eXtreme monitoring: CERN video conference system and audio-visual IoT device infrastructure

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Outline

- Why this talk
- Video conference use case: Vidyo
  - Starting point
  - Stats and aggregated values dashboard
  - Metrics
- Audio-Visual IoT use case
- Conclusions
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Why this talk

- Present a set of principles + implementation to tackle monitoring of:
  - Systems running an OS not managed centrally → Vidyo
  - Systems running not running a standard OS but having an interface to communicate via IP → IoT
  - Distributed world wide → Vidyo or scattered outside a datacentre → IoT
  - Non existent tools to do the job
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Vidyo offerings for monitoring

- **vidyoportal.cern.ch admin dashboard**
  - It goes into alert (red) only if a node is down
- **Our own Drupal dashboard based**
  - Based on Vidyo CDR database
  - Developed long time ago: doesn’t follow changes in Vidyo CDR schema, some stats are simply wrong
  - Very coarse time span, minimum is a day, some stats not available on the spot e.g. need to wait till end of the month/week
  - Maintenance is problematic
- **Very inefficient in order to track an online issue, difficult to use**
  - Tend to finish writing ad-hoc SQL statements towards CDR db
- **No metrics monitoring on servers**
Vidyo in numbers (last 6 months)

- User accounts: total 29k, 10k active (CERN + SWITCH)
- 1042 simultaneous users
- 389 maximum users in a conference call
- Max 1048 meetings per day – 57 minutes average per meeting
- Max 10 recording per day
Kibana: Geo dashboard

Geo distribution of conference calls participants in a week

- 24 Routers
- 16 Gateways
- 2 Portals (cluster)
- 84 WebRTC servers
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eXtreme monitoring principles for Vidyo

- Avoid nice to have for essential to have
- Reuse infrastructure e.g. logstash load balancer, ES cluster, etc.
- Code as little as possible → the less to debug the better
- Prepare the data so you can get meaningful visualizations → nosql document based records (pre-joined)
- Ease maintenance as much as possible
  - Use IT central services as much as possible
- Target your audience: service managers and 2nd level supporters
- It should be GDPR compliant
**Vidyo stats collector architecture**

- **Vidyo CDR database**
- **filebeat**
- **encrypted**
- **Logstash loadbalancer**
- **Openstack**
- **Kibana: online/aggregated dashboards**
- **encrypted**
- **encrypted**
- **Cluster**
- **Repository**

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Repository</th>
</tr>
</thead>
<tbody>
<tr>
<td>vidyorollup</td>
<td><a href="https://github.com/CERNCDICAIC/aggsvideo">https://github.com/CERNCDICAIC/aggsvideo</a></td>
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<tr>
<td>vidyostats</td>
<td><a href="https://github.com/CERNCDICAIC/resthttpck">https://github.com/CERNCDICAIC/resthttpck</a></td>
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**Kibana: Aggregate dashboard**

The **aggregated dashboard** shows aggregated data about Vidyo conference system. Acronyms are self-describing, just to explain some of the legends, as data is coming directly from the CDR MySQL Vidyo database:

- **ConferenceType**: either D direct calls that involved just two people, or C a conference call that could involve more than 2 people.
- **EndpointType**: either G guest access or D authenticated access or L legacy device (HSDI) or R VidyoRoom.

More extend description can be found at VidyoSupport site.

- **EndpointGUID, CDR schema version 2.1**
  - **894**: Max sim_sessions
  - **178**: EEE_run_coordinatiation_meeting__open_to_schools@vidyoportal.com.ch_1941233999837260 - Max max_unique
  - **249**: EEE_run_coordinatiation_meeting__open_to_schools@vidyoportal.com.ch_1941233999837260 - Max max_total
  - **1,048**: Max Meetings Per Day of CDR

- **VIDYO_AGGS_Mem_Telephony_perTenant**
  - **1,299**: ALL - Sum of installs
  - **1,258**: CERN - Sum of installs
  - **41**: SWITCH - Sum of installs

- **VIDYO_AGGSMemPerTenant**
  - **2,671,154**: sum of summations
  - **50.982**: Average summations
Kibana: Aggregate dashboard
Kibana: Online stats

Core components relation with Vidyo meetings
finished calls duration stats

active users

timeline active users arrival

client apps in use

routers in use

WebRTC servers

H.323/SIP calls

Kibana: Online stats
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Metrics monitoring

- Based on telegraf/influxdb/grafana
- Ansible for deployment
  - Vidyo Ubuntu images all over the world
- Alerts via email & mattermost channel
- Openshift bridge for outside CERN servers
- Monitor important processes from Vidyo e.g. gwcc
Metrics collector architecture

Outside CERN network

CERN network

Openstack

24 Routers
16 Gateways
2 Portals (cluster)

Port: 8080

https at 8080

https at 8080

https at 8080

https

ssh

Port: 8080

influxdb

Grafana

24 Routers
16 Gateways
2 Portals (cluster)
Internet2 gateway issue - OTG0050828

- US deployed gateway running on VMWare
  - No ssh access to the underlying hypervisor
  - Pretty complicated to debug
- Thanks to metrics monitoring, solved by sending a disk instead of a full server
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IoT Audio Visual (AV) jungle

- **Wide variety of devices and brands**: microphones, codecs, projectors, screens, clocks, encoders, …
- No commercial product that can handle all of them
  - Overture, GVE
- IP revolution getting to Audio Visual sector → allows to use IT techniques
- Testing with some IoT tools:
  - Finally going for an OSS project: **Node-red** from IBM. Easy way to generate flows that interact with devices using http(s), websockets, telnet, etc.
AV IoT monitoring architecture
Presence/occupancy in a Video conference room

Alerts in a Mattermost channel

Yesterday

[Alerting] Disk filling up!
Disk filling up on some of the pcencoders, please check it out!

win_disk.% Free Space { host: PCWEBC009 }
14.991857870571175

Grafana v5.2.0

Rene Fernandez Sanchez 9:22 AM
I will take care

Rene Fernandez Sanchez 10:04 AM
Done

webhook 10:07 AM
[OK] Disk filling up!

Grafana v5.2.0

Ruben Domingo Gaspar Aparicio 10:52 AM
Super!
CERN IoT solution advantages

- Very flexible architecture
  - **Actuators**: using a broker like kafka/mosquitto/activemq would allow to react to some events, not just monitor them
  - Data model includes topics e.g.
  - **Data enhancer**: querying other service e.g. Indico
- More preventive architecture
- Global view of a very complex ecosystem
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- A data driven approach used in both cases
  - Almost agnostic of the domain/type of the devices to be monitored
- Very flexible design that allows to enrich the apps with new functionality/needs
- Pushing maintenance of the infrastructure to IT central services as much as possible
- Parts of the architecture being reused by other services e.g. Terminal service, Conversion service, Email service.