

Release process in Geant4

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The release process

- Minor, major releases & patches
- Planning of features to be included
- The release phase for β and final release
- Candidate releases & testing
- Validation on the GRID
- Performance benchmarks and Q/A
- Documentation
- Announcement & information flow
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Minor, Major releases & patches

- Traditionally providing one public release each year
 - Preview β release in June
- Patch releases packaged according to the need
 - Criticality and amount of fixes
- Minor release: providing new features and bug fixes with limited changes to interfaces
 - Backward compatibility guaranteed for public interfaces
 - No or minor migration required for user's code
- Major release: providing new features, fixes and major interface changes
 - No backward compatibility; obsolete code/classes may be removed
 - Required migration of user's code advertised and documented
- Decision if minor/major release and dates taken by Steering Board
 - Based on features to be provided and feedback from experiments & users

Planning of features to be included

- Features to be included in a release in direct relation with the yearly work plan of the Collaboration
 - Discussed, collected and prioritized in the Steering Board by each WG
 - Based on requirements from the users' community
- Work plan presented at the first Technical Forum of the year, discussed and refined
 - Including preliminary time schedule for first and second semester
 - Work plan published on the web
 - Items which may be at risk are flagged in the work plan
- Additional items & features may be included
 - Reflected in the work plan which can be updated during the year
- Status of planned features reviewed
 - At the Steering Board before the release
 - At the annual Collaboration meeting, traditionally held in Fall

The release phase

- 6 weeks period for the final public release
 - Working groups (categories) grouped in 3 chunks with deadlines for submission of new features in the first three weeks
 - Ordered according to dependency levels (low-level categories tested first)
 - One week period for each group for fixes
 - Last three weeks dedicated to:
 - Possible general technical code migrations
 - Validation tests, Q/A tests, benchmarks tests
 - Possible required fixes
 - Documentation updates & drafting of release notes
 - Intermediate candidate releases provided to costumers
- Limited period (2-3 weeks) applied for β release
 - Regular monthly development release but subject to more stress testing
- See tags & release procedure document:
 - https://geant4.cern.ch/collaboration/tag_release.shtml

Candidate releases & testing

- Candidate releases provided during the release phase period
 - Installed on AFS at CERN for preview by the experiments and experimental groups
 - Experiments contacts informed through contact-persons
 - Feedback from experiments expected & resolution of reported problems
 - NOTE: monthly development releases are also regularly provided during the whole year and installed for use by the experiments
- Whole testing suite (~250 tests) with long statistics executed in automatic way each night
 - Limited suite (~100 tests) executed in 'continuous' mode whenever a new tag (code module) is submitted to testing
- Testing based in Cdash/Ctest and results posted on the web: <http://cdash.cern.ch/index.php?project=Geant4>

Validation on the GRID

- Stress tests are executed on the GRID
 - Physics benchmarks on simplified calorimeter for different physics observables, different particles at different energies:
 - Visible energy (calorimeter response)
 - Energy resolution
 - Longitudinal shower profile
 - Lateral shower profile
 - Different calorimeter types: TileCal (Fe-Sci), AtlasHEC (Cu-LAr), AtlasECAL (Pb-LAr), AtlasFCAL (W-LAr), CmsECAL (PbWO₄), CmsHCAL (Cu-Sci), LHCb EM (Pb-Sci), CALICE (W-Sci), ZEUS (Pb-Sci)
 - Different physics configurations (physics lists)
 - Overall stability checks on large statistics runs & histogram analysis
- Typically 20000 jobs of ~5000 events each for a public release
 - Also executed at each development release every month (4000 jobs)
- Sites: CERN, IN2P3 (France), CEA (France), NIKHEF, KEK
 - Recently being added also KISTI (South-Korea)

Performance benchmarks & Q/A

- CPU performance monitoring is performed in collaboration with our team at FNAL
 - Providing results for time profiling and memory usage
 - Recently added also statistical results on number of tracks/steps
 - Profiling executed at every development release each month and on candidate releases
 - Results published on web and comparisons with old releases taken as reference
 - See: <http://oink.fnal.gov/perfanalysis/g4p/>
 - Close communication with testing and release teams
- Q/A campaign started since two years based on the Coverity tool
 - Static code analysis performed at each development release every month
 - Working Groups coordinators informed on results and monitoring of progress
- Memory leak checks using the Valgrind tool
 - Performed on candidate releases and final releases
 - Working Groups coordinators informed on results for fast feedback and action

Updates to documentation & release packaging

- Required updates to Users Manuals, Installation Guide applied in the last three weeks before the release
 - All documents kept in SVN repository as DocBook files
 - Working Groups coordinators duty to perform the relevant updates directly on the repository and inform the documentation manager
 - Documentation manager (currently Mike Kelsey, SLAC) checking consistency of documents, finally packaging and publishing on web
 - See: <http://geant4.cern.ch/support/userdocuments.shtml>
- Release notes prepared by the release manager in the last three weeks before the release
 - Draft circulated to Working Group coordinators for further corrections
 - Release manager (G.Cosmo, CERN) finally packaging and publishing
 - See example: <http://cern.ch/geant4/support/ReleaseNotes4.9.5.html>
- Final release packaging and publishing
 - Installations on AFS @ CERN for supported systems (G.Folger, CERN)
 - Source code and binary distributions from web site

Announcement & information flow

- Each new release announced in the main “geant4-announce” mailing list and published on web
- Public releases and development releases also announced internally at CERN:
 - LHC Architects Forum, IT/C5 meetings, LCG Quartely reports and Simulation mailing list
 - LHC experiments contacts
- Features in each new release or patch presented at the following Geant4 Technical Forum

Final Observations

- Release procedure for Geant4 established since 1998
- Evolved in time and now reached pretty stable state
 - Evolution dictated by many factors, among which:
 - Transition from full development to more stable and maintenance phase for different modules
 - Stability requirements from customers and experiments
 - Increasing coverage of tests and benchmarks
- Considerable improvements made in the last years
 - Automation of testing, from Bonsai to new Tags Database and Cdash/Ctest
 - Effort sharing in testing with shifts among Collaborators
 - Nightly and 'continuous' testing runs for fast feedback with developers
 - Systematic CPU performance monitoring
 - Automation of GRID validation and increased resources
 - Improved feedback from experiments