

Description

On August 6th 2019, at 17.30 CET, the protected power line of storage and network systems failed: the busway connecting the dynamic UPS (or KS) to the main electrical panel was subjected to a short circuit and, as a consequence, a mechanical joint of the KS broke. After a second, the bypass of the KS was activated and the power was restored.

The first inspection revealed the fault of the KS system only; in a second moment, also the problem on the busway was evident. While we were working to restore the continuity, we declared a down. The down was closed on August 21st at 20.00 CET.

Impact

Since all the power suppliers of the critical systems (network and storage) were powered only by the protected line, all storage systems (disks and library) and services (srm, gridftp and xrootd servers) failed due to the temporary power interruption. The farm, powered also by a non-protected line was unaffected.

To avoid potential loss of data we decided to not reopen the services until the continuity was restored. This incident affected all experiments using the INFN Tier-1, including the WLCG ones.

Time line of the incident

2019-08-06 17.45 CET – Start of the incident (power interruption)

2019-08-06 19.00 CET – Inspection of the system: fault of the KS is revealed but no evidence of problems on the distribution system. Support of the KS system is alerted.

2019-08-08 09.00 CET – KS support intervention; problem escalated to KS producer.

2019-08-10 21.00 CET – Mechanical joint of the dynamic KS restored.

2019-08-10 21.30 CET – Problem on the busway discovered

2019-08-12 15:00 CET – Substitution of faulty parts of the busway started

2019-08-14 13:00 CET – Busway restored

2019-08-19 13:00 CET – Installation of a static UPS on the second line started.

2019-08-21 15:00 CET – Installation of the static UPS on the second line completed and validated

2019-08-21 17:00 CET – All IT services restored

2019-08-21 19:00 CET – All IT services checked and validated

2019-08-21 20:00 CET – Down closed

Analysis

The INFN Tier-1 data center is powered by two lines (“green” and “red”): before the 2017 flooding, both were protected by a KS (dynamic UPS + Diesel engine). Currently only the green line is protected; the KS on the red line has not been restored yet, due also to the scheduled decennial maintenance on it. In the meanwhile a small static UPS was acquired to protect the critical services (network and storage) also on the red line. Due to some bureaucratic issues, both interventions were delayed: the maintenance on the KS will start in September while the UPS has been delivered to CNAF only at the end of July (the installation was foreseen for September).

On August 6th 2019, at 17.45 CET, the green power line failed: the busway connecting the KS-green to the main electrical panel was subjected to a short circuit and, as a consequence, a mechanical joint of the KS broke. After a second, the bypass of the KS was activated and the power was restored.

The first inspection revealed the fault of the KS system only; in a second moment (August 10th) the problem on the busway was evident. The recovery of these components was delayed due to the holiday period: in August, especially during the central week, most companies in Italy are closed or with limited staff.

To be noticed that the busway had been checked for anomalies on February 2018 (this control should be done at least once in four years).

On August 19th, also the work on the new static UPS started and the installation (and validation) was completed on August 21st: as soon as the continuity was restored, in less than two hours all the systems were restarted and checked.

Also on August 21st the busway was validated by the official maintainer while the KS was revalidated and put back on line on August 22nd.

Also we needed to replace one storage controller and some disks but these faults did not affected users in any way (RAID protection for disk arrays and redundant controllers).

Follow up actions

We have now started discussing with the support companies more stringent maintenance contracts for the whole infrastructure in order to really cover also critical periods such as Christmas break and Summer holidays.

In any case, in September also the static UPS will be backed up by a diesel engine thus having, at least for the critical services (i.e. storage and network) two power lines with absolute continuity.

Moreover, in order to prevent other faults on the busways (all our electrical distribution is based on them), we will perform more frequently thermographic checks on them.