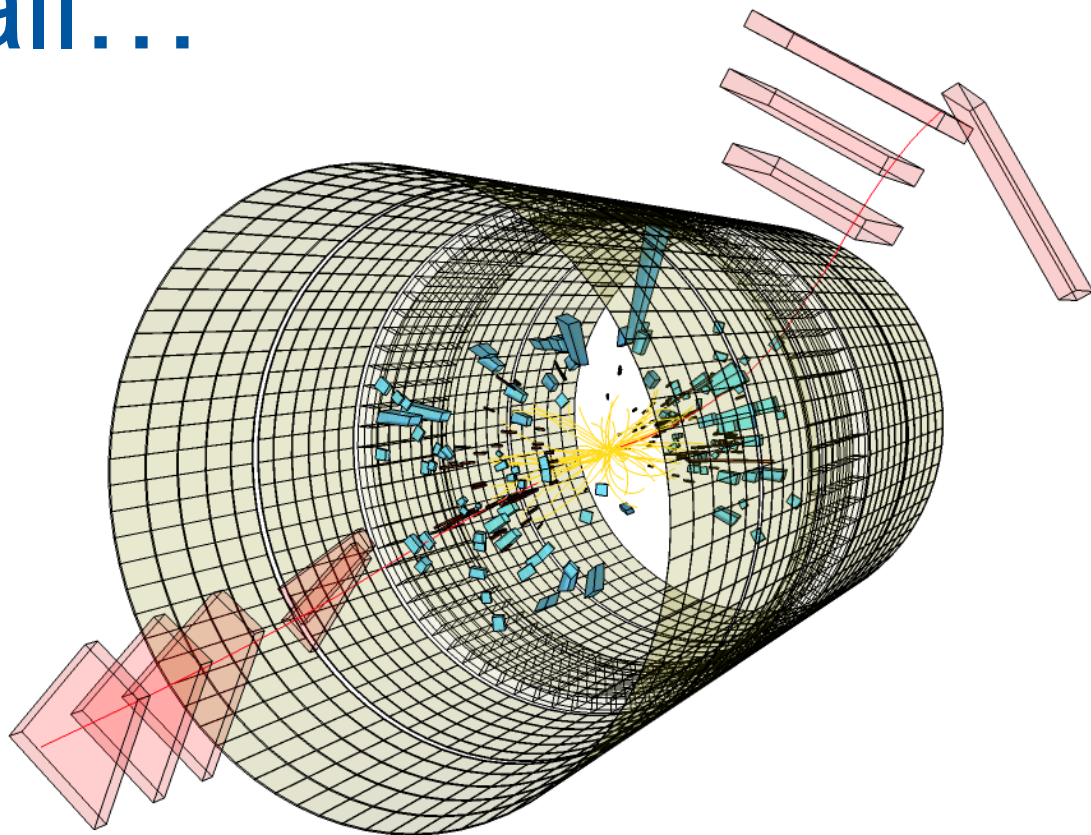




When infinitely large meets infinitely small...

CERN's flagship:
ATLAS computing

Ramón Medrano Llamas
Fernando Barreiro
Daniel van der Ster





CERN, what is it?

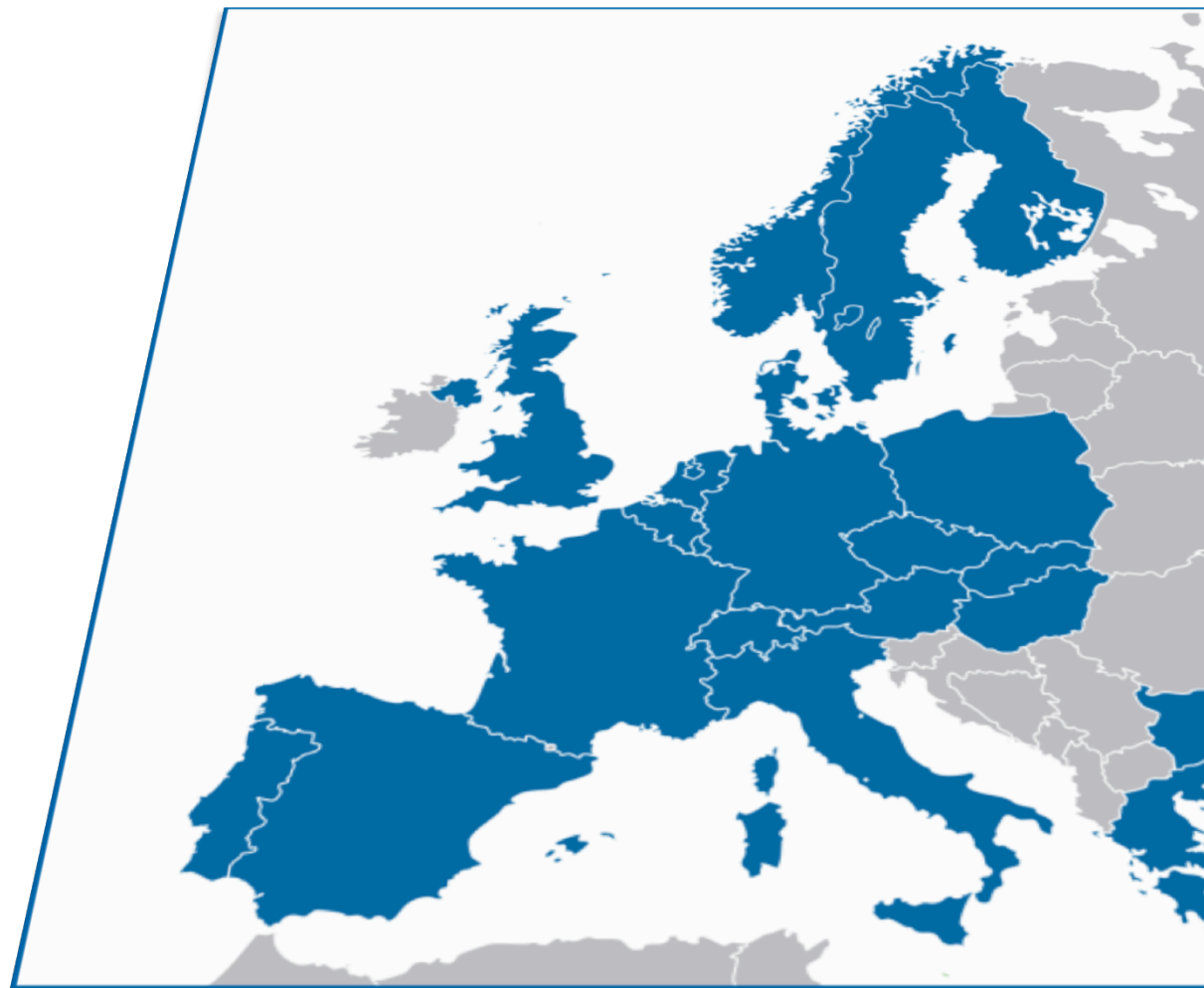
European Laboratory for Particle Physics established in 1952

«The Organization shall have no concern with work for military requirements and the results of its experimental and theoretical work shall be published or otherwise made generally available»

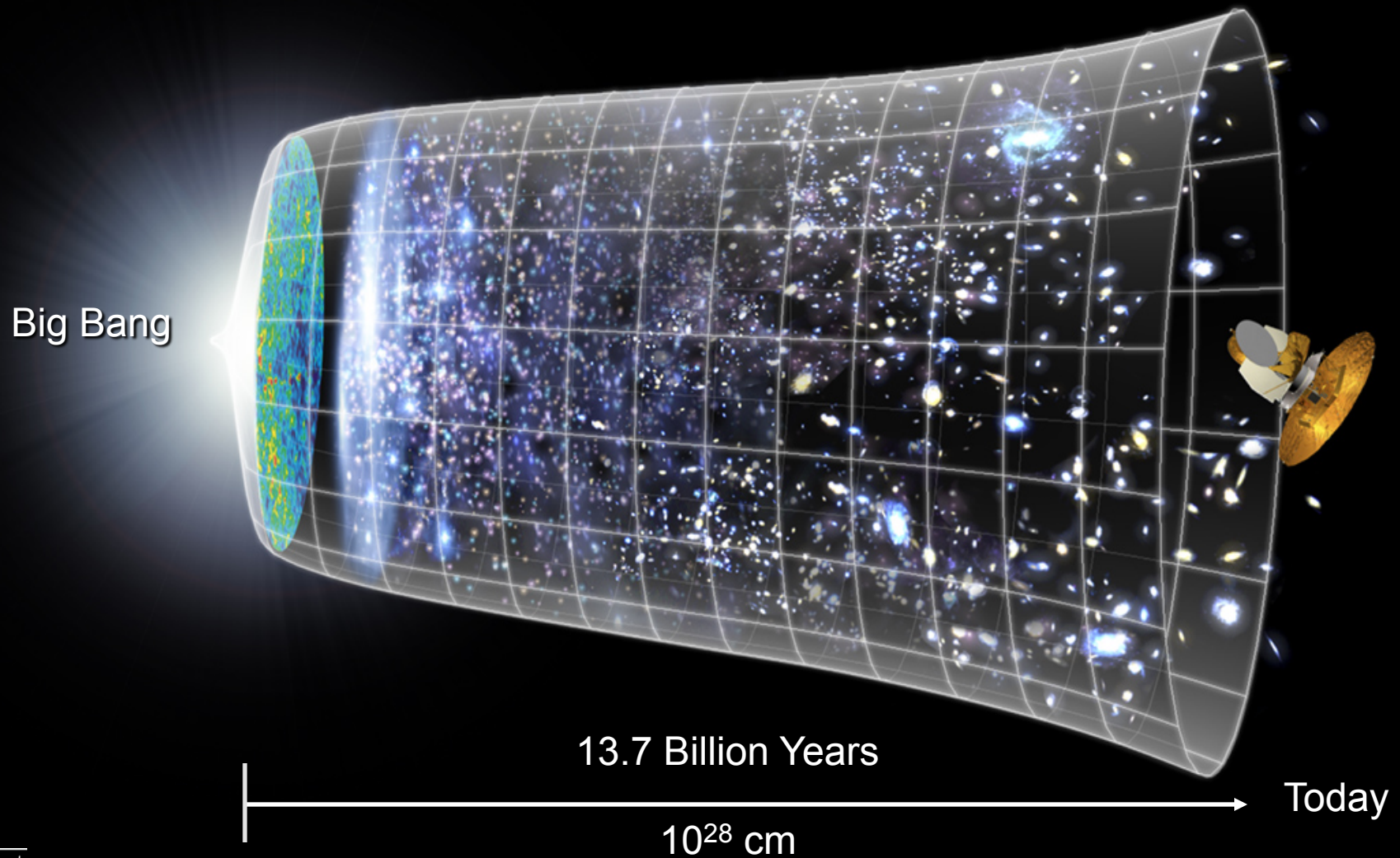
CERN Founding convention

The world's largest physics laboratory

- Founded in 1952
- ~1 billion CHF/year
- 20 member states
and growing
- 2,424 staff members
- ~1,100 associates
- 10,000+ users
globally



Understanding the Universe

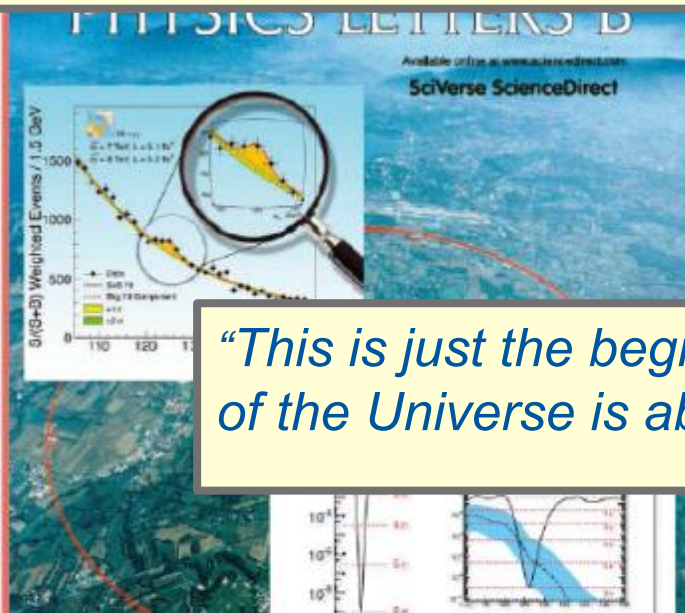


Some achievements

- 1957 First accelerator begins operation
- 1983 Discovery of the W and Z particles
- 1989 The giant LEP starts operating
- 1989 The World Wide Web is invented
- 1992 The ATLAS Collaboration is founded
- 2004 Antimatter is first captured
- 2008 The LHC starts running

2012, 4th July

More than 1,000 TV stations carried video footage of the event, reaching 1 billion people across the world.



“This is just the beginning. Our understanding of the Universe is about to change.”

CERN's Director-General

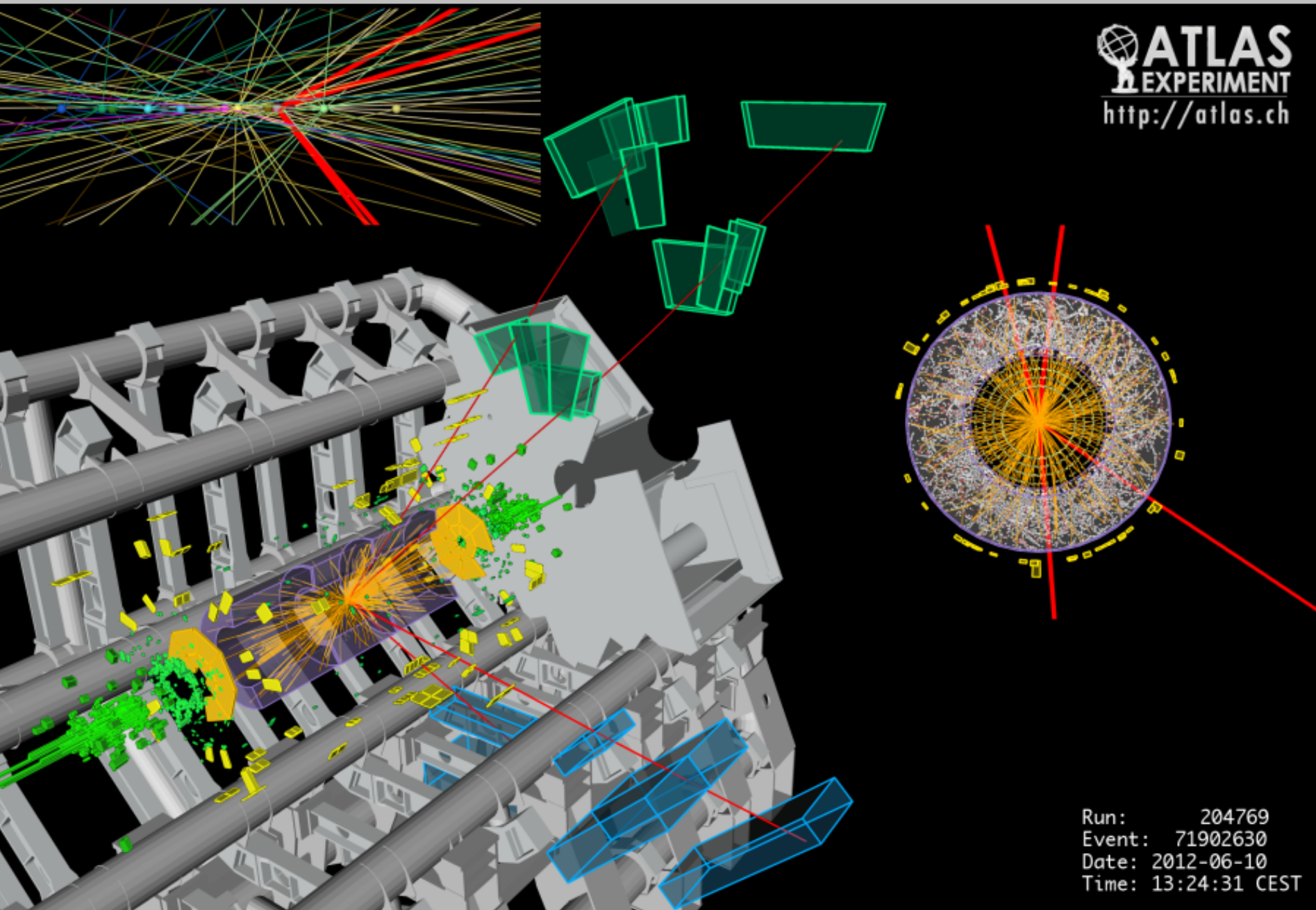
“It's really an incredible thing that it's happened in my lifetime.”

Peter Higgs



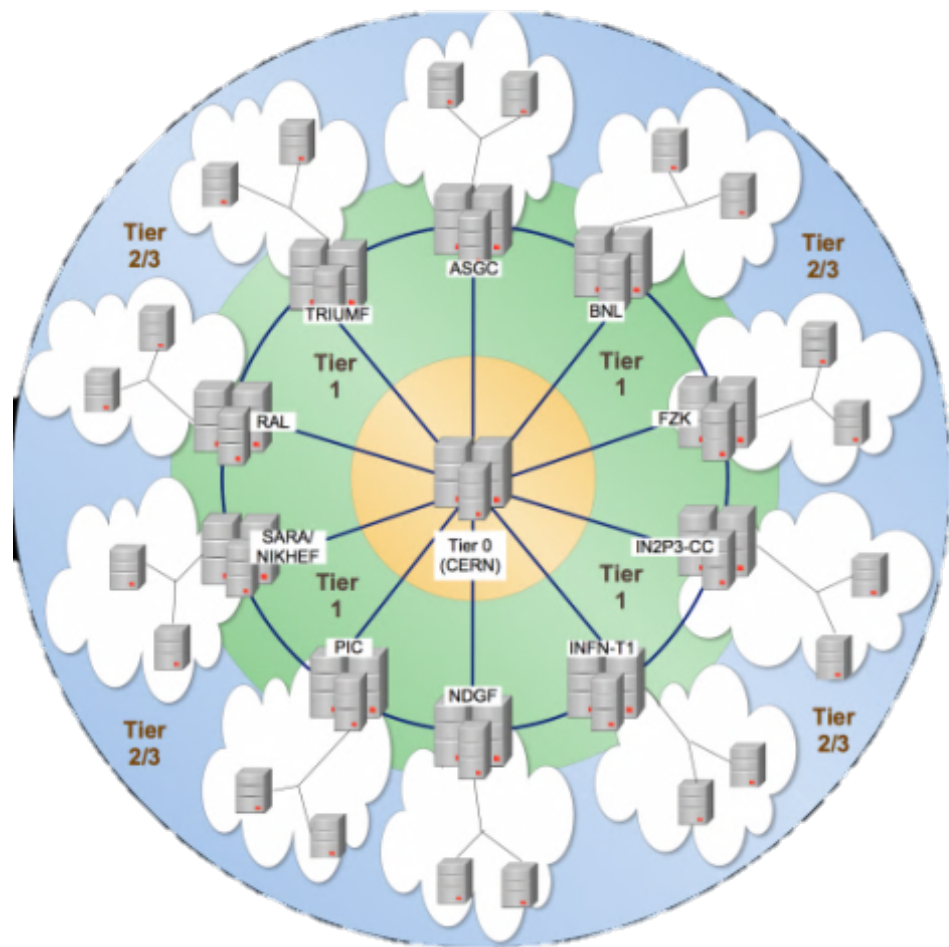
5,1 million people on Twitter received the CMS announcement: *“We have discovered a new boson [...]”*

Finding the Higgs boson

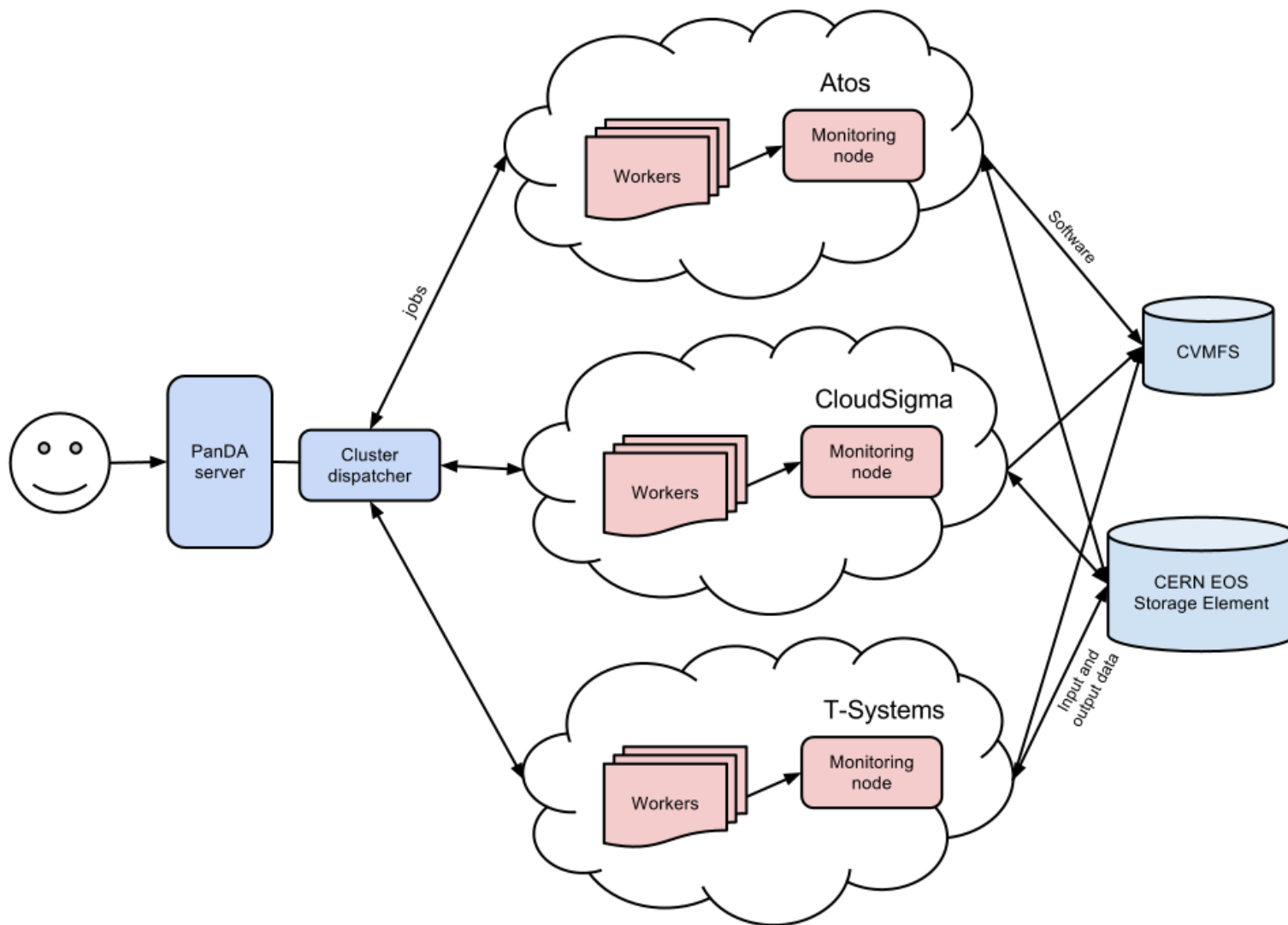


LHC computing grid

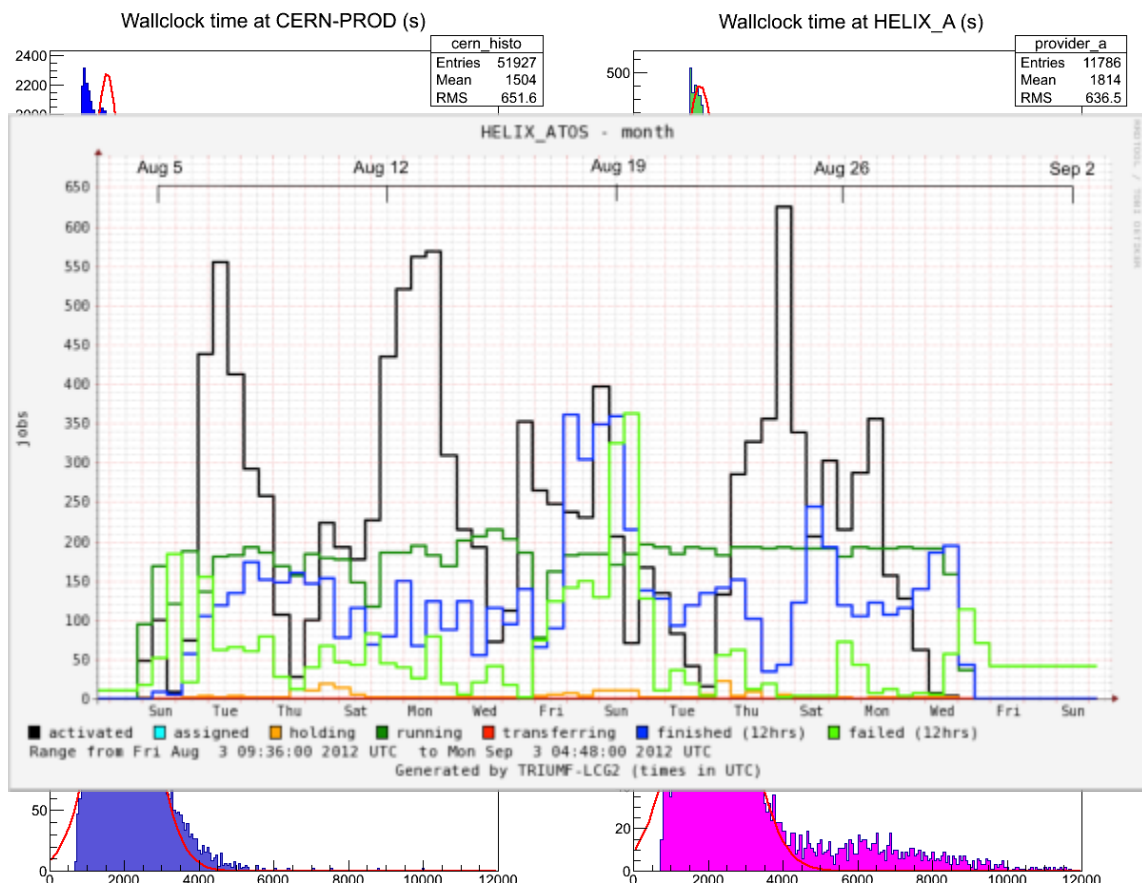
- Raw data from detector:
 - TDAQ filters most of it.
- Tier 0 distributes to T1s
- Each T1 distributes to the regional T2 and T3
- This evolving to a mesh



ATLAS at Helix Nebula



Results of proof of concept deployment



- 100% simulation jobs:
 - Low I/O.
 - No data management.
- 4 core + 8 GiB VMs
 - Easy scheduling.
- ~400 core/cluster
- 40,000+ CPU hours
- 46,000+ ATLAS jobs
- 85% efficiency:
 - Very good (it is a test!)

Conclusions and future work

- The proof of concept was successful:
 - Cloud resources fit well into the new model.
 - All providers integrated in the ATLAS workflow.
 - Processing in the cloud just works.
- Future work:
 - Use standard APIs and protocols.
 - Deal with data management.
 - Extend the workflow to cover more of the scientific chain (e.g. analysis).



www.cern.ch