





NIHAM distributed computing system

-past, present and future-

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NIHAM

- "Nuclear Interactions and Hadronic Matter" Centre of Excellence
- Lead by Prof. Mihai Petrovici
- Members from many IFIN-HH departments and from other institutions
- The group is doing **research in many areas of nuclear physics**
- Core members of the group were involved in the past or are involved now in many international physics collaborations, such as DRACULA (designed by the group), CHIMERA, FOPI, ALICE, and also in the preliminary phase of CBM
- Members of the group were involved in the development of ALICE-TRD detector and frontend electronics
- •NIHAM produce now >20% of ALICE-TRD chambers
- •Members of the group are involved in EGEE project
- NIHAM GRID site

















FOPI – Event Display









Distributed computing - past

- Members regularly used clusters at international sites
- NFS regularly used between user computers
- MOSIX cluster M. Duma
- AliEn site C. Schiaua and G. Stoicea (2002)









Distributed computing - 2005

- The "present" started in 2005, when funding become available
- The first production-grade cluster, 1 frontend machine (dual Xeon 3GHz, 2GB RAM, 2.4 TB raw HDD), 6 nodes (dual Xeon 3GHz, 4GB RAM) another 4 at the end of the year, all server-class, 32bit
- I Gb/s network
- Fortunately, we had a proper space within the Detector Laboratory, cooled by the Lab's unit







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2005 results

- Among the firsts AliEn2 sites (mayjune 2005, C. Schiaua)
- In production since september 2005
- 838 jobs done

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Sites			Edit +
SITE	ADMINISTRATOR	LOCATION	DOMAIN
FZK	Kilian Schwarz <k.schwarz@gsi.de></k.schwarz@gsi.de>	Karlsruhe	fzk.de
CERN			cern.ch
Sejong	Chang Yeong Choi <chang.yeong.choi@cern.ch></chang.yeong.choi@cern.ch>	Seoul, South Korea	sejong.ac.kr
Muenster	Jan Fiete Grosse-Oetringhaus <jfgrosse@uni-muenster.de></jfgrosse@uni-muenster.de>	Muenster	uni-muenster.de
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CERN © 2001 - European Organisation for Nuclear Research - ALICE Experiment









2006 takeoff: developments

- 40 new machines deployed during the year (dual Xeon 3.2 Ghz, 2 MB L2, 4GB RAM), 64 bit
- EGEE site (C. Aiftimiei, C. Schiaua)
- Policy: "Regarding GRID, there is nothing more important than having a running and used site"
- Policy: exploit to the maximum extent the "dedicated" character of the site in order to achieve high stability and availability
- Policy: try to find as fast as possible solutions for the problems showing up during production







Total CPU time for ALICE jobs

Torino - TriGrid Catania - Truiillo - UiB - UNAM



2006 takeoff: results

- ~33500 jobs DONE
- ~360 kHours CPUTime
- ~7% of ALICE
- Starting with September 2006, NIHAM Storage Element was used by ALICE production jobs to store log files



— Bari ← BITP ← Bologna — Cagilari ← Catania ← CCIN2P3 ← CERN ← CERN-L ← CERN.gLite ← CERNMAC ← Clermont ♠ CNAP ← Cytronet ← F2K ← GRIE_DAPINIA ← CSI ← Houston ← HEP ← HPNO ← DS ← HTEP ← KKI ← KNU ← Kolkata ← Kosice ← LBL ← Legnaro ← Madrid ← Muenster ← NIHAM ← NIKHEF ← OSC ← PNPI ← Prague ← RAL ← RRC-KI ← SARA ← SINP ← SUbatech ← Torino ← ThCrind_Catania ← Trujilio ← UNA

Total CPU time for ALICE jobs [hours]



Written files to SEs



UiB















2007 developments

- I5 new machines (dual dual-core Opteron, 2GHz, 8GB RAM)
- 48 TB raw SAS storage (new technology)
- I0 Gbit/s connection to DIC
- The most important development: NIHAM Datacenter, industrial grade cooling unit, industrial-grade UPS-es, Cat. 6 cabling, connection to Institute's Diesel generator









Results up to date

- ~810 kHours delivered
- ~88000 jobs DONE
- ~6.7% of ALICE
- ~2380000 files saved to NIHAM SE
- Average Site Services Availability since July, 1, 2006 : >95%



Aalborg + Athens - Bari + Birmingham + BITP - Bologna - Cagilari + Catania + CCN2P3 + CERN + CERN + C CERN Julit + CERN Jualice0 1 + CERNIAC + Clermont + CNAF + CSC - (Vronet + DCSC, VU + Florence + F2K CRFL DAPUAL + CSC + Houston + HEP + IPNO + DS + ITEP + JUINE + JUASKA Kosice + LBL - Legnaro + LUNARC + Madrid + Muenster + NIHAM + NIKHEF + NSC + OSC + PANDA + FNPI + Poznan Prague + RAL + RFC-KI - SAPA + Sejong + SNP + SPESU + Strasbourg.IRE5 + Subatech + Torino + TriGrid, Catania Trujulo + UTC, CERN, RC + UI = UNAM + UPH + WUT





Aalborg ● Alhens ● BIT = Barn ● Birmingham ● Bologn ● CCIN2P 3 ○ CENN ← CEN-L ● CENNALC ● CENNALC ● CINA ● CSC ⊂ agliant ← Catania ← Ciramon ← Cynore + OCSC / VIO ← ZX ● Filomene ← CRIE (DAPANIA ← CSI ● HUDAN ← HIFP ● FINO ● ISS ● ITEP ● JINR ● Jyvaskyla ● KFXI ● KXTI ● KXIU ● Kolkata ● Kosice ● LBL ● LUNARC ● Legnaro ● Madrid ● Muenster ● NIHAM ● NIKHEF ● ISC ● OSC ● PANDA ● NNI ● Poznan ● Frague ● RAL ● ØRC-KI ● SARA ● SINI ● SF050 ● Sejong ● Strasbourg_IRES ● Subatech ● Torino ● Trinford (catania ⊂ Triughiae UT_CERR_K © E UNAM ● USE ● WIB ● WIT



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Integration with EGEE

- Developed (C. Schiaua) a tool to report AliEn accounting data to RGMA. Still need some polishing before being published.
- EGEE data: >1mil kSi2K hours delivered
- According to EGEE data, NIHAM delivered more than 71% of country's contribution since EGEE accounting started (2004)
- This figure does not take into account last ~3 months of NIHAM (data not yet published by us) and does not include ISS GRID contribution (ISS is not yet EGEE site)
- Taking this 2 factors into account, and assuming that, except ISS, there is no other GRID site in Romania outside EGEE, NIHAM delivered ~75% of country's contribution to EGEE representing ~55% of Romania's computing time delivered trough GRID technologies







Cluster structure









Monitoring – Ganglia, MonALISA









Current Developments

- Deploying a new SE, 48 TB raw, SAS. New technology, requires testing in order to find optimal configuration
- Designing an automatic monitoring, alarm and control system.
- Deploying the required software for local parallel analysis (proof)















Team

Infrastructure planning: M. Petrovici, C. Schiaua

- Cluster maintenance & operation: C. Andrei, C. Schiaua
- GRID site management: C. Aiftimiei, C. Schiaua
- Cooling & Power maintenance: G. Giolu, P. Zaharia
- Immediate action when needed: NIHAM

Thank you!