



MEMORANDUM

Date: December 2, 2019

To: The Honorable Chairman and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

A handwritten signature in black ink, appearing to read "CHH", is written over the printed name "C.H. Huckelberry".

Re: **Update and Status Report on Recent Computer and Phone Outages**

As you are aware, Pima County experienced intermittent phone and network outages during the days prior to Thanksgiving. The following is provided as an explanation of what occurred, a summary of what steps staff took to restore service and what is being done to prevent such an outage from happening again.

What happened:

At approximately 9:30 AM on Tuesday, November 26, 2019 Pima County staff began to report intermittent phone and network outages, impacting email and access to the Internet. Pima County has an Uninterruptable Power Source (UPS) that provides emergency power should the main power system fail. The County contracts our maintenance and repairs of this system with Eaton UPS Service Support and Maintenance (Eaton).

Eaton was scheduled to conduct their annual performance management or monitoring review of the UPS devices and Power Distribution Units (PDUs) in the datacenter located in 150 W. Congress (Administration West) on Tuesday, November 26.

A total of three PDUs were to be checked and two of the three units must be kept online for power to be available. According to notes provided by Eaton, once the first unit was taken off line for service, the two remaining units went into overload status, then transferred the load over to battery power, then went into system bypass mode, and then completely shut down all systems. The cause of this sequence of events is still yet to be made known by Eaton, but the actions of the service engineer shut the Administration West datacenter down completely.

Power was restored almost immediately, but even a minimal outage requires all servers to be restarted. Following the outage, Information Technology Department (ITD) staff began the process of restarting or "bringing up" the 1000+ servers. Some applications, like Advantage, have 30+ servers required to run them, and they have to be brought up in a very specific order for the application to perform correctly.

As the servers were being restarted, a critical component in one of the main switches in the datacenter failed, causing additional outages.

What we did to fix it:

Power to the datacenter was restored quickly but several key management systems that provide for the performance or availability of the computer system remained off line adding to the complexity of isolating and identifying issues. As servers were being brought online a critical component in one of the two main datacenter switches failed. Once staff believed the failed switch was stabilized, work on the servers and storage to repair the data corruption caused by the "hard outage" began. This work took several hours to complete because of the size of the organization and the amount of data maintained. This was a lengthy process, requiring multiple attempts to recover the data in a usable and stable format.

The storage subsystems performed as intended, protecting County data by relocating their active paths to the Pima Emergency Communications & Operations Center (PECOC) datacenter on East 22nd Street. This backup or redundant system, which should have provided auxiliary power, also presented challenges. This "designed and intended" automated process that normally manages these moves between the downtown facility and PECOC in minutes, greatly added to the complexity of troubleshooting and recovering the environment, because of the networking issues caused by the bad switch. This meant that the backup system did not work as the switch component failure was creating a conflict between the two core switches. Staff began troubleshooting to isolate the issue and a plan was implemented to replace the failed switch.

A cross functional team of ITD staff worked through the night and deemed the computer environment stable early Wednesday morning. As staff throughout the County began to arrive work on November 27 and began logging into their computers, traffic on the network increased and it became apparent that there were still instabilities. ITD staff and an engineer from CISCO, an external IT company, identified a routing issue and was the able to remediate the problem. Service to all devices was successfully restored at approximately 11:00 AM.

What we're doing to ensure it doesn't happen again:

ITD has been executing a plan to make the computing network more resilient when issues like this occur. The plan requires significant expenditures of capital and has therefore been undertaken over a number of fiscal years in order to minimize budgetary impact. There are a number of components to this plan, and most of them were in process as of this latest incident date. Key elements of this plan are:

- Complete a fiber optic network ring owned and managed by Pima County to provide a continuous connection between downtown Tucson facilities and PECOC, including the Mission Road Complex and the Sheriff's Department headquarters on Benson Highway. The contract to build out the south end of this ring was awarded on November 19, 2019, and currently one full week of work on the project has been completed. Once complete, there will be two paths from any site on the ring to one of the Pima County ITD data centers, greatly improving the ability to preserve services in the event of an outage at either data center. This CIP project is due to be completed by the end of April 2020.

- Replace end of warranty Hewlett-Packard Enterprise (HPE) servers and storage devices at both Pima County ITD data centers with Dell/EMC equipment. The new equipment is more resilient, higher performing and more capable of being utilized with newer, more resilient network equipment. The server/storage project is due to be completed by the end of February 2020. This project is approximately 85% complete. When this power outage occurred, this environment came back on line and was fully functional, providing it is much more resilient than the current environment that failed, and is being replaced.
- The installation of the newer network equipment, budgeted and planned for the current fiscal year, is pending completion of the server/storage upgrade. As part of this replacement, staff has worked with Cisco engineers to ensure the design and configuration will withstand events such as this one without loss of IT functionality to County Administration, Elected Officials, and departments. A portion of this equipment was put in place to support the server/storage upgrade mentioned above. When power was restored from this outage, this switching/routing environment came back on line with no failures. This is due to be completed no later than end of June 2020.

In addition to the technical and/or computer related efforts delineated above, the following practices will be implemented immediately:

Scheduling of Work

Work will not be done by Facilities Management, Information Technology or any associated vendor or contractor that could have a negative impact on the IT systems during normal work hours (Monday thru Friday, 8:00 AM – 5:00 PM). ITD staff may need to be present during the work and it is understood that they will work other than normal work hours.

Notification of the Board of Supervisors and County Administrator

The Chief Information Officer, or designee, will go immediately following the beginning of an episode to the 11th floor and brief any/all Supervisors and/or staff present and will continue to provide updates and reports at regular intervals in person. Staff will also report such information to the County Administrator and/or his designee.

Elevator Phones

The phones in the elevators are on Mitel rather than an external line provided by a telecommunication provider. When the computers go down, the phones in the elevators also go out. The phones in the elevator will be transferred to a separate system and placed back on plain old telephone service (POTS) lines.

- c: Jan Leshar, Chief Deputy County Administrator
Dan Hunt, Chief Information Officer, Information Technology Department
Lisa Josker, Director Facilities Management