Overall a successful conference

Many interesting topics with lots of benchmarks and performance evaluations

It seems we are all getting prepared for R2!
Operating the Worldwide LHC Computing Grid: current and future challenges

- [http://indico.cern.ch/contributionDisplay.py?contribId=73&sessionId=8&confId=214784](http://indico.cern.ch/contributionDisplay.py?contribId=73&sessionId=8&confId=214784)

- Future challenges
  - Medium term (during Long Shutdown 1)
    - Monitoring consolidation
      - By dedicated project
  - FTS 2 decommissioning
  - Expanding storage federations
  - Dynamic data placement
Operating the Worldwide LHC Computing Grid: current and future challenges (2)

- Long term (Beyond Long Shutdown 1)
  - Sustainable middleware validation and distribution
  - Full IPv6 compliance
  - New hardware technologies and architectures
  - Full integration of cloud resources
Software defined networking and bandwidth-on-demand

- https://indico.cern.ch/contributionDisplay.py?sessionId=0&contribId=485&confId=214784
Software defined networking and bandwidth-on-demand

What is SDN?

**Loose definition:** separation of data-plane from control plane

**In essence:** enables programmability

- Network Provisioning
- Network Monitoring

![Diagram](image_url)

- Control Software
- Firmware
- Network ASICs

- Protocol(s) (SNMP, TL1)

- Network Virtualization
- Network Controller(OS)
- HEP Applications
- Network Apps

- Protocol(s) (OpenFlow, ?)

- Control Software
- Firmware
- Network ASICs

- Network Element

Lawrence Berkeley National Laboratory

U.S. Department of Energy | Office of Science
Big Data - Flexible Data - For HEP

- https://indico.cern.ch/contributionDisplay.py?confId=214784&contribId=487
HEP, as a field, needs to rise above comparisons of CPU hours, petabytes, and gigabytes per second
- These are not Big Data! They are a function of big budget - easy come, easy go! - and are intellectually cheap.

Big Data is about accelerating science:
- Order-magnitude increases in processing capacity.
- Order-magnitude decreases in time-to-science.
- Order-magnitude decreases in dedicated computing personnel.
FTS3

- Mentioned in a few presentations
  - dCache
  - CMS
  - ATLAS
  - etc
dCache storage cloud

As A StorageElement

Generic Remote storage

Local storage compute

DropBox-like storage

SRM
CDMI
HTTP

GridFTP
HTTP

NFS v4.1

FTS 3

WebDAV
HTTP
CDMI
ATLAS

• ...Rucio conveyor daemon has been interfaced with the WLCG (Worldwide LHC Computing Grid Project) File Transfer Service 3 (FTS3). It has been able to submit to FTS3 transfers at a rate of 240 Hz. During this scaling test, the conveyor polled the status of each individual transfer to know when they are complete (green curve on the plot). In the future, this status check will be based on notifications, which is more efficient and scalable...