HTCondor at BNL SDCC

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SDCC: The Scientific Data and Computing Center

- Located at Brookhaven National Laboratory (BNL) on Long Island, New York
- SDCC initially formed at BNL in the mid-1990s as the RHIC Computing Facility

Shared multi-program facility serving ~2,000 users from more than 20 projects

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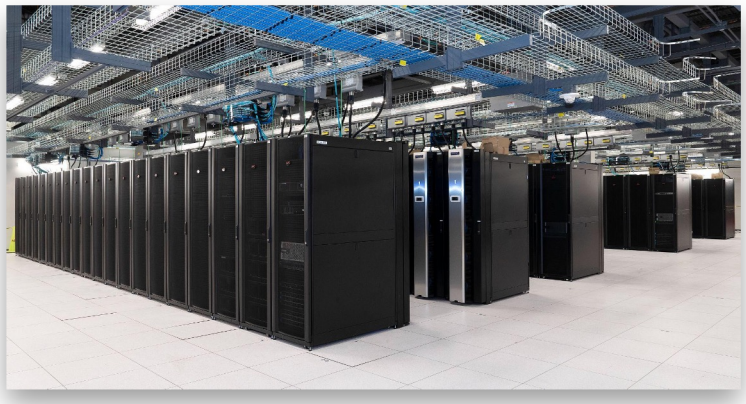
Scientific Data and Computing Center Overview

- Tier-0 computing center for the RHIC experiments
- US Tier-1 Computing facility for the ATLAS experiment at the LHC, also one of the ATLAS shared analysis (Tier-3) facilities in the US
- Computing facility for NSLS-II
- US Data center for Belle II experiment
- Providing computing and storage for proto-DUNE/DUNE along w/ FNAL serving data to all DUNE OSG sites
- Also providing computing resources for various smaller / R&D experiments in NP and HEP
- Serving more than 2,000 users from > 20 projects
- Developing and providing administrative/collaborative tools:
  - Invenio, Jupyter, BNL Box, Discourse, Gitea, Mattermost, etc.
- sPHENIX - commissioning run has started
- BNL was selected as the site for the upcoming major new facility Electron-Ion Collider (EIC/eRHIC)

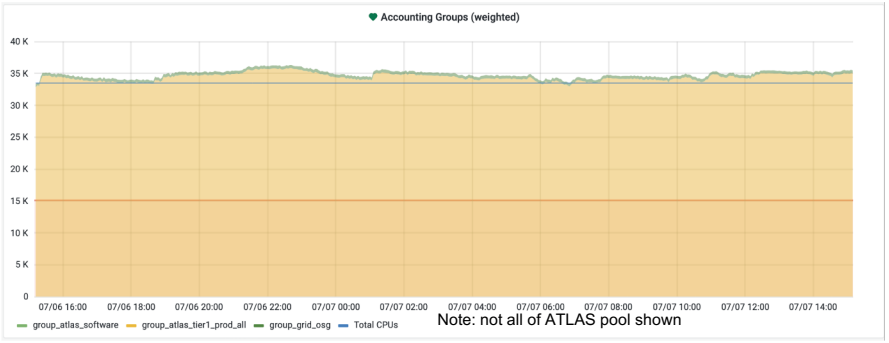
High Throughput Computing @ SDCC

- Providing our users with ~1,700 HTC nodes:
  - ~121,000 logical cores
  - Managed by HTCondor
- All nodes running running Scientific Linux (SL) 7
  - Preparations for an OS upgrade to Alma Linux 9 in progress
- HTCondor 9.0.X -> 10.0.X upgrade in progress



ATLAS Pool

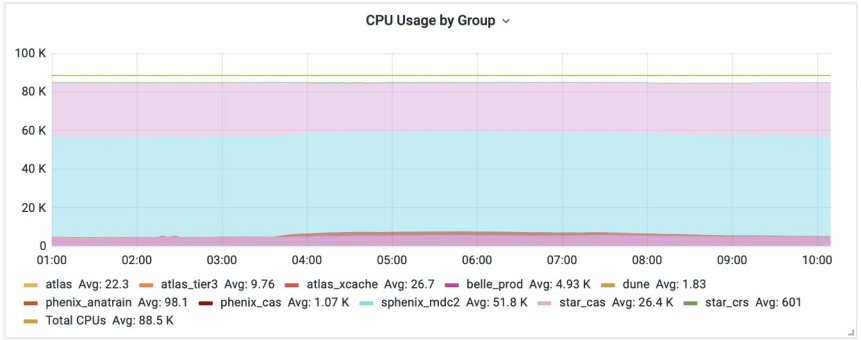
- ~500 HTC nodes:
  - ~35,000 logical cores
- ATLAS tier 1 worker nodes upgraded to Condor 10.0.3



Note: not all of ATLAS pool shown

Shared Pool

- ~1,200 HTC nodes:
  - ~86,000 logical cores
- Large portion of this pool is new Supermicro nodes



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Computing Expansion (2023)

- Largest computing expansion to date
- Purchased 648 Supermicro SYS-610C-TR nodes for ATLAS and the RHIC experiments (~62k logical cores total)
  - Housed in 20 racks
  - System specs:
    - Dual Intel Ice Lake Xeon Gold 6336Y 24-core processors
    - 12x32 GB 3200 MHz ECC DDR4 RAM (384 GB total)
    - 4x2 TB SSD drives
    - 1U form factor
    - 10 Gbps NIC
- Will be receiving some Supermicro ARM test nodes Aug/Sep
  - With Ampere Altra CPUs
- All nodes running Scientific Linux (SL) 7
  - Condor 10.0.X installed

Supermicro SYS-6019U-TR4 Servers

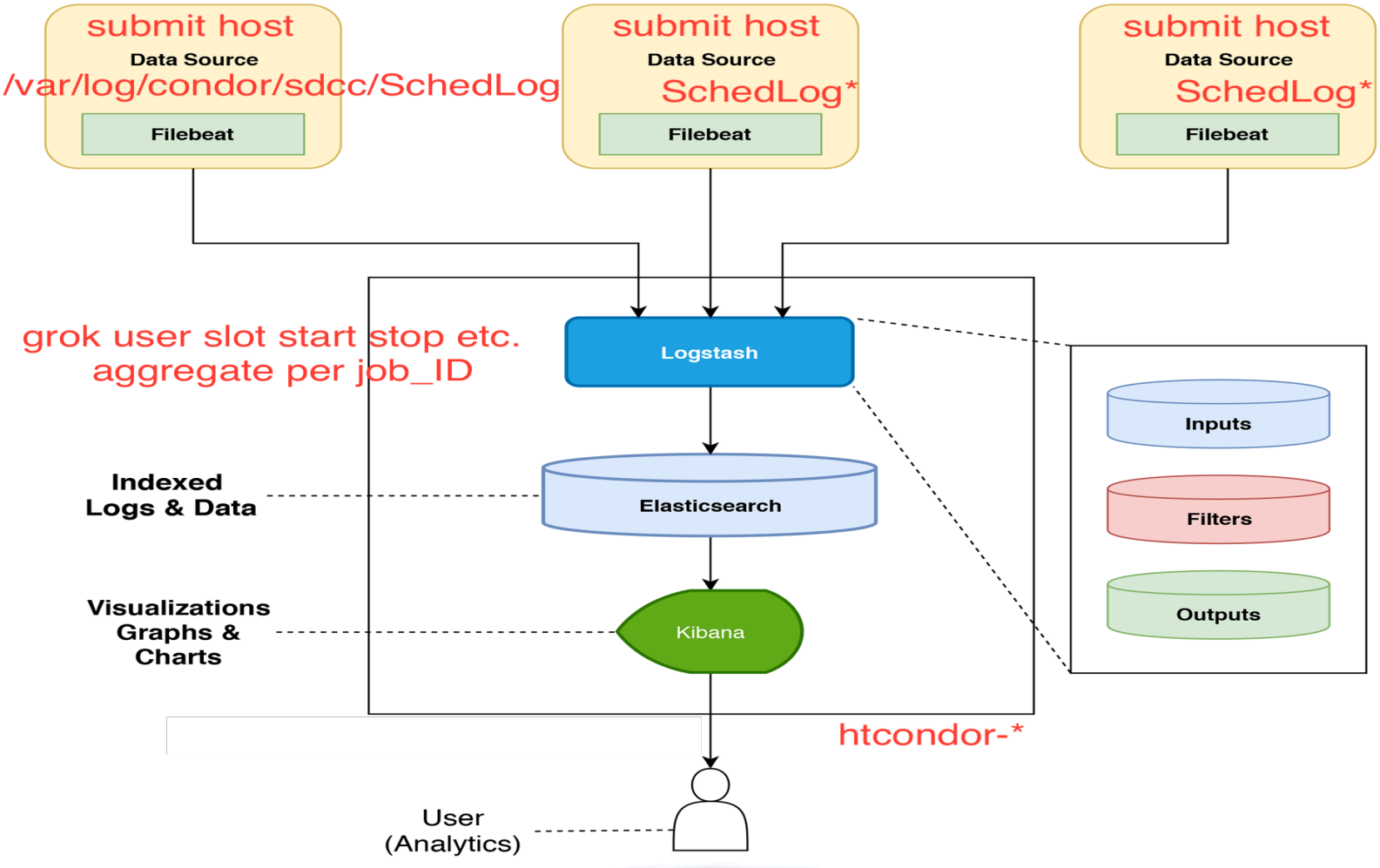
Condor/ Condor CE Upgrade

- Upgrade from Condor 9.0.x to 10.0.X and Condor CE from 5.1.5-1 to 6.X
- To minimize downtime, we upgrade in systems in batches of several racks at a time
- Worker/execute nodes upgraded first, then CEs and submit nodes, and collector/negotiator will be upgraded last
- Cross-version compatibility was tested to ensure this would not impact production

collector / negotiator	schedd (interactive submit)	schedd / Condor CE (grid submit)	startd (execute nodes)
9.0.x	9.0.x	9.0.x (condor) 5.1.5-1 (CE)	Both 9.0.x / 10.0.1
9.0.x	9.0.x	10.0.1 (condor) 5.1.6-1 (CE)	Both 9.0.x / 10.0.1
9.0.x	10.0.1	10.0.1 (condor) 5.1.6-1 (CE)	Both 9.0.x / 10.0.1
10.0.1	10.0.1	10.0.1 (condor) 5.1.6-1 (CE)	Both 9.0.x / 10.0.1

- **Done**: ATLAS Tier1 worker nodes, new Supermicro shared pool worker nodes, next generation CE test system
- **In Progress**: ATLAS/grid CEs upgrade, shared pool worker nodes
- **To do**: Shared pool CEs, all pool collector/negotiators, all interactive submit nodes

Monitoring Redesign for Scalability

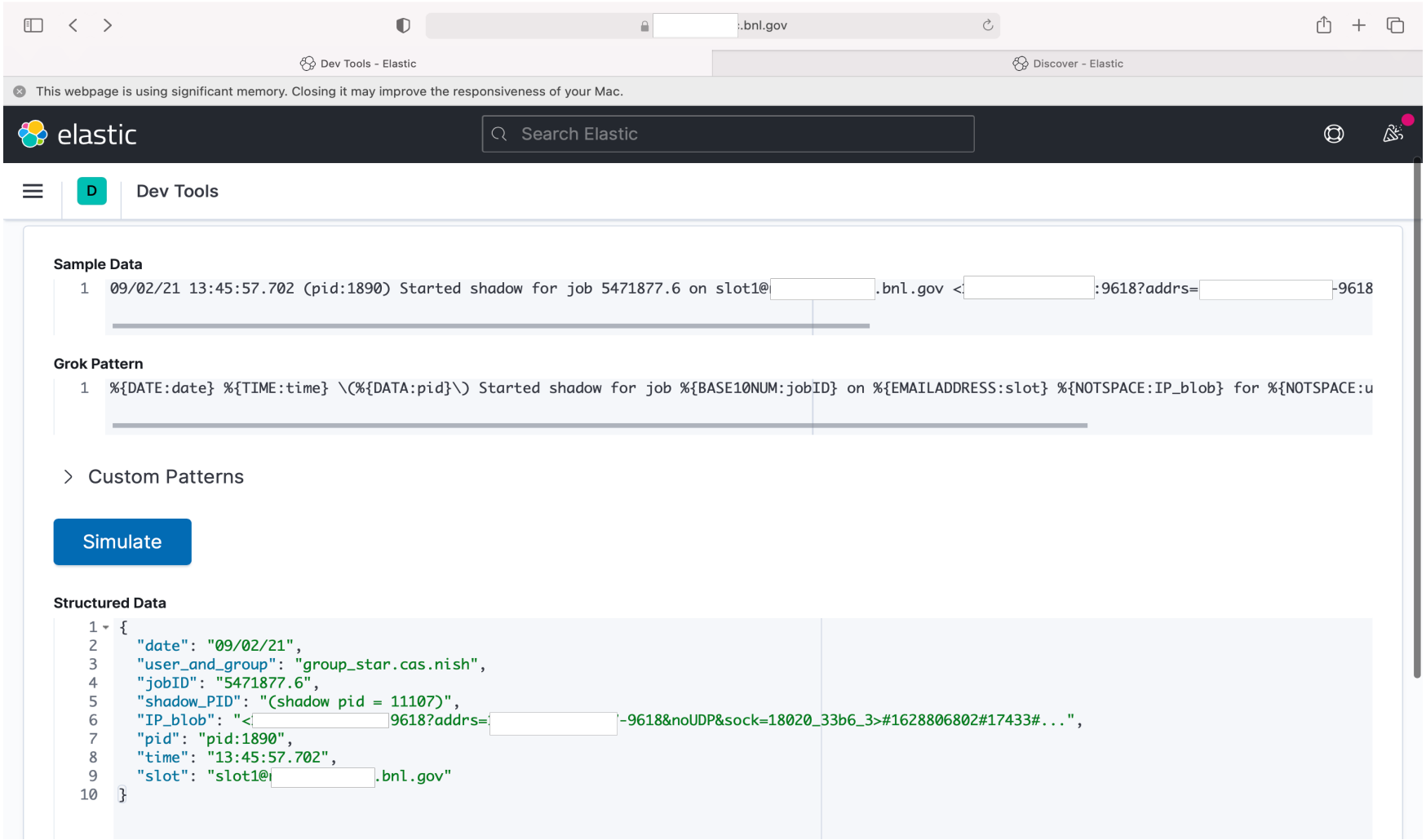


Monitoring Redesign for scalability

- Filebeat service runs on CEs and Submit nodes (~100 hosts)
  - A Logstash instance runs on one server
  - Input source is the log file /var/log/condor/sdcc/SchedLog
  - Output sent to 3 servers running Elasticsearch service

- Filebeat service previously ran on workernodes (2,000+ hosts)
  - This required multi-Logstash and the Lumberjack plugin
    - Lumberjack transported events between Logstash instances

Grok Filter Plugin



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START of a job

Create a map

Map event data

```
aggregate {
  task_id => "%{jobID}"
  code => "
    map['user_and_group'] ||= event.get('user_and_group')
    map['slot'] ||= event.get('slot')
    map['execution_host'] ||= event.get('execution_host')
    map['user'] ||= event.get('user')
  "
  map_action => "create"
}
```

END of a job

Set event fields

From the map

Delete the map

```
aggregate {
  task_id => "%{jobID}"
  code => "
    event.set('user_and_group', map['user_and_group'])
    event.set('slot', map['slot'])
    event.set('execution_host', map['execution_host'])
    event.set('user', map['user'])
  "
  map_action => "update"
  end_of_task => true
  timeout => 604800
}
```

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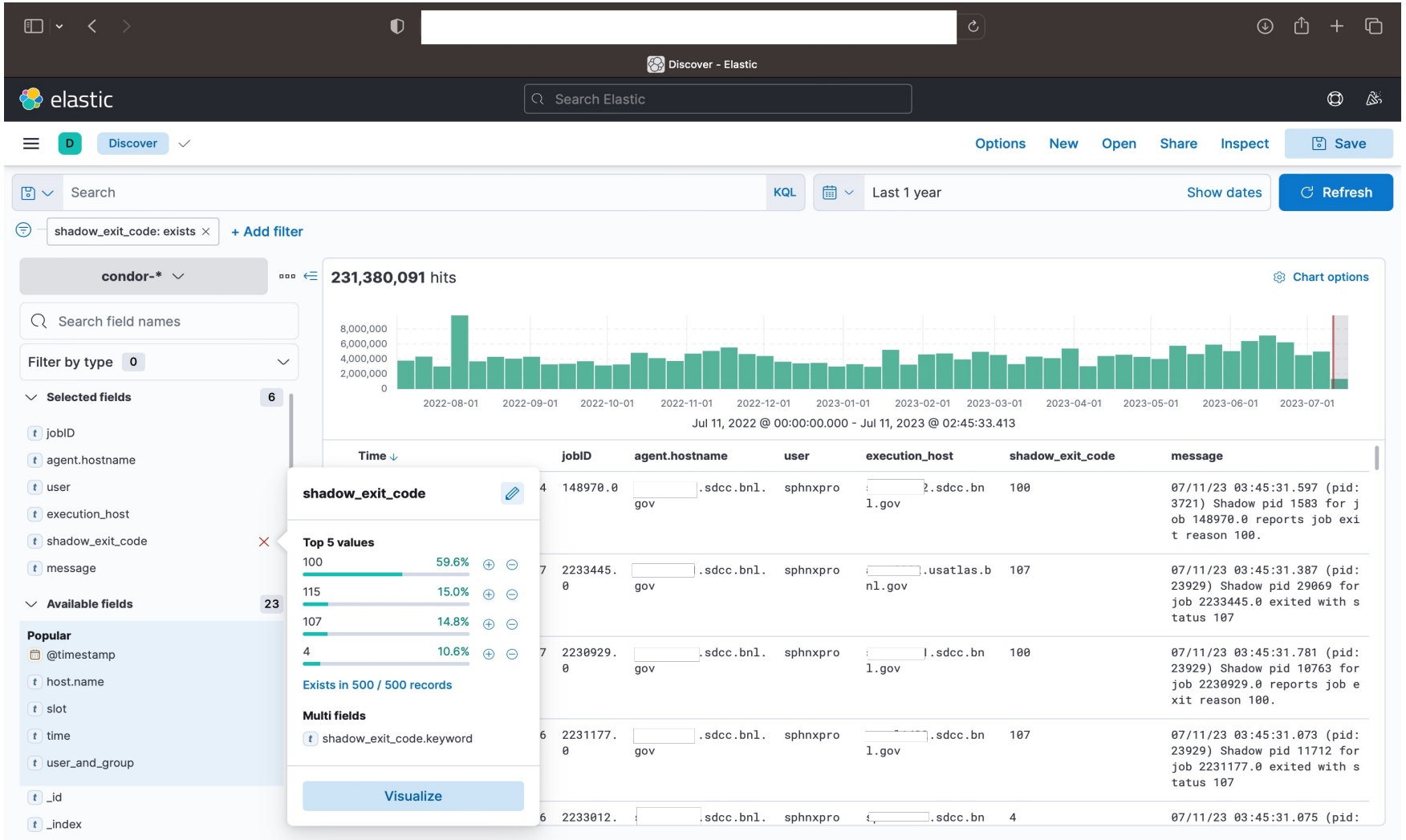
Kibana Discover



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Conclusions

- SDCC provides a batch computing capacity of over 120k cores to 2,000+ users in more than 20 projects
  - We've been using HTCondor for nearly 20 years
- HTCondor 10.0.x upgrade in progress
  - Upgrading a rolling manner to minimize downtime
  - Completed on all US ATLAS T1 compute nodes
- We've implemented custom ELK monitoring of Condor jobs at our facility
  - Recently re-designed to improve scalability
  - Changed from collecting data on all workernodes to submit nodes only

Questions & Comments

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