



U.S. DEPARTMENT OF
ENERGY

Office of
Science

HEP Software Collaboration Governance, Fermilab Perspective

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HEP Software Collaboration Meeting
CERN, April 3rd 2014

HEP Computing Facing Many Challenges Ahead

- Supporting current and future HEP program requires significant resources and infrastructure (e.g. HL-LHC)
 - resources (funding) are becoming a limiting factor
- Evolution of computing architectures and software technologies calls for major software re-engineering and could impact our software development model
 - multicore/many-core, accelerators (GPU, MIC, ...), ARM
 - reduced footprint of memory/core
 - the emergence of cloud concept as a scientific computing tool
- Software engineering a necessity not just a “best practice” requirement
- Leveraging resources and expertise, and coordinating existing efforts in the field at large is an appealing solution to overcome resource and funding limitations

HEP Software collaboration

- A collaboration that leverages and coordinates HEP software activities could
 - Provide consistent strategy and maximize resource deployment efficiency
 - Enable contact with other scientific fields to contribute either resources or software development
 - Many of our tools have broader applicability for science outside HEP
 - Generate new funding opportunities outside our traditional funding “sandbox”
 - increase visibility and appeal of our software efforts

Vision

Coordinate and facilitate the development of a fully interoperable HEP software stack, common software infrastructure, and best practices model for software development and deployment

(a starting point; and I am sure by the time of this talk this would be much more refined)

Scope

- Provide leadership and technical expertise in architecture/design issues.
- Deliver common infrastructure
 - Component interfaces, build tools, testing and validation suites
- Deliver components that are not “domain” specific
 - Geometry representation, data model(s), ...
- Coordinate and facilitate component integration, to achieve a modular, interoperable HEP toolkit
 - Eventually extend to other scientific domains

How could this work?

- Build around an “open-source” software model with well established software engineering practices
 - Agile or plan-driven development methods where appropriate, distributed collaborative environment
- Develop a model and support infrastructure for ensuring interoperability of software packages
 - Strict software development guidelines
 - Component layout with well defined interfaces to enable independent development and easy integration
 - Standards for documenting, testing and releasing software
 - Roles for software architects and code librarians, with the authority and responsibility to define standards and ensure that released code meets these standards

Challenges

- Connect to current HEP software projects
 - Already have organization, process, program, sponsors.
 - ranging from international collaborations to single institution, single funding agency projects
 - Should be viewed as partner projects to the collaboration
- Non-trivial coordination constraints
 - Different funding agencies
 - rules, priorities
 - Different experiment requirements and timelines
 - Have to clearly demonstrate value
 - Tension between current and future, R&D and operations
- Need a “light” organization model
 - To maintain agility in decision making
- But with enough “teeth” to enforce development and design guidelines

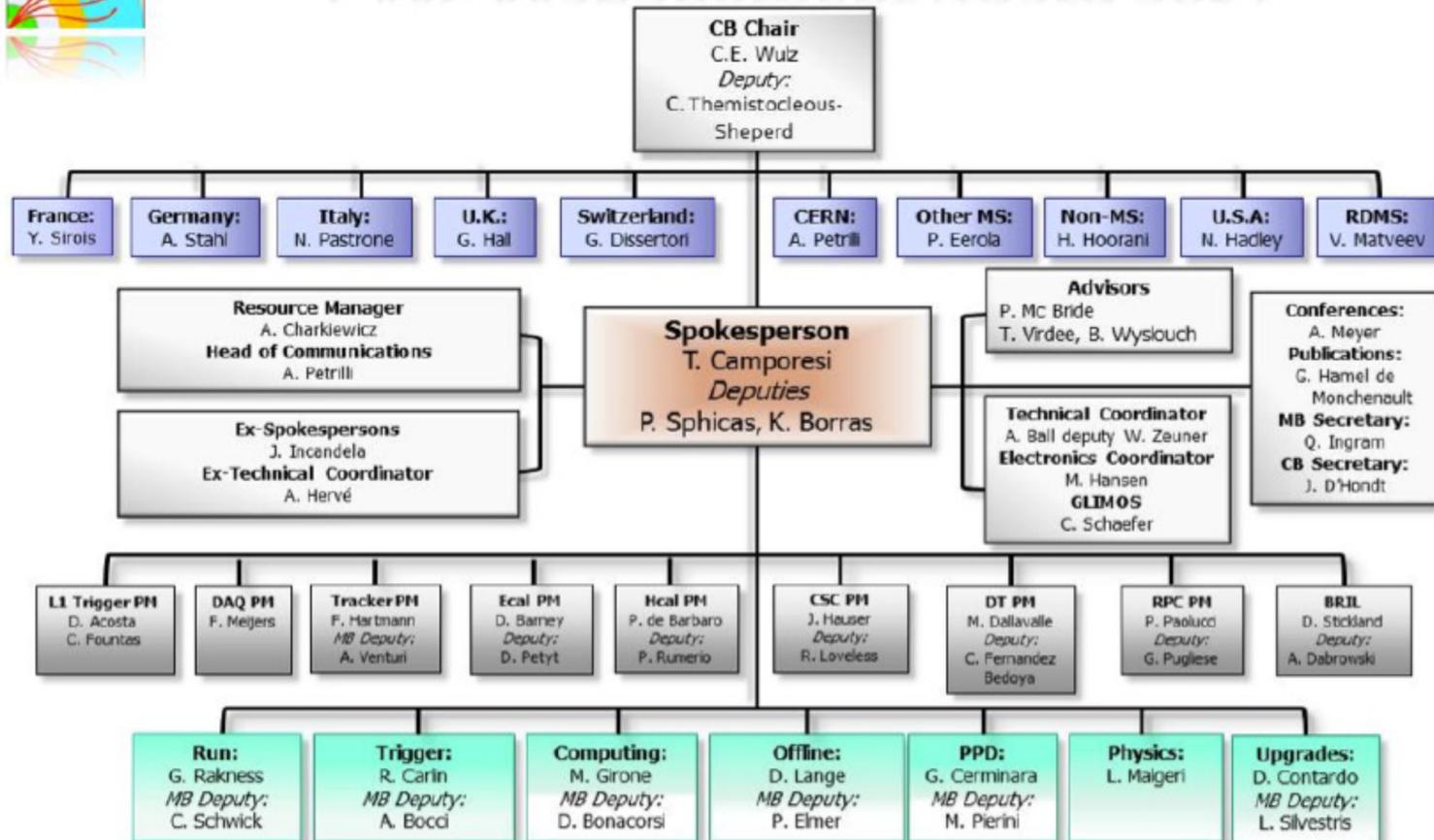
Governance models

Our field has a plethora of collaborations with different governance models to draw from

Governance example: single purpose organization



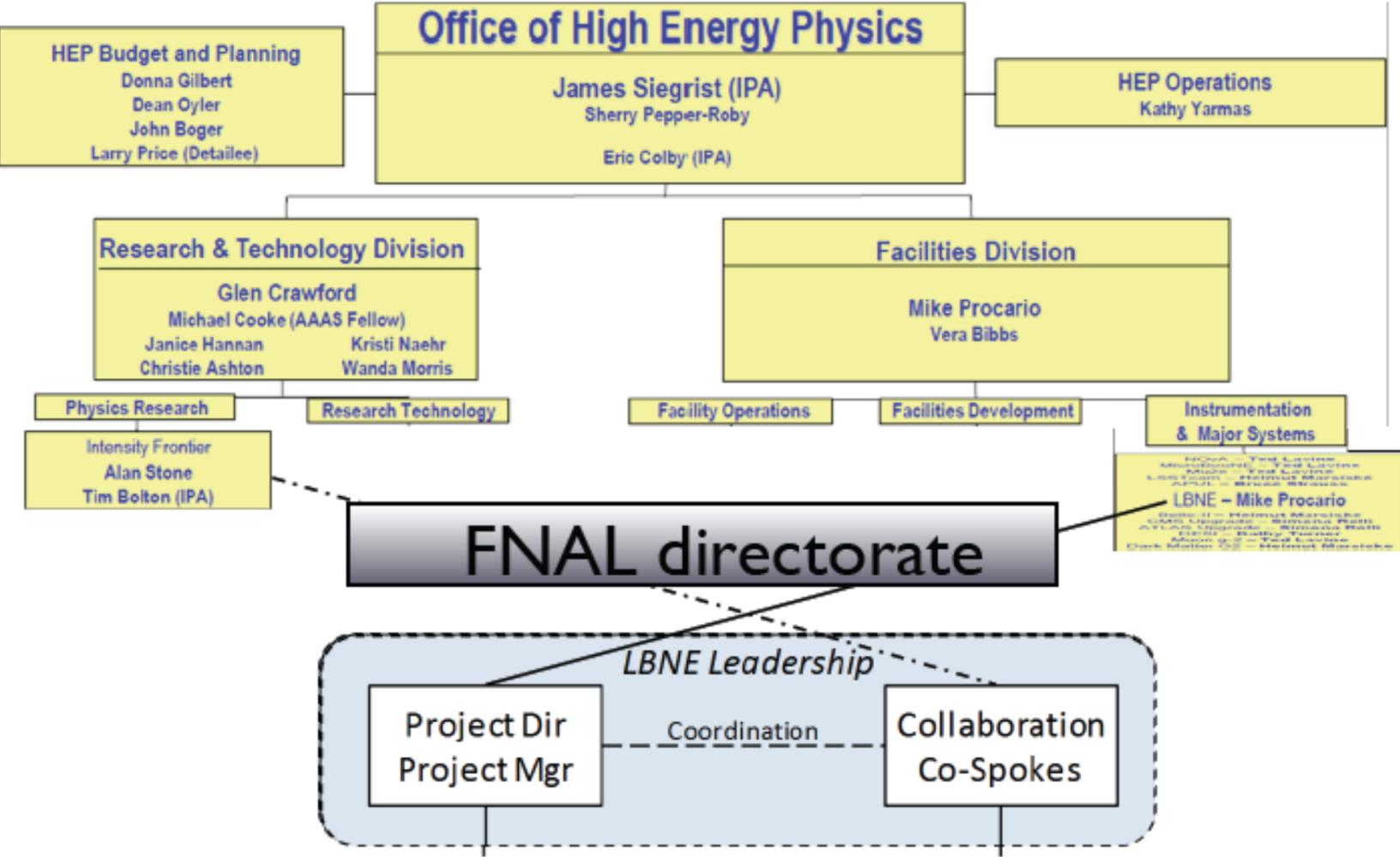
CMS Management Board 2014



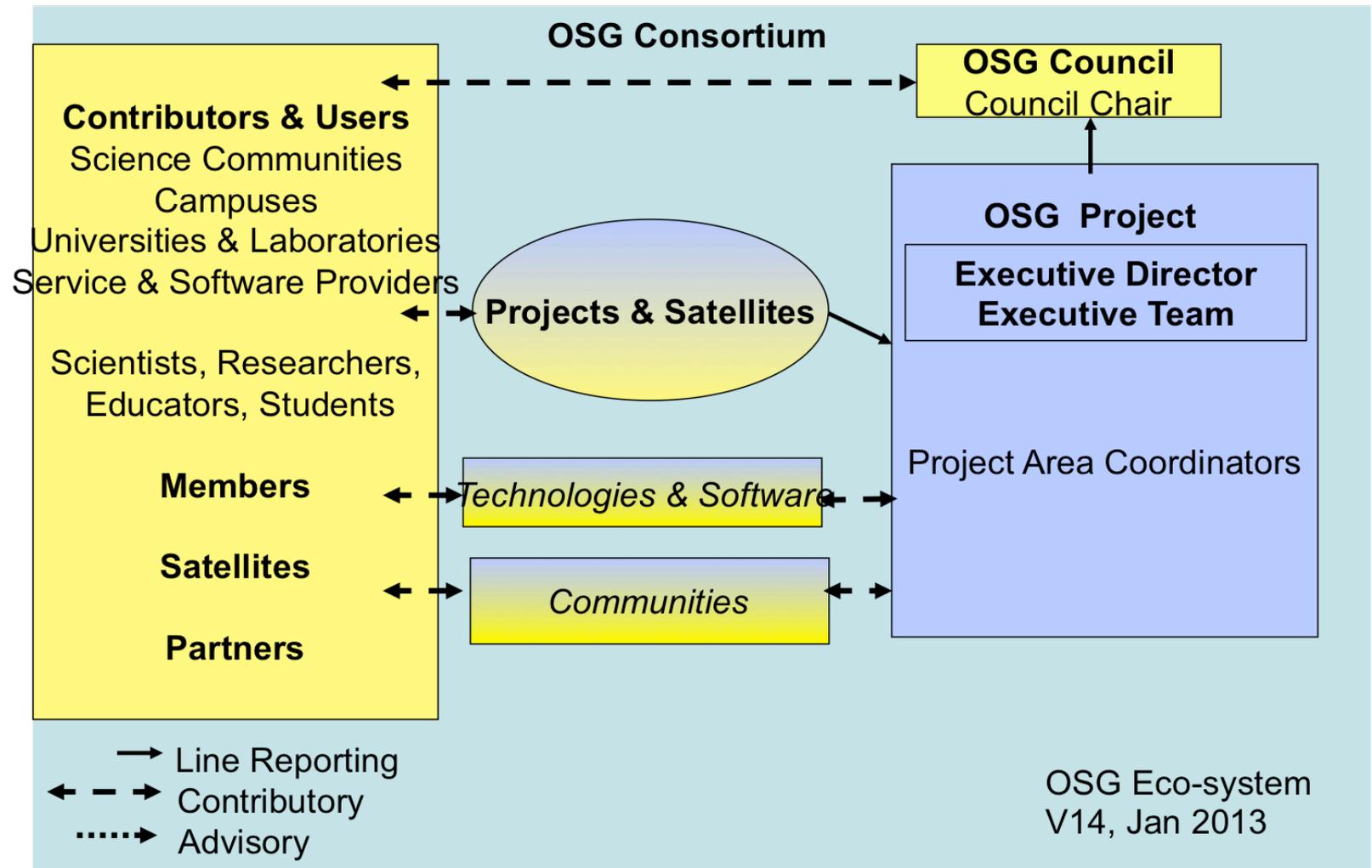
20 January 2014

The CMS Management Board, chaired by the CMS Spokesperson, is responsible for

Governance example: single purpose, project and collaboration



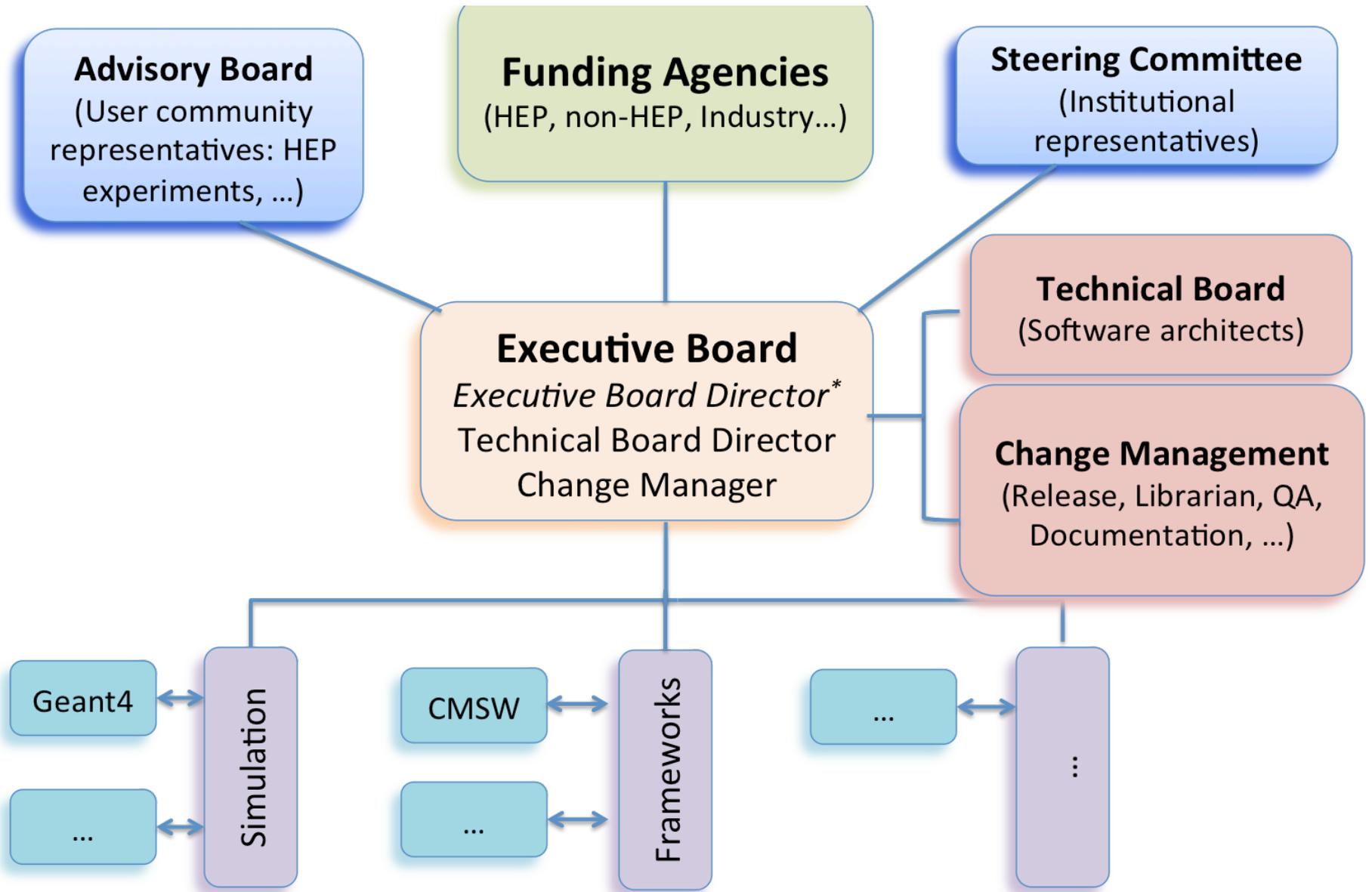
Governance example: diverse community, multi-domain



A possible governance model for the HEP software collaboration

To enable coupling to existing projects and allow a “lightweight” organization, incorporate some of the OSG model ideas

(BTW, we need a name for this thing: the “HEP software collaboration” is a mouthful...)



Roles

- **Advisory Board:** consists of user community reps (HEP experiments, non-HEP in future). Provides requirements, recommendations, science priorities. The management of the collaboration has to solicit and ensure representation of all relevant organizations
- **Funding Agencies:** program managers funding direct collaboration activities (not the projects), as per the collaboration program. Receive proposals, reporting, reviews, as per individual agency requirements
- **Steering Committee:** Institutional representatives of collaborating organizations that provide resources. Appointed by institution management. Discusses program activities, deliverables, milestones, and negotiates resource allocation. Facilitates the appointment of the executive board director.

Roles

- **Executive Board:** the management team, responsible for incorporating advisory board recommendations and steering committee guidelines to define and execute the program, coordinate project partnerships, provide reporting. The EB Director is the overall program coordinator
- **Technical Board:** software architects with domain expertise covering all project domain areas. The “Technical Board Director” is the chief architect and is a member of the management team. The TB Director and a minimum number of Board members should be staff positions. Additional members could be contributed by the projects.
- **Change management:** Facilitates deployment of common infrastructure. Necessary roles: Librarian, QA, Release Manager, Documentation Manager; the Change Manager serves as the overall planning coordinator and is a member of the Executive Board.
- **Project Domain Forums:** provide coordination and facilitate communication from the projects to the collaboration, should be staffed by project reps and run “Domain User Forums”

Implementation

- The Executive Board director is a term position (2 years?)
 - Terms should be defined for the Technical Board Director and Change Manager
- The technical staff (Technical Board, Change Management) are contributed (supported) by the collaborating institutions
 - Selected by the Executive Board in consultation with the Steering Committee
- Partner projects contribute additional members of the Technical Board and staffing for the Domain Forums
- Partner projects maintain independence (sponsors, management), but utilize common layer and infrastructure, and implement architecture guidelines
- Collaborating groups have ownership of different components of the software stack

The Plan Forward

- Walk before we run... (or, even baby steps)
- Establish collaboration within HEP
 - agree on structure, governance, process
 - select a set of activities, get buy-in from institutions and agencies
 - Successfully complete initial program and demonstrate value
- Seek collaboration outside HEP
 - Outreach, identify areas and topics, invite partners from other science domains

Next Steps

- Identify participating institutions and PIs (this meeting)
- Iterate on governance, produce a draft (this meeting)
- PIs form the “Steering Committee”
- Socialize with institutions and funding agencies
- Form collaboration, finalize governance and write bylaws (next meeting)
 - How do we break up the work?
 - How are resources allocated/distributed
- Then onward to funding agencies and institutional management to obtain support to staff positions

Other things to consider

- What is the overall strategy with domain projects?
 - Start with Root and Geant4? (essential for almost everything we do)
 - How do these projects evolve in the context of the collaboration?
 - How to coordinate support of current “independent” software packages as these “integrated” next generation components are being developed?
 - Other projects to start with? How do experiment specific projects fit in?
 - If yes, how about the CMSSW framework and gaudi?
- Time lines and release schedules that fit within the structure of LHC schedule and FNAL neutrino program
- How to interface with other collaborations that coordinate software efforts?
 - HEP-CCE concept in the US to coordinate experiment, cosmology, HPC modeling (accelerator, astro, lattice,...)

Long Term Vision

- This collaboration could take ownership of the entire software stack necessary for the success of the HEP program
 - Simulation Software
 - Workflow's
 - Frameworks
 - Job Submission tools
 - Repositories
 - Release, testing, etc
- Is it a desirable outcome? In this picture, domain projects are not as independent as in the proposed model (in this talk...)