Trigger software validation

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with compliments to Simon George and trigger group

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- Scope of trigger validation
- People involved
- Validation scheme
- Tests
- Samples

Focus of trigger validation

Trigger validation group is created to address quality of trigger software (LVL1 simulation and HLT code) which goes into release

- *technical validation* :
  - there are no crashes, no significant memory leaks
  - there are no errors and not too much warnings
  - there are no bugs in the released code (as far as possible). The slices run as expected (timing, efficiency/rejection is as expected) and all pieces work good together (steering, algos and different slices)
  - EDMs saved are correct and readable back
  - EDMs are serializable
  - trigger menu is according to configuration, and included trigger items are functional

Focus of trigger validation II

- *physics validation:* verify trigger contents, such as menu and rates, in **sample A** events, follow up problems found during production
- provide reference point (histograms, bytestream file, timing table of HLT algos) for online integrations of HLT
- exercise trigger Data Quality checks/histograms on different releases.

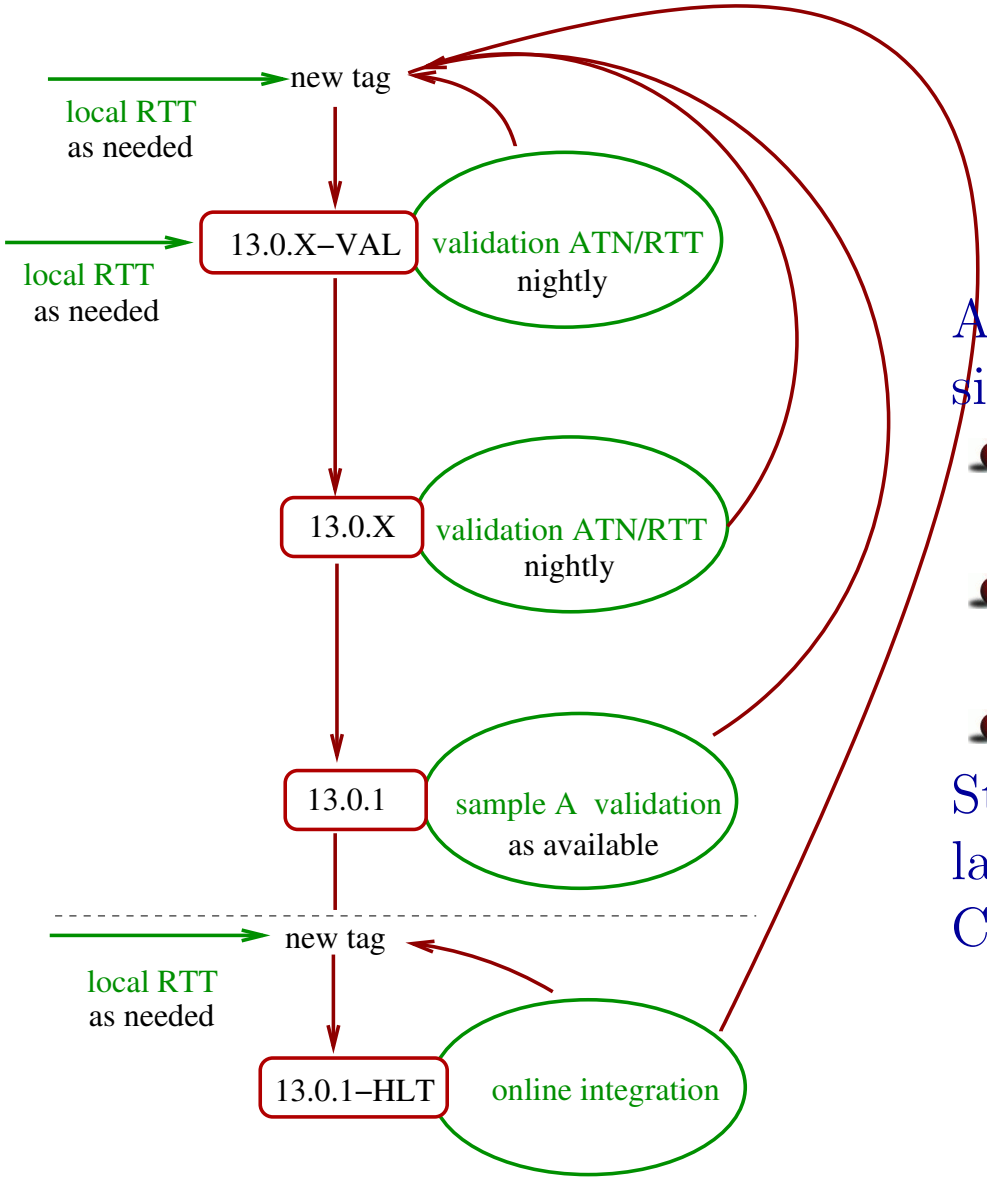
Trigger software is large. It has 9 slices, many trigger items ($\sim$ 100 in 12.0.6), uses data from different subdetectors, depends on offline software, has many developers ($\sim$ 50 active, 130 with cvs commit rights), has to work from day 1.

Trigger validation group

Muon	Giovanni Siragusa
Electron/photon	Valeria Perez-Reale
Tau	David Strom
Jet	Cibran Santamarina
ETmiss	Rashid Djilkibaev
Calo	Denis Damazio, Cibran Santamarina
IDet	Dmitry Emeliyanov, Iwona Grabowska-Bold
B-physics	Julie Kirk, Sergey Sivoklokov (dimuon), Natalia Panikashvili (j/psi)
B-jet tagging	Andrea Coccaro
Cosmics	Jamie Boyd
Overall	Olga Igonkina and Ricardo Goncalo
technical assistance	Tomasz Bold, Frank Winklmeyer, Danilo Ferreira de Lima, John Baines, Simon George

Close contact with people concentrating on online integration and data quality.

Tag validation path



Automate tests as much as possible.

- ATN (text output, $\sim$ 10 events)
- RTT (histograms, $\sim$ 1000 events)
- standalone tests, if needed

Start testing 2 weeks before AtlasTrigger closing date in TagCollector

Tests to perform

Releases 12.0.4-6 - a lot of experience is gained during *manual* validation of software. Release 13.0.X - make *standard* and automated tests. Some manual work still will be needed.

- Slice and algorithm (performance) validation :
  (affected by initialization, offline changes, and bugs)
  - check of basic distributions
  - efficiency/rate
  - job configuration
- Integration tests
  - HLT developers concentrate on a particular slice (*Egamma, Muon, Jet*, etc) or sequence, however, many problems (e.g. job configuration, steering framework) appear when many sequences are run together (stepping on each other toes).
  - Validate many job options - choose particular subdetector, different menus, with/without offline, MC truth, etc.
  - some tests are common with online integration

Tests to perform II

- Time and memory usage control, (not optimization)

- Input/Output validation
  - RoIs are passed correctly to next level
  - RDO $\rightarrow$ bytestream,
  - EDM correctly written to and read from ESD/AOD/TAG:
  - control size of bytestream, AOD

- re-running trigger on ESD/AOD

See:
https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerValidationTests

Samples for validation

Trigger runs from RDO. Have to have sufficient RDO to develop/validate trigger.

Need:

- lots of backgrounds (200-300k per di-jet sample)
- number of single particle samples ($\sim 10k$ for egamma, $\sim$ 1M without calo digits for muons)
- number of signal MC (Z, W, Higgs etc)
- mostly from latest release, but also some part of previous release RDO are needed.

Complete list is given in
https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerValidationSamples

Physics studies/trigger optimization is to be done with AOD. Have to have good trigger content in AOD.

Work with sample A as in
https://twiki.cern.ch/twiki/bin/view/Atlas/ValidationSample

As large statistics is available this will help to catch *rare* bugs.

Outlook

- Have set up new *trigger validation* group to address validation of LVL1 simulation and HLT software
- A lot of experience from validation of 12.0.6 release (first release where trigger is included in production), which is being transformed into automatic RTT tests. ATN tests are available since a while and are being extended. The validation test-suite is being developed
- Release 13 has major HLT modifications (new steering, configurables, tuning of AOD sizes), expect heavy load on validation at first. Good for training of tests.
- have requested trigger developers to declare variables to monitor. Important component of validation. Simultaneous unification of monitoring tools across the HLT. Parallel development of tools independent on HLT to monitor HLT.

Outlook

- Working to put many tests (order of 20?) to RTT couple of weeks before AtlasTrigger is closed.

- Option to run RTT locally is essential for quick debugging of RTT tests and for quick feedback on some especially sensitive new tags.
- *Physics* validation will be important for validation tests with large statistics ($\gg 1k$) - something that we can not run every night.

- Some amount of *manual* tests will remain such as checks for memory leaks (at the beginning), some performance studies, understanding of RTT reports, follow up on savannah bugs, etc