Improvement of AMGA Python Client Library for the Belle II Experiment

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Motivation

- gBasf2 uses AMGA python client API to access AMGA
- AMGA python client API has a lack of functionalities, compared to C++ client API
  - No support for client-side metadata federation
- Developer from the Belle II distributed computing system asks for improvement of AMGA python client API
  - Client-side metadata federation support, GSI (python SSL wrapper for DIRAC) support, API refinement

Overview of the Belle II Experiment

- An upgrade of the B factory experiment Belle at the KEX laboratory in Tsukuba, Japan, investigating CP violation, which explains why the universe today consists only of matter and no anti-matter
  - SuperKEKB accelerator commissioning starts in early 2016
  - Phase 2 run (w/o the vertex detector) starts in 2017
  - Phase 3 run (w/ the full detector) starts in 2018
- Expected to produce ~100PB (one set of raw data) and another ~100PB (MC/analysis data)
- 1.8GB/s @ Storage
- 10s of millions of files distributed across multiple grid sites
- Belle II Computing Model uses DIRAC for distributed workload management, AMGA for metadata catalog, and gBasf2 for job submission client

AMGA Overview

- Standalone Grid metadata catalog for supporting metadata description, discovery and archive of large-scale scientific data
  - Directory-like hierarchical structure
  - Various authentication methods (ID/password, VOMS certificate)
  - ACL-based authorization
  - Heterogeneous DB back-ends (Modular back-end: PostgreSQL, MySQL, Oracle, SQLite)
    - Standardized access methods (Modular front-end: TCP Streaming, SOAP WS-DAIR, SSL)
  - Multi-process/Multi-thread DB connection
  - Pre-existing DB import
  - Metadata replication and federation (experimental)
  - General-purpose AMGA Manager GUI
  - Various programming API (C++, Java, Python)

Support for Client-side Metadata Federation

- Limitation of AMGA client-side metadata federation
  - Supported by C++ client API only
  - Creates entry of root privilege only, not of user privilege
  - Supports password-based authentication only
- Implemented client-side metadata federation on python client API
  - Introduces new module for federation (mfded.py)
  - Modifies AMGA python client API (mdcclient.py) to use new module, transparently to users
  - Preserves ownership of the entry created by non-root user
  - Supports certificate-based authentication

Support for GSI (python SSL wrapper for DIRAC)

- Use of different SSL libraries between DIRAC and AMGA
  - AMGA supports built-in SSL and TLSSite, while DIRAC supports GSI
- Added GSI support to AMGA python client API
  - Introduces USE_GSI flag to turn it on
  - Could streamline SSL communication scheme for the Belle II distributed computing system
  - Could observe increased stability of SSL connection

Refinement of python client API

- Separate API calls between execution and fetch of AMGA command
  - Prone to misuse AMGA python client API from gBasf2
- Refined AMGA python client API to hide separation between execution and fetch to user
  - Synchronizes execution and fetch of AMGA command by introducing fetch flag to the related python client API
  - Modified API: listEntries, selectAttr, getAttr
  - New API: selectQuery
  - Simplifies use of AMGA python client API

Summary and Future Plans

- Improvement of AMGA python client library, based on requirements from developer of Belle II distributed computing system
  - Added support for client-side metadata federation and GSI, along with API refinement
- Investigation of new action items based on the result of the recent MC campaign
  - Will continue to maintain AMGA python client library based on requirements