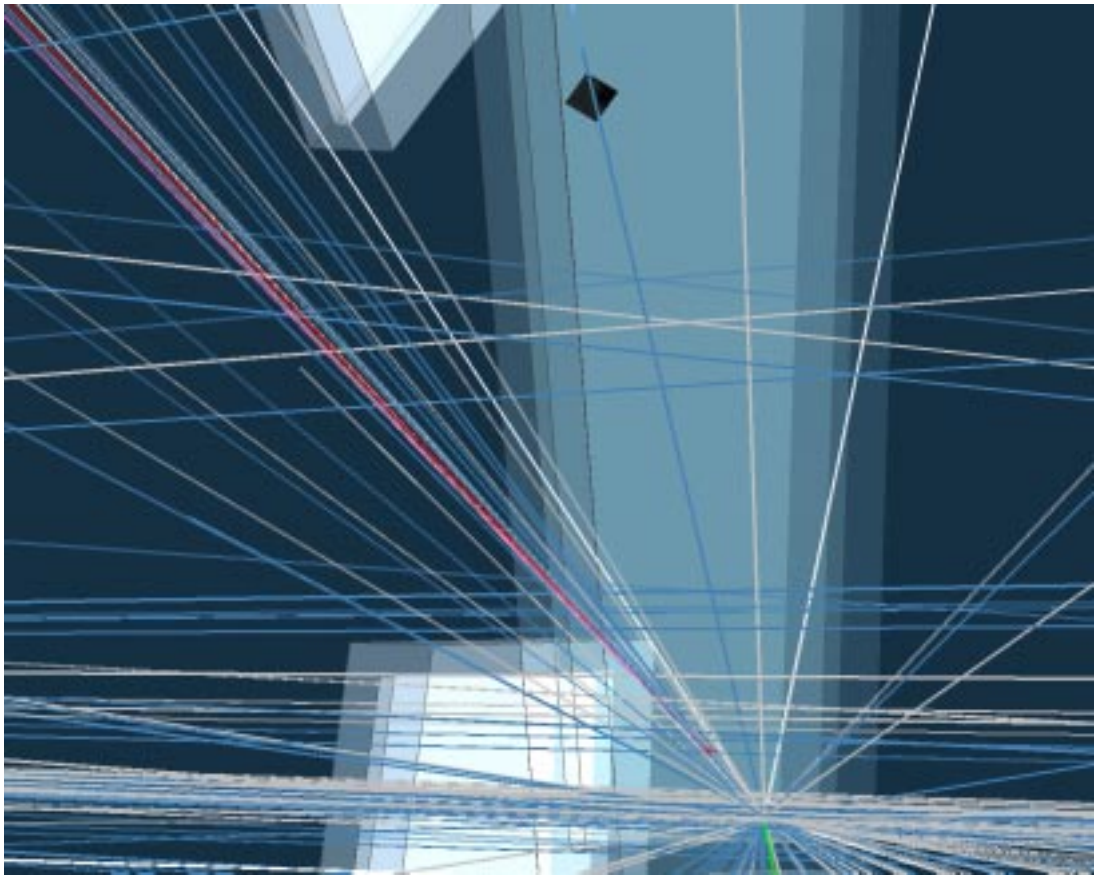
Silicon Trigger Cluster Card



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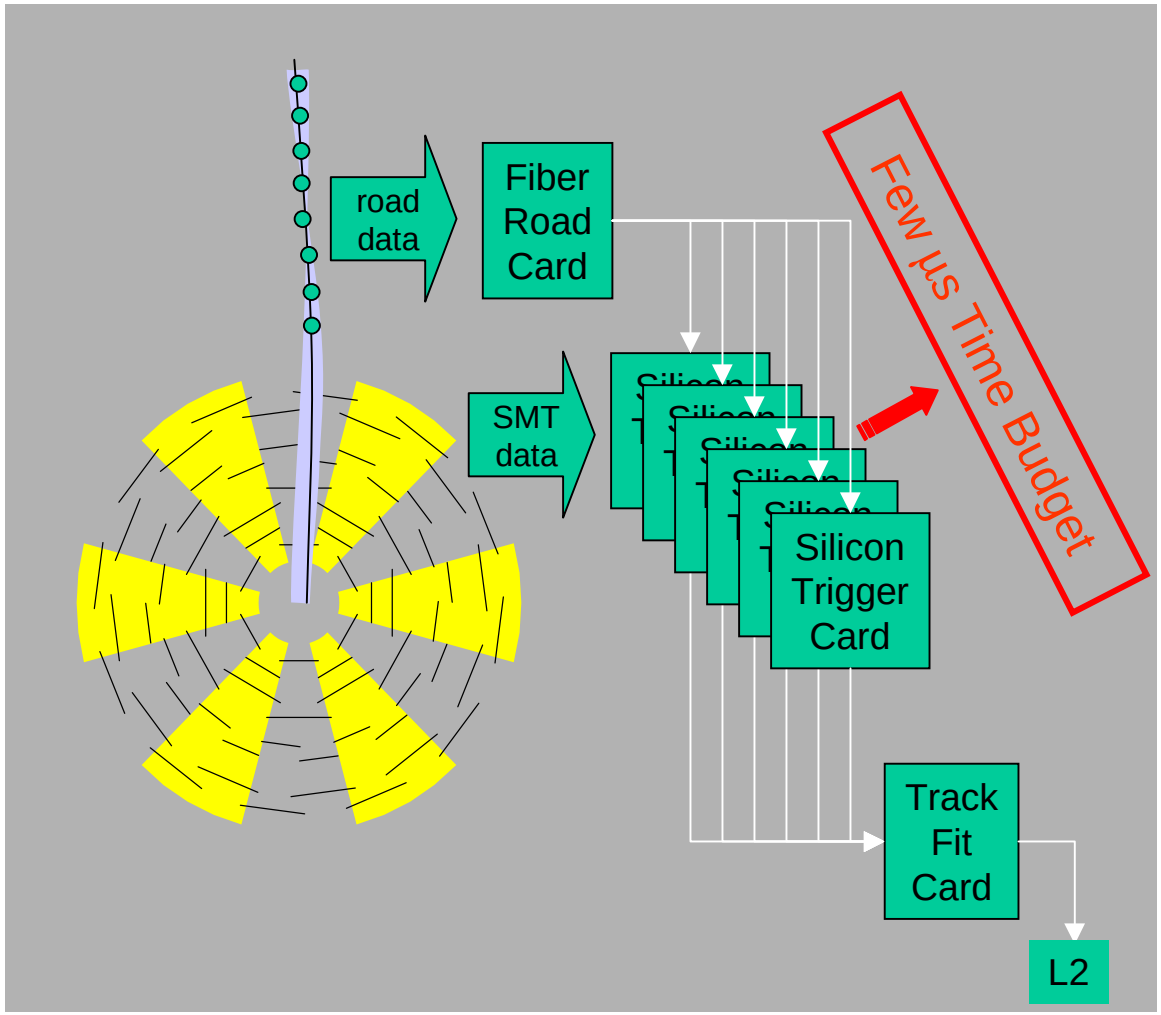
STC Functionality

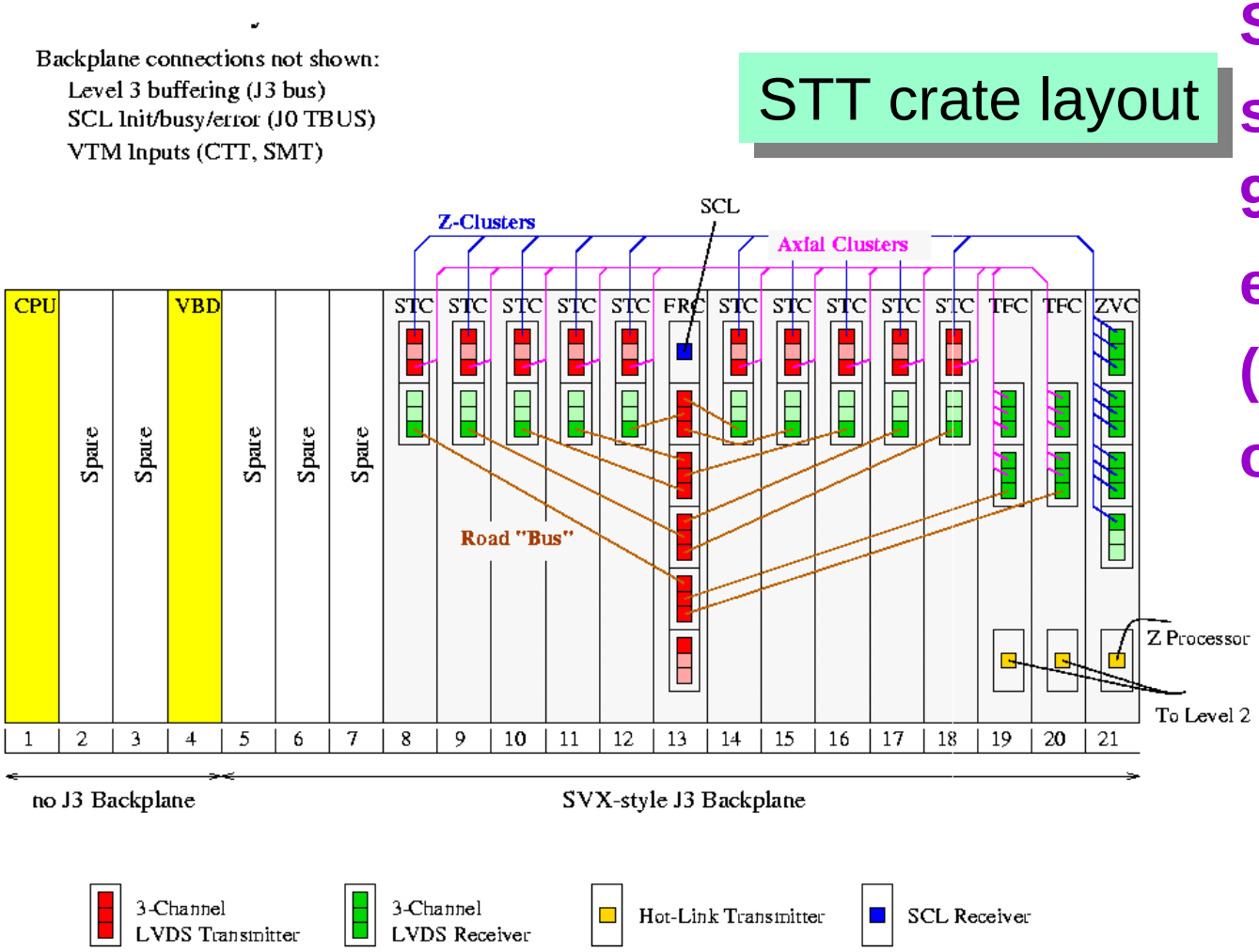
- **What are we expected to do?**



– **Find clusters in the Silicon detector associated with the outer track**

- **Inputs:**
  - receive SMT data
  - receive L1CTT roads
- **Functionality:**
  - find hit clusters
  - filter axial hits in track roads
- **Data output**
  - send filtered hits to TFC
  - send ALL hits to L3
  - send 90° hits to ZVC
  - collect stats for monitoring
  - send all internal info for unbiased events

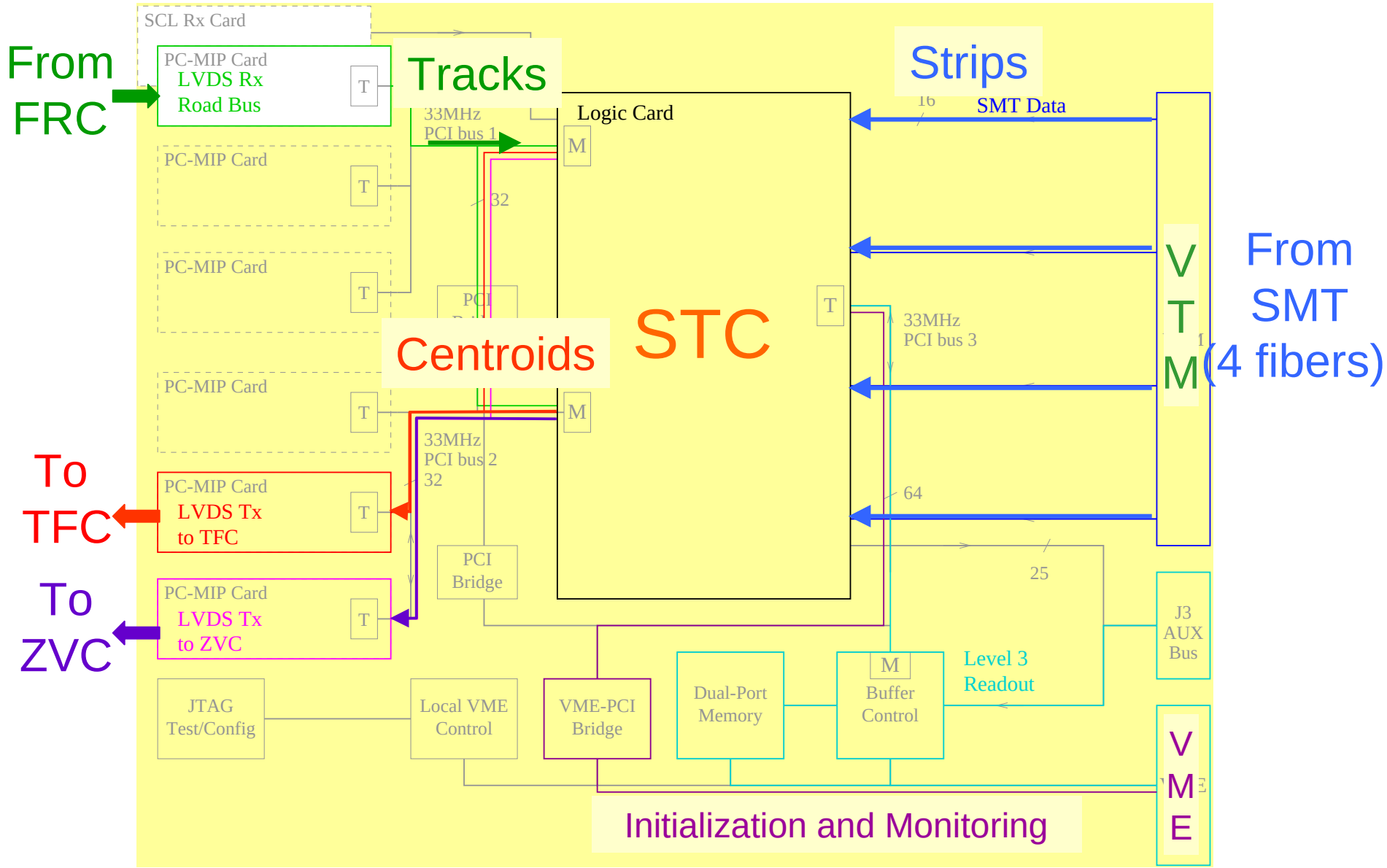
Where do we fit in?



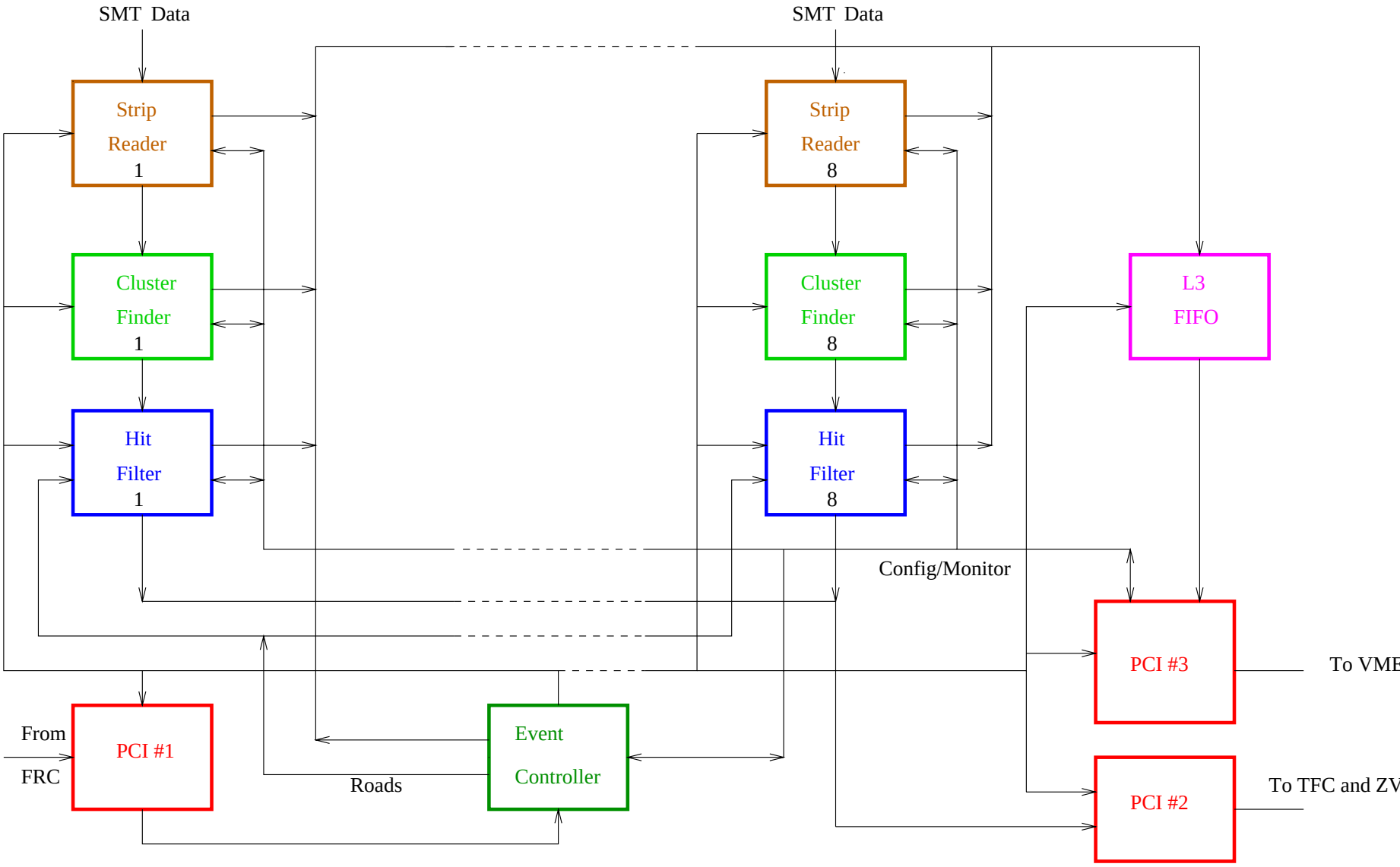
Six fold STT symmetry ⇒ 9 STC cards in each crate (72 SMT ladders on 36 fibers)

current cabling scheme suggests 6 out of 36 fiber will have data mixed across 30° sectors

Implementation

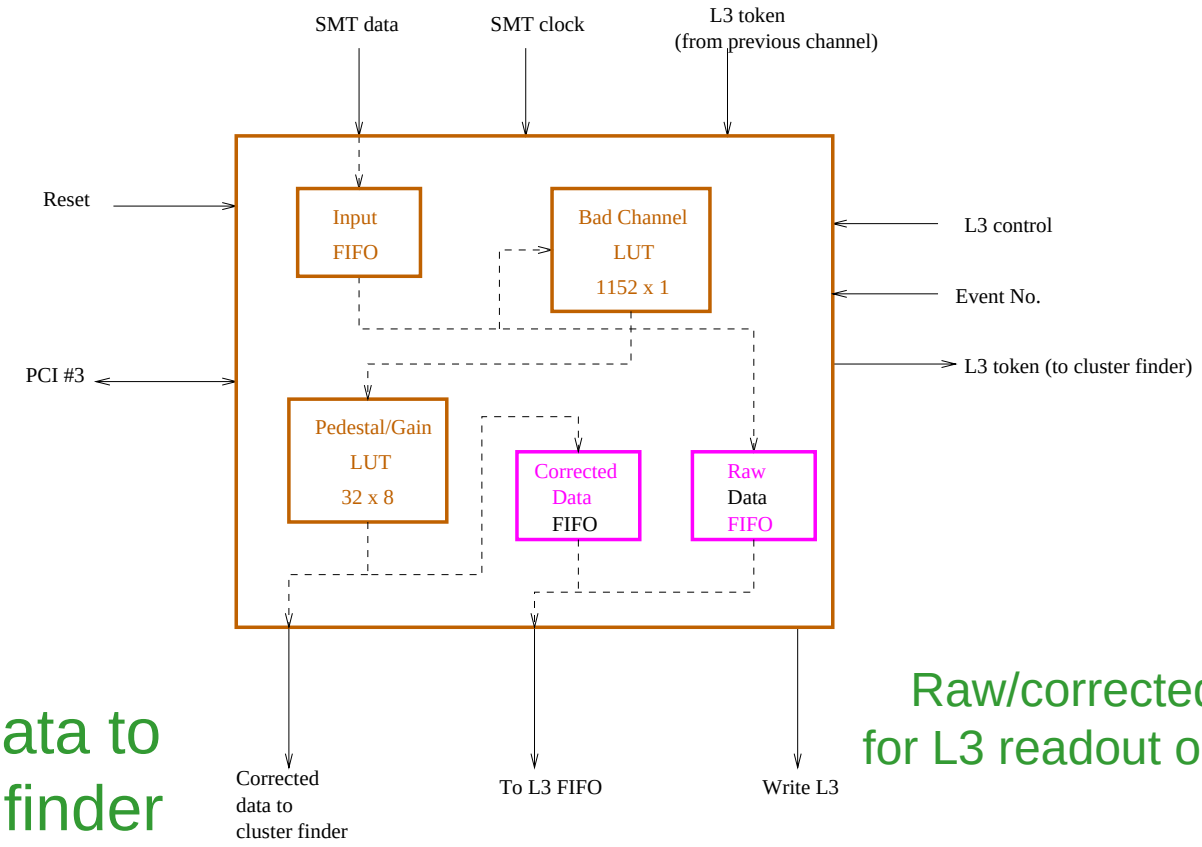


STC Flow Diagram



SMT Data Input Stage

- **Read in SMT strip information**
- **suppress bad channels**
- **apply gains and pedestal corrections (by chip)**

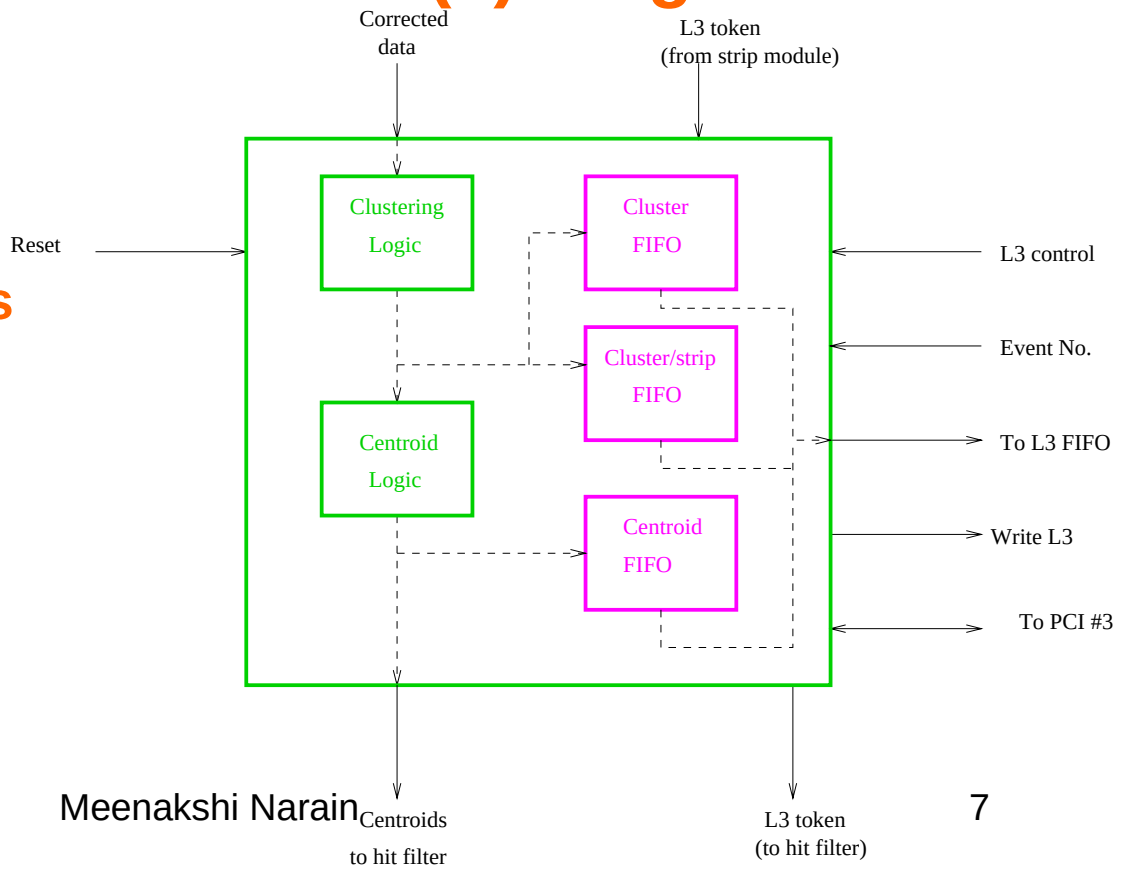


Send data to cluster finder

Raw/corrected data available for L3 readout on unbiased events

Clustering Stage

- **Combine contiguous strips above a threshold into clusters**
- **Compute cluster centroid based on peak with the highest pulse height and its ±2(1) neighbours**
  - **Centroids sent to**
    - **Hit Filter and L3 FIFO**
- **Compute dE/dx thresholds**

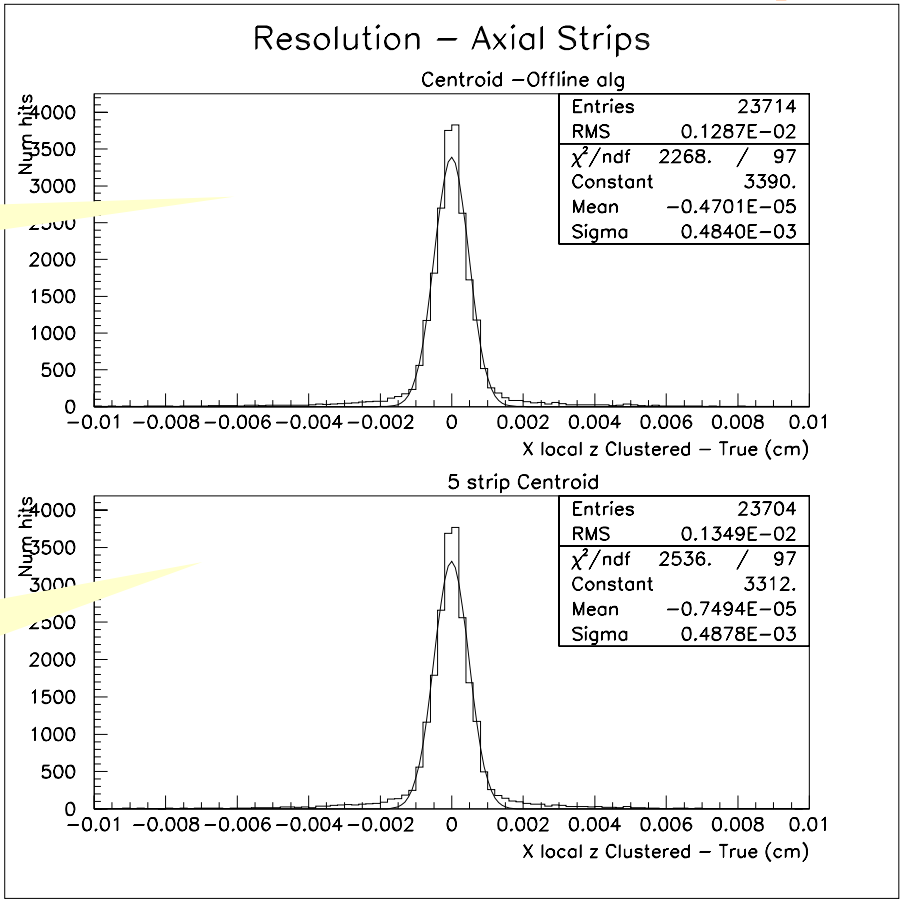


Clustering & Centroid Algorithm

- **Keep L2STT clustering same as Offline**
- **Limit centroid calculation to 5 *central strips***

Resolution for offline algorithm

Resolution for 5 strip centroid algorithm

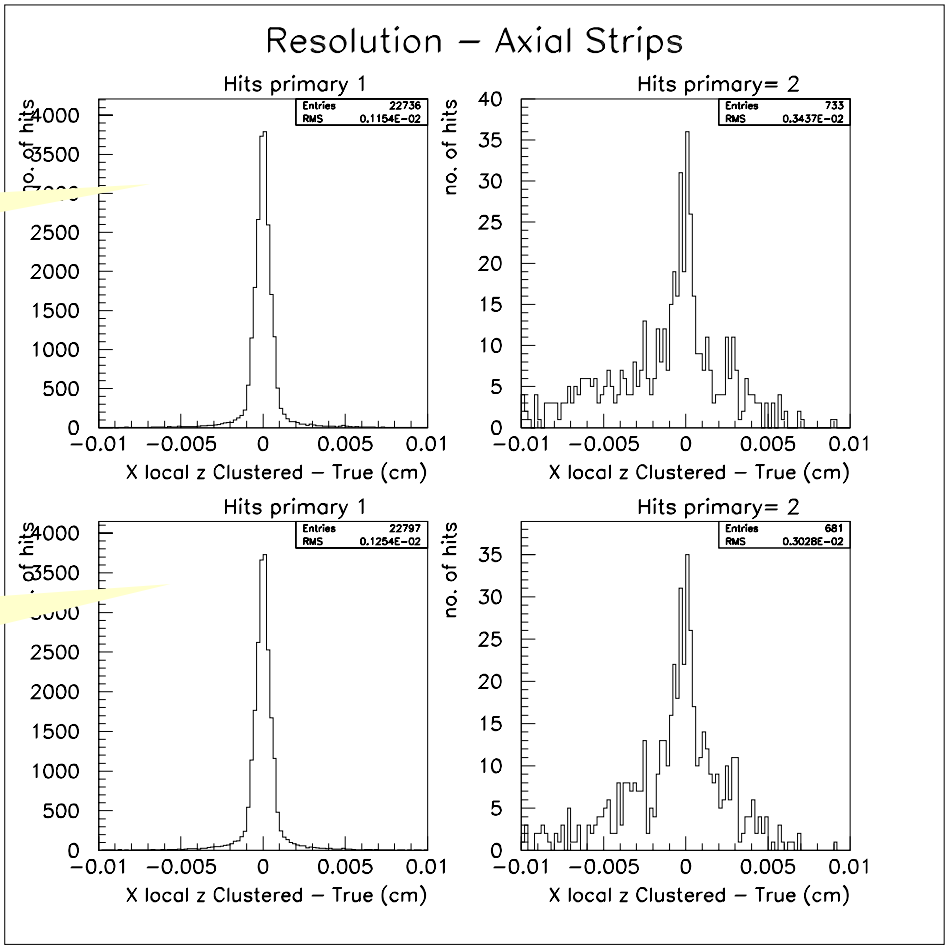


Clustering & Centroid Algorithm

- **Resolution for clusters with hits from multiple tracks**

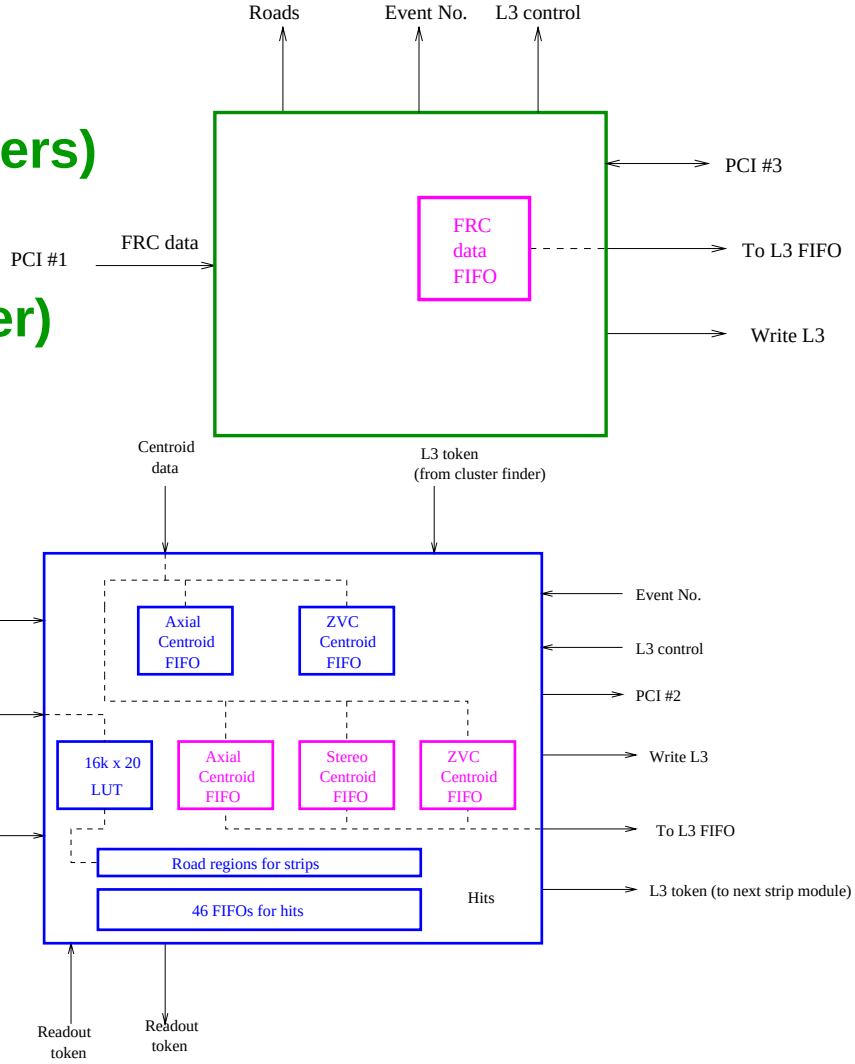
Resolution for offline algorithm

Resolution for 5 strip centroid algorithm



Event Controller and Hit Filter

- **Event Controller read in data from FRC**
  - **Event information**
    - **(Evt #, SCL info, Level1 Qualifiers)**
  - **Read L1CTT tracks**
    - **(send necessary info to hit filter)**
- **Hit Filter**
  - **convert L1CTT road to SMT roads**
  - **collect all centroids in a given road**
  - **send centroids in road to TFC**



Data Output

Data type	L3 (normal)	L3 (unbiased)	TFC
Raw			
Corrected		1 of 8	
Cluster (incl strips)		1 of 8	
Centroids Axial, 2-deg, 90-deg	X	X	
Centroids In roads		X	X
L1CTT info		X	
Bytes/event	160	630	136

Configuration and Monitoring

- **Monitor : (on CollectStatus L1_QUAL send the following to the CPU)**
  - **error counts for all 8 STC channels/card**
  - **8-bit histogram of channel hit**
  - **Total # of axial/ 2°/ 90° centroids for each channel**
  - **Time spent in various processing states**
  - **# of hits transferred to TFC**
- **Configuration:**
  - **look up tables**
    - **gains, pedestal, road conversion, various thresholds**
  - **`begin run' download:**
    - **bad channel list**
    - **L3 and monitor readout data-type**

Functional Simulation

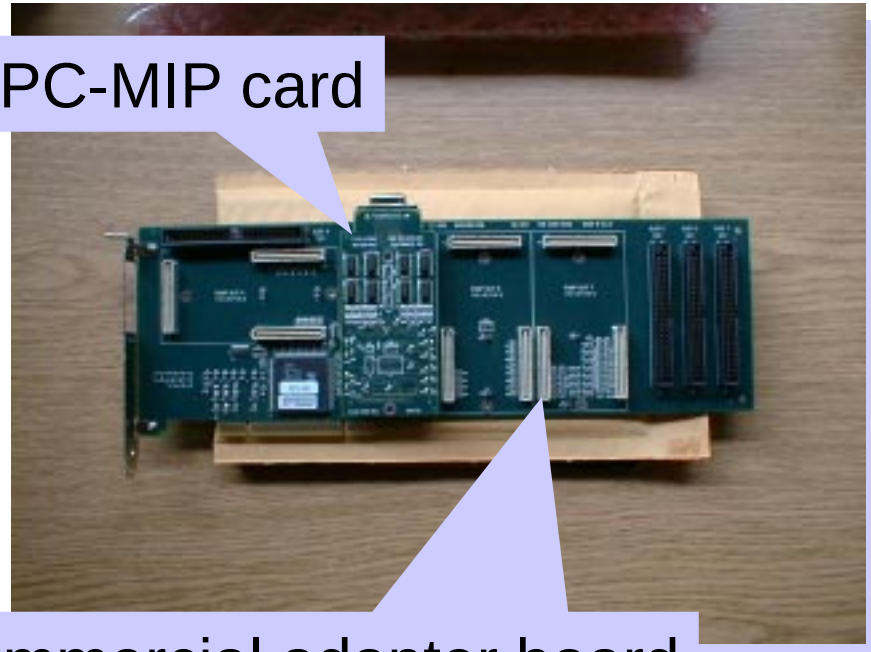
- **clustering algorithm and centroid computation (June'99 version)**
  - **Resource allocation for device EPF10K50EQC208-1**
    - **assume: 1 MHz Clock, Single Chip, No bad/skipped channels**

Total logic cells used:	1433/2880 (49%)
Total embedded cells used:	40/160 (25%)
Total EABs used:	8/10 (80%)
Average fan-in:	3.24/4 (81%)
Total flipflops required:	481

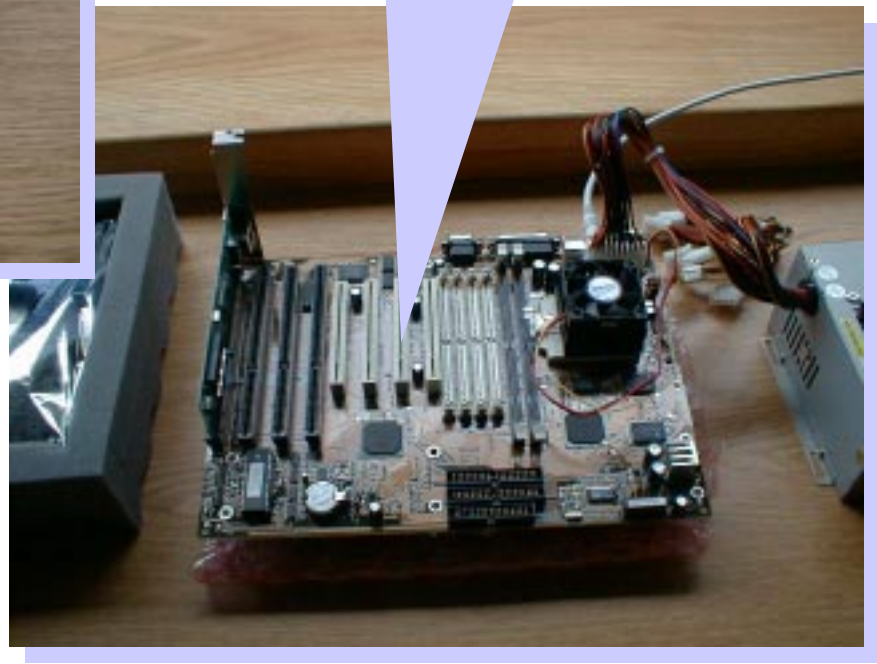
  - **Static Timing Analysis of Baseline Design showed 30MHz Maximum Clock Freq**
  - **Performance limited by Clustering Module.**

  - **Beginning Revision 2 Design...**
    - **Add Hit Filter**
    - **Add 3 or 5 strip cluster finder option**
    - **Examine PCI bus interface**
    - **Add L3 buffer/monitoring requirements.**

STC development and test platform



development platform



Summary

- **Specifications near completion**
- **Functional simulation started to assess the timing and resources needed**

- **Expect to start layout by 6/1/00**
- **Prototype next fall**