Status of TAIGA data handling and analysis software.



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GRADLCI meeting 2019, Irkutsk

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DESY.

TAIGA experiments

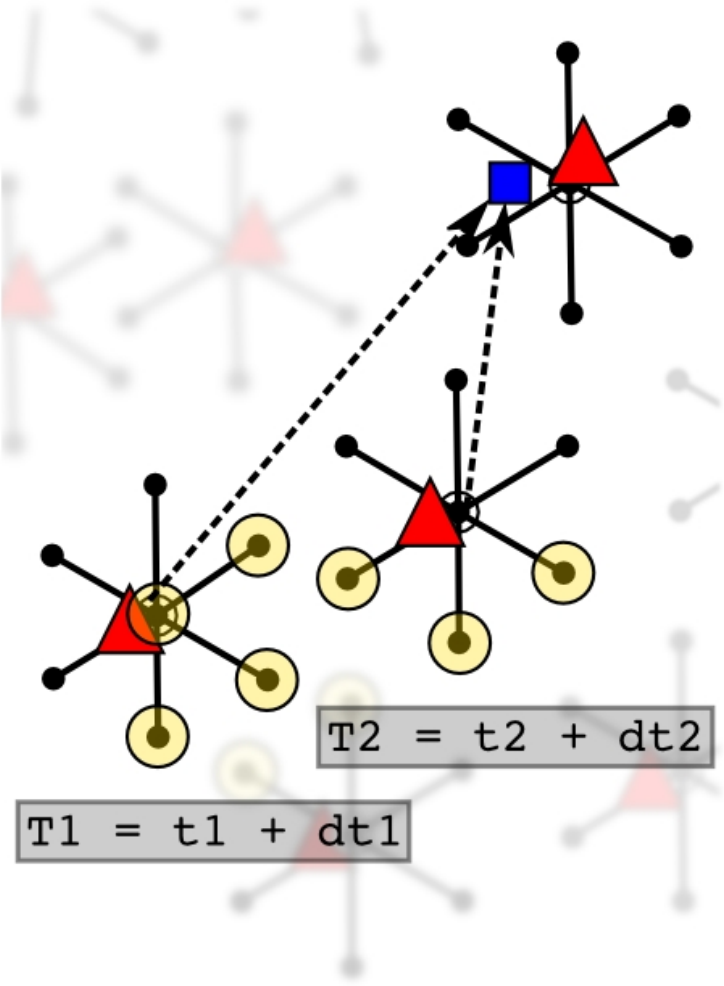
Cosmic-ray setups

- Tunka-133
- Tunka-Rex
- Tunka-Grande

Gamma-ray setups

- TAIGA-HiSCORE
- TAIGA-IACT

DAQ of cosmic-ray setups



- Every run local clocks set to zero
- Cluster centers have independent triggers (more than 2 simultaneous signals from PMT consider as event)
- Delays in optical fibers are taken into account. Event time is $T =$ local time $+$ fiber delay
- We merge separate events with $\Delta T \leqslant 7000$ ns into one
- UTC time sets for each event in DAQ center and then data reader chooses one for merged event.

DAQ of cosmic-ray setups

Triplex mode (Tunka-133 + Tunka-Grande + Tunka-Rex):
triggered by Tunka-133
Duplex mode (Tunka-Grande + Tunka-Rex):
triggered by Tunka-Grande

Uniform ADC:

- 12 bit depth
- 200 MS/s sampling rate
- 1024 sample traces
- 4 FADC boards with 4 channels each

Tunka-Rex is plugged to the last channels of Tunka-133/Grande boards:
Tunka-133 board: Tunka-133 – 0-13, Tunka-Rex – 14-15
Tunka-Grande board: Tunka-Grande – 0-11, Tunka-Rex – 12-15

Remarks on DAQ software and raw data

- Data format and software have satisfactory description by Korosteleva
- Cross-check of data formats by Fedorov (tree builder)
  and Mikhailov & Shigarov (Kaitai)
- Tunka-Rex is plugged to Tunka-133/Grande
  $\Rightarrow$ has to be parsed in the same flow
- Tunka-133/Rex/Grande have common trigger
  $\Rightarrow$ events have to be treated in the same flow (related to metadata)
- Data are stored in Moscow (official repository), Irkutsk, Karlsruhe
- Backups, control sums, signatures?

Software for cosmic-ray setups

Tunka-133/Grande
Maintainer(s): Prosin
License: unknown
Documentation: NO
Version control: NO
Ticket system: NO
External libraries: NO

Tunka-Rex
Maintainer(s): Bezyazeekov, Fedorov, Lenok, Kostunin
License: GNU GPL, Auger License (for Offline libraries)
Documentation: partial
Version control: hg
Ticket system: Redmine
External libraries: Auger Offline

Software for gamma-ray setups

TAIGA-HiSCORE

Maintainer(s): Porelli, Prosin, Sveshnikova, Tluczykont, Wischnewski
License: unknown
Documentation: partial
Version control: git, svn
Ticket system: NO
External libraries: unknown (sim_telarray?)

TAIGA-IACT

Maintainer(s):
data analysis/simulation – Postnikov, Sveshnikova, Tluczykont;
slow control – Zhurov
License: GNU GPL for EPICS extensions, unknown for rest
Documentation: partial
Version control: git
Ticket system: Redmine (Irkutsk group)
External libraries:
simulations – sim_telarray;
pointing – EPICS;
data analysis – NO

Tunka bitbucket account

`https://bitbucket.org/tunka/`

Members: Bezyazeekov, Fedorov, Kostunin, Shipilov
Public repositories: datatools, simm, astropm
Private repositories: denoiser, monitoring, efieldfitter

Conclusion

- Raw data of TAIGA setups has satisfactory description
- Raw data of CR setups (Tunka-133/Rex/Grande) has to be treated in the same workflow
- Lack of control sums and digital signatures of data

- TAIGA software has serious collisions with FAIR(?) concepts
- The analysis of Tunka-133/Grande is NOT reproducible by third parties
- Unfortunately only Irkutsk group (Kazarina, Zhurov) is trying to follow good practices of software development
  (version control, ticket system, documentation)
- Strategy of TAIGA-IACT software development is a dead end for experiment: with present manpower/expertise the quality of HAP/MARS/CTA*software will never be reached