Components of the

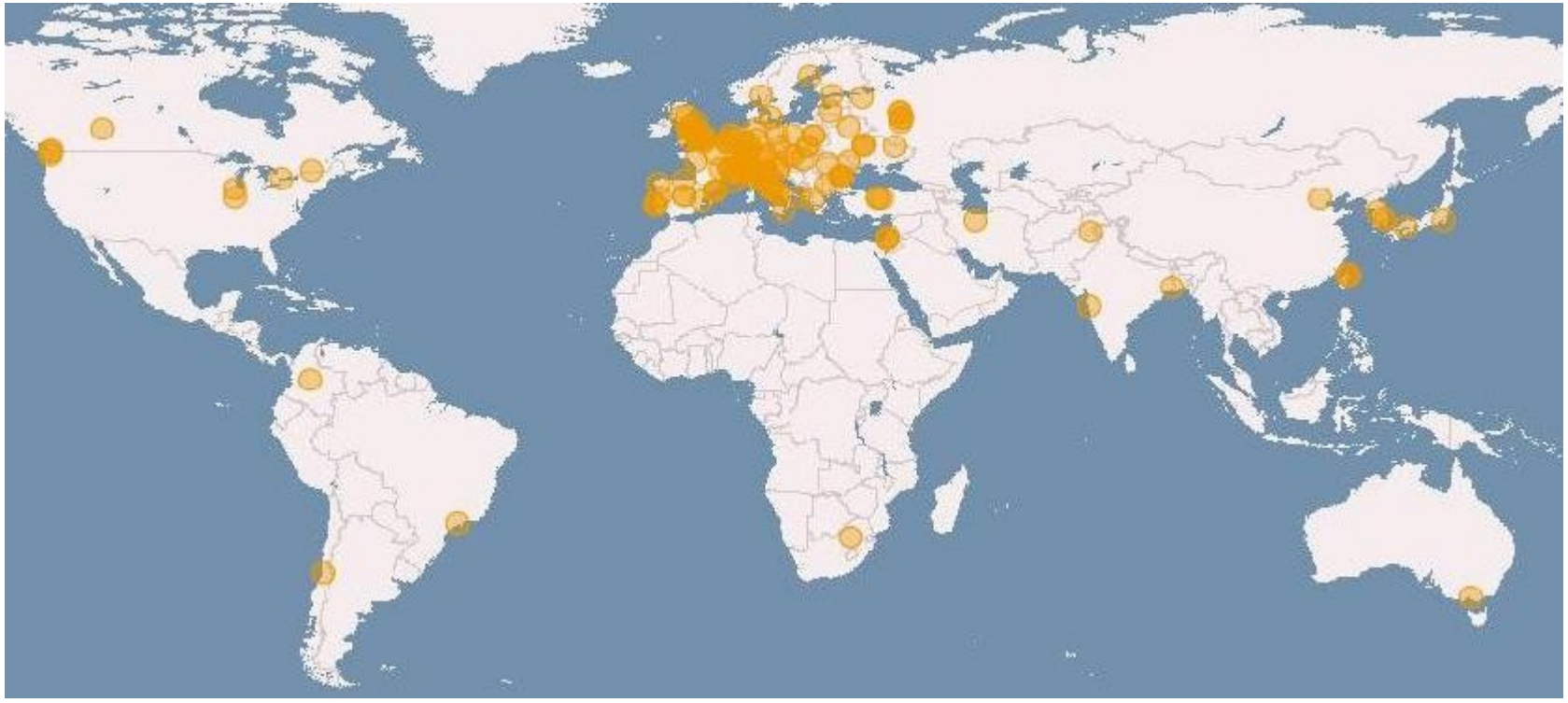
Worldwide LHC Computing Grid

in Hungary

Csaba Hajdu

RECFA meeting
Budapest, 04.10.2013

Worldwide LHC Computing Grid sites



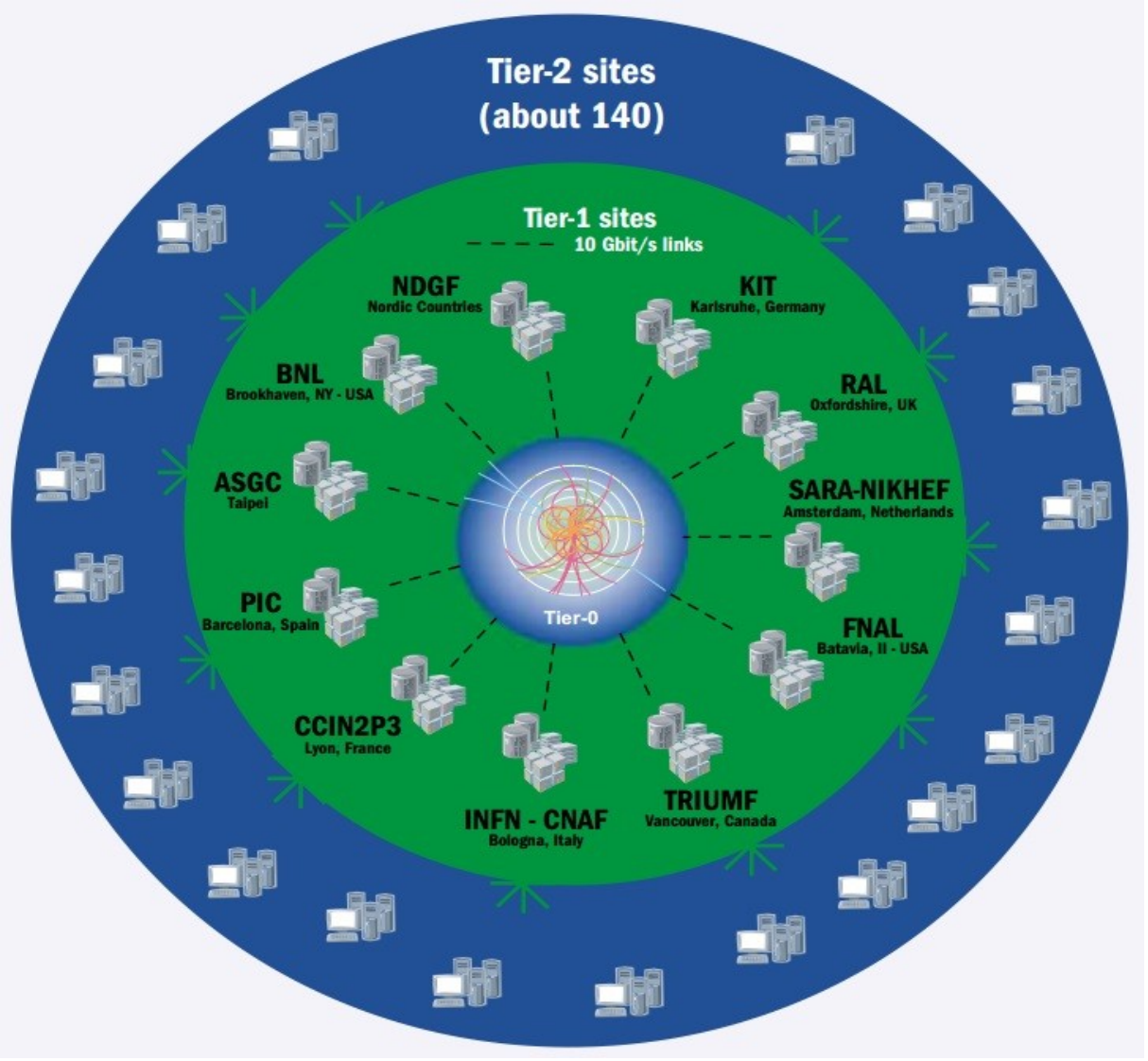
Electric power grid: we don't care which power plant supplies us

WLCG: users want results quickly, and
don't care where the data and processors are

Distributed computing facility for storing, processing and analysing the ~15PB data produced annually by the LHC

Presentlty installed capacity :
~ 180 PB tape
~ 200 PB disk
~ 450000 CPU cores

Tier structure: T0 – T1 – T2 – T3


Tier-2 sites
(about 140)
Tier-1 sites
10 Gbit/s links
NDGF
Nordic Countries
KIT
Karlsruhe, Germany
BNL
Brookhaven, NY - USA
RAL
Oxfordshire, UK
ASGC
Taipei
SARA-NIKHEF
Amsterdam, Netherlands
PIC
Barcelona, Spain
Tier-0
FNAL
Batavia, Il - USA
CCIN2P3
Lyon, France
INFN - CNAF
Bologna, Italy
TRIUMF
Vancouver, Canada

T0

storage of raw data first copy
first pass data reconstruction
data distribution to T1s
reprocessing data during LHC shutdowns

T1

raw data backups
storage of reconstucted data
storage of simulation data produced at T2
data reprocessing

T2

user analysis jobs
MC production
central commitments, but no 24/24 intervention required

T3

local clusters with no central commitments
T3_HU_Debrecen (under certification)

T0: originally the CERN Computing Center

from mid 2013: CERN + Wigner RCP

splitting is technically possible

data travels ~1000 km

operation costs are lower in Budapest

PhD student @ Wigner:

the T0 could just as well be on the Moon

unfortunalely people deciding about funding don't really get this point...

more about the T0 during the tour

T1: ~12 large sites, tape storage

not in Hungary (yet? ☺)

T2_HU_Budapest

2003

7th site to join WLCG

50 cores (32bit) + 1.8 TB

2013

~600 cores (64bit) + 290 TB

(machines from 2007 are still in production...)

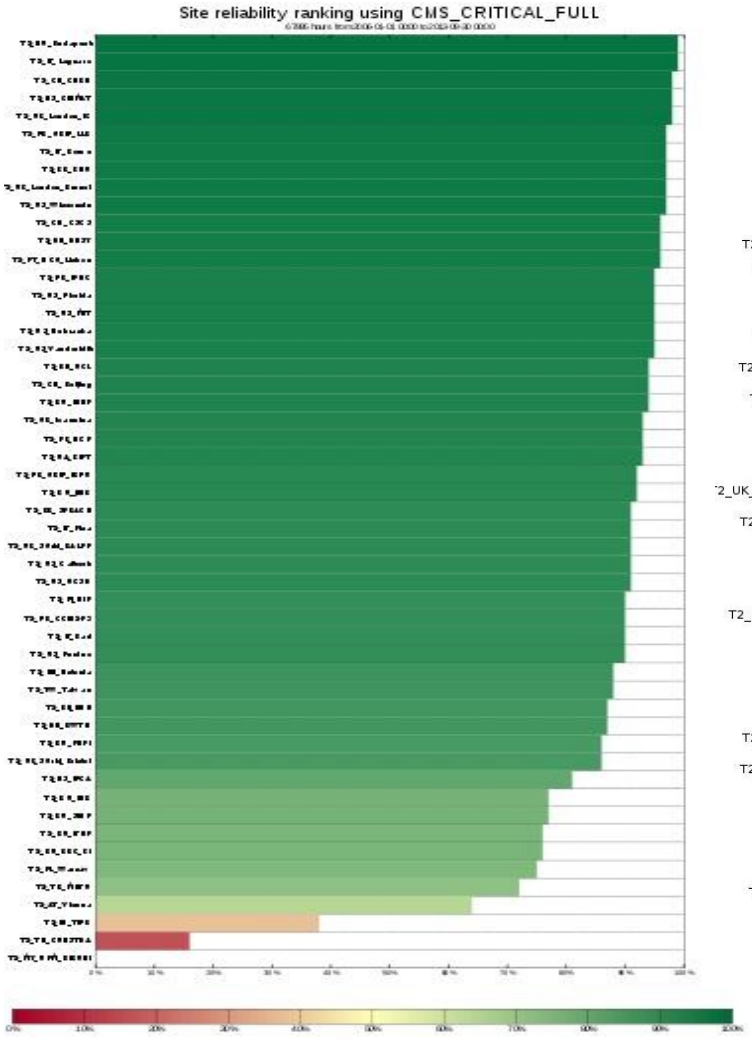
Supported VOs: Alice, CMS 1/3 – 2/3

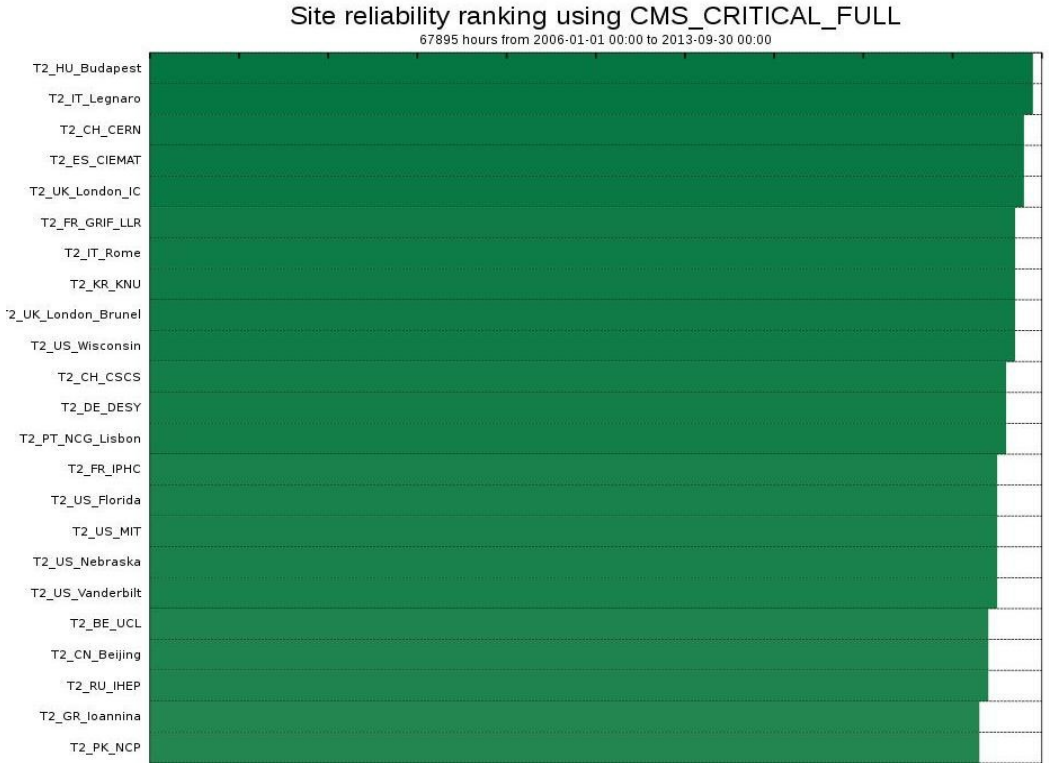
Hungrid – not WLCG, globally less than 1% of our resources
if someone needs 100 cores for a day, he has a chance to get it

Staff: 3~4 peak, 1.5 now
we are probably the T2 with the smallest staff

Cooling and UPS system recently reconstructed
10 Gbit external connection in a few months

Needed: replacement + new CPUs and storage
internal networking upgrade


Site reliability ranking using CMS_CRITICAL_FULL


Site reliability ranking using CMS_CRITICAL_FULL
67895 hours from 2006-01-01 00:00 to 2013-09-30 00:00
T2_HU_Budapest
T2_IT_Legnaro
T2_CH_CERN
T2_ES_CIEMAT
T2_UK_London_IC
T2_FR_GRIF_LLR
T2_IT_Rome
T2_KR_KNU
T2_UK_London_Brunel
T2_US_Wisconsin
T2_CH_CSCS
T2_DE_DESY
T2_PT_NCG_Lisbon
T2_FR_IPHC
T2_US_Florida
T2_US_MIT
T2_US_Nebraska
T2_US_Vanderbilt
T2_BE_UCL
T2_CN_Beijing
T2_RU_IHEP
T2_GR_Ioannina
T2_PK_NCP