

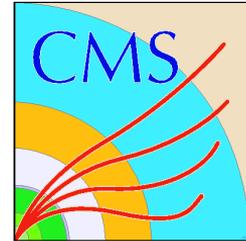
# WLCG Web Proxy Auto Discovery for Dynamically Created Web Proxies

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# Purpose of WLCG Web Proxy Auto Discovery

- WLCG Web Proxy Auto Discovery is a service to locate general purpose web caching proxies that High Throughput Computing jobs can use
  - Primary user of proxies: Frontier Distributed Database for ATLAS & CMS
  - Secondary user: CVMFS, which spread very quickly in large part because of the existing squid web cache infrastructure deployed for Frontier
  - Other smaller use cases take advantage of the squids as well, such as ATLAS evgen production configuration
- ATLAS & CMS statically maintain Frontier client configurations for squid proxies at traditional grid sites
  - In very different ways
  - Makes it tough to run opportunistically at each other's sites, and tough for other VOs and applications in jobs to take advantage of the caches: WLCG WPAD provides a way

# Current users of WLCG WPAD

- The current primary users of WLCG WPAD are
  - U.S. CMS opportunistic jobs at non-CMS sites
  - LHC@Home
    - Many LHC@Home jobs are actually run at WLCG sites
  - Default CernVM configuration
- These also use openhtc.io (Cloudflare) for additional caching, especially at small locations that have no squid of their own
  - See CHEP 2018 paper <https://doi.org/10.1051/epjconf/201921404023>
  - Those jobs that do land at WLCG sites are directed to monitored backup proxies if the site proxies fail, instead of direct to Cloudflare, so failures can be discovered and diagnosed

# Dynamically created web proxies

- The model of statically configuring web proxies is good for manually managed grid sites, but not so good for dynamically created web proxies such as in clouds
- For that purpose, an existing system dynamic registration of web proxies called Shoal has been integrated with WLCG WPAD
  - Shoal is from the University of Victoria  
<https://github.com/hep-gc/shoal>

# Frontier-squid/Shoal/WLCG WPAD integration

- The frontier-squid rpm now includes a shoal-agent that it configures and starts if SQUID\_AUTO\_DISCOVERY=true
  - At start time, asks wlcg-wpad server for its own IP address and for the name of the shoal server
    - Currently directs to server at the University of Victoria
- The wlcg-wpad server reads registered squids from the shoal server. Then when a job contacts wlcg-wpad:
  - wlcg-wpad looks up GeolP organization of the job
  - If the GeolP org matches a grid site, the static list gets priority
  - Otherwise if there are shoal-registered squids matching the org, they are all returned, load balanced
  - Separate services within an org (such as one cloud provider) can be distinguished by configuring public IP address ranges

# How Web Proxy Auto Discovery works

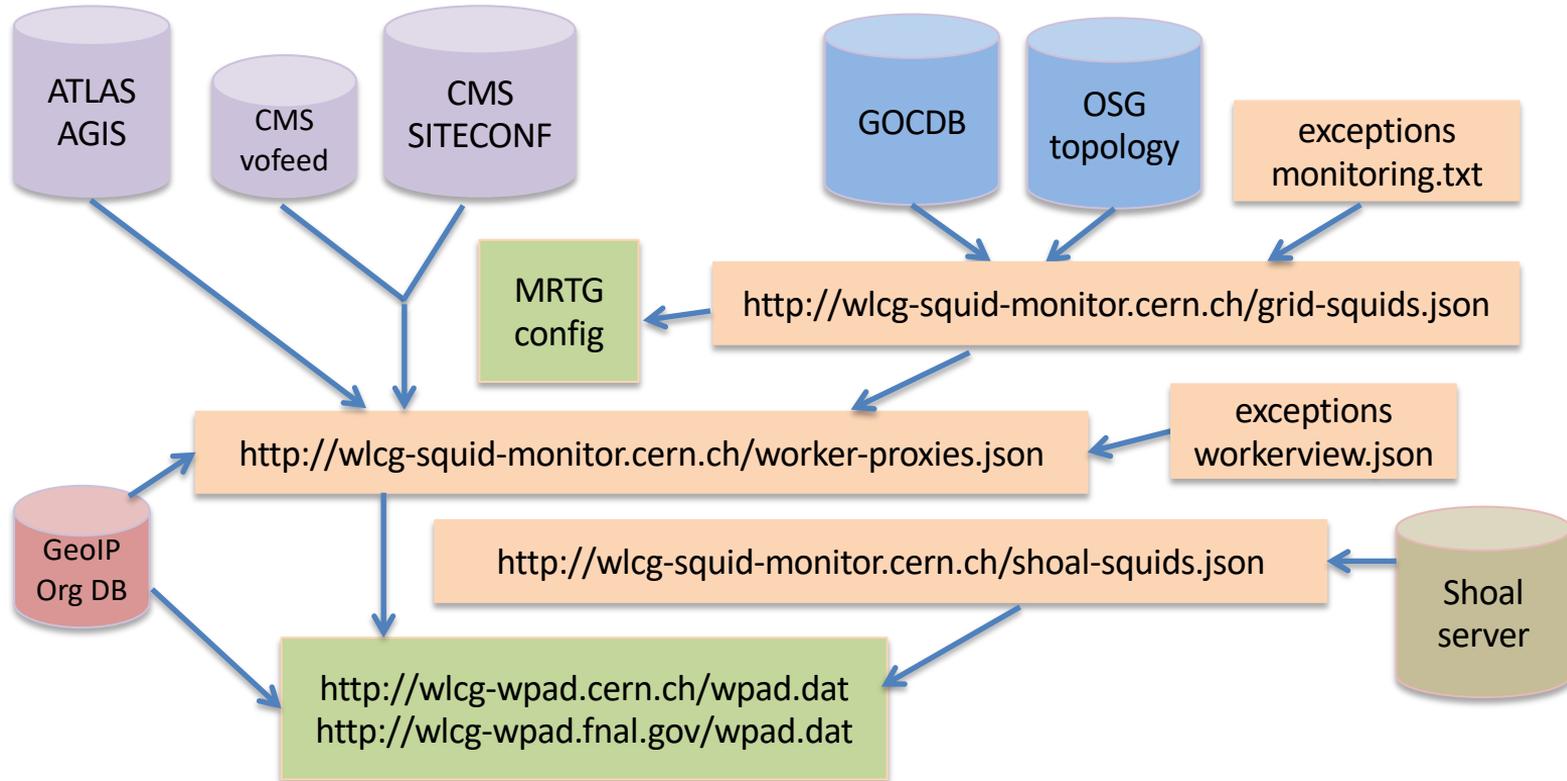
- It's a de-facto internet standard for finding web proxies
  - Supported by all major web browsers
  - Clients try `http://wpad/wpad.dat` to read a Proxy Auto Config format file, a javascript subset, for example:

```
function FindProxyForURL(url, host) {  
    return "PROXY http://squid.aglt2.org:3128";  
}
```
  - Can select different values based on destination url or source ip address
  - Open source `pacparser` library available to interpret, supported by both Frontier and CVMFS
  - Also supported by `pacwget` (<https://github.com/pacwget/pacwget>)
    - `Wget` wrapper that can use multiple squids auto discovered by WPAD

# WLCG WPAD

- We extend WPAD standard for WLCG to four URLs:
  - If `http://wpad/wpad.dat` not found, try `http://grid-wpad/wpad.dat`
  - If that is not found either, try `http://wlcg-wpad.cern.ch/wpad.dat` and `http://wlcg-wpad.fnal.gov/wpad.dat` in either order
- CERN & FNAL services are each on a pair of 10Gbit/s physical servers (that also support 4 squid proxy services to the internet)
- Large sites are encouraged to run their own `http://wpad/wpad.dat` or `http://grid-wpad/wpad.dat` web service to reduce latency and offload CERN & FNAL servers
  - Especially if they have multiple squid services at their site
  - CERN has grid-wpad service to distinguish CMS, ATLAS, and general IT services and was used to separate Wigner and Meyrin subsites
- More details in CHEP 2016 paper <https://doi.org/10.1088/1742-6596/898/5/052043>

# WLCG WPAD Information flow

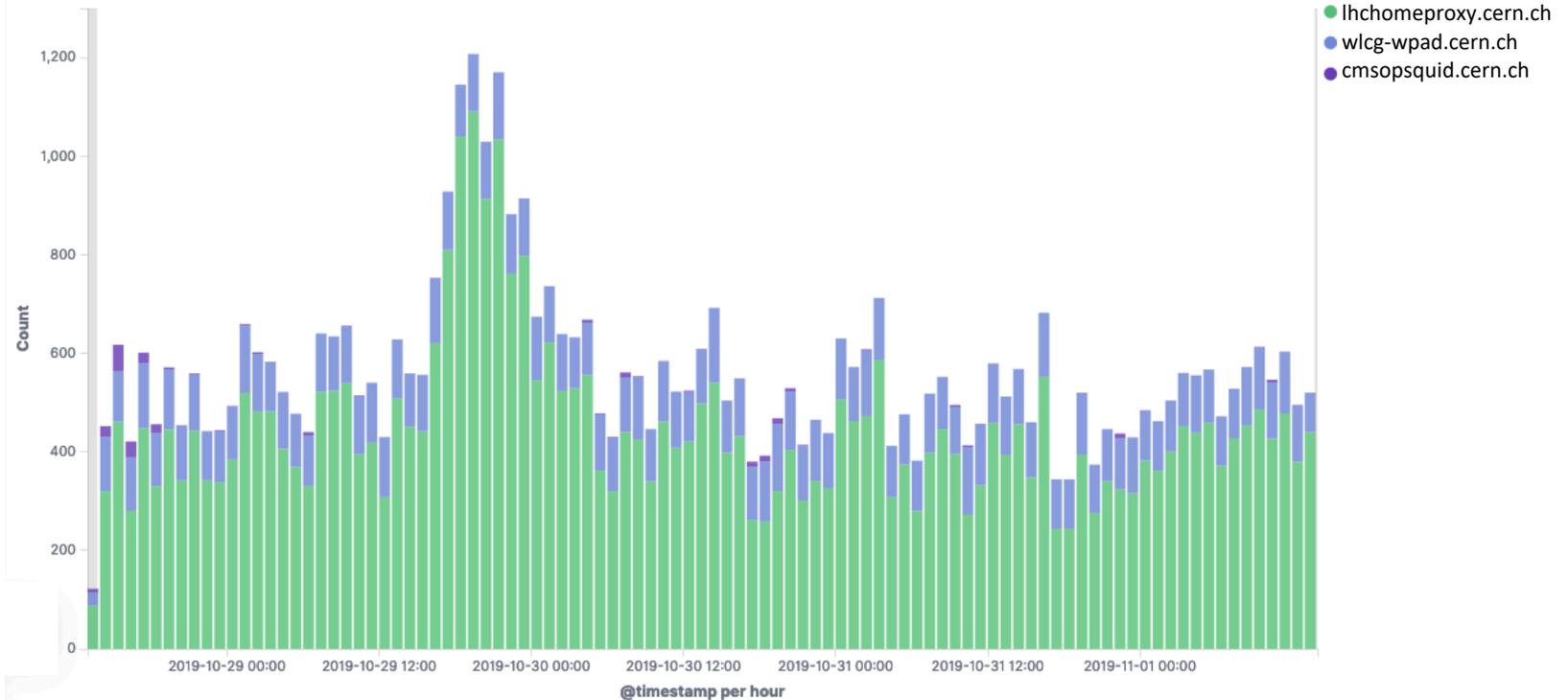


# WLCG WPAD Variations

- The wlcg-wpad service supports variations distinguished by DNS alias
- Most interesting case is <http://cernvm-wpad.cern.ch/wpad.dat> and <http://cernvm-wpad.fnal.gov/wpad.dat>
  - For CernVM default configuration, to work out of the box
  - If no squid found, defaults to falling through to openhtc.io/Cloudflare
  - However if more than configured number of requests from one GeoIP org within configured time, directs instead to monitored backup proxies at CERN & FNAL for configured period
  - Intended to identify large resource users with no local squids defined

# Recent usage on cern.ch servers

Wpad - Service names



# Conclusion

- The standard method for web cache discovery on WLCG is now extended to clouds and other opportunistic resources
  - May also want to use on HPC and container orchestration systems
- Links:
  - <https://twiki.cern.ch/twiki/bin/view/LCG/HttpProxyDiscoveryTaskForce>
  - <http://wlcg-wpad.cern.ch/wpad.dat> or <http://wlcg-wpad.fnal.gov/wpad.dat>
    - Optionally add ?ip= to change IPv4 address looked up
  - <http://wlcg-squid-monitor.cern.ch/worker-proxies.json>
  - <http://wlcg-squid-monitor.cern.ch/shoal-squids.json>