



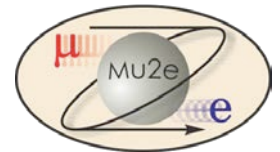
U.S. DEPARTMENT OF
ENERGY Office of
Science

Mu2e CD-2 475.09.05 Controls and Networking

Ryan A. Rivera

L3 Manager

7/8/2014

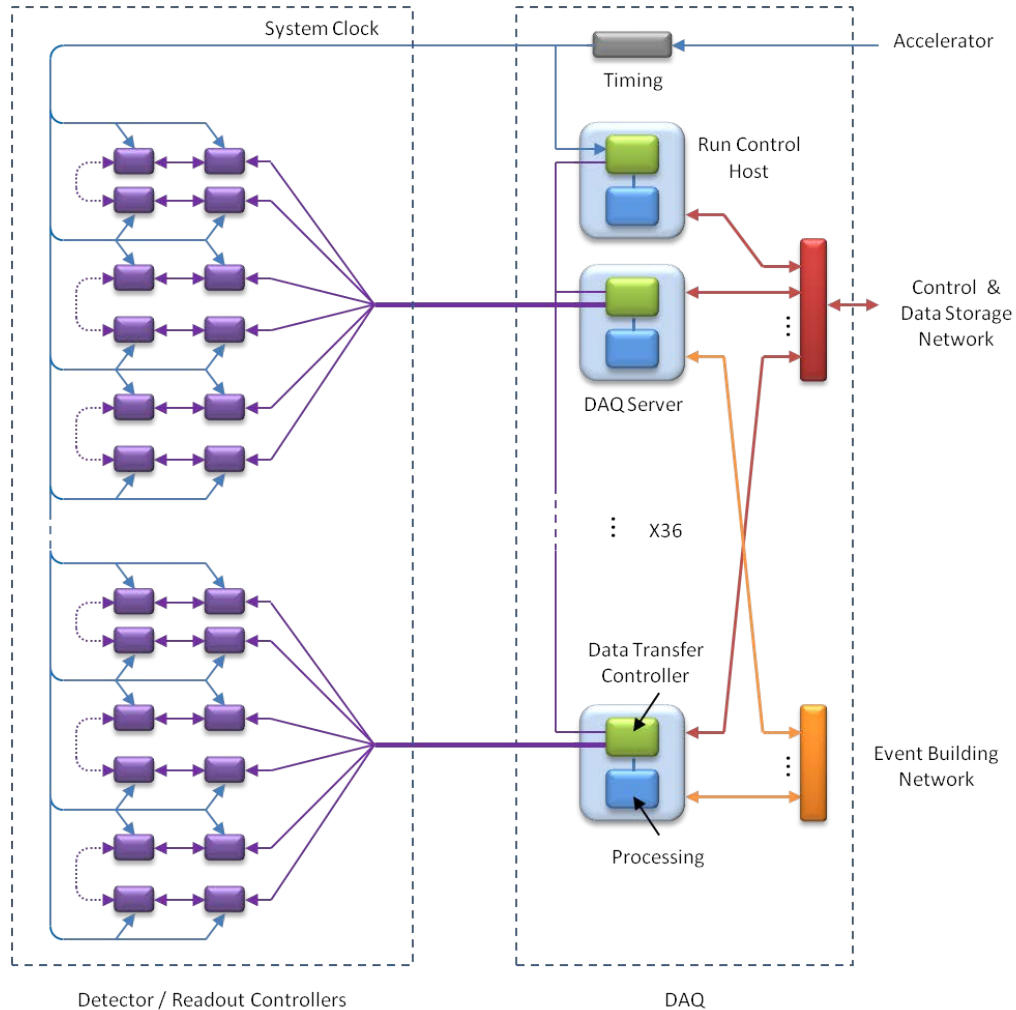


Requirements

- General purpose networking equipment and software
 - Access switch/router and top-of-rack data and management switches
- Remote Control Room (Wilson Hall) computers and operator interface software
- Local Control interface
- Ethernet based DCS infrastructure
 - Multi-chassis control system, generic endpoint hardware
- Controls software and user interface for DCS
- Communication protocol for use in high magnetic field areas of the detector hall

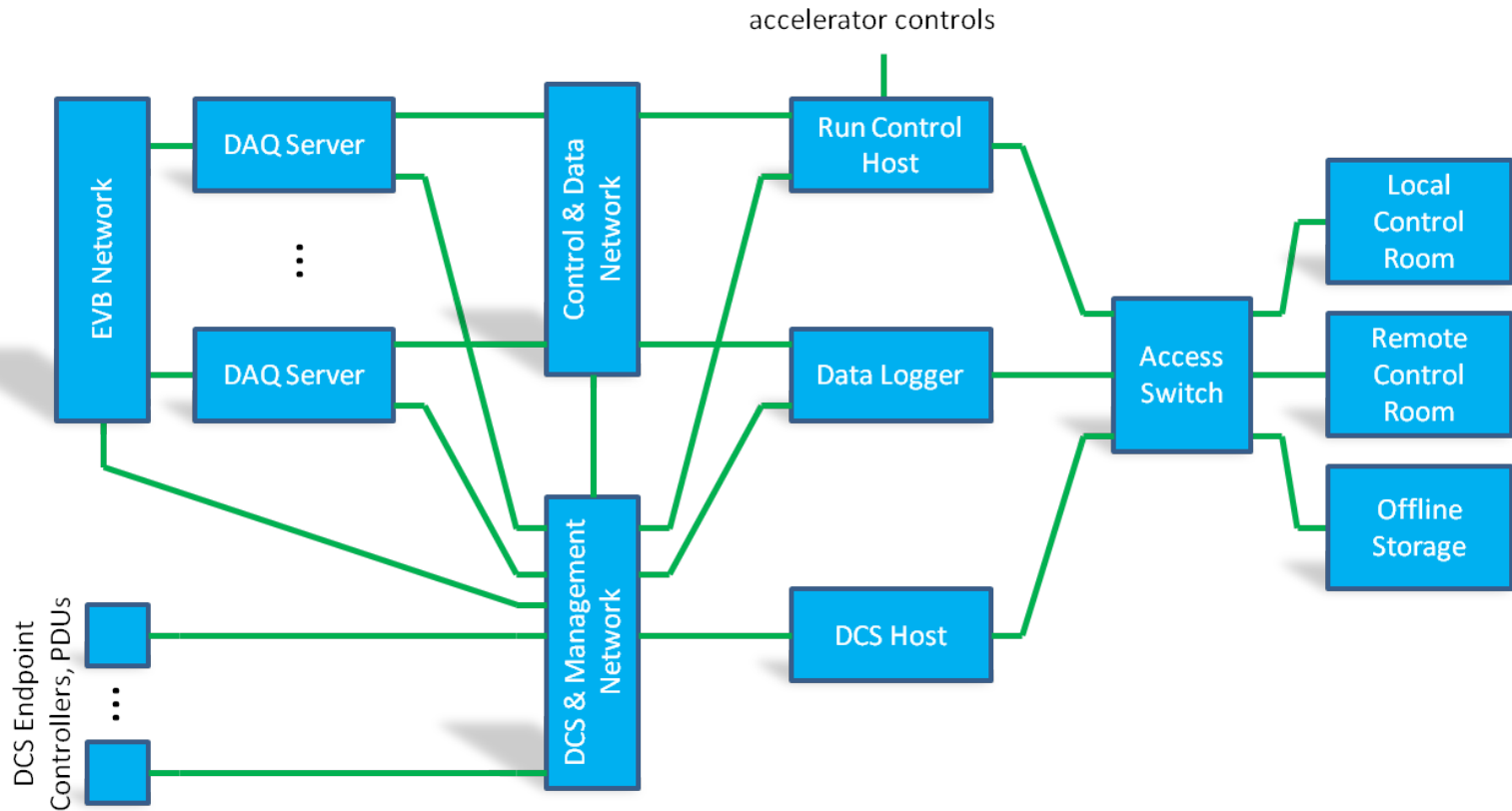
Design

Controls and Networking System (CN) Hardware



Design Cont.

Control and Networking System (CN) Detail



Design Cont.

Control System Studio (from NOvA DCS)

DCS - APD Temperature Monitor
 NDOS Detector Overview 2012/05/10 15:26:04

NDOS

		1	2	3	4	
Far end	T	1	2	3	4	1
	O	2	3	4	1	2
Bottom	P	3	4	1	2	3
	R	4	1	2	3	4

Commission DCMs: 01 02 03 04

Switch to the Far detector overview | **DCM status**: Reading is okay (green), In alarm (red), Not commissioned (grey), Not receiving data (purple) | Go back to DCS Startup and Configuration page | Geographical View

DCS - APD Temperature Monitor
 NDOS di-block 01 Overview 2012/05/10 15:26:04

Geographical View | Cooled APD, reading is okay | Missed APD readings in error

PV	Description	Alarm Time	Current Severity	Current Status	Alarm Severity	Alarm Status	Alarm Value
dcm-3-01-03_41_tecc	dcm-3-01-03:41_tecc	2012/05/10 10:56:19	MAJOR	HIHI_ALARM	MAJOR	HIHI_ALARM	13.02
dcm-3-01-03_42_dc	dcm-3-01-03:42_dc	2012/05/10 10:54:34	MAJOR	HIHI_ALARM	MAJOR	HIHI_ALARM	24.79
dcm-3-01-03_42_tecc	dcm-3-01-03:42_tecc	2012/05/10 10:56:19	MAJOR	HIHI_ALARM	MAJOR	HIHI_ALARM	-13.44
dcm-3-01-03_43_dc	dcm-3-01-03:43_dc	2012/05/10 10:54:34	MAJOR	HIHI_ALARM	MAJOR	HIHI_ALARM	96.73

Changes since CD-1

- CRV output rate change is increase of 7x data rate for bandwidth requirement to DAQ servers.

Performance

- 1G/10G Networking is off-the-shelf and meets bandwidth requirements.
- Mu2e DCS will be based on NOVA DCS which has similar expected channel count and data rate.

Remaining work before CD-3

- Pilot System
 - Operational slow control channel over optical links between DAQ Servers and prototype detector ROCs
 - ROC firmware download over slow control channel
 - ROC reset via CANbus
 - Single chassis DCS system control and monitoring
 - Interface software to connect the Run Control Host, DCS Host, and Data Logger to the remote control room and offline storage/processing

Organizational Breakdown

- L2 Manager – M. Bowden
- L3 Manager – R. Rivera
- Engineers/Application Developers – R. Rechenmacher, K. Biery, R. Kwarciany, G. Deuerling, M. Wang

Quality Assurance

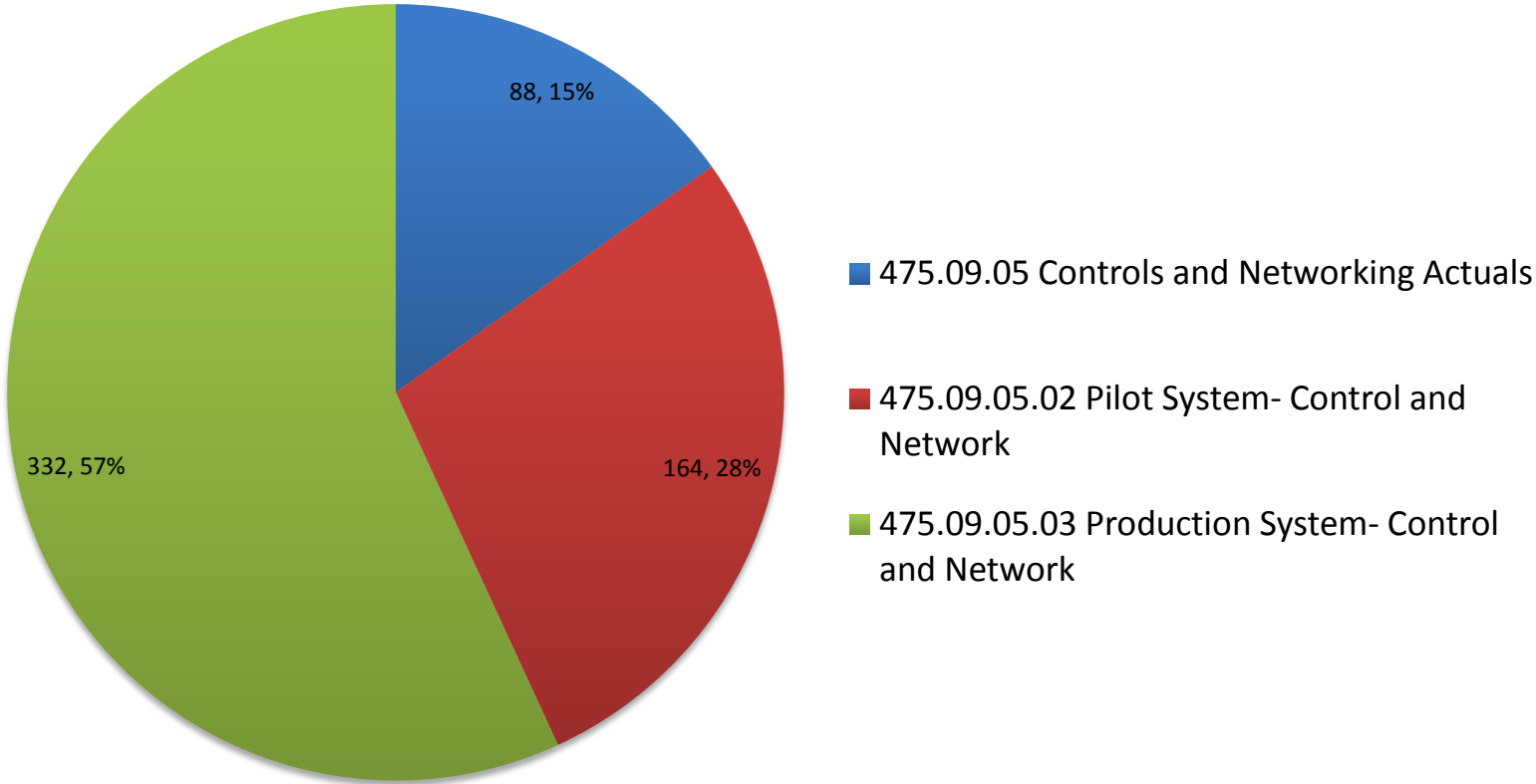
- Controls and Networking plans for 16 month period of optimization and debug at end of Production phase.
- Production phase completion date is 7/27/2018.

Risks

- Higher than expected data rates to the DAQ.
 - Risk Cause: Underestimate of particle flux and detector activity
 - Risk Effect: May require additional networking infrastructure

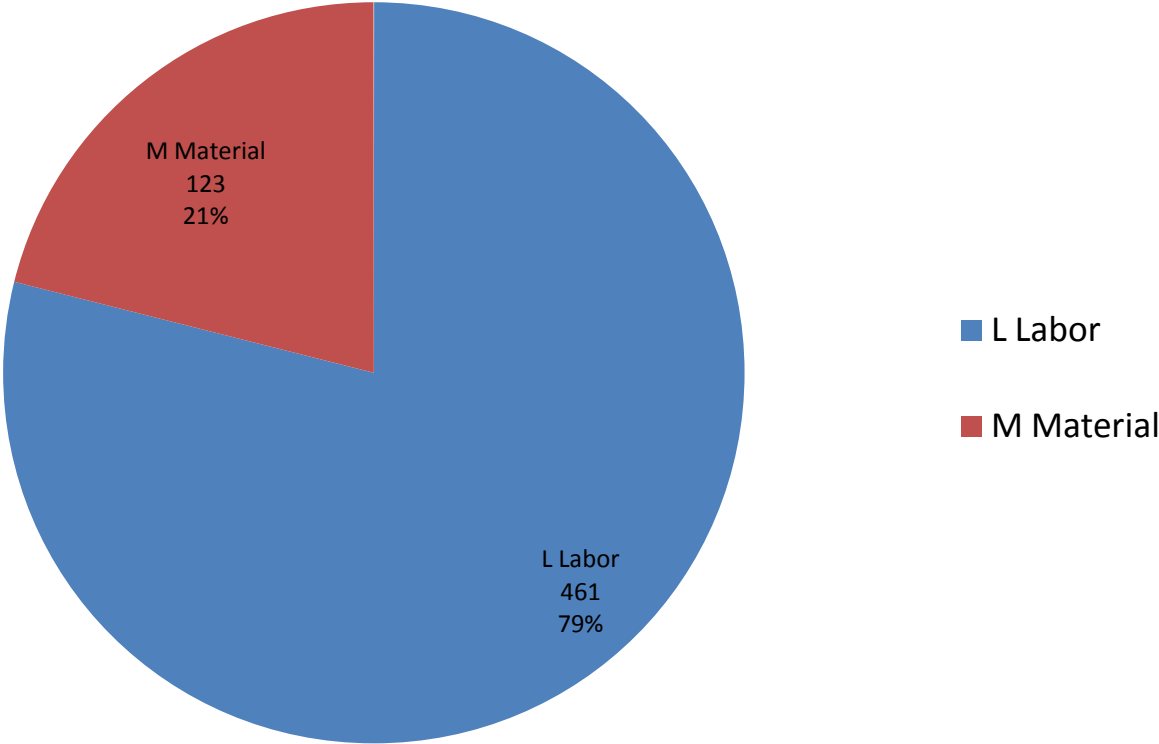
Cost Distribution by L4

Base Cost by L4 (AY \$k)



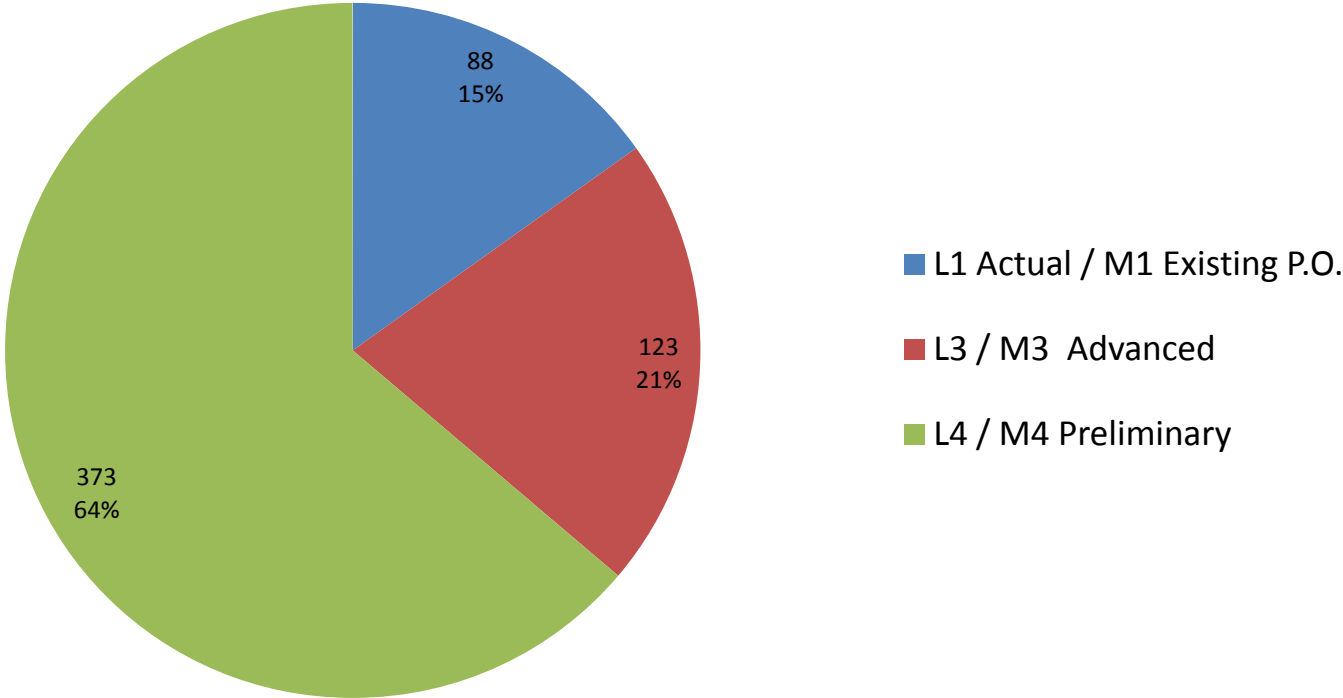
Cost Distribution by Resource Type

Base Cost (AY \$k)



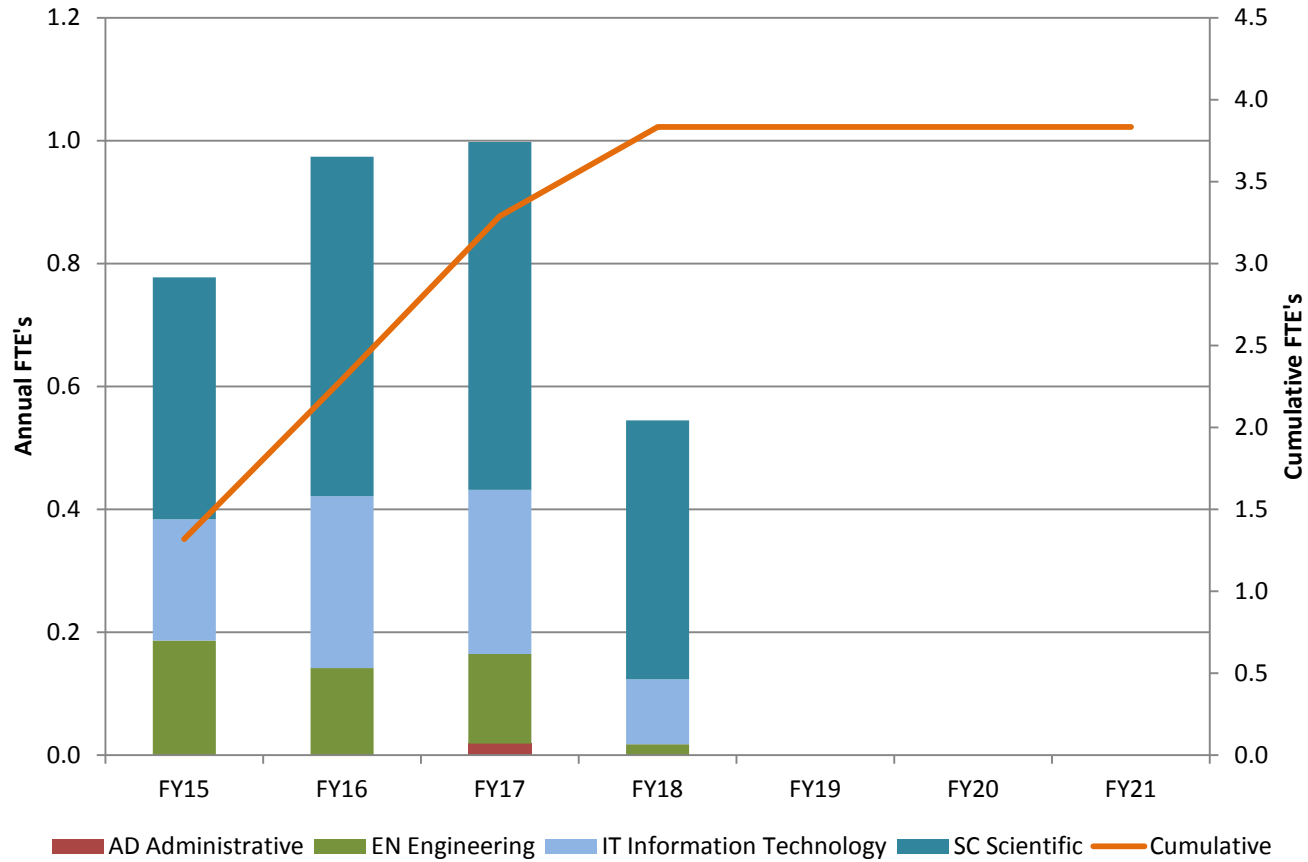
Quality of Estimate

Base Cost by Estimate Type (AY\$k)



Labor Resources

FTEs by Discipline



Cost Table

WBS 9.5 Controls and Networking

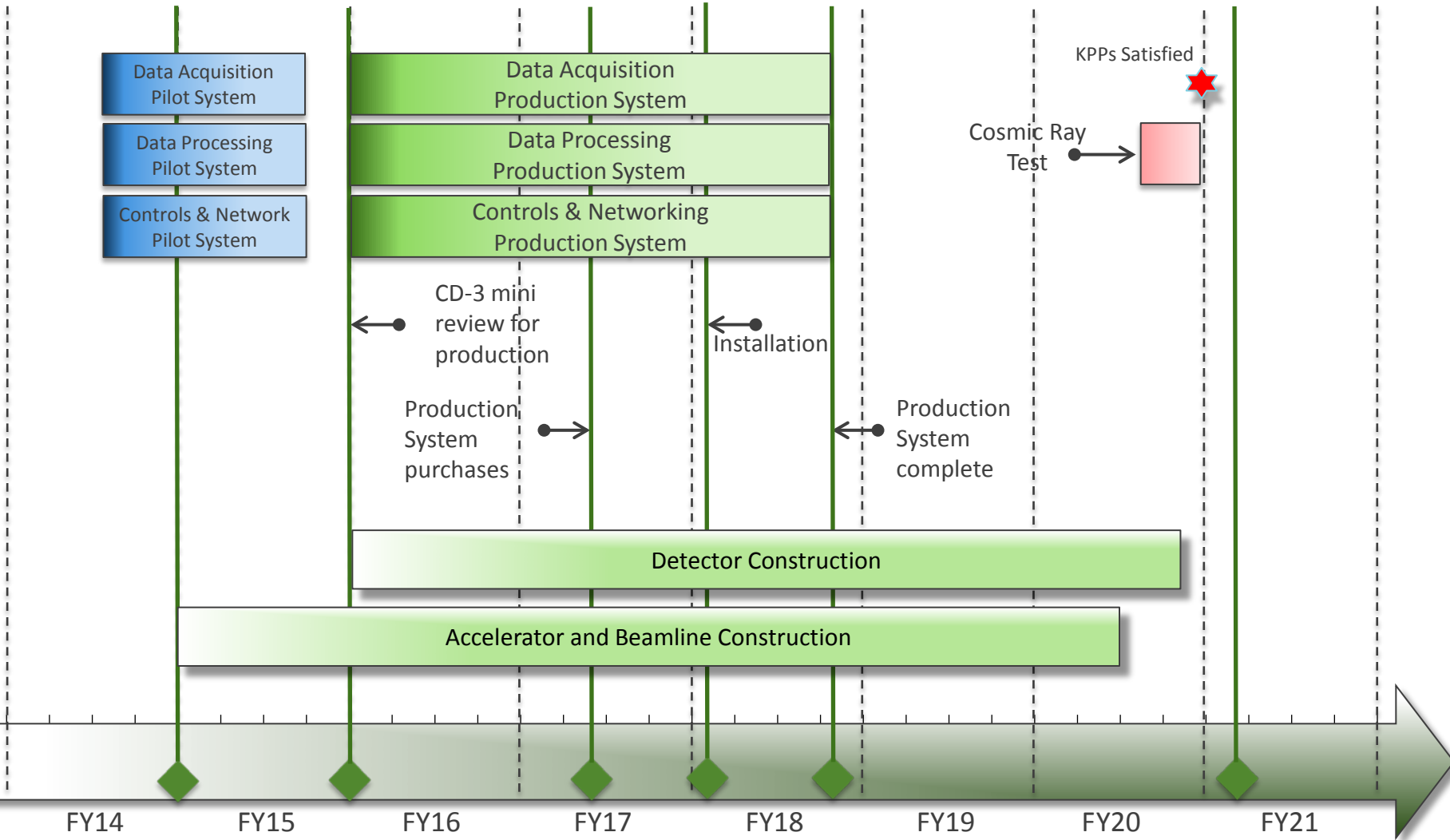
Costs are fully burdened in AY \$k

	M&S	Labor	BAC	Estimate Uncertainty	% contingency on ETC	Total
475.09 Trigger & DAQ						
475.09.05 Controls and Networking						
475.09.05 Controls and Networking Actuals		88	88			88
475.09.05.02 Pilot System- Controls and Networking	12	151	164	55	34%	219
475.09.05.03 Production System- Controls and Networking	111	222	332	100	30%	432
Grand Total	123	461	585	155	31%	740

Major Milestones

- Prototype System Complete (4/30/2014)
- Pilot System Complete (6/11/2015)
- Production System Complete (7/27/2018)

Schedule



Summary

- Controls and Networking is on pace and in position to proceed with Pilot System.