



# Weather and Aviation: Big Data to Operational Insights

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Aviation Operations Leader

Aviation



Ground  
Transportation



Media &  
Entertainment



Insurance



Financial  
Services



Government

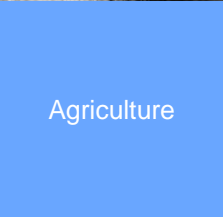


Oil & Gas



Utilities

Agriculture



Retail



# Weather impacts every business on the planet

# *Weather impacts every aspect of an airline business*



## **Deliver Exceptional Passenger Experience**

As airlines look to consolidate channels and deepen client engagement, timely weather insights can ensure a smooth a journey and frequent positive engagement.



## **Expand & Diversify Revenue Streams**

From travel inspiration to ancillary revenues, weather is a signal offering unique insights to target inventory and offers at the right place and time.



## **Increase Operational Efficiency & Asset Utilization**

Weather certainty and relevance builds confidence in flight plans and IRROP playbooks to reduce unnecessary costs, optimize staff, and recover fast.



## **Ensure Safety & Compliance**

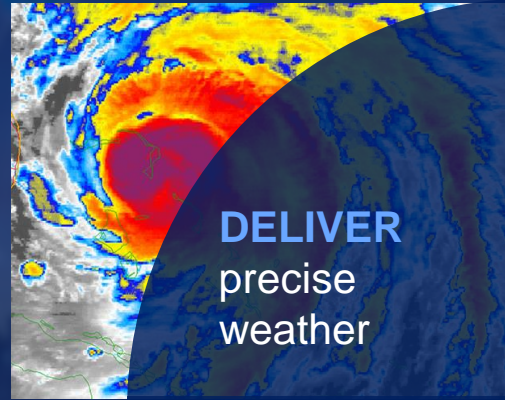
Timely and precise weather alerts reduce injuries, unplanned maintenance and protect assets.



# We are a decisions PLATFORM

Transforming Weather into Better Business Outcomes

<b>Solutions</b> <i>Optimize</i>	
<b>Analysis</b> <i>Insights</i>	
<b>Data</b> <i>Process</i>	
<b>IoT</b> <i>Connect</i>	
<b>Cloud</b> <i>Empower</i>	



# IT STARTS WITH MORE DATA



# EMPOWERED BY UNRIVALED SCALE

Sources: QlikSense internal report, April 2017; The Weather Company internal data

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**45B**  
daily forecast  
calls

**11ms**  
latency

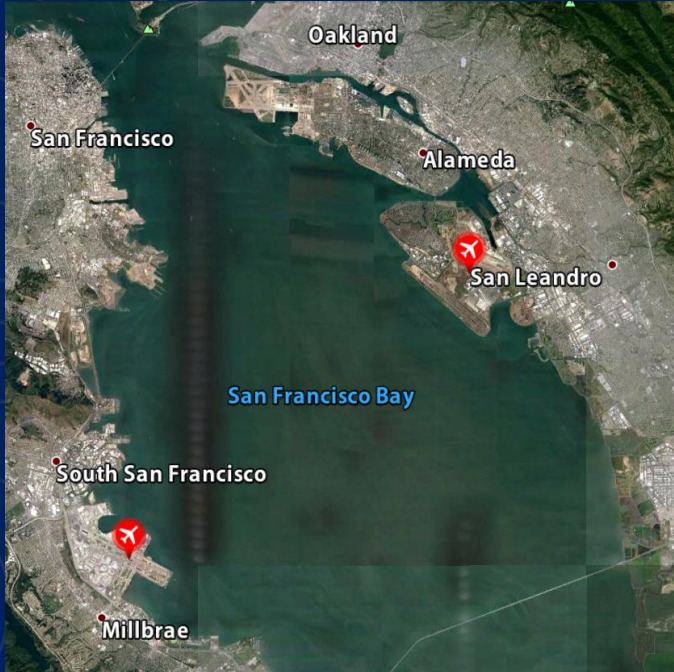
**2.2B**  
locations  
mapped every  
15 minutes

**400TB**  
data processed  
every day

**Petabytes**  
historical archive

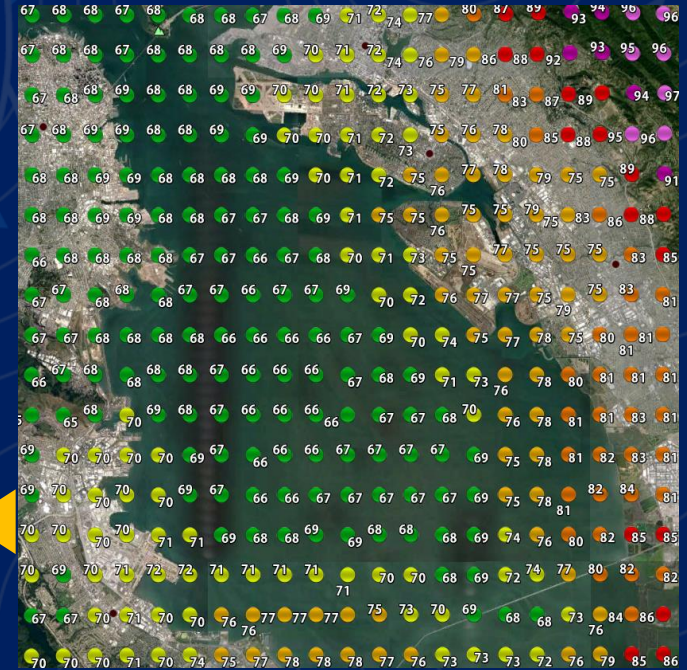
The  
Weather  
Company  
An IBM Business

# The Power of PRECISION



Most weather data is based on airport observations

We deliver 100x more points to capture local differences in conditions





# Next-gen weather prediction:

Model for Prediction Across Scales (MPAS)

## Driven by IoT data including:

- 20M barometric pressure sensors on mobile phones
- Temperature and wind data from commercial aircraft, radars, satellites, and ground observations

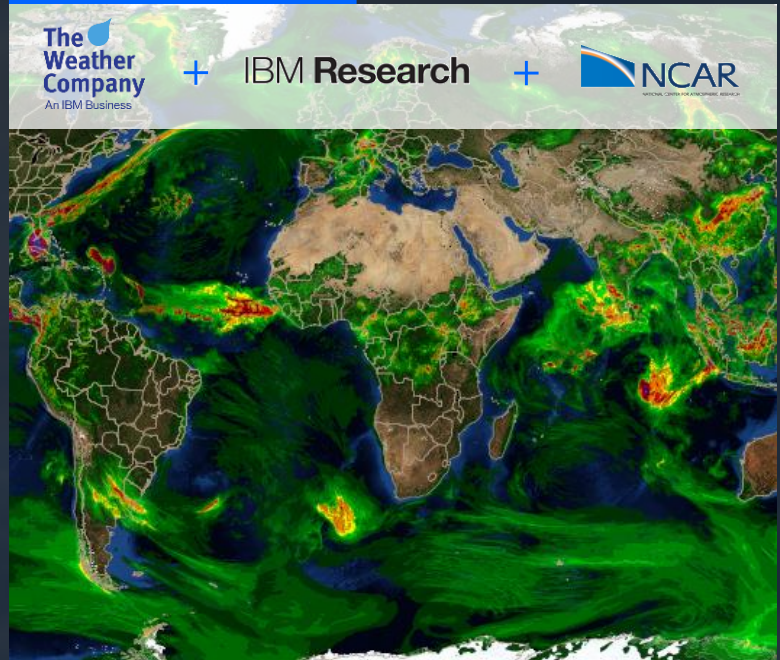
## Powered by:

- High-utilization purpose-built IBM super computers
- Utilizes parallel processing

## Resulting in:

- 3X-5X resolution and frequency improvement in global forecasting
- Ability to resolve individual thunderstorms

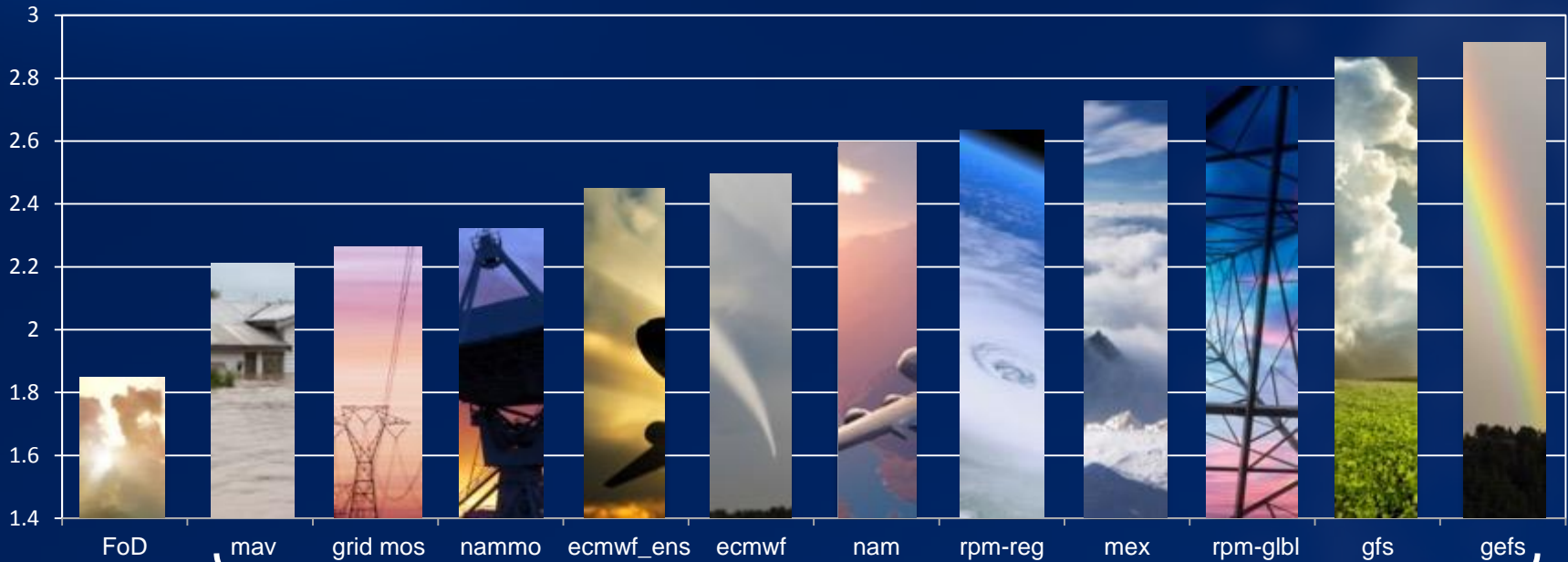
A collaboration among:





# Weather Forecast Accuracy

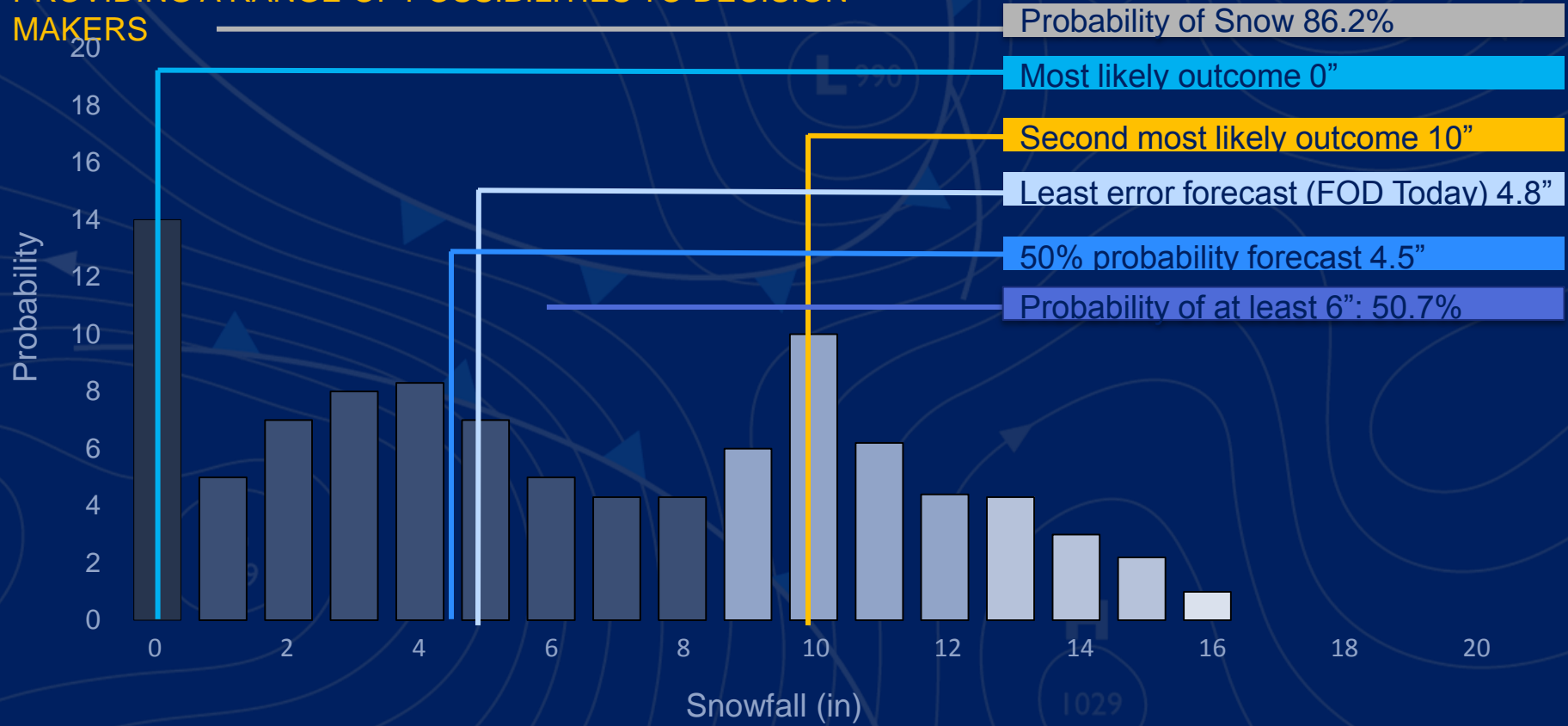
## 2015 US 1-3 Day Temperature Forecast RMS Errors



Various government forecast models

# Deterministic to Probabilistic

PROVIDING A RANGE OF POSSIBILITIES TO DECISION MAKERS



# Delay Use Case

# Minutes Matter



**Weather causes ~70% of delays\***

Airport Capacity

Taxi Times

En route flow programs

Downstream delay propagation

**Major Areas of Business Impact**

Fuel Burn

Flight Time

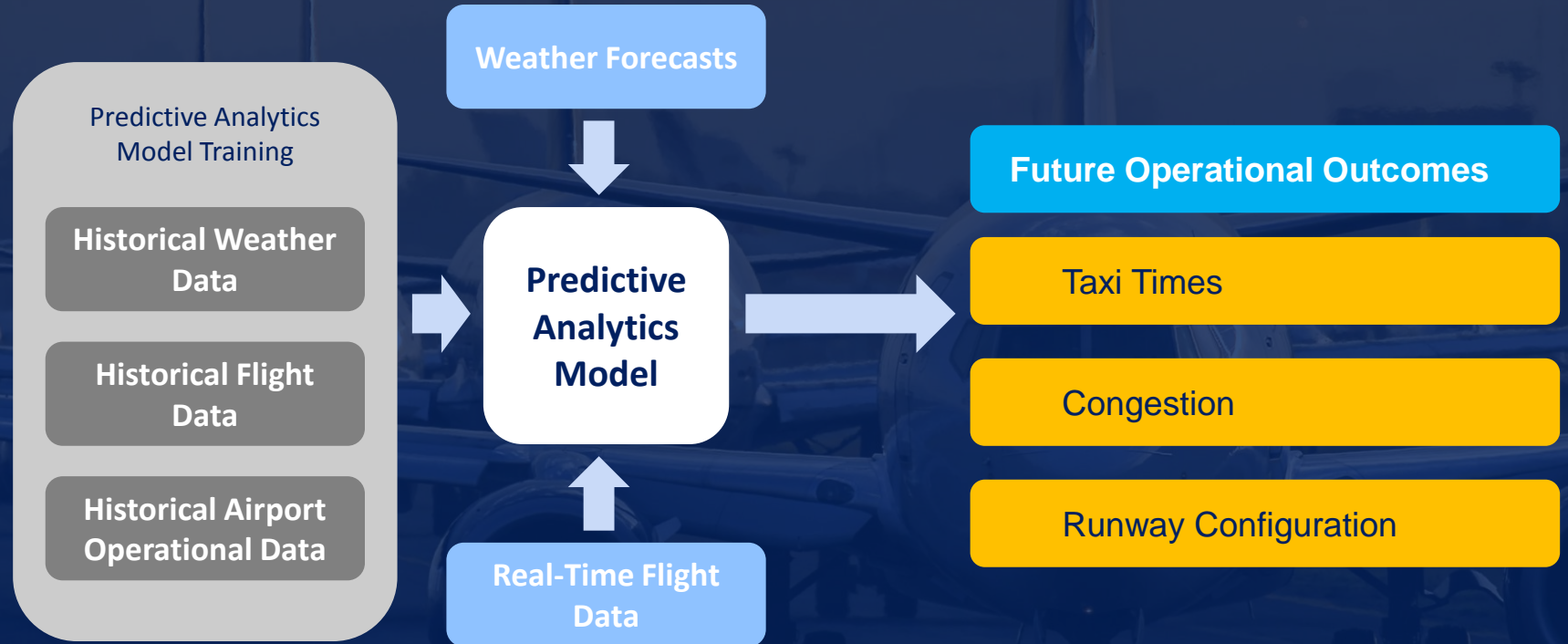
Crew Duty Exceedances

On-time Performance

Customer satisfaction

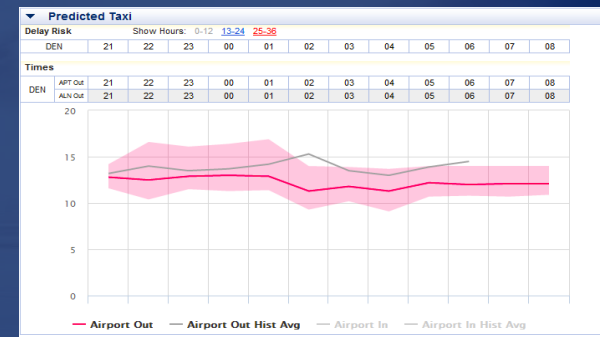
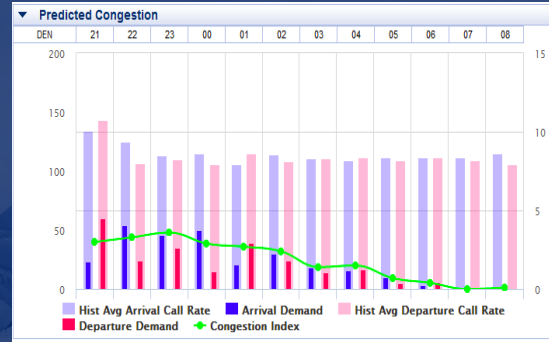
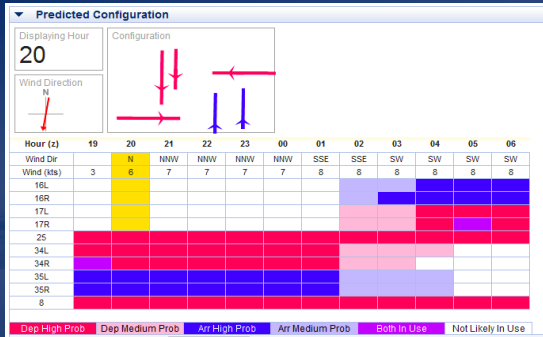
Brand Image

# Airport Analytics

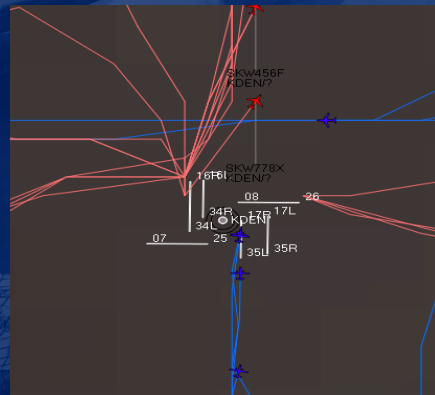




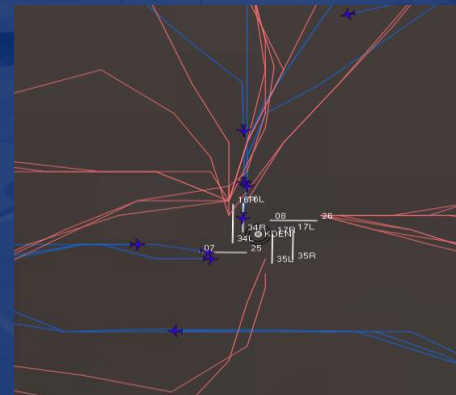
# Runway Configuration (DEN)



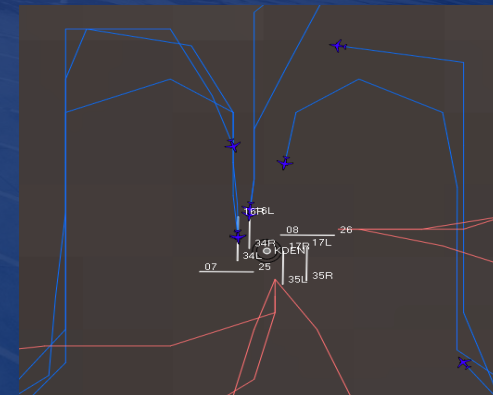
01Z



02Z



03Z



04Z

# Probabilistic Weather Forecasts for Aviation

*Use machine learning applied against 154 public and proprietary weather models to identify the full range of potential weather outcomes and summarize probability distributions*

Variables:



TEMPERATURE



PRECIPITATION



SNOWFALL



WIND  
DIRECTION &  
SPEED



DEWPOINT



RELATIVE  
HUMIDITY



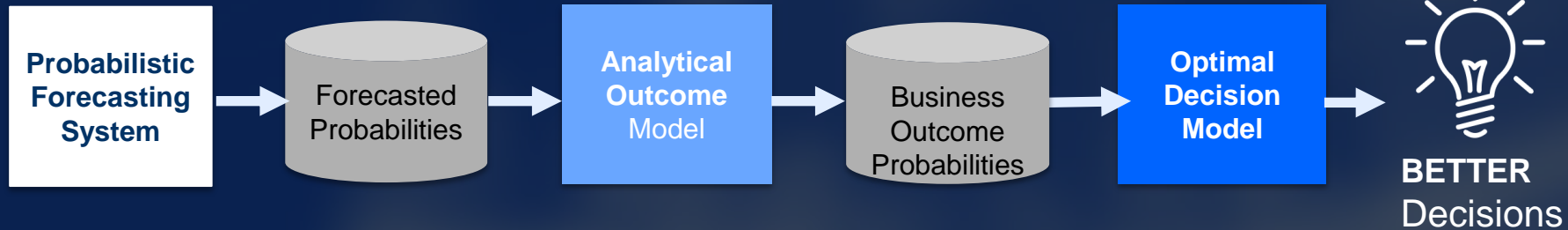
CEILING



VISIBILITY

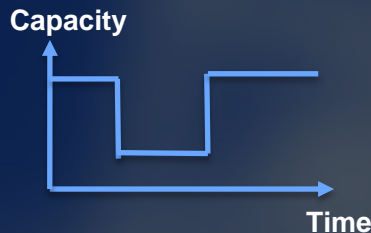
# Leveraging Probabilistic Weather Forecast in Assessing Airport Capacity Impact

## Paradigm



**Outcome** - Weather Analytical Scenarios (WAS) – Identify *Timing, Duration and Magnitude* of System Impact

**WAS #1**  
70%



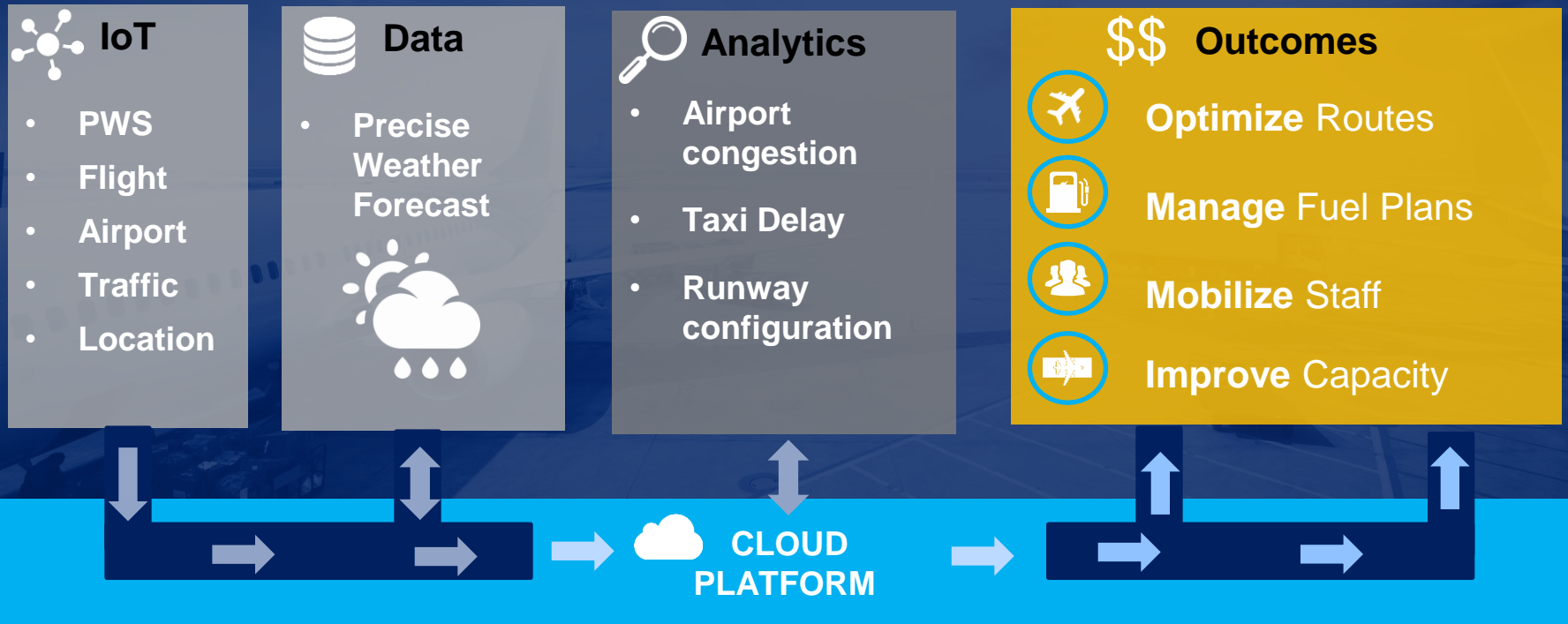
**WAS #2**  
20%



**WAS #3**  
10%



# Bringing it all Together





# THANK YOU

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