

## Upgrades Can Take You Down

September 2015

In our recent article, “Human Triple Whammy – NYSE, UA, WSJ,”<sup>1</sup> we noted that humans cause about 40% of all outages. Another major cause of outages is software upgrades gone wrong.



The major problem with upgrades is that the systems being upgraded are becoming ever more complex. Each component of the system has many points of integration with other components. It's hard to predict how a little change to one component might affect the overall system or how that system interacts with other systems.

It is becoming more difficult to thoroughly test upgrades – there are just too many processing paths through the system. Consequently, thorough testing is being replaced with risk-based testing. Just the paths that are most likely to be executed are tested. Edge conditions such as error processing are given short shrift in the testing process. There just isn't enough time or budget to run regression testing or stress testing for all of the code in the system. Instead, the team of programmers stands by with their fingers crossed during the first several days of system operation following an upgrade.

Several recent outages have illustrated this problem:

### New York Stock Exchange

In the early hours of Wednesday, July 8, 2015, technicians at the New York Stock Exchange (NYSE) were busily upgrading the software to its gateways to support an upcoming change to the Session Initiation Protocol (SIP). SIP is a communication protocol for controlling multimedia communication sessions, typically Internet voice and video and instant messaging over IP.

During final testing, around 7:30 AM local time, problems were discovered with the upgrade. The gateways were misconfigured for the new software release, causing communication issues between the customer gateways providing access between the member brokers and the NYSE trading systems. The gateways were reloaded with the proper software version, and the markets opened on time at 9:30 AM.

However, as the morning progressed, additional communication issues between the gateways and the trading systems emerged. They became so severe that trading was shut down at 11:32 AM. In a statement, an NYSE spokesperson explained, “It was determined that the NYSE and NYSE MKT gateways were not loaded with the proper configuration compatible with the new release.” It was not feasible to simply back out the upgrade and continue on with the original known configuration since this might have caused many trades to be canceled.

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<sup>1</sup> Human Triple Whammy – NYSE, UA, WSJ, *Availability Digest*, July 2015.  
[http://www.availabilitydigest.com/public\\_articles/1007/human\\_whammy.pdf](http://www.availabilitydigest.com/public_articles/1007/human_whammy.pdf)

The NYSE faced a particularly difficult deadline in that mutual funds and other investment vehicles need a closing price in order to evaluate their portfolios, a regulatory requirement. As the 4 PM closing bell approached, things grew more tense.

Finally, at 3:10 PM, the NYSE was able to get its trading systems operational; and trading continued at a frenzied pace until the 4 PM close. The stock exchange had been down for nearly four hours.

## **FAA Air Traffic Control System**

The FAA is nearing the completion of a multi-year, multi-billion dollar replacement of its air traffic control system. The new system replaces radar tracking of airliners with GPS tracking. GPS tracking is far more accurate and allows the FAA to route planes directly to their destinations rather than over a series of navigation aids, thus reducing travel time and saving fuel costs. The new system is known as NextGen.

A major component of NextGen is the EnRoute Automation Modernization system (ERAM). ERAM is installed at the FAA's 20 high-altitude air-traffic control centers. It generates the display data for the controllers and alerts them when aircraft are flying too close together for safety.

An upgrade was being made to the ERAM system at the FAA's Leesburg, Virginia, air traffic control center on Saturday, August 15, 2015. This particular ERAM system provides aircraft control for the Washington, D.C., metro area. The upgrade went awry and caused the ERAM system to fail. Without ERAM, air traffic controllers had to revert to earlier radar procedures, which precluded them from handling the number of flights that were scheduled into and out of the Washington area. The outage stranded thousands of passengers and caused the cancellation of hundreds of flights.

Even though ERAM includes a fully functional backup system precluding the need to restrict operations in the event of a primary system failure, the nature of the failed upgrade prevented the FAA from failing over to its backup system.

## **SunGard and BNY Mellon**

SunGard provides software and services to financial, education, and public sector organizations. As part of its clientele, it hosts an accounting platform that helps the Bank of New York Mellon (BNY Mellon) calculate asset values for its funds clients.

Over the weekend of August 22, 2015, BNY Mellon found that it could not calculate the prices of mutual funds and exchange-traded funds (ETFs). The problem persisted for several days, prolonging confusion over the price of recent trades and any potential compensation owed. After several days of scrambling to fix the problem, the cause of the problem was not fully known.

Finally, on Thursday afternoon, August 27, SunGard broke several days of silence and admitted the problem was its fault. It had been attempting a systems upgrade to its fund accounting software the previous weekend, and the upgrade caused the system to fail. SunGard said the glitch was caused by an unforeseen complication resulting from an operating system change. The production environment became corrupted during the change, which unfortunately also corrupted the backup system. It apologized to BNY Mellon for the problem and for its long silence.

The breakdown affected twenty mutual fund companies and 26 ETF providers. The SunGard system resumed with limited capacity on Tuesday, August 25, leaving BNY Mellon with a backlog of funds to price. BNY Mellon said that it would take more than a day and perhaps into the weekend to finalize prices if no further problems arose.

## Lessons Learned

There are two lessons to be learned from these outages. One is that upgrades must be thoroughly tested before they are put into production. Obviously, this is becoming ever more difficult as systems get larger and more complex.

The other is that no matter how much testing is done on an upgrade, upgrades will fail. Therefore, there must be a fallback plan that is known to work. If the upgrade fails, the system must be immediately returned to the previously known working configuration so that there is no interruption to critical processing. Successful fallback plans require a great deal of planning to ensure that they are reliable.

## Acknowledgements

Information for this article was obtained from the following sources:

NYSE outage highlights need for IT automation, *Search Data Center*, July 9, 2015.

Flight delays persist as FAA resumes operations, *USA Today*, August 15, 2015.

Software limits exposed in air traffic outage, *The Hill*, August 17, 2015.

Wayne-based SunGard apologizes for fund pricing glitch at BNY Mellon, *Philly Voice*, August 27, 2015.