

The logo consists of the letters 'C' and 'F' in a large, white, sans-serif font, positioned in the top-left corner of the slide. The background behind the letters is a vertical strip of images showing server racks and network equipment.

CF

Computing Facilities

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Department

Update on CERN Computing Facilities Evolution

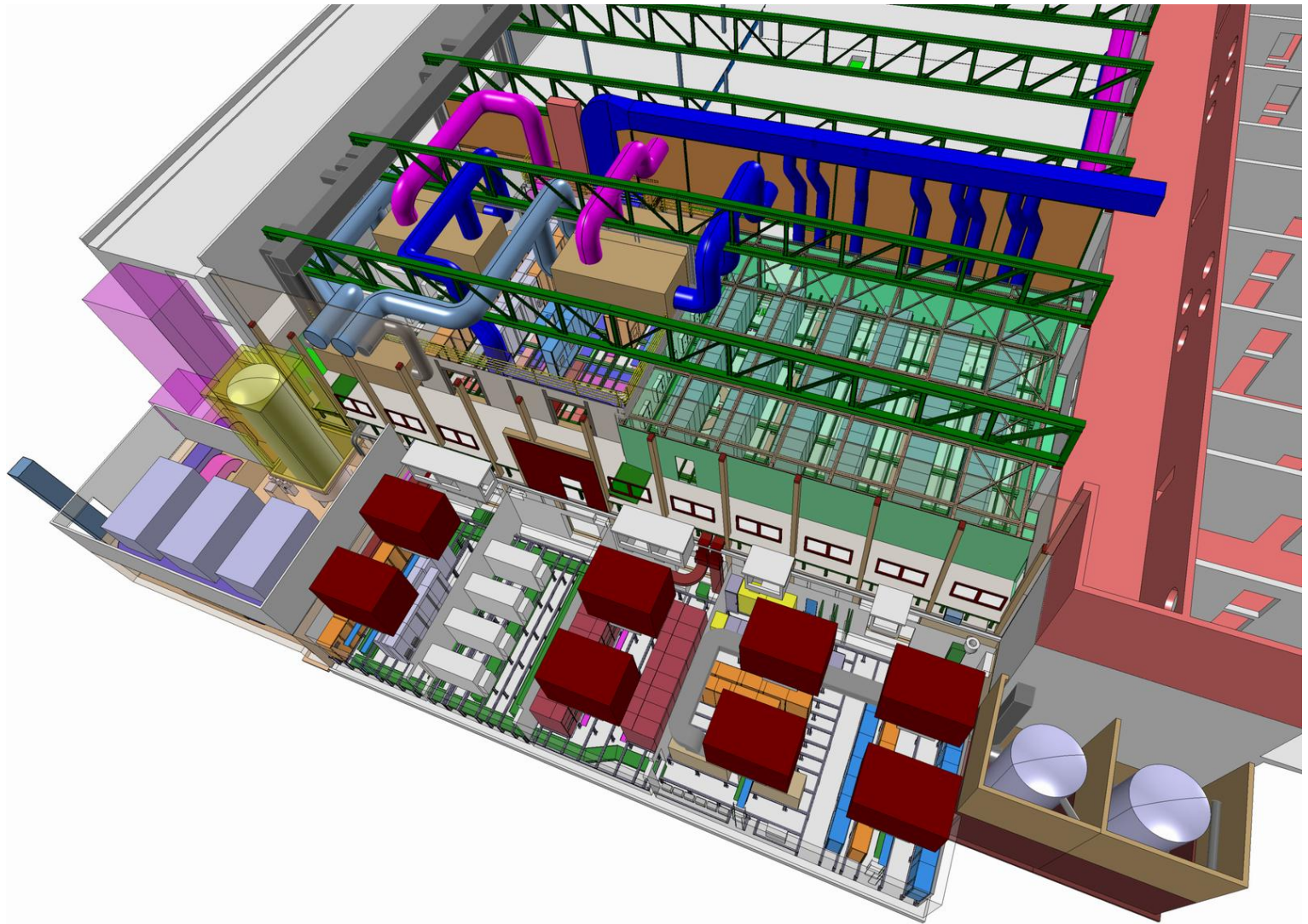
Spring HEPiX 2012

- Computer Centre consolidation project update since last HEPiX
- Remote hosting project progress since the last HEPiX
- Closing remarks

- Solve the cooling issue for the critical UPS room
 - New UPS systems in a different location
- New, fully dedicated and redundant cooling installation for critical equipment, including the UPS system.
- Increase critical capacity to 600kW
- Increase overall power capacity to 3.5MW
- Restore N+1 redundancy for both critical and physics UPS systems
- Secure cooling for critical equipment when running on UPS and extended stored cooling capacity for physics
- Move of AHUs to UPS (not in original scope but added later)
- Decouple the A/C for CC from the adjacent office building

- First phase of civil engineering work nearing completion
 - New CV room completed
 - New electrical rooms nearing completion
 - New IT room nearing completion
- Electrical cabling for new UPS/LV Switchboard rooms was underway
- Design studies for ventilation systems underway

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- First phase of civil engineering finished
 - New CV building
 - New electrical rooms in ‘Barn’
 - New IT room in ‘Barn’
- Some rework was required for acceptance
- Remaining civil engineering works to be done once the installation of CV and EL has progressed sufficiently for this to be done





- Ventilation ducting installation underway and well advanced
- First AHUs delivered and being installed
- Ventilation to be ready for the new physics electrical rooms mid-May
- Mixed water production and distribution installation due to start soon
- Chillers due to be delivered in June
- Overall commissioning July-September

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AHUs Being Delivered



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AHUs Awaiting Installation

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Ventilation Ducts on Roof of Electrical Rooms

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Ventilation Ducts on Roof of Electrical Rooms

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- New Physics UPS system and switchboards installed
 - Small fire in new UPS system which caused a delay of three weeks
- PDUs being switched from the three old UPS to new UPS and back again in turn allowing of connection of existing UPS system to the new distribution switchboard
 - Degradation for short periods
 - Should be finished end of June
- Critical LV installation planned Jul 2012-Oct 2012
- IT room electrical installation planned Mar 2012-May 2012

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New Electrical Installations

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CERN IT Department
CH-1211 Geneva 23
Switzerland
www.cern.ch/it

CERN Computer Facilities Evolution - HEPiX April 2012 - 18



- Tender for IT racks with passive rear door heat exchangers completed and order sent out
- Delivery expected for September
- Room and new technical infrastructure ready for IT equipment November
- Strategy is to provide new capacity for critical , i.e. large procurement, and virtualization as far as possible
- Services, and not machine, to be migrated
- Two distinct fibre paths between new and old rooms

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New IT Room



- How to provide resources once CERN CC full?
- Call for tender issued
 - Sent out on 12th Sept
 - Specification with as few constraints as possible
 - Draft SLA included
 - A number of questions for clarification were received and answered (did people actually read the documents?)
 - Replies were due by 7th Nov

- Contract length 3+1+1+1+1
- Reliable hosting of CERN equipment in a separated area with controlled access
 - Including all infrastructure support and maintenance
- Provision of fully configured racks including intelligent PDUs
- Essentially all services which cannot be done remotely
 - Reception, unpacking and physical installation of servers
 - All network cabling according to CERN specification
 - Smart ‘hands and eyes’
 - Repair operations and stock management
 - Retirement operations

- Real time monitoring info to be provided into CERN monitoring system
- Installation of remote controlled cameras on request
- Equipment for adjudication:
 - 2U CPU servers ~1kW and redundant PSUs
 - 4U disk servers or SAS JBOD with 36 disks of 2TB ~ 450W and redundant PSUs
 - Brocade routers up to 33U with 8 PSUs ~7kW
 - 2U HP switches with redundant PSUs ~400W
 - 1U KVM switches with single PSU
 - 4 disk servers for every 3 CPU servers

- Central star point:
 - 4 racks for fibre patching
 - 4 racks for UTP patching
 - 2 racks for central switches
 - All necessary racks for routers (see slides on SLA)
- External WAN connectivity:
 - 2x100Gpbs capacity (separate paths) to the most convenient PoP in the GEANT network
 - 100Gpbs capacity as 1x100Gbps, or 3x40Gbps or 10x10Gbps

SLA provided for adjudication but will be reworked with contractor.

		2013		2014	2015	2016	2017	2018		2019
		Q1	Q3	Q4	Q4	Q4	Q4	Q1	Q4	Q1
Delivery	Non-critical	50	350	250	250	250	650		500	
	Critical	50	150	50	50	50	250		100	
Retirement	Non-critical							400		250
	Critical							200		50
Total Installed	Non-critical	50	400	650	900	1150	1800	1400	1900	1650
	Critical	50	200	250	300	350	600	400	500	450
	Total	100	600	900	1200	1500	2400	1800	2400	2100

The equipment shall be installed and operational within the racks within two working weeks of each delivery.

- January 2013
 - 10 racks for LAN routers and 2 racks for WAN routers
- October 2016
 - 2 additional racks for LAN routers
- October 2018
 - 4 additional racks for LAN routers

Each router shall be installed and operational within its rack within one working week following delivery, including all necessary cabling. In the case of the delivery of multiple routers at one time, it shall be one elapsed working week for each delivered router.

		2013		2014	2015	2016	2017	2018		2019
		Q1	Q3	Q4	Q4	Q4	Q4	Q1	Q4	Q1
Delivery	Non-critical	28				14			28	28
	Critical	56								56
Retirement	Non-critical									28
	Critical									56
Total Installed	Non-critical	28	28	28	28	42	42	42	70	70
	Critical	56	56	56	56	56	56	56	56	56
Total		84	84	84	84	98	98	98	126	126

- CERN equipment shall run at all times
 - Micro cuts
 - Maintenance
 - With the exception of downstream of in-room switchboards for non-critical equipment
- Equipment interruption once every two years < 4 hours
 - For non-critical equipment this can be abrupt
 - For critical equipment a 10 minute buffer must be provided to allow equipment to be switched off in a controlled manner
 - Switch off to be triggered automatically

- Operating inlet temperature range 14-27°C with limited excursions up to a maximum of 32° C (based on the ASHRAE recommendations)
- Real time monitoring parameters:
 - Current power usage of CERN equipment – 10 minutes
 - Current capacity of UPS systems (if used) – 1 minute
 - Infrastructure alarms indicating faults potentially affecting CERN equipment, including any loss of redundancy – 5 seconds
 - Relevant temperature and humidity readings for the cooling infrastructure, e.g. inlet and return temperature of cooling air (and/or water), humidity of inlet air – 1 minute
- For retirements all equipment shall be removed and prepared for disposal or shipment within 4 weeks

- The following summarises the expected failure rates of IT server components:
 - Disks – 2% annual failure rate, i.e. 2 failures per year for every 100 disks
 - Other standard components: Cooling fans, CPU, Disk, Memory module, PSU and RAID controller – 5 interventions per 100 servers per year
 - More complex repairs such as replacing the mainboard, backplane or investigations of unknown failures – 3 interventions per 100 servers per year
- The following repair times shall be respected:
 - Disks – 8 working hours.
 - Other standard components: Cooling fans, CPU, Disk, Memory module, PSU and RAID controller – 8 working hours.
 - More complex repairs such as replacing the mainboard, backplane or investigations of unknown failures – to be shipped to the appropriate vendor within 10 working days.
- The following summarises the expected failure rates of networking equipment:
 - Switches – 5 repair operations for every 100 switches per year.
 - Routers – 5 repair operations per router per year.
- The following repair times shall be respected:
 - 4 working hours.

- Smart 'hands and eyes' support to be provided during working hours (8 hours between 07:00 and 19:00 CET)
 - 5 interventions per hundred IT systems and 10 per network equipment per year
 - Intervention time:
 - Non-critical equipment – 1 working day
 - Critical equipment, including networking – 4 working hours
- At the end of the contract all equipment shall be removed from racks and prepared for disposal or shipment within 8 weeks.
- Penalties defined for non respect of the SLA

Country	Bid	Declined
Belgium	1	
Finland	1	
France		1
Germany	1	1
Hungary	2	1
Norway	5	4
Poland		1
Portugal		1
Spain	2	
Sweden	1	3
Switzerland	1	2
UK	2	
	16	14

- The financial offers were reviewed and in some cases corrected
- The technical compliance of a number of offers were reviewed (those which were within a similar price range)
- Meetings were held with 5 consortia to ensure that
 - we understood correctly what was being offered
 - they had correctly understood what we were asking for
 - errors were discovered in their understanding
- Site selected and approved at FC 14th March

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And the winner is....

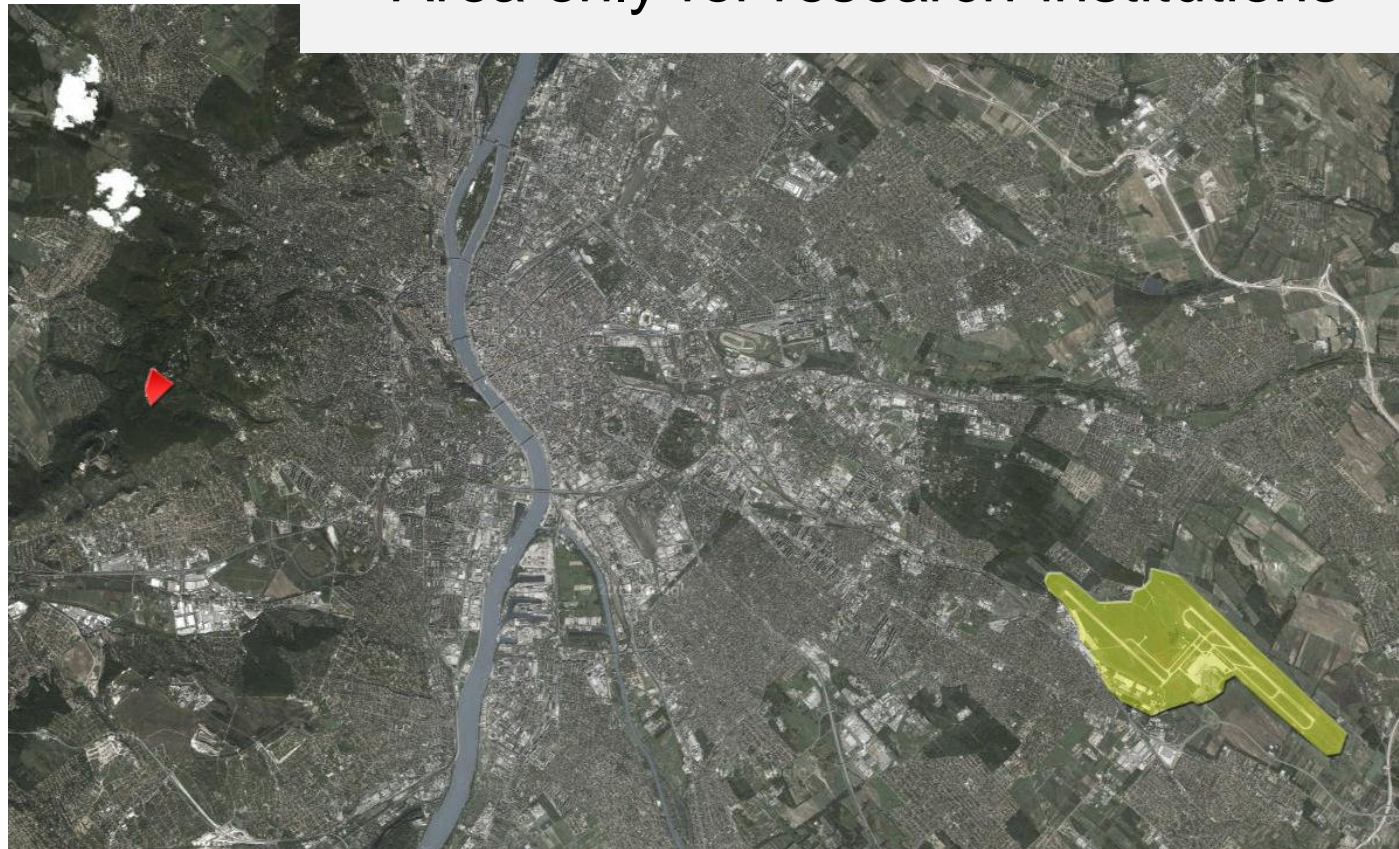
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Wigner Data Centre in Budapest

(Previously known as KFKI RMKI)



- Easy reach to the airport and city centre
- Huge area within the fence
- Highly secure area
- Area only for research institutions



- New facility due to be ready at the end of 2012
- 725m² in an existing building but new infrastructure
- 3 blocks of 275m² each with six rows of 21 racks with average power density of 10kW and A+B feeds to all racks
- 2 independent HV lines to site
- Full UPS and diesel coverage for all IT load (and cooling)
 - 3 UPS systems per block (A+B for IT and one for cooling and infrastructure systems)
- Maximum 2.7MW
- In-row cooling units with N+1 redundancy per row (N+2 per block)
- N+1 chillers with free cooling technology (under 18°C^{*})
- Well defined team structure for support
- Fire detection and suppression for IT and electrical rooms
- Multi-level access control; site, DC area, building, room
- Estimated PUE of 1.5

- Contract currently being prepared
- During 2012
 - Tender for network connectivity
 - Small test installation
 - Define and agree working procedures and reporting
 - Define and agree SLA
 - Integrate with CERN monitoring/ticketing systems
 - Define what equipment we wish to install and how it should be operated
- 2013
 - 1Q 2013: install initial capacity (100kW plus networking) and beginning larger scale testing
 - 4Q 2013: install further 500kW
- Goal for 1Q 2014 to be in production as IaaS

- Various upgrade projects are progressing (more or less smoothly and on schedule)
- CC Upgrade to be completed in November 2012
- Gradual migration of services to new hardware in the new It room
- Remote Hosting Site ready to receive first equipment January 2013
- Expect to go into full production January 2014
- Business continuity being addressed in parallel

Interest in sharing energy saving/efficiency measures?

- Thank you for your attention!

Questions?