

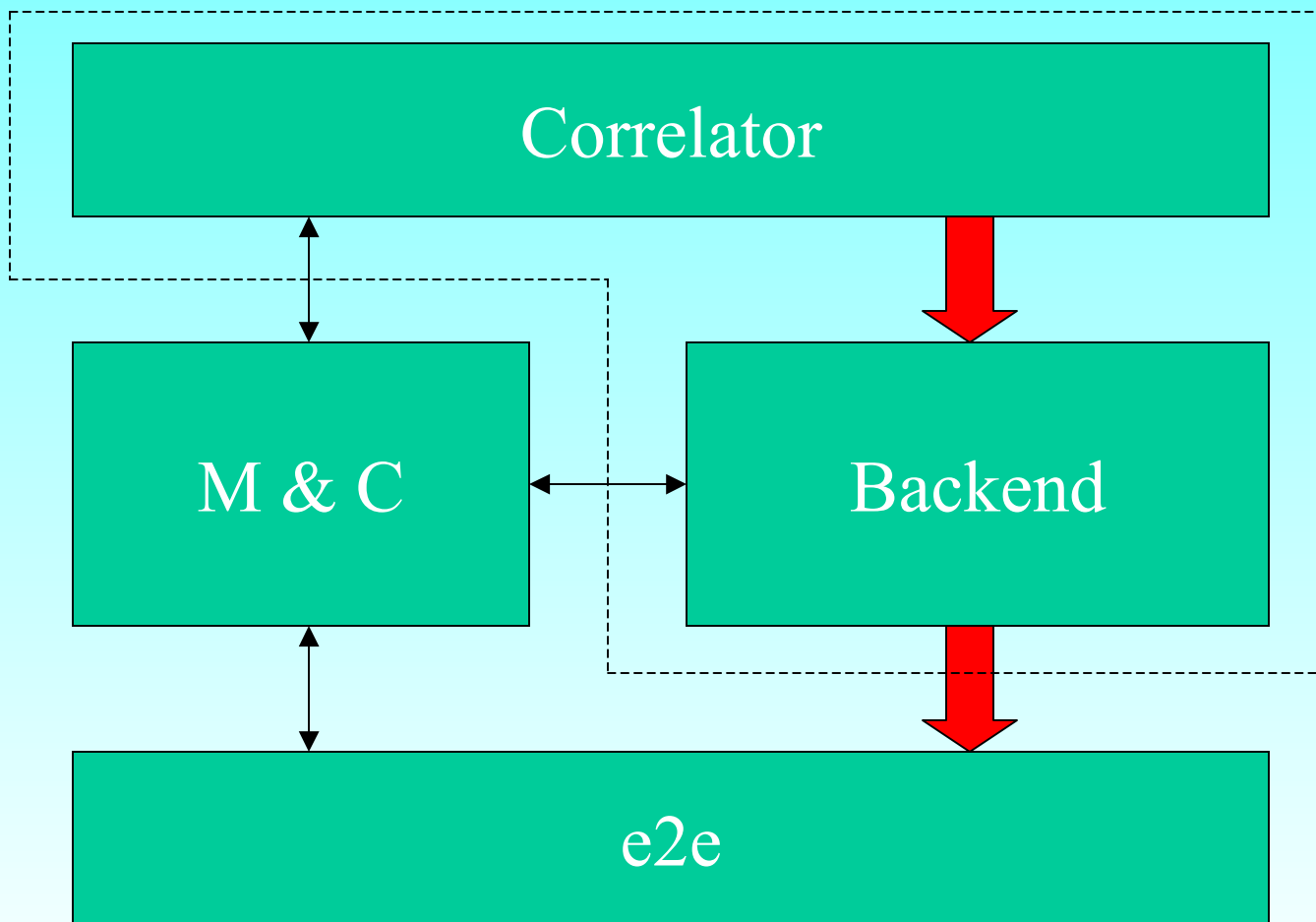
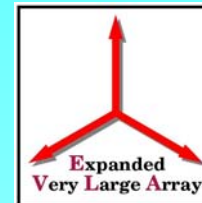
Correlator Backend System

Overview

Tom Morgan, NRAO

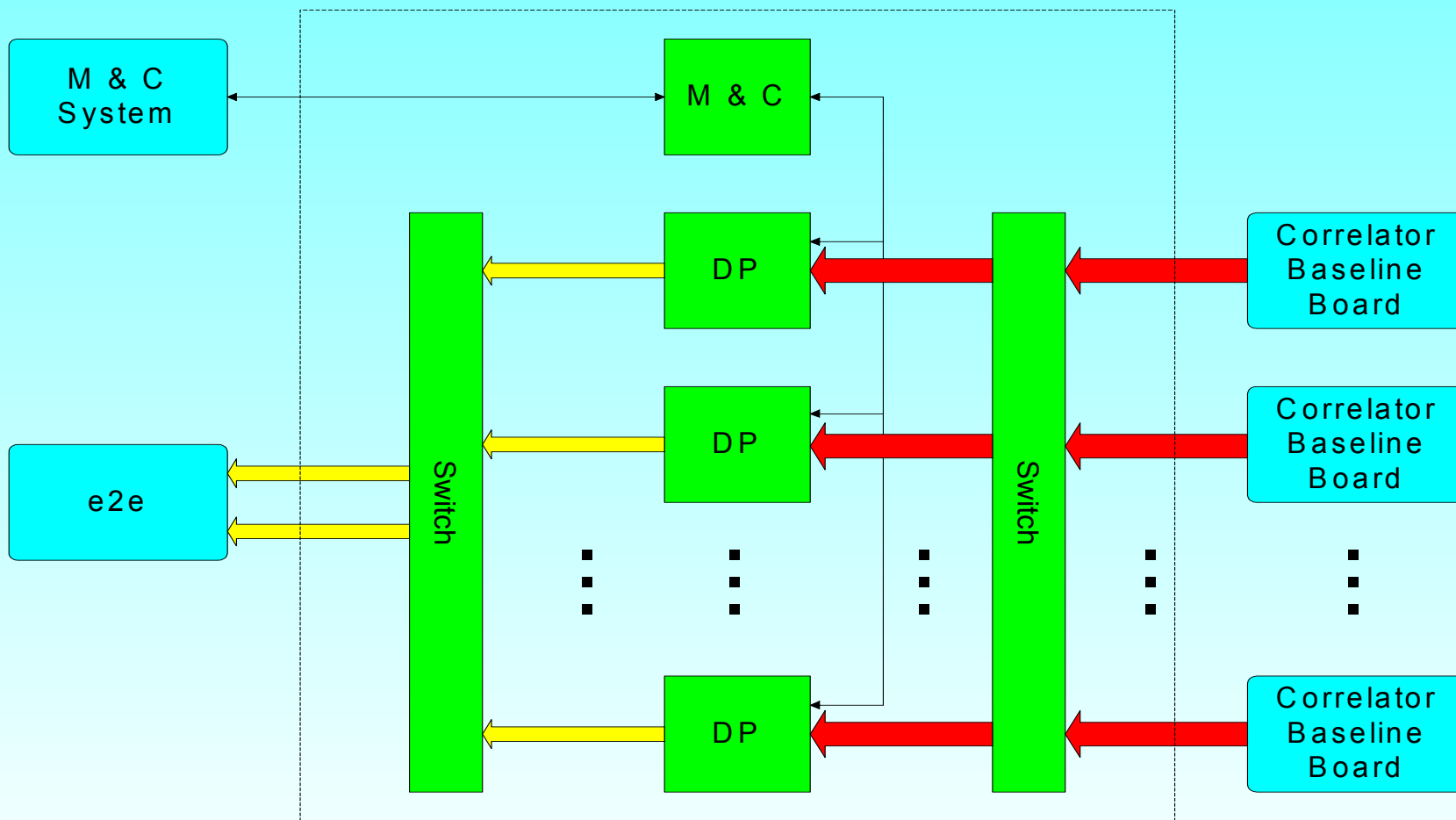
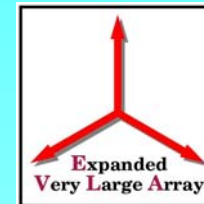


Major Systems



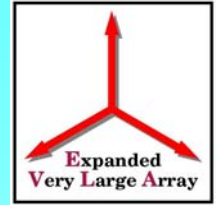


Backend Components





Backend Processing



- Verify Correlator Output
- Assemble Lag Sets from Lag Frames
- Apply Normalizations and Corrections
- FFT
- Integrate
- Noise Reduction/Excision



Initial Data Rates



- 64 Correlator Chips per Baseline Board (16 Subbands x 4 Polarization Products) x 2048 Lags x 8 Bytes per Lag = 1 Mbyte per CC per Dump
- 0.1 sec Dump Interval => 10 Mbytes/sec per Baseline Board
- 160 Baseline Boards => 1.6 Gbytes/sec Aggregate Sustained Input Rate
- 64:1 Reduction (6.4 sec Integration Time) on Backend => 25 Mbytes /sec Aggregate Sustained Output Rate



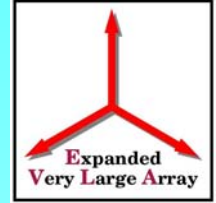
Data Rate Limiting Factors



- Connection Technology and Switch Speeds
- Memory and Disk Storage Capacities
- Processor Speeds
- Archive Size and Filling Rates
- Ultimately a \$ Limitation



Correlator to Backend Interface



- 160 (27-32 Antennas) Minimum to 336 (48 Antennas) Correlator Connections
- ~50 Backend Connections
- Initial Maximum Aggregate Transfer Rate of 1.6 Gbytes/sec
- Gbit/sec Switch



Backend to e2e Interface



- Initial Maximum Aggregate Transfer Rate of 25 Mbytes/sec
- ~ 50 Backend Connections
- Formatted as AIPS++ Measurement Sets
- Avoid Inter-processor Data Movement on the Backend
- Minimize Overheads on the Backend
- Backend has Provision for Backup Storage of Output on Disk



e2e Connection Modes



- Network Based Message Passing
- Channel Based I/O
- Backend Driven
- e2e Driven



Message Passing



- Backend Output Transfer via Network Packets
- High Speed Ethernet



Channel I/O



-
- Backend Output Data Transfer via Direct File Read/Write or Memory Copy
 - Fiber Channel, SCSI ...



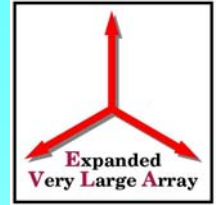
Backend Driven



- Backend System Runs Software that does Transfers
- If Message Passing: Backend Sends Data to an e2e Based Process and Retains a Copy until Receipt is Acknowledged
- If Channel I/O: Backend does Direct FileWrites into the Archive



e2e Driven



- e2e System Runs Software that does Transfers
- If Message Passing: e2e Runs Processes on Backend Nodes and Accesses Files or Memory for Data
- If Channel I/O: e2e does File Read/Write or Memory Copy from Either End



Development Schedule



- 2Q 2002 – 4 Node Test Cluster
- 3Q 2002 – 8+ Node Cluster
- 4Q 2002 – Functional Prototype
- 3Q 2003 – Activate e2e Connection
- 4Q 2003 – Full Functionality
- 3Q 2004 – First Prototype Correlator Boards
- 4Q 2004 – Earliest BE Connect to Correlator Hardware