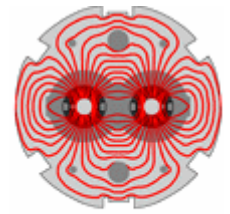


# LHC Remote Operations Center

**Erik Gottschalk**  
**Fermilab**



# Introduction



We have plans for a joint CMS & LHC remote operations center. **LARP**

## Current status:

- ROC is ready for operations
- LHC@FNAL conceptual design is completed & funded for FY06

We are looking for feedback and help:

- What functionality and physical aspects are important to you?
- What are the needs of individual subdetector groups?
- How will remote shift activities be organized?

Send feedback to [alstone@fnal.gov](mailto:alstone@fnal.gov), [erik@fnal.gov](mailto:erik@fnal.gov), [maeshima@fnal.gov](mailto:maeshima@fnal.gov), [mcbride@fnal.gov](mailto:mcbride@fnal.gov) or join us at the ROC meeting Tuesday's at 4:00.

Additional information is available:

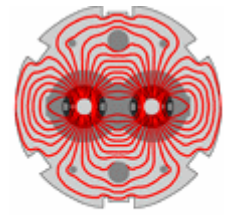
[http://www.uscms.org/LPC/lpc\\_roc](http://www.uscms.org/LPC/lpc_roc) (ROC web page)

<http://cd-amr.fnal.gov/remop/remop.html> (LHC@FNAL web page)

<http://twiki.cern.ch/twiki/bin/view/CMS/LHCatFNAL> (LHC@FNAL wiki)



# Overview

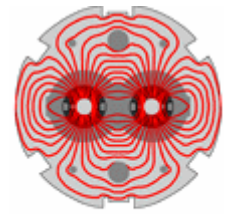


*LARP*

- **CMS and LHC control rooms at CERN**
- **Remote operation of CMS**
- **Plans for ROC & LHC@FNAL**
- **3D model of LHC@FNAL**
- **Summary**



# Control Rooms at CERN



*LARP*

- Temporary **CMS** control room for the Magnet Test Cosmic Challenge (MTCC) – “green barrack”
- **CMS** control room at Point 5
  - Under construction
- **CMS** Control & Analysis Room (CCAR)
  - Future remote operations (and control) center at Meyrin
  - Described as the “heartbeat” of CMS at CERN
- New **LHC** control room – **CERN Control Centre**

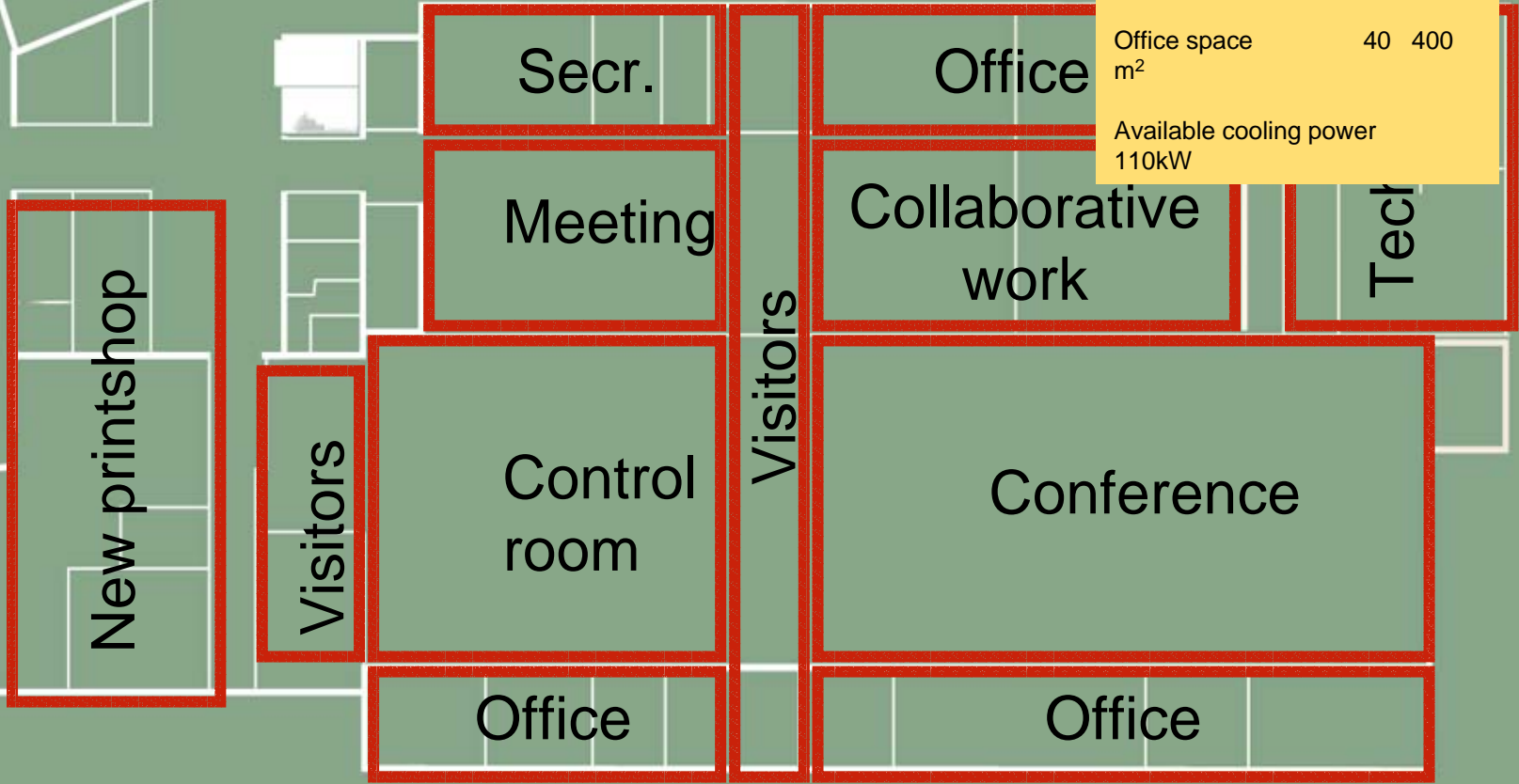
The CCC combines all of the control rooms for the accelerators, cryogenic systems and technical infrastructure into one room. The CCC began operations on February 1<sup>st</sup>, 2006.



# CCAR (possible) layout

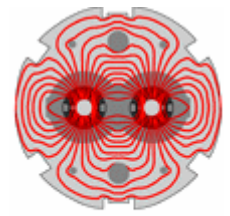
Towards  
Main  
Building

Space breakdown		
Control room	1	150 m <sup>2</sup>
Conference room	1	300 m <sup>2</sup>
Meeting/VRVS room	1	70 m <sup>2</sup>
Technical room	1	80 m <sup>2</sup>
Group work room	1	140 m <sup>2</sup>
Office space	40	400 m <sup>2</sup>
Available cooling power 110kW		

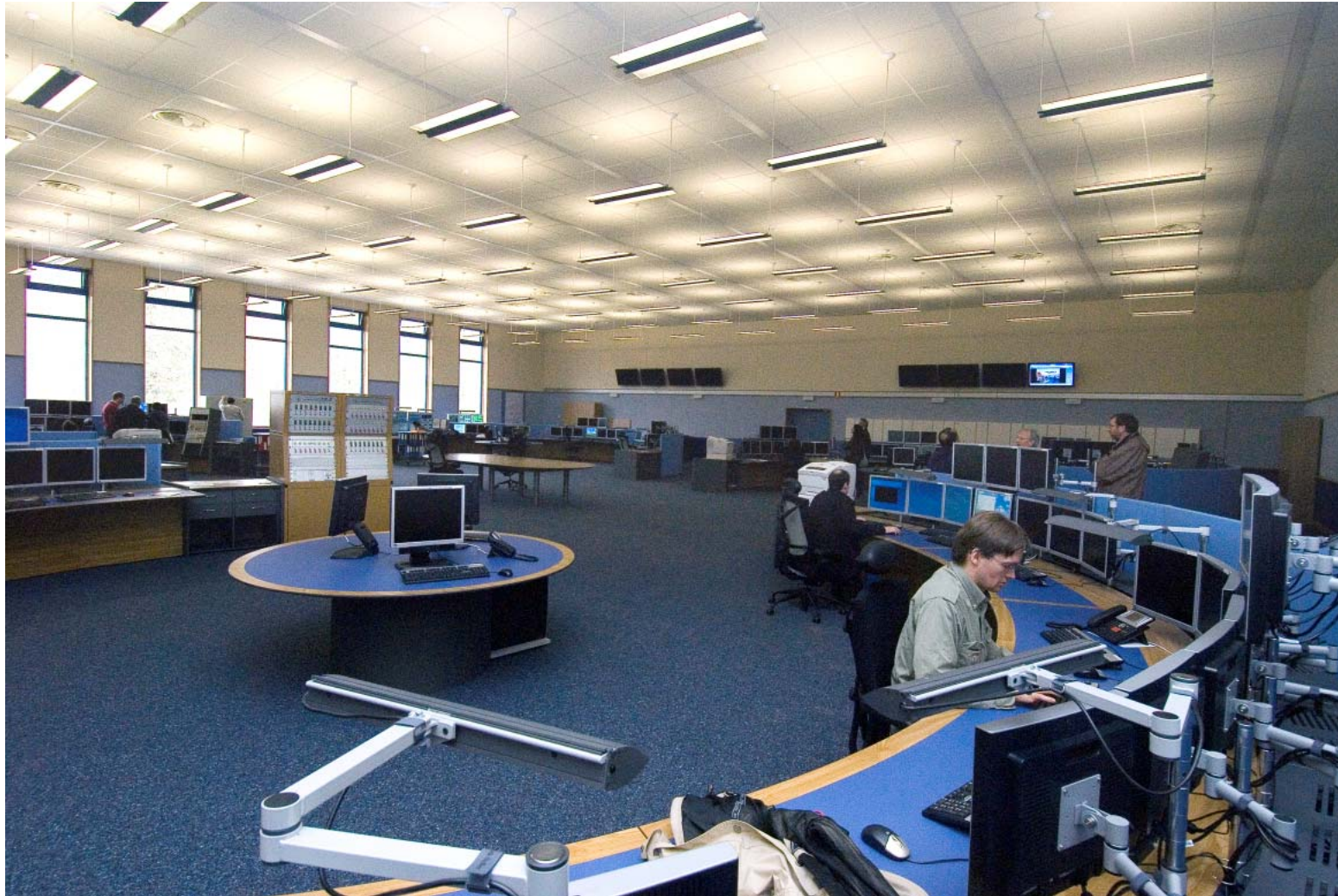




# CERN Control Centre (CCC)

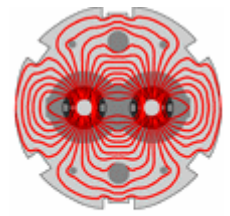


*LARP*





# Remote Operation of CMS



*LARP*

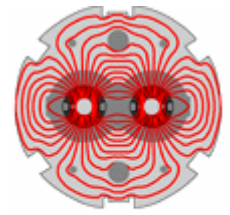
- How will CMS operate?
- This was discussed during CPT Week at CERN, Jan.-Feb. 2006.

Friday 03 February 2006

<b>CCAR Meeting</b> (2006-02-03 08:30->12:30)		<b>Chairperson:</b> Paris Sphicas
		<b>Room:</b> <a href="#">40-S2-A01</a>
08:30	Introduction (15) ( <a href="#">transparencies</a> )	Paris
08:45	Current plans for CCAR (25) ( <a href="#">more information</a> )	Hans Hoffmann
09:10	Infrastructure for CCAR (30) ( <a href="#">more information</a> )	Werner Jank
09:40	VRVS: status and future (15) ( <a href="#">more information</a> )	Philip Galvez
09:55	Monitoring: Monalisa (15) ( <a href="#">transparencies</a> )	<a href="#">Iosif Legrand</a>
10:10	Break	
10:40	Experience from CDF II Detector Operations (20) ( <a href="#">more information</a> )	Jeff Spalding
11:00	CDF Offline Operations (20) ( <a href="#">transparencies</a> )	Rob Harris
11:20	Babar offline operations (20) ( <a href="#">transparencies</a> )	Peter Elmer
11:40	FNAL Remote Control Room (20) ( <a href="#">more information</a> )	Kaori Maeshima



# Remote Operation of CMS



*LARP*

Why does CMS need remote operations at CERN?

- SX5 is ~13 km from Meyrin
- SX5 lacks “infrastructure” available at Meyrin
- CMS control room, currently under construction, is “tiny”
- CMS control room has a low ceiling
- SX5 does not have large and small meeting rooms that are necessary for daily/weekly meetings and expert space

Paris Sphicas:

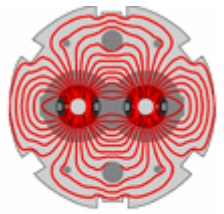
*Asymptotically, at sufficiently long times after startup, we will run CMS remotely*

- This is not a question of whether this will happen – it’s a question of when.





# Remote Operations in the U.S.

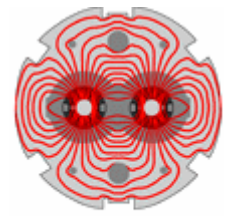


*LARP*

- The ROC (WH-11) is ready for operations!
  - Kaori Maeshima, Alan Stone & others
- Planning for remote operations for CMS commissioning and operations, and LHC beam commissioning and operations
- Transition from the 11<sup>th</sup> floor to the 1<sup>st</sup> floor of Wilson Hall (LHC@FNAL) by Spring 2007
  - More visibility for CMS
  - Joint effort for CMS & LARP (LHC Accelerator Research Program)
  - Combine commissioning & operations efforts



# ROC (WH-11)



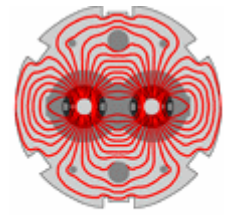
**LARP**



[http://www.uscms.org/LPC/lpc\\_roc](http://www.uscms.org/LPC/lpc_roc)



# LHC@FNAL (WH-1)

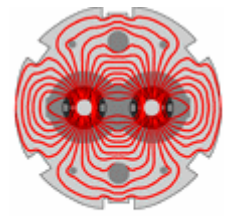


*LARP*

- 1) Dedicated facility to support both CMS and LHC commissioning and operations.
  - Remote shifts for CMS
- 2) Facilitate communication with CMS and LHC control rooms.
  - Call center for US-CMS collaborators to access information about CMS and the LHC accelerator.
  - Introduce collaboration tools to improve communication
- 3) Take advantage of a unique opportunity to have detector and accelerator experts working together to solve problems.



# LHC@FNAL Task Force



*LARP*

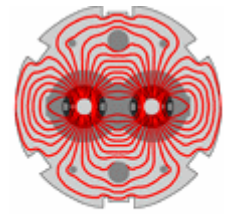
- Erik Gottschalk – Chair (FNAL-PPD)
  - Kurt Biery (FNAL-CD)
  - Suzanne Gysin\* (FNAL-CD)
  - Elvin Harms\* (FNAL-AD)
  - Shuichi Kunori (U. of Maryland)
  - Mike Lamm\* (FNAL-TD)
  - Mike Lamont\* (CERN-AB)
  - Kaori Maeshima (FNAL-PPD)
  - Patty McBride (FNAL-CD)
  - Elliott McCrory\* (FNAL-AD)
  - Andris Skuja (U. of Maryland)
  - Jean Slaughter\* (FNAL-AD)
  - Al Thomas (FNAL-CD)
- ✓ Task force was charged by the Fermilab Director in April, 2005.
  - ✓ Task force wrote a requirements document and WBS.
  - ✓ Work completed in March, 2006.

\* Accelerator Subgroup

The LHC@FNAL task force had its last meeting on March 29, 2006.



# Planning for LHC@FNAL

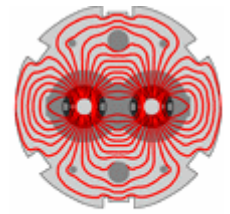


**LARP**

- The LHC@FNAL task force developed a plan with CMS collaborators. Most of our input came from CMS HCAL and tracker groups, with some input from CDF, D0, MINOS, and MiniBoone.
- We worked with CMS and US-CMS management, as well as members of LARP (LHC Accelerator Research Program) and LARP management at all steps in the process.
- A requirements document for LHC@FNAL was prepared and reviewed last summer.
- We visited 9 sites (e.g. Hubble, NIF, ESOC) to find out how other projects do remote operations.
- The goal is to have LHC@FNAL ready before the start of beam (end of 2006).



# ROC & LHC@FNAL Timetable

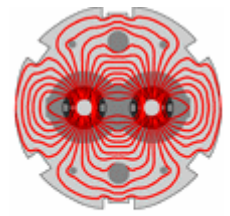


**LARP**

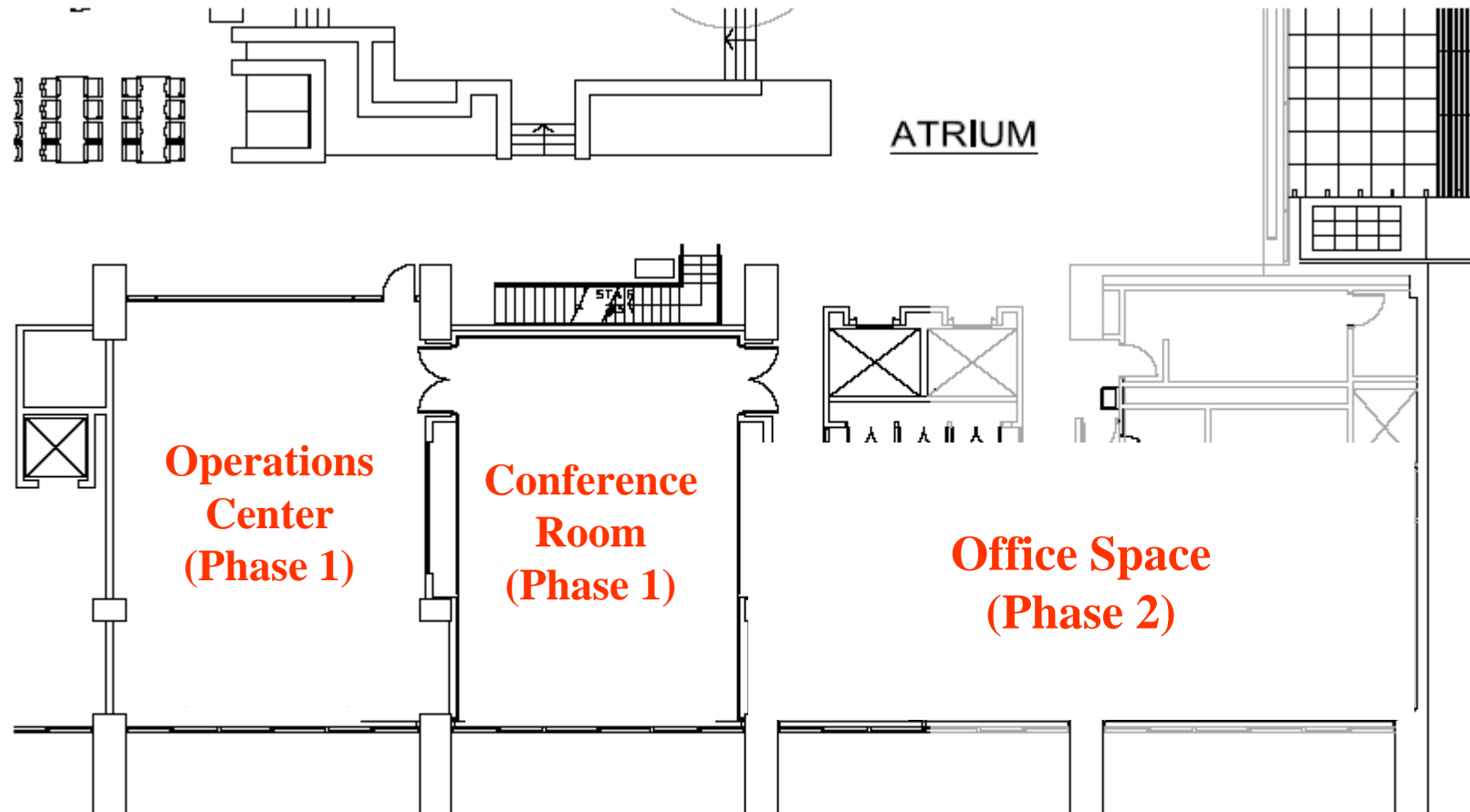
- ROC renovation started – June 2005
- LHC@FNAL Requirements Review – July 2005
- Preliminary requirements document completed – July 2005
- ROC renovation completed – September 2005
- LHC@FNAL plan developed – Fall 2005
- WBS presented to FNAL Directorate – Feb. 2006
- Requirements document completed – March 2006
- Engineering design start – March 2006
- **Looking for feedback and help now!**
- LHC@FNAL (Phase 1) construction start – May 2006
- LHC@FNAL (Phase 1) construction completed – October 2006
- Move ROC operations to LHC@FNAL – Spring 2007



# New Location & Layout

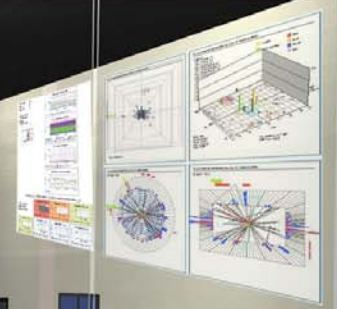


**LARP**



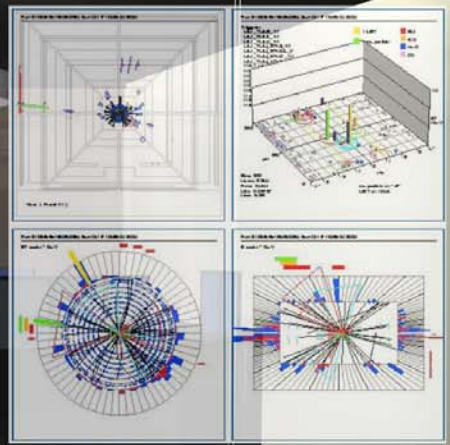
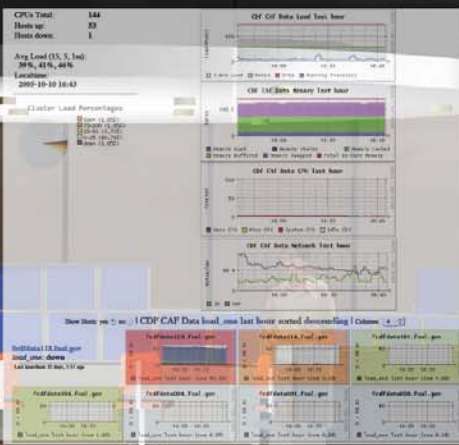
TRANS08

LHC @  
FNAL



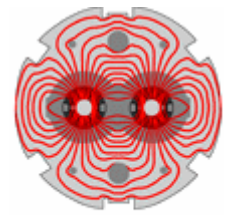


LHC @  
FNAL

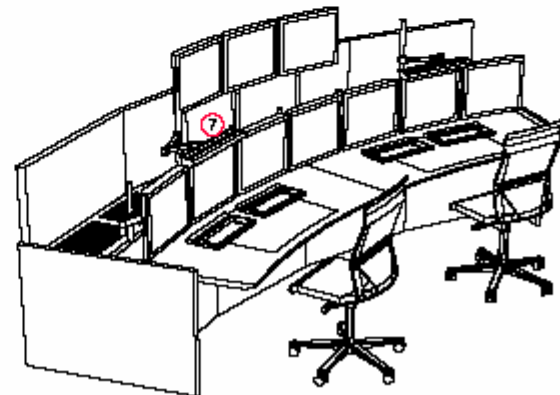
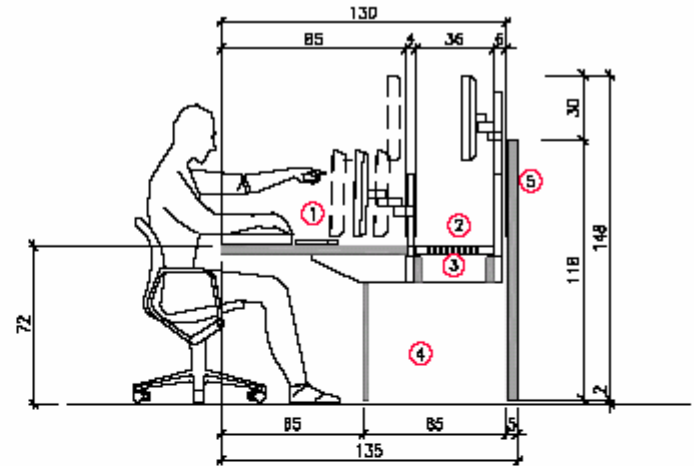
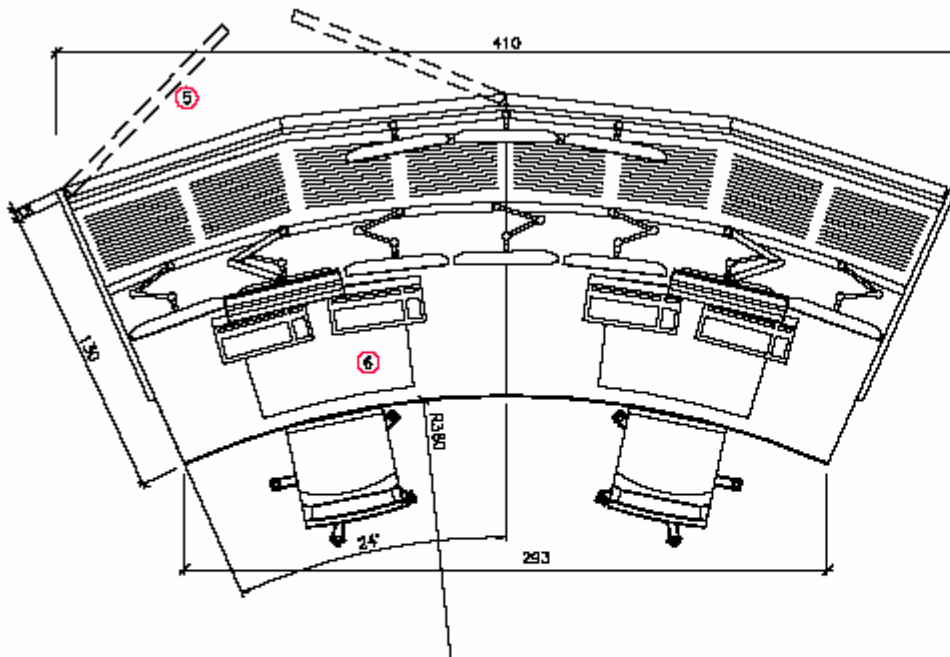




# Consoles



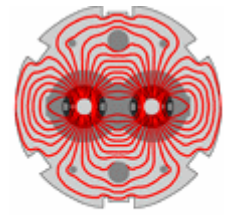
**LARP**



- ① Work top
- ② Monitor top
- ③ Cable channel
- ④ Installation room
- ⑤ Acoustic screen doors
- ⑥ Insert
- ⑦ Light-top



# Possible CMS Activities



*LARP*

## Operations Center:

- Online shifts (DQM, trigger monitoring)
- Offline shifts (data processing, data distribution, GRID)
- Miscellaneous (shift training, DB maintenance)
- Call center for US-CMS

## Conference Room (integrated with Ops. Center):

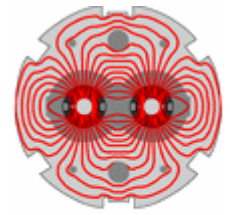
- Daily & weekly meetings

## Office Space:

- Two small meeting rooms (3 – 5 people each)
- Expert space
- Rest area for shifters



# Summary



*LARP*

We have plans for a joint CMS and LHC remote operations center, and are looking for feedback and help.

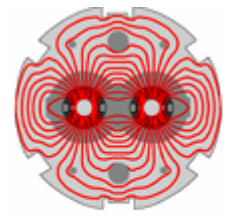
If you have questions or suggestions contact:

- [alstone@fnal.gov](mailto:alstone@fnal.gov) (Alan Stone)
- [erik@fnal.gov](mailto:erik@fnal.gov) (Erik Gottschalk)
- [maeshima@fnal.gov](mailto:maeshima@fnal.gov) (Kaori Maeshima)
- [mcbride@fnal.gov](mailto:mcbride@fnal.gov) (Patty McBride)

Let us know what you think during the discussion session!!



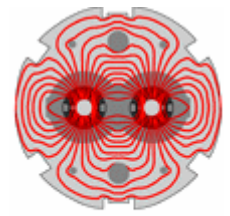
# Additional Slides



*LARP*



# LHC@FNAL Current Status

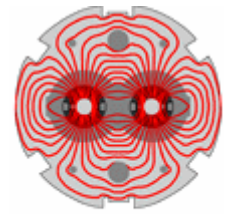


**LARP**

- LHC@FNAL layout endorsed by Fermilab Director
- Funding secured
- Conceptual Design Report completed and reviewed
- Project Execution Plan written
- Project Managers
  - Elvin Harms (FNAL-AD) – construction
  - Erik Gottschalk (FNAL-PPD) – consoles
- Weekly meetings to prepare construction drawings
- Presentation to US-CMS Collaboration (early April)
- Presentation to LHC Accelerator Research Program (LARP) at its collaboration meeting (late April)
- Construction complete by end of FY06



# Assumptions



**LARP**

## For CMS

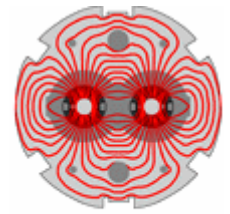
- CMS will have a shift schedule, a run plan, and a protocol that defines responsibilities and roles of shift personnel. We assume that a shift leader is responsible for CMS shift activities.
- LHC@FNAL will have shift operators who will be able to assist US-CMS collaborators with CMS activities during commissioning and operations.
- LHC@FNAL will participate in CMS shifts. Neither the duration nor the frequency of the LHC@FNAL shifts has been determined.
- The CMS Collaboration will have a protocol for access to the CMS control system (PVSS), and a policy for how access to the control system will vary depending on the physical location of an individual user.
- The CMS Collaboration will have a policy that defines how DAQ resources are allocated. This includes allocation of DAQ resources to various detector groups for calibration and testing.
- The CMS Collaboration will have a protocol that defines how on-demand video conferencing will be used in CMS control rooms and LHC@FNAL.
- The CMS Collaboration will provide web access to electronic logbook and monitoring information to collaborators worldwide
- The CMS Collaboration will maintain a *call tree* that lists on-call experts worldwide for each CMS subsystem during commissioning and operations

## For both CMS & LHC

- LHC@FNAL will comply with all CERN and Fermilab safety and security standards.



# Site Visits



**LARP**

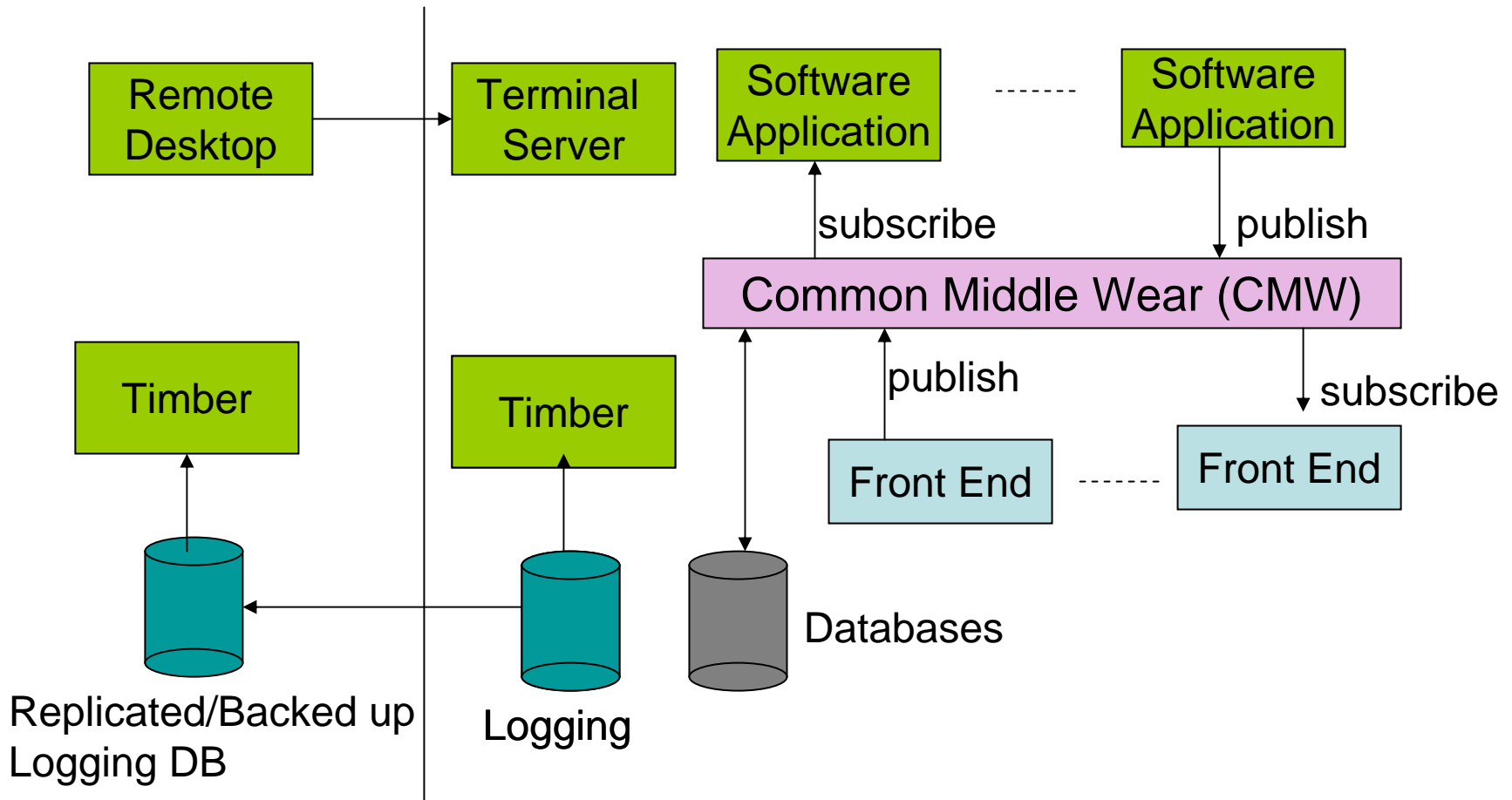
- **Technology Research, Education, and Commercialization Center (TRECC) – West Chicago, Illinois (Aug. 25, 2005)**
- **Gemini Project remote control room – Hilo, Hawaii (Sept. 20, 2005)**
  - <http://docdb.fnal.gov/CMS-public/DocDB/ShowDocument?docid=425>
- **Jefferson Lab control room – Newport News, Virginia (Sept. 27, 2005)**
  - <http://docdb.fnal.gov/CMS-public/DocDB/ShowDocument?docid=505>
- **Hubble Space Telescope & STScI – Baltimore, Maryland (Oct. 25, 2005)**
- **National Ignition Facility – Livermore, California (Oct. 27, 2005)**
  - <http://docdb.fnal.gov/CMS-public/DocDB/ShowDocument?docid=532>
- **General Atomics – San Diego, California (Oct. 28, 2005)**
- **Spallation Neutron Source – Oak Ridge, Tennessee (Nov. 15, 2005)**
  - <http://docdb.fnal.gov/CMS-public/DocDB/ShowDocument?docid=570>
- **Advanced Photon Source – Argonne, Illinois (Nov. 17, 2005)**
- **European Space Operations Centre – Darmstadt, Germany (Dec. 7, 2005)**
  - <http://docdb.fnal.gov/CMS-public/DocDB/ShowDocument?docid=622>



# Baseline for LHC Remote Access

## LHC@FNAL

## LHC Technical Network



# Preferred Model for Remote Access

**LHC@FNAL**

**LHC Technical Network**

