HENP SIG
LHC Network Measurement
Challenges

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April 22 2008
Internet2 Spring Members Meeting

Networking for the Future of Science
Current Network Environment

• Most R&E network backbones are composed of 10Gbps links
• The LHC community has the tools, techniques, infrastructure & capability to transfer data at 10Gbps.

• But…
  – Network topology is **constantly** changing!
  – LHC data transfer flows are not typical internet flows
  – Many network operators don’t have a lot of experience with large flows
  – Most physics flows cross multiple domains
  – Many cross-domain links haven’t been tested at capacity
  – Line rate flows don’t aggregate nicely
  – Debugging problems can be difficult
Measurement Requirements

• You must have the ability to easily determine the status of the set of paths you rely on for your critical missions.
  – Up and working correctly?
    • How do you prove it?
  – Down
    • Is there a known problem that is being worked on?
      – Are you seeing a symptom of the problem or something else?
    • Is part of the network down or the applications down?
    • How do you prove the problem is, or is not in your cluster/campus/regional?
    • Who do you call and what hard data can you provide to help them quickly identify the problem and fix it?
  – Up but not performing as expected.
    • Is there a known problem?
    • Who do you call and what hard data can you provide to help them quickly identify the problem and fix it?

• Do you know if your use of the network is affecting others?
  – Are you getting more, less, or exactly your fair share?
New Network Traffic Profiles

- Old Typical Traffic Pattern

- Steady State Instrument Output Pattern

- Tuned Bulk Data Transfer

How many 5-7 Gbps flows can you aggregate on a 10 Gbps backbone?
Community Progress

• There has been a lot of work in the Network Measurement space
  – Developing frameworks for exchanging measurement data
  – Developing & improving measurement tools
  – Defining diagnostic methodologies
  – Analysis techniques

• There is a small community that understands how to use these tools and techniques for network performance analysis, verification and debugging

• We need to help the LHC community take advantage of these capabilities
  – Metcalfe’s law - The value of a network is proportional to the square of the number of users.
LHC US Tier 1/2/3 Measurement Documents

• Why
  – A general white paper describing the value of network measurement to the community.

• What
  – A BCP styled after IETF BCP 15 that covers
    • What Measurements to support
      – Delay, Bandwidth, Interface Utilization, Errors & Discards, etc
    • Protocols
      – For measurement collection: ICMP, OWAMP, iperf etc.
      – For measurement Publication & Sharing - perfSONAR
    • Schedules & parameters
      – For regularly scheduled tests
    • Data sharing guidelines

• How
  – An implementation guide describing
    • What tools to use
    • How to configure them

• Constrained Scope
  – Limit the scope to the US LHC community
Next Steps

• Identify Tier 2/Tier 3 representatives who can participate in writing & reviewing BCP
  – Physics User
  – Campus Networking Person

• Present draft recommendations to the US LHC community at the T1/T2/T3 meeting at BNL in May

• Evaluate the ‘US Recommendations’ applicability to the global environment at LHCOPN meeting in June

• Present recommendations & pilot implementations at Joint Techs in July

• US LHC community using infrastructure by end of summer
Conclusions

• The Physics community
  – is The premier network user at this time
  – wants to be good network citizens

• The network should not be a black box.