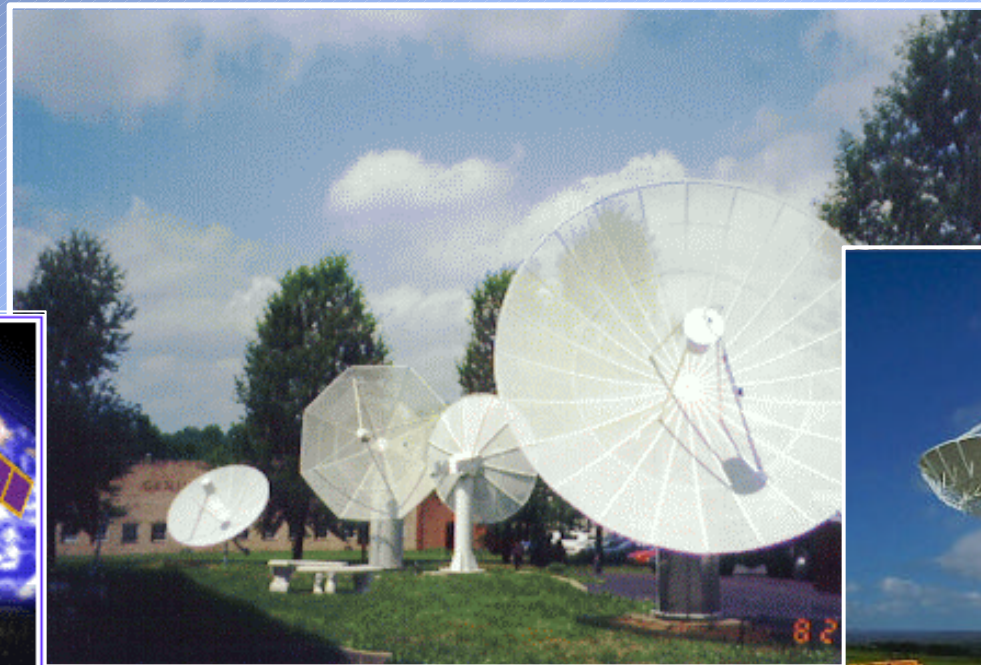


Universal Space Network Providing An Alternative to Dedicated Networks



Gregory S. Hollister
Universal Space Network
Ground Systems Architecture
Workshop
23-25 February 2000

Background on USN

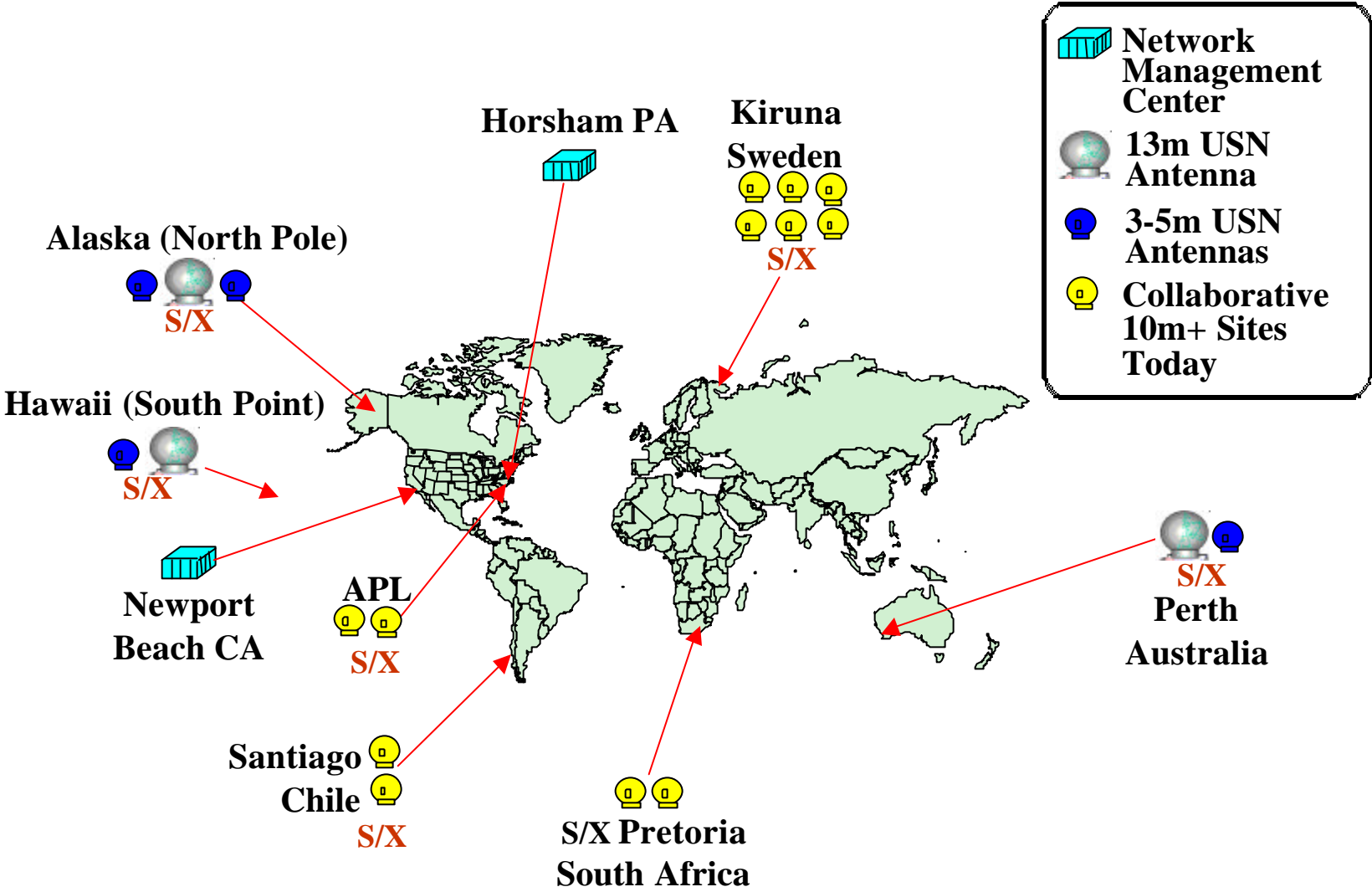


- Purpose - Spacecraft Tracking, Telemetry and Control
- Spacecraft Data Reception, Processing and Dissemination
 - S/X-Band Today at Rates up to 30Mbps
 - Enhancement to 150-600Mbps planned
- Primary, Backup & Contingency RF/Data Support
- Realtime and Store & Forward Spacecraft Tele-commanding
- Launch & Early Orbit support (30/60 day checkout period)
- Ground Segment RF and Dataflow Compatibility Certification

Key Customers Today

SWAS LEOP Service, FUSE Operational Support, VCL, TIMED, X-37, Triana, QuickTOM, CSOS, etc.

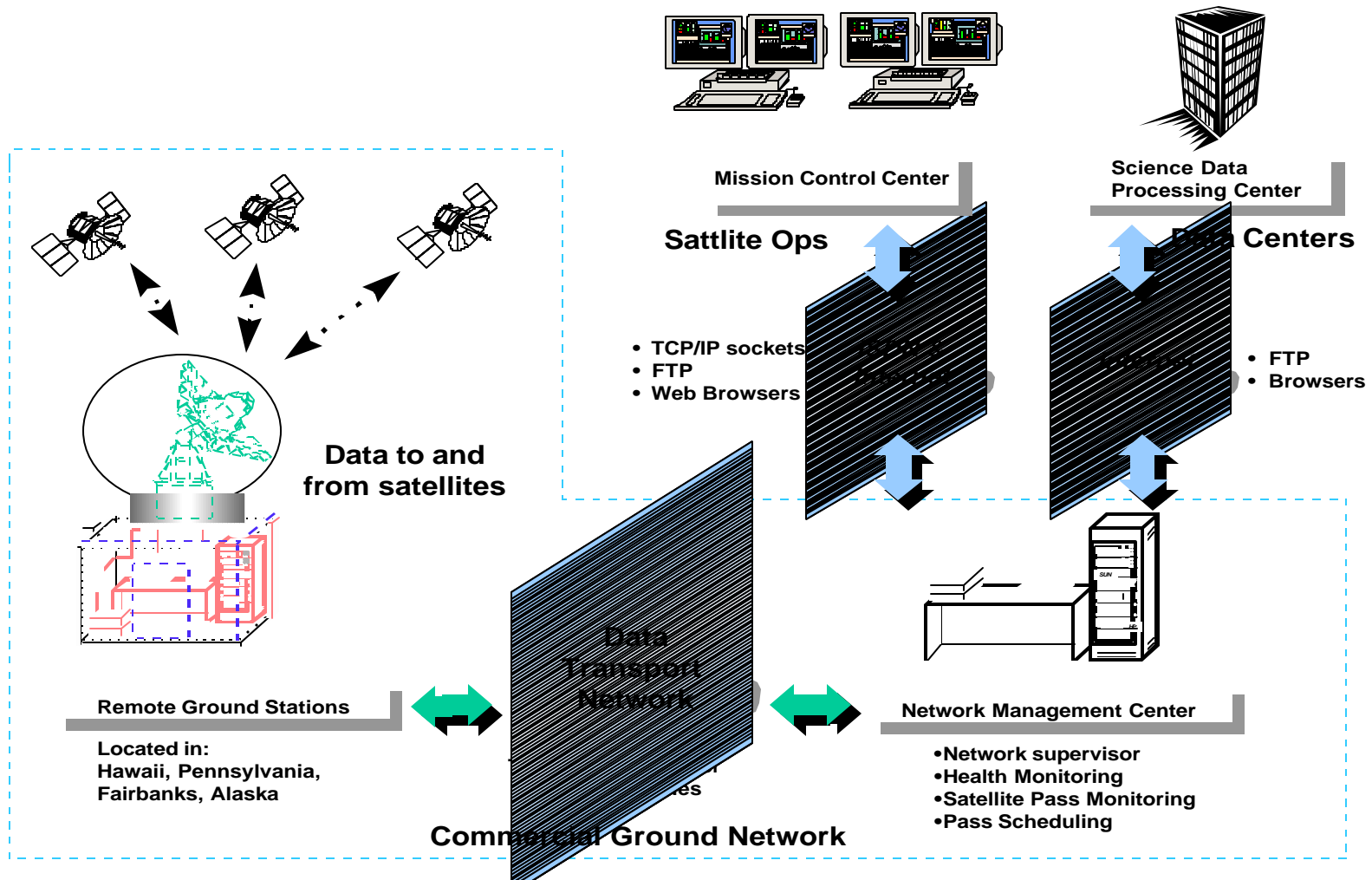
Universal Space Network in 2000



Architecture



USN Commerical Ground Network Architecture



13 Meter Antenna Components



| Item | Description |
|------------------------|---|
| • Antenna tracker | Datron 13-meter S/X Band 3 axis hemispherical |
| • TT&C Rcvrs | Microdyne MR700 and 1620 Combiner |
| • X-Band Rcvrs | DCS 2200 |
| • Bit Sync | L-3 Communications (Aydin) 3335A |
| • Exciters | HP 3342A |
| • Station Switching | HP |
| • Data Processor | L3-COM Impact 2000 and Avtec PTP-EX |
| • Command generator | GDP 786 |
| • USB Tracking/Doppler | Enertec 3801 |
| • SGLS Telecommand | GDP 789 |
| • High Power Amps | Andrew |
| • Routers | Cisco 1600 |
| • Computers | Dell |
| • Test Equipment | HP |
| • GPS Time | True Time XL-DC |

Frequency Bands

universal space network
access your world

- S and X bands are supported today at all USN primary and collaborative sites
- We are currently working a contract to support Space Systems Loral which will be done in the Ku band
- Our modification of our Alaska Antenna will allow support for SGLS this summer

**USN WILL SUPPORT S/X/Ku/SGLS BY
SUMMER'S END**

Operations Procedures



- Customers provide tech data for satellite connections
- Interface established and stored
- Users schedule resource via web
- NMC “turns on” RGS
- User does telem through NMC
- Mission data is store and forward

USN Interfaces

USN has created a flexible interface using COTS standards

- Data is collected and sorted at the frame level
- Ground receipt information is attached as a header (flexible to meet different mission requirements)
- Data is then stored or shipped at the frame level
- Connections to the MOC are TCP/IP socket protocols - reliable transmissions.
- Tapes can be either Ampex or DAT tapes. Daily mailings.

Communications

- GTE WAN provides several connection options
- Existing connections to NASA Goddard, USN passed security audit

User to RTS Interface



There is no user to RTS interface. Access to the net comes through the NMC, which in turn is the focal point for customers to schedule supports, establish connections to perform telemetry through the NMC, and FTP mission data from the NMC data collection system.

User to NMC



- Users access the NMC via a TCP/IP Socket established over ISDN Dial Up
- Information on antenna availability as well as ability for customers to schedule a pass is done via our Web Browser
- Access to mission data stored at our NMC is accessed via FTP protocols. Users access the site and download their data

NMC to RTS



- Connectivity and interface is established via a TCP/IP protocol over ISDN, allowing for establishment of:
- Command Socket Connection
- Telemetry Socket Connection
- Ground Station Status Socket Connection

RTS to Satellite



- Satellite Ranging is performed using UTDF
- CCSDS is used for Spacecraft Communications
- Doppler Extraction is used for velocity for Velocity

Summary



USN's network is based on open standards and capable of supporting any satellite control customer.

Interface issues will vary depending on the customers mode of operation.

Reduced costs and a flexible architecture will provide the same type of service in the AFSCN.