

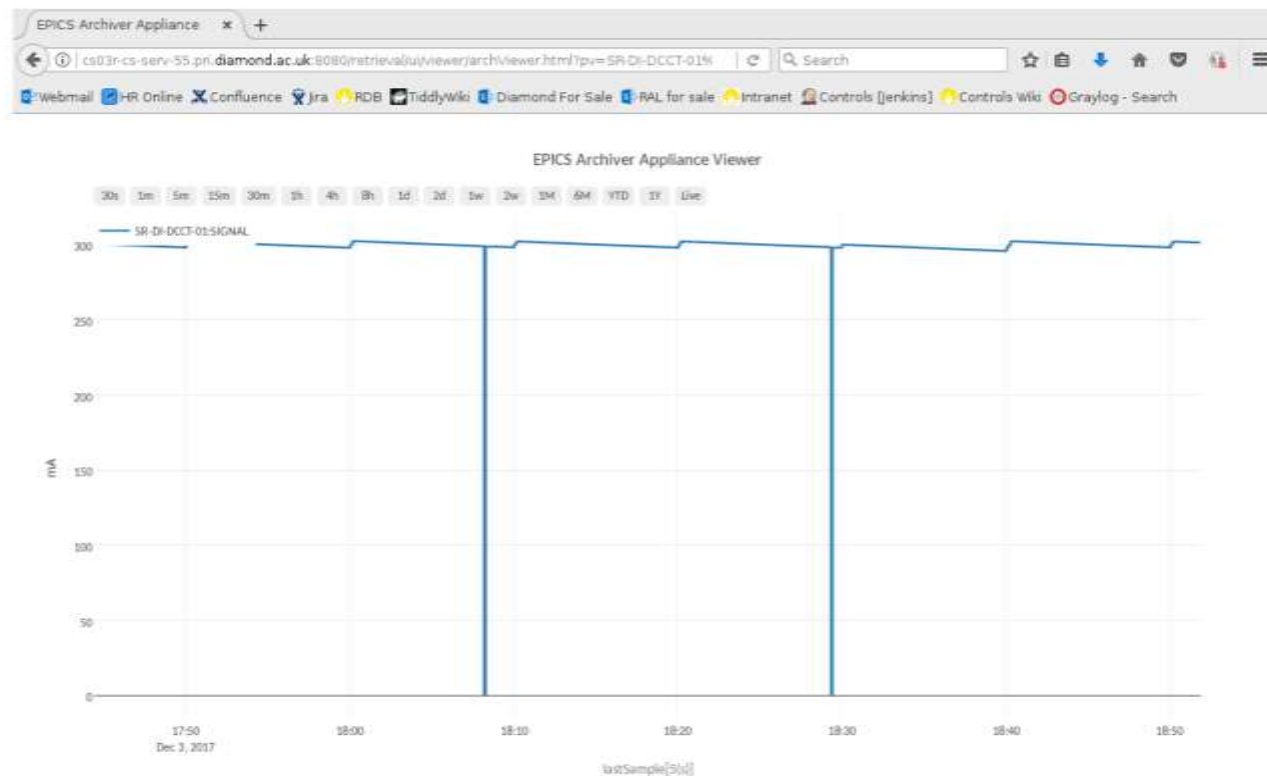
# Understanding EPICS Broadcast Traffic

Will Rogers

Diamond Light Source

# Symptoms

- Beam current PV dropping out

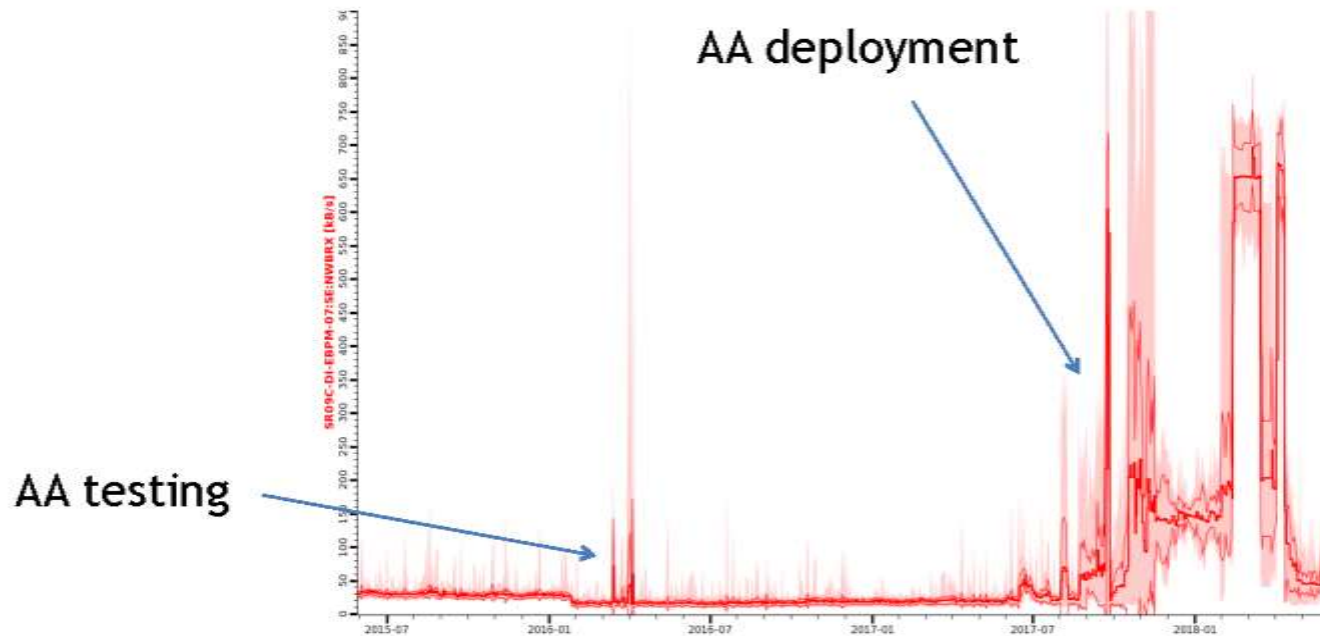


# Symptoms

- IOC used digital voltmeter connected to DCCT
- IOC connects to DVM via TCP
- DVM seems OK
- IOC seems OK, but connection gets dropped occasionally
- What's going on here?

# Network investigation

- Our network monitoring is limited, but:
- We found a PV recording total broadcast packets

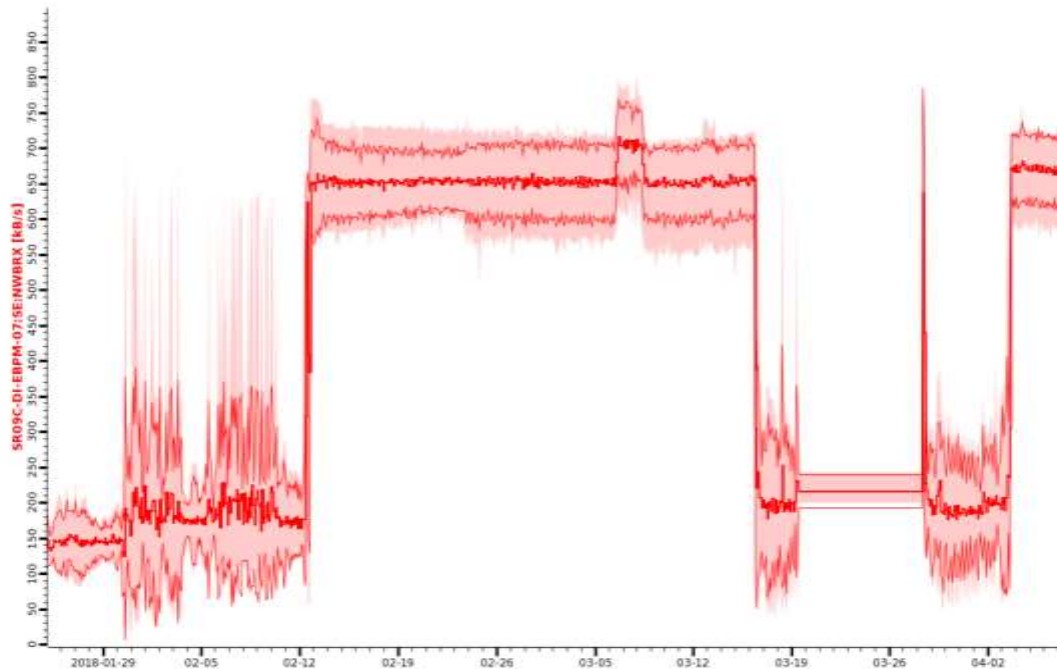


# Archiver Appliance

- Our Channel Archiver is at end of life
- We are deploying the EPICS Archiver Appliance
- Using a cluster of three machines
- The AA evidently has a role in this traffic increase

# Network investigation

- Distinct on and off steps; factor of 3 increase



# Network investigation

- CASHark (Michael Davidsaver) shows us:
  - AA machines are generating the traffic
  - One of the three is the real problem

No.	Time	Source	Destination	Protocol
1	0.000000	172.23.194.54	172.23.207.255	CA
2	0.000140	172.23.194.54	172.23.207.255	CA
3	0.000258	172.23.194.54	172.23.207.255	CA
4	0.000352	172.23.194.54	172.23.207.255	CA
5	0.000439	172.23.194.54	172.23.207.255	CA

```
▼ Channel Access
  Command: Search (0x0006)
  Payload Size: 32
  Reply: Only for Success (0x0005)
  Version: 13
  Client Channel ID: 57808
  Param 2: 0x0000e1d0
  PV Name: BLO4I-EA-XBPM-04:FEMT04:I.NAME
```

# Network investigation

- The PVs being searched for are **disconnected**
  - So don't archive them
  - But why the steps?
  - And why only one machine?
- There's more to understand here
- What next?



# Broadcast searches

- What happens when a PV is disconnected?
  - ‘Back-off’ algorithm
  - Maximum interval between searches is 300s
  - But in JCA it’s only 30s

```
private static final int MIN_SEND_INTERVAL_MS_DEFAULT = 100;  
private static final int MAX_SEND_INTERVAL_MS_DEFAULT = 30000;  
private static final int INTERVAL_MULTIPLIER_DEFAULT = 2;
```

- => Pull request to JCA
- That doesn’t answer our questions

# CA Beacons

- Each IOC sends out a broadcast message every 15 seconds to say ‘I’m still alive’
- On startup, an IOC sends these messages more frequently
- This allows clients that are searching for a PV to know that something has changed – and restart the searches

# casw

- Enter casw
  - What does it stand for?
- Used for detecting ‘beacon anomalies’

```
File Edit View Search Terminal Help
hgs15624@pc0072 ~ (master)> casw
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:04.080638502
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:04.200878455
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:04.361041635
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:04.681135633
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:05.321250225
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:06.601346500
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:09.161466494
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:14.281591192
p45-control.diamond.ac.uk:36160 2018-05-30 10:59:24.521686745
□
```

# casw

- We see beacon **anomalies** every 15s on cs03r-cs-serv-54!
- These come from misconfigured broadcast packets on a new IOC
- We take down the IOC, the traffic steps down!

# Misconfigured broadcasts

- New micro-TCA server
- Two network interfaces:
  - Private on back-plane
  - Primary network
- Broadcast packet had wrong IP address
- Reconfiguring (how?) fixed the problem

```
export EPICS_CAS_AUTO_BEACON_ADDR_LIST=NO
export EPICS_CAS_BEACON_ADDR_LIST=$BCAST
```

# The AA

- JCA broadcasts 10x as frequently
- Never-connected PVs searched by all 3 appliances
- Never-connected PVs also search for 5 meta-data fields
- => Traffic up to 150x levels of Channel Archiver
- => Never-connected PVs must be watched!

# Latest

- Done:
  - Crack down on disconnected PVs in AA
  - Fix misconfigured IOC
- To do:
  - Use updated version of JCA
  - Run casw continuously to central logging system
  - Monitor broadcasts on primary network
- Open questions:
  - Why only one of three AA servers affected?
  - Why only one of two misconfigured IOCs causing the problem?
  - Why were the beacons incorrect?