

**Topic: Using data to solve problems, provide accountability, and improve the operation**

United Airlines has 85,000 employees and operates in hundreds of locations on 6 continents.

Data visualization tools are quickly becoming an integral part of our operations. These tools are utilized by almost every operating division and business unit at United helping us make informed decisions on operational capabilities, long term planning, and how to best improve our metrics. This breakout session will cover how we selected the data visualization tool that worked best for us, a demo of some of our capabilities, and how trained our user base.

**Bio:** Brett Bonner, aviation enthusiast, has worked in United Airlines' operation, safety, and marketing departments. He is a champion of data visualization and had established a robust and reliable visualization and reporting platform at United Airlines. Brett's main focus has been training of data visualization, injury and damage reduction, fraud identification and elimination, automation of data, data consolidation, and operational reliability.

Brett has 2 degrees in aviation, including an advanced degree in aviation safety. Before United Airlines, Brett has worked for airport authorities. He holds a pilot license and is a certified airport rescue fire fighter.

# Capitalizing on the power of Data

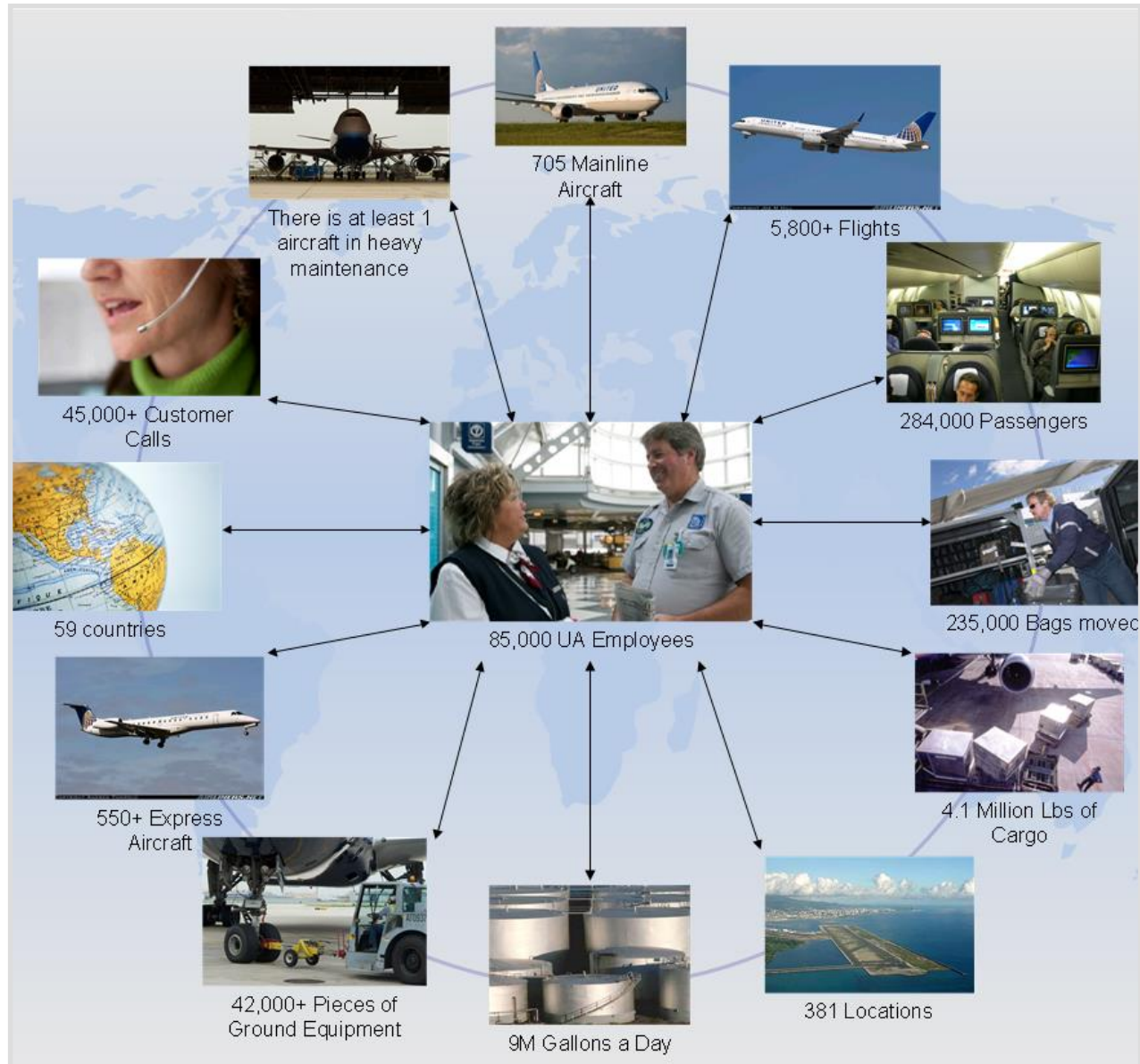
Brett Bonner  
Manager of Data Visualization



A STAR ALLIANCE MEMBER 

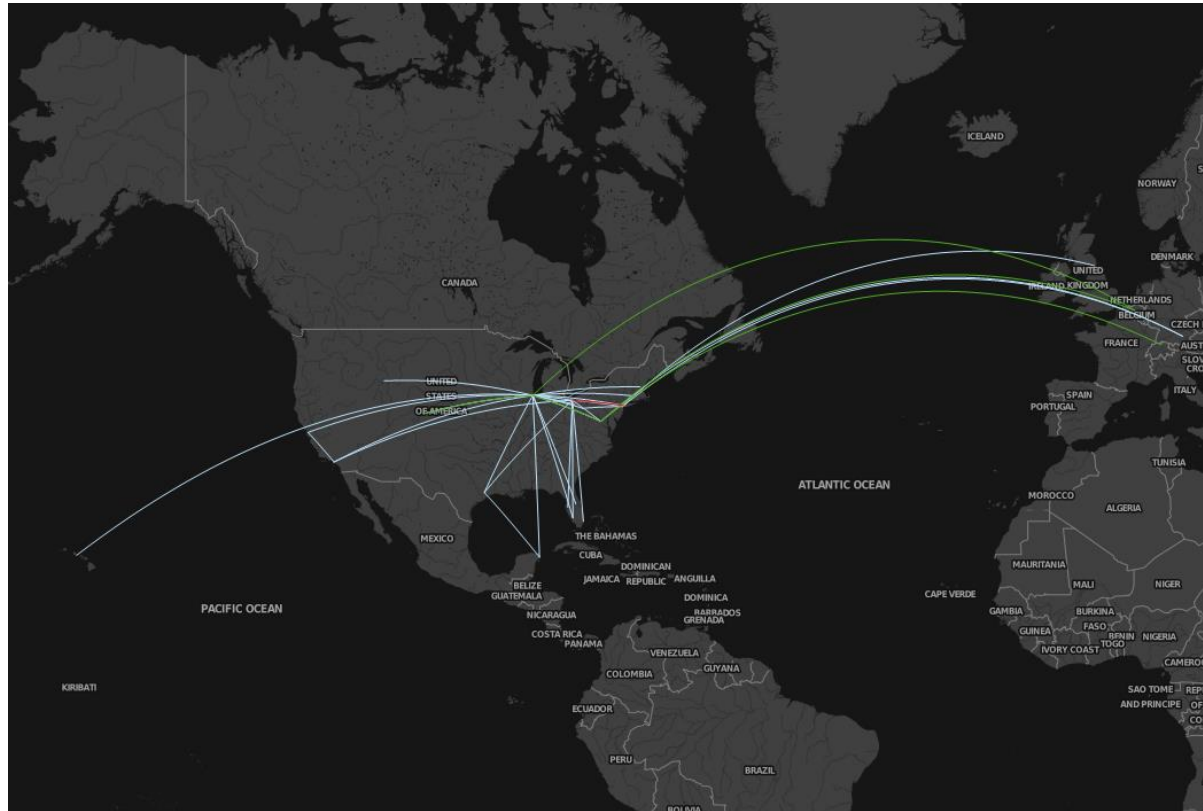
**UNITED** 

# A Typical Day



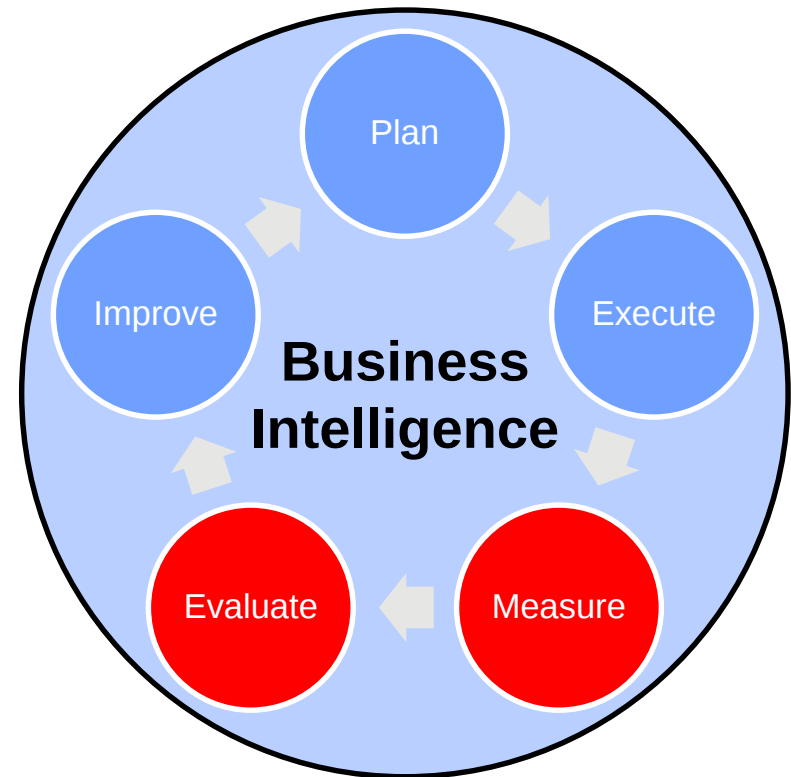
# Today's Flight Plan

- Identifying the stakeholder needs
- Defining the User
- Show and Tell
- Bumps in the road
- Infrastructure

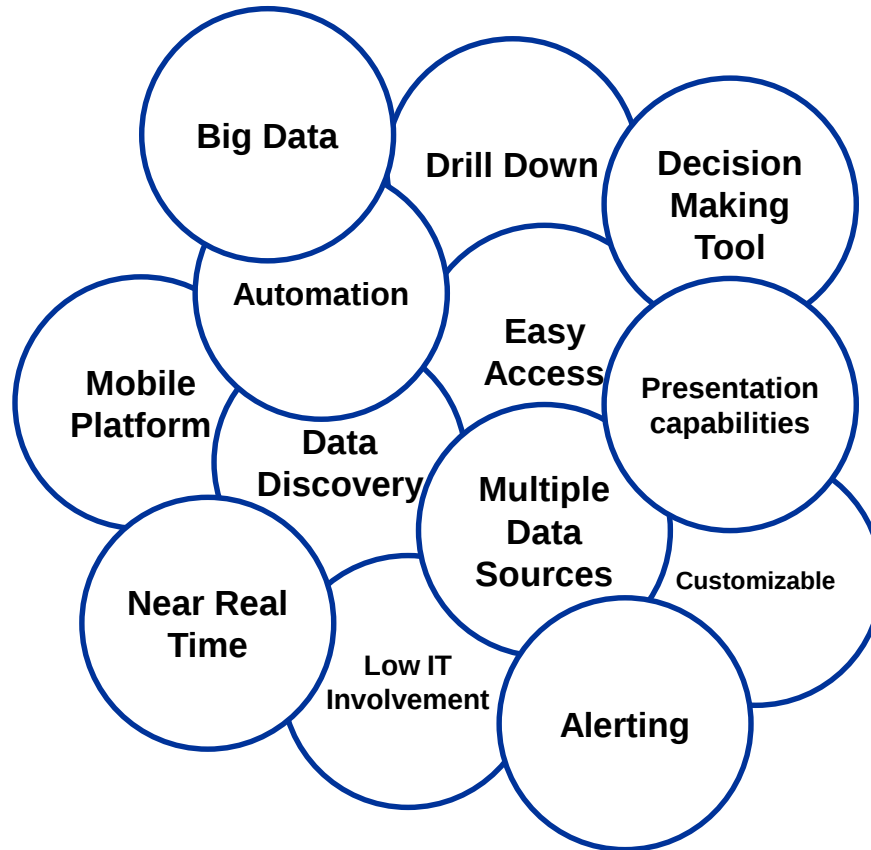


# Why do we need a BI

- Data rich organization, but sometimes analytically poor
- Multiple different data sources
  - Teradata, MSSQL, Oracle, Hadoop
- Need for automation
- Data hungry leadership
- Metrics that can be tracked, trended, and impacted
- Competing platforms (Excel, OBIEE, Hyperion Brio, SQL Management Studio) are complex, outdated, not shareable, not automated, or have limited access.



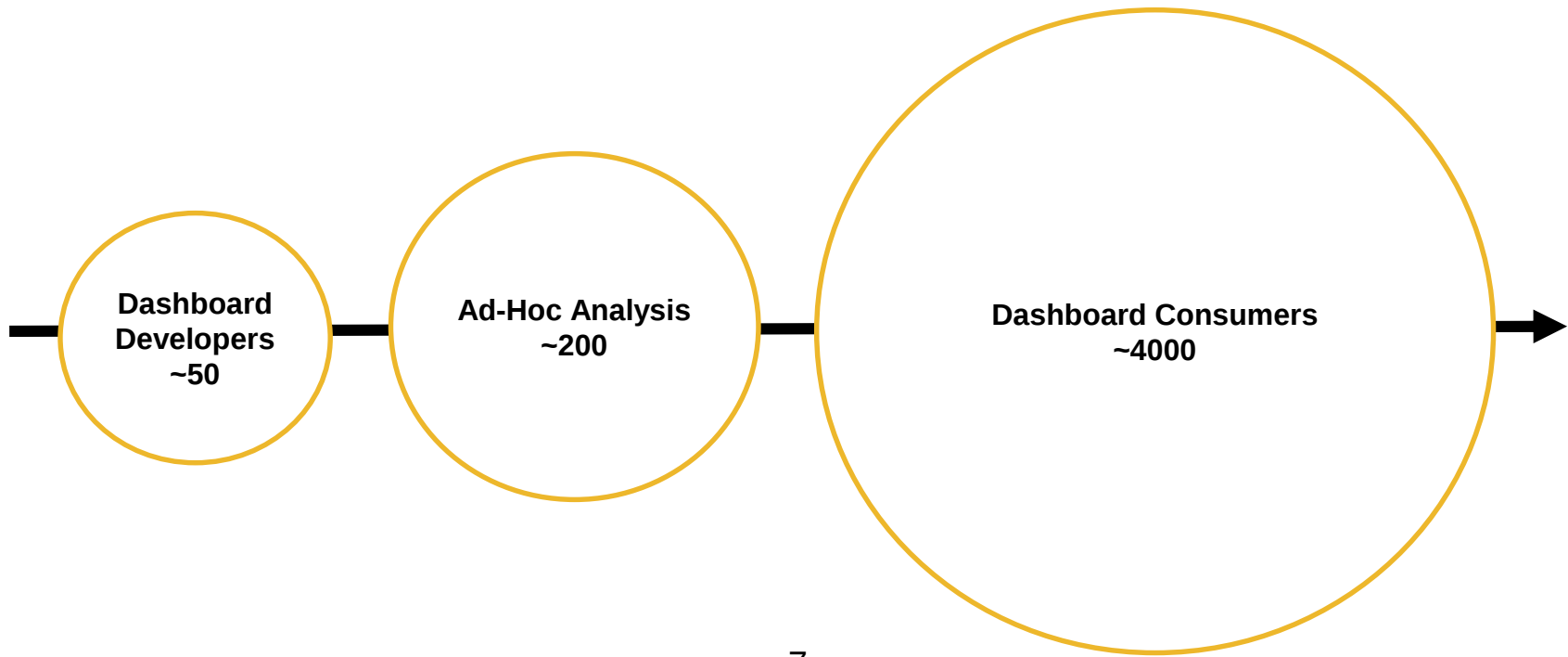
# The needs of the airline



**This is how we will define success**

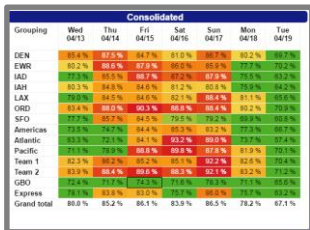
# Defining the user

- Classify users into three groups:
  - **Developers** – Designs dashboards to be used by a wide audience
  - **Ad-Hoc User** – Does adhoc analysis or designs dashboards for a limited audience
  - **Consumers** – Users of dashboards



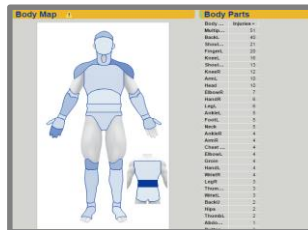
# How different people use Data visualization at United

- While Data visualization can be used in many different ways, here is a sampling of the most common applications



## Stats Reporting

- Audience:**
  - Large - Operating Division, Auditors
- Goal:**
  - Monitor performance, identify issues
- Notable Project:**
  - Jet Bridge Project – 30% improvement



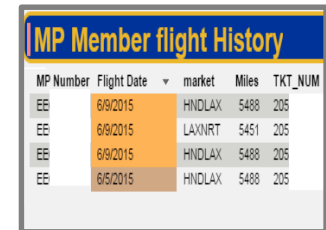
## Data Analysis

- Audience:**
  - Medium, Task focused decision makers
- Goal:**
  - Improve success rate of tasks
- Notable Project:**
  - Reduction of lower back injuries due to loading aircraft



## Predictive Analysis

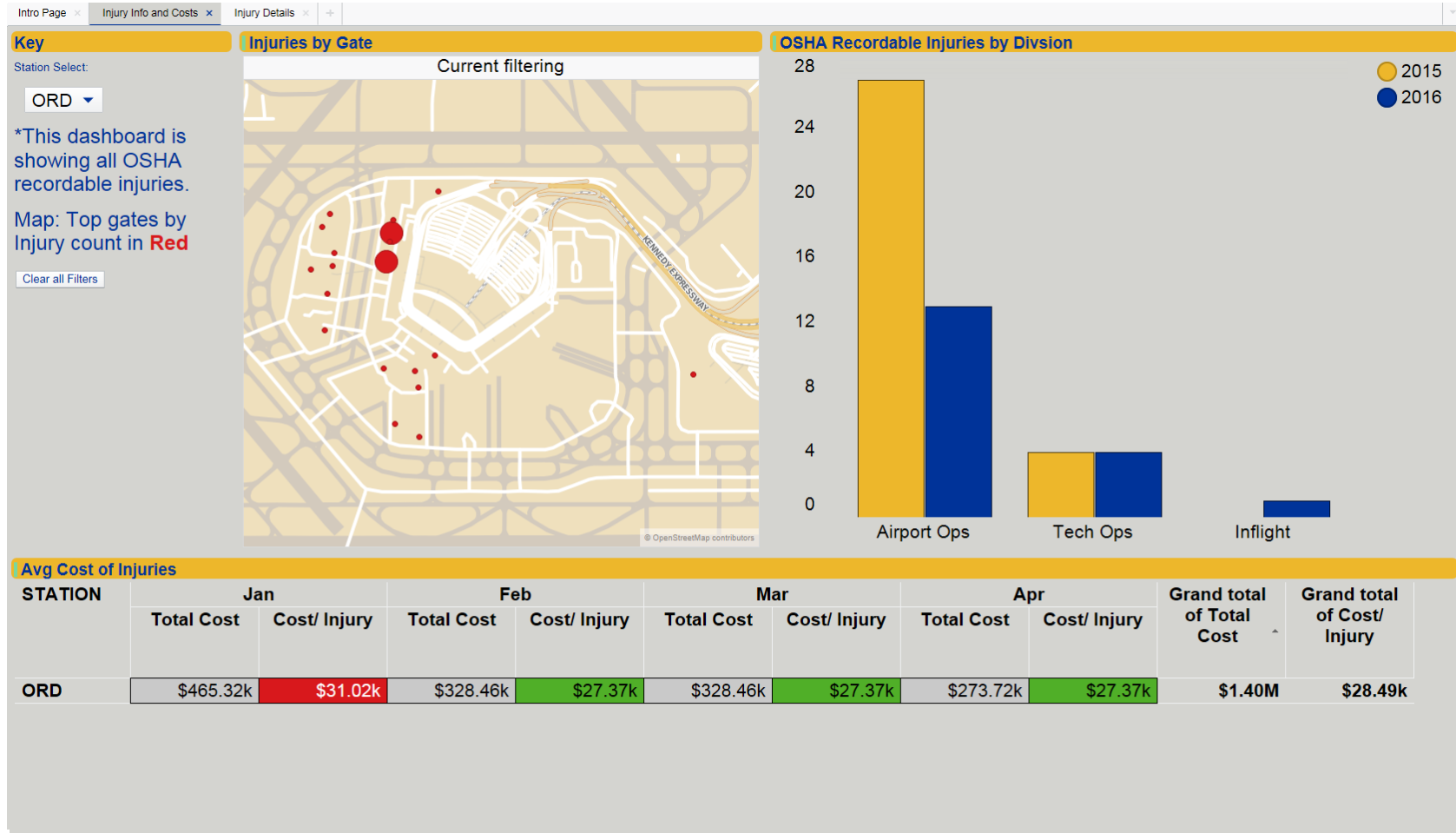
- Audience:**
  - Small: Financial/statistical decision makers
- Goal:**
  - Improve rates, percentages, predictive
- Notable Project:**
  - Gate checked bag project



## Seek and Destroy

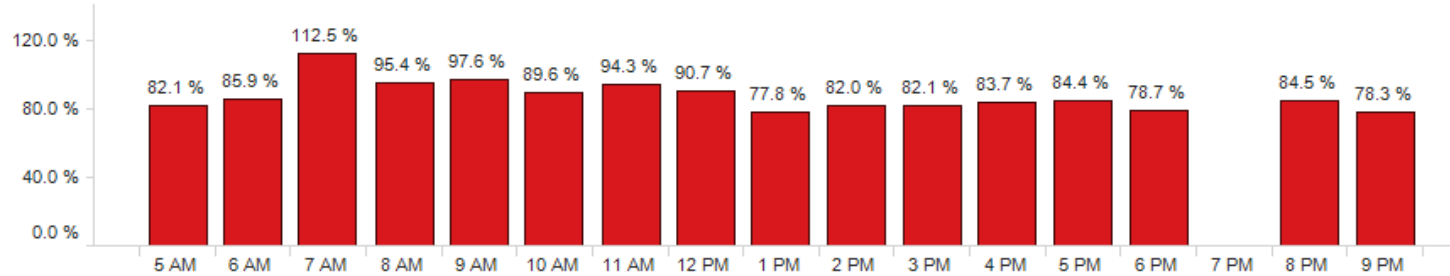
- Audience:**
  - Very small – Task owners
- Goal:**
  - To identify inconsistencies
- Notable Project:**
  - Mileage Plus Fraud - > 150K savings in 1 month

# Data Analysis Sample – Employee Injuries



# Data Analysis Sample – United Club over-crowding

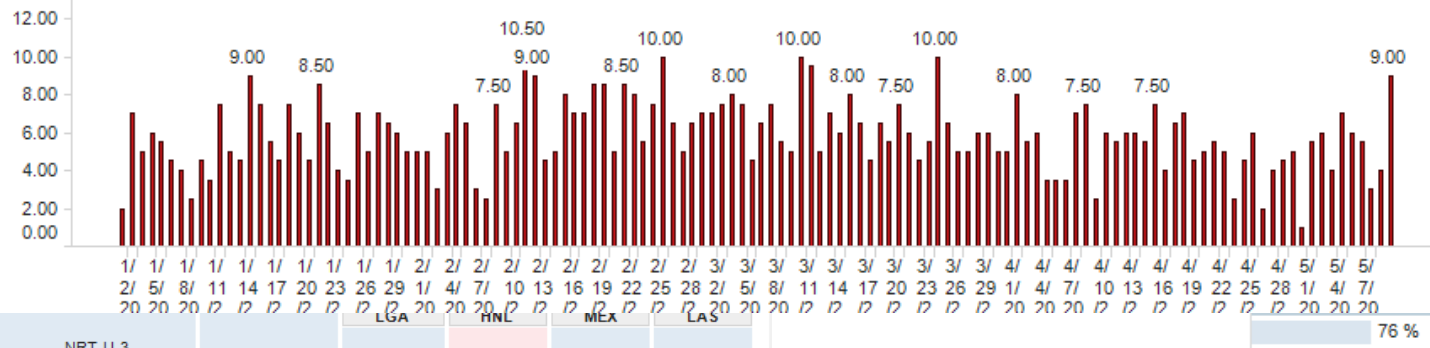
Month - Day - Hour



% of seats filled

Hourly

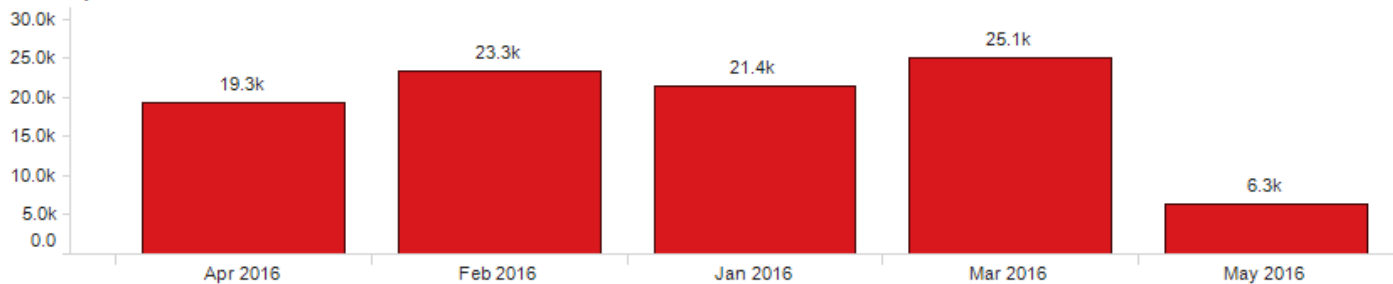
Month - Day - Hour



Hours of overcrowd...

Daily

Month - Day - Hour



# of overcrowded vi...

Monthly

# Data Analysis Sample – Automated E-mails

- Push data to people who would not pull it daily
- Drive people to the dashboard when issues occur
- Drives accountability

This report is from Ground Safety. If you have any questions, please contact Ed Eckardt @ [ed.eckardt@united.com](mailto:ed.eckardt@united.com)

To access the daily safety report, click on - <http://vcld11gshp01.global.ual.com:8080/SpotfireWeb/ViewAnalysis.aspx?file=/Safety%20Data/Daily%20Safety%20Report>

Please note the rate charts for both OSHA recordable injuries and A4A damages are updated once per week on Monday evening.



Damage Counts - Last 7 days:



Reported Injuries by Hub/Div Last 7 Days:

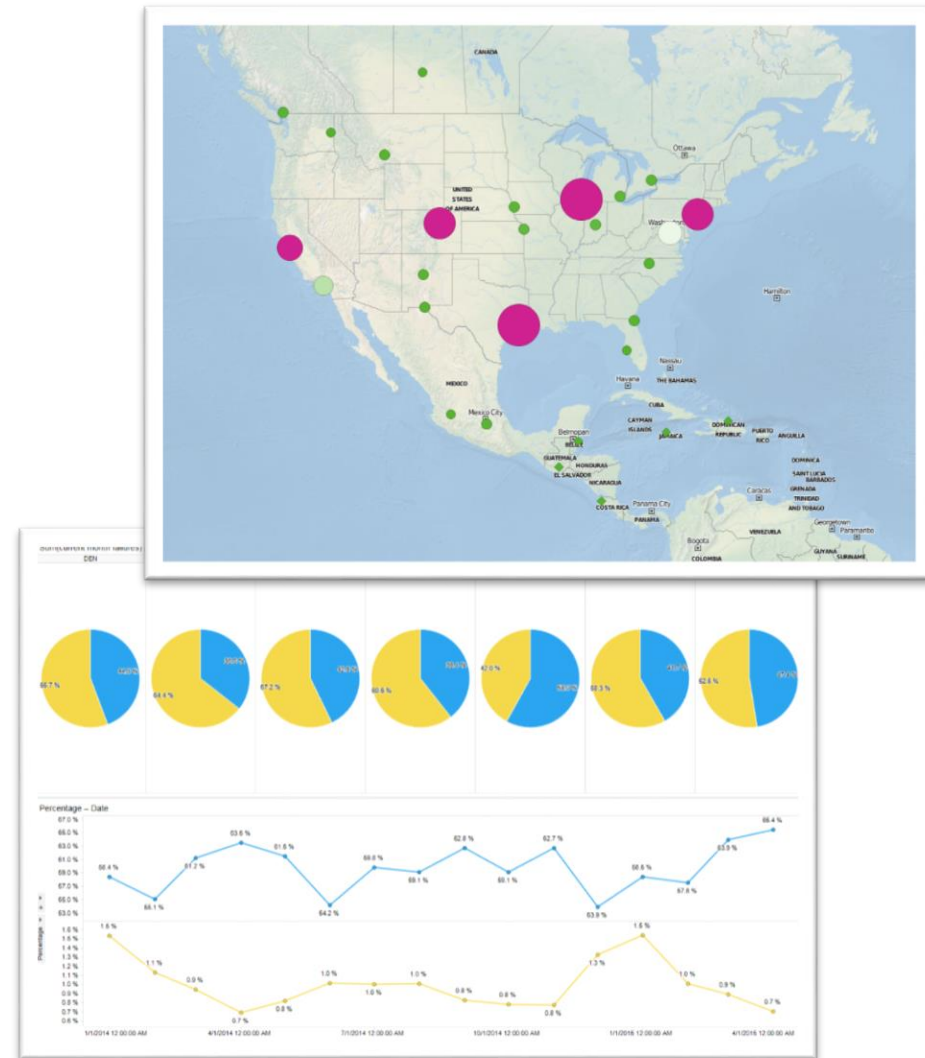
| Station | AO  | TO  | IF  | FS  | FO  | CC  | Other | Grand... |
|---------|-----|-----|-----|-----|-----|-----|-------|----------|
| DEN     | 4   | 2   | 4   | 2   | ... | ... | ...   | 12       |
| EWR     | 11  | 1   | 7   | 2   | ... | ... | ...   | 21       |
| IAD     | 3   | 2   | 1   | ... | ... | ... | 2     | 8        |
| IAH     | 10  | 2   | 3   | ... | 1   | ... | ...   | 16       |
| LAX     | 8   | 1   | 6   | ... | ... | ... | 1     | 16       |
| ORD     | 23  | 4   | 13  | ... | ... | ... | ...   | 40       |
| SFO     | 4   | 7   | 2   | ... | 1   | ... | ...   | 14       |
| BOS     | ... | ... | 1   | ... | ... | ... | ...   | 1        |
| CLE     | 2   | 1   | ... | ... | ... | ... | ...   | 4        |
| DCA     | ... | ... | 8   | ... | ... | ... | ...   | 9        |
| GUM     | ... | ... | 1   | ... | ... | ... | ...   | 1        |
| HNL     | 2   | ... | ... | ... | ... | ... | ...   | 2        |
| HOU     | ... | ... | 1   | ... | ... | ... | ...   | 1        |
| JFK     | ... | ... | 5   | ... | ... | ... | ...   | 5        |
| LAS     | ... | ... | ... | ... | ... | ... | ...   | ...      |

A4A Recordable Damage Statistics - YT

| Div    | ML Dmg Count | ML Dmg Rate | ML Dmg Target | UAX Dmg Count | UAX Dmg Rate | Target | Count | Rate | Target |
|--------|--------------|-------------|---------------|---------------|--------------|--------|-------|------|--------|
| AO     | 18           | 0.82        | 0.68          | 24            | 0.80         | 0.37   | 42    | 0.81 | 0.50   |
| IF     | 3            | 0.14        | 0.08          | 0             | 0.00         | 0.00   | 0     | 0.00 | 0.00   |
| TO     | 6            | 0.27        | 0.44          | 0             | 0.00         | 0.00   | 0     | 0.00 | 0.00   |
| FS     | 0            | 0.00        | 0.05          | 1             | 0.03         | 0.03   | 1     | 0.02 | 0.04   |
| FO     | 0            | ...         | 0.05          | 0             | 0.00         | 0.00   | 0     | 0.00 | 0.00   |
| UAX    | 0            | 0.00        | 0.05          | 6             | 0.20         | 0.16   | 6     | 0.12 | 0.12   |
| CC     | 0            | 0.00        | 0.00          | 0             | 0.00         | 0.00   | 0     | 0.00 | 0.00   |
| System | 29           | 1.32        | 1.47          | 38            | 1.26         | 0.79   | 67    | 1.29 | 1.06   |

# Training

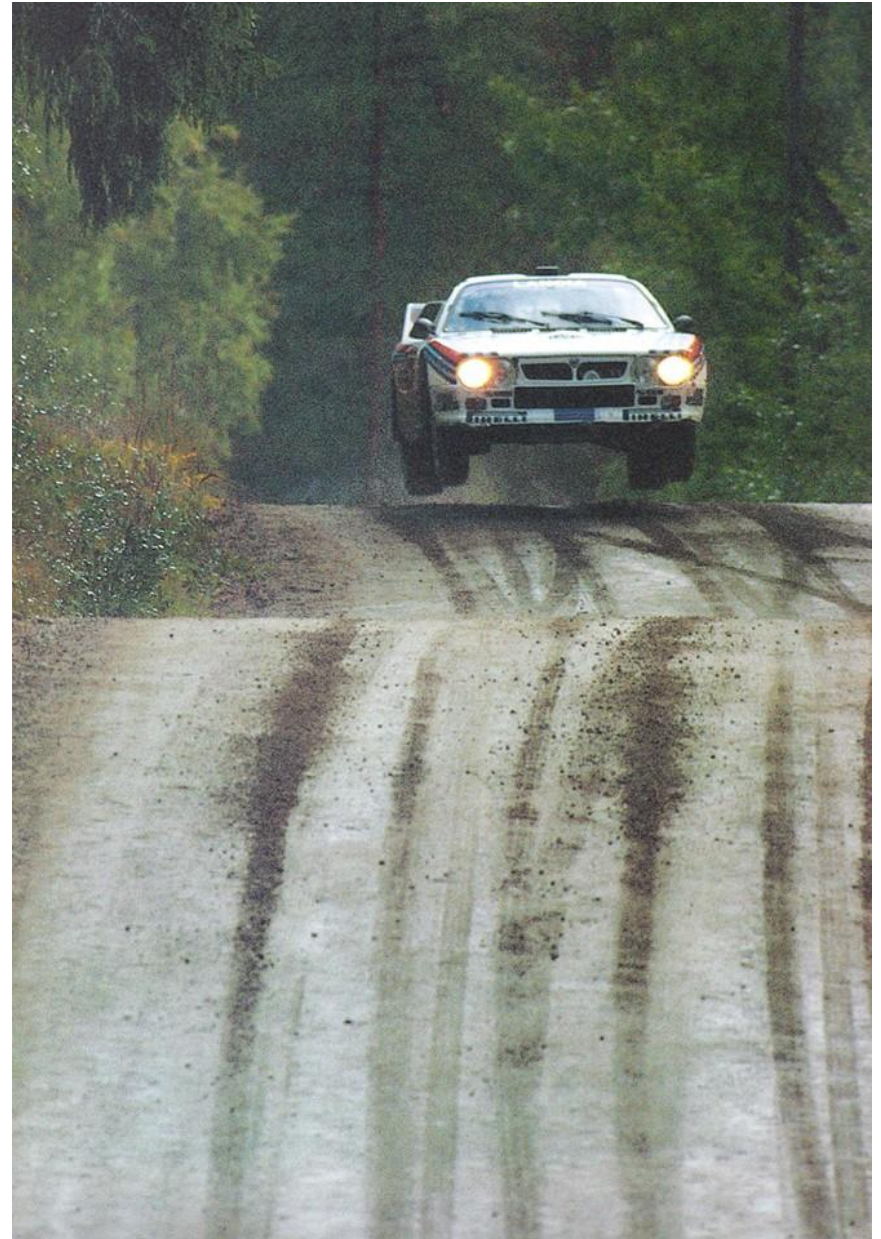
- We developed in-house training. A training session is 6 hours long.
- Each training session holds 20-25 attendees.
- Over 200 employees within 6 months.
- Goals for the training session:
  - Show how Data visualization can be useful for their jobs by showing real United use cases.
  - Learn how to build simple reports.
  - Get to know us: the friendly Data Visualization team!



**Developing in-house training can be cheap, simple, and effective**

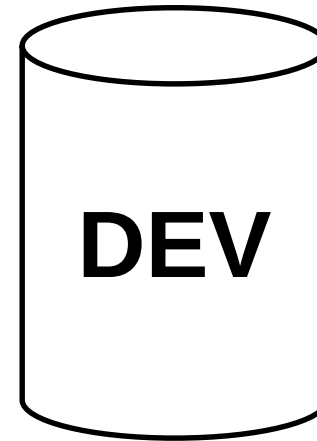
# Bumps in the road

- Importance of two environments
- Real Time data
- Publication without review

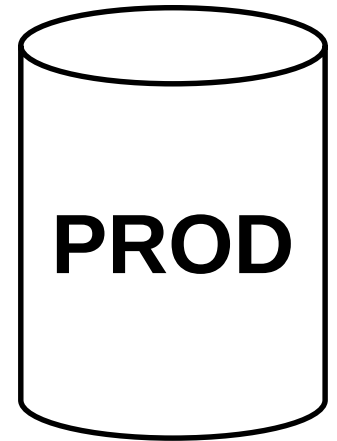


# Importance of two environments

- United has been operating with one environment. This mix of Development and Production has caused issues:
  - Instability as people are testing poorly designed dashboards (loose queries)
  - Confusion in the library structure
  - Sensitive data/data sources potentially exposed (HR Data)
  - Inability to assign resources to production



- Ad-Hoc Analysis
- Team Projects
- Sandbox for Production
- Loose rules for data sources
- Strict library organization
- Test deployments
- Web Player access via Developer only



- 24-7 support
- Limited access via client
- Open access via web player
- Strict library organization
- No test deployments

# Real Time data – Lesson Learned

- Our stakeholders often push the limits of real time/near-real time
- Dashboard for maintenance to authorize flight stopped refreshing
- A change in a query increased the time to pull data
- Takeaways:
  - Keep near-real time dashboards simple with quick, tight queries
  - Never set the reload time less than the time it takes the query to run

Configure Update Schedule - Google Chrome

vclid11gpshpdb01.global.ual.com:8080/SpotfireWeb/Administration/ScheduledUpdatesEdit.asp

**UNITED**

**Configure Update Schedule - TechOps/Production/MEL\_DASHBOARD**

Update method:

☒ Automatic

☐ User notification

Schedule 1

Keep analysis pre-loaded to assure fast access between:

00 : 00 and 23 : 55

☒ Monday ☒ Friday

☒ Tuesday ☒ Saturday

☒ Wednesday ☒ Sunday

☒ Thursday

☒ Reload and trigger update (within the specified time frame) every:

5 minutes

[Add an additional schedule](#)

Save Cancel

# Publication without review

- The vast majority of Data visualization users are consumers. A poor product results in corrosion of the user base.
- Risks:
  - A poor product involving bad layout, long load times, incorrect/confusing data
  - Duplicative stats with different numbers
- Identify power users and engage/assist them early in their design processes.

**Focus is on removing any item that can slow the dashboard down.  
If it is not needed, delete it. If the data can be cleaned up, do it.**

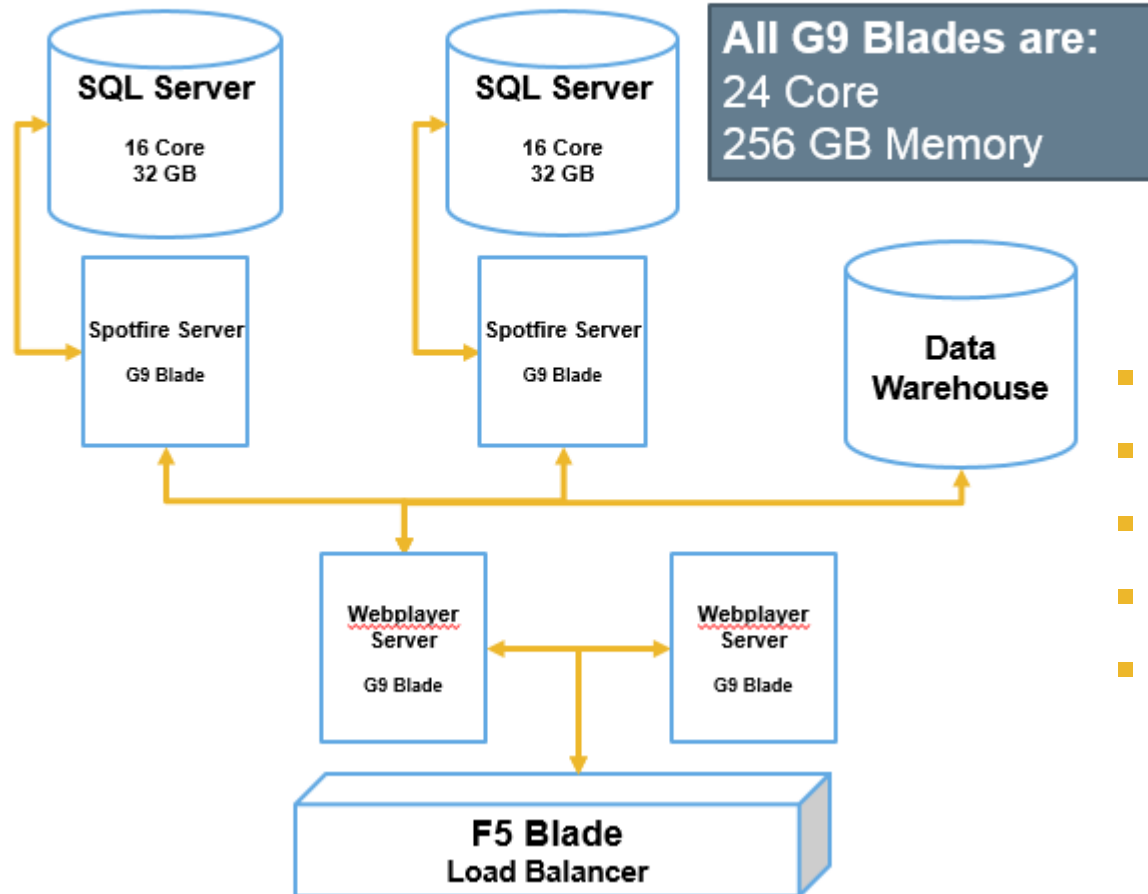
# Infrastructure: Growth Model

**Tomorrow:**

Spotfire 7.5

**M-SEC Zone**

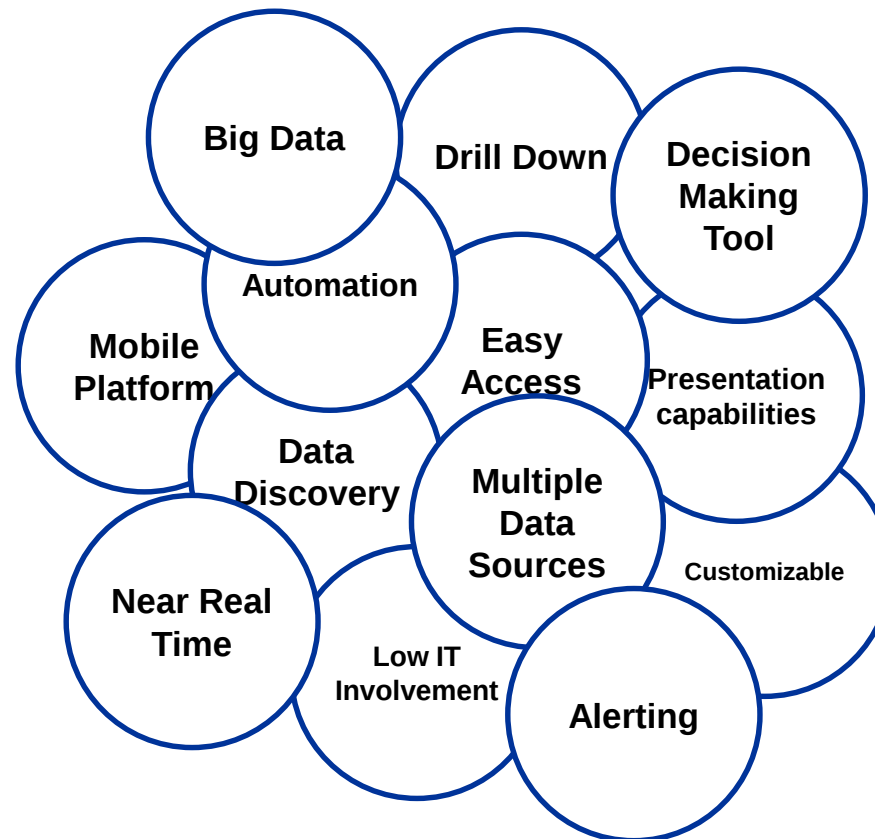
**Intranet**



**Why?**

- Needs of 85,000 people
- Speed and capability
- Cleaner environment
- Smarter web setup
- Improved scalability

# The needs of the airline – How did we do?



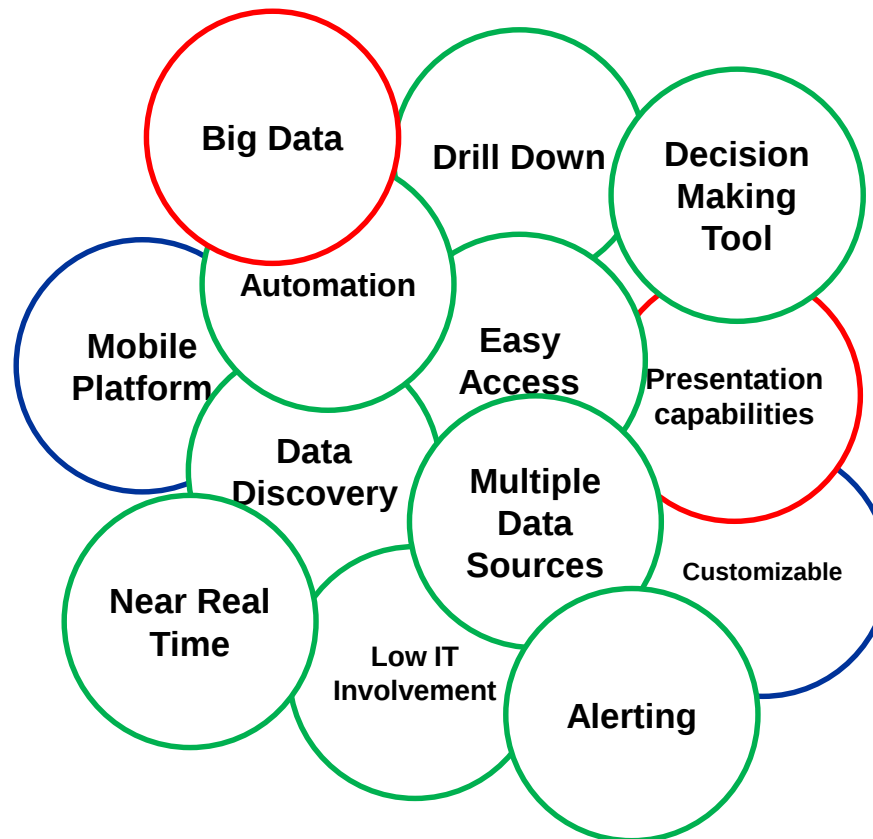
# The needs of the airline – How did we do?

**Customizable:** Difficulty keeping with corporate branding standards

**Mobile Platform:** Internal firewall issues. IT Security requires a separate server

**Big Data:** Difficulty connecting to Google big query

**Presentation capabilities:** Often need to re-build the visualizations so that they look good



## Key

Meets  
Needs  
Perfectly

Acceptable

Needs  
Work

# 2016 National Safety Council – Safety Innovation Award

Our Mission is Safety:  At Work  At Home  On the Road | [Events](#)

[Learn](#) [Join](#) [Measure](#) [Act](#) [Connect](#) [MyNSC](#) [S](#)

NSC / [Act](#) / [Green-Cross-Innovation-Finalists](#)

## United Airlines Corporate Safety Wins Green Cross Safety Innovation Award

[United Airlines](#) and United Express operate nearly 5,000 commercial flights a day to 342 airports worldwide.



**The safety objective:** In 2010, United and Continental airlines merged, requiring the Safety Division to integrate volumes of data from many operating groups and databases. In addition, new FAA regulations required airlines to implement a safety management system. We needed to turn mountains of data into accessible, actionable, easy-to-use, multilingual information that made sense to everyone from front-line workers to top executives.

**The result:** The Data Visualization project is flexible, easy to use and drives attention to safety. Marketing, sales, cargo, tech operations, network operations, airport operations and food services groups all have adopted it. Over two years, United reduced damages by 23% and injuries by 11%; our Airport Operations division reduced injuries by 20%. The Data Visualization model has been adopted by five key operating divisions. We continue to expand the program by adding real-time data sources, which increases transparency and improves the quality of our discussions about how we can improve as an organization.

**Advice to others:** Integrating data from multiple sources and visualizing that data is a valuable exercise for any organization. Involving users, first-level management and safety action teams in the design builds employee and team commitment to the overall safety program.

# 2016 National Safety Council – Safety Innovation Award



# Thank You



## Backup Slides

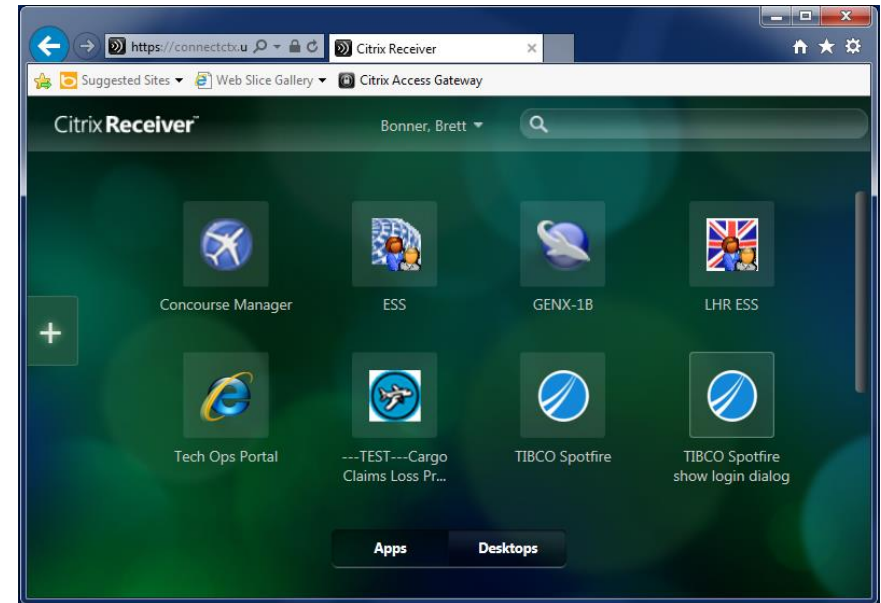


A STAR ALLIANCE MEMBER 

**UNITED** 

# 32 bit vs 64 bit install of Windows

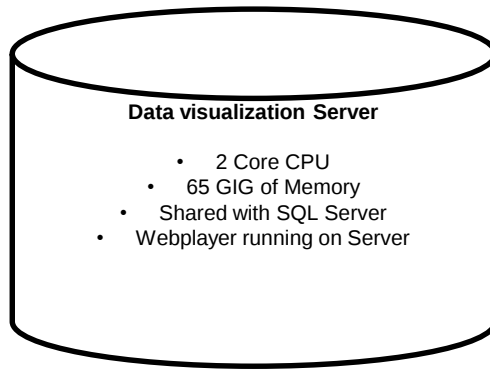
- United primarily has 32-bit installation of windows on company computers
- Data visualization 6.5 is 32-bit only
- Data visualization 7.0 is 64-bit only
- Several United applications require a 32-bit installation of windows
- Our solution: Operate two environments with 7.0 being the one most supported
- The best solution: Set up a Citrix/Virtual desktop environment to support 7.0 on 32-bit computers
- This problem was solved with Data visualization 7.5 as it supports both 32-bit and 64-bit.



# Infrastructure: Today and tomorrow

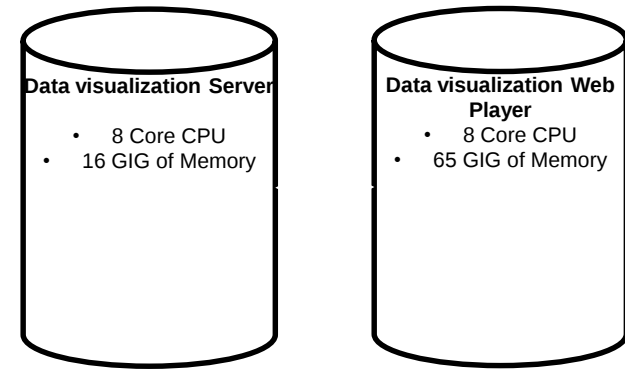
## Today:

### Data visualization 6.5



Active Developers: 25  
Web Player users: 30

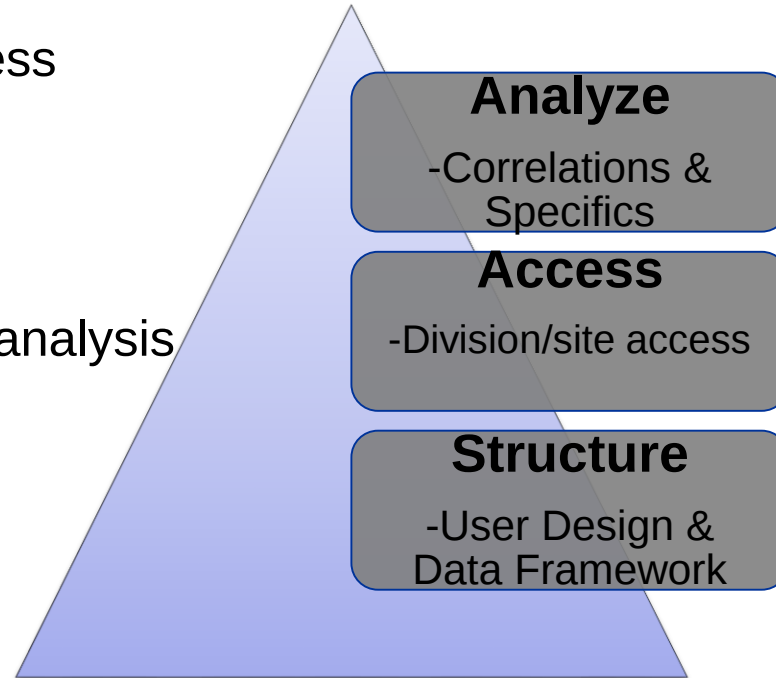
### Data visualization 7.0



Active Developers: 150  
Web Player users: 2,000

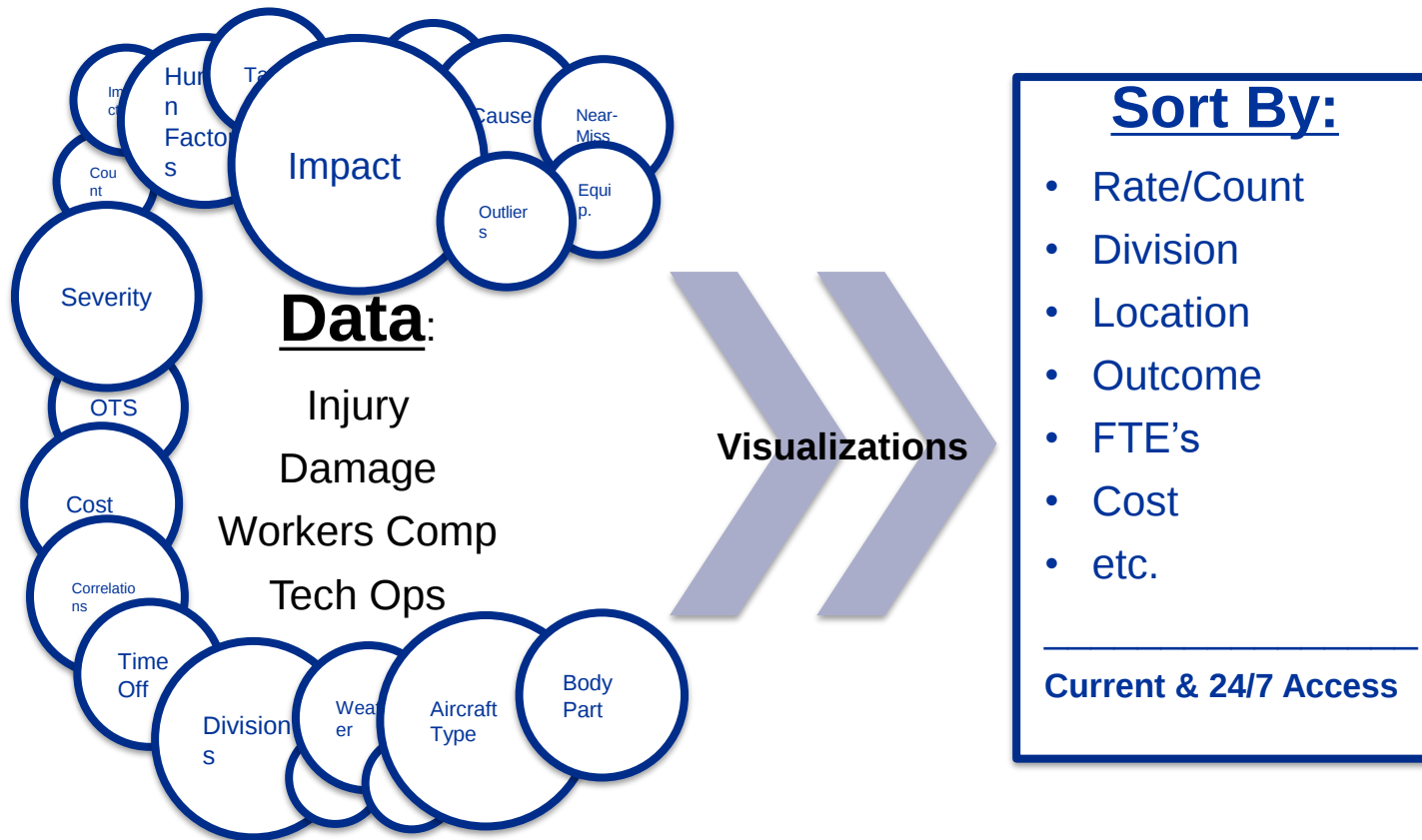
# Data Management – Philosophy

- Getting more value with less (Force Multipliers)
  - Automation
  - Simple tools
- Using visuals for intuitive analysis
  - Maps
  - Diagrams
- Velocity
  - Real time access
- Impact
  - Drive change/performance



**Ease of Use**

# Tools: Data Management – Approach

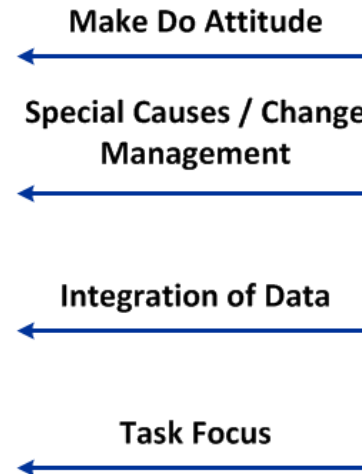


# Gaps & Opportunity

## Forces For



## Forces Against



# Data Visualization – Next Steps

- Real Time Data simplified by:
  - Division/Location
  - Practical Based Data for user
  - Managing outliers:
    - Frequency/Severity/Dollars
  - Eliminate data requests(real time)
  - 24/7 data access:
    - System/Division/Station

