CMS Centres Worldwide

A New Collaborative Infrastructure

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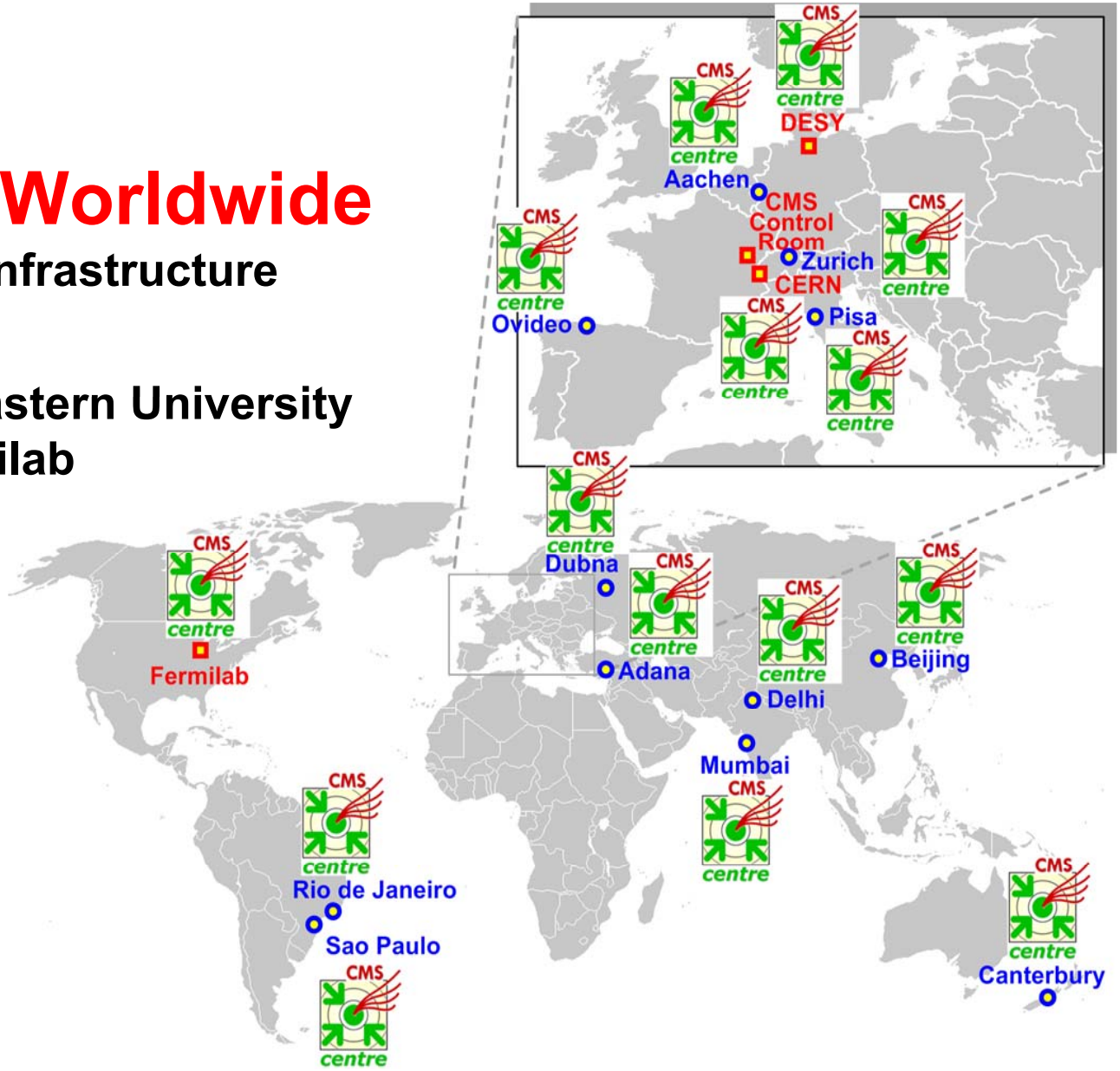
Erik Gottschalk, Fermilab



Brochure: http://cern.ch/lucas-nice/cms-centre/WWW/cms-centres-worldwide.pdf

Frequently Asked Questions

1. **What is a CMS Centre and how is it used ?**
2. What hardware is needed?
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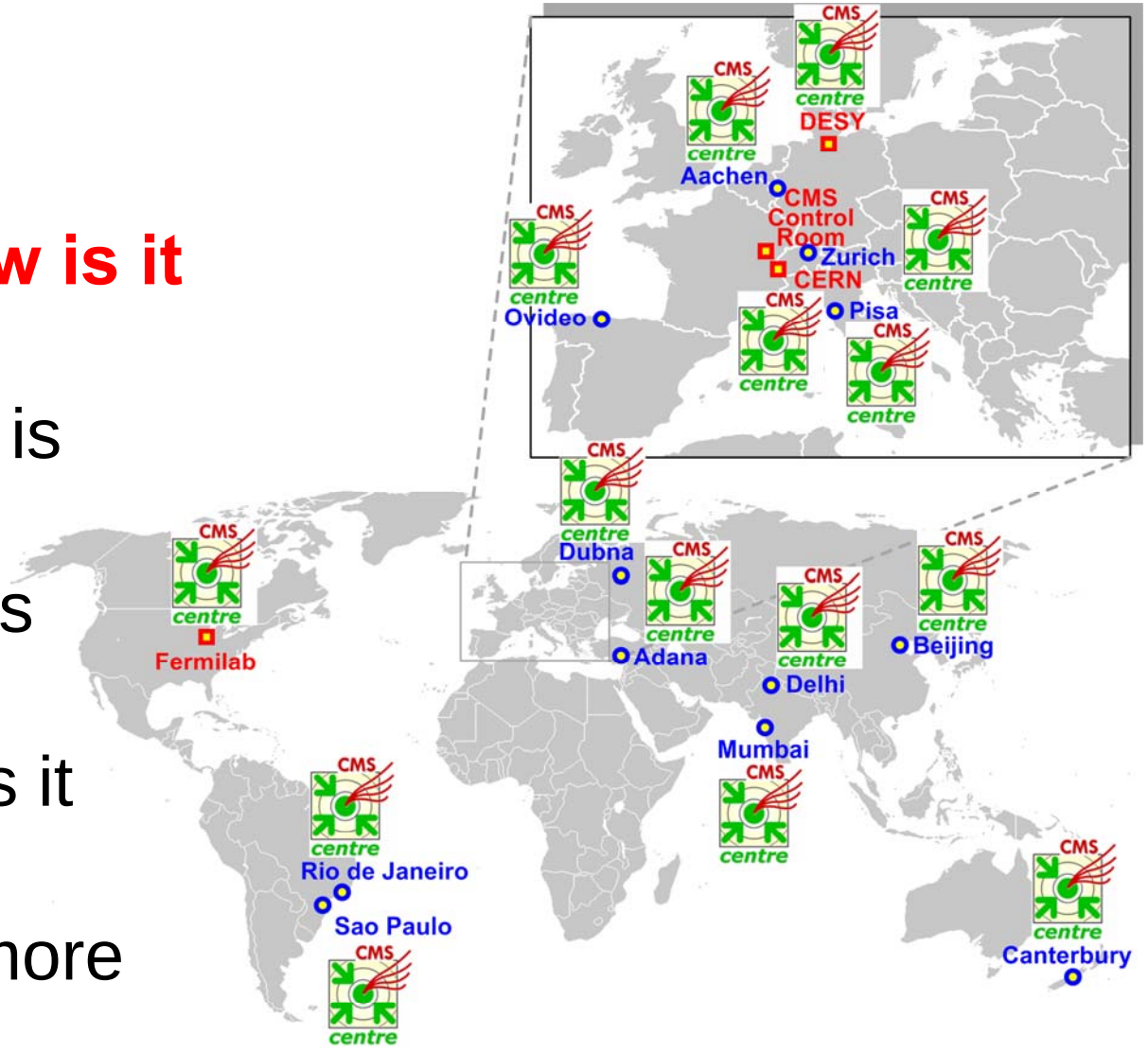

Co-location of people in CMS Centres

- **Experts work <u>together</u> on detector data quality monitoring (DQM), calibration, data analysis**
- **Computing operations shifts**
  - Other shifts might be done remotely once LHC and CMS running stabilizes (e.g. DQM)
- **Education and outreach**

CMS Centres proved to be extremely effective with LHC First Beam and CMS Cosmic Commissioning

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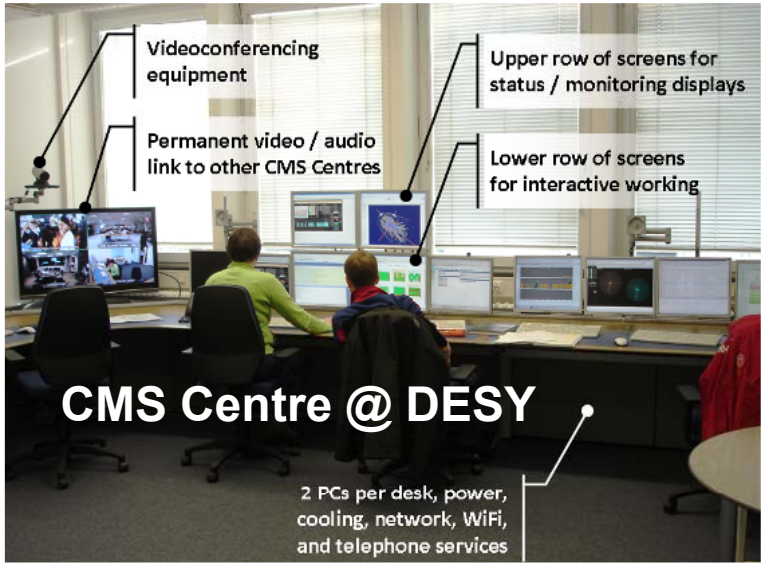
Co-location of people in CMS Centres

- **A CMS Centre @ My Institute is a highly-visible local CMS focal point**
- **Status and monitoring displays to follow CMS operations**
- **Computing consoles for students, postdocs and faculty to work together**
  - Physical co-location of people
- **Video links to CERN and other institutes**
  - Virtual co-location of people
- **Outreach displays**



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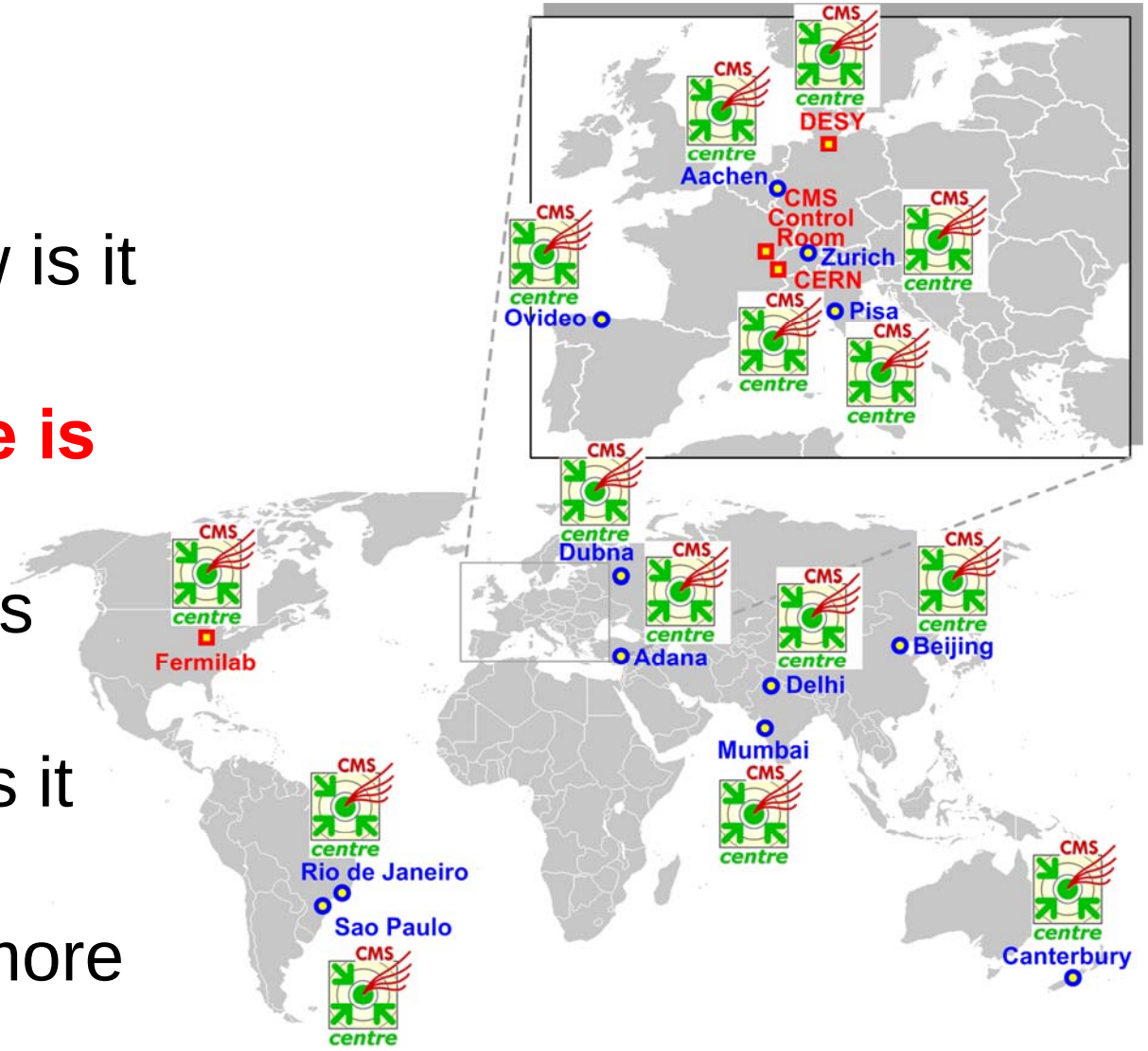
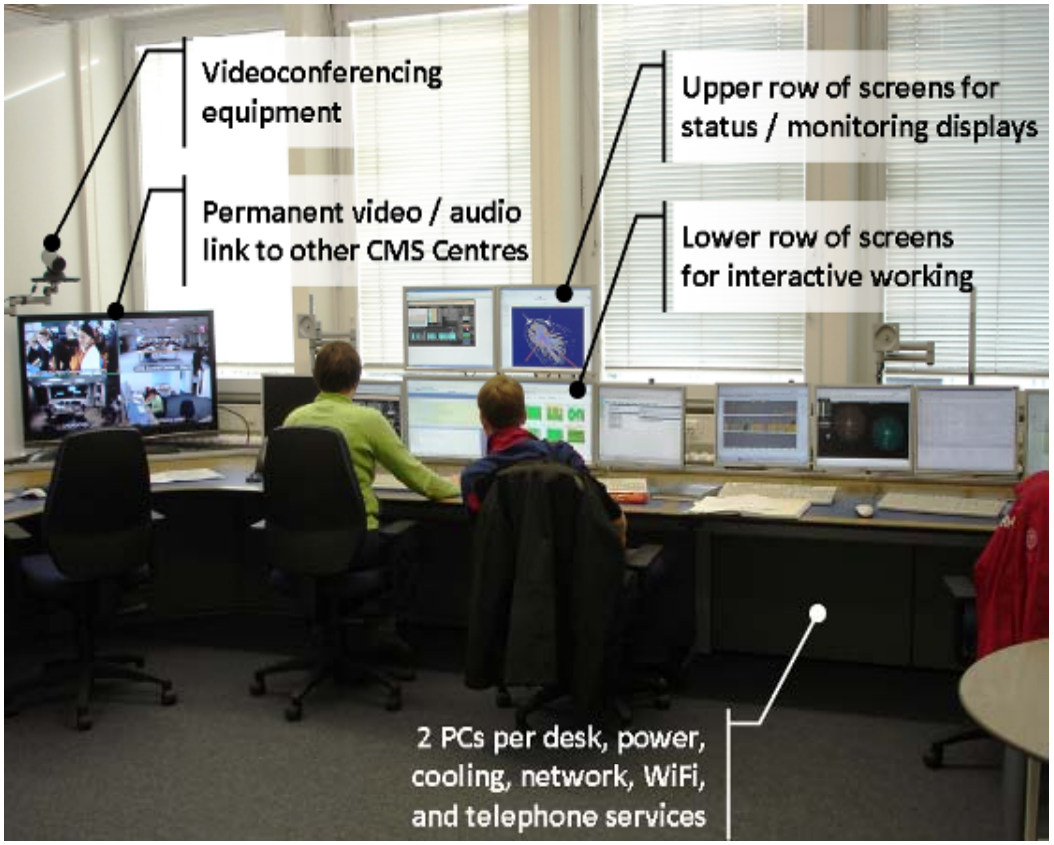


Physical co-location: Hardware Facilities

- **General Facilities**
  - Office (> 20 sq. m) with usual facilities (power, network …)
  - TVs / projectors for outreach
- **Several Computing Consoles each with**
  - 1 PC + 2 screens for interactive work *(lower row)*
  - 1 PC + 2 screens for status / monitoring displays *(upper row)*
  - 2 kW power (10 sockets) and 4 network sockets
- **Number of consoles ranges from 2 (small institute) to 22 (main CERN centre)**



All systems use affordable commodity hardware

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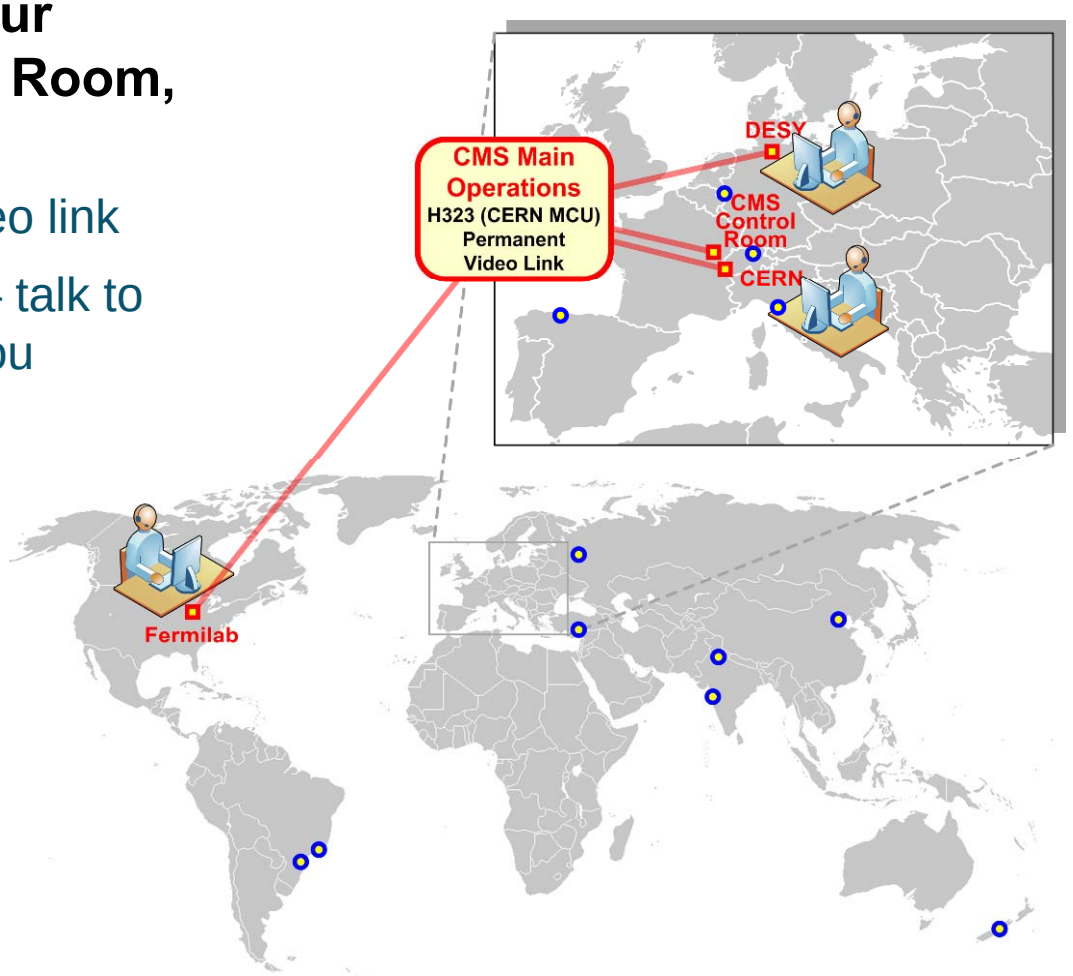
Virtual co-location: Video "Telepresence"

- **Communication between four main CMS Centres (Control Room, CERN, FNAL, DESY)**
  - Permanently-running HD video link
  - Large eye-level TV screens – talk to remote people as if next to you



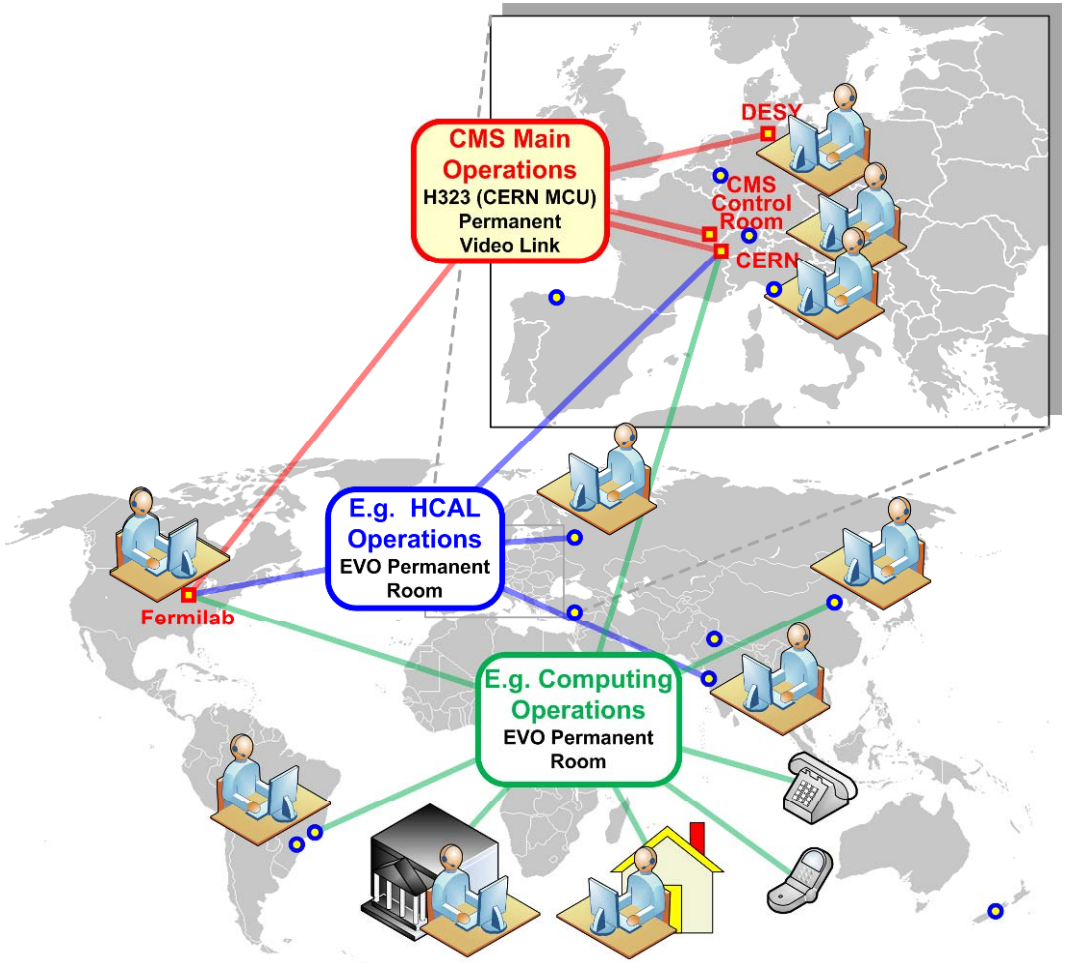
- **Also VIP and press events**

Uses commercial High-Definition video systems
Hardware video/audio endpoints and Multipoint Control Unit (Polycom, Tandberg, Codian), 50 inch HD TVs

Brochure: http://cern.ch/lucas-ni

Virtual co-location: Video "Telepresence"

- **Communications between CMS Centres in institutes uses EVO for video & chat**
- **Permanently-running dedicated EVO rooms**
  - For various operations groups: Computing, Tracker, ECAL, etc.
  - Centres and individuals connect as needed



Modest hardware needs

PC for EVO video (de-)coding; camera (e.g. Logitech, Quickcam …), microphone (e.g. Phoenix / ClearOne …)

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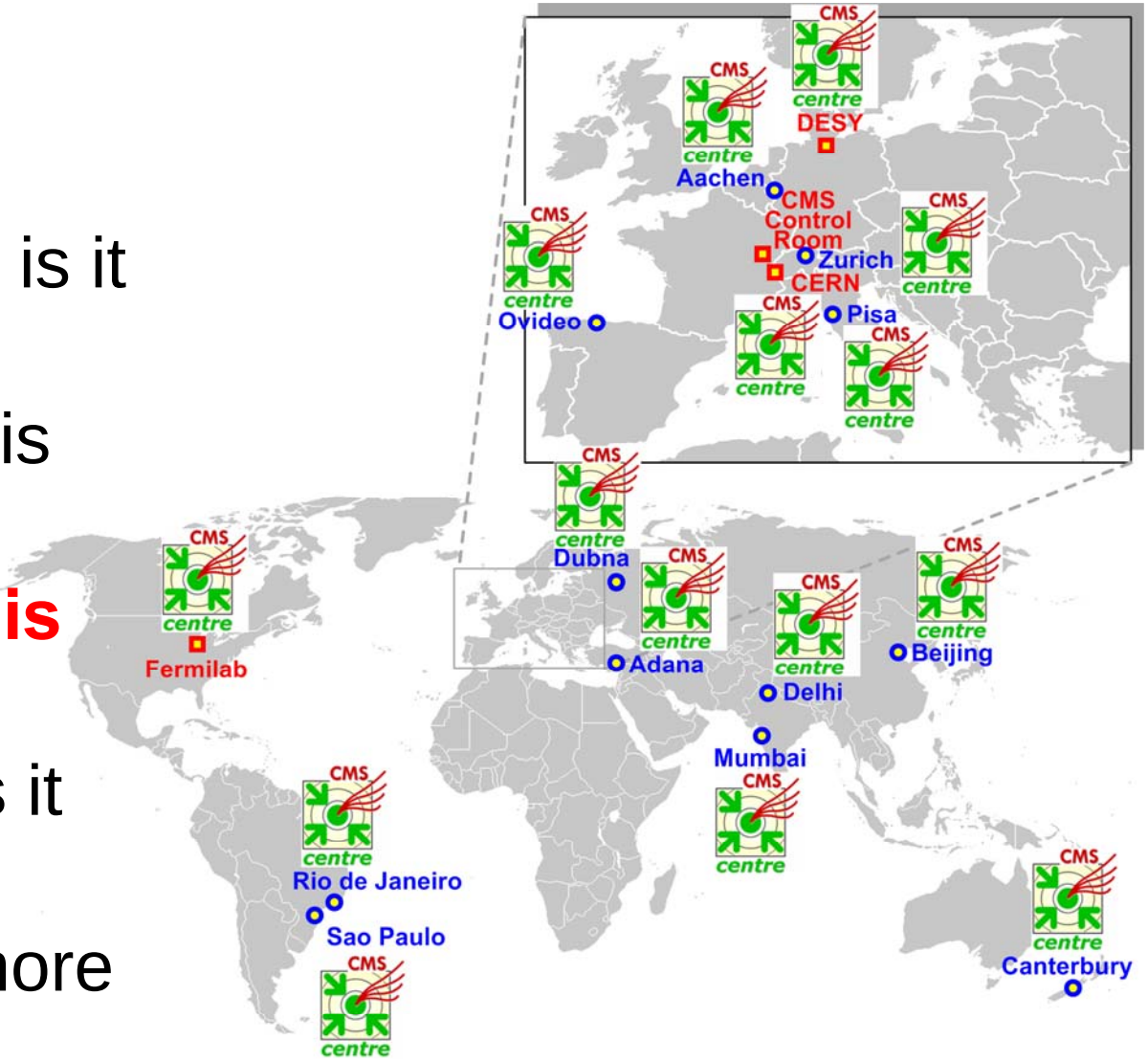

Required Software: a Web browser

- **CMS monitoring, operations and outreach systems are predominantly Web-based e.g.**
  - **DQM** system for CMS detector data quality monitoring
  - **Ci2i** to manage CMS Centre displays, users, groups, etc.
  - **CMS-TV** for status displays and outreach

See examples

- **PCs typically run Linux (e.g. SLC4,5) and local users install what they need for their own work**
  - Reconstruction, analysis … (CMSSW, ROOT,…)
  - Event display (Fireworks, Iguana,…)

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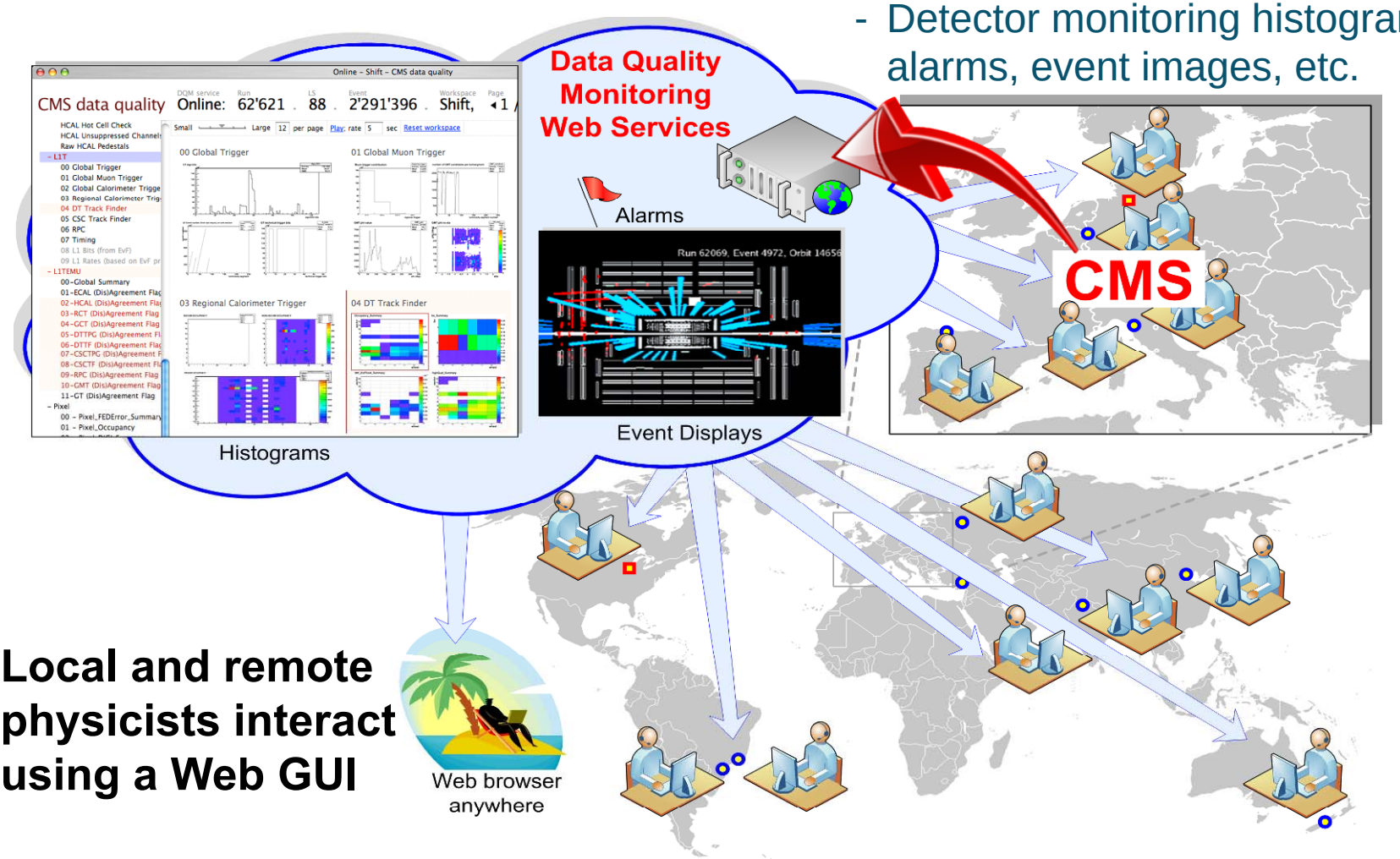
Web Application: Ex 1. Data Quality Monitoring

- **CMS sends data to Web server**
  - Detector monitoring histograms, alarms, event images, etc.



- **Local and remote physicists interact using a Web GUI**

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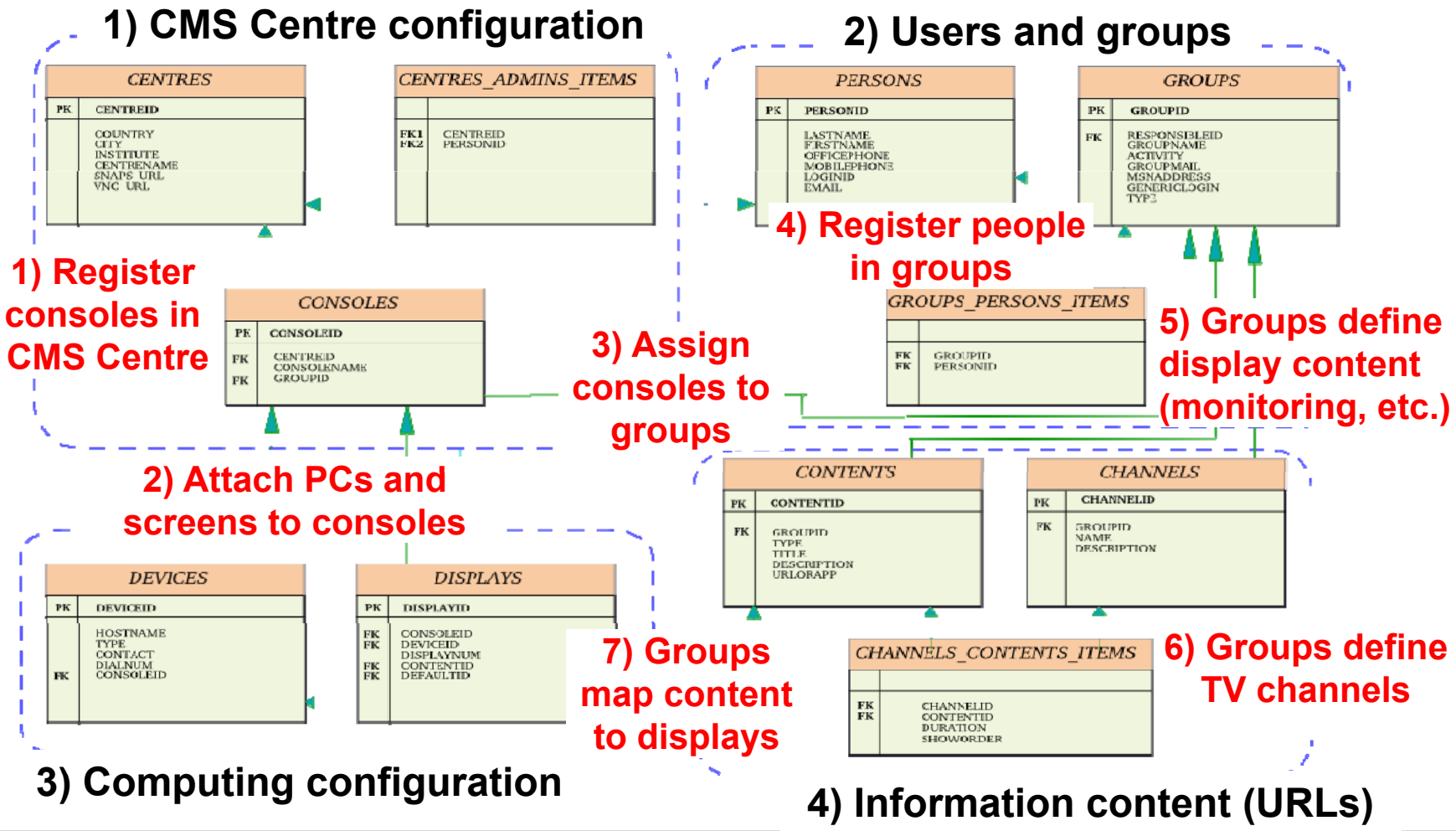
Web Application: Ex 2. ci2i ("see eye to eye")

CMS Centre Management tool using Oracle, Javascript, Tomcat, Apache

http://cmsdoc.cern.ch/cmscc/



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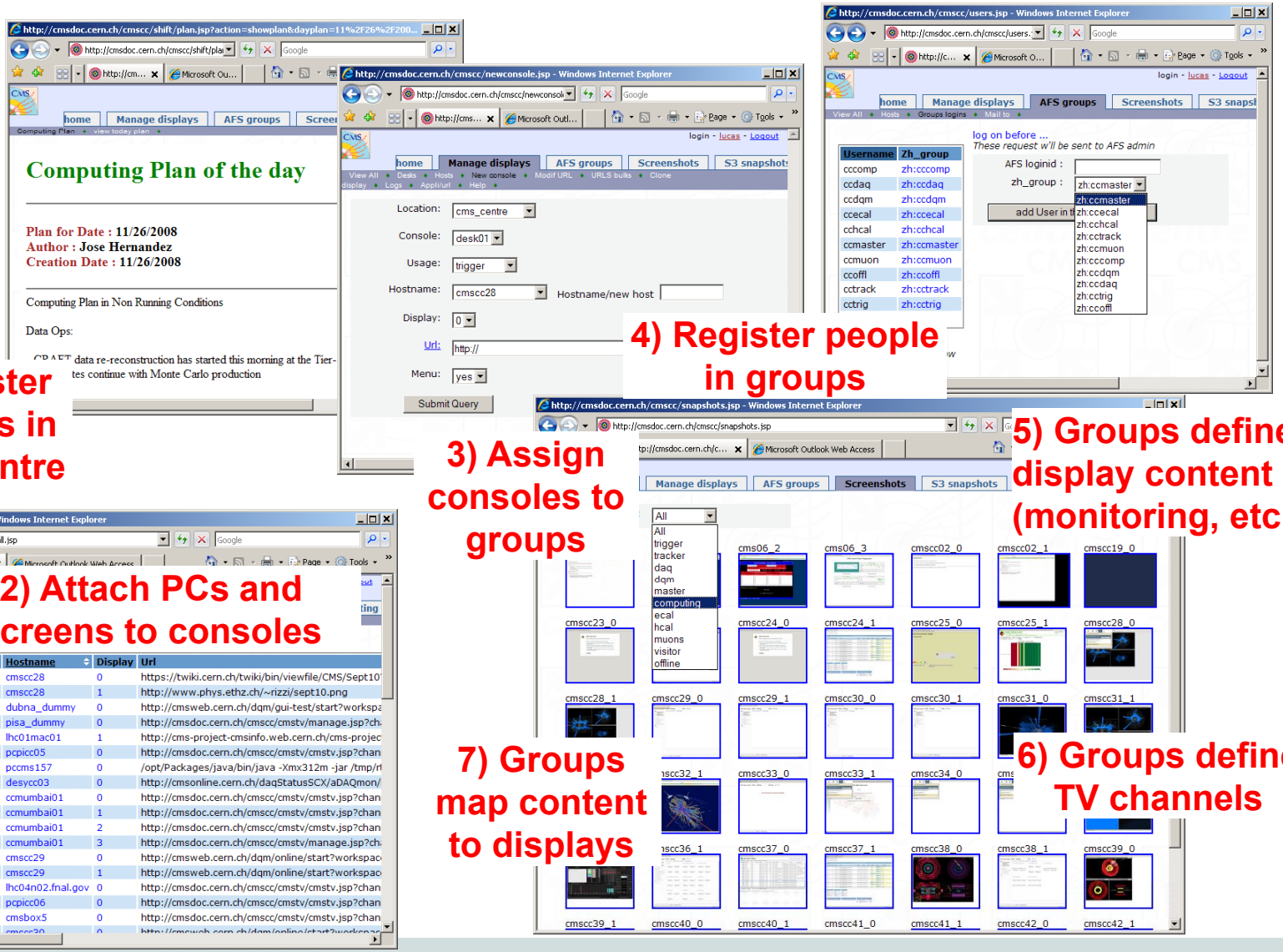

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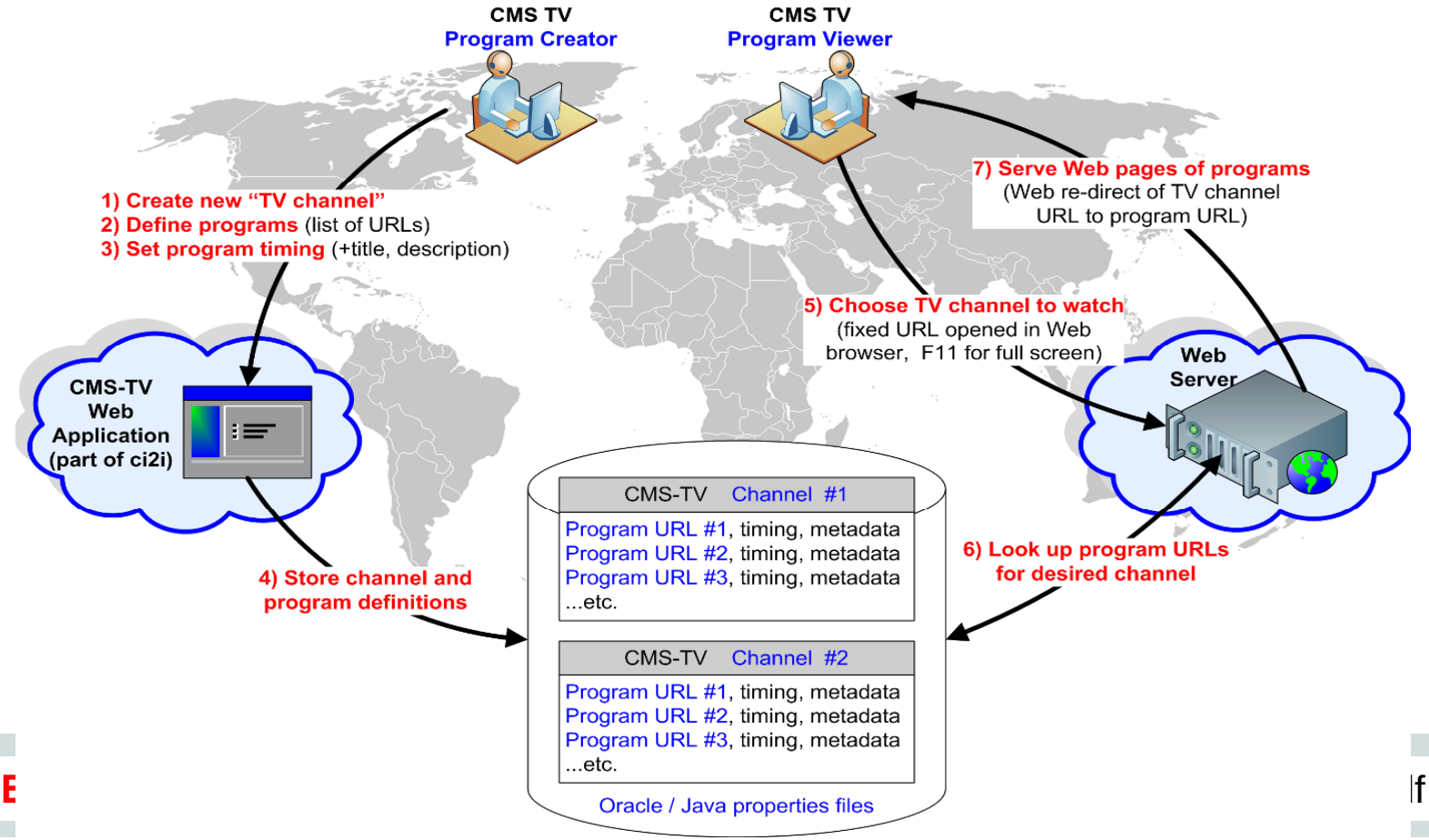
Web Application: Ex. 3 "CMS TV"

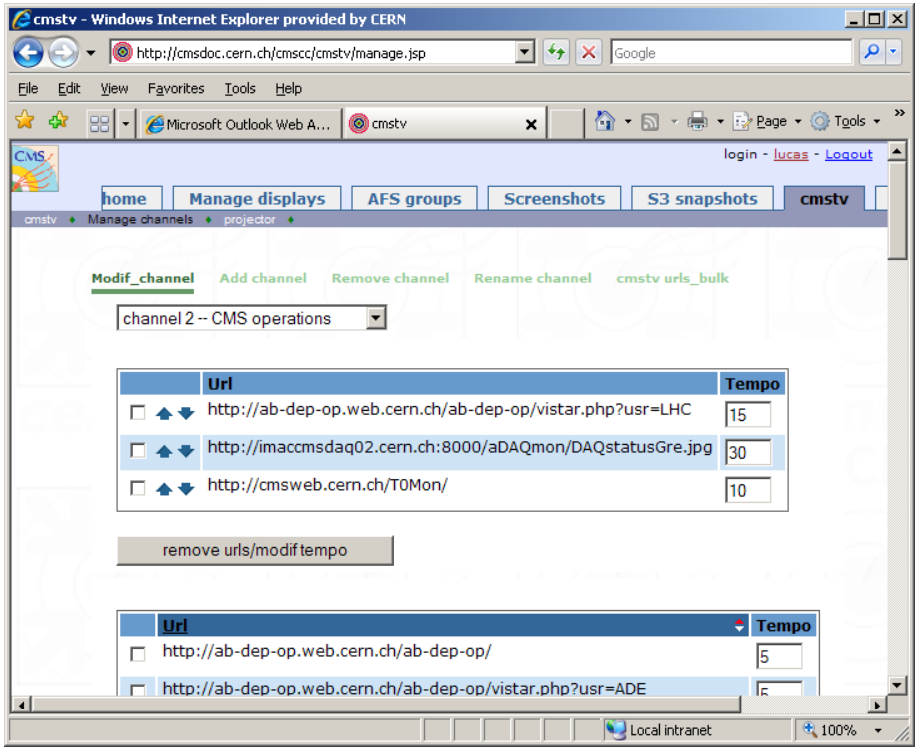
- **Used for cyclic status displays and outreach**
  - Web browser (e.g. a public display) points to a fixed URL ("TV channel")
  - "CMS-TV" re-directs fixed URL to a set of dynamically changing URLs ("programs") e.g. LHC Page 1, CMS DAQ Status, Live Event Display…



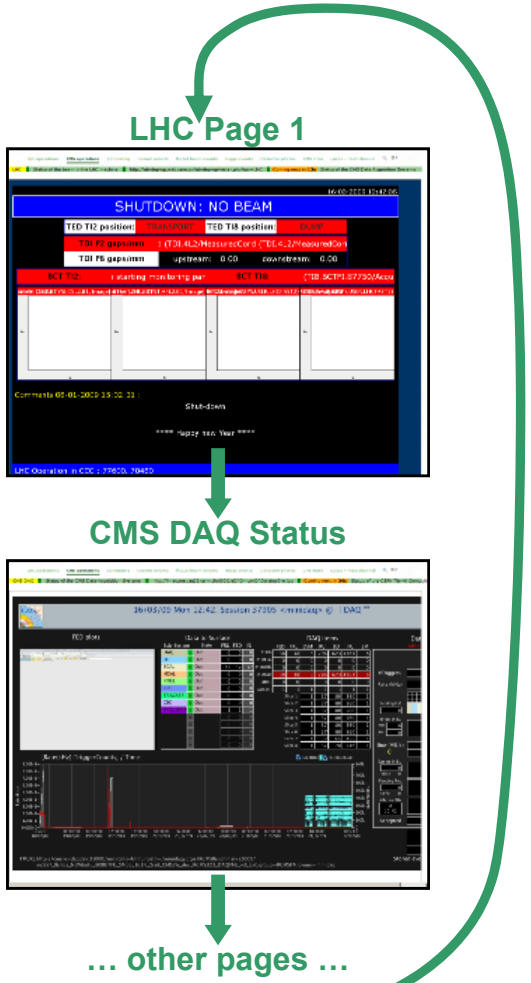
Web Application: Ex. 3 "CMS TV"

- **E.g.** http://cmsdoc.cern.ch/cmscc/cmstv/cmstv.jsp?channel=1
  - Press F11 for full screen (Firefox, Explorer,…)

Management Interface



TV Display



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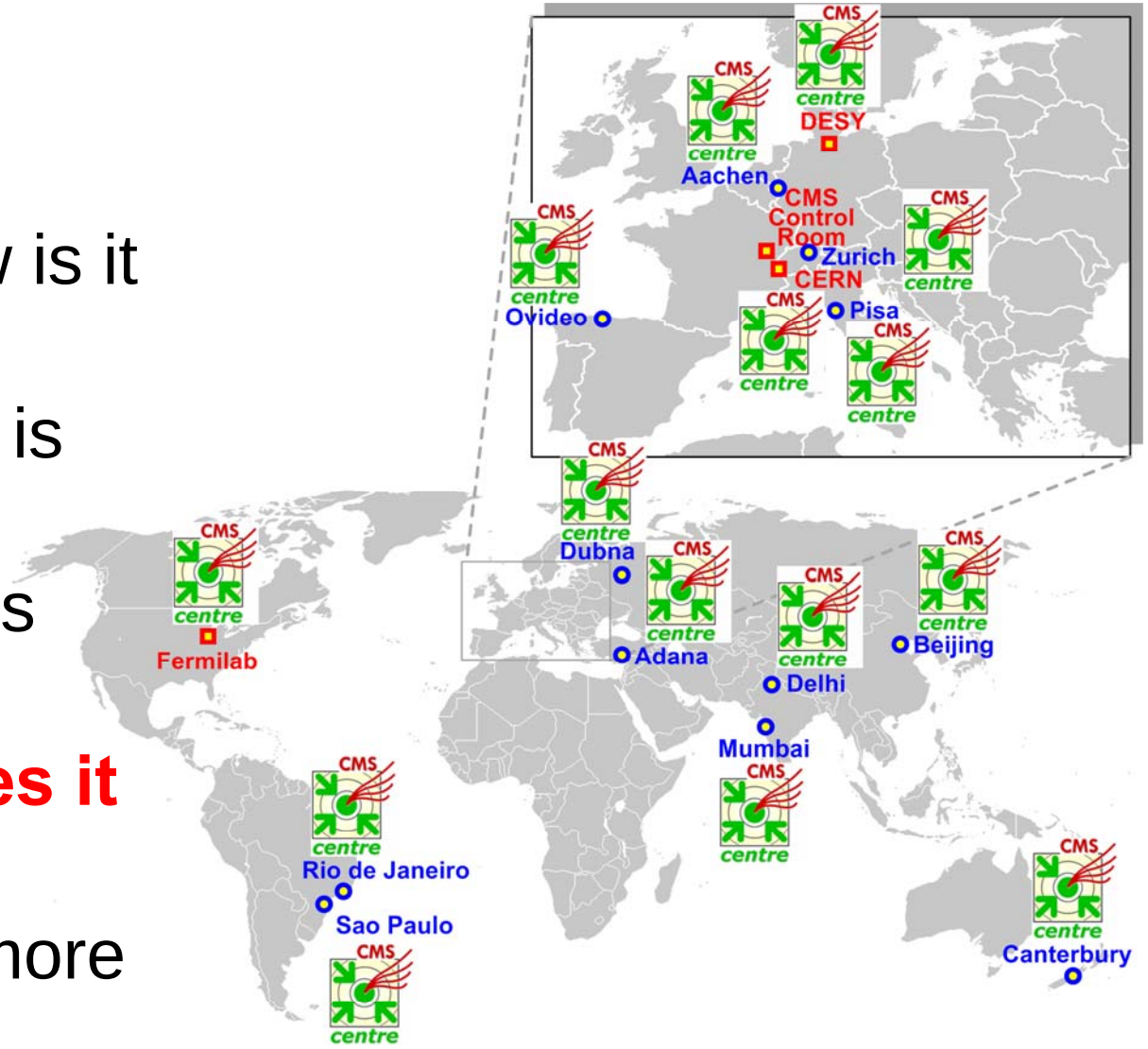

Cost per Centre ≈ 7.3 kCHF (general costs)

+ 3.6 kCHF per console × (no. of consoles)

- **Modest Centre with two full consoles: 14.5 kCHF**
  - Cheaper if you re-use existing equipment
  - Would come to 2.6 MCHF for all 182 CMS institutes
- **Franchise business model**
  - Standard (cheap) design with commodity systems
  - Institute provides funding

Cost of general equipment		Unit cost (CHF)	Quantity per centre	Total Cost (CHF)
Large screen displays	LCD / plasma display (> 40") or projector + screen for showing LHC/CMS status, event displays, etc.	1500	2	**3000**
Linux PC	To drive display screens	900	1	**900**
Outreach displays	For example posters	500	1	**500**
Video conference system (low-end - see footnote*)	PC running EVO (software) coder/decoder	900	1	**900**
	Camera, e.g. Logitech PRO 9000 or QuickCam Vision Pro (high definition)	140	1	**140**
	Echo-cancelling microphone (e.g. PHOENIX Duet Executive USB/RJ11 or ClearOne Chat 150 USB)	360	1	**360**
	Display TV with built-in speakers	1500	1	**1500**
Total cost of general equipment				**7300**

Cost per console		Unit cost (CHF)	Quantity per console	Total Cost (CHF)
Linux PC	One for interactive work (on lower row of screens) One for status displays (on upper row of screens)	900	2	**1800**
LCD flat screen (e.g. 19")	Two for interactive work (lower row of screens) Two for status displays (upper row of screens)	375	4	**1500**
Multi-screen support	Physical support for 2 x 2 array of screens	300	1	**300**
Total cost per console				**3600**

* Alternative option: higher quality H.323 hardware coder/decoder (connected point to point or via MCU), camera, microphones, etc. (e.g. Tandberg, Polycom, or Aethra). Need a PC if using EVO. 5600

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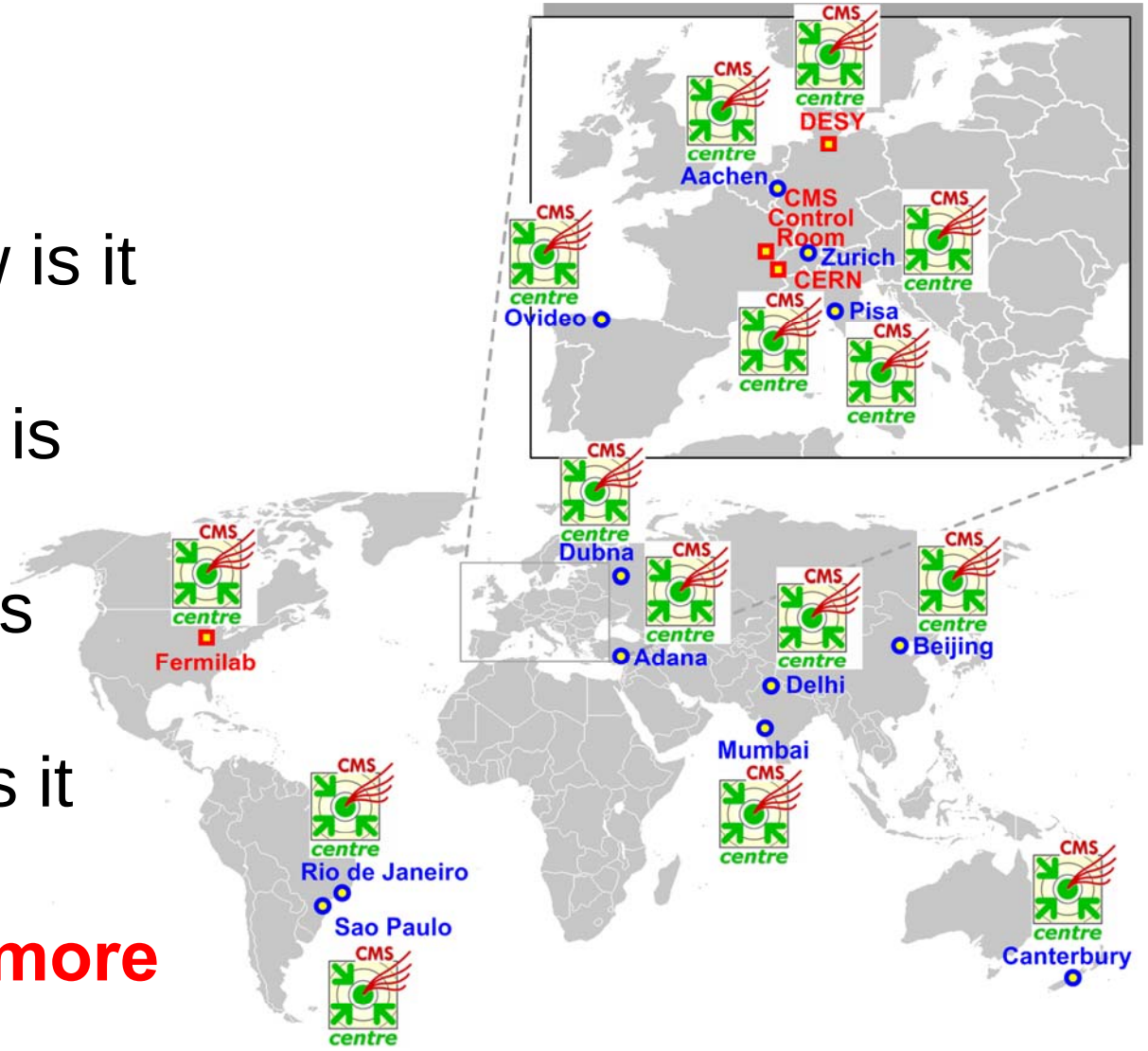

More information

- **Read the brochure: "How to build a CMS Centre @ My Institute"**
  - http://cern.ch/lucas-nice/cms-centre/WWW/cms-centres-worldwide.pdf
- **"CMS Centres Worldwide" Project Leader: Lucas.Taylor@cern.ch**
- **CMS Centre Web site: http://cmsdoc.cern.ch/cmscc/index.jsp**
- **Other talks and papers**
  - CHEP 09: Erik Gottschalk et al. in plenary and HD Videoconferencing talk
  - CHEP 09: Lassi Tuura et al. on CMS Data Quality Monitoring talk
  - CHEP09: Gilles Raymond and LT on ci2i and CMS TV poster
  - L. Taylor et al., "Functions and Requirements of the CMS Centre at CERN", CMS NOTE-2007/010, 16 March 2007
  - L. Taylor et al., "CMS centres for control, monitoring, offline operations and prompt analysis" Proc. of CHEP '07, 2–7 Sept. 2007, Victoria; J. of Phys: Conf. Series, Vol. 119, 2008.

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FAQ Summary

1. **What is a CMS Centre and how is it used ?**
   A human focal point for collaborative work & communication

2. **What hardware is needed?**
   PCs, screens, video system

3. **What software is needed?**
   A Web browser plus your own stuff

4. **How much does it cost?**
   < 15 kCHF (9 kEuro or 13 k$)

5. **How can I get more information?**
   Read the brochure / contact me

"Take-aways"

Physical co-location in CMS Centres really works
(proved with LHC beam and cosmics)

Virtual co-location really works
(permanently-running high-quality videoconferencing "telepresence")

CMS monitoring, operations, and outreach is all Web-based
(strategy is already paying off)

Franchise business model supports the rapid spread of CMS Centres
(standard design and cheap)

CMS Centre concept is simple, works, and suits both CMS and wider use
(in HEP, academia or beyond)

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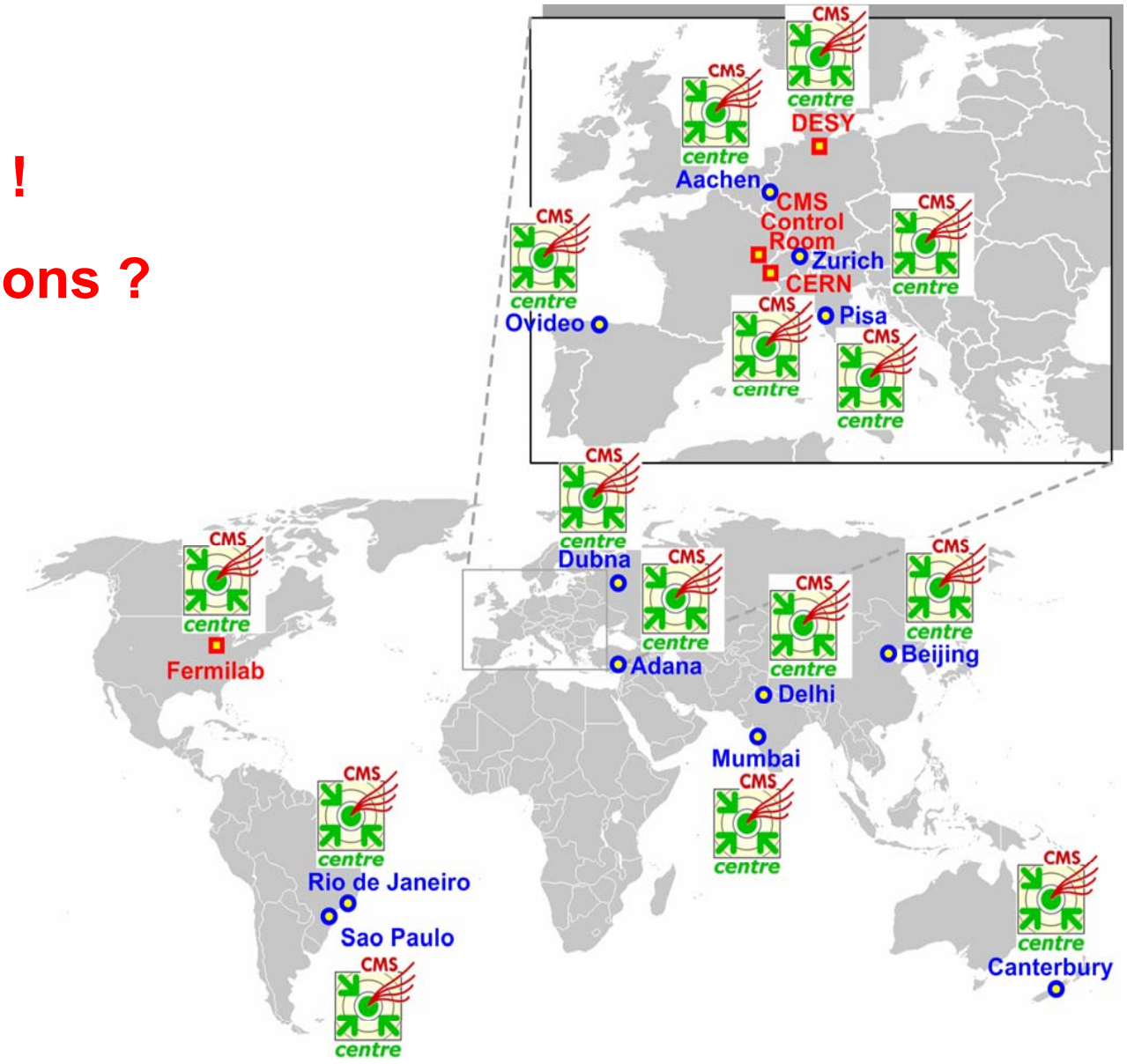
Thank you !

Any questions ?



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