User/Development Support Systems and Tools

Geant4 Collaboration Workshop

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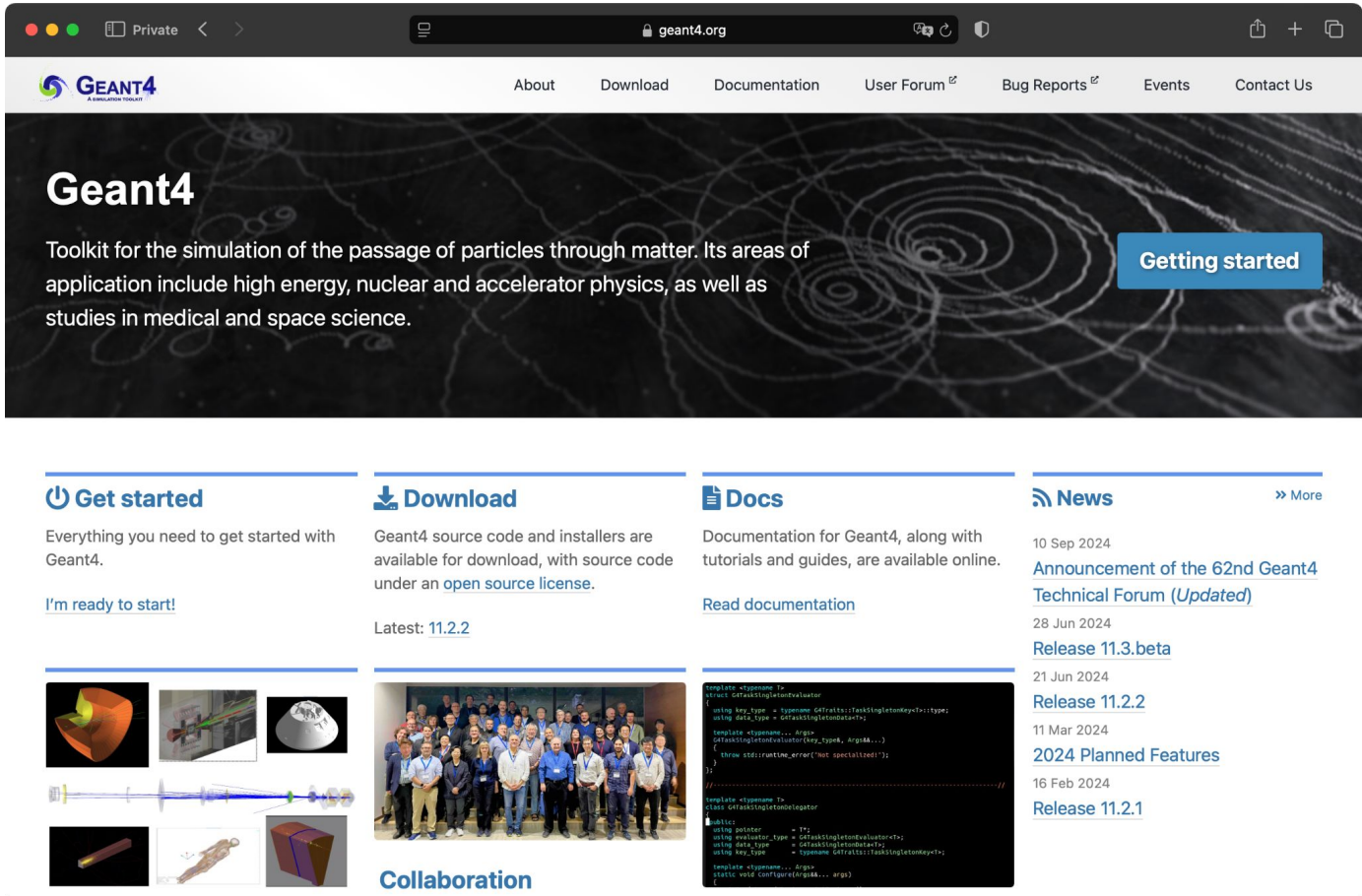
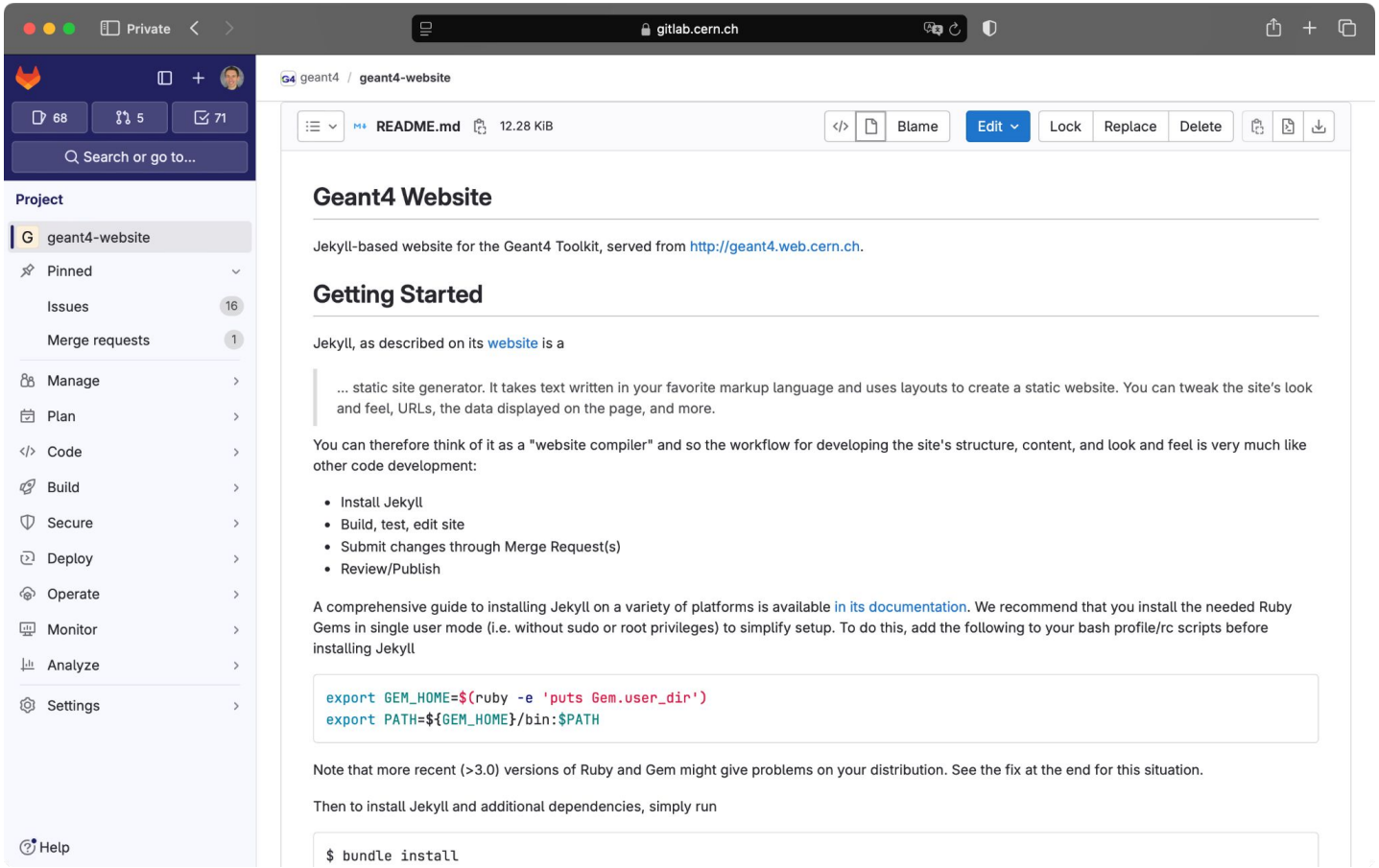
Geant4 Website

- Running stably, both at CERN and KEK mirror, minor updates since Sapporo
  - *Releases, workplans, members*



Contributions Welcome!

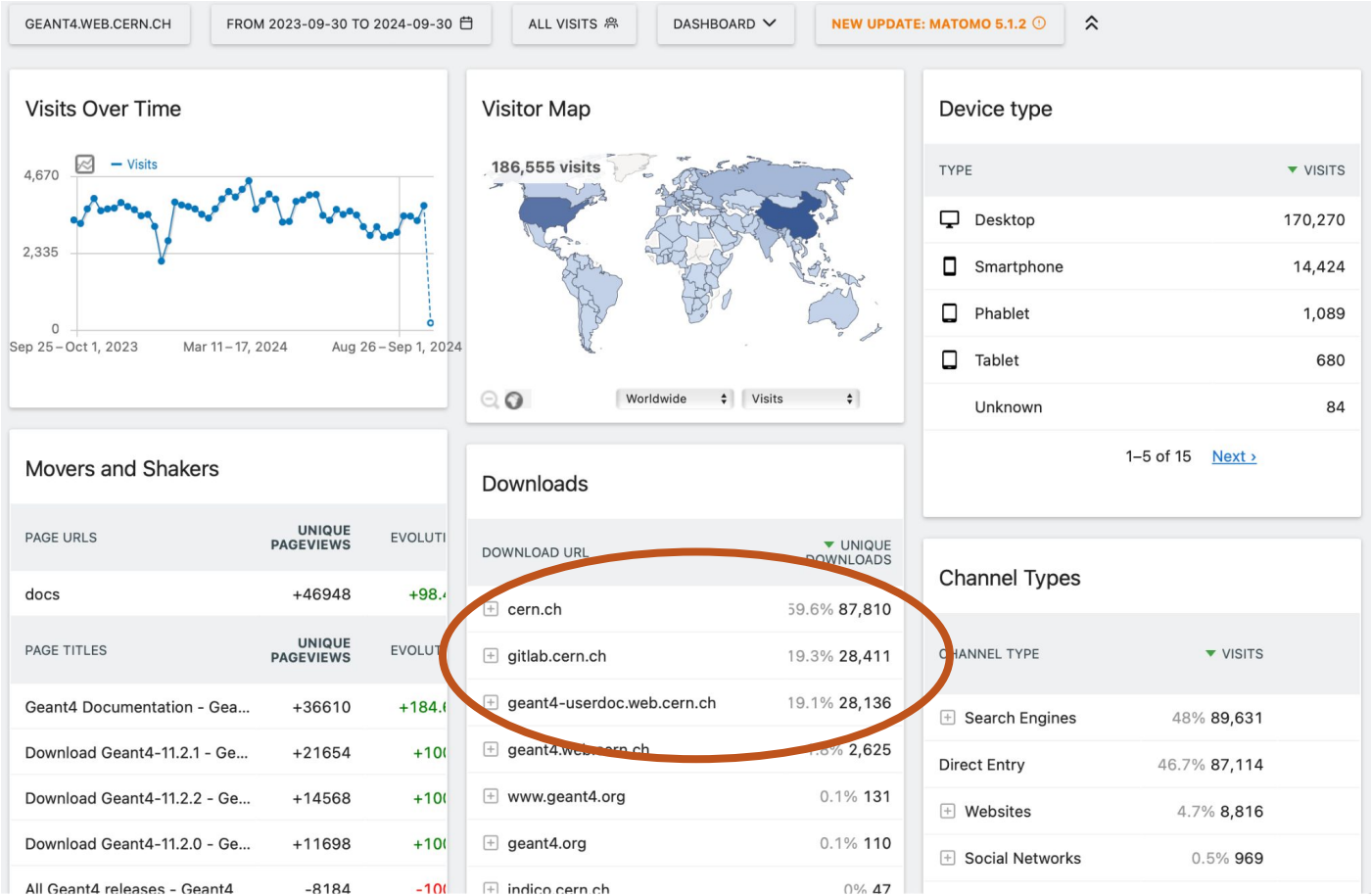
- Full docs on how to contribute to content on GitLab
- If you have any problems of issues, just ask!



https://gitlab.cern.ch/geant4/geant4-website

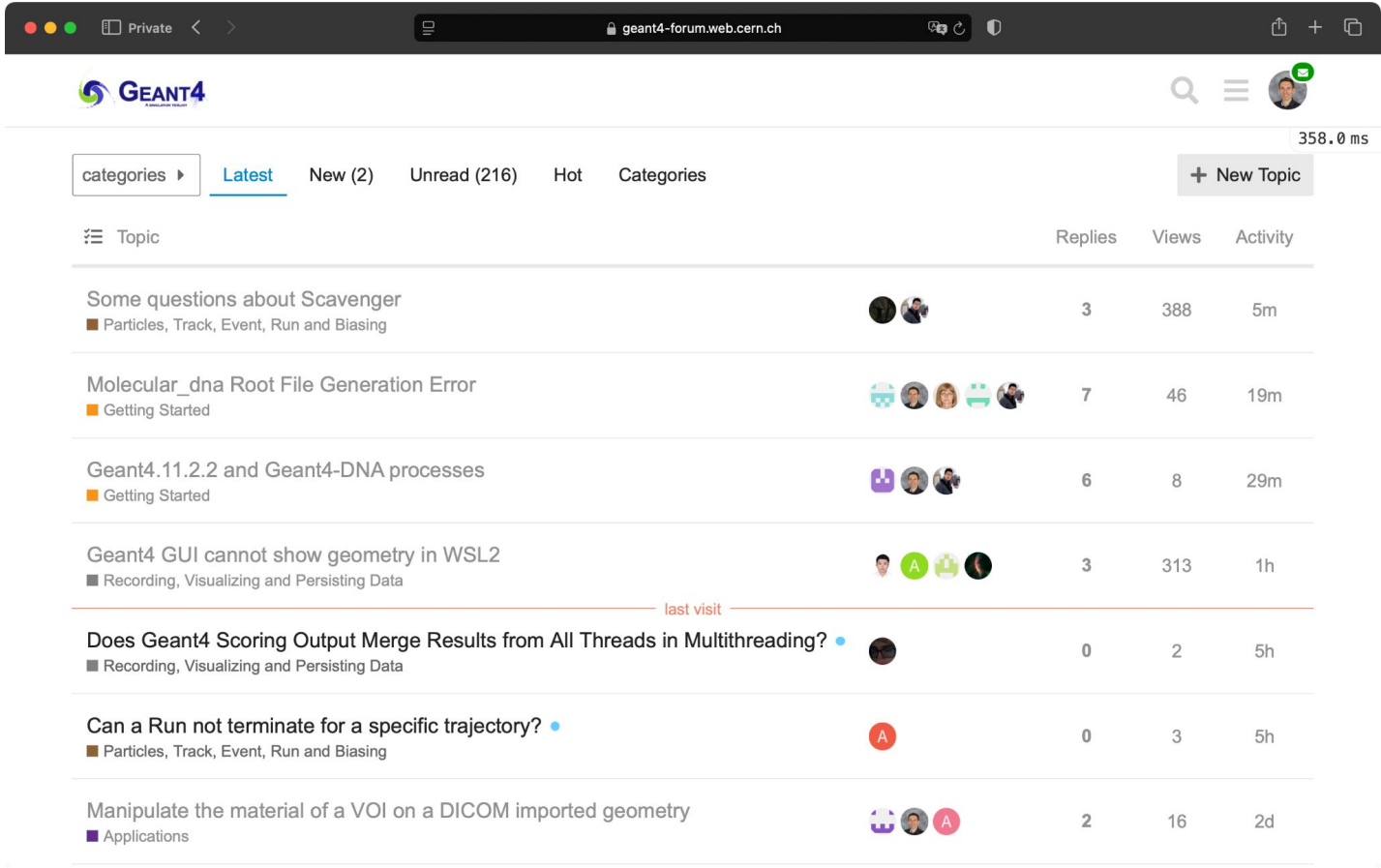
Website/Download Analytics

- Steady number of visitors over time
- Documentation and Downloads most visited as might be expected.
- **>28K downloads of source code**
  - *Primarily 11.X and 10.7*
  - *Tail of older versions*



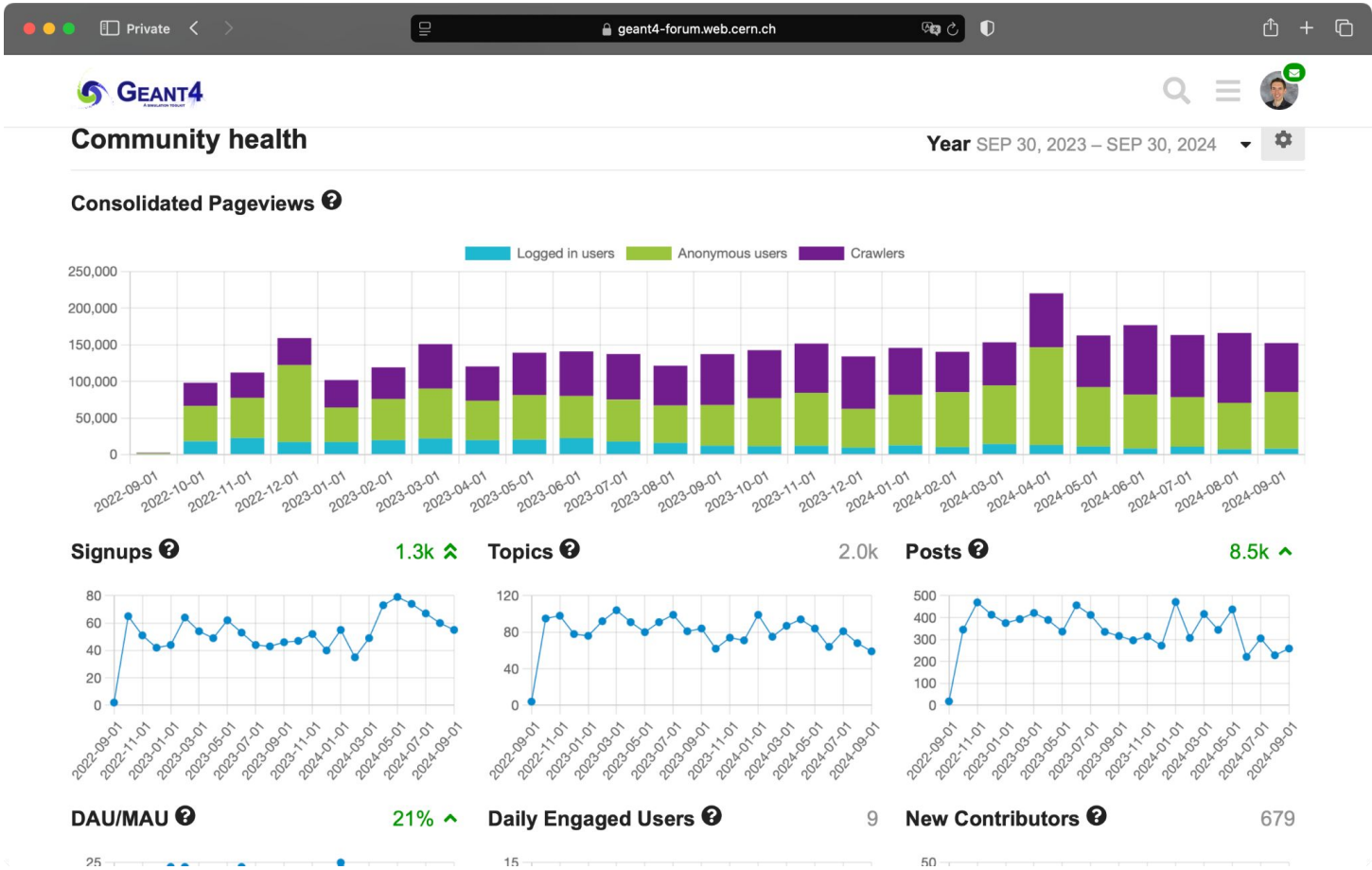
Geant4 Forum

- Our main online day-to-day Q&A with users.
- **Please review and answer posts!**
  - *Only a few of us regularly answering questions.*
  - ***Leaving posts unanswered gives a bad impression.***



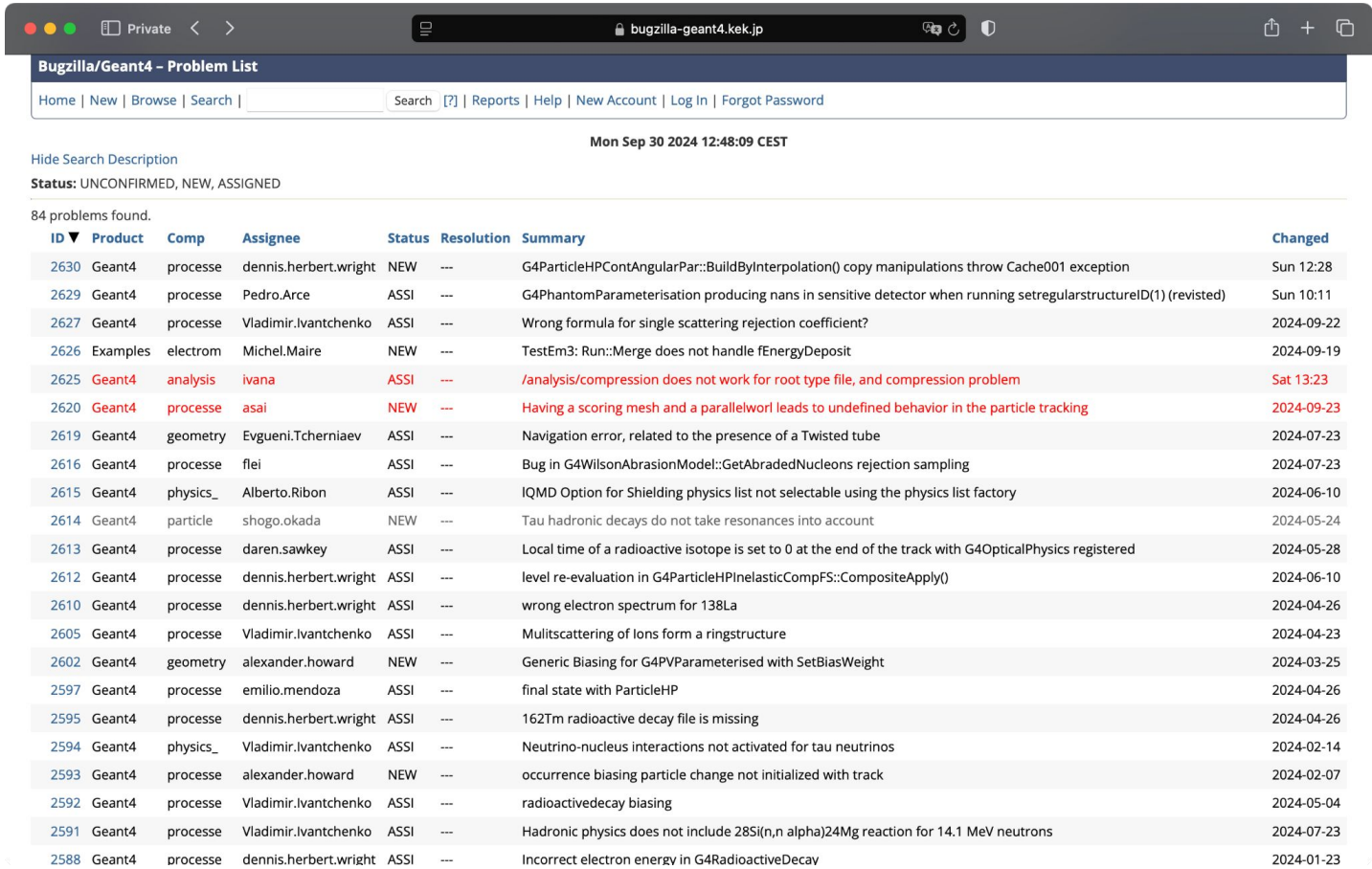
Geant4 Forum: Analytics

- Users still visiting, posting, but…
- Slight signs of a decline
- Answers per topic remains low…
- **Again, critical we engage and answer questions!**



Geant4 Bugzilla: https://bugzilla-geant4.kek.jp

- Don’t forget to respond to bugs on Bugzilla, and provide regular feedback to the reporter.
- **Should really have a push to try and resolve especially long standing reports**



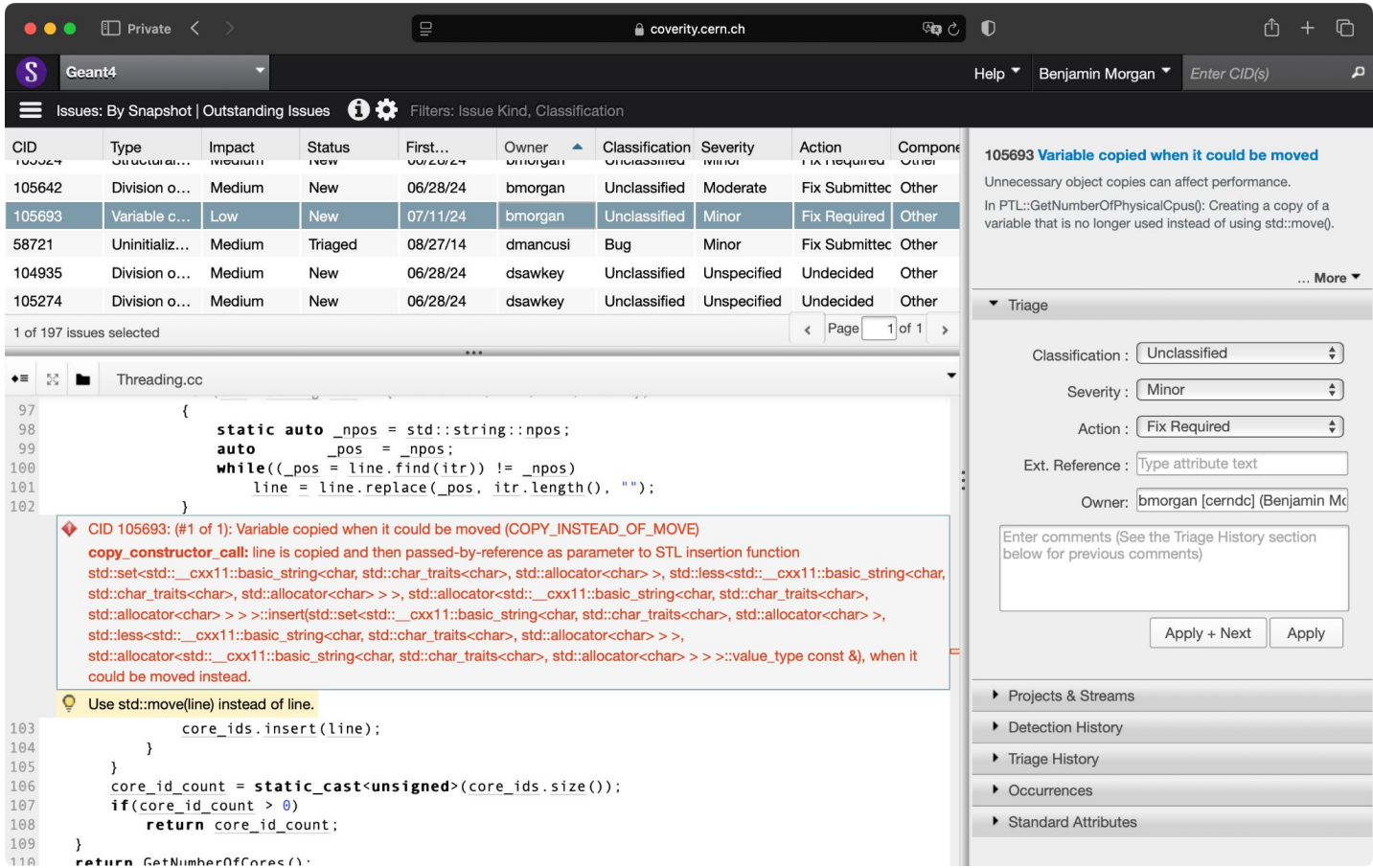
ID ▼	Product	Comp	Assignee	Status	Resolution	Summary	Changed
2630	Geant4	processe	dennis.herbert.wright	NEW	---	G4ParticleHPContAngularPar::BuildByInterpolation() copy manipulations throw Cache001 exception	Sun 12:28
2629	Geant4	processe	Pedro.Arce	ASSI	---	G4PhantomParameterisation producing nans in sensitive detector when running setregularstructureID(1) (revisted)	Sun 10:11
2627	Geant4	processe	Vladimir.Ivantchenko	ASSI	---	Wrong formula for single scattering rejection coefficient?	2024-09-22
2626	Examples	electrom	Michel.Maire	NEW	---	TestEm3: Run::Merge does not handle fEnergyDeposit	2024-09-19
2625	Geant4	analysis	ivana	ASSI	---	/analysis/compression does not work for root type file, and compression problem	Sat 13:23
2620	Geant4	processe	asai	NEW	---	Having a scoring mesh and a parallelworl leads to undefined behavior in the particle tracking	2024-09-23
2619	Geant4	geometry	Evgueni.Tcherniaev	ASSI	---	Navigation error, related to the presence of a Twisted tube	2024-07-23
2616	Geant4	processe	flei	ASSI	---	Bug in G4WilsonAbrasionModel::GetAbradedNucleons rejection sampling	2024-07-23
2615	Geant4	physics_	Alberto.Ribon	ASSI	---	IQMD Option for Shielding physics list not selectable using the physics list factory	2024-06-10
2614	Geant4	particle	shogo.okada	NEW	---	Tau hadronic decays do not take resonances into account	2024-05-24
2613	Geant4	processe	daren.sawkey	ASSI	---	Local time of a radioactive isotope is set to 0 at the end of the track with G4OpticalPhysics registered	2024-05-28
2612	Geant4	processe	dennis.herbert.wright	ASSI	---	level re-evaluation in G4ParticleHPInelasticCompFS::CompositeApply()	2024-06-10
2610	Geant4	processe	dennis.herbert.wright	ASSI	---	wrong electron spectrum for 138La	2024-04-26
2605	Geant4	processe	Vladimir.Ivantchenko	ASSI	---	Mulitscattering of Ions form a ringstructure	2024-04-23
2602	Geant4	geometry	alexander.howard	NEW	---	Generic Biasing for G4PVParameterised with SetBiasWeight	2024-03-25
2597	Geant4	processe	emilio.mendoza	ASSI	---	final state with ParticleHP	2024-04-26
2595	Geant4	processe	dennis.herbert.wright	ASSI	---	162Tm radioactive decay file is missing	2024-04-26
2594	Geant4	physics_	Vladimir.Ivantchenko	ASSI	---	Neutrino-nucleus interactions not activated for tau neutrinos	2024-02-14
2593	Geant4	processe	alexander.howard	NEW	---	occurrence biasing particle change not initialized with track	2024-02-07
2592	Geant4	processe	Vladimir.Ivantchenko	ASSI	---	radioactivedecay biasing	2024-05-04
2591	Geant4	processe	Vladimir.Ivantchenko	ASSI	---	Hadronic physics does not include 28Si(n,n alpha)24Mg reaction for 14.1 MeV neutrons	2024-07-23
2588	Geant4	processe	dennis.herbert.wright	ASSI	---	Incorrect electron energy in G4RadioactiveDecay	2024-01-23

User Support Systems: Summary

- Our user support systems are functioning well, with high interest and apparent use of Geant4 across the globe
  - ***At least 28K downloads of the source code over last year*** *(lower limit as we only record those through the website, not directly on GitLab/Hub).*
- However, **I think we need to increase our engagement with and support of users through the Discourse Forum and Bugzilla systems**
  - *Questions/queries on the Forum are going unanswered, with only a handful of collaborators regularly/actively posting*
  - *Similarly, we have a relatively high number of outstanding bugs (though it's appreciated that sometimes the reporter does not respond back in kind!) that it would be good to address (even if as WONTFIX/OBSOLETE)*
- **It's on all of us as collaborators and contributors to support our users through these channels just as much as developing toolkit code, examples and docs!**

Development Tools: https://coverity.cern.ch

- Our primary **static analysis** tool
- Finds more defects than compiler or clang-tidy
- Major update this year with more modern C++ fixes.
- **Means more issues have been flagged, so make sure you follow up on the reports sent out to you each month!**



Development Tools: CMake updates of note

- Package cache "helper" file that stores buildtime paths to dependencies like Xerces-C no longer installed by default
  - *Quite a few posts on the forum about errors caused by this after system upgrades, since stored paths change, particularly on macOS*
- Link-Time Optimization builds tested in Nightly to forewarn of issues previously only reported back to us by CMS/ATLAS internal builds that use this
- **Initial support for building/running GoogleTest-based unit tests for kernel code**
  - *Initially in intercoms, global categories, migrating code from, e.g.* `source/intercoms/tests`
- **Not CMake directly, but note that three new datasets have been added this year**
  - *Three currently optional, but means that* ***we have 15(!) in total***
  - *Bugzilla 2506, and other questions on the forum and in packaging (Spack) about "when do I need dataset X"*
  - *Combined build/config/documentation issue, so open to discussion on what we can do to make things clearer for both ourselves and users here…*
  - *See also tomorrow's session on Initialization in Parallel (where datasets are read)*

Development Tools: Jenkins/CDash upgrades

- Lot of work behind the scenes this year by Gunter Folger and SFT to upgrade CDash and roll out new platforms like alma9/RHEL9, Win11, macOS 15!
- Functional improvements to CI/CDash completed or in progress
  - ***Example guidelines checks*** *now run in Nightly (violations tracked in Issue #183)*
  - *Speed up reporting of CI results to CDash, so problems can be identified sooner and to reduce upload load on CDash*
  - *Filtering of MR changes to disable full CI build for non-code changes, or,* ***if MR changes an example, add it to the CI build (See Issue #175)***
- **A particularly important one will be automatic Nightlies for patch branches**
  - ***Make workflow identical to master branch: Test/merge a patch as soon as MR is made***
  - ***Increased automation patches branch is always in "ready to validate" state, easing patch release process***
  - ***See Issue #218***

Library Modularization: Issue 122

- **Basic idea:** find a better grouping of ***source code modules*** into ***libraries***

```
+-foo/
  +- CMakeLists.txt
  +- bar/
  | …
  +- baz/
     +- sources.cmake
     +- include/
     |  +-G4Baz.hh
     |  +- … public headers…
     +- private/
     |  +-G4ImplementationDetail.hh
     |  +- … only used in baz …
     +- src/
        +- G4Baz.cc
        +- G4ImplementationDetail.cc
        +- …source code files…
```

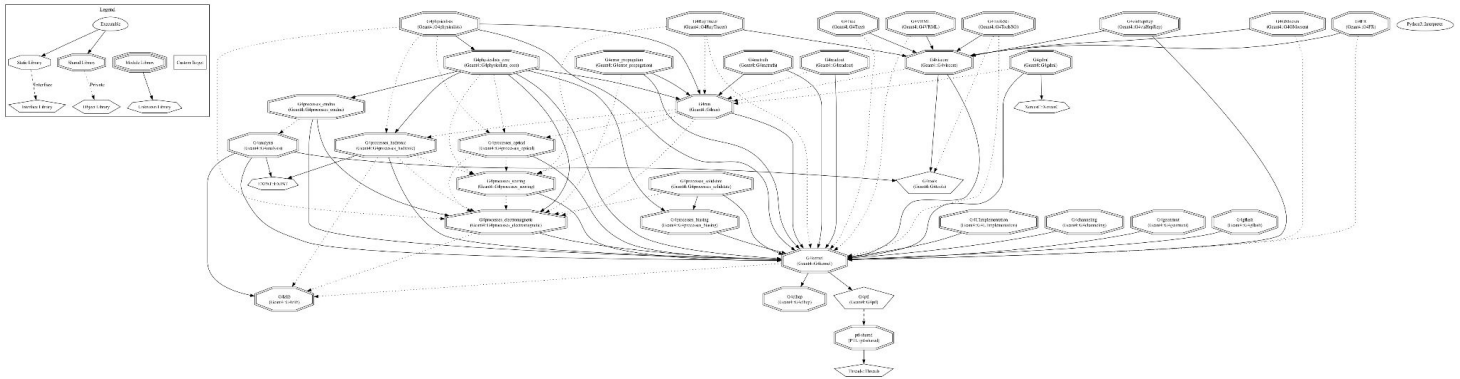
```
# CMakeLists.txt
include(bar/sources.cmake)
include(baz/sources.cmake)
geant4_add_category(G4foo MODULES G4bar G4baz)
```

```
# sources.cmake
geant4_add_module(G4baz
  PUBLIC_HEADERS
    G4Baz.hh
    …
  PRIVATE_HEADERS
    G4ImplementationDetail.hh
    …
  SOURCES
    G4Baz.cc
    G4ImplementationDetail.cc
    …)
```

```
+- install/
  +- include/
  |  +- Geant4/
  |     +- G4bar.hh
  |     +- G4baz.hh
  +- lib/
     +- libG4foo.a
```

Library Modularization: Issue 122

- **So why change the current set of so-called "global" libraries?**
  - *Some are too big (libG4processes), so lack modularity or are problematic to use*
  - *Some are small (core kernel), and can lack coherence in use (i.e. practically always link to all of them)*
  - *Some have optional modules/classes, which makes use awkward ("if I link to X, does it supply Y?")*
- Initial approach is to group modules into libraries along a rough boundary of
  - *"Kernel": the core Geant4 types/data, run/event/track/step loop, and abstract interfaces*
  - *"Implementation": concrete implementations, mostly physics processes/models*
  - *"Addons": optional components such as GDML*
- Issue 122 lays out this **potential structure/organisation in a dependency graph**



Library Modularization: Technical Issues

1. **Dependencies/coupling between modules to be understood/resolved**
   a. *`G4processes_emdna` has a dependency on `G4analysis`*
   b. *`G4run` has dependencies on several process modules: `G4scoring`, `G4optical`, `G4hadronic_mgt`, `G4emutils`*
2. **Check for modules to split/merge based on capability**
   a. *E.g. AdjointMC in `G4event`, `G4run`, `G4particles`, processes , split/merge into "G4adjoint" module/library?*
3. **Backward compatibility of library names**
   a. *E.g. User code links **`libG4event.so`** now, but would need to link **`libG4kernel.so`** after modularization*
   b. *Requires some design/development to provide solution: Issue #343, Issue #209*
   c. ***May** require deferment of modularization to next major release if robust solution can't be found*

Development Tools: Summary

- **Reminder** to check the monthly Coverity reports, fix reports assigned to you!
- Initial support/migration of global, intercoms unit tests to GoogleTest
  - *More to come…*
- Now 12(15) datasets in use in toolkit
  - *Need to think about better solutions to document where/when used*
  - *Not discussed today, but related, how to develop/report tags, formats for HPC*
- Work in progress to speed up integration of MRs into patch branches
  - *Easing process of preparing patch releases*
- Long-running library modularization task still going, but some technical issues to be understood and resolved
  - *Suspect overall change will be for the next major release, but should address dependency/coupling issues identified now*