



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 analysis data & results	existing goal	target: 06/10
---	---------------	---------------

- 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

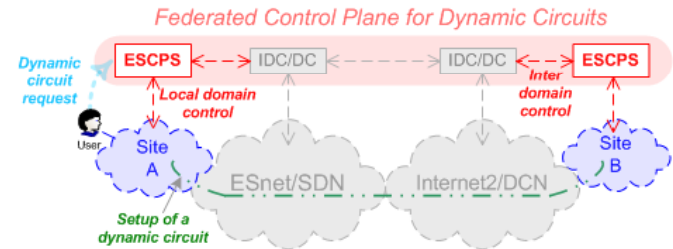
– Specifications & roadmap for development of prototype	12/01/09
– Functional E-Center prototype with most major components	9/30/10

- 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

- 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:

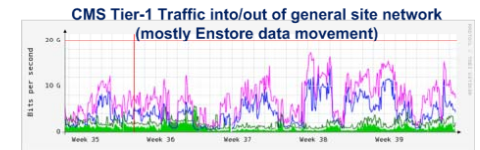
1. ESCPS is a joint project with BNL & Univ. of Delaware, with all complications that entails
2. Intended to supersede Lambda Station, and related BNL/U-Del circuit support projects

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
- 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
essential important more discretionary	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 Interfac	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	1.25	\$16,000	
	R & D / ESC PS Project	Project	High	0.60	\$6,000	
	R & D / Lambda Station FTWatch	Project	Medium	0.30		
	Total			6.5	\$540,800	0

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

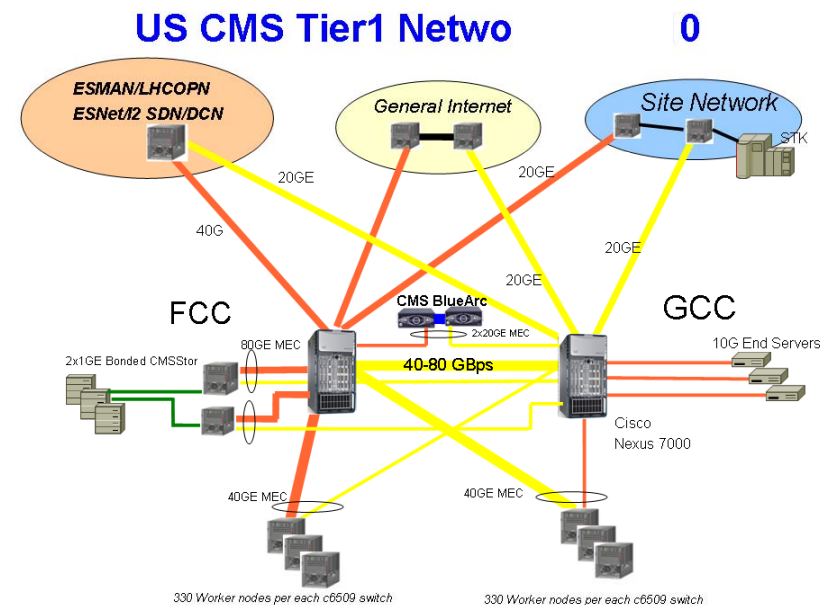
WAN Group Activity / Effort Matrix

ActivityName-FY08	Andrey	Mark	Max	Phil	Vyto	Wenji	New Hire #1	New Hire #2	total FTE <u>years</u>	total FTE <u>months</u>
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



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
- 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

Chicago Area MAN

