

# CMS Input

J. Letts (UCSD), D. Piparo (CERN) - IT R&D Advisory Group - September 22, 2021



# This talk

- A short talk
- Identify requirements of ongoing R&D projects that could benefit from IT central support
  - And are potentially common with other experiments
- Ideas about the role of this meeting

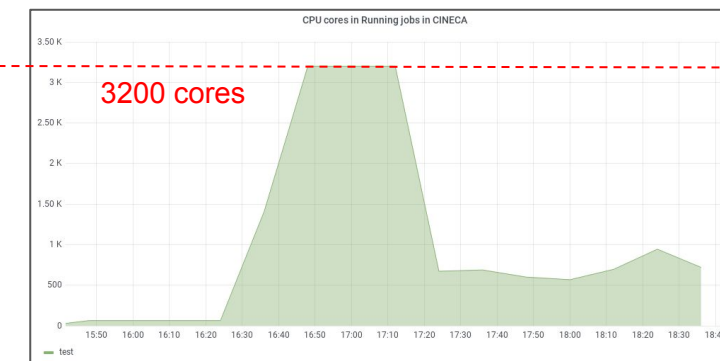


# Non-x86 Platforms and GPUs for CI/CB

- Why non-X\_86 CPUs?
  - Better code, e.g. more stable math routines
  - Be ready to take advantage of allocations on HPCs
- **POWER8/9 and ARM nodes needed by CMS for CI/CB**
  - No 24/7 availability, builds can be skipped once in a while
- **GPUs used for CI/CB**
  - Current availability is at the right level for us
  - We continue to need GPUs
- **GPUs also used for development**
  - Current availability slows down development (see next slide)

<b>MARCONI - 100</b>	Rank	System
<b>Nodes:</b> 980	11	Marconi-100
<b>Processors:</b> 2x16 cores IBM POWER9 AC922 at 3.1 GHz		
<b>Accelerators:</b> 4 x NVIDIA Volta V100 GPUs, Nvlink 2.0, 16GB		
<b>Cores:</b> 32 cores/node		
<b>RAM:</b> 256 GB/node		
<b>Peak Performance:</b> ~32 PFlop/s		<a href="https://www.top500.org">Nov20 top500.org</a>
<a href="#">Quick startup guide</a>		A "Small Summit"

A first "scale" test performed as well



CMS could run on M100, Power9 machine @ INFN CINECA also thanks to CERN IT support, that provided the build nodes to prepare the code for this exercise.

**POWER+ARM: needed to be ready for allocations at HPCs and to improve our code and external packages, also for x86**

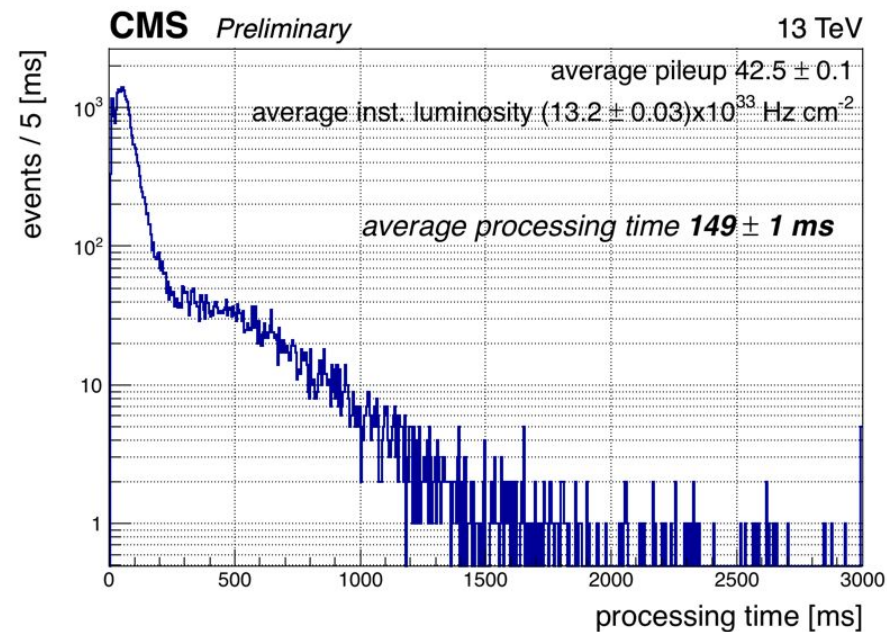




# Developing and Profiling on Heterogeneous Platforms

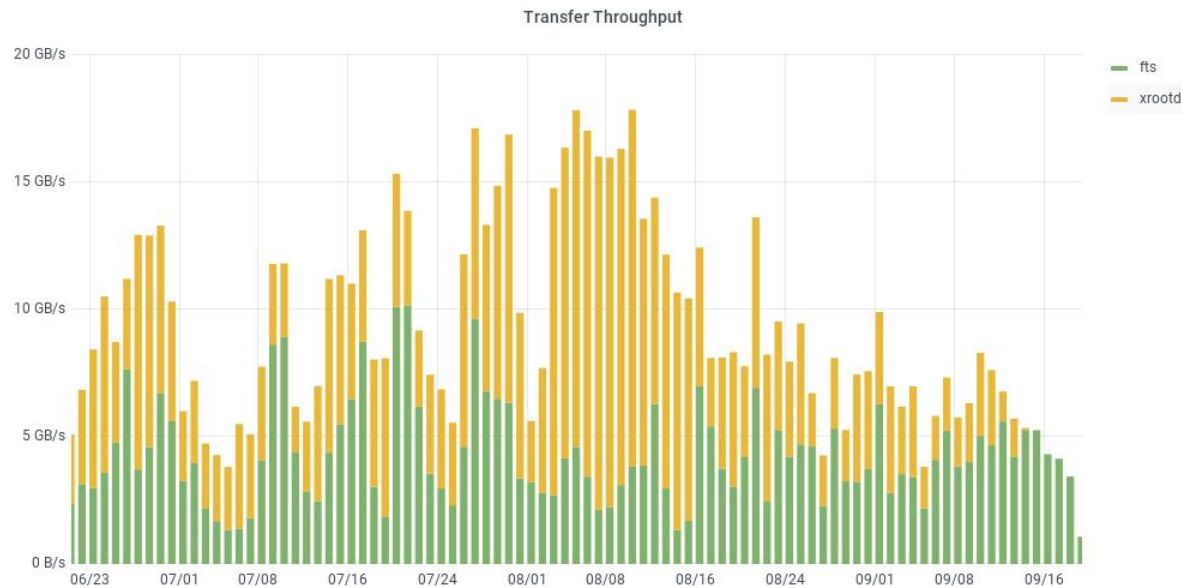
- The average time of the HLT processing (or “timing”) must stay below the HLT farm limit.
  - The timing is a key parameter to be monitored during the preparation of the HLT menu.
- Run 2: timing measured **using voboxes** (vocms006 and vocms007 ) - CPU configuration similar to the HLT
  - Used by all the HLT developers to measure timing of the full HLT menu before and after their development
  - The machines are available connected to the **GPN**
- Run 3: CMS HLT will have GPUs, 20% of filtering is offloaded to GPUs (NVIDIA T4)
  - **GPUs are necessary to measure the HLT timing**
- Currently some machines with GPUs are at P5
  - Accessible only through the CMS private network
- **Development currently limited by availability of GPU boxes**

**GPU equipped boxes would speed up considerably HLT menu and reconstruction developments for Run 3 (and Phase-2)**



# Measuring Network Usage

- Network: key resource in our present and future computing model
- Understood and reliable monitoring of network: extremely useful
  - WLCG Monitoring: **a good start, could more functionality be added?**
  - E.g. transfers between sites (no same site tape r/w), remote reads, usage of transatlantic link?
- **Data is necessary to improve network usage in Run 3 and Phase-2**
  - Might be useful to FTS to improve orchestration of transfers



[See this plot on WLCG monitoring](#)

Understood and reliable network monitoring enables evolution of computing models

# Evolving our Approach to Analysis

- R&D activities presently ongoing in CMS, in the area of hardware and software
- What can help at CERN is:
  - Good network to connect to EOS
  - Powerful nodes (64, 128, 256 threads + SSD)
  - Test space for xcache instances
  - Give access to experimental, more performant EOS instances
- Current support for the aforementioned items is sufficient

# Role of This Meeting

- Opportunity to report progress and signal needs, trying to highlight potentially common areas which could benefit from central support (like today)
- Advise on ongoing R&D activities in IT, too
- Roughly 3 phases of an R&D project:
  1. Initial (creating): developing an idea, frenetic development, prototypes made/thrown away, new approaches...
  2. Mature (consolidating): R&D demonstrated to be useful (e.g. reduces costs, risks, allows more Physics with the same budget), needs to be consolidated to explore how it can reach production
  3. Production: treated as a service, stable sw product
- Can this group help at the initial phase of 2., e.g. providing input to IT for prioritisation within the Department?