Easily expandable
  - Low networking cost if not encrypted ~ 11 kbps per voice loop, encrypted ~ 40 kbps
  - No talk, no traffic except keep alive
  - Easy to configure and use, one NASA voice loop = one IVoDS conference
  - Use almost anywhere that has access to an IP network path of acceptable performance
  - Excellent sound quality
- Cons:
  - Performance susceptible to network congestion
  - User acceptance factor e.g. no handset

IVoDS User Client



Capabilities

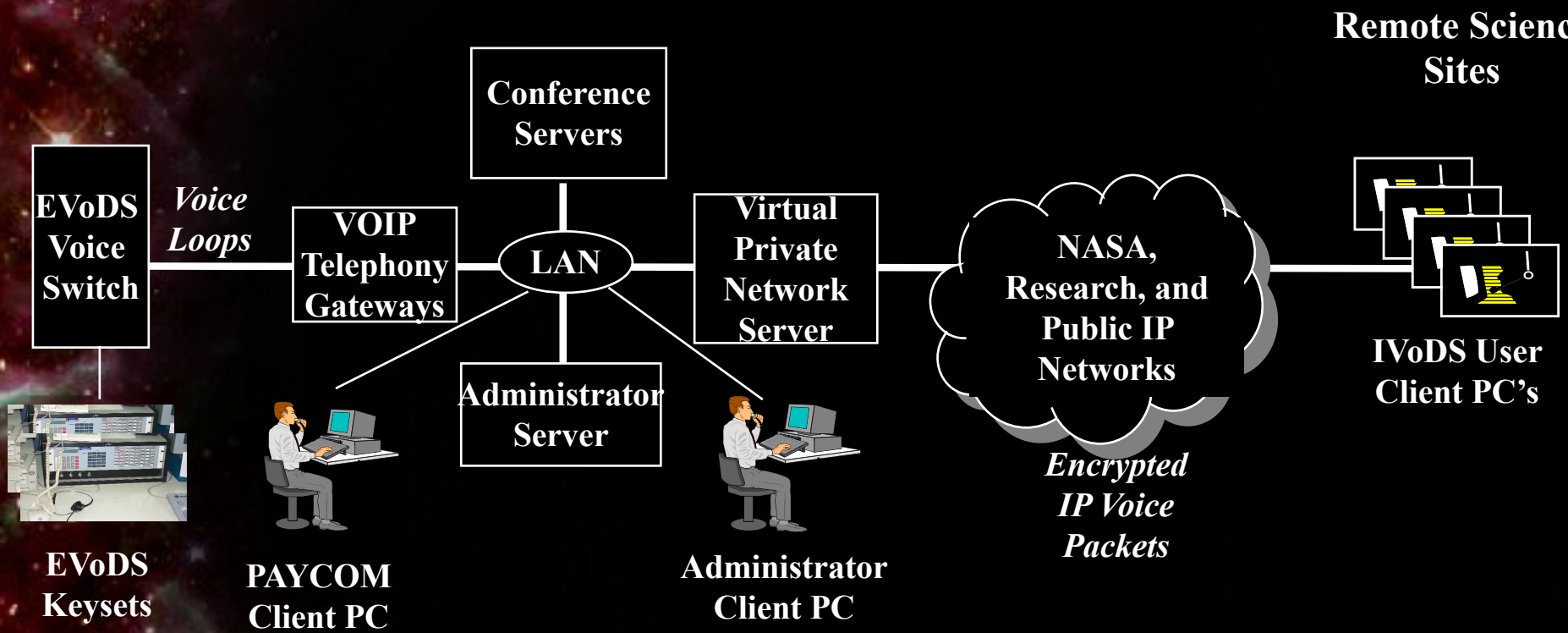
- Monitor 8 conferences simultaneously, talk on one
- User selects from authorized subset of available voice conferences
- Volume control/mute for individual conferences
- Assign talk and monitor privileges per user
- Show lighted talk traffic per conference
- Talk to crew on Space (Air) to Ground if enabled by PAYCOM

Coming IVoDS Enhancements

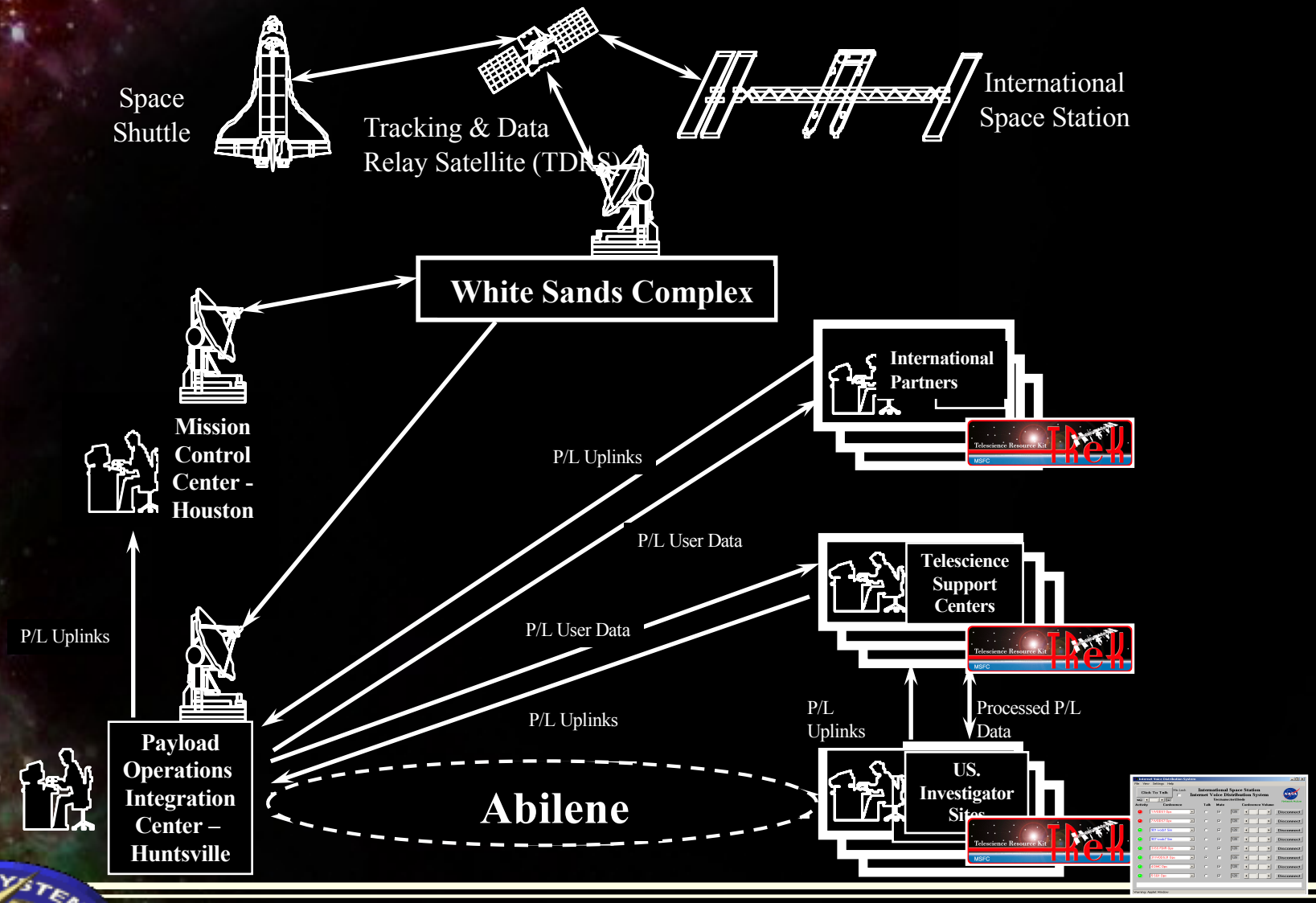
- Instant Messaging
- Text Messaging by Loop
- Video Conferencing
- Collaboration Tools i.e. App Sharing

Internet Voice Distribution System Supporting ISS Science Operations

MSFC Payload Operations and Integration Center – Huntsville Alabama



ISS Payload Telemetry and Command Flow



Some Rough Cost Estimates

◆ Networking	Use existing bandwidth or buy more
◆ TReK including hardware	$5-$8K
◆ IVoDS server (25 users) incl HW	$10-$25K
◆ EZStream incl HW	$5-$8K

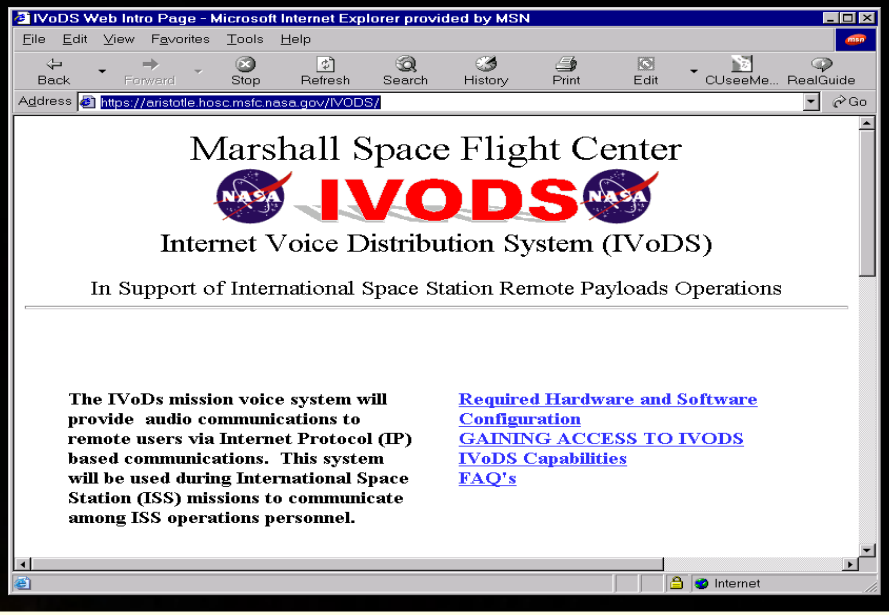
Contacts

TReK Customer Support

- The TReK Team provides the following types of support to TReK customers:
  - Beta Software Testing Program
  - TReK Web Site (http://trek.msfc.nasa.gov)
  - Help Desk (Technical Support Phone Line -- 544-3521)
  - E-Mail Technical Support Help (trek.help@msfc.nasa.gov)
- TReK Project Lead: Michelle Schneider
  - 256-544-1535
  - Michelle.Schneider@msfc.nasa.gov

IVoDS Contacts

- Contacts:
  - AZ Technology, Jim Chamberlain, 256-837-9877, x.123, chamberlain@aztechnology.com
  - Marshall Space Flight Center, Susan Best, 256-544-3773, susan.best@msfc.nasa.gov
- IVoDS user information:



Questions?

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