CD FY10 Budget and Tactical Plan Review

FY10 Tactical Plans for
Wide-Area Networking

Tactical plan name(s)	DocDB#
FY10 Tactical Plan for Wide Area Networking	**3354v1**

Phil DeMar

10/1/2009

FY10 Tactical Plan for *Networking/WAN*

- ## Tactical Plan Leader: Phil DeMar

Service Activity List

- WAN Services/Advanced WAN Infrastructure
- WAN Services/Routed Services
- WAN Services/Performance Analysis
- MAN Services/FNAL-funded
- MAN Services/ESnet-funded
- CMS Tier-1 Services/CMS-supported
- CMS Tier-1 Services/CD-supported

- Service Evolution/Network Investigations
- Service Evolution/Network Tools Development
- Service Evolution/Network Upgrades
- Management/Leadership/Global Network Interfaces
- Management/Leadership/ESCC Chair
- Management/Line Management

FY10 Tactical Plan for *Networking/WAN* (cont)

- Tactical Plan Leader: Phil DeMar

  Project Activity List
  - Networking/WAN/R&D/E-Center Project
  - Networking/WAN/R&D/ESCPS Project
  - Networking/WAN/R&D/Lambda Station FTWatch
  - Networking/WAN/R&D/Research

Service Activity: Off-Site IP Routed Services

- Description: General internet connectivity for the Laboratory

- Goals Related to this Activity [from Tactical Plan]
    - 1. Five 9s reliability in offsite IP connectivity   existing goal   high priority
    - 2. Minimal network perimeter congestion or discards   existing goal   high priority

- Key Metrics
    - Off-site bandwidth capacity & traffic utilization levels   measured by MRTG graphs
    - Site reachability from ESnet   measured by ESnet perfSONAR
    - System & link uptime of network perimeter devices   measured by NAGIOS monitoring

- Issues and Risks
    - Upgrade of MAN will reduce failover capabilities during transition period
    - Starting preliminary investigations into 100Gb/s-capable perimeter network devices

Service Activity: End-to-End Circuit Services

- Description: Support for end-to-end, alternate path data circuits for high impact data movement

- Goals Related to this Activity [from Tactical Plan]
  - 1. Highly reliable offsite circuit service w/failover   existing goal   high priority
  - 2. Minimal network perimeter congestion or discards   existing goal   high priority
  - 3. Four 9s reliability in LHCOPN data path   existing goal   high priority
  - 4. Expand perfSONAR monitoring to all US-CMS Tier2s   existing goal   medium priority
  - 5. 2 x 10GE LHCOPN service to CERN   new goal   low priority

- Key Metrics
  - Off-site bandwidth capacity & traffic utilization levels   measured by MRTG graphs
  - System uptime of network perimeter devices   measured by NAGIOS monitoring
  - % of end-to-end circuit outages with proper failover   measured by RoutePlotter
  - LHCOPN circuit reliability   measured by GEANT MDM
  - Number of end-to-end circuits supported
  - Number of perfSONAR-monitored US-CMS Tier2 sites

- Issues and Risks
  - Technical evolution of circuit services within R&E community is unclear
  - Support effort and technical complexity concerns with scaling service up to high number of sites

Service Activity: Wide-Area Performance Analysis Services

- Description: Analysis & optimization assistance for data movement into and out of the site

- Goals Related to this Activity [from Tactical Plan]
  - 1. Assist achievement of optimal wide area performance   existing goal   medium priority
  - 2. Performance analysis content management system   new goal   low priority

- Key Metrics
  - Quantified performance improvements for stakeholders

- Milestones:
  - Implementation of a content management system for   existing goal   target: 06/10
    analysis data & results

- Issues and Risks
  - Desire to tie this into perfSONAR-based data collection (long term vision)
  - E-Center project likely to include referrals to service

Service Activity: MAN Services

- Description: Support and joint operation (with ANL) of the Chicago area Metropolitan Area Network (MAN)

- Goals Related to this Activity [from Tactical Plan]
  - 1. Four 9s reliability in MAN channels   existing goal   high priority
  - 2. Full physical redundancy in MAN infrastructure   existing goal   high priority
  - 3. Additional 10GE MAN channel (FNAL-ANL)   existing goal   high priority

- Key Metrics
  - MAN channel uptime   measured by NAGIOS monitoring
  - Ciena hub uptime   measured by NAGIOS monitoring

- Milestones
  - Installation of 2nd Ciena Hub   targeted completion 12/31/09
  - 10GE testbed channel between FNAL & ANL   targeted completion 1/31/10

- Issues and Risks
  - Some possibility of MAN forklift upgrade as part of ESnet 100GE network upgrade
  - "Slight" opportunity for 100GE extension of ESnet 100GE testbed to FNAL in FY10/11
    - But do need to be planning how we would support & use such a service

# Service Activity: CMS Tier-1 Network Services

- Description: Design & operation of the network infrastructure for the CMS Tier-1 Center

- Goals Related to this Activity [from Tactical Plan]
    - 1. Complete transition to new network configuration   existing goal   high priority
    - 2. Minimal internal LAN congestion points   existing goal   high priority
    - 3. Congestion-free off-site data paths   existing goal   high priority
    - 2. Full logical redundancy in Tier-1 network infrastructure   existing goal   high priority

- Key Metrics
    - Internal LAN bandwidth capacity & traffic utilization levels   measured by MRTG graphs
    - Off-site link capacity & traffic utilization levels   measured by MRTG graphs
    - System & link uptime of network perimeter devices   measured by NAGIOS monitoring

- Milestones
    - Direct server attachment to core Nexus switches   targeted completion 4/1/10
    - Expand 10GE port capacity on Nexus switches   targeted completion 7/1/10

- Issues and Risks
    - Actual CMS data movement rates will not be known until LHC starts sustained operations
    - Capacity needs within CMS Tier-1 LAN already pushing 80Gb/s
        - But 100GE technology is still 1-2 years off, and will be very costly initially

Project Activity: E-Center Project

- Description: Official project name is Network Weather Service & Performance E-Center. Project objective is to gather relevant network path monitoring & measurement data with perfSONAR, and present it to users in a coherent & understandable manner.

- Goals Related to this Activity
  - 1. Develop E-Center Project Plan   new goal   high priority
  - 2. Functional E-Center Year-1 prototype   new goal   high priority

- Key Milestones
  - Specifications & roadmap for development of prototype   12/01/09
  - Functional E-Center prototype with most major components   9/30/10

- Project Documentation: E-Center project web site still in planning stages

- Issues and Risks:
  1. E-Center is a joint projects with Esnet & Bucknell, including all complications that entails
     - Strong tie-in's with other newly funded DOE/SC/ASCR projects
  2. E-Center offers future R&D opportunities for advanced performance analysis capabilities
  3. Pursuing additional funding for site perfSONAR deployment in conjunction with E-Center

Project Activity: ESCPS Project

Federated Control Plane for Dynamic Circuits

- Description: Official project name is End Site Control Plane System. Project objective is to provide end site network control plane services for establishment and operation of dynamic end-to-end circuits.
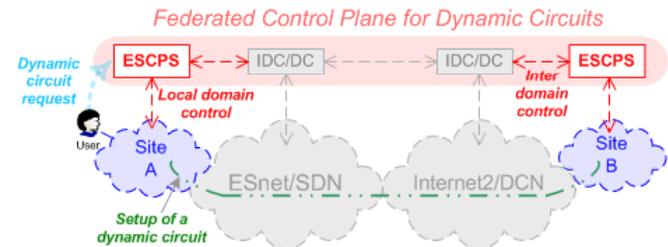
- Goals Related to this Activity
  - 1. Develop ESCPS Project Plan   new goal   high priority
  - 2. Functional ESCPS Year-1 prototype   new goal   high priority

- Key Milestones
  - Specifications & roadmap for development of prototype   12/01/09
  - Functional ESCPS prototype with most major components   9/30/10

- Project Documentation: ESCPS project web site still in planning stages

- Issues and Risks:
  1. ESCPS is a joint project with BNL & Univ. of Delaware, with all complications that entails
  2. Intended to supersede Lambda Station, and related BNL/U-Del circuit support projects

Ripple Effect on Shared IT Services
(What new requirements does your service have for other services)

Activity Level 2	Network Connectivity: Expanded Service	<--	Network-Attached Storage: Add Space	<--
CMS/Tier-1 Services/CD-supported	Addtl bandwidth into Enstore	NTS		
MAN Services/FNAL-funded	Addtl fiber for 2nd MAN hub	ATP		
Service Evolution/Network Tools Development			5 TB	NMS

- **CMS bandwidth into/out of Enstore:**
  - Upgraded to 20Gb/s path across core network in FY09
  - May need to increase path to 30Gb/s in FY10

CMS Tier-1 Traffic into/out of general site network (mostly Enstore data movement)

- **2nd MAN hub will require fiber path between WH & GCC via LCC**
  - For CMS Tier-1 redundancy in general, a high fiber count path between GCC & FCC via LCC-WH is highly desirable

- **Additional network storage budget line item is over-budgeted**
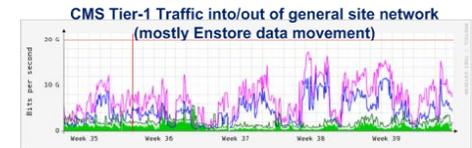
FY10 FTE and M&S: Request vs. Allocation

Level 0/1 Activity: *Networking/WAN*

Activity Level 2	Project/ Service	Project Priority	FY10 FTE Request	FY10 M&S Request	FY10 FTE Allocation	FY10 M&S Allocation
WAN Services / Advanced WAN Infrastructure	Service	High	0.40	$10,400		
WAN Services / Routed Services	Service	High	0.40	$36,900		
WAN Services / Performance Analysis	Service	Medium	0.40	$3,000		
CMS Tier-1 Services / CMS-supported	Service	High	0.50			
CMS Tier-1 Services / CD-supported	Service	High	0.15			
MAN Services / FNAL	Service	High	0.25	$101,200		
MAN Services / Esnet	Service	High	0.25	$58,000		
Management / Leadership / Global Network Interface	Service	Medium	0.10	$10,900		
Management / Leadership / ESCC Chair	Service	High	0.25	$13,000		
Management / Line Management	Service	High	0.10	$3,000		
Service Evolution / Network Investigation	Service	Medium	0.40	$17,000		
Service Evolution / Network Tools Development	Service	Medium	0.40	$40,400		
Service Evolution / Network Upgrades	Service	Medium	0.30	$214,000		
R & D / Network Research	Project	Low	0.45	$11,000		
R & D / E-Center Project	Project	High	1.75	$16,000		
R & D / ESC PS Project	Project	High	1.10	$6,000		
R & D / Lambda Station FTWatch	Project	Medium	0.30			
Total			7.5	$540,800	0	0

essential

important

more discretionary

Project 55

External funding

FY10 FTE and M&S: Discussion

- 3 projects with late FY09 procurement, leading to FY10 deployment:
  - 2nd Ciena hub for off-site network (MAN) physical diversity
    - Planning post-Super Computing installation
  - GridWorks network split into production-quality & disrupt-able segments
  - Circuit router chassis upgrade
- Noteworthy M&S line items:
  - MAN services M&S ($150k) is nearly all MAN fiber lease & co-lo costs
  - Next-generation border router ($120k) looking toward richer routing technology capabilities & 100GE-capable platform
  - New border router supervisor ($25k) to keep ahead on performance
  - New Flow Collector system ($20k) for NetFlow V9 & IPv6 capabilities
- New R&D projects based on one new hire early in FY & another halfway thru:
  - Both are joint projects; major obligation on our part to do work…

Summary of Past Action Items

- Location of 2nd offsite network (MAN) hub
  - Description: Determine whether location of 2nd Ciena hub should be in WH or GCC.
  - State: Still open. Project has been delayed by late procurement. Tentatively planning a post-SC installation. Quality fiber path between WH & LCC along beam line needed for using GCC.

Tactical Plan Summary

- New activity tree for FY10

- Tactical plan under common Networking Strategic Plan

- Services consistent with service offerings in FY09
  - Metrics and performance targets also consistent with FY09

- Several FY09 equipment upgrades to be deployed in FY10
  - Implementation of 2nd MAN hub is the most significant one

- Initiating two new R&D projects in FY10
  - Transitioning staff to project support will take time
  - One term FTE needed to get kick-start projects
    - Personal requisition in being drafted
  - 2nd one likely needed by next spring

- M&S expenditures in line with FY09 request
 - Includes a number of unfunded FY09 line items

WAN Group Activity / Effort Matrix

ActivityName-FY08	Andrey	Mark	Max	Phil	Vyto	Wenji	New Hire #1	New Hire #2	total FTE years	total FTE months
WAN Services / Advanced WAN Infrastructure	0.05		0.1	0.05	0.2				0.4	4.8
WAN Services / Routed Services	0.05	0.1		0.05	0.2				0.4	4.8
WAN Services / Performance Analysis		0.15	0.05	0.05		0.15			0.4	4.8
CMS Tier-1 Services / CMS-supported	0.35				0.15				0.5	6.0
CMS Tier-1 Services / CD-supported		0.1		0.05					0.15	1.8
MAN Services / FNAL		0.15		0.05	0.05				0.25	3.0
MAN Services / Esnet		0.05		0.05	0.15				0.25	3.0
Leadership / Global Network Interfaces				0.1					0.1	1.2
Leadership / ESCC Chair				0.25					0.25	3.0
Management / Infrastructure									0	0.0
Management / Line Management				0.1					0.1	1.2
Service Evolution / Network Investigation		0.1	0.1		0.1	0.1			0.4	4.8
Service Evolution / Network Tools Development	0.2	0.1	0.1						0.4	4.8
Service Evolution / Network Upgrades		0.15			0.15				0.3	3.6
R & D / Network Research		0.1		0.05		0.3			0.45	5.4
R & D / E-Center Project			0.65	0.1		0.25	0.5	0.25	1.75	21.0
R & D / ESC PS Project	0.25			0.1			0.5	0.25	1.1	13.2
R & D / Lambda Station FTWatch	0.1			0	0.2				0.3	3.6
Total:	1	1	1	1	1	1	1	0.5	7.5	90.0

External funding
Project 55 funding

CMS Tier-1 Facility – Upgraded Network Support

- **Current state of deployment**
  - Now based on higher performance Nexus 7000 switches
  - Still 2 core devices, but now split between FCC & GCC
  - Up to 8x10GE switch interconnect

- **FY10 plans:**
  - 2 x bandwidth to off-site circuits
  - Migrate some servers to direct attachment to Nexus
  - Support initial 10GE host connections
  - Start looking into 100GE for inter-Nexus connection

US CMS Tier1 Netwo   0
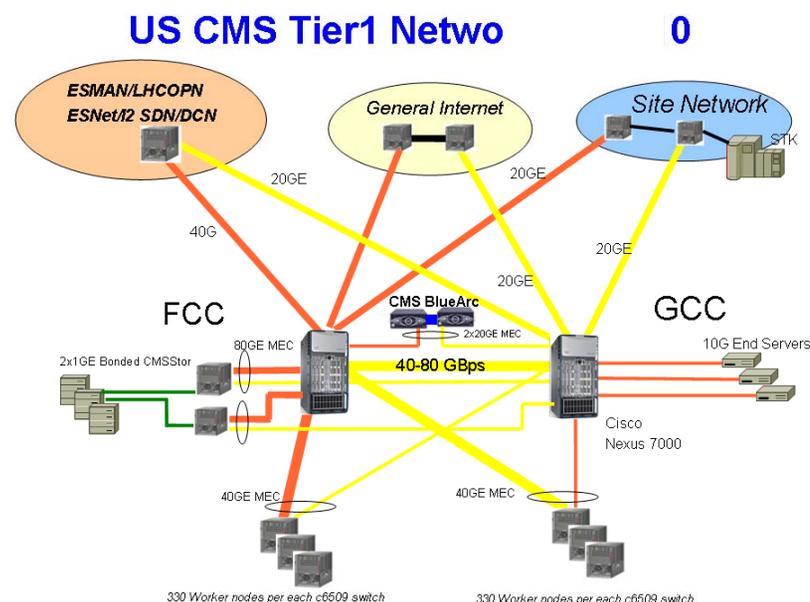
Projects Carrying Over from FY09

- **FY10 MAN upgrade plans:**
  - 2nd MAN hub will provide location diversity for Lab's off-site network infrastructure
  - Installation in conjunction with similar dual hub upgrade at ANL
    - Adding 10GE channel to ANL

Chicago Area MAN

- **FY10 GridWorks configuration:**
  - Partition into stable and disruptive (R&D) LAN segments
    - Completion target 12/01/09
  - Desire to replace the R&D switch with a more flexible platform