International Telecommunication Union Regional Radio Conference and the EGEE grid

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Summary

- International Telecommunication Union (ITU) and the Radiocommunication Bureau (ITU-BR)
- Regional Radio Conference RRC-04/06
- The data and the planning process
- The computational problem
- The ITU-BR distributed computing system
- Experience with the EGEE grid
- Experience with Diane and MonALISA

The International Telecommunication Union (ITU)

ITU: oldest UN agency (17 May 1865) history

- Telecommunication Standardization Sector (ITU-T)
  - Production of standards covering all fields of telecommunications

    ITU-T/OGF Workshop on Next Generation Networks and Grids (23-24/10)
- Telecommunication Development Sector (ITU-D)
  - Assists the Member States in development of their telecommunication infrastructures
- Radiocommunication Sector (ITU-R)
  - Management of the radio-frequency spectrum and satellite orbits for fixed, mobile, broadcasting and many other communication services

ITU-BR RRC-04/06

- Regional Radio Conference for the introduction of digital broadcasting in the UHF (470-862 MHz) and VHF (174-230 MHz) bands.

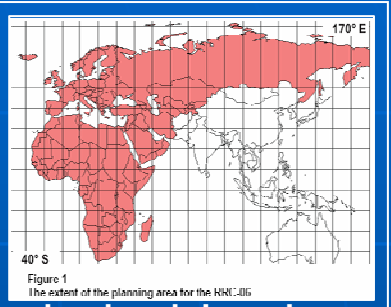


Figure 1
The extent of the planning area for the RRC-06

- RRC-04 (May 2004, 95 countries) established the technical basis (planning criteria and parameters) for the RRC-06 and defined the work for the intersessional activities
- Amongst the intersessional activities:
  - First planning exercise (28/02/05-> 15/07/05)
  - Second planning exercise (31/10/05 -> 28/02/06): Draft Plan
- RRC-06 (15 May–16 June 2006) established the new frequency plan in Geneva (120 countries, > 1000 delegates).
  This plan is part of a new international agreement.

The data

- Digital broadcasting requirements (~70 K)
  - T-DAB and DVB-T : many system variants (i.e. data capacity/reception modes) ->Reference Planning Configurations
  - Assignments (location and features of transmitter known)
  - Allotments (service area known) -> Reference Networks (number, location, power of transmitters) to approx. real networks
- Existing and planned analogue television stations (~95 K)
- Existing and planned fixed and mobile stations (~10 K)
- Administrative declarations (several millions)

The Planning process

Planning based on the protection of service area for assignments and allotments

- Compatibility analysis(*)
  - D2d, d2o-o2d

  For each digital requirement :
    - List of available channels
    - List of incompatibilities
- Synthesis
  - Determine a suitable frequency for each requirement
    - to maximize the number of requirements satisfied
    - to avoid harmful interference
- Complementary analysis(*)
  - Determine which analogue assignments may suffer interference from the implementation of a given digital assignment or allotment

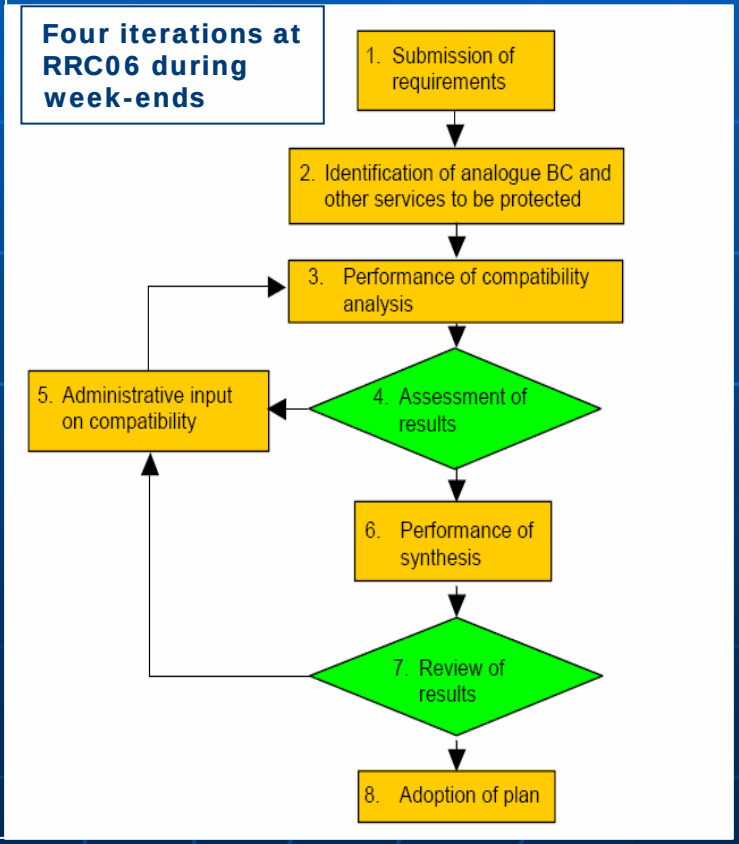
(*)Suitable to be run on a distributed infrastructure

Planning software experts:

- **K. Hunt**
- **T. O'Leary**

EBU·UER

- Propagation model for field strength prediction: ITU-R P.1546-1 (statistical model)



RRC06 outcome:GE06 Plans

GE06 Plans and related agreements

- Digital plan
- Analogue plan(*)
- List of other primary services
- Rules for modifications to the Plans and for coordination of other primary services (Art.4)
- Rules for notification of frequency assignments (Art.5)

(*)Transition period from analogue to digital broadcasting (17 June 2015 for most adm.)

Requirements satisfied (%)

	VHF	UHF
Iter1	64%	74%
Iter2	73%	85%
Iter3	84%	94%
Iter4	93%	98%

The percentage of requirements satisfied increased at RRC06 as Member States negotiated and formulated more compatible requirements.

ST61 (Europe)
GE89 (Africa)

GE06

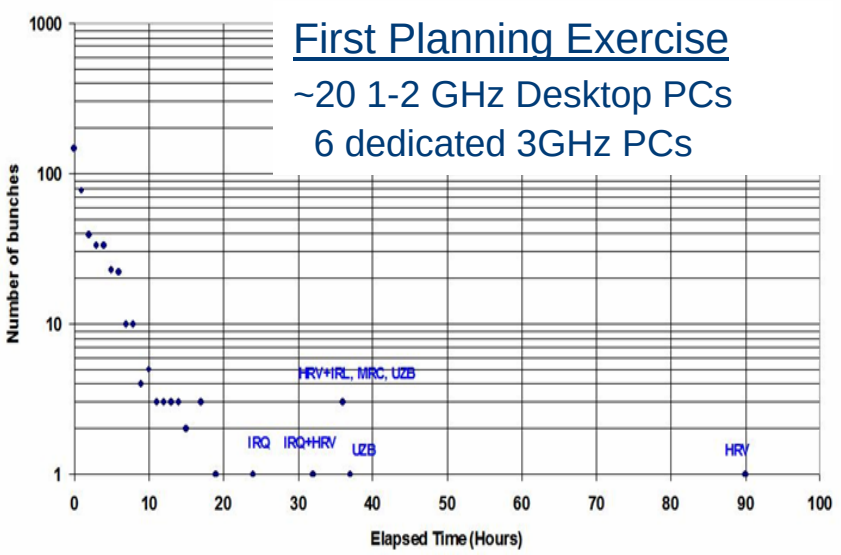
The computational problem

- Running compatibility and complementary analysis very CPU-intensive
- Very limited time to perform the calculation at the RRC06
  - Full scale calculation in < 1day
  - Smaller parallel regional area (CNG) runs during the week

<u>First planning exercise (06/2005)</u>

- CPU time: 90 days
- Elapsed time: > 1week!

d2dUHF Jobs: 428 CPU time: 1300 hours



<u>After the first planning exercise:</u>
•Look for more resources in BR
•Look for resources in EGEE

→ Safety for the RRC06: 2 independent systems

BR distributed computing system

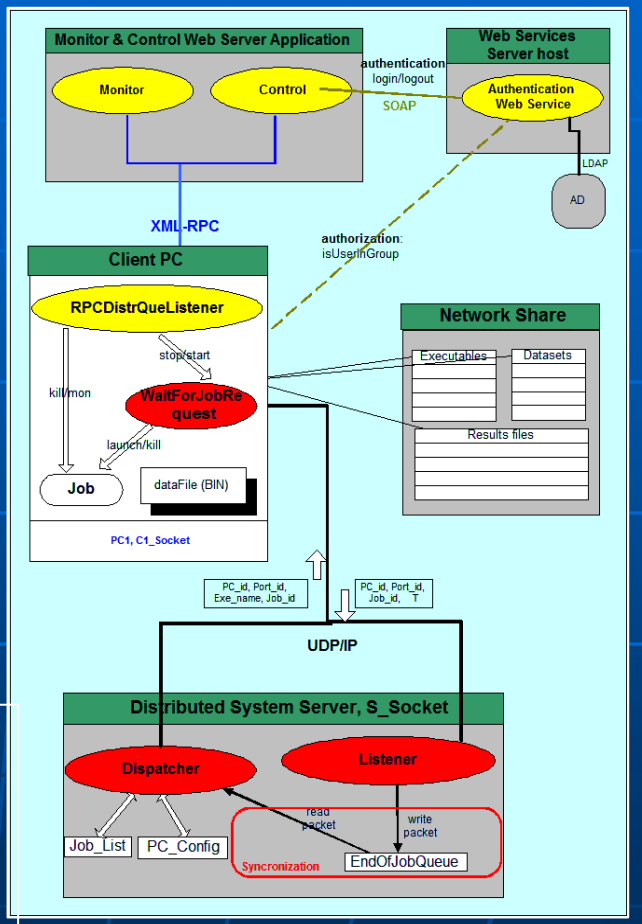
ITU-BR developed system

- Client-Server system
- Windows services, Perl
- UDP, XML-RPC
- .NET C# GUI
- Data deployment (~300MB) at client service start up (~15m.)
- MD5 checksum
- Easily scalable

Credits : J. Boursy (ITU-R)

84 3.6 GHz PCs farm
168 parallel jobs (hyper-thread)

ITU cluster Montbrillant

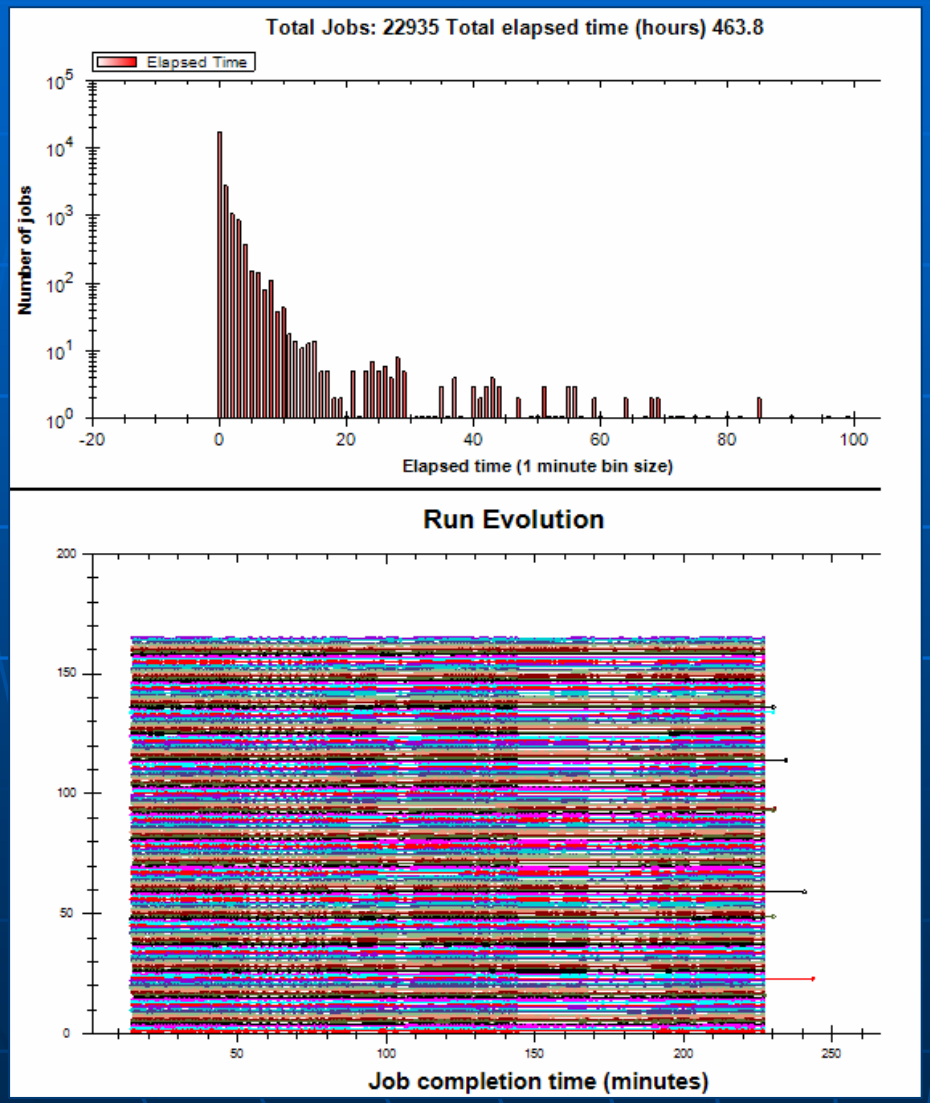


Thanks to ITU-IS:

- **infrastructure set-up (T. Arnold)**
- **support**

(S. Manandhar, J. Bhandary)

BR distributed computing system



Run ID	T Int (h)	T Elaps(h)	Jobs(#)
Iter1_1	752	6.1	18053
Iter1_2	621	5.9	26419
Iter1_2%	591	5.0	22085
Iter1_compl	415	3.0	17000
Iter2	463	4.1	22935
Iter2_compl	406	3.0	18984
Iter3	300	3.4	22935
Iter3_compl	361	2.8	4782
Iter4	205	2.6	21100
Iter4_compl	373	3.0	4774
	4487	38.9	179067

RRC06: 6.2 months running time

~180 K jobs run!!!

Experience with the EGEE grid

The work plan

- Technical kick-off meeting at CERN (Oct. 21, 2005)
- Feasibility studies and implementation (Oct., Nov. 2005)
  - Direct submission to the Grid → too much overhead!
  - Diane master-worker system to optimise the usage of resources
- Tests and refinements (Jan.-Apr. 2006)
- Verification of results quality (porting):
  - Result files comparison between EGEE (Linux) and ITU (Windows) resources
  - Full-scale test with Draft Plan data (Feb. 2006), ~30k jobs

Grid Infrastructure

- New virtual organization (GEAR, 300+ CPUs)
- Safety-> Extra Redundancy
  - 3UIs: 2 at CERN(both used), 1 in Madrid (not used)
  - 2 dedicated RBs: all used

Experience with EGEE grid

Software Distribution

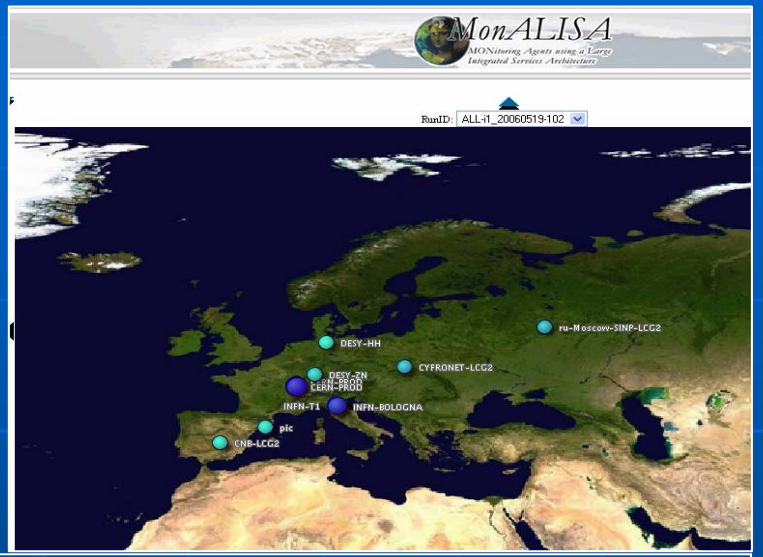
- Tarball installation in the site software area (~350 MB, soft.+ data, Md5 checksum)

CERN responsibilities:

- Consulting in GRID technologies
- Online support before and during the Conference
- Preparation of scripts for easy operation of the GRID by ITU personnel

ITU responsibilities:

- Providing tarball
- Operation of the system



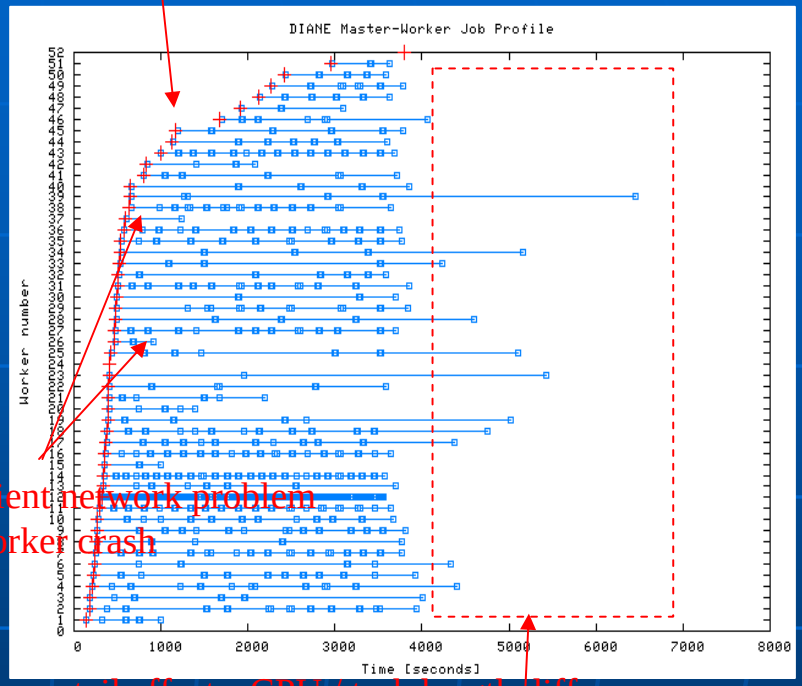
Participating institutions

- CERN
- INFN-CNAF Bologna
  (+ sites of GridIT infrastructure)
- PIC Barcelona, CNB Madrid
- DESY (Hamburg, Zeuthen)
- Cyfronet Krakow
- Moscow State University

Experience with EGEE grid

- Diane operational modes
  - active
    - start submitting jobs to EGEE when the software is ready and installed
    - conserving resources but larger latency
  - inactive
    - submit jobs to EGEE in advance and wait until the software is ready and installed
    - jobs are idling but response time is faster

(K.Moscicki poster n. 228
User Level Scheduling for improved Quality of Service in the Grid)



Source: J.Moscicki EGEE-II INFSO-RI-03 1688

Diane Applications

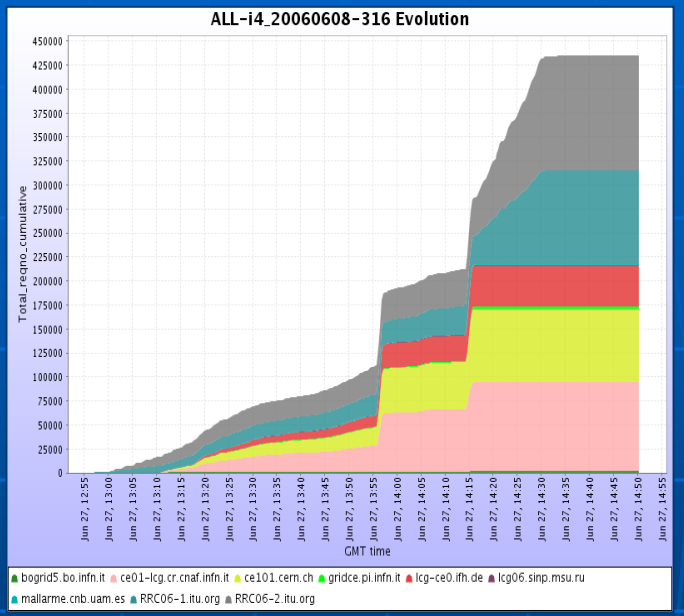
1) Data Analysis in High Energy Physics (Atlas)
2) Geant 4 Simulation in Low Energy Physics (e.g. medical apps, radioprotection, small detectors on spacecrafts)
3) Geant 4 Regression Testing
4) Bioinformatics (BLAST, Autodock) e.g. Avian Flu Drug Search (see presentation on EGEE conference by H.C.LEE)

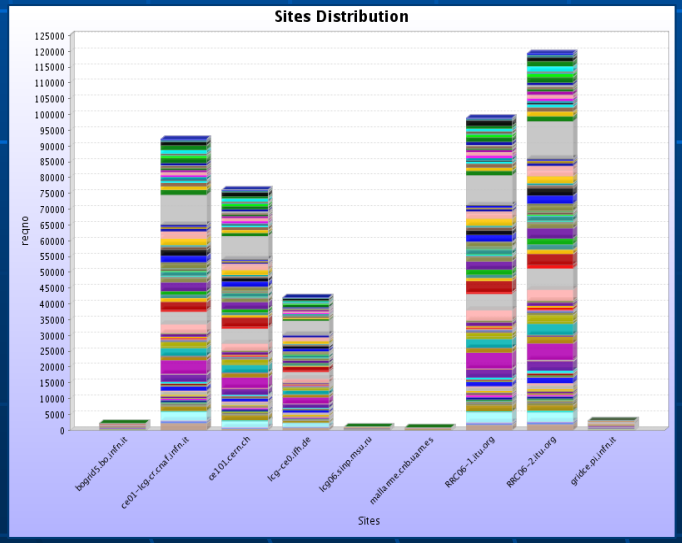
System Integration

Two complementary systems:

-Dedicated resources for fast response
-EGEE grid for maximum performance

-We have demonstrated the possibility of a seamless integration (could be interesting for other applications)





eGee Enabling Grids for E-sciencE

MONitoring Agents using a Large Integrated Services Architecture (Monalisa)

•ApMon Perl module to send UDP packets to the MonALISA service
•2 ITU clusters monitored with EGEE GRID sites!

Conclusion

- A key ingredient for the success of the ITU Regional Radio Conference RRC-06 has been the capability of performing complex calculations in a very limited amount of time.
- Two independent distributed systems have been used at the RRC-06 Conference
  - The ITU-BR system on a local cluster
  - The EGEE infrastructure
- EGEE insured adequate support for an important CPU-intensive international event and opened the possibility to allow faster and more detailed studies during the Conference

Conclusion

- EGEE: 'on demand' Grid computing for the ITU-RRC06
- EGEE guaranteed safety for the RRC06: cross-checking results
- User Level Scheduling EGEE Grid with Diane allowed successful run of ITU application (high QoS requirements)
- ITU: new user community integrated very quickly into the grid (ITU staff was trained to be autonomous in a short time)
- ITU personnel performed most of the operations (but required often expert support)

Acknowledgment

CERN: K. Moscicki, P. Mendez, A.Muraru, M. Lamanna
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Press releases:

- **Digital broadcasting set to transform communication landscape by 2015**
- **EGEE helps achieve international digital broadcasting agreement**