Always On: HP Supply Chain Risk Management Processes & Analytics

HP Business Continuity Planning
September 2018

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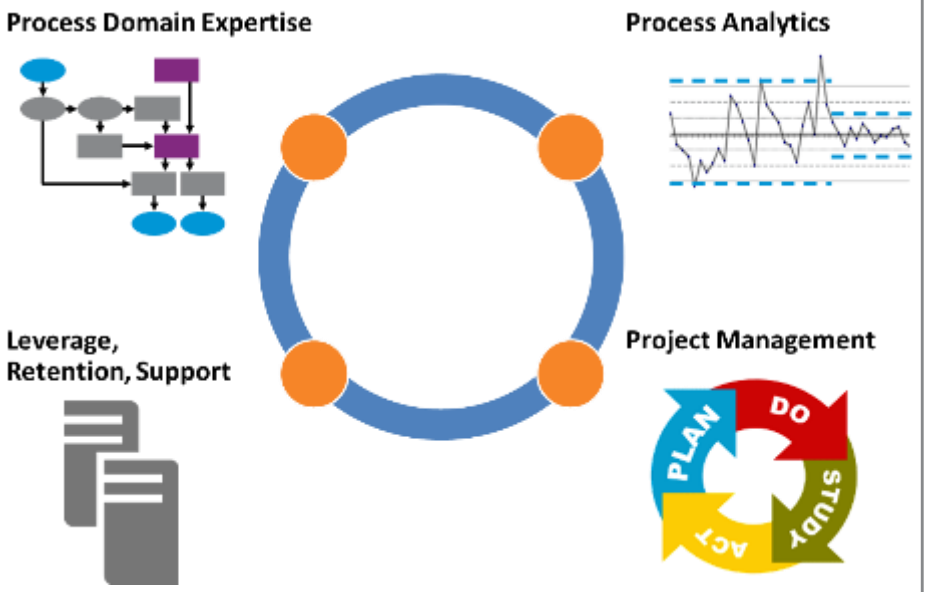
Collaborating To Create Value For HP

Business Continuity Planning Team

Process Engineering Team



We Are Where You Are

110

Manufacturing Sites

145

Distribution Centers

Print & PC leadership

HP's Commercial PCs
rank #1 or #2
in 44 of the top 48 countries

HP ships 1.7 PCs
every second

HP's Printing
ranks #1 or #2
in 51 of the top 55 countries (ink + laser)

HP ships 1 printer
every second

Powering **430**
of the Global Fortune 500 companies

Supply Chain Operations

Never break the chain

HP Business Continuity Roadmap

SC Visualization Program

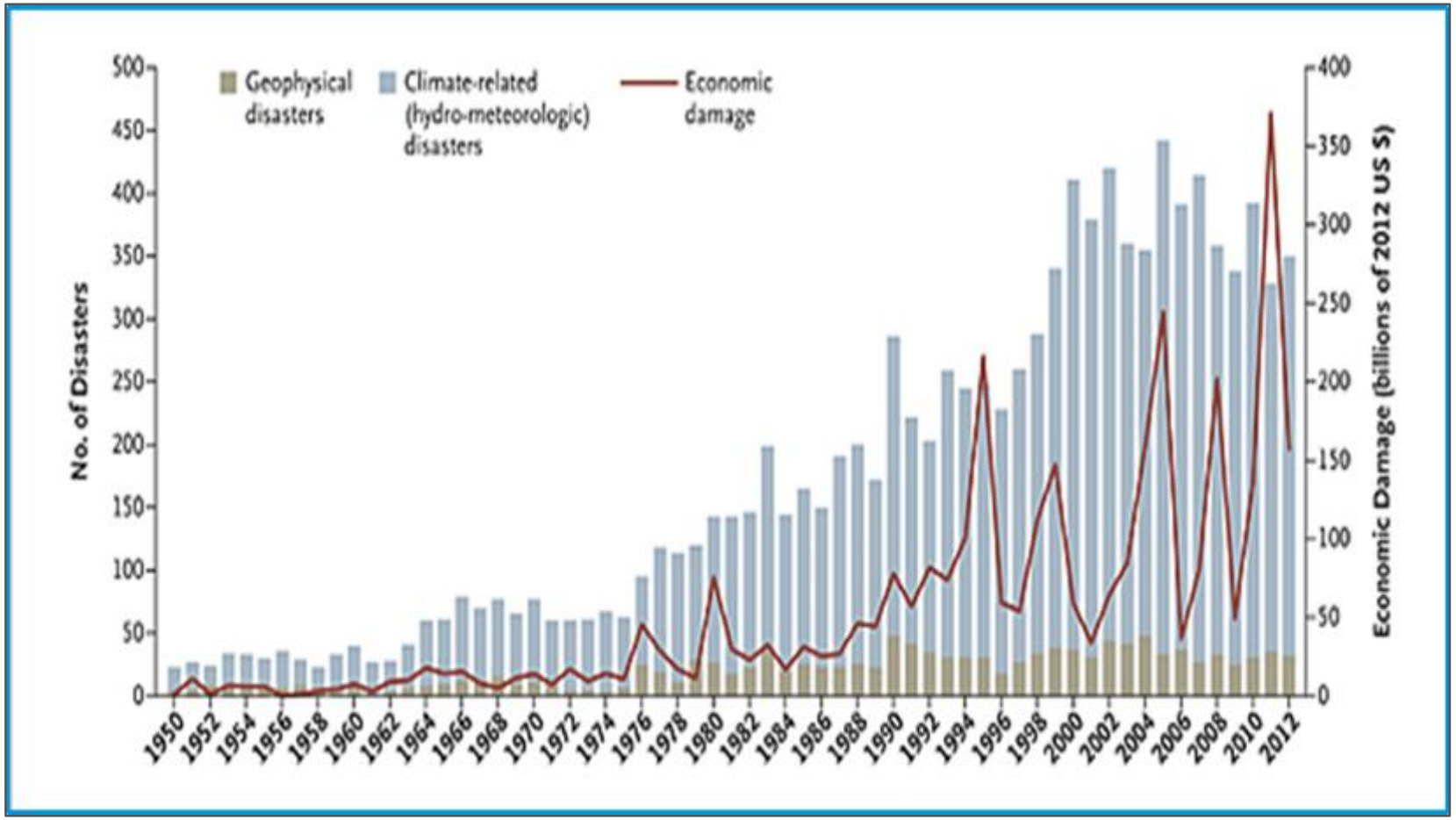
Why did we start this journey?

Situation

- Global SC disruptions are on the rise
- We continue to consolidate & run a leaner supply chain
- Regional concentration
- These facts lead to increased probability & impact of SC Disruptions in the future

Solution

- Centralized SC node database with graphing & visualization
- Real time visibility of disruptions and potential impacts



* Source: "Steady Increase in Climate Related Natural Disasters" November 15, 2013

HP Business Continuity Planning (BCP) Roadmap

Centralize & Visualize

- Develop common node database
- Develop common global processes
- Develop capability to visualization nodes

Awareness & Response

- Develop threat alert architecture and processing
- Overlay threat alerts onto visualization interface
- Enable rapid organizational response & resolution

Predict & Prevent

- Utilize predictive analytics to characterize network impact
- Develop risk assessment scorecard & processes
- Integrate BCP intelligence into supply design

Supply Chain Operations

Never break the chain

Conclusions

Concluding Thoughts On Business Continuity Planning

- BCP is a process discipline
- Often neglected/off radar until things break
- Three step maturity model is benefiting HP
- Increasingly important for new business deals

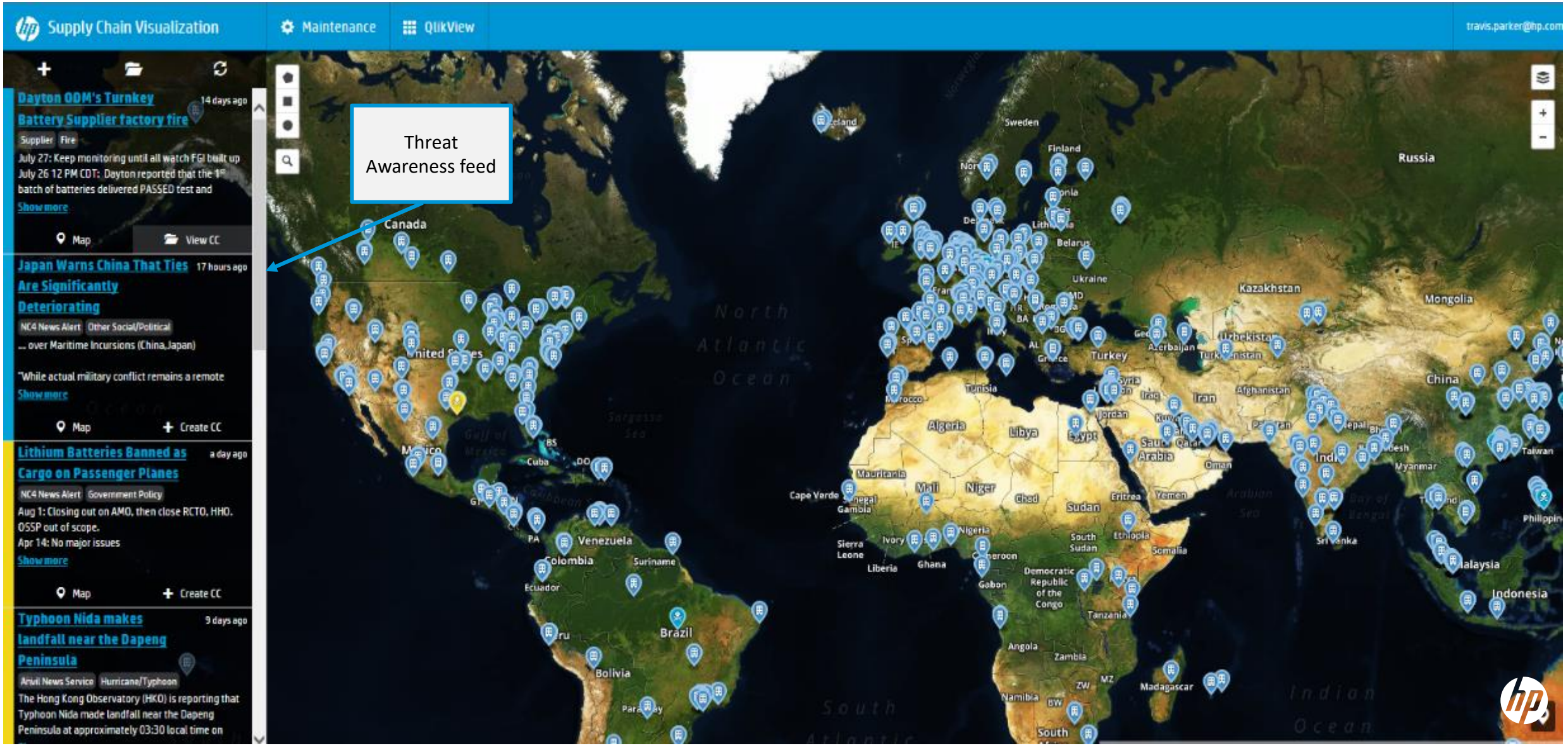
Supply Chain Operations

Never break the chain

Supply Chain Awareness & Response

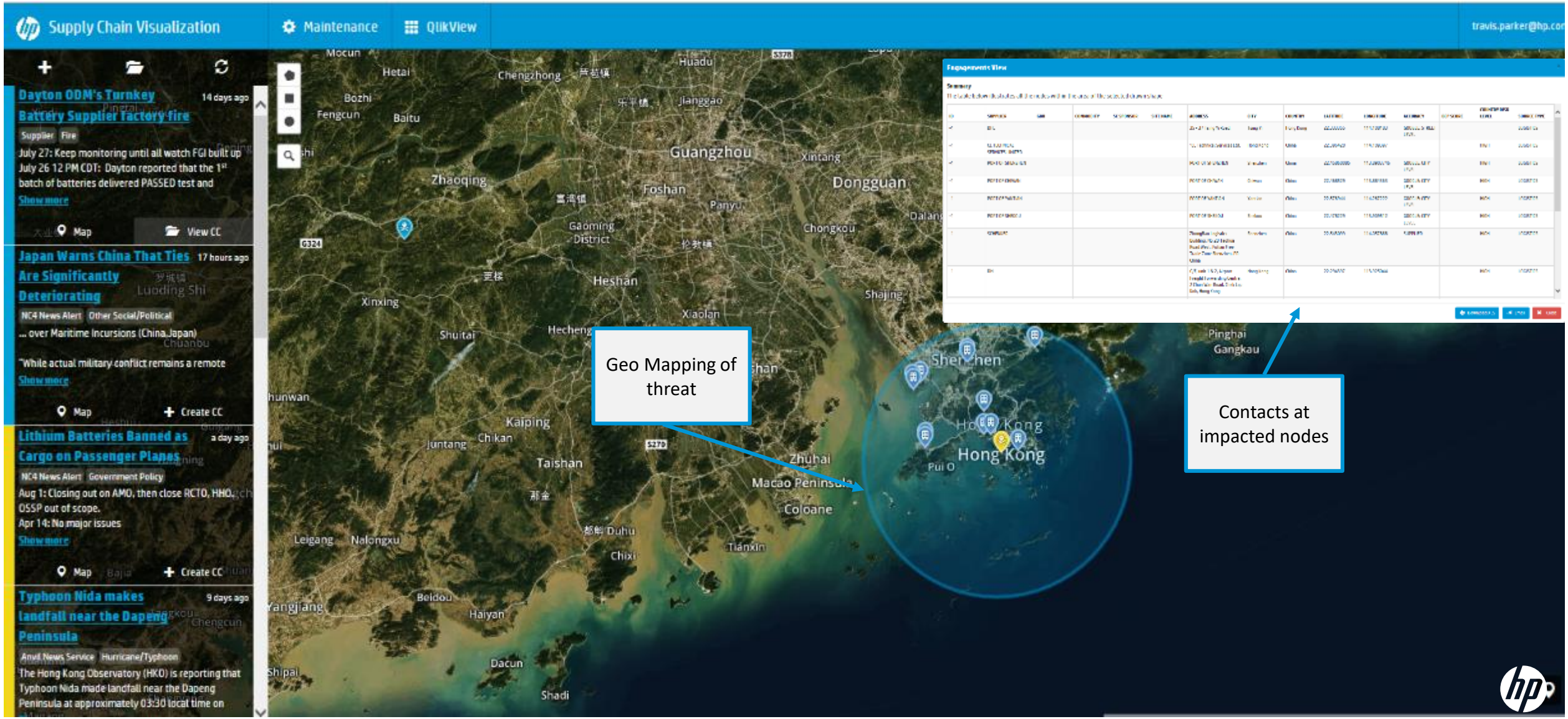
Visualizing Global Risks In A Single Interface

Enabling Advanced Awareness & Rapid Respond



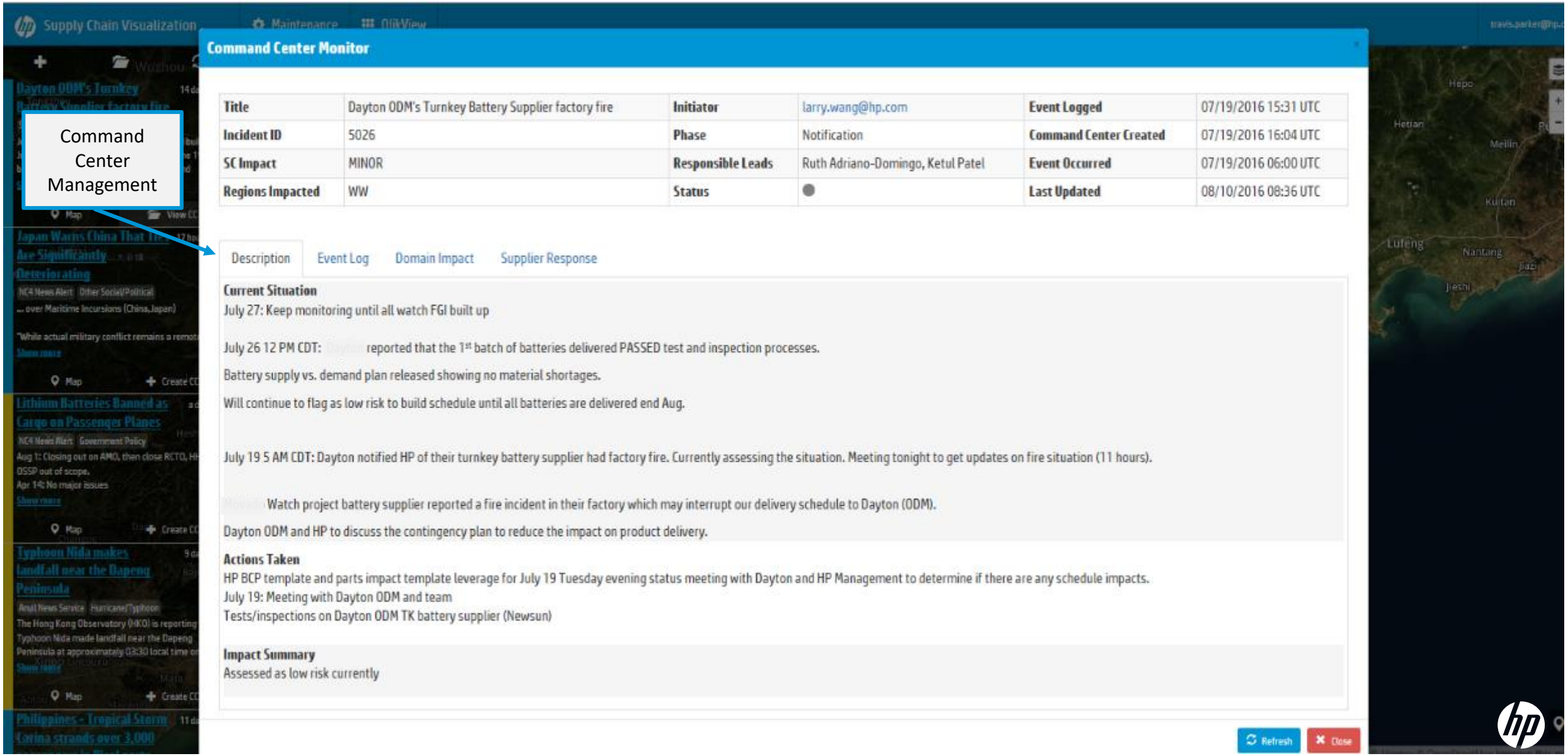
Rapid Escalation And Mobilization

Enabling Advanced Awareness & Rapid Respond



Coordinating Actions To Ensure Rapid Resolution

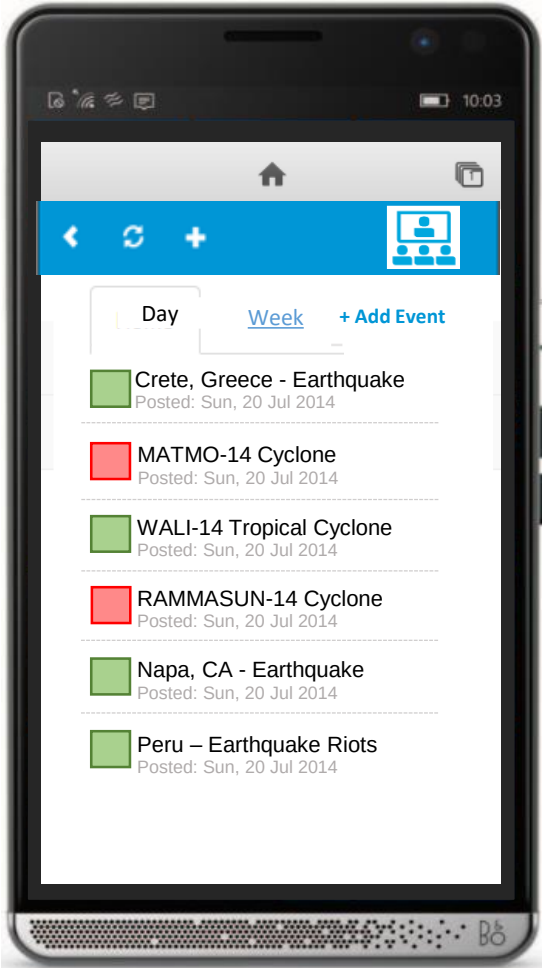
Enabling Advanced Awareness & Rapid Respond



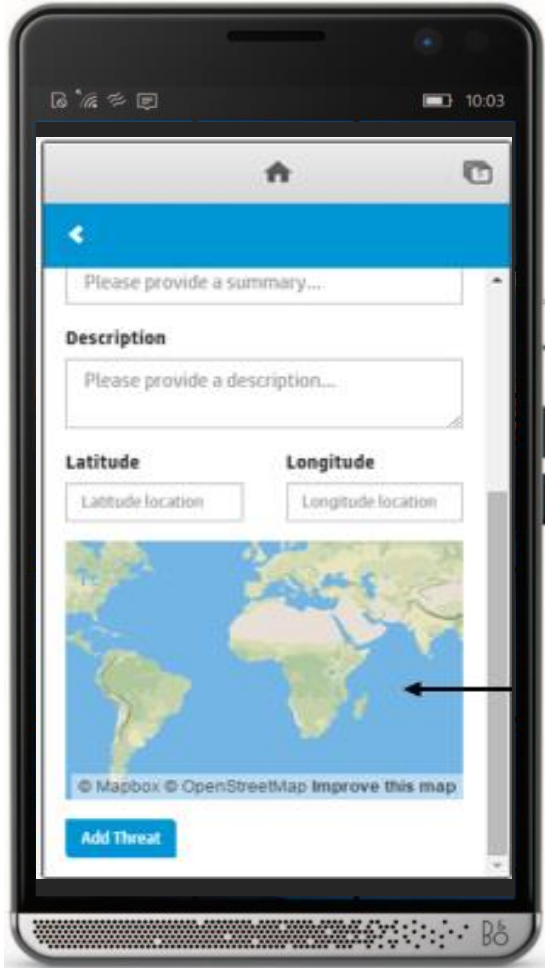
Mobile App Enabling Response Optimization

Enabling Advanced Awareness & Rapid Respond

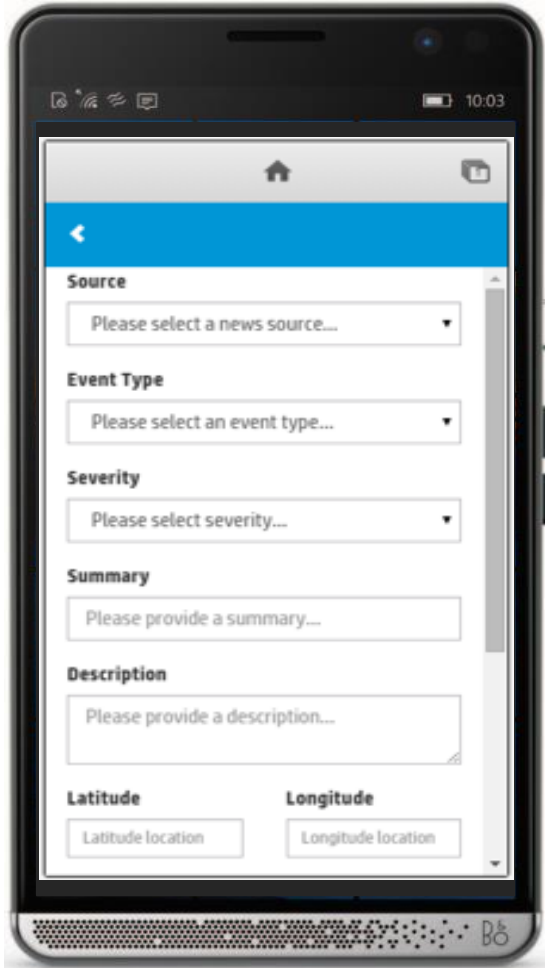
Monitor Threat Status



Add or Update threats

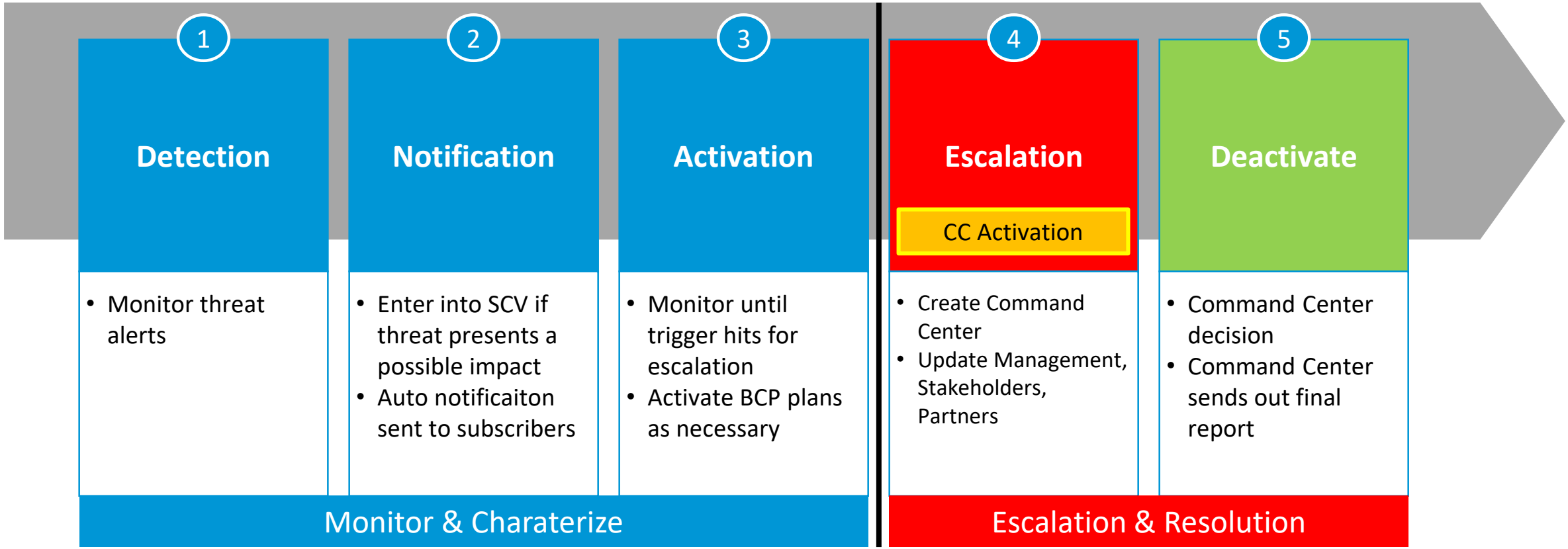


Manage communications



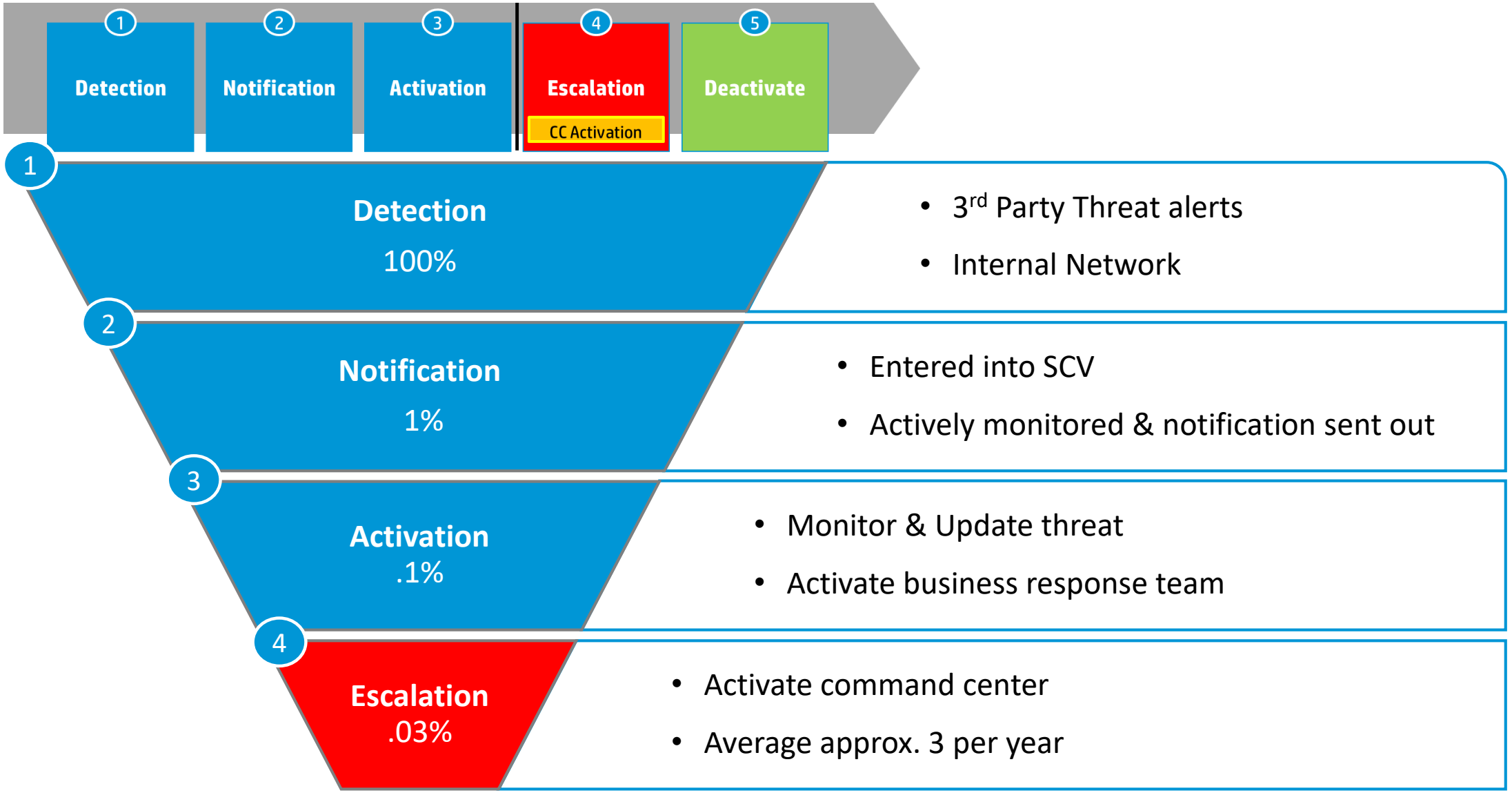
Defined Process Steps Drive System Effectiveness

Alert management phases



Not Every Alert Is A Concern To Business Continuity

Threat funnel narrows global issues down to critical network focuses for HP

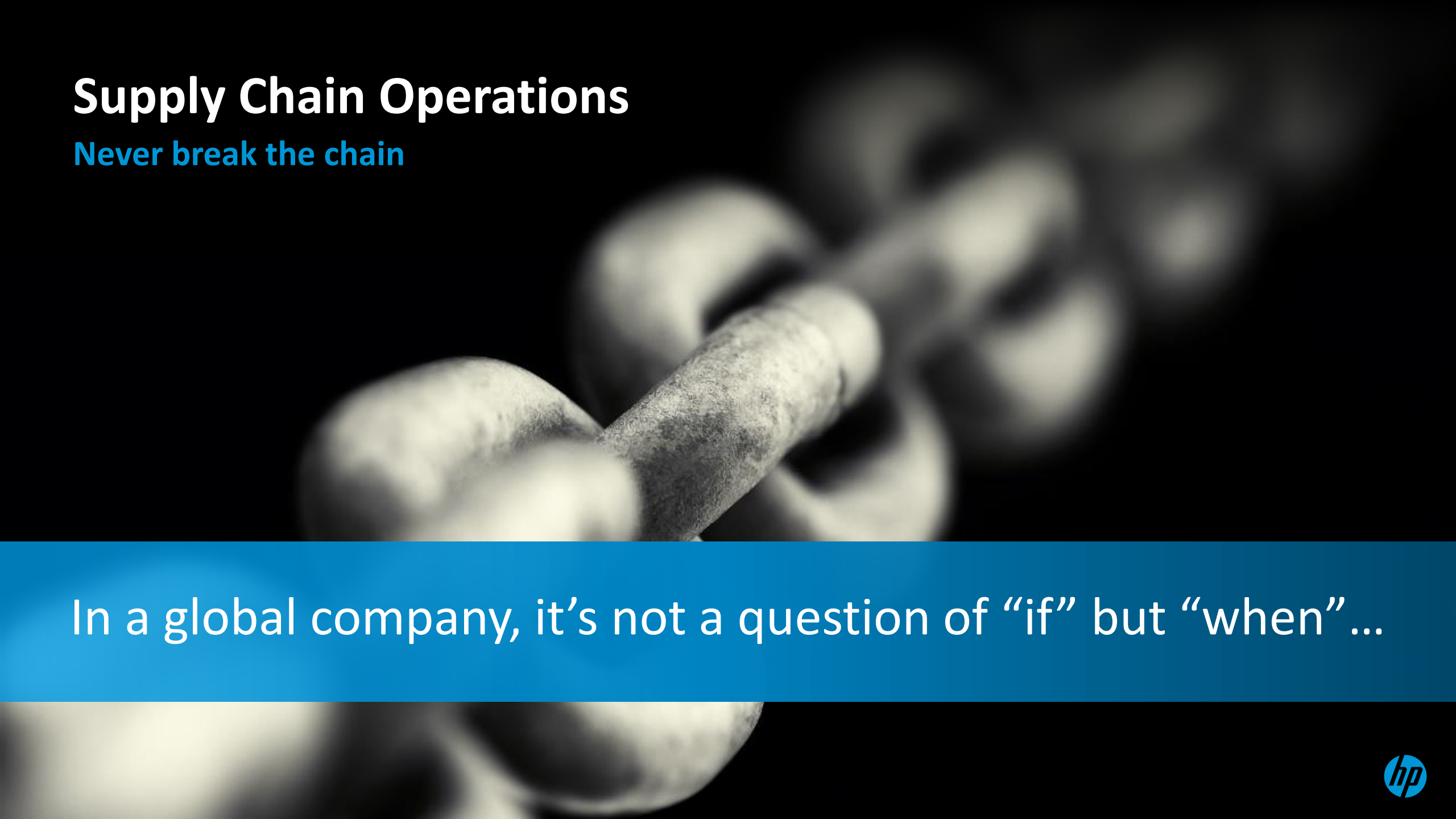


Speed Is Critical In Protecting Our Supply Chain

Significant improvements in our threat characterization cycle

Supply Chain Operations

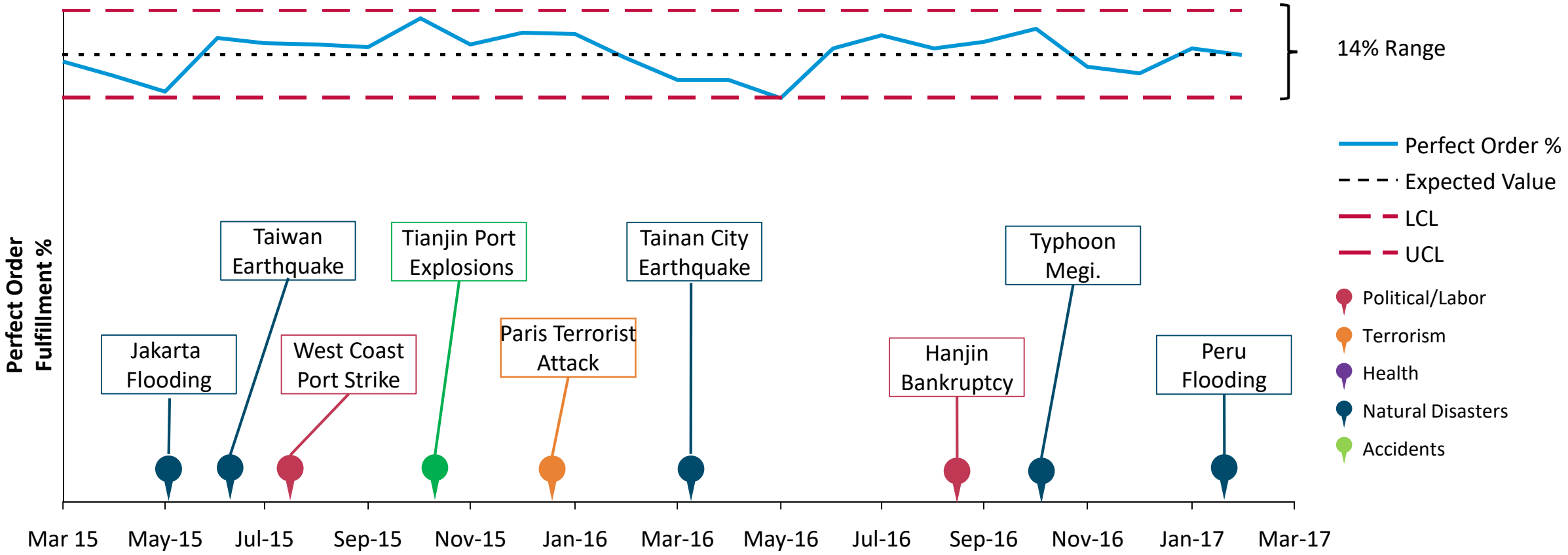
Never break the chain



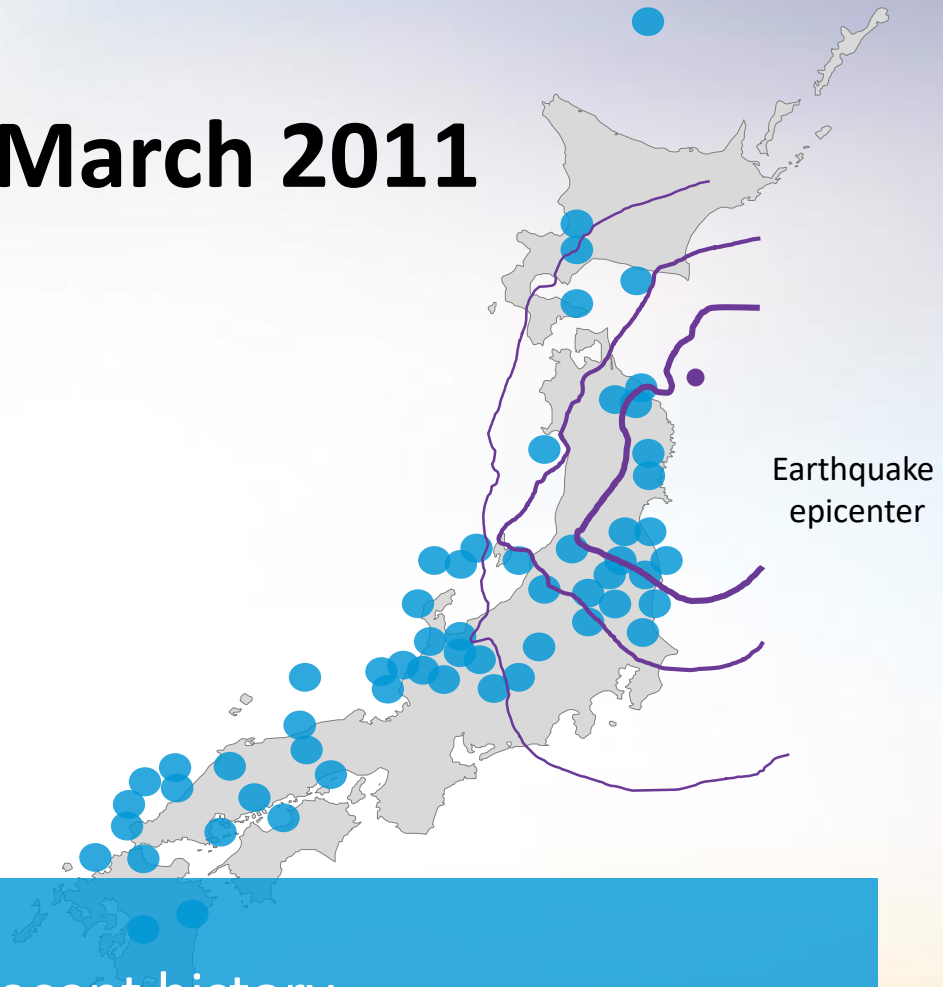
In a global company, it’s not a question of “if” but “when”…

Global Events ≠ HP Network Disruptions

BCP Processes & Capabilities Ensure Customer Commitments are fulfilled



Japan Earthquake and Tsunami – March 2011



Largest earthquake in Japan's recent history

Deadly tsunami
and power grid failures

Infrastructure damage
including roads, rail and sea

How We Responded

Immediately

Immediate engagement between HP Operations, Suppliers, and Procurement via SCV

Laser focus on high risk suppliers and components

Immediate pull from Inventory

Daily calls with all at-risk suppliers

90 mins after earthquake

Short/Mid-Term

Executed on alternative supply options

Identified and implemented qualification plans for additional suppliers, similar components

Implemented risk purchases pending qualification

24 hours to one week

Long Term

Evaluating possible changes to circuit design

1. BCP

Established watch list, plan for high risk suppliers and materials

Rebalanced requirements and purchase orders with manufacturing partners

One week later

35 Days

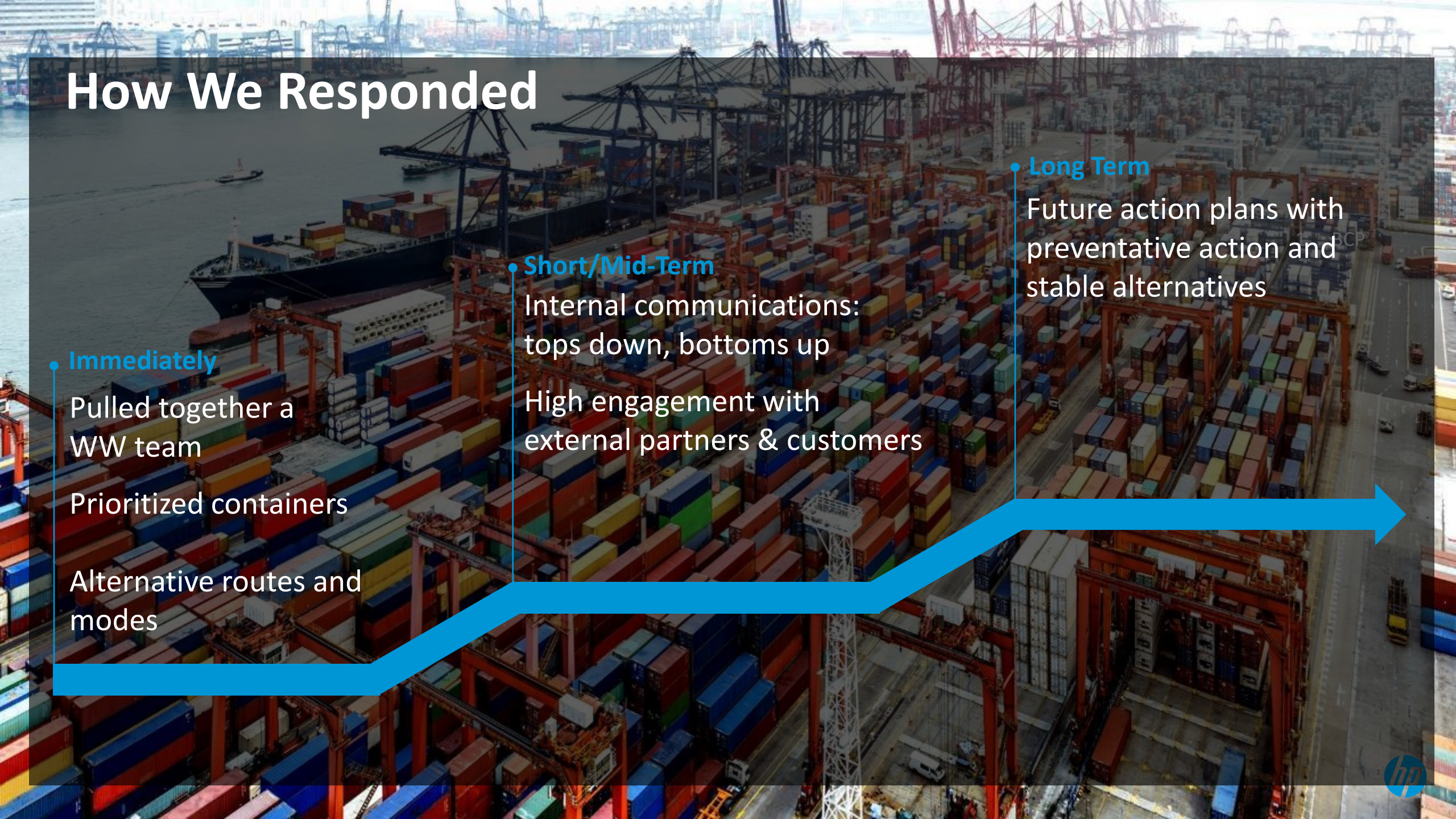
AMS West Coast Port Strike – January 2015

29 ports threatened by potential labor strike

70% of APJ imports
enter from effected area

44% of all containers
to the U.S. enter from West Coast ports

How We Responded



Immediately

Pulled together a WW team

Prioritized containers

Alternative routes and modes

Short/Mid-Term

Internal communications: tops down, bottoms up

High engagement with external partners & customers

Long Term

Future action plans with preventative action and stable alternatives

Supply Chain Operations

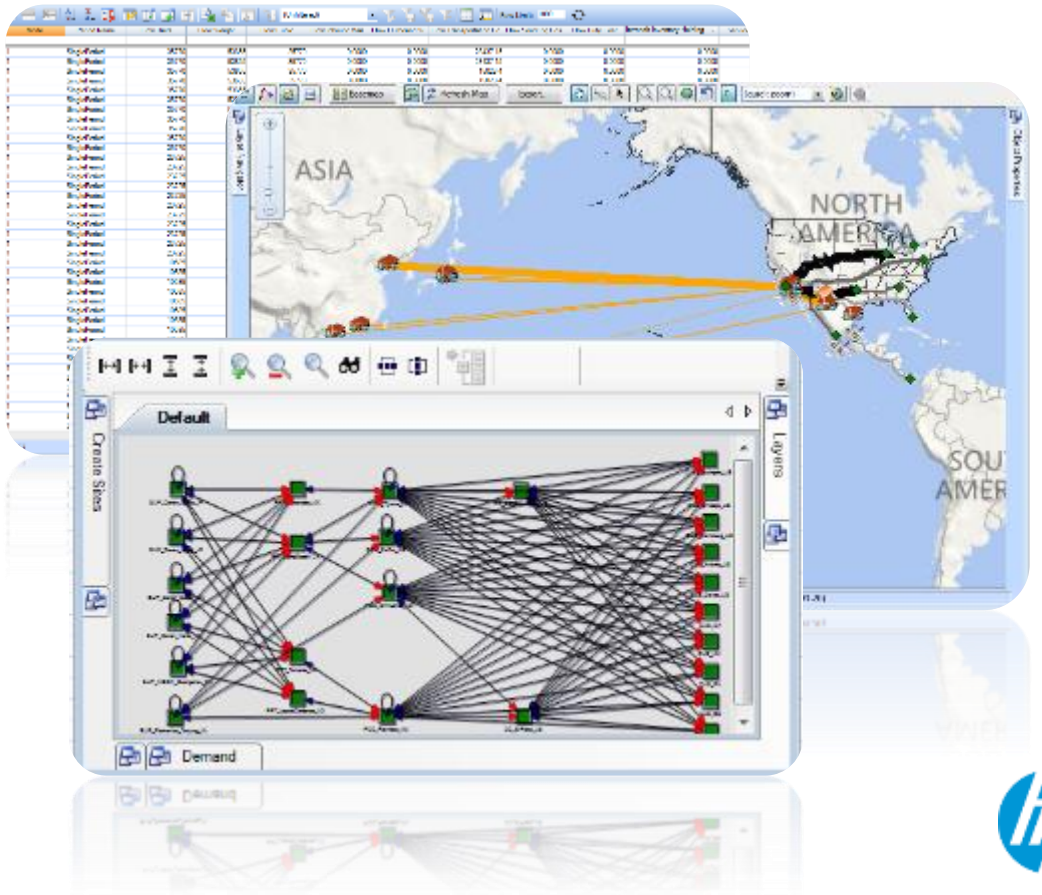
Never break the chain

Predictive Analytics Overview

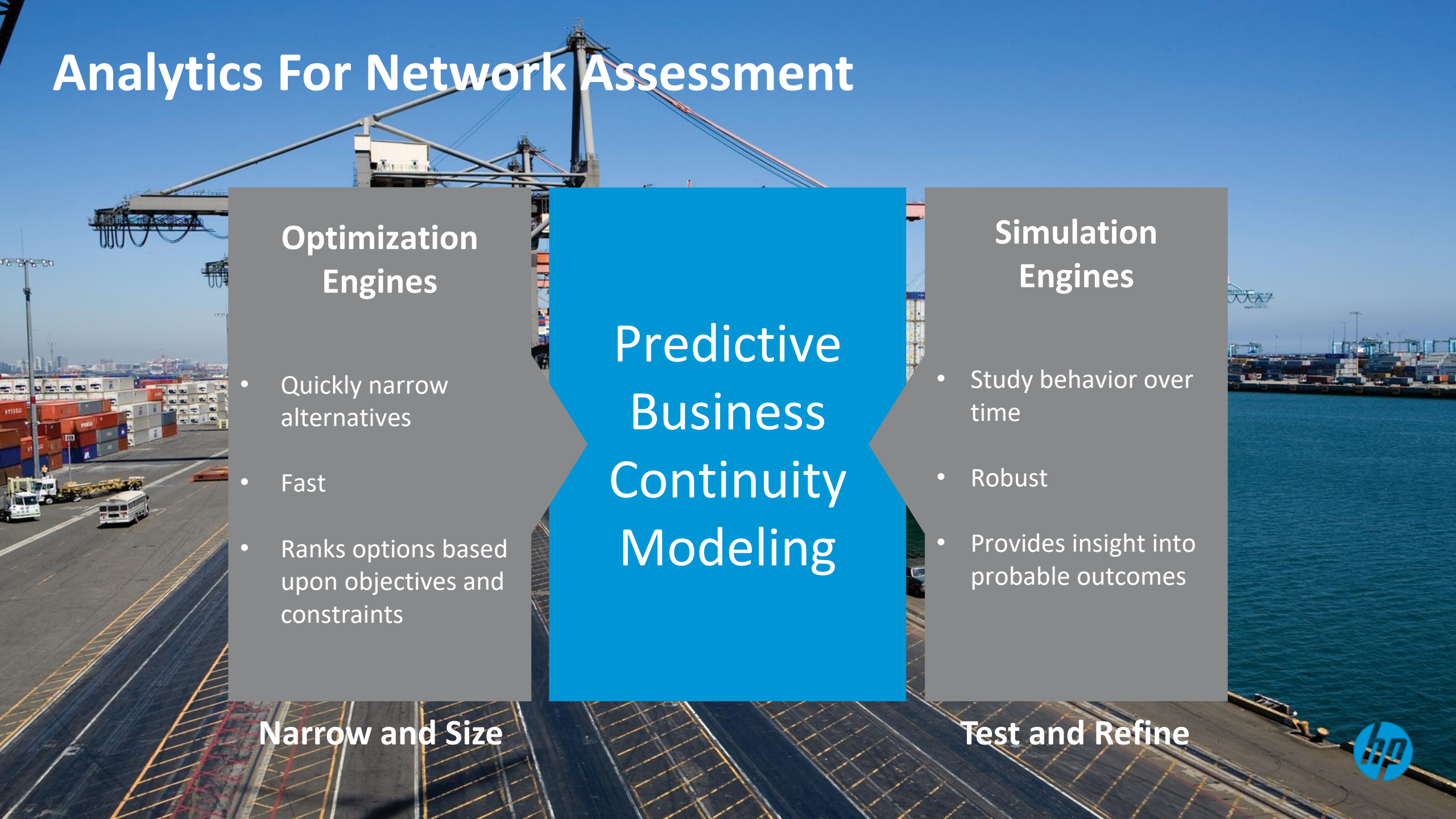
From Mobilization To Characterization

From event visualization and awareness…

… to network impact assessment and decision support.



Analytics For Network Assessment



Optimization Engines

- Quickly narrow alternatives
- Fast
- Ranks options based upon objectives and constraints

Predictive Business Continuity Modeling

Simulation Engines

- Study behavior over time
- Robust
- Provides insight into probable outcomes

Narrow and Size

Test and Refine

A Case Example Of Predictive Risk Modeling

Deploying Predictive Capabilities

IATA

Lithium Batteries as Cargo in 2016 Update III

Additional Changes for Lithium Ion Batteries

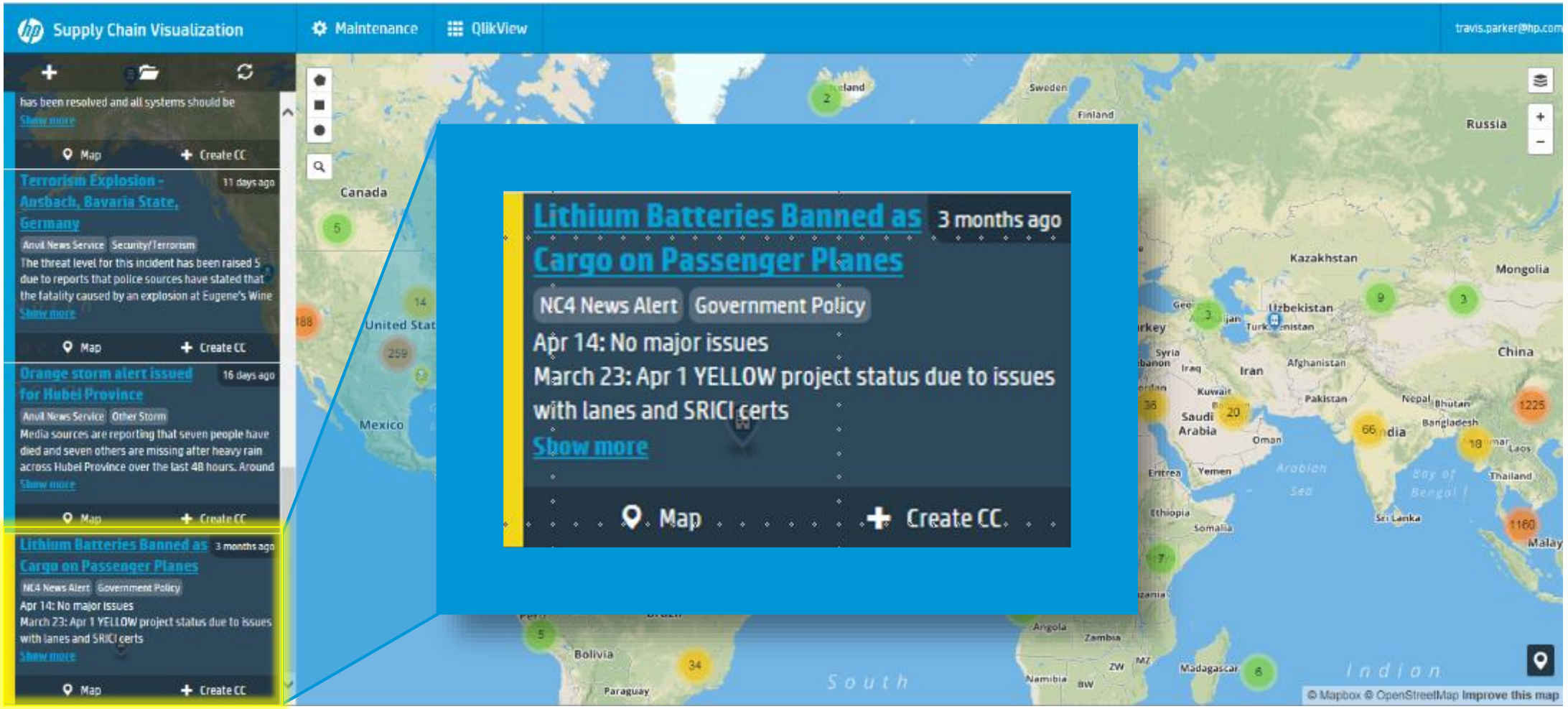
On 22 February the ICAO Council adopted the ... Commission (ANC) that lithium ion batteries, UN 3480, ...acking Instruction 965 only, b... forbidden, on an interim basis, as cargo on passenger aircraft. The prohibition does not apply to lithium ion batteries packed with equipment or lithium ion batteries contained in equipment, UN 3481, Packing Instruction 966 and Packing...

The prohibition becomes effective 1 April 2016, as applie... ion batteries, UN 3480, PI 965, to be shipped at a state o...

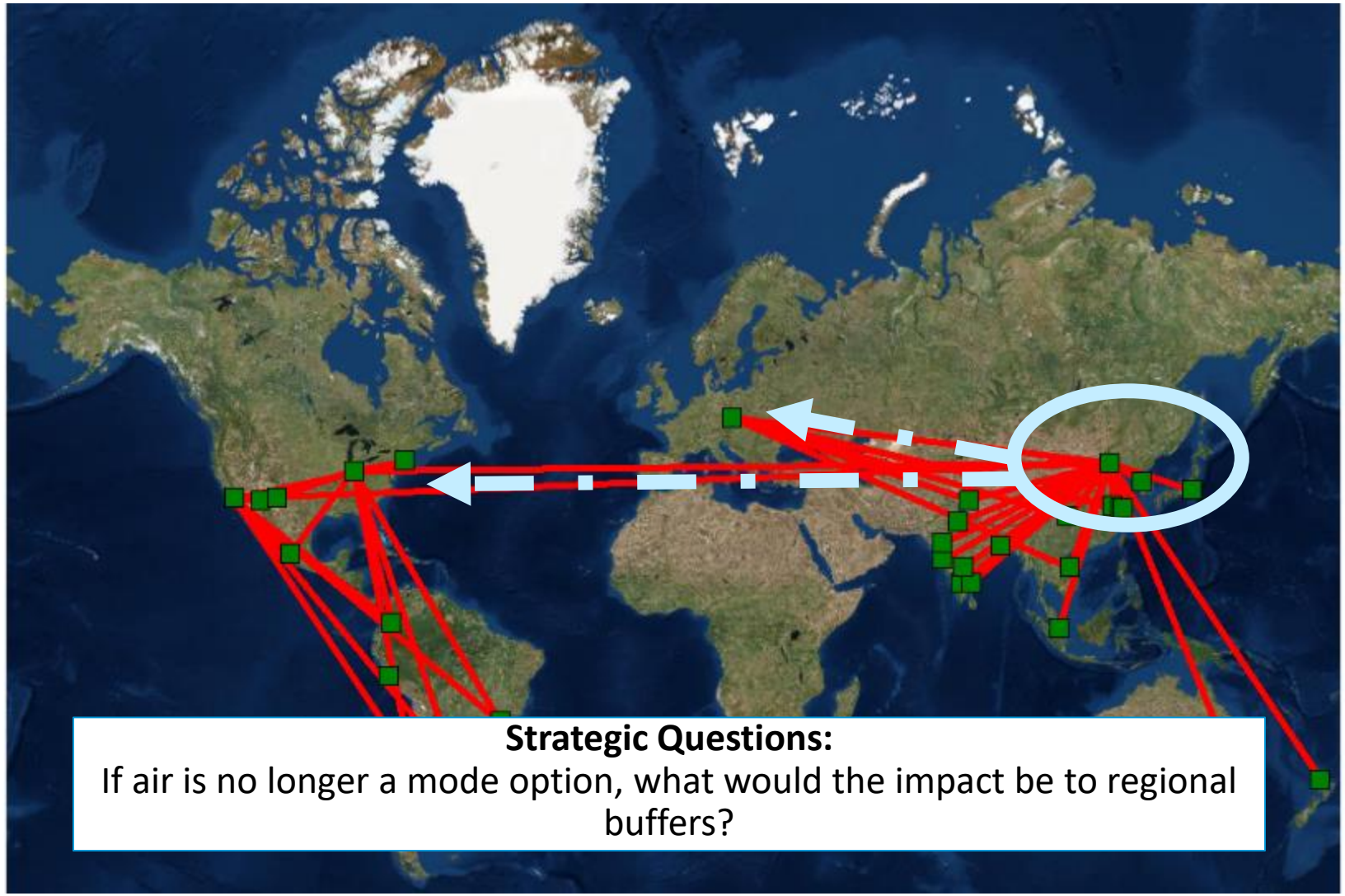
April 1st, 2016

- **Passenger aircraft ban for lithium ion batteries:** All international shipments of lithium batteries without equipment are prohibited as cargo on passenger aircraft. (ICAO indicates this is a temporary measure until controls are in place to mitigate transport risks to an acceptable level.) This limitation does not affect lithium ion batteries packed with or contained in equipment. All shipments of lithium ion batteries outside equipment must now carry a Cargo Aircraft Label (pictured above).
- **State of charge limits:** A 30 percent state of charge (SOC) limit on lithium-ion cells and batteries, including Section II cells and batteries, will now apply. This does not apply to batteries packed with or contained in equipment.
- **Restrictions on package quantity:** A shipper is not allowed to offer more than one Section II package (batteries only) per air consignment.
- **Restrictions on overpacks:** Overpacks may contain no more than one Section II package (batteries only) – 8 cells or 2 batteries.
- **Battery package separation:** A shipper must offer lithium battery shipments (batteries only) separately from other cargo.

Threat Alert Mobilizes Organization To Action



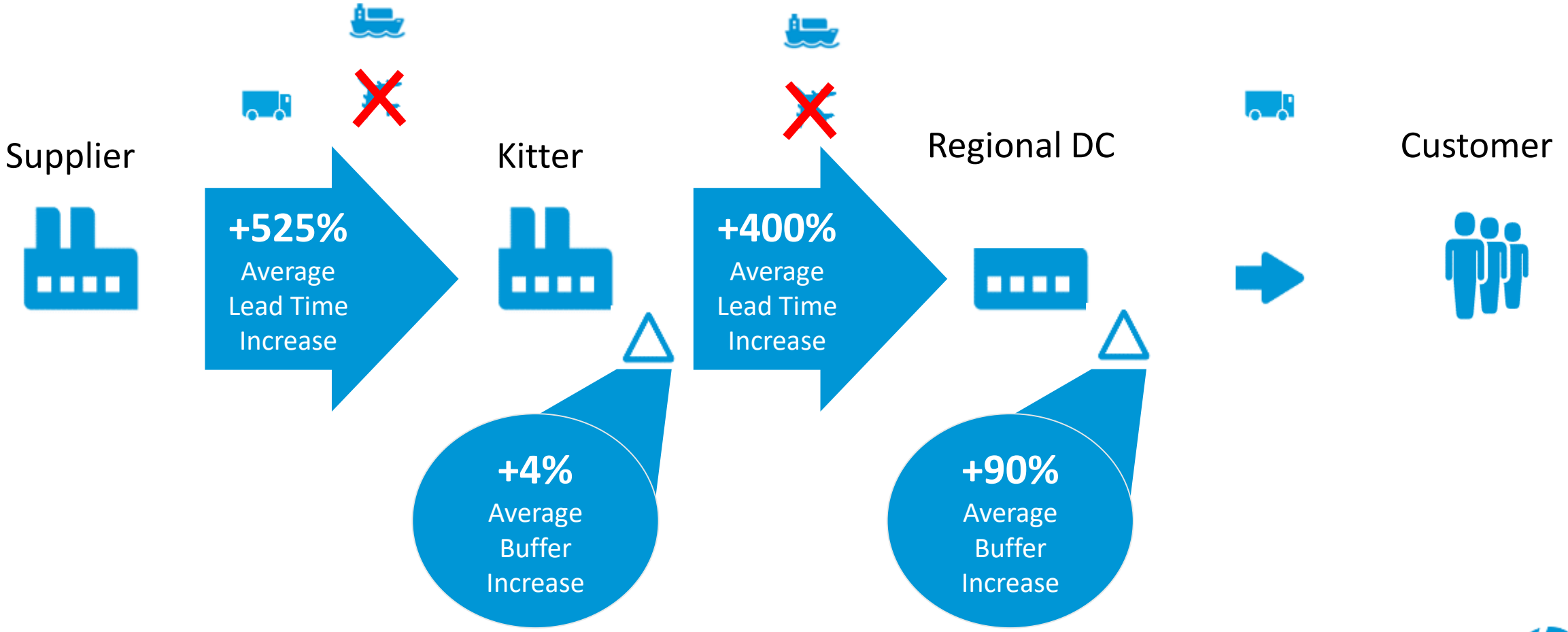
Characterizing Issue Impact On A System



One of four HP business networks that would be impacted by battery freight restrictions.

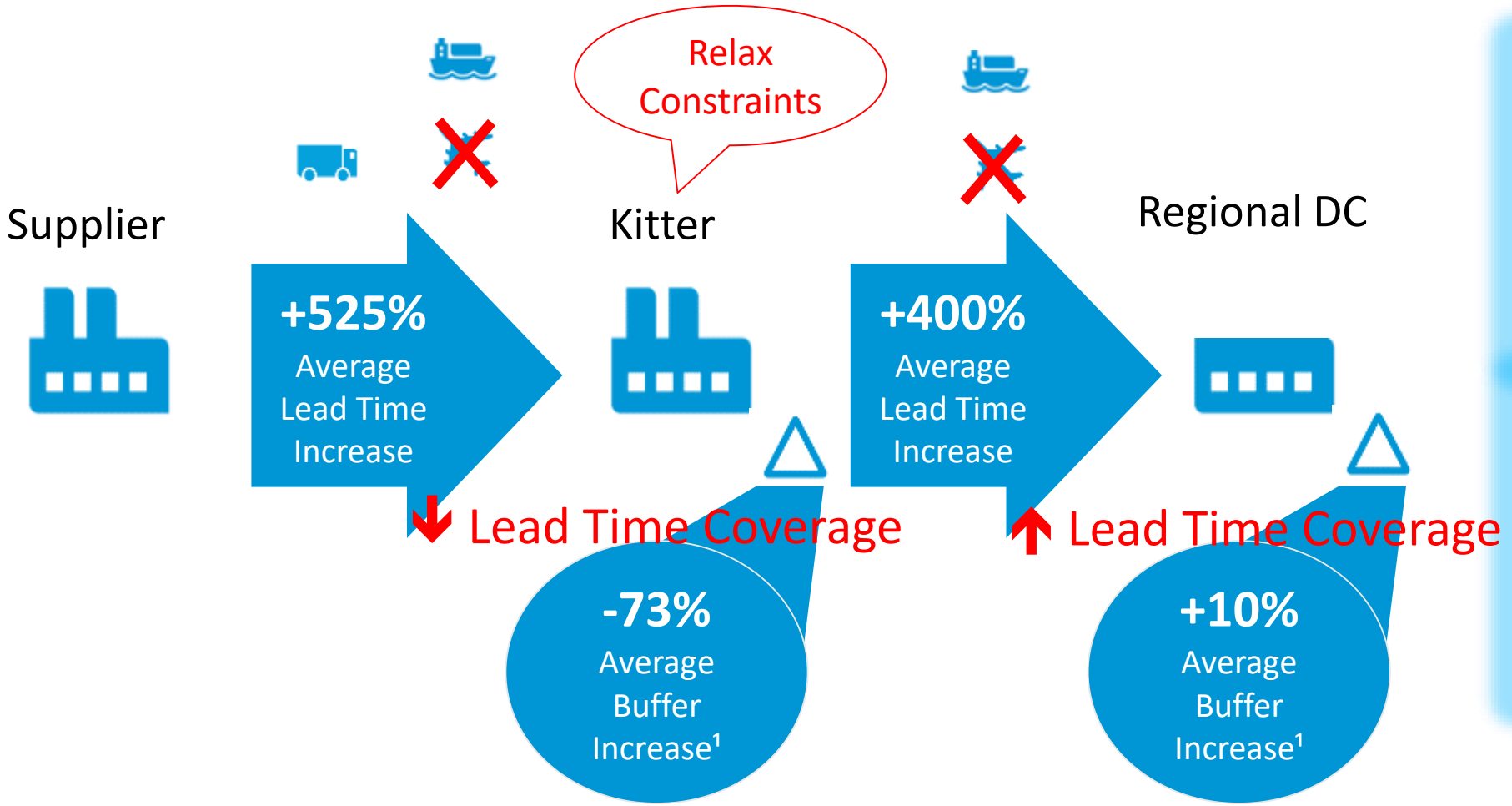
Modeling Step 1: Evaluate The Impact

What Does Losing Air Transit Modes Mean To Inventory Performance



Modeling Step 2: Mitigate The Risk

Predictive Modeling Tools Help Create Better Solutions For Disruptive Events



-30%

Reduction in system buffer units versus basic No Air scenario

-13%

Reduction in system buffer units versus Baseline scenario

[1]Compared to no-air scenario with kitter constrained to offer immediate availability.

Tuning Modeling Capabilities For Risk Management

Immediate Play Forward (Crisis Management)	Design Network (Strategic)
• "What is immediate system impact?" • Critical Success Factor: Time to insight	• "How do we minimize risk now and in the future?" • Critical Success Factor: Scenario characterization

Poke Yoka: Detection Solutions

Poke Yoka: Prevention Solutions

HP Development Focuses For Predictive Modeling

- Replace projects with online models
- Develop data architecture to support rapid analysis
- Risk assessments drive scenario development

Supply Chain Operations

Never break the chain

Working Ahead – Preventative BCP

Pilot Risk Assessment Categories

BCP Score Card

- BCP Maturity score
- Single source
- Time to interrupt
- Time to recovery
- Revenue at risk
- Legal & Regulatory
- Geo political
- Recent trend of threats
- Financial & organizational stability