FIFE Workshop Architecture Committee

OFFLINE COMPUTING ARCHITECTURE

STEPHAN LAMMEL
FOR THE COMMITTEE

Offline Computing Architecture

- Rob Roser, SCD head, setup a committee in March to review and amend the computing architecture for Frontier Experiments
- During the previous year the number of accidental overloads of the central NAS increased to a point of significant experiment/user impact.
- With the experience of 1st gen. neutrino/Run II/CMS, new neutrino experiments being commissioned and additional IF experiments being planned, the time was considered opportune to review/update the architecture as to get a most robust foundation for the integrated offline computing services of FIFE.

Offline Computing Architecture

- Central network attached storage:
  - provided by a high performance server/appliance (but I/O never-the-less finite)
  - used for experimental software by all IF experiments
  - used for experiment data storage by current neutrino experiments
  - used for services, application space, executables, staging space, scratch space, user data/project space, Grid login areas, etc.
  - directly accessible/mounted on FermiGrid worker nodes

➔convenient to use

➔easy to overload

➔impact of an overload widespread

Offline Computing Architecture

- The FIFE architecture committee should provide a conceptual design recommendation that emphasizes
  - robustness
  - scalability
  - long-term viability (assume technology updates)
  - cost (migrate to, operate/support, upgrade/expand)
- The scope of the offline computing architecture should include
  - support for software development
  - data processing, simulation, analysis at Fermilab or via Fermilab front-end, in the data center, user desktop or laptop
  - (excluding data-acquisition, detector control and monitoring)

Offline Computing Architecture

- What is the impact or benefit to YOU
  - less analysis/computing interrupts/outages
  - more analysis/computing resources
    - less outages/failures
    - more cost effective computing
    - better scalability
  - better match to user needs/working habits/similarity with other setups
  - less (hopefully no or little) need for changes in the future

Offline Computing Architecture

- The committee hasn't completed its work. It is looking at things by components:
  - networking and network services (authentic/authorization)
  - user home area (currently AFS)
  - experiment and support software (central NAS, on-site only)
  - databases (scalability of direct DB access)
  - interactive computing
  - CPU intensive computing
  - I/O intensive computing (are querying experiments on needs)
  - batch computing (Grids, VMs, clouds, ...)
  - data handling (formats, metadata, storage, access, user data)

Offline Computing Architecture

- The committee hopes to complete most of its work this month
  - deliverable is an architecture document to Rob Roser
- Migration into the architecture is expected to occur over a O(year)
  - i expect some aspects to be addressed quickly to improve robustness with accidental NAS overloads
  - i could also see grandfather clauses for existing experiments/existing services/data

Offline Computing Architecture

- Charge to committee:

Dear FIFE Architecture Committee,

A problem investigation was set up in December to understand the many overloads of our central Network Attached Storage, the BlueArc system, during the past year. One of the recommendations from the committee was to review and revise the architecture of the offline computing systems we currently provide to Frontier experiments. The current architecture was built from available components. Various components have been extended and adapted to meet experiment needs during the past five years, but the overall architecture has not been re-evaluated.

The sum of the hardware resource needs has now reached Run II scale. We are currently using solutions that are more costly then alternatives that are now available. Components of some systems have reached scalability limits. Third generation neutrino experiments, NOvA and MicroBooNE, are being commissioned; Intensity Frontier muon and fourth generation neutrino experiments are being built; and more Cosmic Frontier experiments are being supported by the laboratory. Therefore, now is an opportune time to review and re-architect the offline compute systems for those frontier experiments. The outcome will provide a foundation for our new activity to provide and support integrated offline systems - FabrIc for Frontier Experiments (FIFE) – whose goal is to provide collaborative scientific-data processing solutions for these experiments.

I would like the committee to review the current IF offline architecture and redesign it taking into account experience from IF, Run II and CMS. The new architecture should emphasize robustness, scalability, long-term viability and cost. Fermilab and the experiments must be able to migrate from the existing architecture in a cost-effective way.

I am asking you to provide a conceptual design of the scientific computing architecture that we want to migrate to. I anticipate migrating to this architecture during the next few years. The architecture should not focus on implementation but assume technology updates and changes during the lifetime of the FIFE project. (Where new technology can simplify scientific computing, and we should tightly follow a development, I expect you to point this out.)

The scope of the system architecture should include support for software development, data processing, simulation and analysis activities (excluding data acquisition, detector control and monitoring) at Fermilab or via a Fermilab front-end, in the data center, on the desktop or laptop (i.e. include the use of off-site Grid and Cloud facilities and mobile client devices). The committee should foresee means to test system and component implementation and for the experiments where appropriate.

I ask the committee to complete its work by May 1st and document the proposed architecture. I know that this is tight, but we will rely on this to guide the FY-13 purchases.

Thank you for serving on this important committee!