
Applications Area Phase II Planning

LHCC Referees Meeting
9/05/2005

Pere Mato/CERN



Outline

- ◆ Application Area Focus
- ◆ Preparation of the Programme of work
- ◆ Changes for LCG phase 2
 - Applications Area organization
 - What the proposed changes are
 - Recommendations from AA internal review
- ◆ Producing detailed plans
- ◆ Resource estimates
- ◆ Summary

Application Area Focus

- ◆ Deliver the common physics applications software
- ◆ Organized to ensure focus on real experiment needs
 - Experiment-driven requirements and monitoring
 - Architects in management and execution
 - Open information flow and decision making
 - Participation of experiment developers
 - Frequent releases enabling iterative feedback
- ◆ Success defined by experiment validation
 - Integration, evaluation, successful deployment



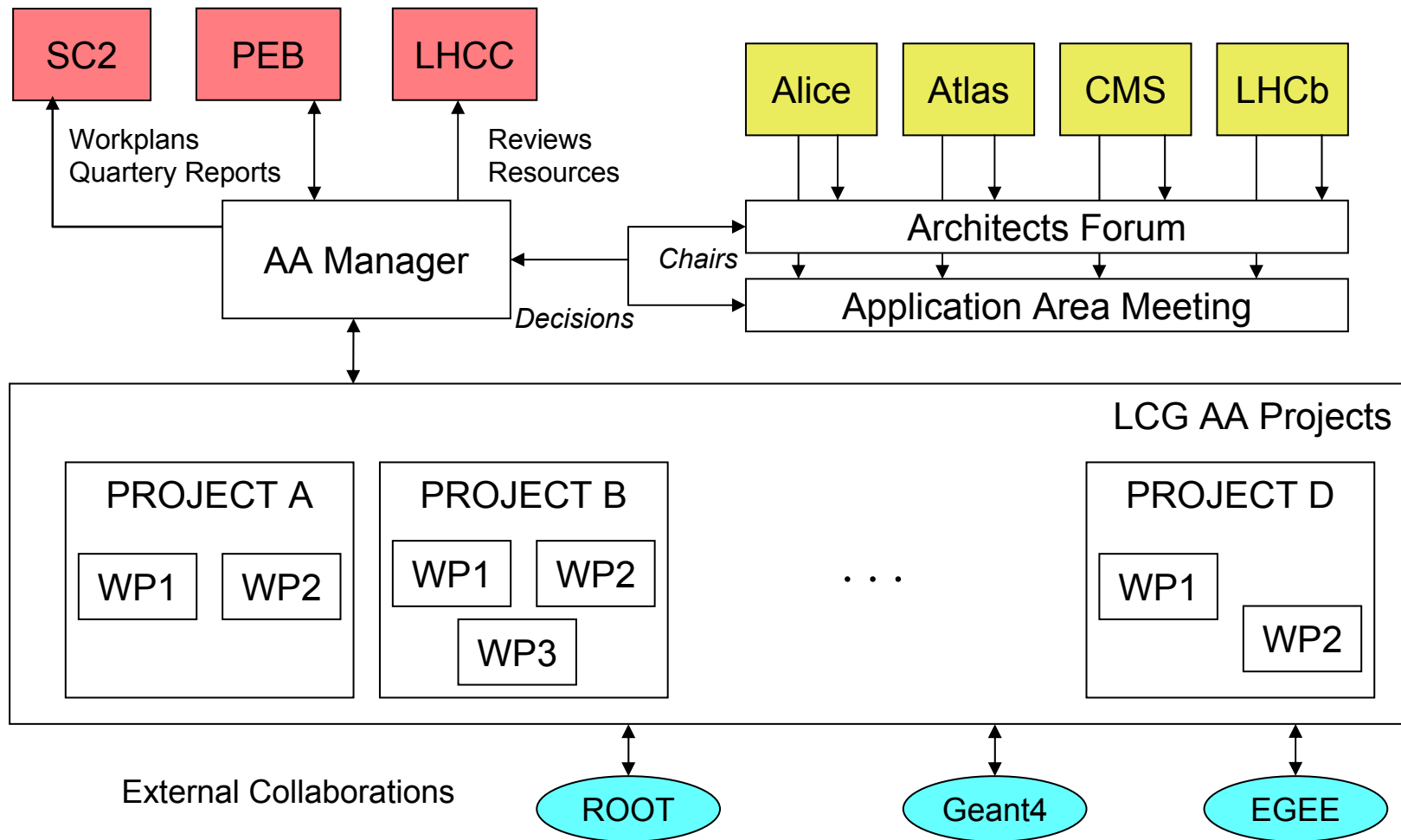
Applications Area in LCG Phase II

- ◆ Phase II covers from mid-2005 to mid-2008
- ◆ Need to establish the level of long-term support that is required for the products that are essential for the experiments
 - Minimize duplication
 - Re-use software and infrastructure across projects
 - Ease maintenance of AA software at the end of the LCG
- ◆ More emphasis in development of **Physics Analysis**

Programme of work Preparation

- ◆ Process initiated in February
- ◆ Had a round of discussions with PH management, project leaders, experiment architects, experiment representatives, etc.
- ◆ Presentations to the experiments
 - CMS March 15th, ATLAS April 11th, LHCb April 13th
- ◆ AA internal review (March 30th - April 1st) ([web page](#))
 - Overall plan presented
 - Final report released last week
- ◆ More detailed plans for each AA project are being prepared
 - Process in place
 - Written planning document during this quarter

Applications Area Organization



Current AA Projects

- ◆ SPI - Software process infrastructure (A. Aimar)
 - Software and development services: external libraries, savannah, software distribution, support for build, test, QA, etc.
- ◆ SEAL - Core Libraries and Services (P. Mato)
 - Foundation class libraries, math libraries, framework services, object dictionaries, python services, etc.
- ◆ POOL - Persistency Framework (D. Duellmann)
 - Storage manager, file catalogs, event collections, relational access layer, conditions database, etc.
- ◆ PI - Physicist Interface (V. Innocente)
 - Analysis services (AIDA), Analysis environment (CINT, Python)
- ◆ SIMU - Simulation project (G. Cosmo)
 - Simulation framework, physics validation studies, MC event generators, participation in Geant4, Fluka.

AA Organization

◆ Application Area Meetings (AAM)

- Informal forum of exchange of information between the AA projects and experiments, etc.
 - » Project status, release news, results, new ideas, evaluations, new requirements, general discussions, experiment feedback, etc.
- Encourage presentations from the projects and experiments
- Every two weeks on Wednesdays @ 16:30
- Each meeting should have a "theme" defined well in advance

AA Organization (2)

◆ Architects Forum Meetings

- Formal decision and action taking meeting
- Consists of the experiment architects, AA projects leaders, computing coordinators with an standing invitation and other invited participants
- Experiments participate directly in the planning, management, and architectural and technical direction of AA activities
- Public minutes after internal circulation
- Good atmosphere, effective, agreement generally comes easily. No problems so far.

AA Organization (3)

◆ Work Plans

- AA Projects must prepare yearly work plans
- Opportunity to re-think strategic decisions, change of direction, introduce new work packages
- Approved by PEB

◆ Quarterly reports

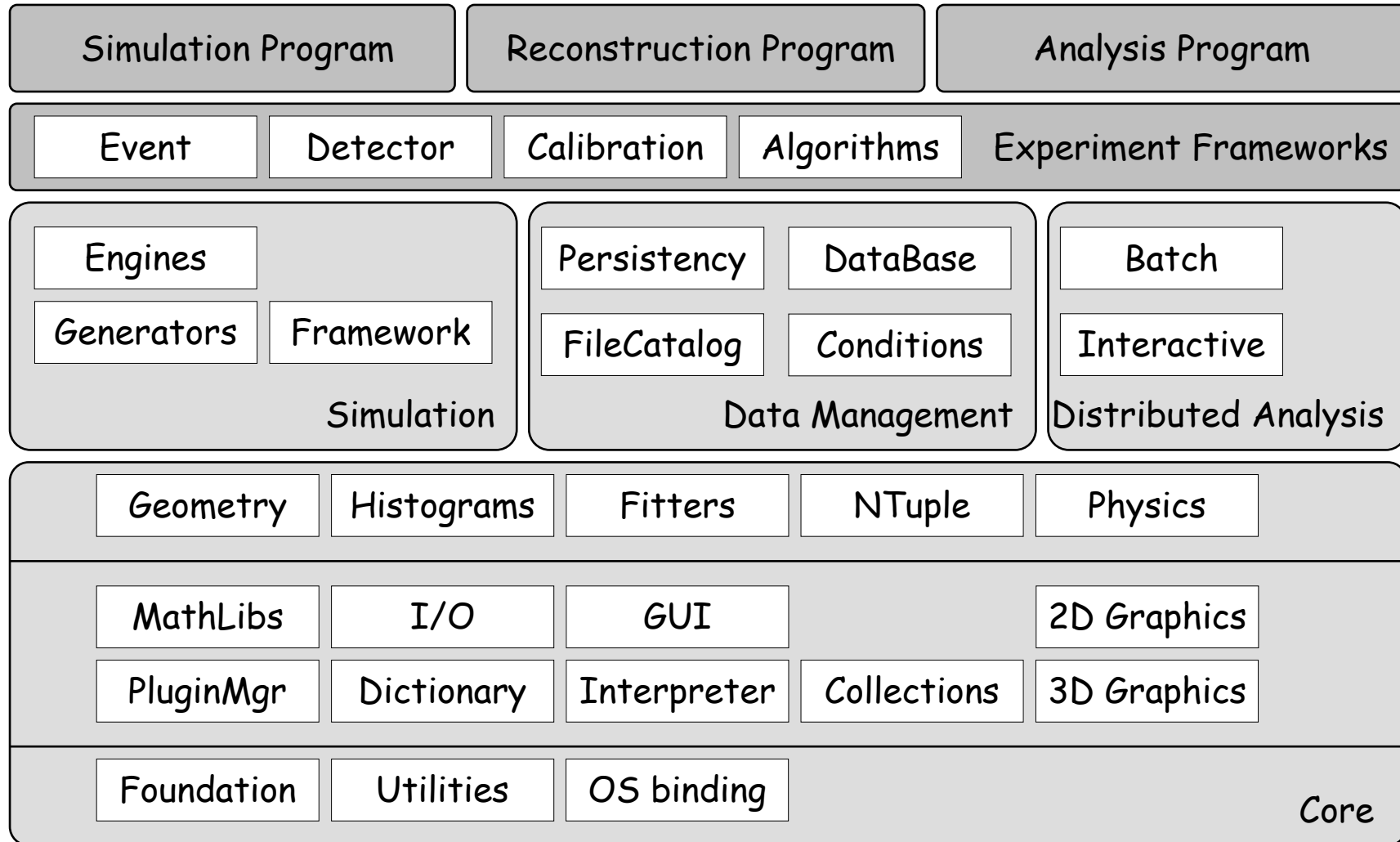
- To monitor progress of the projects
- Scrutinized by SC2 committee and generation of feedback

◆ Reviews

- Internal AA reviews and LHCC reviews



New Domain Decomposition



Changes in the AA Projects

1. SEAL and ROOT projects merge
2. Some redefinition of SPI role
3. Some adaptations of POOL required
4. PI discontinued and existing libraries absorbed by client projects
5. SIMULATION project basically unchanged

SEAL + ROOT project merge

- ◆ Both SEAL and ROOT projects have a big overlap
 - The objectives are very similar
 - Avoid duplication by construction
- ◆ Single AA project to provide all the **core and framework software**
 - Put all the people involved in a single TEAM
 - Select or evolved each provided functionality to the best technical solution
 - Make sure that all clients receive a good service
 - Encourage the usage of the core software by the other domains

Rational of the SEAL+ROOT Merge

- ◆ Optimization of resources
 - Avoid duplication of developments
- ◆ Better "coherency" vis-à-vis our clients, the LHC experiments
- ◆ ROOT activity fully integrated in the LCG organization
 - Planning, milestones, reviews, resources, etc.
- ◆ Ease long-term maintenance and evolution of a single set of software products
 - Thinking on the post-LCG era

What it means in practice?

- ◆ Single team lead by Rene Brun
- ◆ Combined program of work, single deliverable
 - Initially the union of what is available in SEAL+ROOT
 - Continuation of the convergence work in Dictionary, MathLibs, etc.
 - Towards a single set of functionalities in a time scale of 1-2 years
- ◆ User-level compatibility **MUST** be maintained
 - Adiabatic transition for the LHC collaborations
- ◆ Software **evolution** decided by the new project team
 - The "WHAT" is agreed with the experiments
 - The "HOW" is mostly left to the developers with input from experiment core people
- ◆ Distributed responsibility
 - Work packages
- ◆ Open team/project nature
 - Encourage external participation

Difficulties

◆ Cultural merge

- Team members with different backgrounds
- Different ways of developing software
- Need to establish a "common" culture
 - Compromises from both sides

◆ Client merge

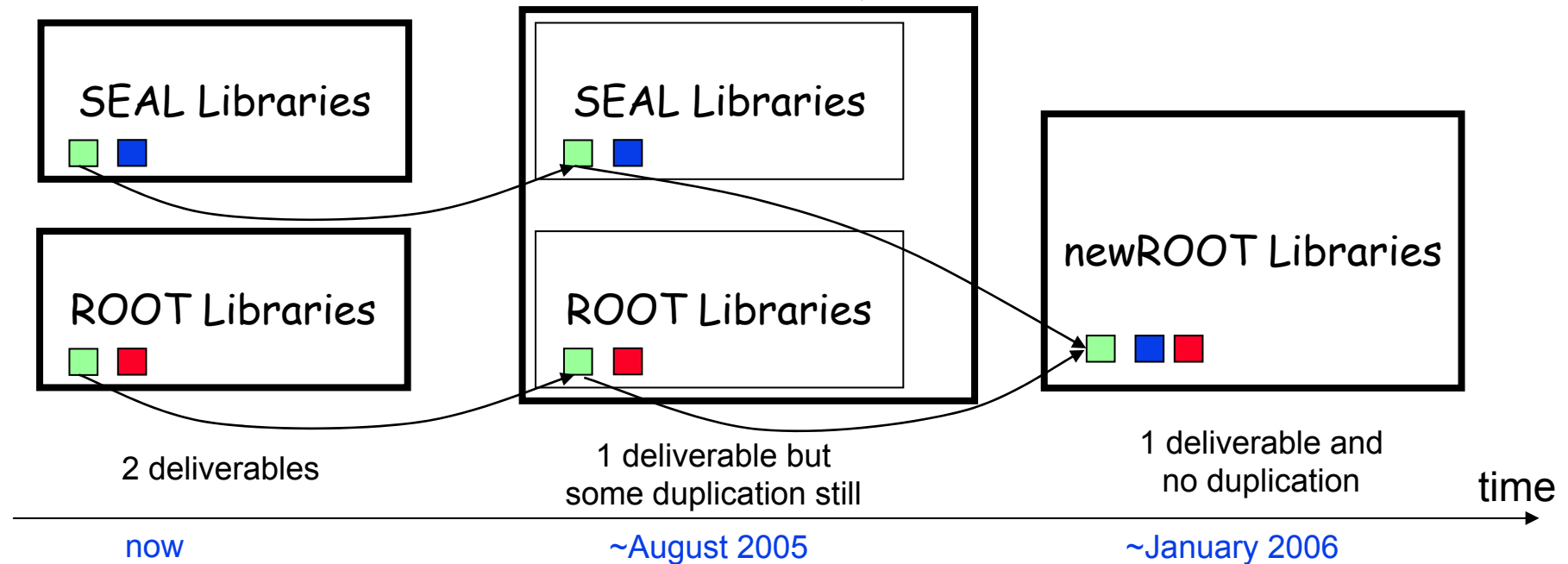
- Possible conflicts between LHC requirements and other ROOT users requirements
- Client adaptability to changes
- Platforms support, licensing issues, etc.
 - Study case by case

◆ The evolution of each functionality needs to be plan carefully

- Detailed plans are being developed by the new Team and discussed together to the experiments
 - supervised by the AF

SEAL + ROOT Migration

- ◆ Adiabatic changes towards experiments
 - Experiments need to see libraries they use currently will evolve from current usage today towards a unique set
- ◆ Details be planned in the Programme of Work
 - Will be extra tasks in order to complete migration



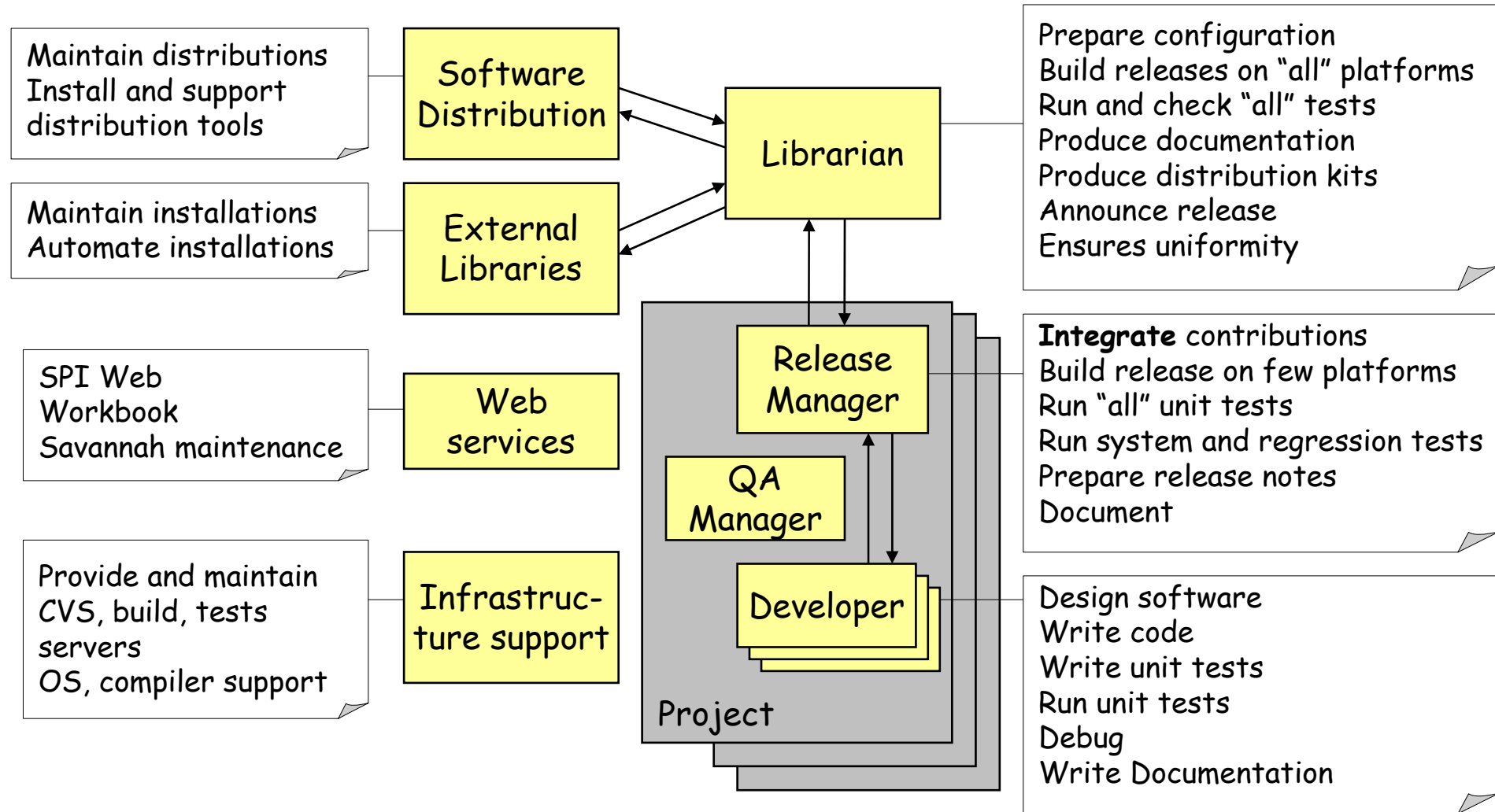
AA Review Recommendations

- ◆ Ensure that the best part of the two projects is taken forward
 - Not be seen as just to "add missing features to ROOT"
- ◆ Lightweight packaging is **crucial**
 - Minimize/avoid new dependencies, reduce where possible
 - Remove the TObject inheritance where appropriate
- ◆ Plugin management, component model
 - Should preserve SEAL architectural strengths
 - Evaluate the impact on existing experiment schemes
- ◆ Broad agreement on the need of a common dictionary
 - Clean implementation, unify code generation (e.g. python bindings)
 - Actions, timescale, etc. subject to the May workshop
- ◆ Support for the proposed overall schedule

SPI: Redefinition of its role

- ◆ A number of “services” of common interest will continue to be run
 - Savannah, external libraries, etc.
- ◆ Helping projects and LHC experiments to provide/maintain the software development infrastructure
 - CVS servers, build server, etc.
- ◆ Direct participation in the software development projects
 - Librarians, release managers, documentation, toolsmiths, QA

Software Development Roles



Estimated resources

	Common (SPI)	CORE	POOL	SIMU
Software Builds	Librarian (0.5 FTE)	Release Manager (0.5 FTE)	Release Manager (0.5 FTE)	Release Manager (0.5 FTE)
External Libraries	External Lib Mgr (0.5 FTE)	(0.1 FTE)	(0.1 FTE)	(0.1 FTE)
Software Distribution	Distribution Mgr (0.5 FTE)			
Quality Assurance	QA support (0.2 FTE)	(0.5 FTE)	(0.5 FTE)	(0.5 FTE)
Documentation	Web master (0.4 FTE)	(0.2 FTE)	(0.2 FTE)	(0.2 FTE)
Project portals (savannah)	Savannah support (0.8 FTE)	(0.1 FTE)	(0.1 FTE)	(0.1 FTE)
Development Infrastructure	Infrastructure support (0.2 FTE)			
	~3.1 FTE	~1.3 FTE (*)	~1.3 FTE (*)	~1.3 FTE (*)

(*) do not need to be equally distributed among all projects



Recommendations by AA Internal Review

- ◆ Benefits of central librarian already visible
- ◆ Direct participation in projects strongly encouraged
- ◆ Tools developed for SPI should be packaged for general use
- ◆ Doxygen and Savannah
 - Automation, cross-references, common practices, ...
 - No CERN/LCG resources dedicated to alternative systems
- ◆ External software
 - Clear procedures for selecting, providing, supporting external software
- ◆ Training
 - Should be responsibility of SPI
 - Highly successful Python course must be continued

POOL: Some adaptations required



- ◆ Domain of expertise in data persistency, data management, deployment in the Grid and (relational) databases in general
- ◆ No major changes in the structure are proposed
- ◆ Two differentiated parts
 - POOL (object persistency)
 - COOL (conditions database)
- ◆ Proposed to move the ROOT storage manager implementation to new SEAL+ROOT project
- ◆ Study the collections and their relations with ROOT trees
- ◆ Started discussions about the Relation Access Layer (RAL) organization

Recommendations by AA Internal Review

- ◆ General concern about impact of SEAL+ROOT merge
 - Will generate additional workload which must be anticipated in the planning
- ◆ Documentation greatly improved but problems remain
- ◆ Welcome split of RAL and POOL release cycles
- ◆ Error handling and reporting need to be improved
- ◆ Confusion in the collections, not clear what is really needed
- ◆ Ability to follow a pool::Ref<T> from a interactive ROOT session is needed
- ◆ COOL: Experiments interested in COOL are encouraged to commit more manpower
- ◆ POOL and security: reuse solutions developed in Grid community

PI: absorbed by client projects



- ◆ The proposal is that the project is discontinued as such
- ◆ Make the inventory of existing libraries and study their usage by LHC experiments
 - If not used then abandon library
 - If used by a single experiment (or single framework) move the library in question to the experiment (or framework)
 - Incorporate remaining parts to SEAL+ROOT project

SIMULATION: Basically unchanged

- ◆ Domain of expertise in event generators and detector simulation
- ◆ No changes in the structure are proposed
- ◆ Current subprojects
 - Simulation Framework
 - Geant4
 - Fluka
 - Physics Validation
 - Generator Services
- ◆ Added new subproject Garfield - simulation of gaseous detectors
- ◆ Encourage to (re)use the core software and software development infrastructure
 - Interactivity, persistency, analysis, etc.

Recommendations by AA Internal Review

- ◆ GENSER
 - Recommended more granular packaging
 - Concerns about HepMC. Make sure that HepMC is well supported.
- ◆ Physics Validation
 - The coming decrease of manpower is very worrying
 - The active participation from experiment should continue
 - Re-visit with the experiments the effects of present simulation uncertainty
- ◆ Geant4
 - Any concerns on the validity of the physics results should be brought forward in the validation subproject
- ◆ Fluka
 - Should be directly usable via geometry conversion mechanisms
 - Installation in SPI external software area
- ◆ Simulation Framework
 - Further development of GDML is encouraged
 - Encourage exchange of experience with Python interfaces

Conclusion of the AA Review Committee

- ◆ Most of the last review recommendations have been implemented or are in the plan
- ◆ The proposed evolution plan is technically reasonable and supported by all experiments
 - It should allow integrating ROOT activity in LCG organization
 - Coherent set of products to users
 - Facilitate the long term support
- ◆ The technical details of the plan should continue to be discussed and approved by the Architects Forum
 - LHC experiments should set schedule and priorities
- ◆ LCG-SC2 should follow up closely the progress

SEAL+ROOT: Steps towards detailed plans

1. Produce a list of topics (functionality) that needs to be merged or understood the needs and implications
2. Experiments should prioritize the list
3. Topics will be handled one-by-one. The treatment of all the topics can not be done in parallel, but on other hand, they do not need to be treated completely sequentially.
4. AA projects and experiments will assign people for each of the topics and informal discussions will be organized to gather the requirements, constraints, design and implementation issues.
5. A written proposal for each topic will be produced after a period of 2-3 weeks specifying the agreed functionality, API, implementation details, impact for the experiments, time scale, and so on.
6. Then, an open AA meeting will be organized to present and discuss the topic.
7. Finally, the AF will decide and give green light for the implementation.

List of topics requiring detailed plans

- ◆ MathCore library
 - Contents: basic mathematical functions, random numbers, numerical algorithms
 - End-user interface. Function naming
 - Standalone library
 - End-user interface
 - Licensing issues
- ◆ Vectors library (possible replacement of CLHEP)
 - Contents: basic classes for 2D, 3D and Lorentz Vectors
 - Templated (multi-precision)
 - End-user interface. Evolution from current CLHEP interface.
 - Standalone library.
 - Impact for G4, Event generators, etc.
- ◆ Linear Algebra library
 - Contents: linear algebra vector and matrices classes
 - Templated (multi-precision)
 - End-user interface.
 - Standalone library
- ◆ Plugin Management
 - Basic mechanisms to allow dynamic loading and instantiation of "components"
 - Building plugin information (what module(library) contain a given plugin)
 - Definition of plugins without generating dictionaries of implementations
- ◆ Component Model library
 - Contents: set of classes to support componentware.
 - Component identification and hierarchical look-up, abstract interfaces support, lifetime management
 - Base current experiment frameworks in common component model
 - Standalone library?
- ◆ Dictionaries
 - Incorporating Reflex into POOL/Experiments
 - Convergence plans to have a single dictionary within ROOT
 - (wait for workshop conclusions)

List of topics requiring detailed plans (2)

- ◆ POOL ROOT Storage Service
 - Migrating the implementation from POOL to CORE(ROOT)
 - Implementation of the POOL defined interfaces
 - Standalone, abstract and back-end neutral interface
- ◆ POOL References
 - Back-end storage technology neutral
 - Access from native ROOT
 - Connection to file catalogues
- ◆ Relational Access
 - Separation of concerns between interface and concrete implementation
 - Generic and database technology neutral interface
 - Convergence with ROOT/TTreeSQL
- ◆ Event Collections
 - Needed requirements: storage technology independence
 - Convergence with ROOT/TTree
- ◆ GUI
 - Choice of the GUI toolkit (Qt is favored among experiments)
 - Interoperability of ROOT GUI
- ◆ AIDA interoperability
 - Future of AIDA after stop of PI
 - Native implementations of AIDA in ROOT
- ◆ Python bindings
 - Convergence between PyReflex and PyROOT

Staffing Requirements Estimates

The total staffing levels estimated as required, and being planned:

	2004	2005	2006	2007	2008
SPI	6.2	6.2	5.5	4.6	3.9
SEAL+ROOT	6.8+6.5	5.9+6.2	6.2+6.4	5.7+5.5	4.7+4.8
POOL	14.1	14.4	12.8	8.5	7.5
PI	0.7	0.1	0	0	0
Simulation	15.6	10.5	9.7	7.9	7.5
Total	49.9	43.3	40.6	32.1	28.4

Staffing Sources

	2004	2005	2006	2007	2008
CERN base	21.2				
LCG special contributions	17.7				
Staff at CERN	38.9	37	34.5	27	24
Experiments	10.6	7	6.5	6	5
Total	49.5	44	41	33	29

Summary

- ◆ Started to plan second phase of Applications Area
 - The major proposed change for this new phase is the merge of ROOT and SEAL projects
 - Adjustments proposed in SPI, POOL
 - No major changes foreseen in SIMU
- ◆ Internal AA Review: "Evolution plan technically reasonable and supported by all experiments"
- ◆ Technical details of the plan will be continued to be discussed (one topic at the time) by the projects and experiments and approved by Architects Forum
- ◆ The planning document will be produced during this quarter