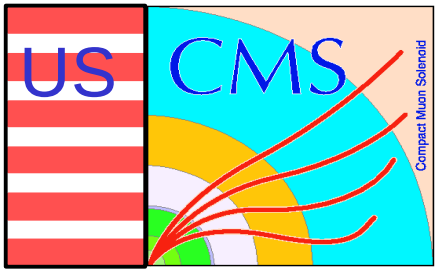
DDU Status



J. Gilmore

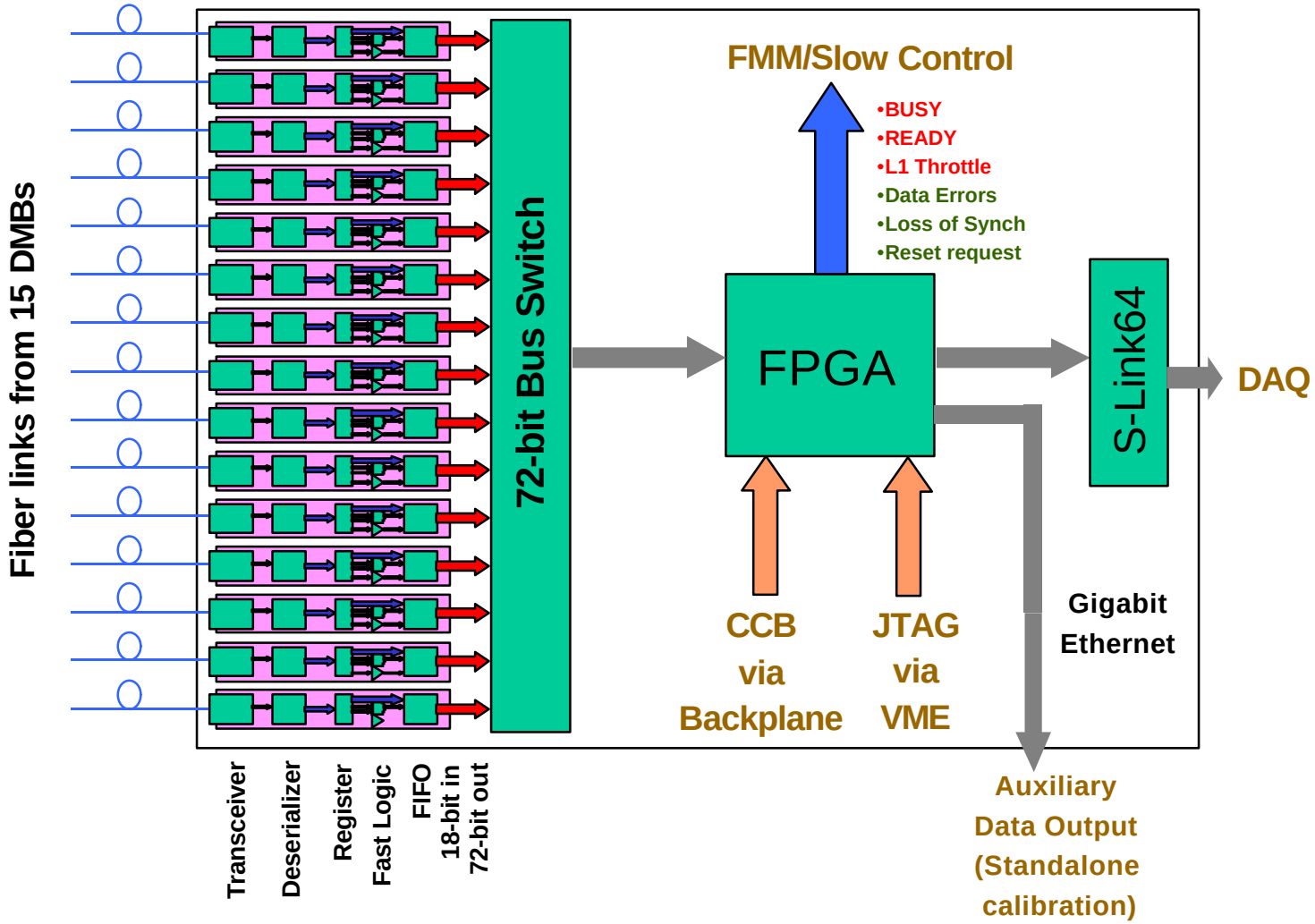
CMS-EMU Meeting, Houston

January 2002

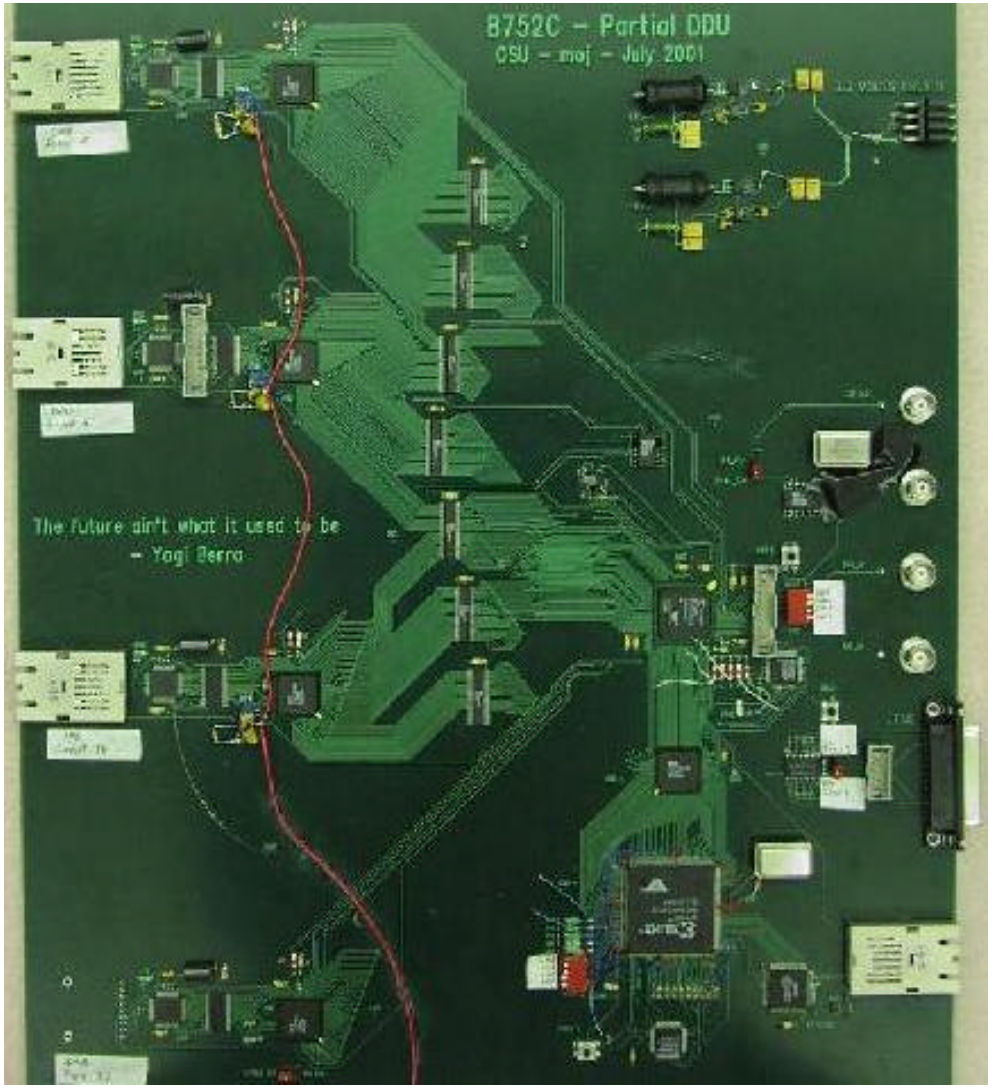
DDU Functions

- **What does the DDU do?**
  - **High-Bandwidth data concentration**
    - **15 DMB ⇨ 1 S-Link64**
  - **Full error checking and status monitoring**
    - **CRC check, word count, event number, overflow, link status**
  - **FMM and Slow Control communication path**
- **1st DDU Prototype Tests**
  - **4 DMB inputs**
  - **Full error checking implemented**
  - **PC readout via Gigabit Ethernet**
  - **DMB calibration pulses, regular and random timing**
  - **90 MB/sec continuous data transfer rate (PC limited)**
    - **Use modified Acenic driver, writes directly to memory**
    - **SCSI Ultra 160 can't keep up, but that's another issue…**

DDU Design


Fiber links from 15 DMBs
72-bit Bus Switch
FMM/Slow Control
•BUSY
•READY
•L1 Throttle
•Data Errors
•Loss of Synch
•Reset request
FPGA
S-Link64
DAQ
CCB via Backplane
JTAG via VME
Gigabit Ethernet
Auxiliary Data Output (Standalone calibration)
Transceiver
Deserializer
Register
Fast Logic
FIFO 18-bit in 72-bit out

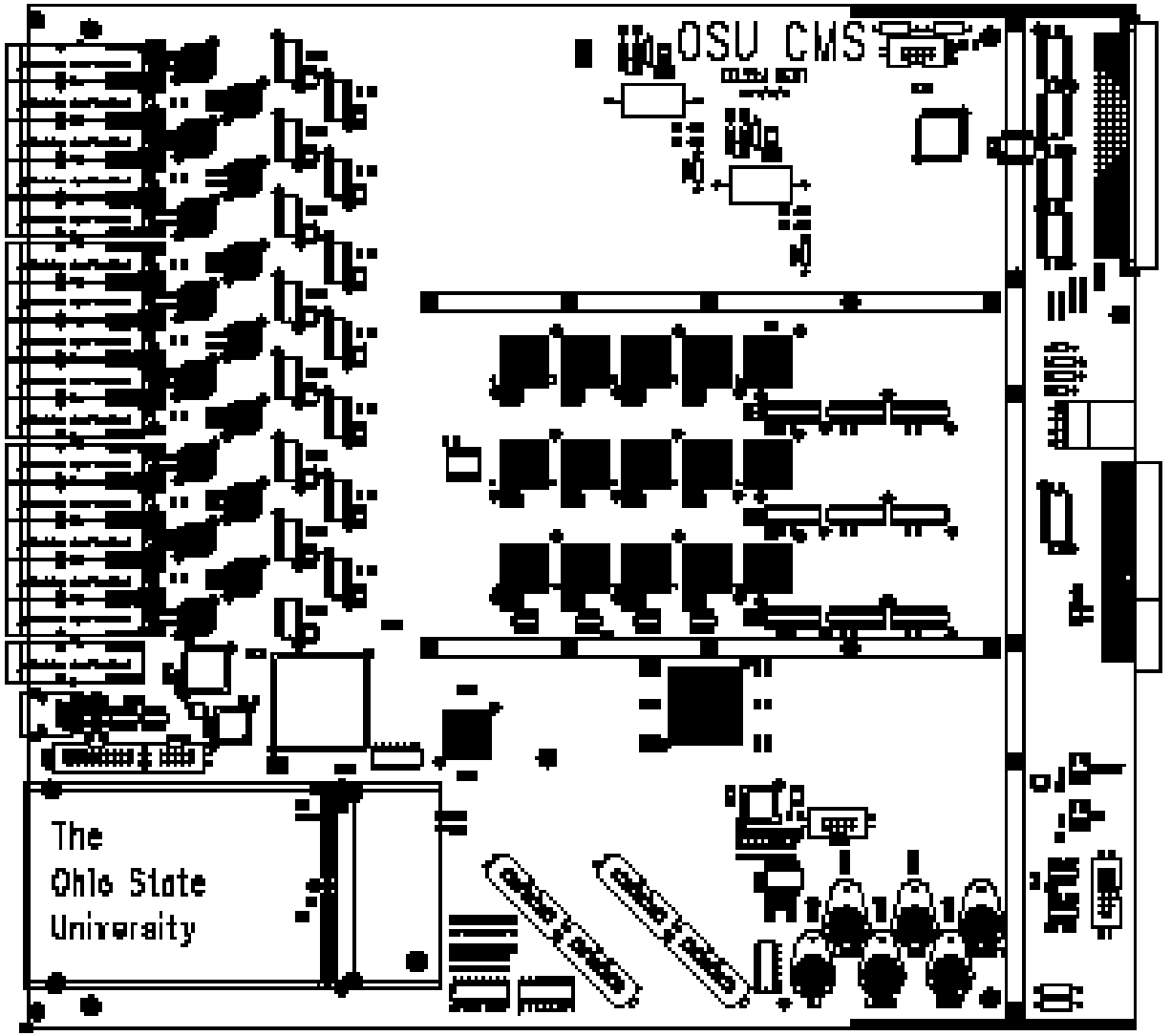
First DDU Prototype



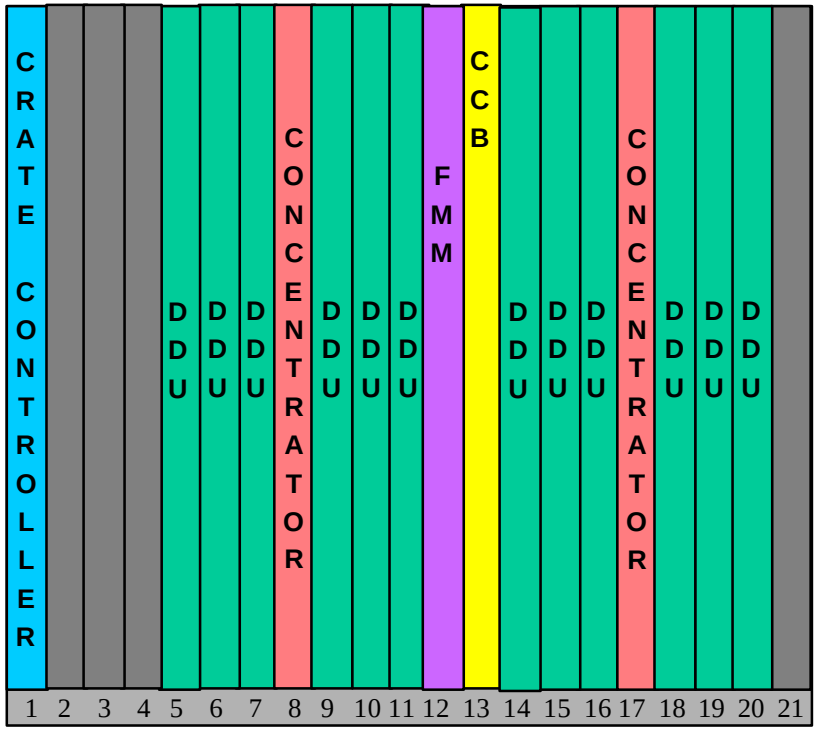
DDU Future

- **Next DDU Design**
  - Full 15 DMB readout prototype
    - Layout nearly complete, compatible with peripheral crate backplane
  - VME support for Slow Control
  - Gigabit Ethernet and S-Link64 readout capability
  - FMM communication port (LVDS via RJ45)
- **Future Concerns**
  - FMM and Slow Control
    - Protocol issues: how to differentiate FMM from Slow Control signals?
    - Who is responsible for design and construction? Prototypes?
  - Gigabit Ethernet data volume (calibration and spy data)
    - 90 MB/s continuous data transfer (direct to memory, no processing)
    - Data storage is SLOW: fastest disk only ~20 MB/s (SCSI Ultra 160)
    - 4 GB RAM (Linux limit) ⇨ ~45 seconds maximum storage
    - Data analysis processes further reduce this rate
    - Calibration run may use ~12 GB per DDU * (2-3 DDUs per readout PC)
    - We need a fast storage solution! (~90 MB/sec?)

Next DDU: Layout



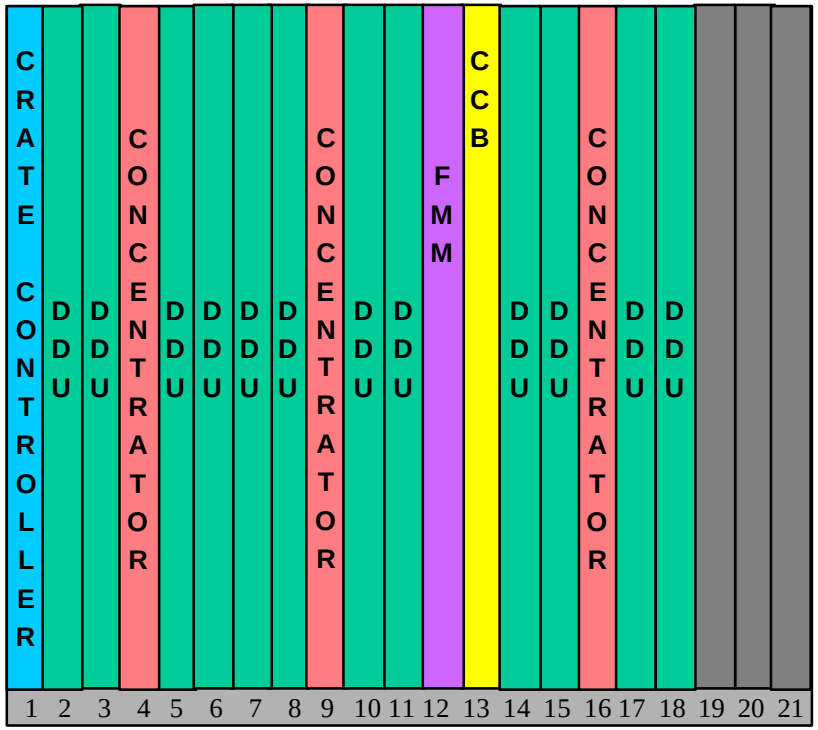
EMU DDU/FED Crate (1)



- Each of the 36 DDUs receive input from 15 DMBs
- EMU Readout needs 3 crates with 12 DDUs / crate
- Uses peripheral crate backplane and CCB
- Concentrator (DCC): 6 to 1 data merging
- FMM collects (from DDU)
  BUSY, READY, L1_Throttle
- Slow Control via controller

- **6 DCC option: 6-to-1 concentration**
  - **Where does SR/SP DDU come into the DCC?**
- **Need 12-18 standalone PCs in nearby racks for calibration and spy data readout**

EMU DDU/FED Crate (2)



- Each of the 36 DDUs receive input from 15 DMBs
- EMU Readout needs 3 crates with 12 DDUs / crate
- Uses peripheral crate backplane and CCB
- Concentrator (DCC): 4 to 1 data merging
- FMM collects (from DDU) BUSY, READY, L1_Throttle
- Slow Control via controller

- **9 DCC option: 4-to-1 concentration**
  - **Where does SR/SP DDU come into the DCC?**
- **Need 12-18 standalone PCs in nearby racks for calibration and spy data readout**