

Superstorm Sandy: Infrastructure Impacts

NANOG 57

Orlando

February 4th, 2013

Golding
rator



Superstorm Sandy: What Happened?

October 2012

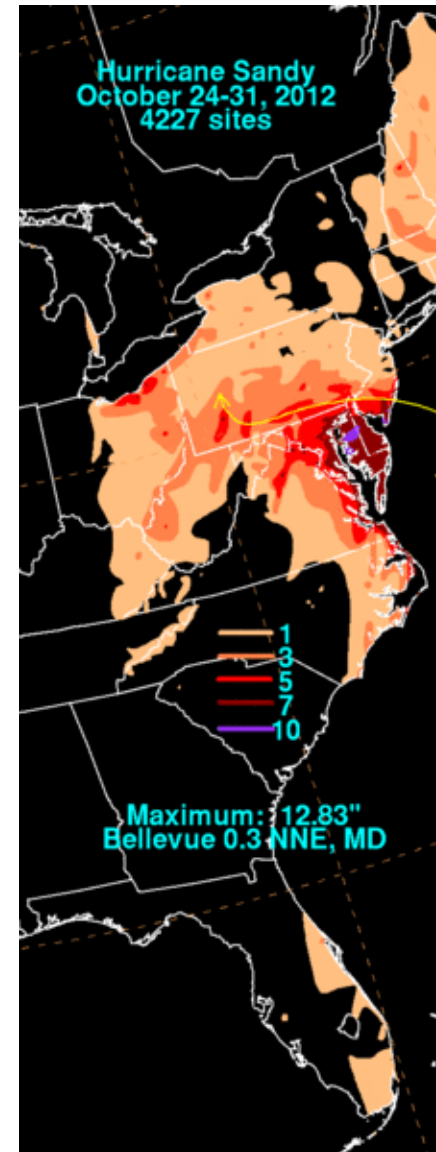
Largest Atlantic hurricane on record

Category 2 winds

Estimated damage and business impacts in excess of USD\$65bn

- Significant flooding and wind damage

Greatest damage in New York and New Jersey



Superstorm Sandy: What Happened?

Prime data center territory in downtown Manhattan and the northern NJ datacenter corridor

- Significant interconnection facilities include 60 Hudson, 111 8th Ave, 65 Halsey
- Not just a hazard to Internet – significant nexus of financial exchange (FX)



Significant Data Center Impact

Primary issues were flooding and availability of diesel fuel

- Well prepared facilities did better
- Some data centers inside larger buildings were at the mercy of the building management's preparation
- Reinforced problems inherent in converting high-rise buildings to data center
- Also raised questions about availability of fuel inside constrained metro regions



Today's Panel

Cross-section of major data center, interconnection, hosting, and colocation providers

Operational management with direct control of the situation

Most were “on the ground” for Sandy – tactical leadership



Today's Panel

Michael Parks, Chief Technology Officer, Datapipe

Scott Davis, EVP of Operations, Dupont Fabros Technology

Michael Poleshuk , Senior Director - IBX Operations, Equinix

Neil Crowley, Director – Data Center Operations, Internap

Daniel Golding, Datacenter Strategy and Operations Consultant and
NANOG BoD



Super Storm Sandy: Infrastructure Impacts

Neil Crowley

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Ready-Set-Go

- Operational Preparedness: maintenance
- Emergency Action Plan (EAP) – 96-hr countdown
 - People
 - Suppliers and vendors
 - Critical infrastructure
 - Communication, communication, and communication
- Event Response: exercising sequence of operation
- Disaster Recovery: storm surge and inundation

Aftermath – Inundation Challenges

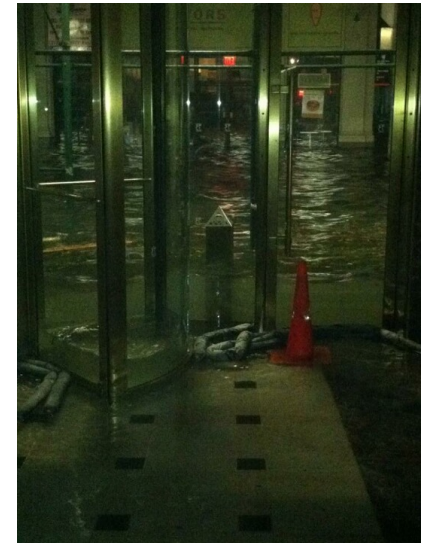


- **People** – sheltered in place
- **Suppliers** – restricted access
- **Critical Infrastructure** – city and building infrastructure impaired
- **Communication** – fixed and mobile comms impacted
- **Event Response** – std. emerg. procedures insufficient
- **Disaster Recovery** – Black Start Operations

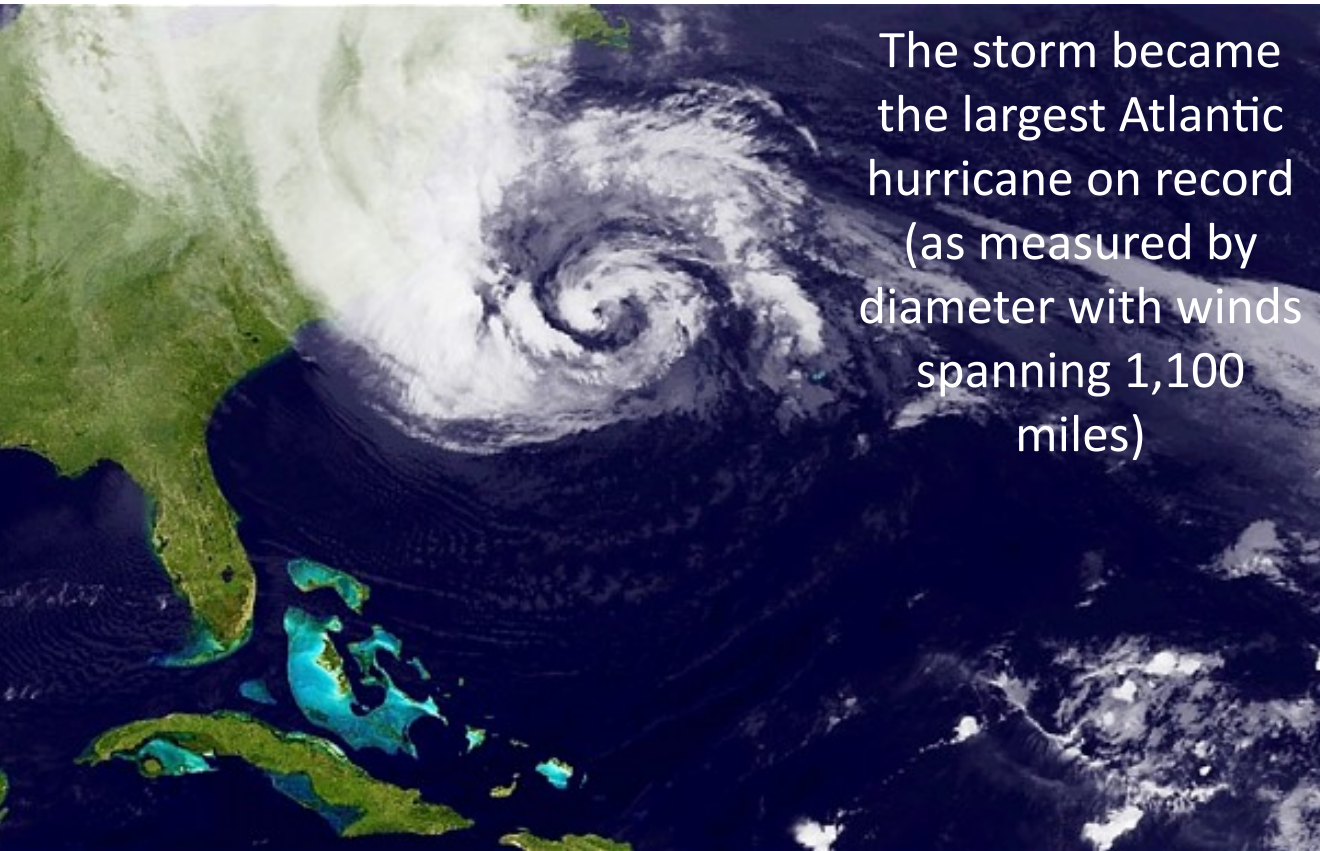
Key Take Aways

- Building owners – elevation of utility, mechanical systems
- Emergency fuel systems – designed for submersion or protected from inundation
- Quick connect systems
- FEMA – Advisory Base Flood Elevations (ABFEs):

www.region2coastal.com/sandy/abfe



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The storm became
the largest Atlantic
hurricane on record
(as measured by
diameter with winds
spanning 1,100
miles)



E Q U I N I X

Hurricane Sandy

Presented by **Michael Poleshuk** | Sr. Director Operations, Northeast

Presented on **02-04-2013**

Equinix Operational Performance

DC Metro / Philadelphia Metro

- No customer impact (brief power fluctuations)

Boston

- No impact

NY/NJ Metro

- Widespread power outages across Manhattan and part of Secaucus
- IBX NY9 experienced 4 outages
 - Three attributed to landlord infrastructure
 - One attributed to Equinix generator
- IBX NY8 experienced an outage
 - Failed generator speed sensor
- Flooding had no direct data center impacts
 - Impacted road access to our data centers for short period(NY2, NY5 and NY7)
- Water leak at NY4 (Secaucus) isolated to two adjacent cages

Equinix Post-Storm Lessons Learned

What worked well?

The Equinix Operations Center provided preparedness information to customers via the IBX Advisory process three days prior to predicted landfall

Regular updates throughout the duration of the storm

Received customer praise of communication during and after the storm

Responding in real time to customer feedback we enhanced site specific information by adding an additional level of detail to content being provided in updates

Fuel levels, fuel delivery schedules, generator run time, etc.

IBX Advisories

- **Every four hours during the storm window**
- **Provided change updates**
- **Vehicle that customers can count on for regular news**
- **Enhanced detail for each site as storm progressed**

Equinix Post-Storm Lessons Learned

Where can we improve?

Need to revisit expectations for landlord response and information to be provided during an incident

Provide “fresh” updated information with each Advisory versus stating “all is well and nothing has changed”

Infrastructure assessment at sites

Give customers multiple avenues to receive information

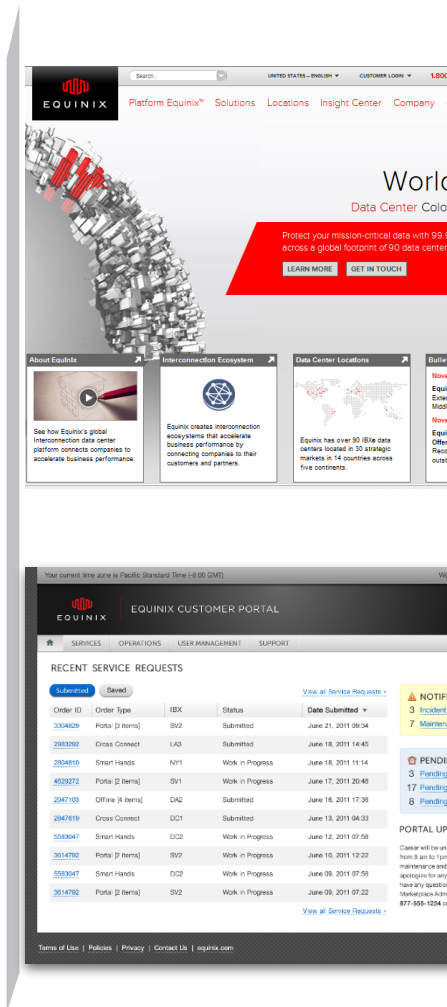
IBX Advisories and Incident Notifications

Equinix Blog

www.equinix.com

Customer Portal

Earlier Executive Communication



Unix Post-Storm Lessons Learned

Engineering is currently conducting an assessment Initial recommendations the following:

NY8 (60 Hudson)

- Additional batteries to increase runtime in event generator/utility down
- N+1 Design – Secure additional space and install new 1MW generator

NY9 (111 8th Avenue)

- Suite 734 – Additional batteries to double capacity, Install a maintenance bypass capability.
- Suite 518 – Replace existing batteries with higher capacity batteries
- Suite 518 and 734 – Replace existing generator with 2MW generator to support both suites. Removes dependency on landlord for primary emergency generator and creates an N+1 environment with the landlord as the backup generator.



Super Storm Sandy: Infrastructure Impacts

Michael Parks

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Communication with Your Teams is Priority One

Take action when there is reasonable probability of a large storm that could adversely affect normal services

Move employees to an unaffected part of the country

- Datapipe moved employees from the New Jersey office to an office in Austin, Texas for the week

Book hotel rooms near facilities so employees could walk to work if transit was impossible

Stock up on supplies in the local facility in case employees have to spend several days there (Food and water become issues as local hotels ran out of food)

Prepare team members in other locations around the world - their shifts might have to be flexible so they could pick up any slack

Softphones keep communication flowing for remote workers
(Global IP based phone system with multiple SIP/PRI trunks)



Communication with Your Teams is Priority One

While preparing a data center for disaster you must think about the employees that run the facility

- The data center has generators, backup power, redundant networking do your employees have the ability to work remotely?
- Your employees have comcast or verizon for access in their homes – usually provided by a single dropwire from the telephone pole
- Your employees homes are usually not N+N
- Our employees were isolated without power, Internet, Cell service, and lastly, no ability to buy gasoline to drive out of their situation.



Site Selection & Generator details

Site Selection

- 10 year plain
- Access to multiple network providers
- Less than 1 mile from major highways
- 100+ hotel rooms within 10 miles
- 250 within walking distance to Data Center

Generator Details

- Fuel for all generators was replenished prior to storm, 72 hours available
- Worked with CAT dealer to perform inspections of all units, test runs
- Sent full fuel trucks from local supplier and place onsite for additional reserves
- Power systems are N+N
- Fully rated dual path from utility to rack



During the Storm

We kept our generators running as utility power showed poor quality and large fluctuations

We had plenty of fuel to spare –no issue

“Unforeseen circumstance occurred”

- Fuel supply tanker company that we rented two trucks from was ordered to service hospitals and government buildings and left our property. The sheer scale of the storm had undermined the plan to have additional fuel supply onsite as delivery suppliers were not keeping up with demand.

A hole in our plan was discovered.

We worked closely with our major accounts contact at the local utility. We were told NOT to return to the grid until they could get the grid stable. Transformers were still exploding due to shorted lines.



Flooded infrastructure

We learned that the New York harbor fuel delivery docks were destroyed during the storm and would require major repairs

We starting looking for out of state fuel delivery options but were told all trucks where already under contract with other customers.

Plan “B” was quickly pulled together. We searched the Internet for fuel truck suppliers and found one in Texas who had several. Dealer offered to fill the tanker and drive the truck up to us and deliver it to the data center property.



Fuel Truck



el truck is a aircraft fueler/defuel. This allowed us to move fuel between
tape owned Data centers as needed.

Currently working local fuel providers to setup wholesale contract to become
our own fuel supplier.

DATAPIF



Superstorm Sandy: Infrastructure Impacts



DuPont Fabros Technology

ed by:
Davis | EVP Data Center Operations
t Fabros Technology

Superstorm Sandy: Pre-Storm

Overview / NJ1:

Wholesale colocation with 7
sites in VA and 1 site in
Scataway, NJ

5 sites delivered uninterrupted
service through the event

Pre-Storm Activities:

Review Weather Checklist

Commence communications
with Clients



DuPont Fabros Te

Superstorm Sandy: Onset of the Storm

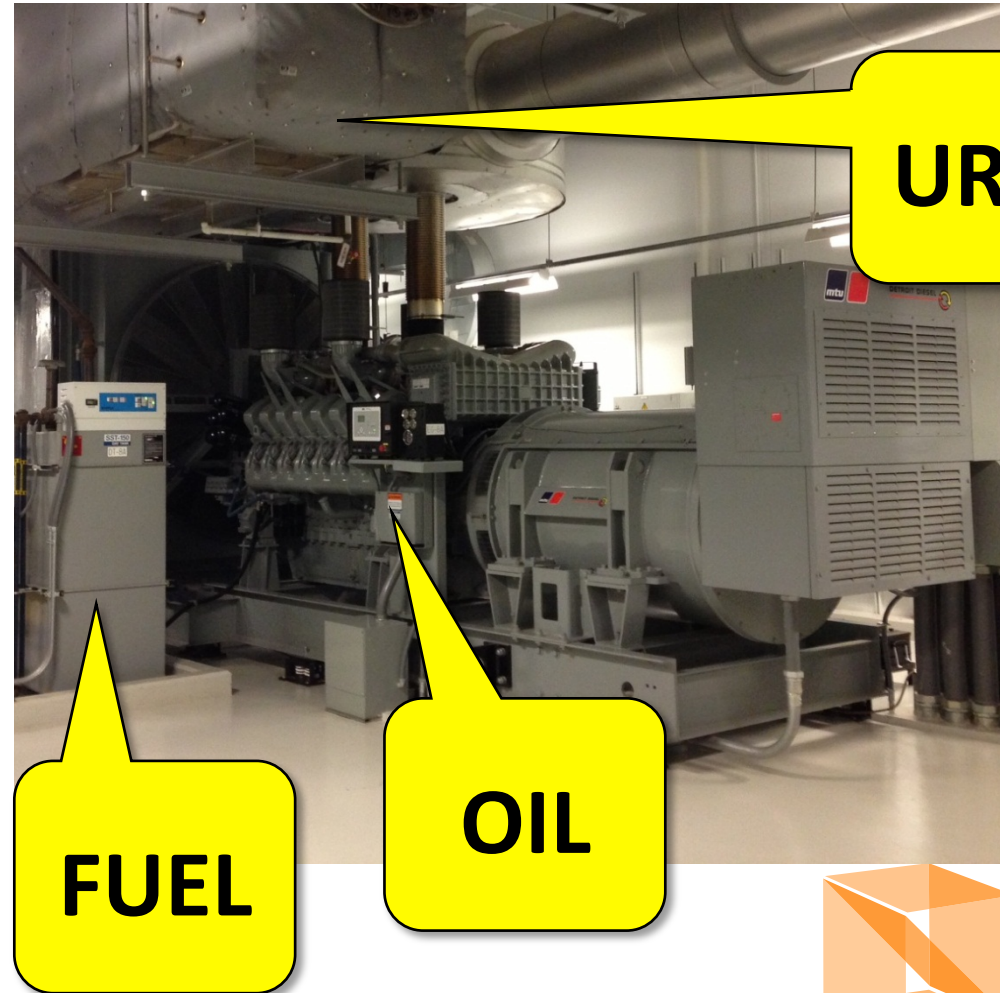
going periodic Client Communications
personnel sheltered on site

1 sees 2 brief utility outages and loses
e side of 69kV loop

eventually losing second side of loop and
stains 100+ hour outage

el consumption is obvious. Oil and Urea
(where applicable) may not be

NJ1 replenished over 200 gallons of
motor oil



Superstorm Sandy: Managing the Event

Risk of running lightly loaded EG's

- Rotation of LB to each unit for an hour

Lost 1 EG during the run (ECU Comms Failure) – Off for ~10 minutes – Reset

Scarcity of Gasoline for Vehicles

Fuel Sources:

- Implemented out of state resources
- Delivery to one tank and draw from the other – polish the delivery



Superstorm Sandy: Lessons Learned

Frequent periodic communication on Status of Event

Gasoline Supply / Resource

Personal Affects (soaps, towels, etc)

Community outreach – aiding others to get fuel

- PSE&G Communications – Offer to use our facilities & amenities

Nearby hotels (unless walking distance) may not be a viable option

Motor Oil supply in house (increase)

Fuel supplies on site (increase)

Table top exercises with your fuel supplier

Backup up radio system was critical with failing cell services



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