Computing Status

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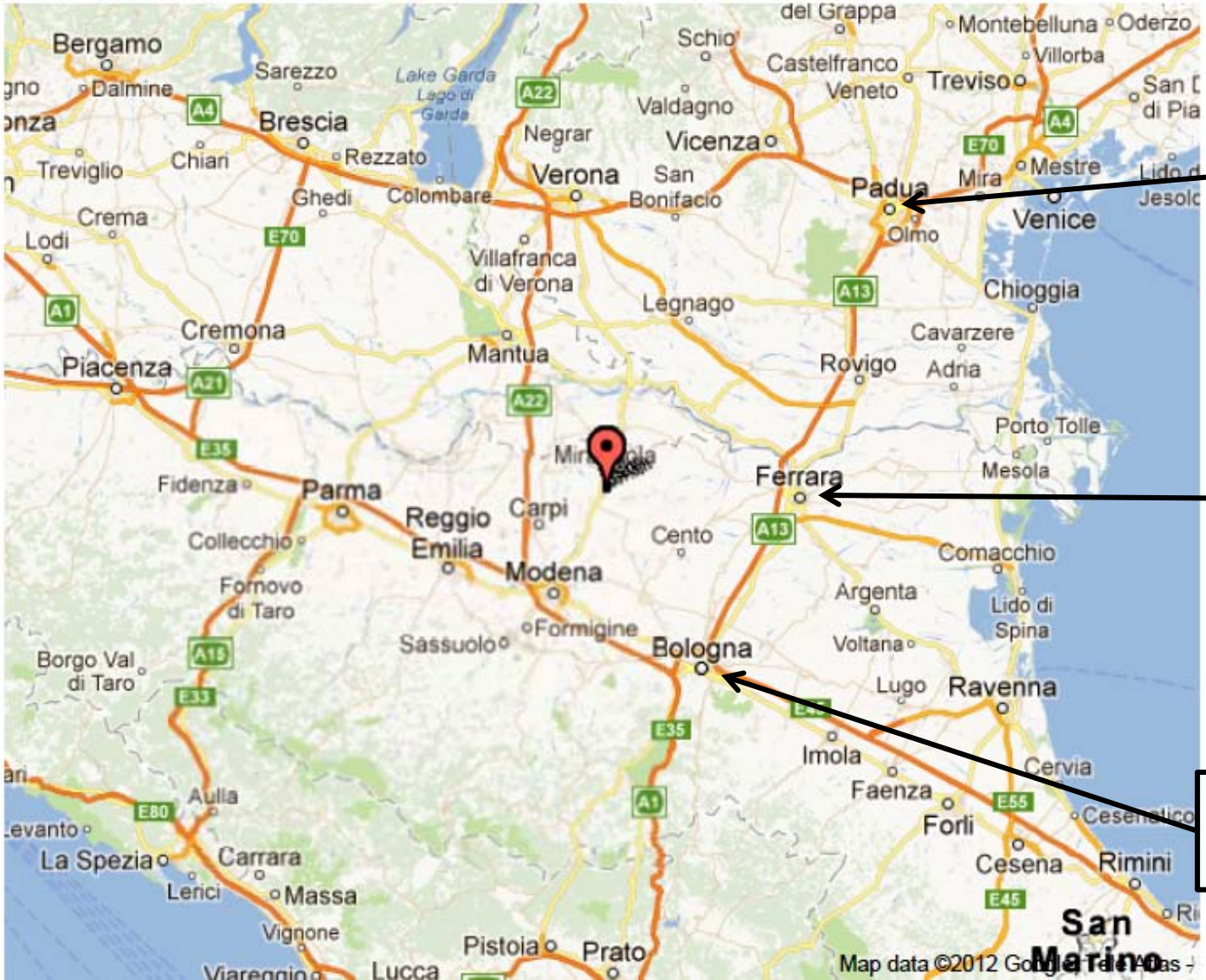
Torino

IV SuperB Collaboration Meeting
Elba, June 1st, 2012

Outline

- Impact of earthquake.
- Collaborative Tools.
- FastSim & Physics Tools. -> Physics Tools session.
- FullSim & Background. -> FullSim & Background session.
- Distributed Computing -> Distributed Computing session.
- Status of PON ReCaS.
- R&D -> R&D + Planning sessions.
- CHEP -> CHEP Report session.

May 20th and 29th Earthquakes (1)



SVN, YUM, Alfresco

Wiki, LDAP Authentication

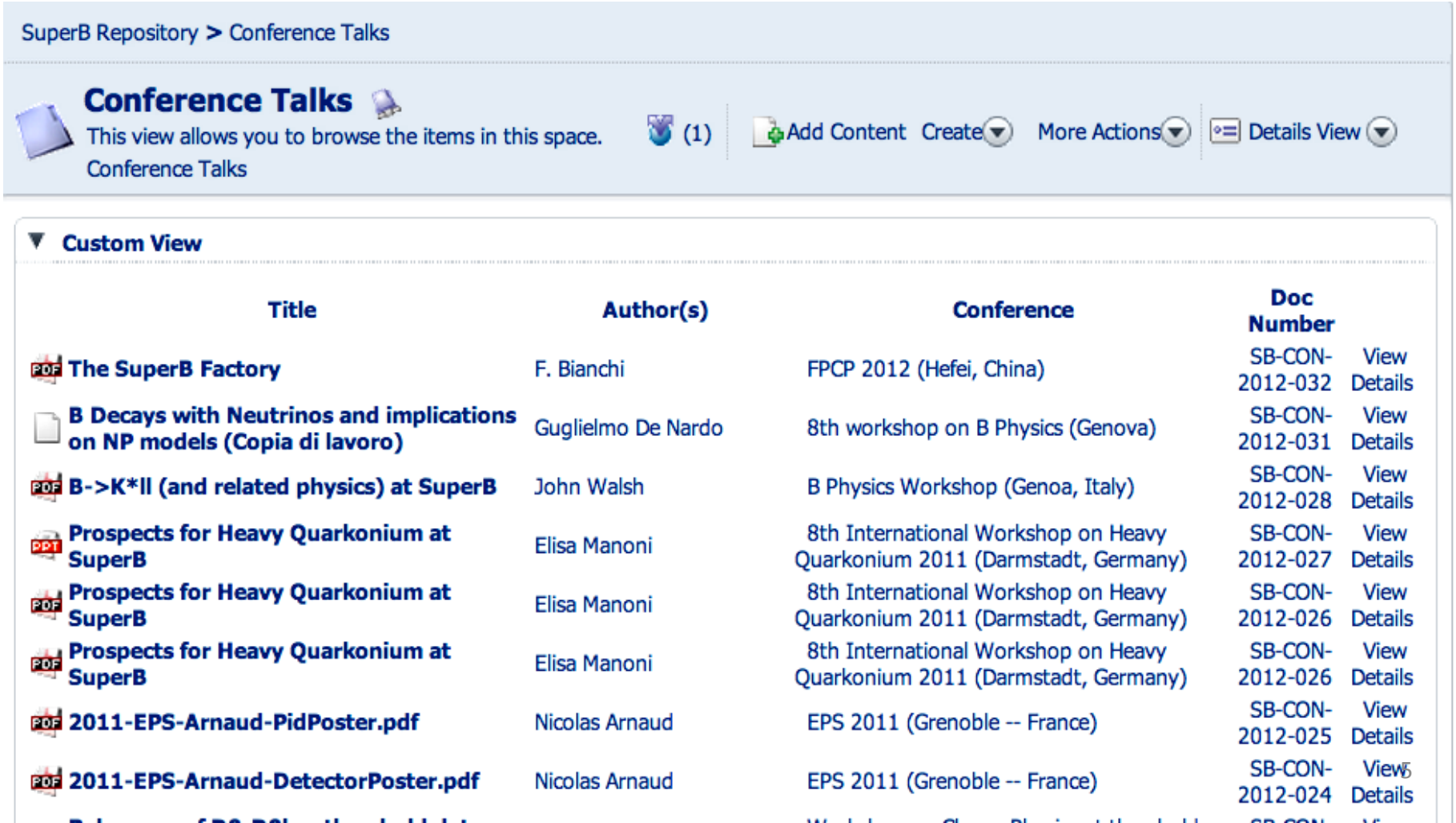
CNAF: portal, single sign on systems

May 20th and 29th Earthquakes (2)

- Impact on SuperB collaborative tools:
  - Network interruptions.
  - Physics Department in Ferrara and CNAF closed to allow safety checks.
  - Services unavailable.
- In the near future moving all coll. tools to an high availability cluster at CNAF will avoid couplings between problems at different sites.
  - Hardware at CNAF.
  - Set up expected next week.
- On a longer term: duplication of services in another location.

Collaborative Tools

- Web portal migrated to Liferay 6.1
- Improved display of information in Alfresco.



Recent Activity of the Physics Tools Group

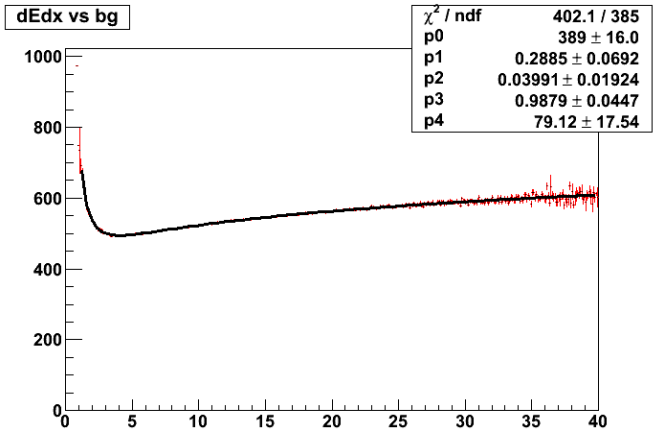
- FastSim and tools main recent developments:
  - developments in detector simulations
    - DCH, EMC
  - background frames
    - towards adding also Touschek and beam gas bkg to physics events
  - vertexing tools
- Next FastSim release:
  - V0.3.2currently scheduled for the week of June18

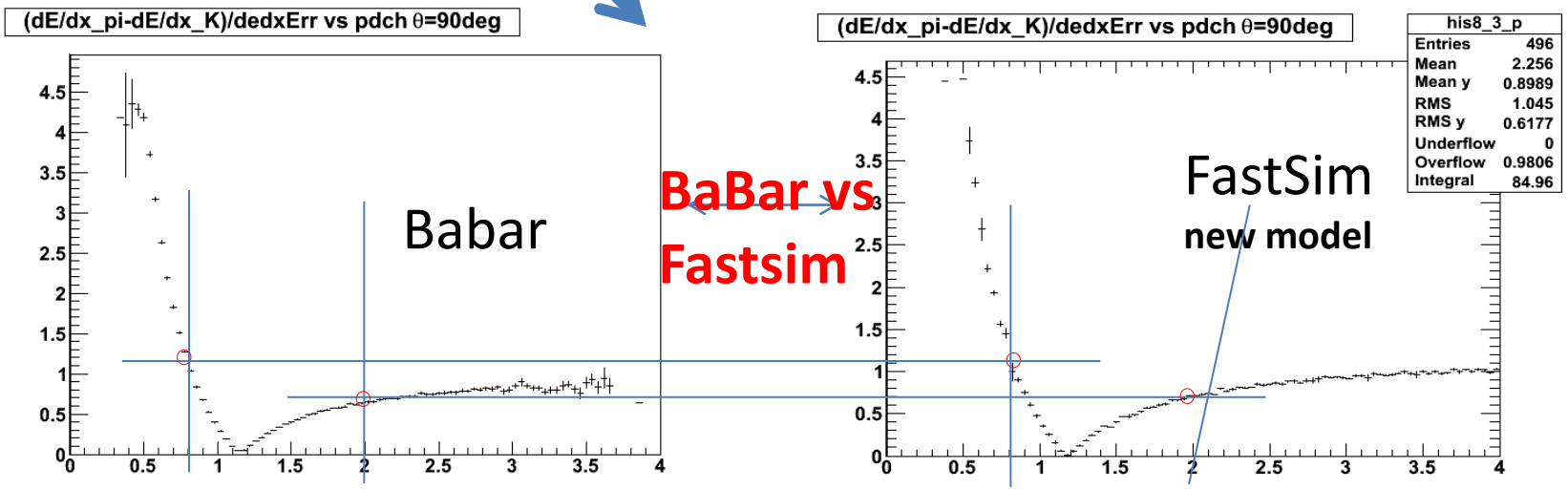
Example of Improvement in Detectors Simulation

Improved dE/dx measurement in DCH

step 1: fit dE/dx vs bg on BaBar data.

step 2: use this function instead of the built-in Bethe Bloch in FastSim.





The agreement is good at all momenta

Physics Tools Session this Week

Saturday, June 2 at 16:00

16:00->*17:30* **Parallel 5: Computing + Physics - Physics Tools** (Convener: Matteo Rama (*LNF*)) (Sala Elena)

16:00	Background frames (20')	Luis Alejandro Perez Perez (*PI*)
16:20	EMC simulation in fastsim (20')	Chih-hsiang Cheng (*Caltech*)
16:40	update simulation of dE/dx in fastsim (20')	Matteo Rama (*LNF*)
17:00	Vertexing tools (20')	Gianluca Inguglia (*Queen Mary University of London*)

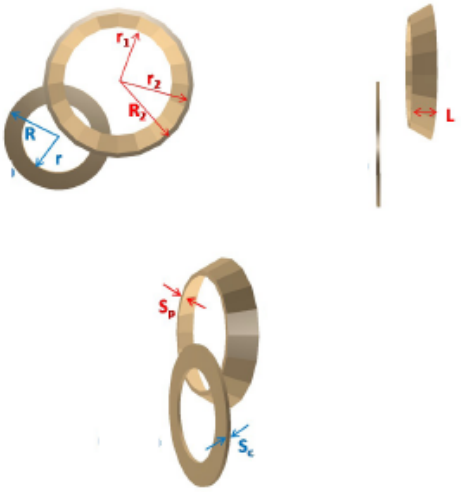
Use and performance of physics tools are discussed in many Subsystems and Physics sessions. In particular:

Sunday, June 3 at 15:40

15:40->*17:10* **Parallel 9: Det + Physics - Physics Performance in presence of background** (Sala Maria Luisa)

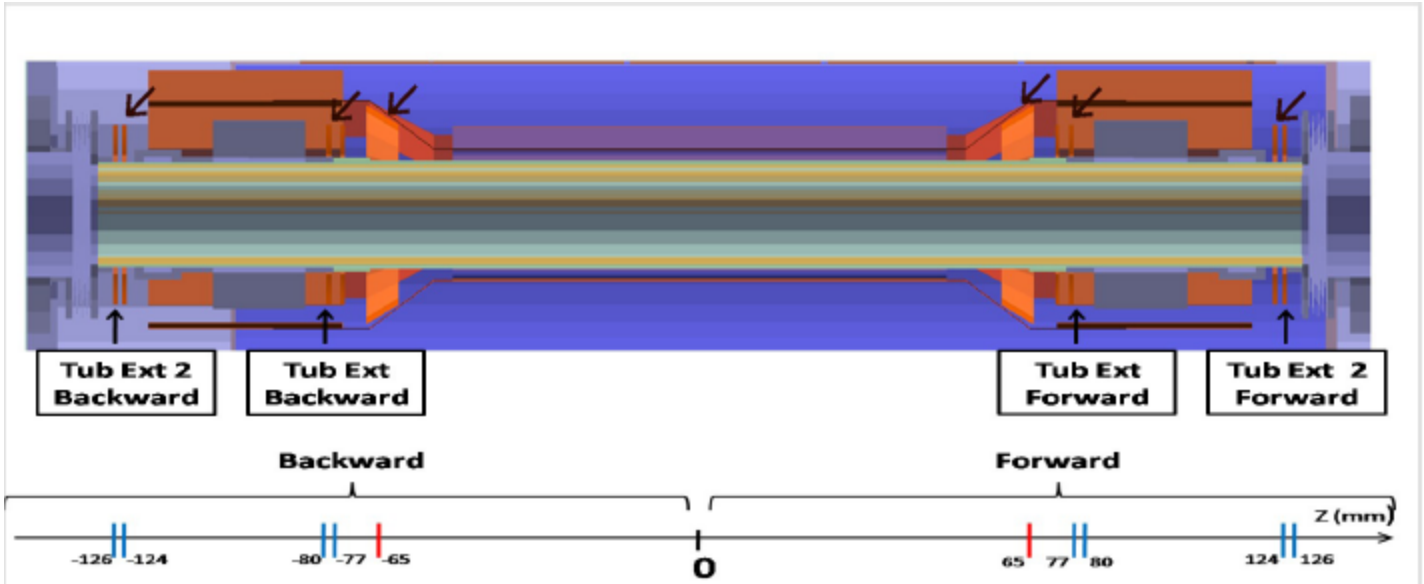
FullSim

- Added radiation monitors.
- Performed many studies with dedicated production.
  - Results to be presented in MDI session.



Tube
r=12 mm
R=18 mm
Sc=1 mm
Area=565.49 mm2

Polycone
r1=16.8 mm
R1=18.2 mm
r2=20.8 mm
R2=22.2 mm
L=7 mm
Sp=1.4 mm
Volume=3431 mm3



April 2012 production: FullSim samples

- **We produced several samples to estimate machine induced background:**

- Rad-bhabha samples for three geometries (which include new FDIRC Lead-steel-polyethylene shield): 10k bunch crossings
  - Geometry_CIPE_V00-00-02 (nominal W-shield -> 3.0cm)
  - Geometry_CIPE_V00-00-02_Tungsten4.5cm (W-shield increased by 1.5cm -> 4.5cm total)
  - Geometry_CIPE_V00-00-02_CSI_Tungsten4.5cm (W-shield 4.5cm thick and Fwd-EMC is CsI)

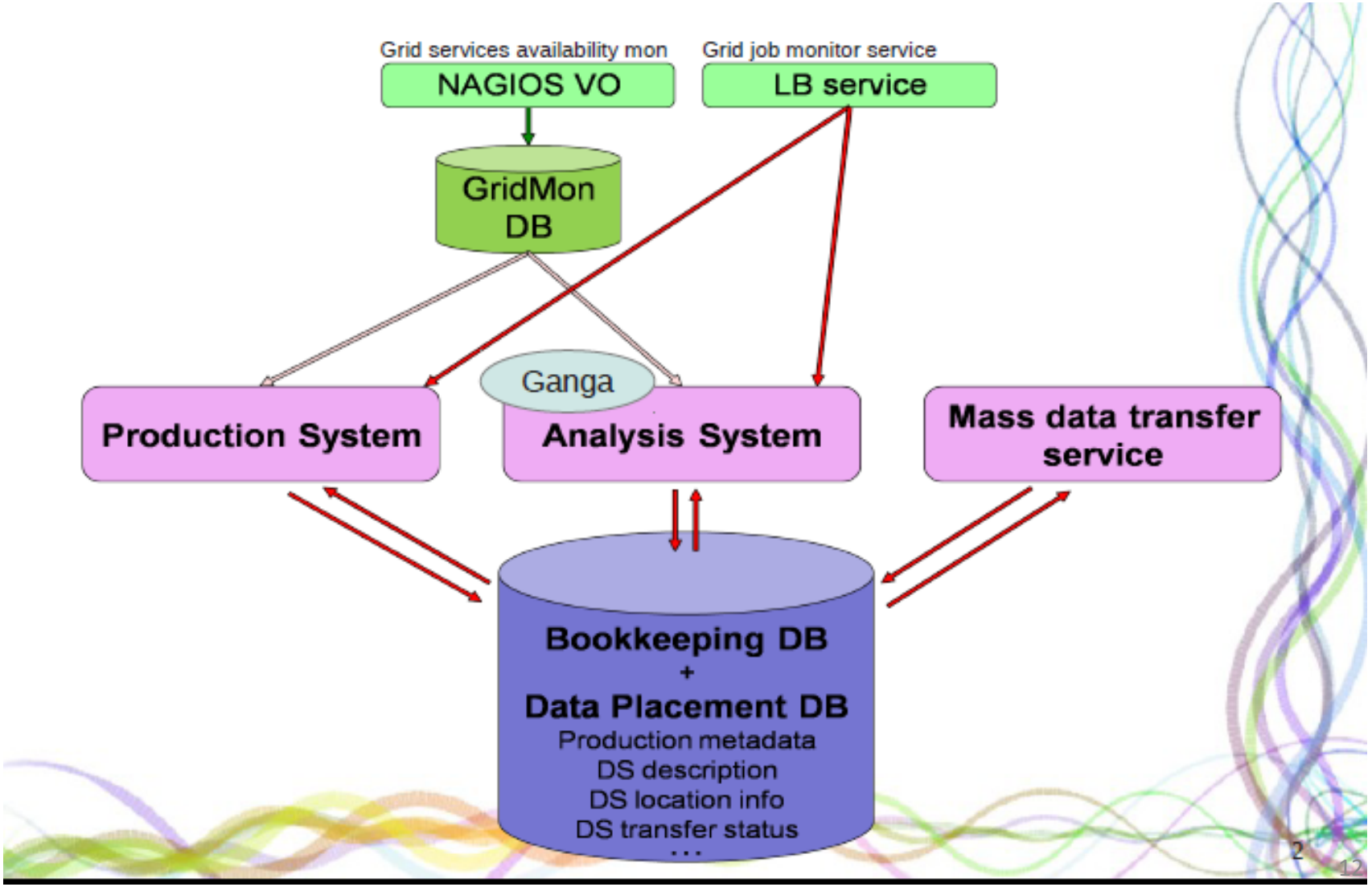
- The other background sources were generated with the same geometry: Geometry_CIPE_V00-00-02_Tungsten4.5cm (W-shield 4.5cm thick)
  - Pairs (2-photon): 100k bunch crossings
  - Touschek HER/LER: ~250k primary losses
  - BeamGas HER/LER: ~280k primary losses

April 2012 production: FastSim background frames

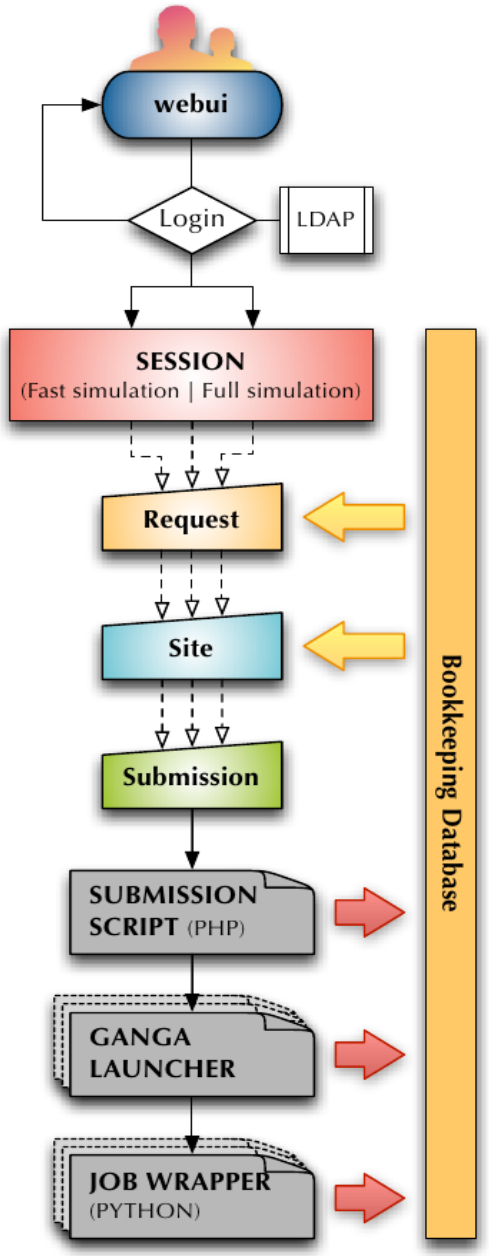
- **We also produced the fast-sim bg-frame samples for all the background sources considered up to now:** Geometry with the Wshield increased up to 4.5cm thick
  - Rad-bhabha: 1M bunch crossings
  - Pairs (2-photon): 100k bunch crossings
  - Touschek HER/LER: ~250k primary losses
  - BeamGas HER/LER: ~280k primary losses

- It is the first time Paris, Touschek and BeamGas bg-frame samples are produced with BRN:
  - Pairs bg-frame sample need to be compared with the samples
  - produced with fast-sim
  - Touschek/BeamGas samples are biased (every primary has a
  - weight): need to develop a code in fast-sim to correctly include these
  - sources in the fast-sim background mixing framework

Distributed Computing Tools Overview



Production System



- Porting of framework code permitting interaction with new PostgreSQL bookkeeping DB, completed.
- New dataset management and job submission monitor features completed and tested.
- New monitor features related to Logging and Bookkeeping service interactions completed.
- New resource integrated monitor completed.
- Bookkeeping Wide Area Network interface is under refactoring.

Book-keeping Database

- Porting of BK DB from MySQL (5.1) to PostgreSQL (9.1) decided after the 2nd SuperB Collaboration Meeting.
- Porting is now completed.
  - Stress test performed, results are excellent.
- A quality check in terms of Normal Forms analysis has been completed.
  - A list of problems has been released
- FastSim production will use PostgreSQL backend, FullSim is still using MySql

Ganga SuperB Layer

- Main functionality implemented and tested
  - Analysis of personal or official production and generic dataset.
  - Personal production.
  - Basic dataset management, status and transfer tasks
- SuperB ganga plugin passed the code review session with Ganga developers.
- SuperB plugin code resides now on official Ganga project SVN.
  - The complete integration with official Ganga release is in progress.
- Development of few remaining basic functionality is in progress.
  - Plans include large scale tests.
- Tutorial page:
  - http://mailman.fe.infn.it/superbwiki/index.php/Tutorial_%28draft%29

Nagios Monitoring (CNAF)

- Site status is monitored with NAGIOS:
  - https://sb-serv01.cr.cnaf.infn.it/nagios/
- Interoperability with new VO dashboard portal has been tuned.
- Still some bugs unresolved impacting xml configuration file
  - A solution is under testing
- Host monitoring tool under development in Napoli
  - Primary target is monitoring the resources in the PON sites.

Dirac Evaluation

- New Dirac release has been installed at CNAF:
  - Better documentation.
  - Improved configuration workflow. The entire system has moved to a more general design in terms of VO requirements.
- Work in progress: Mass data transfer test, direct submission
- Dirac training workshop on June 7th.
  - Someone will participate.

Distributed Resources

27 sites are available to the SuperB VO.
From: Canada, France, Italy, Poland, UK and USA

Site	Min (cores)	Max (cores)	Disk (TB)	SRM layer	Grid Org.	Site contacts
RAL(T1)	200	1000	25	Castor	EGI	F. Wilson, C. Brew
Ralpp	50	500	5	dCache	EGI	F. Wilson, C. Brew
Queen Mary	300	2000	150	StoRM	EGI	A. Martin, C. Walker
Oxford Univ.	50	200	*1*	DPM	EGI	K. Mohammad, E. MacMahon
IN2P3-CC(T1)	*500*	*1000*	*16*	dCache	EGI	N. Arnaud, O. Dadoun
Grif	50	300	2	DPM	EGI	N. Arnaud, O. Dadoun
in2p3-lpsc	50	100	2	DPM	EGI	J.S. Real
in2p3-ires	50	100	2	DPM	EGI	Y. Patois
CNAF(T1)	500	1000	180	StoRM	EGI	A. Fella, P. Franchini
Pisa	50	500	0.5	StoRM	EGI	A. Ciampa, E. Mazzoni, D. Fabiani
Legnaro	50	100	1	StoRM	EGI	G. Maron, A. Crescente, S. Fantinel
Napoli	500	2000	15	DPM	EGI	S. Pardi, A. Doria
Bari	160	260	0.5	StoRM/Lustre	EGI	G. Donvito, V. Spinoso
Ferrara	10	50	0.5	StoRM	EGI	L. Tomassetti, A. Donati
Cagliari	10	50	1	StoRM	EGI	D. Mura
Perugia	10	50	1	StoRM	EGI	R. Cefala'
Torino	50	100	2	DPM	EGI	S. Bagnasco, R. Brunetti
Frascati	30	100	2	DPM	EGI	E. Vilucchi, G. Fortugno, A. Martini
Milano	50	100	2	StoRM	EGI	N. Neri, L. Vaccarossa, D. Rebatto
Catania*	?	?	?	StoRM	EGI	G. Platania
Slac	400	400	10	NFS	OSG	S. Luiz, W. Yang
Caltech	200	400	4.5	NFS	OSG	S. Lo, F. Porter, P. Ongmongkolkul
Fnal*	50	400	1	dCache	OSG	M. Slyz
OhioSC*	?	?	?	dCache	OSG	R. Andreassen, D. Johnson
Victoria	50	100	5	dCache	EGI	A. Agarwal
McGill*	100	200	1	StoRM	EGI	S. Robertson, S.K. Nderitu
Cyfronet	100	500	10	DPM	EGI	L. Flis, T. Szepienie, J. Chwastowski
Total	3570	11510	440			

* VO enabling procedure in progress

Distributed resources status

- Distributed resource full testing is in progress:
  - Misconfiguration problems in ~1/3 of the sites.
  - Fixing, reinstalling and further testing in progress.
- VO enabling operations at remote sites:
  - **McGill**: testing services in progress.
  - **SLAC**: new services under testing.
  - **Caltech**: enabled for the VO.
  - **Fermilab**: final test phase.

OSG

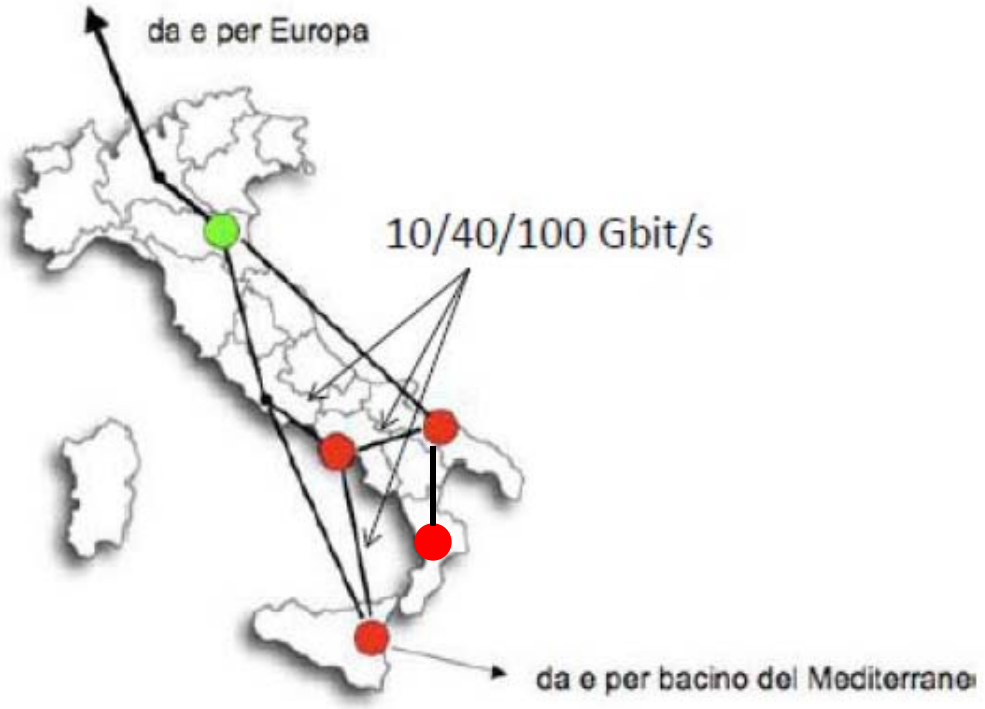
- A cooperation with OSG support group is in place since four months:
  - Meeting participants: G.Garzoglio (OSG support leader), S. Luiz, M.Slyz, T.levshin.

- Goal is to fit the SuperB requirements to OSG computing peculiarities.
  - Authentication, resource setup, training issues.
  - Site contacts interface.
  - All OSG sites could be enabled.
    - Efforts focused on SLAC, Caltech, Fermilab and Ohio Supercomputing Center.

Computing Infrastructure (1)

- In Italy:
  - CNAF
  - 4 new centers in Bari, Catania, Cosenza, Napoli

- + centers in other participating countries

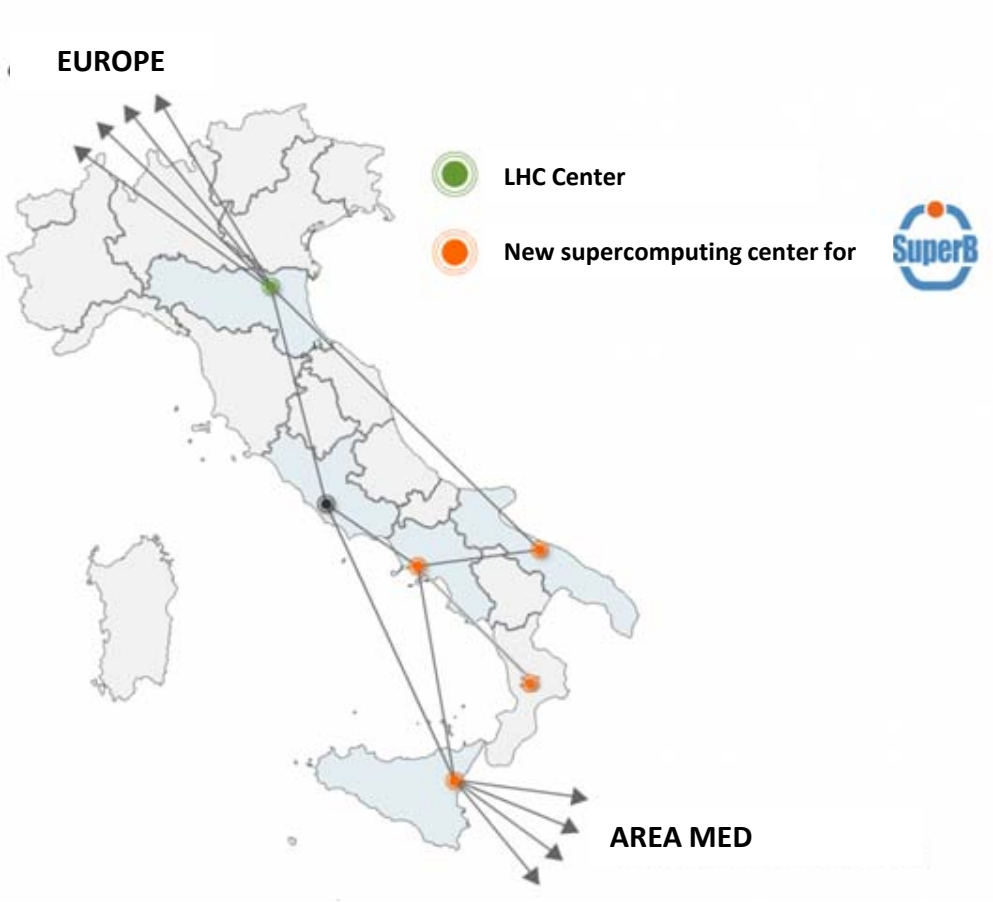


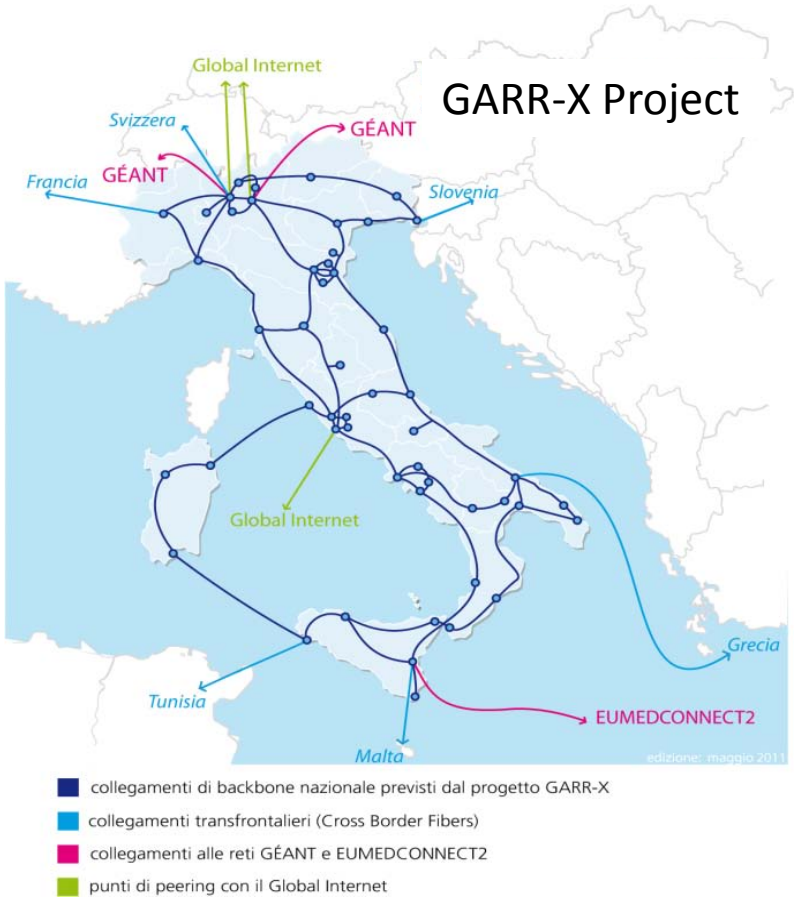
Computing Infrastructure (2)

- Discussions are in progress, will produce a document.

- Baseline:
  - Minimal amount of resources at Cabibbo Lab
    - Online + data buffer on disk + (calibration pass of event reconstruction).
  - Raw data on tape at CNAF.
    - Second copy elsewhere.
  - Cabibbo Lab, CNAF & ReCaS centers will have the functionalities of a "Distributed Tier0".
    - Event reconstruction, MC production, Skimming, (Analysis).
  - Tier1 & Tier2 class centers: MC production and Analysis.

ReCaS Rete di Calcolo per SuperB e altre applicazioni





The sites are now migrating to GARR-X network (Napoli in one month, Bari in two months)

ReCaS Rete di Calcolo per SuperB e altre applicazioni

Storage, Server and Infrastructure specifications for UNINA, INFN-NA, are completed.

UNIBA, INFN-BA and INFN-CT require more detailed specifications (4 months).

The first tenders (NA & BA) will start soon.

Planned Resources

	CPU kHepSpec	Storage (PByte)
UNINA	6	0,8
INFN-NA	2	0,3
UNIBA	10	2,5
INFN-BA	3	0,5
INFN-CT	7	0,8
INFN-CS	5	0,6
TOTAL	33	5,5

R&D: Parallel Computing (1) (Padova, CNAF)

- Goal: extracting sources of parallelism in SuperB applications:
  - Analysis algorithms work on millions of events → execute the same algorithm on many events concurrently
  - Some algorithms can be split up → execute chunks of computation on the same event concurrently
  - Dataflow can be factorized to run different processing steps concurrently → this is currently **our primary goal** with the SuperB framework

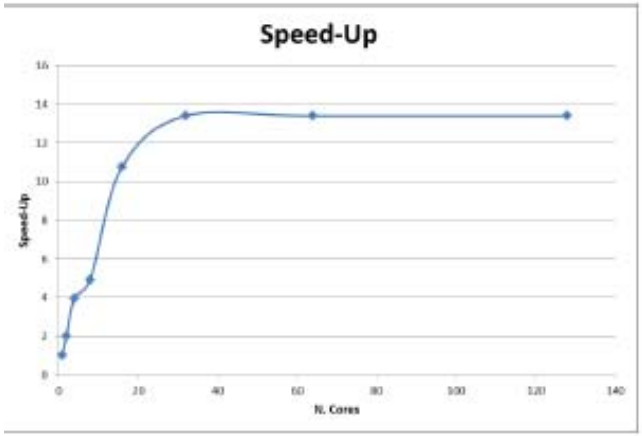
- First step is the analysis of current code, specifically FastSim
  - The goal is the factorization of the workflow, extracting the currently hidden parallelism

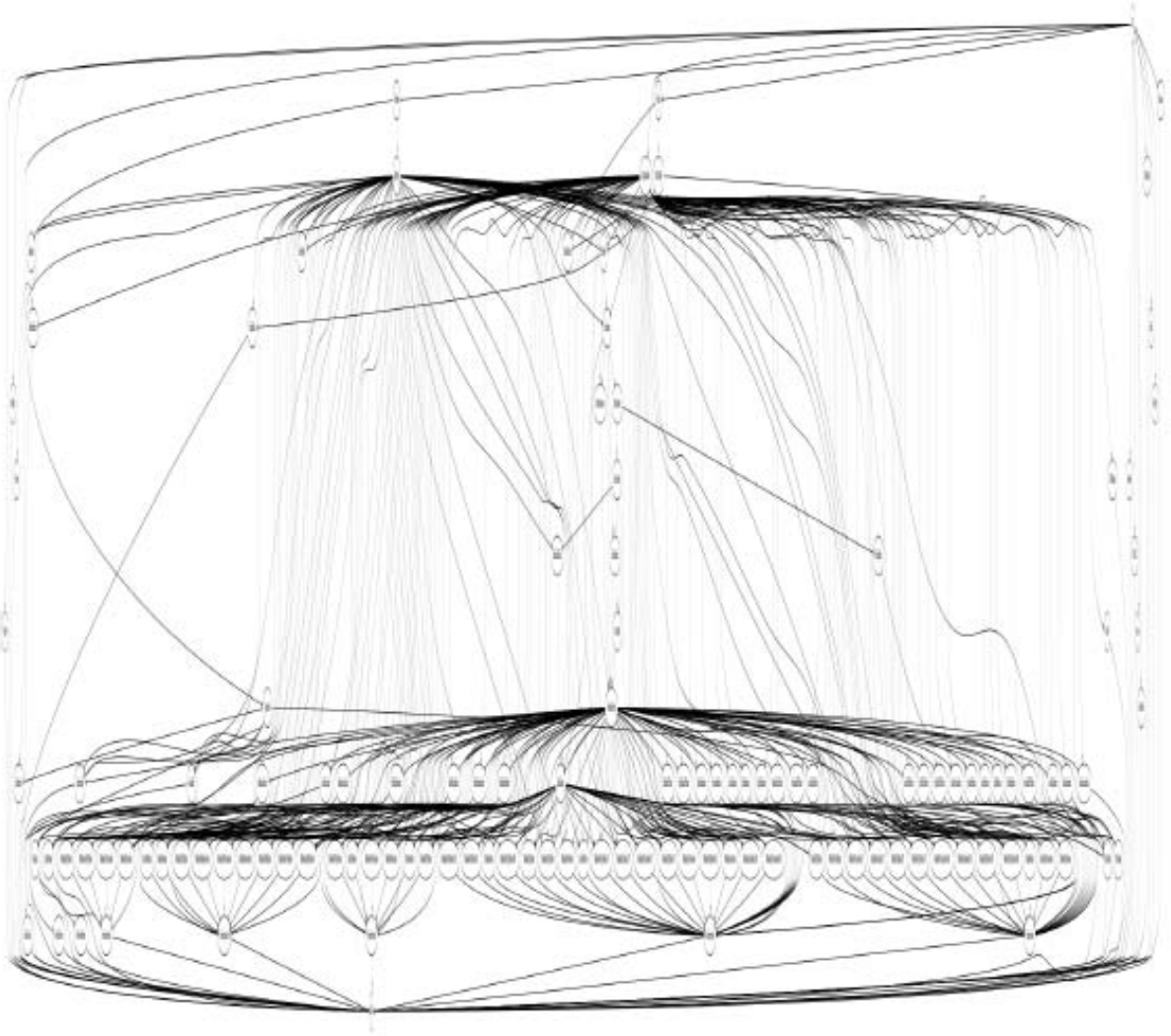
R&D: Parallel Computing (2)

- The target is a specific Fast Simulation executable whose data flow includes 127 modules.
- For each module the analysis extracts:
  - The list of required input or data products needed by the module to run.
  - The list of provided output generated by the module
  - The event processing time.
- The lists are used to build a graph of dependencies between modules.
- A simulation run shows that there is a significant speed-up increasing the number of threads.

R&D: Parallel Computing (3)

# of modules	127
Graph depth	10
Min rank	1
Max rank	54
Avg rank	12

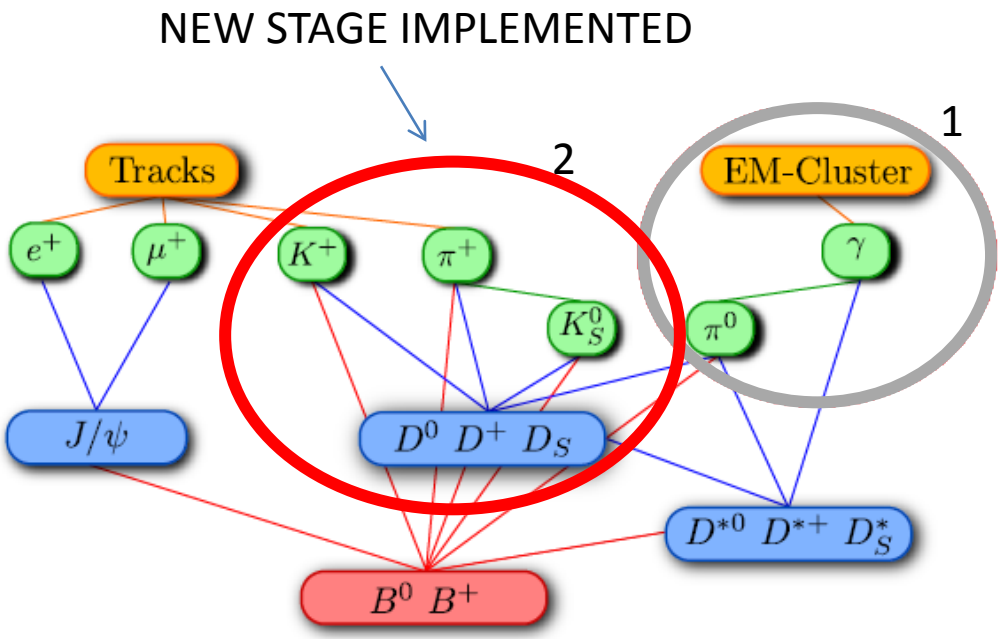




R&D: Parallel Computing (4)

- Investigation of the Intel Many-Integrated Core (MIC) architecture.
- Exercise: porting (a small part of) EvtGen.
  - Non-goal for the moment: measure performance.
- First step to understand if and under which conditions MIC is suitable for HEP software.
- Findings so far:
  - It works.
  - Changes needed to the code are not very intrusive.

R&D: GPGPU Testing (Napoli)



stage	particelle
1	tracks, K_S, γ, π^0
2	$D^{\pm}_{(s)}$, D^0, e J/ψ
3	$D^{*\pm}_{(s)}$ e D^{*0}
4	$B^{\pm}$ e B^0

Toy Model for the combinatorial problem

GOAL: Preliminary assessment of possible improvements and limiting factors in using GPGPU architectures in physics candidates composition.

Modellization: given N four-vectors sum all pairs without repetitions. Calculate the invariant mass and select candidates satisfying loose requirements. Iterate the process on several layers to build candidate B decay chains.

Toy model implemented in CUDA C by 2 undergraduate students.

R&D: Distributed Storage(Bari, Napoli, Pisa)

- Testing storage solutions:
  - Work on going on: Hadoop, GlusterFS.
    - Testing failover capabilities and scalability.

- Testing remote data access:
  - Testing and developing software access library.
    - This will hide complexity of data access to the end users.
  - Testing remote data access using HTTP protocols.
  - Testing SuperB code over WAN to measure the performance.

R&D: Distributed Storage(Bari, Napoli, Pisa)

- Next steps:
  - Testing new EMI Data Management tools:
    - Dynamic Catalogue
    - FTS3
  - Design and test a software solution for Distributed Tier0 center.

CHEP Conference (1)

- Contributions:
  - Oral presentation: "**Exploiting new CPU architectures in the SuperB software framework**", M.Corvo
  - Oral presentation: "**SuperB R&D computing program: HTTP direct access to distributed resources**", A.Fella
  - Poster: "**Testing and evaluating storage technology to build a distributed Tier1 for SuperB in Italy**", S.Pardi
  - Poster: "**SuperB Simulation Production System**", L.Tomassetti
  - Poster: "**DIRAC evaluation for the SuperB experiment**", A.Fella

CHEP Conference (2)

- Contributions have been appreciated.
  - Several questions and comments.
  - Both orals cited in final track summaries.
  - We are going in the right direction !
- Many useful discussions
  - PhEDEx system evaluation
  - Fermilab resource access
  - ROOT I/O optimization
  - Dirac system
  - Many core exploitation, parallel computation
  - GlideinWMS
- See session on Sat 2nd, 11:00 Computing - Report from CHEP

Conclusions

- The computing group is supporting the collaboration by providing:
  - Collaborative Tools
  - Physics Tools: FastSim, etc.
  - FullSim
  - Production Tools
  - Bookkeeping Tools
- There is an active R&D program aimed at the design of the computing model.
- The activities funded under the Pon ReCaS are an important step forward into building the computing infrastructure.
- A severe lack of manpower is affecting us.
- Come and join the fun !