

# Persistency framework summary and input for phase-2 planning

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# POOL Phase 1 Highlights



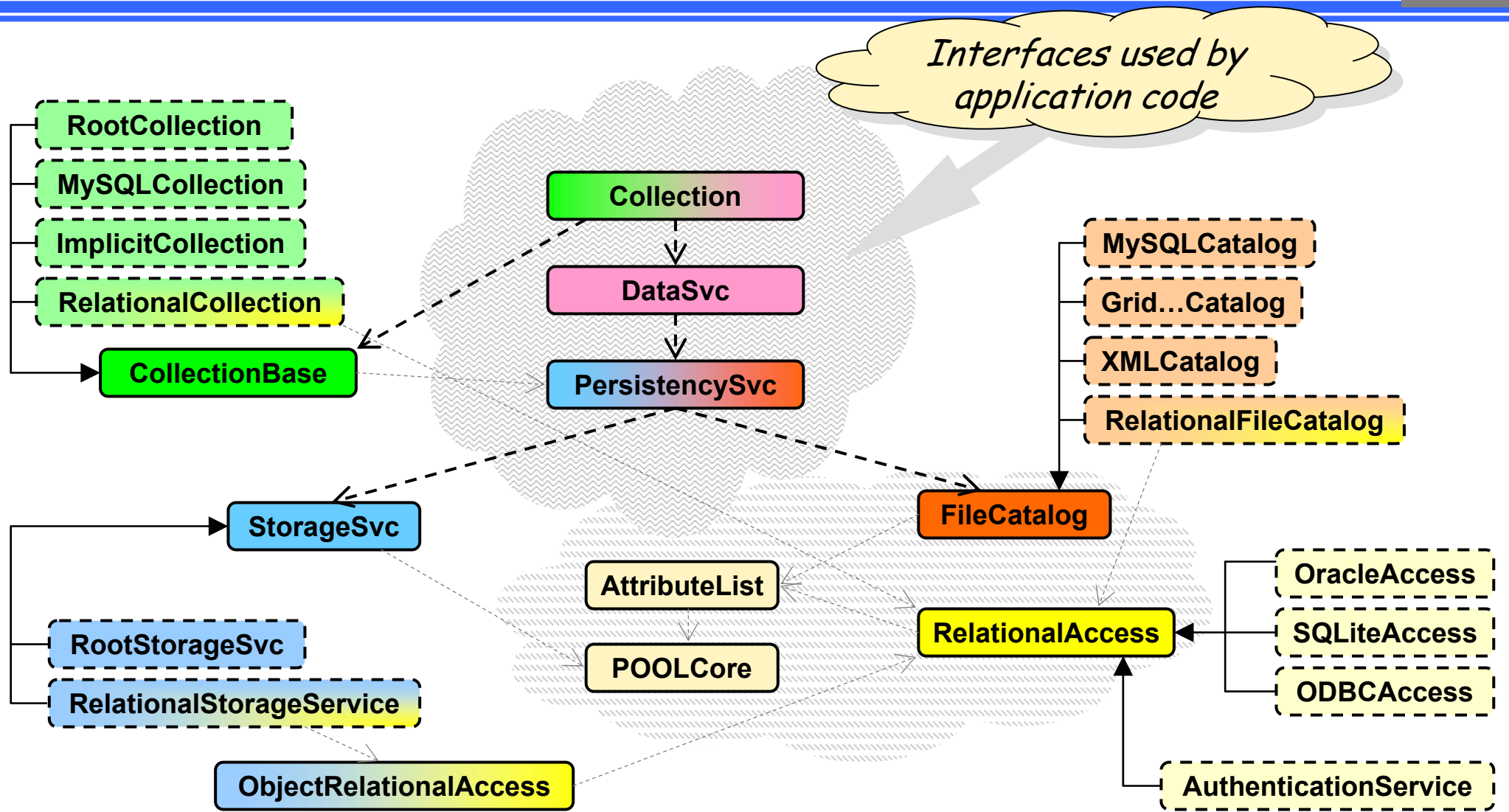
- **Schema extraction, representation and ROOT connection proven**
  - Prototype started in POOL and migrated to SEAL
  - gccxml and SEAL/Reflection are a valid approach
  - Interface to cint implemented in POOL and now moving to cintex
- **Complete STL handling in POOL**
  - Now migrated into ROOT 4 and used from there
- **POOL File Catalog deployment model picked up by all experiments**
  - consistent s/w for very different environments (development, non-grid and grid connected cases)
  - Catalog fragment extract/publish model is baseline for most productions
- **Technology abstraction has largely been achieved**
  - POOL RAL and RDBMS Storage Manager completed this goal and will allow for a consistent database foundation (monitoring, security, error handling)
  - POOL stayed open eg wrt to middleware developments (File Catalogs)
  - Blueprint plug-in model was essential to achieve this
- **Integration in experiment offline frameworks has been achieved**
  - Strong experiment involvement was in design and implementation was key
- **POOL successfully deployed close to PB scale**
  - Re-use of existing components (ROOT I/O, RDBMS) helped a lot!

# POOL Project Evolution



- **POOL entered its third year of active development**
  - Joint development between CERN and experiments
  - During the last years we followed the proposed work plan and met the rather aggressive schedule to move POOL into the experiment production
  - Last year POOL has been proven in the LCG data challenges with volumes ~400TB
- **Changing from pure development mode to deployment, support and maintenance**
  - Several developers moved their effort into experiment integration or provision of back-end services
    - This is a healthy move and insures proper coupling between software and deployment!
    - But it affects the available development manpower
  - Task profile changing from design and debugging to user support and service optimisation
- **Need to maintain stable and focused manpower from CERN and the experiments**
  - Only this close contact has made POOL a successful project
  - Experiments and CERN have confirmed their commitment to the project
- **Manpower available to project developments now rather limited**
  - LCG Side - funding now insured
    - (re-)hiring round for phase 2 has started
  - Experiment Side - contributions are in several cases still without commitment
    - Valuable contributions received (new Tree Branch code from Bill)
- **Reliable planning needs committed manpower for the duration of the plan**

# POOL Architecture



--- Uses

— Implements

# Main Phase 2 Topics



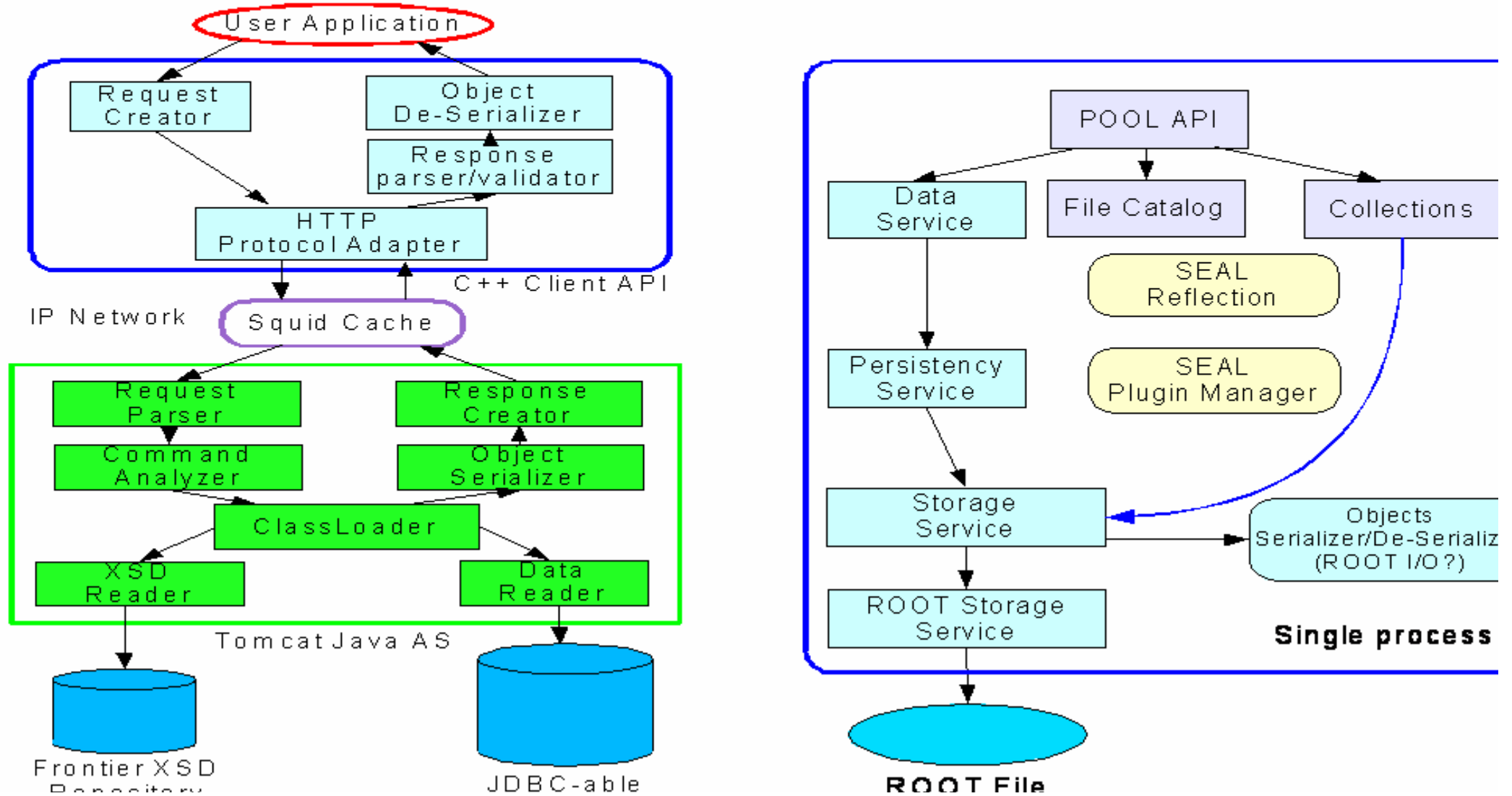
- Getting close to end of the design & deployment phase
  - Main functionality has been provided
    - Some RTAG features have not been provided yet..
    - .. and not asked for anymore
  - Experiment requirements and focus change in some areas after more deployment experience
    - Need to insure that POOL experiment communication stays effective
    - POOL link people attend relevant experiment meetings (shared with IT service representation)
- AA Phase 2: Maintenance, Consolidation and Service Integration
  - Faster, simpler, more reliable
  - Better service integration with low level services
    - (Mass)storage and database services at Tier 0
    - LCG StorageElement, file catalogs and distributed database services
  - Need to establish closer technical links to grid deployment groups to insure that requirements from AA are communicated

# POOL RAL and LCG 3D



- Propose POOL RAL as reference implementation interfacing to a distributed database service (LCG 3D)
  - Location independent connection to a database in the grid
    - Service catalog using the POOL (File) catalog components underway
  - Mapping of grid identity to local database/file user and role
    - VOMS implementation for DB (and files)
  - Database connection pooling and consistent DB error logging/handling
  - Consistent database client and database server monitoring
    - Eg query hitslist and database time
    - For single application or aggregated for a database domain
  - Relational data distribution
- Provide RAL independent from other POOL components
  - Packaged separately for applications which have no other POOL dependency but would profit from a consistent database service integration
- RAL as candidate foundation to be used by ROOT Database Trees?

# Frontier & POOL (Simplified)



# FroNtier Integration



- Access to remote Databases is provided by the FroNtier system developed at FNAL
  - http based data transfer with light-weight, database independent client
  - Full encapsulation of database details (schema, queries, physical storage) behind application server
  - Simplified deployment option for read-only data in particular for higher level tiers with only limited resources to provide a database service
- Proof of concept POOL integration has been done by FroNtier team at FNAL
  - Frontier objects appear as normal POOL objects as described by the LCG Dictionary
  - More work required to setup a test deployment infrastructure (within LCG 3D) but very promising option eg for conditions data
  - Integration with COOL project is being discussed
- POOL Integration of the pre-existing FroNtier system with was possible in relatively short time



# Proposed POOL Milestones



- Split File Catalog production release (Q2)
  - Adapters for external FC implementations included in production release (Globus RLS, LFC (GD), gLite (GM), xrootd(?))
- RAL delivered as separately installable component (Q2)
  - SEAL/ROOT dependency will remain
- POOL build and releases passed to SPI (Q2)
- RAL supports logical database lookup, monitoring, connection handling and provides Grid Security integration (Q3)
  - Integration with LCG 3D infrastructure
- POOL FroNtier integration (production version) (?)
  - If requested by experiments
- POOL Integrated with new reflex/cintex dictionary components (?)
  - Depends on SEAL/ROOT milestones
- POOL schema loading on demand implemented (Q3/Q4)
  - After new dictionary integration?
- POOL files access integrated with experiment analysis frameworks (Q2)
  - Refs and collection support requirements needs clarification

# Manpower & Commitments Today



- Contributors with 20% FTE or more in POOL and a CVS commit during the last 6 month
- IT-ADC
  - Ioannis Papadopoulos, Radovan Chytrcek, Giacomo Govi, Maria Girone, {Dirk Duellmann}
- ATLAS
  - {Marcin Nowak}, Kristo Karr, {Yulia Shapiro}
- LHCb
  - Markus Frank(?) -> move to SEAL/ROOT
- CMS
  - Zhen Xie(?), {Bill Tanenbaum}

# Proposed COOL Milestones



- **First COOL production release (Q1/Q2)**
  - Followed by a open review (Q2)
- **COOL meets performance requirements (Q2/Q3)**
  - After validation against experiment reference workload
- **COOL deployed in production at Tier 0 (Q3)**
  - Integrated with Physics database services at CERN
- **COOL data distribution deployed according to experiment models (Q3/Q4)**
  - Integrated with LCG 3D service
- **COOL integrated with FroNtier as data distribution mechanism (?)**

# Manpower & Commitments Today



- Contributors with 20% FTE or more in COOL
  - and a CVS commit during the last 6 month
- IT-ADC
  - Andrea Valassi
- ATLAS
  - Sven A. Schmidt

# Summary



- The LCG POOL project provides a hybrid store integrating object streaming with RDBMS technology
  - POOL has been successfully integrated into three quite different LHC experiments software frameworks
  - Successfully deployed as baseline persistency mechanism for CMS, ATLAS and LHCb at the **scale of ~400TB**
- POOL continues the LCG component approach by abstracting database access in a vendor neutral way
  - A Relational Abstraction Layer has been released and is being picked up by several experiments
  - Minimised risk of vendor binding, simplified maintenance **and data distribution** are the main motivations
- POOL as a project is (slowly) migrating to a support and maintenance phase
  - Need keep remaining manpower focused in order to complete remaining developments and to provide adequate support to user community
  - Maintaining a significant experiment contribution is required insure the the tight feedback loop which made POOL an effective project
- The LCG Conditions DB project has produced several releases of the Oracle and MySQL based implementations within the LCG Application Area
  - After an interface and extension review a concrete plan to consolidate the implementations has been discussed
  - Manpower also from the experiments is now becoming available to the project allowing to re-factor the package based on the Relational Abstraction Layer
- New complementary technologies such as FroNtier are being integrated into the LCG persistency framework as distributed access to database data gets more interest

# Main Concerns



- **ROOT/SEAL merge promises longer term savings**
  - but will come with significant additional effort in the medium term
  - and more compatibility constraints from non-LCG users
- **POOL relies on several SEAL components**
  - Some of which being “consolidated” with ROOT counterparts
    - Change cascade of this consolidation to POOL and above needs careful evaluation
  - Merged product (ROOT/SEAL/RootStorageService) needs careful dependency check to avoid new or circular dependencies
    - Those can create more maintenance effort than code duplication
- **Manpower in POOL and COOL is scarce**
  - But proper coupling to experiment users and grid deployment /services will requires significant testing & communication
  - COOL project is progressing rapidly, is well aligned with other AA s/w, seems to have many interested users
    - But little commitment in terms of manpower
  - Any unplanned development requests are likely create significant