



## **Incident Review - Root Cause Analysis (RCA)**

**DATE OF REPORT:** September 17, 2015

**DATE/TIME OF OUTAGE:** September 14, 2015 at 1:15 PM.

### **SUMMARY:**

On 9/14/15 @ approximately 1:15 PM ET, one of the three Uninterruptable Power Supplies (UPS A) in the Chicago Data Center went offline and caused a loss of power to a portion of the facility. The racks within the data center that lost power contained several critical systems, including DNS and Email systems that service a significant portion of Hostway customer base, including customers whose websites are physically located in other data centers.

Normally, a UPS will fail open – meaning they default to supplying power directly from the utility. In this case, the UPS failed closed – which suggested a possible “hard short” – a short circuit in one of the high voltage cables. In such a situation, resetting the UPS without addressing the short circuit could result in anything ranging from extensive damage to all servers on the circuit to a fire or explosion.

Two courses of remedial action were therefore undertaken simultaneously: The team conducted an audit of all of the high voltage cabling connected to the UPS, and began rerouting power from the functional UPS nodes to the affected racks – restoring power to several clusters of servers at a time over the next few hours.

No electrical shorts were found, and at approximately 4:30 PM most services were restored.

The next event in the outage sequence was caused by human error. The power to UPS B was interrupted when the electrician accidentally shut down Power Distribution Unit (PDU) B. That power was immediately restored. Although brief, this additional interruption in power caused several servers to go back through the startup sequence – and since these servers were already in the process of recovering from the earlier ungraceful restart, it greatly exacerbated the recovery and restoration timeframe for the affected services.

**No data is known to have been lost during outage.** However, the additional power cycle caused a significant amount of data corruption – especially with regard to systems that are database-oriented, such as the Chicago Exchange email cluster. These databases needed to go through a lengthy rebuild process before they could be remounted and be readable by the server. Customers impacted by the

corruption could not access emails sent or received prior to the outage until the database where their mailbox was stored was rebuilt and remounted.

### **SUPPLEMENTAL INFORMATION**

On 5/15/15 a Major Planned Maintenance was performed on all the UPS systems in the Chicago data center. During this maintenance, the unit would have been put into bypass and shut down so arc covers could be removed for connection and component inspection. Other tests that were performed included bypass operation, thermal scans, verify voltages and current, batteries tested, and visual inspection. No concerns were found.

### **ROOT CAUSE:**

1. The Uninterruptable Power Supply (UPS) A in the Chicago data center went offline. This caused a loss of power to server rows.

Why UPS A went offline is as of yet undetermined. We do believe that at the time of the outage, there was an input AC under voltage (similar to a brownout), but a quick power fluctuation should not have caused the UPS to go offline. After the outage, the inspection of UPS 'A' did not find any problems within any of the subsystems or components. We continue to have the manufacturer reviewing the logs to further isolate where the specific problem may have originated to take appropriate action.

2. Inadvertent shutdown of UPS B. After UPS A was switched on, the racks still did not have any power. The electrician went to another floor to the Power Distribution Units (PDUs) to check the power status of PDU A. PDU B was opened to obtain the physical manual to determine where breaker was located at for the full PDU. PDU B is not connected to UPS A. The electrician thought he was in front of PDU A. He pressed the emergency switch stop in PDU B to "listen" for the main breaker trip. That turned off UPS B, thus powering off all equipment connected to UPS B. Many of the systems that were originally connected to UPS A had been switched to UPS B in an attempt to restore service. Pressing the emergency switch button on PDU B powered off all of the systems that had just been restored, including databases that were rebuilding.

## **CORRECTIVE ACTIONS:**

**The following actions are either already under way or will be undertaken to further mitigate the risk of any loss of power to systems in our Chicago data center:**

1. The Manufacturer of the UPS and its Services Resources have been on-site at the Chicago DC to analyze and potentially correct the UPS (Digital logs of the UPS are being evaluated).
2. Change the Service/Support UPS contract from the current Provider to the Manufacturer of the UPS.
3. Expedite the activation of the Dual Power Top of Rack Switches in the racks in the Chicago DC. This is an existing Hostway Network Upgrade project; the dual-power TOP switches are ordered, installed and tested in the Chicago DC. The activation to Production will be expedited. This is a company-wide project that is scheduled in all Hostway DCs.
4. Review and make adjustments to our power architecture to ensure we are optimized for our critical infrastructure.
5. Audit all technical/operational documentation and current Maintenance/Support contracts and reports of the Quarterly Service Activities versus the AS IS and address any potential discrepancies.
6. Plan and execute more frequent end-to-end testing of Power Provisioning from the Dual Grid over the UPS/Generator, PDU, TOR switches, Racks and Systems.
7. Complete the rollout of further geographic redundancy of our DNS infrastructure to eliminate any possibility of DNS service interruption from a single data center outage.
8. Implement an out-of-band crisis communications channel for frontline support technicians and customers to be continuously in sync with the latest status reports from the engineering and operations teams on the ground – so that impacted customers have information that is as accurate and close to real time as possible.