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CERN: Build terabit networks or the Higgs gets it!

Particle boffins describe the future they need invented to keep discovering the universe

By Simon Sharwood, 23 May 2014

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CERN's openlab has published a document explaining stuff it wants someone to invent so it can get the most out of the large hadron collider (LHC) and its other instruments.

The Whitepaper on Future IT Challenges in Scientific Research (PDF) sets out the problem, namely that exotic kit was needed to cope with the petabyte-per-second the LHC creates, so future instruments and experiments will be hard to run without new innovation.

The paper sets out a few technologies it would like someone to invent, rather soon. Those technologies include:

- Very high-bandwidth networks capable of integrating data from about a thousand 100 Gbit/s links, to cope with data flows from the LHCb experiment, that will try to simulate the moments after the big bang;
- Technology to handle 20 gigabytes per second of writes to storage, plus two verification reads;
- Better benchmarking of new technologies, to help design better high-performance kit and also to help manufacturers understand how to deliver the products CERN needs;
- A revival of the SETI at Home concept of using individual desktop computers to work on a single project, thanks to "hardware-level support for deploying virtual machines and using advanced virtualisation and trusted computing features" that turn myriad desktops into a single logical machine to attack big problems;
- Latency-tolerant wide-area NFS.

CERN also spells out some more prosaic requirements, such as simulation software that makes proper use of modern CPU architectures. Also on its list is more people with "expertise and skills in multi-core parallel programming," as few scientists of any sorts emerge from University ready to code for the kind of kit CERN runs.

There's plenty more in the 56-page document, some of it unremarkable and some of it – like a call for wireless networks that can "operate, in a high-radiation, high magnetic field environment, at bandwidths exceeding 100Gbit/s and without losing a single frame" – rather more blue sky. That last suggestion, by the way, is called for in order to replace wired sensors around the LHC with wireless devices. As the document notes, CERN has unusual requirements but its needs often become commonplace after surprisingly little time passes. It's not hard to imagine wireless devices meeting CERN's requirements for microwave ovens connected to the Internet of Things. ®

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