



# **CD/SCF/DMS/WAN Design Note**

## **USCMS Tier1 Facility Network**

### **Current status and FY10 Upgrade Plan**

#### *Abstract*

FY10 is the second year of a two years upgrade plan for the USCMS Tier1 network. This document provides a brief update on current status and major upgrade steps planned for this year.

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### FY10 Upgrade Summary

To comply with requirements for high density 10GE aggregation and constantly growing demands for high bandwidth, the USCMS Tier1 Network is being migrated to an architecture based on a new hardware platform, the Cisco Systems Inc. Nexus 7000 data center switch. The Nexus 7000 is the first product of the third generation of data center class switches that became available for purchase at the middle of FY09. Due to budget constraints it was planned to complete migration to the new platform within two years. The complete upgrade plan has been described in the document "CD/SCF/DMS/WANNR Design Note, USCMS Tier1 Network, Current status and FY09-11 Upgrade roadmap, 02/23/2009".

Migration to the new platform started in April 2009 and continued throughout summer while at the same time providing non-disruptive service and maintaining sufficient bandwidth for the production CMS computing farms as well as supporting deployment of new servers. In August 2009 all major architectural changes were completed as planned.

FY10 is designated for incremental additions of 10GE modules to reach an adequate quantity of non-blocking 10GE ports at the USCMS Network core. The Nexus 7000 family of products is rapidly growing. We anticipate, based on discussion with the vendor, that the same hardware modules, but with richer features and capabilities, will become available later in the 2010 calendar year. That is why, the FY10 purchase cycle is divided into two phases. During its first phase in November 2009 - January 2010 the number of non-blocking 10GE ports needs to be increased to correspond to the current bandwidth requirements. It is very important to finish this upgrade during the scheduled LHC shutdown season or, at least, during its initial startup period in CY2010. The second phase is planned for May-July 2010. It has more flexibility for adjustments to the LHC operational schedule when it becomes published.

Upgrade of the USCMS Tier Network described in this document does not impose any additional requirements on any other network segments at Fermilab. Neither does it require any changes in current operational model.

## Current Status

The topology of USCMS Tier1 Facility Network, as of November 2009, is presented in figure 1.

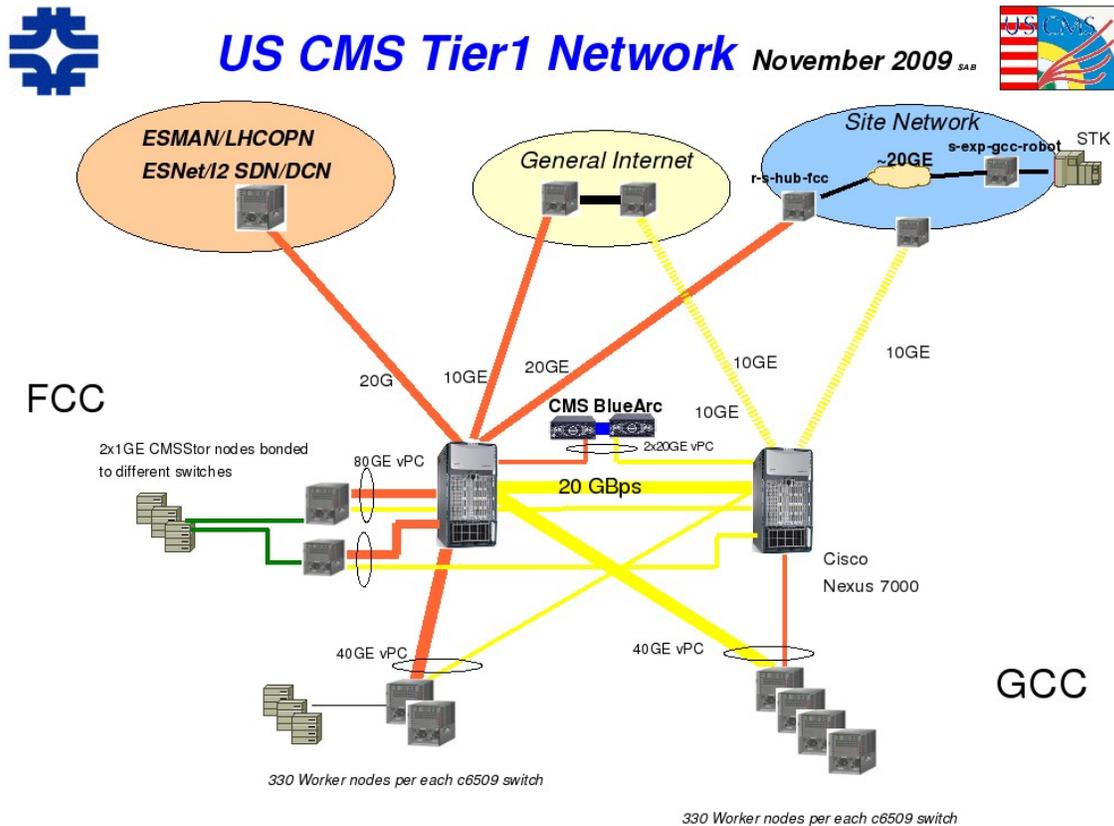


Figure 1: The USCMS T1 Network as of November 2009

A brief summary of current topology is outlined below:

- Two 10GE aggregation hubs based on Cisco Nexus 7000 switches
- The access layer connecting approximately 1700 end systems is based on Cisco C6509 switches that are linked with both aggregation hubs via new vPC (virtual port channel) technology. It provide very efficient load balancing of traffic across all links and approximately 50ms fail over time in case of failing links.
- Each remote 6509 switch is connected at higher bandwidth to the N7K hub in FCC to use its switching fabric rather than inter-switch link.

- C6509s located in FCC connect mostly CMSSTOR nodes that are required to provision more bandwidth. That is why these switches are connected at 80Gbps to the aggregation layer with a bandwidth distribution of 60Gbps to N7K-FCC and 20Gbp to N7K-GCC
- C6509s located in GCC computing rooms are mostly used to connect worker nodes with a bandwidth distribution of 30Gbps to N7K-FCC and 10Gbps to N7K-GCC.

The Table 1 below provides numbers of non-blocking 10GE ports needed now, currently available based on FY09 budget and planned to have when purchase CD111022 is completed.

Table 1: The need for non-blocking 10GE ports

	Required number of non-blocking 10GE ports	Currently purchased	CD111022 planned
r-cms-hub-fcc(N7K-FCC)	41	24	40
r-cms-hub-gcc(N7K-GCC)	12	8	16

The following table gives numbers of 10GE non-blocking ports as it is planned to have by May -July 2010.

	Required number of 10GE non-blocking	Planned to have
r-cms-hub-fcc (N7K-FCC)	60	64
r-cms-hub-gcc (N7-GCC)	40	40

## Timeline of FY10 upgrade.

Timeline of major upgrade steps in FY10 is outlined below. Two major factors that might affect projected timeline are purchasing delay, both internal and external, and the LHC operational schedule.

Nov 2009 - Jan 2010	February 2010 - May 2010	June - August 2010	August -September 2010
QoS, N7K-based Routing Core	CD111022 HW/SW, evaluate non-Cisco optics, 80GE for selected C6509 in GCC	New 10GE HW, increase BW between N7K-FCC and N7K-GCC	Migrate CMSSTOR nodes to new HW

## Related documents

1. FY2010 Computing Division Strategic Plan, 3510-v1, 3507-v2
2. FY10 Wide-Area Networking Tactical Plan Review, 3455-v4
3. FY10 USCMS Grid Service tactical Plan, 3309-v1
4. FY10 Strategic Plan for LHC, 3298-v1
5. CD/SCF/DMS/WANNR Design Note, USCMS Tier Facility Network, Current Status and FY09-11 Upgrade Roadmap