CSA07 Physics Planning

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CSA07 Skims

- PAG+POG+DPG = 46 total for 12 groups
  - Down from a much larger number… great work.
- There are still operational issues:
  - First problem: very large job count
    - Run on many files of a few thousand events. This means lots of jobs.
    - Can reduce number of jobs by running skims together.
  - Second problem: buffering
    - Run into a buffering problem if you combine too many skims since you have to buffer the output. Sridhara suggests 5 may be ok.
    - There is a higher risk that these combined skims jobs could crash.
- There is some possibility that we will need to revisit the skims list but for the moment we will try to avoid doing that.
  - It will depend on how much we can simplify things
    - Skims run on the same primary dataset (PD) can be combined more easily
    - Skims running on and outputting AOD or AODSIM use little buffering and can be combined with less risk
    - I am putting together summary tables for the skims as per information provided so far by the various CSA07 group contacts
  - The idea is to see how to group the skims in a way that simplifies things while keeping the system robust

Important Dates

- CSA07 now scheduled for Sep. 24th
- Final changes to skims
  - Changes to logic must be all done by Sep. 10th
  - Changes to thresholds, other parameters, must be finalized by the time of release of 1_6_0 + a few days, but no more than a week.

Computing TDR: Data Streams (§2.6)

- Online will classify Raw events into O(50) PD solely on trigger path
- "Analyses rarely make use of more than a well defined and small number of trigger paths. Thus events will be classified into a number of PD as a function of their trigger history.
- For convenience the PD may be grouped into O(10) online streams with roughly similar rates.
- The PD classification shall be immutable (rely on TRG)
  - Don't reject events from PD during reprocessing to allow consistent classification over time
- Duplication of events between PD allowed to ~10%
  - Advantage of duplication is that it allows one to need to access fewer datasets for analysis

- Skims
  - Immutability of PD no way excludes the possibility of forming subsets …satisfying more complex offline selection.
  - These may be genuine secondary event collections …copying selected events from PD or they may be in the form of event directories

Data Flow ($\oint$2.3)

- FEDS → EB → DAQ_RAW → HLT
- Out of HLT come RAW events at 150Hz (est. 225 MB/s)
  - Split into Primary Datasets (PD) and Express Stream (ES)
  - PD are immutable
    - Defined by HLT trigger paths: relevant info is retained with Event
    - Can always be reconstructed
- Reconstruction (RECO)
  - First fast RECO at Tier-0 (T0)
    - RAW+RECO of each PD are archived to the T0 Mass Storage System (MSS)
    - A copy of each PD (RAW+RECO) is transferred to a T1 which has custodial responsibility
    - Copies to other T1's depend on available bandwidth and storage
  - First copy of AODs also produced at T0's and distributed to T1s

Data Flow (cont)

- T1
  - Produce subsequent versions of AODs
  - *Skimming of RAW, RECO, AOD as requested by Physics Groups requests
    - Produce higher generation numbers of AODs
  - **Also can produce TAGs
    - contain high level physics objects and pointers to events (event and run number) allowing rapid Identification for further study.
- T2
  - *“Selected skimmed data, all AOD of selected primary streams, and a fraction of RECO and RAW events are transferred to T2 centres which support iterative analysis [by] authorised groups of users”
    - Grouping is expected to be done not only on a geographic but also on a logical basis, e.g. supporting physicists performing the same analysis or the same detector studies”

Tiers (∮3.1)

- T1
  - Provide the large-scale facilities ‘behind the scenes’
- T2
  - Numerous. Provide capacity for analysis, calibration, MC
  - Rely on T1 for access to large datasets
- T3
  - Provide interactive resources for local groups
- CMS-CAF@ CERN
  - Provide fast turnaround of certain data samples

- The majority of CMS users will rely upon T2 and T3 as their basis for analysis.

Working model*

- Primary Datasets
  - Now we are dealing with 11 (see Sridhara's talk) groupings of L1/HLT trigger paths
  - This does not preclude the possibility of a higher level of granularity from the computing side with respect to distribution
- Skims
  - Total of 46 PAG+POG+DPG
    - Around 3-5 per group (12 groups)
  - Final versions of physics skims are more inclusive in many cases and have large overlap in some cases
    - Redundancy and large datasets appear non-optimal

**This is my naïve sense of things, based on the preceding info and past experience from other experiments – and has been evolving, but not so fast lately*

Working model (cont)*

- Cons
  - Taken as they are, the outputs of the skims at T2's are going to be large and therefore possibly cumbersome to use
  - The fact that various groups have similar datasets appears to be an inefficient use of resources.
- Pros
  - Large inclusive sets sitting at T2 can be filtered to produce smaller workable datasets kept at T2 or copied to T3
    - Allows one to remake sets frequently and under local control
      - Not sure about book-keeping, provenance, DB posting etc. but should be possible
    - The advantage is that you probably do not know what small datasets you want right away and so can evolve them under your control quickly
    - Can also remake them whenever some reprocessing is needed
  - As for redundancy of skims
    - Now they are similar but in future could become very different as groups develop a better understanding of data and what they want to do
      - E.g. CDF top group has its own multijet primary dataset for all-hadronic top that is different from that used by QCD

CSA07

- **Each group must start thinking about "doing analysis in real-time"**
  - **Means a small team of people who follow the data from the Tier-0 to the Tier-2**
    - **Make basic plots**
    - **Establish basic health of the data**
  - **A starting point is the reco-validation person in Ilaria's taskforce.**
    - **Goal: identify problems within 24 hours of Tier-0**
      - **➔ Don't know if possible**
  - **Note: we do not have to do real-time analysis…**
- **Remaining issues:**
  - **Primary datasets (finalization); special: JetCalib stream**
  - **Jet bins in the data or not. Gunter/Nikos not present today, so delay discussion to tomorrow's afternoon session**
  - **Second reco pass (at T1s): do we do it with 100pb-1 constants?**

Real time exercises in CSA07

- For discussion
  - Monitoring data flow:
    - T0 to T1 – not sure who is responsible here and how physics should be involved.
    - T1 to T2 – physics should be involved in monitoring skims
  - Monitoring of data quality in quasi-real-time
    - Think about simple but critical quantities that can be used to assure data is healthy.
    - E.g. MTCC ~real-time DQM.
    - Offline Shifts
      - People have already been planning ahead to offline shifts – should physics should contribute here or is this mainly DPG level monitoring?
      - Should physics review/contribute to the items that are being monitored in offline shifts?
- Also we are just starting to think about possible Express stream activities during CSA07

More info

Event Model (§2.5)

- RECO
  - "Reconstruction is expensive… the RECO tier will provide compact information of analysis to avoid the necessity of access of RAW data for most analysis…
    - At the lowest level … hits, clusters, segments. Based on these objects reconstructed tracks and vertices are stored.
    - At the highest level reconstructed jets, muons, electrons, b-jets etc. are stored.
    - A direct reference from high-level to low-level objects possible
- AOD
    - Contain a copy of all high-level physics objects …plus summary RECO sufficient to support typical analysis actions such as track refitting with improved alignment or kinematic constraints, re-evaluation of energy and/or position of ECAL clusters based on analysis-specific corrections.
    - Will not contain (or support): all hits, novel pattern recognition, application of new calib. constants