Deployment and Operation of the ATLAS EventIndex for LHC Run 3

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EventIndex: an event-level metadata catalogue for all ATLAS events

Architecture:

• Designed to scale for **big data** [1-4]:

EXPERIMENT

- Able to keep **trillions** of event records.
- Able to ingest 10k records/s.
- Data platform with open-source components.
 - Hadoop ecosystem:

Use cases:

- **Event Picking.**
- Counts or selections.
- **Overlaps:**
 - of triggers in a dataset.
 - of events between derivations.

Event record content:

Event records with immutable event information:

- Run and event number.
- Event location (GUID).
- Provenance.
- Trigger information.
- Luminosity block, Bunch crossing identifier.

HBase, Phoenix, YARN, Spark, Scala, HDFS.

Production checks.

New/revised components for LHC Run 3

New Producer transformation:

- Streamlined
- Adapted to current ATLAS Athena framework releases
- More resilient to network problems

Revised data transport mechanism:

- Payload to object store, metadata to messaging system
- Back-up store in EOS@CERN if object store unreachable

New data storage technology:

- HBase dataset and event tables
- Phoenix interface for SQL queries
- Much faster Loader compared to previous implementation See CHEP2023 poster [6]

New event picking server:

- Web service to automate event picking for large requests (thousands to millions of events) [5]
- Sends asynchronous queries, event picking jobs to the Grid and notifies user when done

New client tools for data queries and retrieval:

- List and count datasets and events according
 - to request
- Event lookup See CHEP2023 poster [7]

 \rightarrow Data flow Information flow



02/01





References

[1] Barberis D. et al., " The ATLAS EventIndex: an event catalogue for experiments collecting large amounts of data", J.Phys.Conf.Ser. 513 (2014) 042002.

[2] Barberis D. et al., " The ATLAS EventIndex: architecture, design choices, deployment and first operation experience", J. Phys. Conf. Ser. 664 (2015) 4, 042003.

[3] Barberis D. et al., "The ATLAS EventIndex for LHC Run 3", EPJ Web Conf. 245 (2020) 04017.

[4] Barberis D. et al., " The ATLAS EventIndex: A BigData Catalogue for All ATLAS Experiment Events", Comput.Softw.Big Sci. 7 (2023) 1, 2.

[5] Alexandrov E. et al., "Development of the ATLAS Event Picking Server", Proc. 9th Int. Conf. on Distributed Computing and Grid Technologies in Science and Education (2021) 223-228.

Other contributions to CHEP2023

[6] HBase/Phoenix-based Data Collection and Storage for the ATLAS EventIndex, https://indico.jlab.org/event/459/contributions/11346 [7] Query Service for the new ATLAS EventIndex system, https://indico.jlab.org/event/459/contributions/11337 [8] Testing framework and monitoring system for the ATLAS EventIndex,

https://indico.jlab.org/event/459/contributions/11315