Samba and CERNBox:
Providing online access to Windows-based users at CERN

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Storage solutions for the HEP Community

CERN**Box**

- 8 years of dev & ops
  - 5K+ monthly active users, 37K users in total
  - 6PB+ data, 1.7B+ files, 110K+ shares
- Sync & Share + online access
- Consolidating "home directories" into CERNBox
  - Onboarding DFS-based use cases
  - Samba gateways instrumental to support them
- Central Hub for CERN Data and Apps

https://cernbox.web.cern.ch

EOS
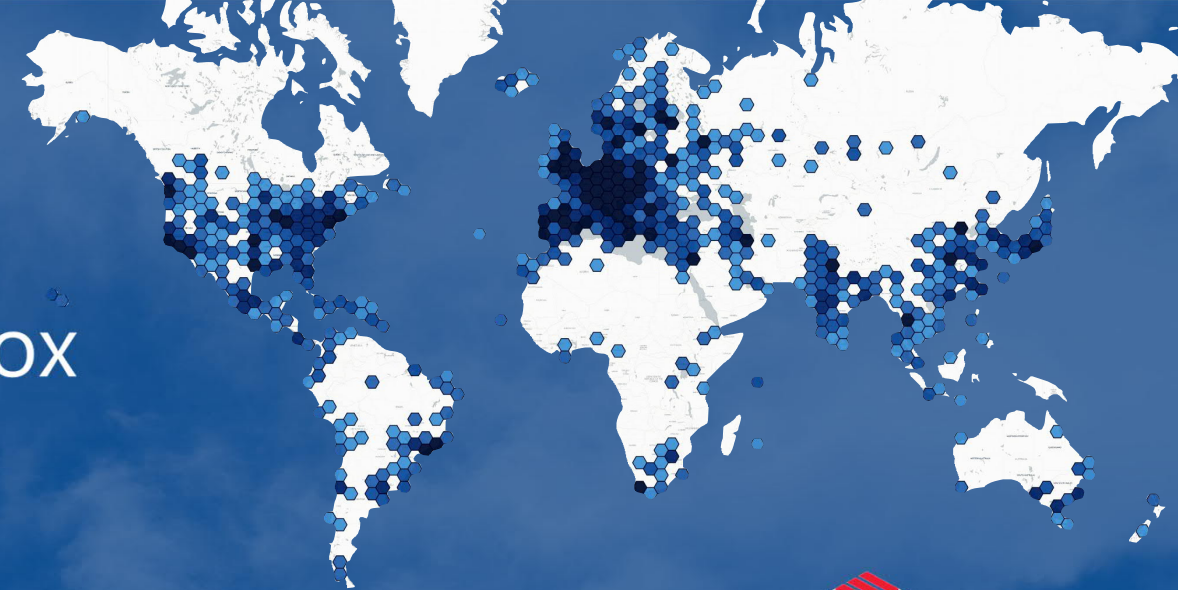
Powered by EOS

- Open Source in-house storage solution
- 10+ years of dev & ops
- Serving the LHC storage and throughput requirements
 - 100s of PBs
  - Disk & Tape

https://eos.web.cern.ch

Samba for CERNBox

- Cluster of 4 nodes, High-Available setup

  - 192 GB RAM, 25 Gbps NIC, *floating IPs* as required by `ctdb`

  - **Samba 4.11** on CentOS 8.3

  - A small `/cephfs` mount in place to share the state

- Distributed Storage (EOS) is FUSE-mounted

  - Multiple instances all exposed via \\cernbox-smb\eos\...

- Windows Domain (AD) joined in dedicated keytab mode

  - Authc performed by `winbind`, Authz performed by EOS

- File locking supported across all gateways

  - A must to support Office concurrent usage notifications

Load-balanced alias

SAMBA Gateways

/cephfs

/eos/...
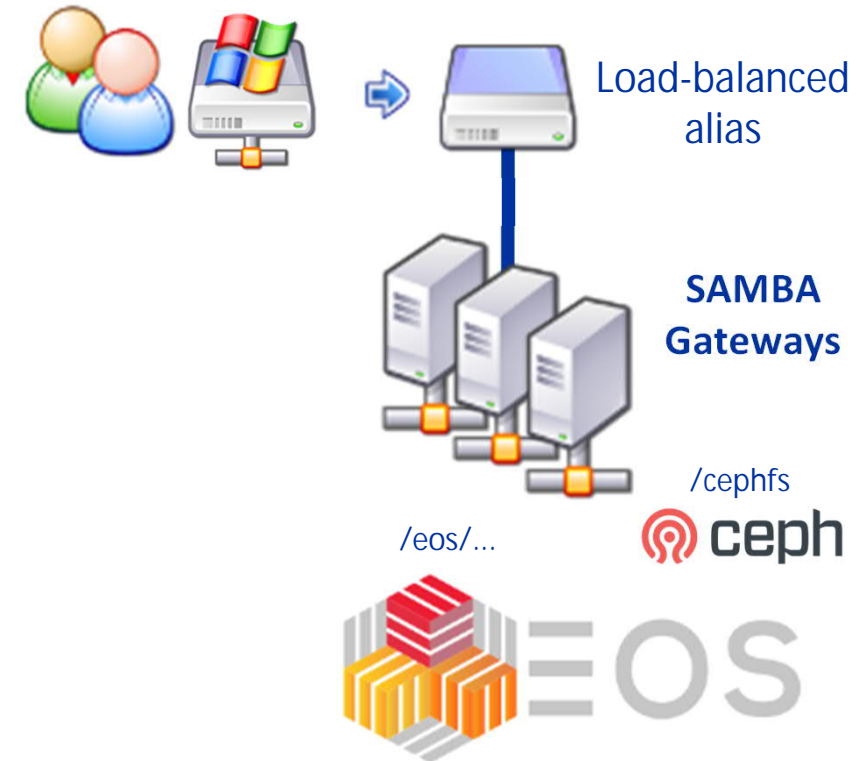
Timeline
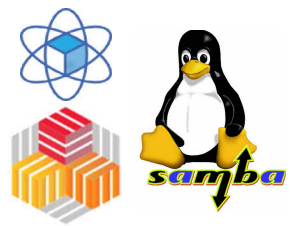
- **Production service as of September 2019**
  - **Samba 4.8** on CentOS 7, 4 nodes with 64 GB RAM
  - Windows Terminal Servers configured to use it for roaming profiles

- **Usage growth in Q2 2020**
  - Upgraded to **4.10**, then reverted because of too much pressure on our underlying FUSE-mounted storage

- **New cluster commissioned in October 2020**
  - Samba **4.11**, improved EOS FUSE implementation, very stable service

- **"Coming Soon"**
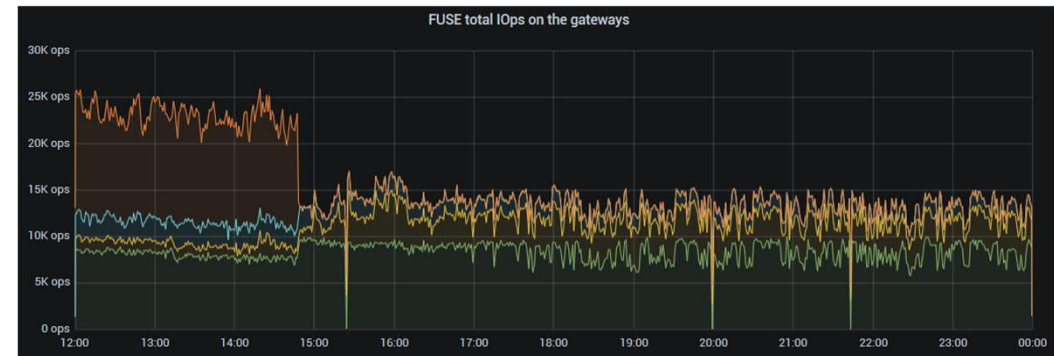 - Upgrade to Samba **4.13.latest** + deployment of a VFS module to support *RichACL*-based permissions
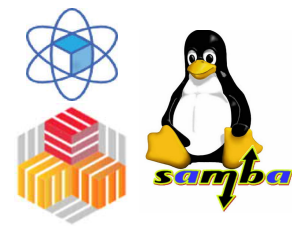
Usage Evolution
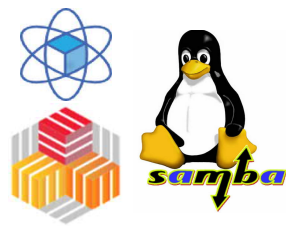
- **Close to peaks of 3K connections, average has doubled compared to ~ a year ago**


2020 <|> 2021
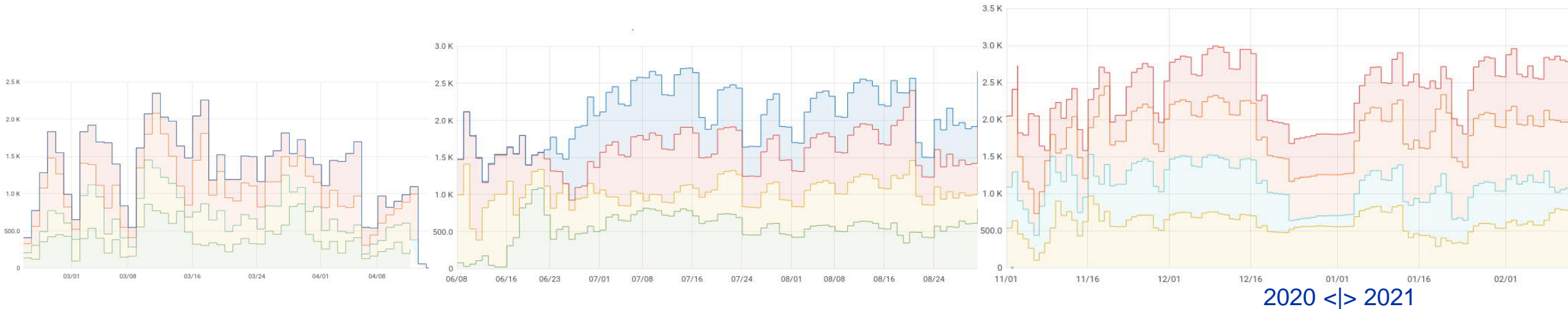
- **Significant usage also in terms of I/O ops sustained by FUSE**

  - Rates of ~10 kHz seen on a regular basis

  - Windows clients often insist on some files!
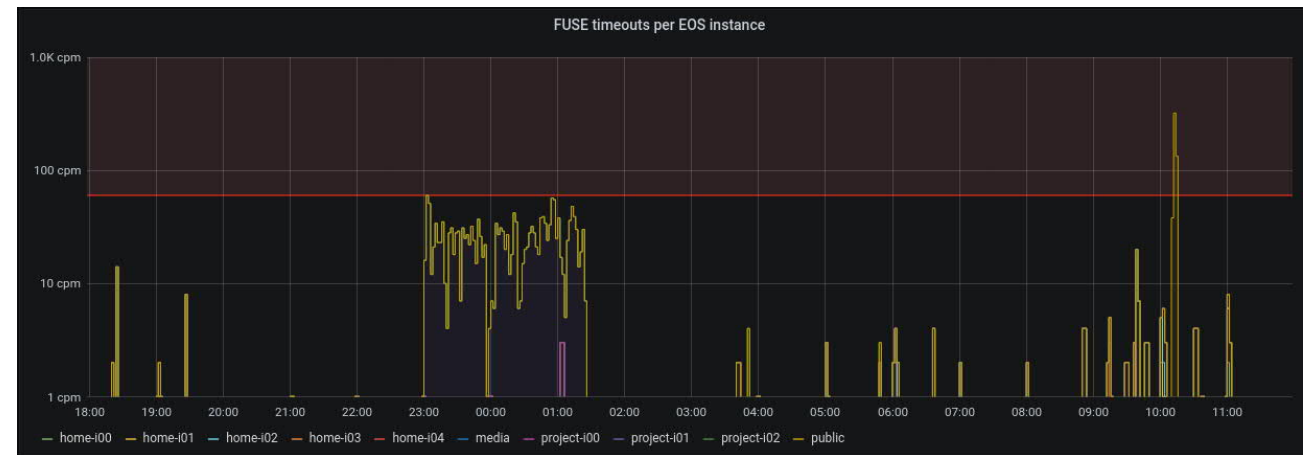
Monitoring and Alerting

- **Custom probe pushing data to InfluxDB, Grafana dashboard**
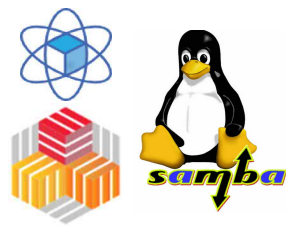 - Aim to address issues before users are impacted: log parsing + active probing

- Faulty behavior in FUSE logs can be alerted to administrators
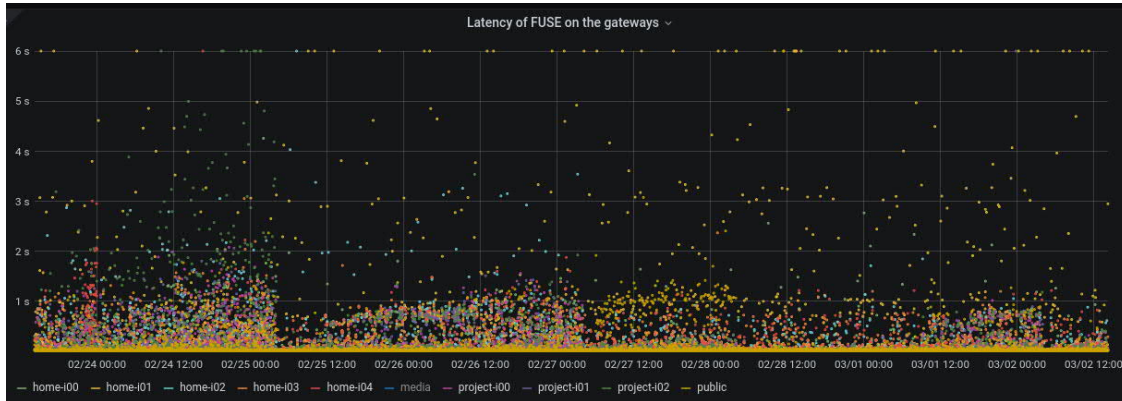
- Long run trends in terms of FUSE latency can be analyzed
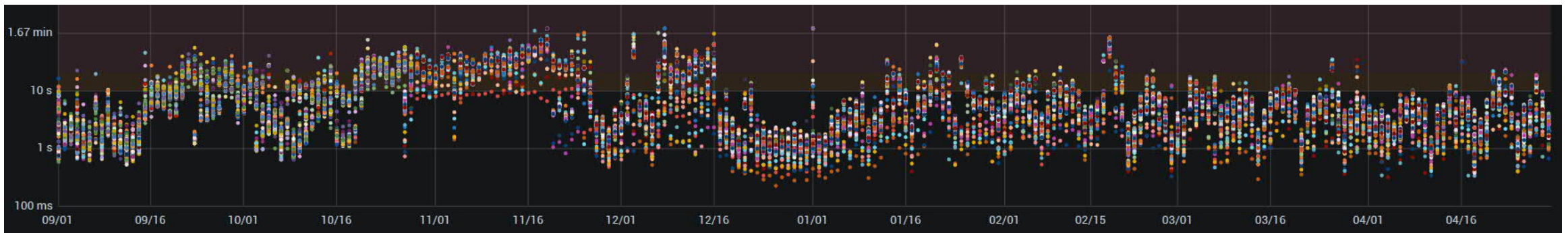
Monitoring and Alerting

- **A Samba over FUSE stack is extremely latency-sensitive**

  - Substantial efforts invested in our storage to address latency

  - Extensive usage of tracing tools (`strace`, `wireshark`) to identify and fix bottlenecks
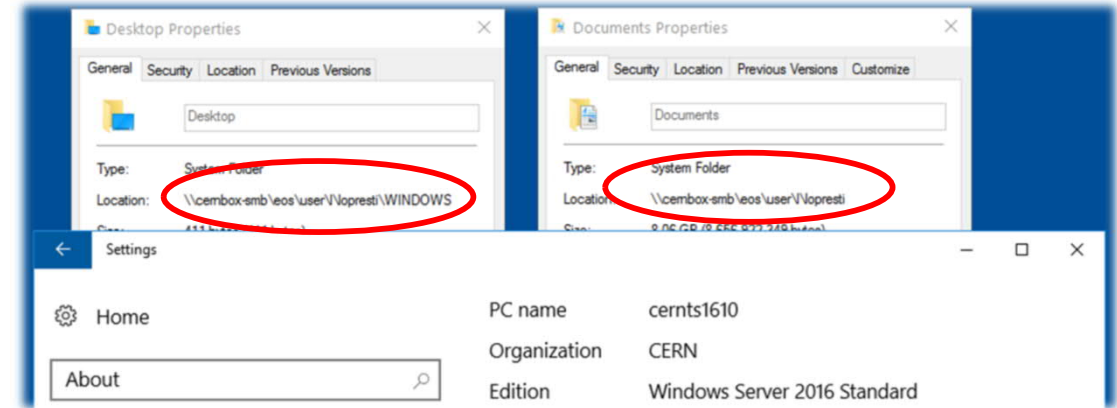
Time to stat each SMB mount from a Windows Server, daily

Coming next

- **Further usage growth** expected ahead:
  about to migrate more Windows-based use cases, in particular
  concerning shared project areas used by engineering applications

  - Possibly need to isolate the most demanding use cases
    in a separate storage backend, optimized for low latency operations

- Getting more engaged with the upstream Samba community:
  possible synergies emerged at the recent *SambaXP 2021* Conference

  - https://sambaxp.org/archive, held online, May 3rd-5th 2021

Conclusions: the bigger picture

- ## Multiple access paths . . .

  - ### Windows Desktop/Documents/… system folders

    - Either synchronized, or mapped to Samba

  - ### Samba became a first-class citizen among the available access methods to CERNBox

    - Significant usage, critical service for many workflows in the user community

- ## . . . aiming at a coherent cross-platform UX

EOS/XRootD clients

Windows clients via Samba

Sync clients

Web UI & apps

CERNBox