EVLA Monitor and Control

M&C Network
Requirements

- Connectivity
- Performance (Predictability)
- Accessibility
- Security
- Configuration
- Costs
Connectivity

- 40+ modules/antenna
- 28 antennas
- 22Km range
- Test port(s)
- RFI from switches must conform to EVLA RFI plan
- Antenna Ethernet switches should be in vertex room
  - Air quality
  - Temperature control
Performance (Predictability)

- No collision domain
  - No retransmits barring fiber error
- 3 million packets/sec/switch
- 100Mbit dedicated to each module
- Latency
  - Through Fiber ~10 us/3Km
  - Through switches ~20-30 us
  - 60-90 us aggregate through switches
Performance

- Antenna state change in < 100 us
- > 100 us elapsed time to most antennas
- Some buffering must be done on fast switching MIBs
Accessibility

• Direct Monitoring
  – From Antenna
  – From Monitor & Control Network

• Proxied Monitoring
  – From remote NRAO locations
    • AOC systems,
    • GB, CV, etc
  – From non-NRAO locations
Security

- No direct remote access
- Proxied access is controlled via access lists
  - Control access at all routers
  - Block all access, then mask in what’s needed
- Intrusion detection
  - Mechanisms for detecting access
    - Egress filtering/logging
    - M&C system monitoring
Configuration

• Class C per antenna
  – Part of non-routable network class B
• IPv4 and IPv6 support in all devices
• ICMP support at MIBs
• Broadcast capabilities ?
  – From MIB to network ?
  – From M&C control system to MIBs ?
Costs (at Antenna)

- **Cisco 3508 Uplink Switch**
  - 1 Chassis @ $3200
  - 1Gbit Long Haul (22km) @ $3800
  - 4 1Gbit Fan-out connects @ $320 each
  - $8400 per antenna

- **Allied Telesyn 16 port fan-out switch**
  - 4 Switches @ $2125
  - 4 Uplink (from 3508) @ $350 each
  - $9900 per antenna

- **Uplink total + Fan-out total**
  - $18K per antenna
  - $512K total
Costs (at Control Building)

• Fan-out to antennas
  – 1 30 port router (all ZX modules)
    • Alternatively 8 4 port Cisco 3508 (all ZX modules)
  – 1 chassis @ $16K
    • Alternatively 8 3508 Chassis at $3200
  – 28 Long Haul ZX Modules @ $3800 each
  – $122K at control building
Costs (Total)

- $634K total from Control Building to all 28 antennas
- Cost Drivers
  - 22Km drives costs
  - Configure close in antennas first
  - Buy long haul interfaces as needed
    - Worst case scenario 9 antennas >10Km for A Array
  - Buy as late as possible
Funding

• $122K at control building
  – From WBS 6.7.5.15 from 02-08

• $512K for antennas
  – All from WBS 6.7.5.15 from 02-08
  – Currently only $270K is budgeted in 03
  – Need to reinstate ~ $360K and distribute from 02-08