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)
• 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, test ports
  – From Monitor & Control Network

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

• Multicast Monitor data to VLA/AOC networks
Security

• No direct remote access
  – Private address range 10.80.x.y
• 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
  - 10.80.xxx.yyy
- IPv4 and IPv6 support in all devices
- ICMP support at MIBs
- Multicast capability in all routers/switches/MIBS
  - From MIB to M&C and AOC networks
  - Time synchronization
Costs

• ~$660K total from Control Building to all 28 antennas at current costs

• Cost Drivers
  – 22Km drives costs
  – 48 100mbit fiber ports
  – 2 Gbit long haul interfaces/antenna

• Buy as late as possible
Funding

- $90K at control building
  - From WBS 6.10.10
- $323K for antennas
  - From WBS 6.10.10
  - $270K removed to balance budget 1/11/02
- Currently $413K is budgeted through 2010
- Cost reduction through 2010 should cover shortfall