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#TC18

How Walgreens transformed Supply Chain Management with Kyvos, Tableau, and Big Data

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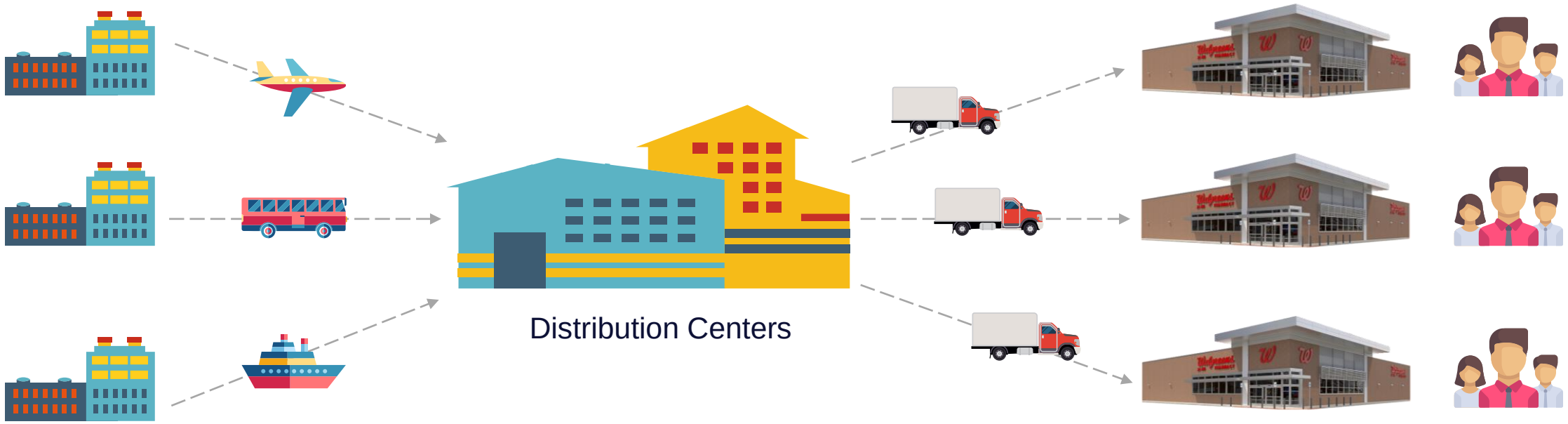
Walgreens Trusted since 1901™

We champion the health and well-being of every community in America.

Walgreens


Health &
Wellness
Grocery &
Household
40,000
Products
Beauty &
Personal Care
Seasonal &
General
Merchandise

Walgreens



20,000 Suppliers
40,000 Products

9,000 Stores
100 M Customers

Reporting Ecosystem

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Tools

Tableau
Excel
SAS

Databases

DB2
Hive
Hadoop
Netezza
Oracle

Users

Analysts
Data Scientists
Leadership
Planners
Suppliers

Frequency

Daily
Weekly
Monthly
Quarterly

Overview | Reporting Landscape

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Thousands of custom reports being created to support the business.

Forecasting

Supplier Management

Out of Stock (Outs)

Inventory Purpose

Sales & Operations Planning

Business Questions

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Scorecard	Questions
Forecast	• Items performance (forecast vs. actual sales) across stores & categories? What are the trends? • Accuracy of item level forecasting? – How do my forecasting results compare to other planners? • Item forecasts are most important to review today?

Suppliers	• Suppliers meeting their KPI goals? The overall trend?
	  – Suppliers scoring best or worst by KPI?
	• For specific items and individual suppliers:
	  – Purchase orders filled on-time? In full? If not, where are the biggest misses (research through drill down to PO detail).
	  – Where is shrink or waste an issue?

Business Questions

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Scorecard	Questions
Out of Stock (Outs)	• Items currently out of stock? which categories or stores? – For how long? – Root causes?
Inventory Purpose	• Inventory plan impacting stores? DCs? What are the trends? • Inventory for each item by category? – Projected demand by store type? By promoted vs. basic items? – Biggest changes to inventory vs. prior week? • Reduce days of supply without impacting sales?
Sales & Operations Planning	• Performance against sales goals? • Promotions on the calendar for items? – Performance of similar items on prior promotions? – Inventory level for an item we want to promote? • Reliability of suppliers for this item?

Data Size and Characteristics

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Use Case	Fact Rows	Dimensions	Measures	Data Grain	Time Window of Data
Forecast Scorecard	**62 Billion**	59	61	Weekly	104 weeks
Suppliers Scorecard	**42 Billion**	69	36	Weekly	104 weeks
Out of Stock (Outs) Scorecard	**6 Billion**	57	45	Daily	104 weeks
Inventory Purpose	**124 Billion**	48	41	Weekly	53 weeks
Sales & Operations Planning	**50 Billion**	56	36	Daily	104 weeks

Challenges with Existing Systems

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- High processing time–**manual compilation and aggregation** taking hours
- Building scorecards **time consuming** hence done monthly
- Slow response times–**minutes & hours to return queries**
- Resources **waiting for days** to get insights
- Contradicting reports because of **data silos** and **lack of common integration logic**
- Existing systems **not scalable** up to trillions of rows
- Not possible to **drill down** to granular details
- Tableau couldn’t optimally perform due to **volume of data and query limitations**
- Connecting live via Hive did not work

What we wanted to achieve?

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To create a performant solution where multiple prior attempts had not succeeded. Data volumes and query complexity exceeded Tableau's recommended best practices.

It seemed like an impossible task…

- Trillions of records from 50+ tables and sources
- Historical analysis at the lowest granularity with 30+ filters
- Centralize and standardize data logic
- High performance
- Scalable architecture
- Self-service access – with controls
- Security for internal and external users

Why we chose Kyvos?

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- Surpassed our SLAs–**sub-second responses** for most queries
- High concurrency–supports our **5,000 users and vendors**
- Scalability–availability of lowest grain for **2 years of data** across business units
- Flexibility–**immediate data access** as it becomes available
- Seamless connectivity with Tableau–**SQL connectivity** to maximize Tableau performance
- Responsiveness–excellent support and professional services

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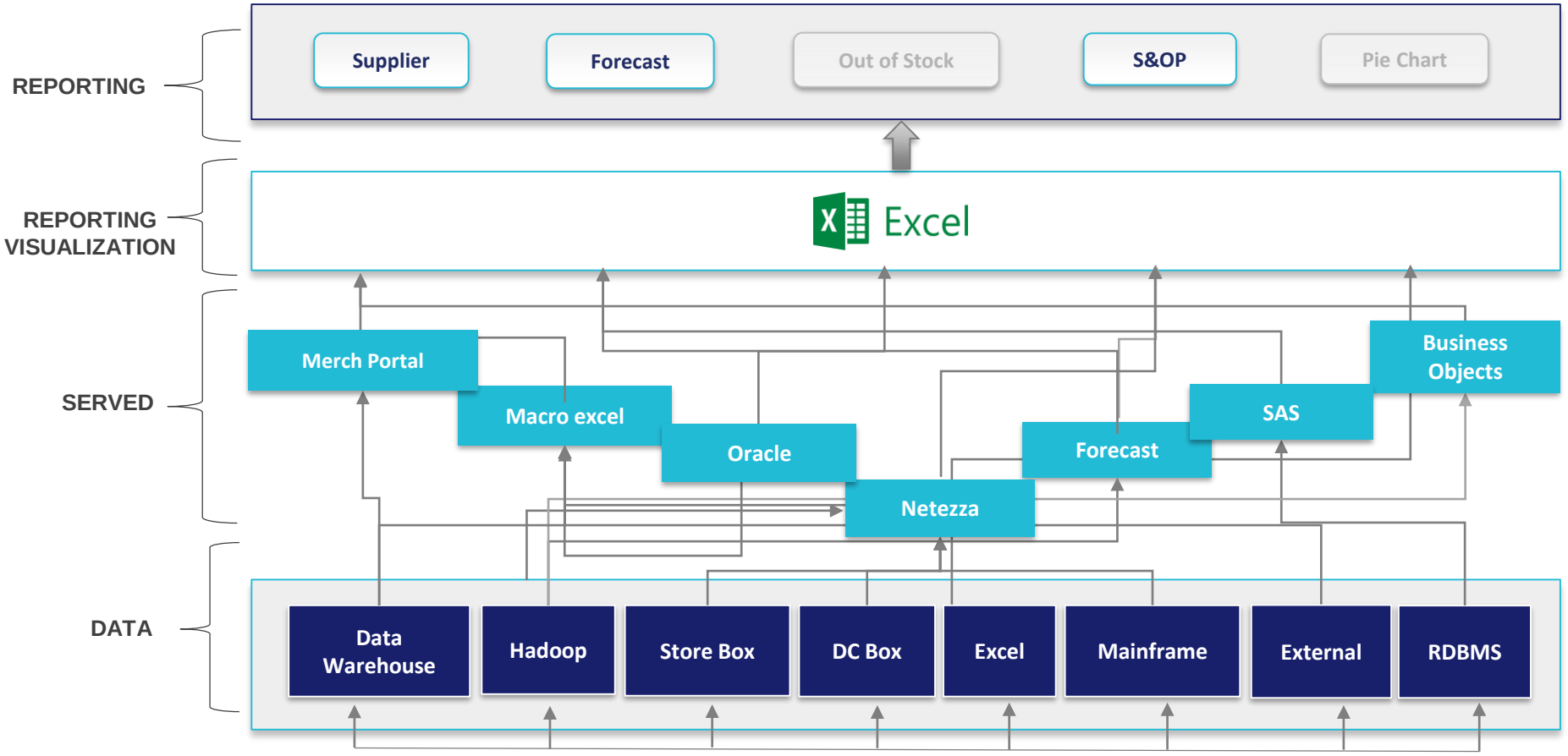
Walgreens Use Case–Old State



- Various methods of Scorecard and Dashboard Generation
- High Processing Time
- Inconsistent Data sets
- Data sourced from across the network
- Manual Report Generation

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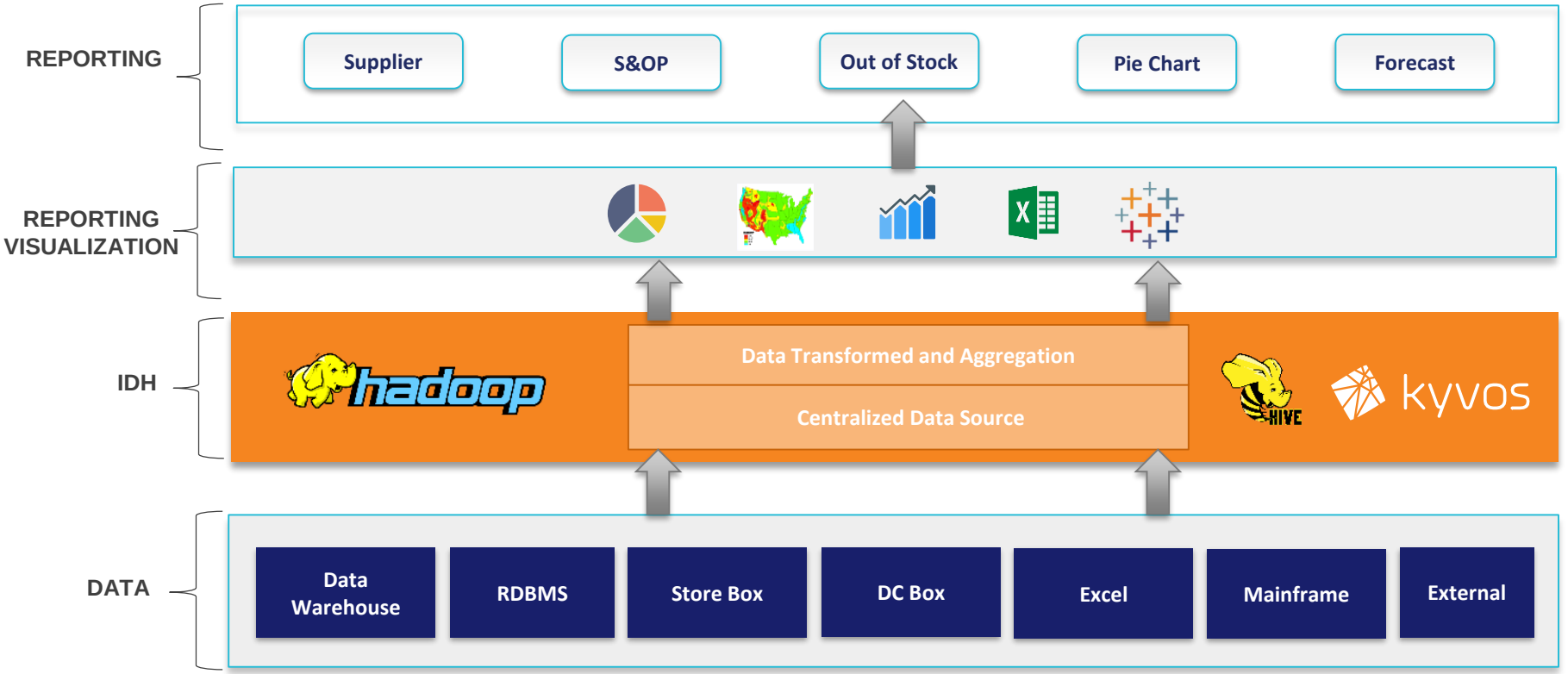
Walgreens Use Case–New State



- Centralized scorecard and dashboard generation
- Reduced processing time for timely reports
- Data unification across the network
- Consistent data sets
- Highly-responsive dashboards

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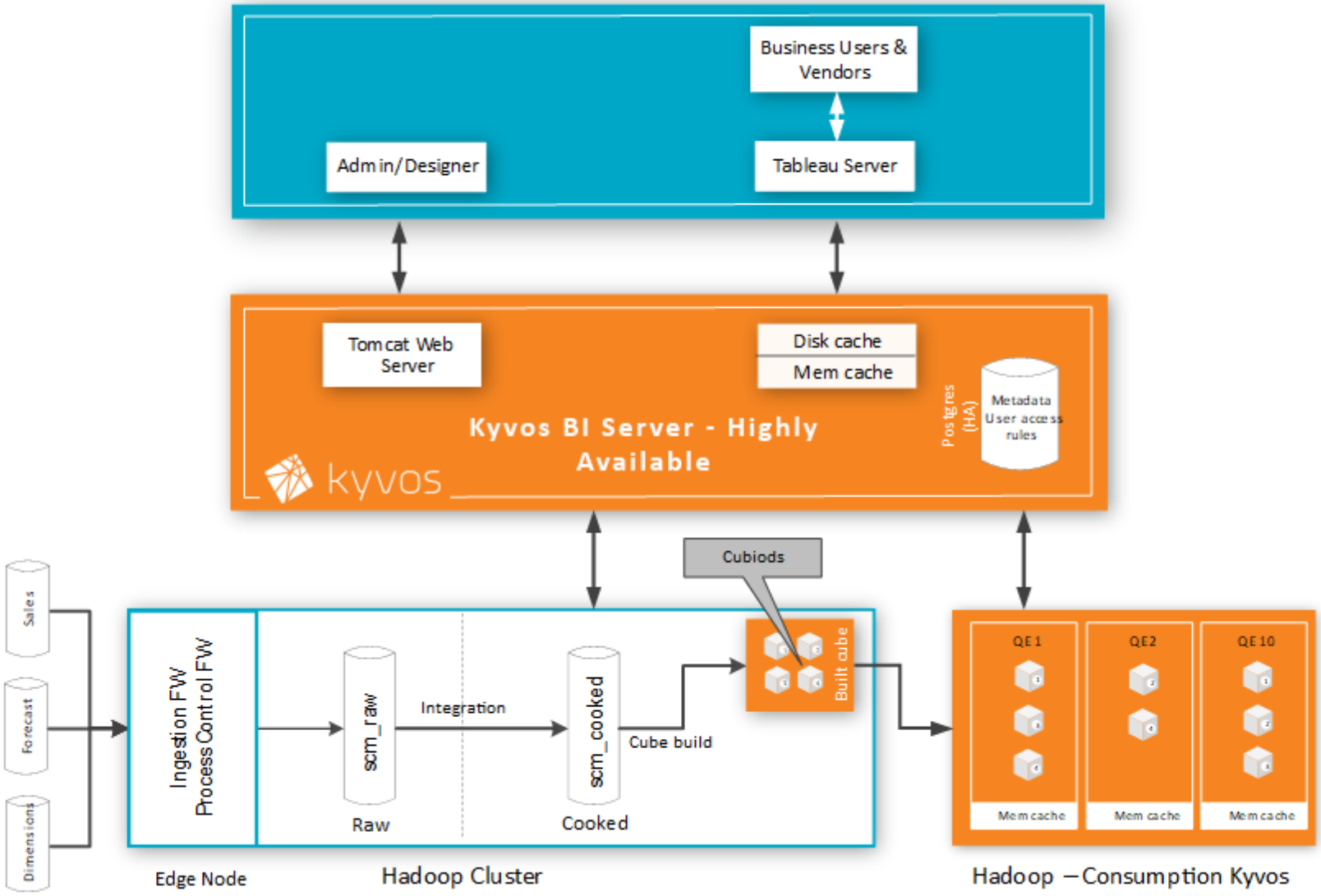
Tableau Performance with Kyvos

Use Case	Fact Rows	Dimensions	Measures	Time Window of Data	Cube Size	Query Performance
Forecast Scorecard	**62 Billion**	59	61	104 Weeks	74 TB	**10 seconds**
Suppliers Scorecard	**42 Billion**	69	36	104 Weeks	70 TB	**6.8 seconds**
Out of Stock (Outs) Scorecard	**6 Billion**	57	45	104 Weeks	19 TB	**8.2 seconds**
Inventory Purpose	**124 Billion**	48	41	53 Weeks	29 TB	**9 seconds**
Sales & Operations Planning	**50 Billion**	56	36	104 Weeks	74 TB	**7 seconds**

Walgreens Big Data Architecture



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Supplier Performance Use Case

Objective: Enable our vendors to analyze their performance at each item and store level including lead times, shipment, and forecasts.

To provide row level security for each vendor's data.

Supplier scorecard fully automated, available weekly with KPIs on supplier performance

- Walgreens Supplier Management team able to **compare suppliers side by side**
- **Multiple reports** consolidated **into a single scorecard**
- Supports **complex filtering and queries** to identify trends and take action

Supplier direct access to their KPIs and performance trends with row level security

- KPIs for **week to date** and **year to date**
- **Current year Performance vs last year**
- KPI to PO Drill down to **line item detail**
- Best/Worst performing items

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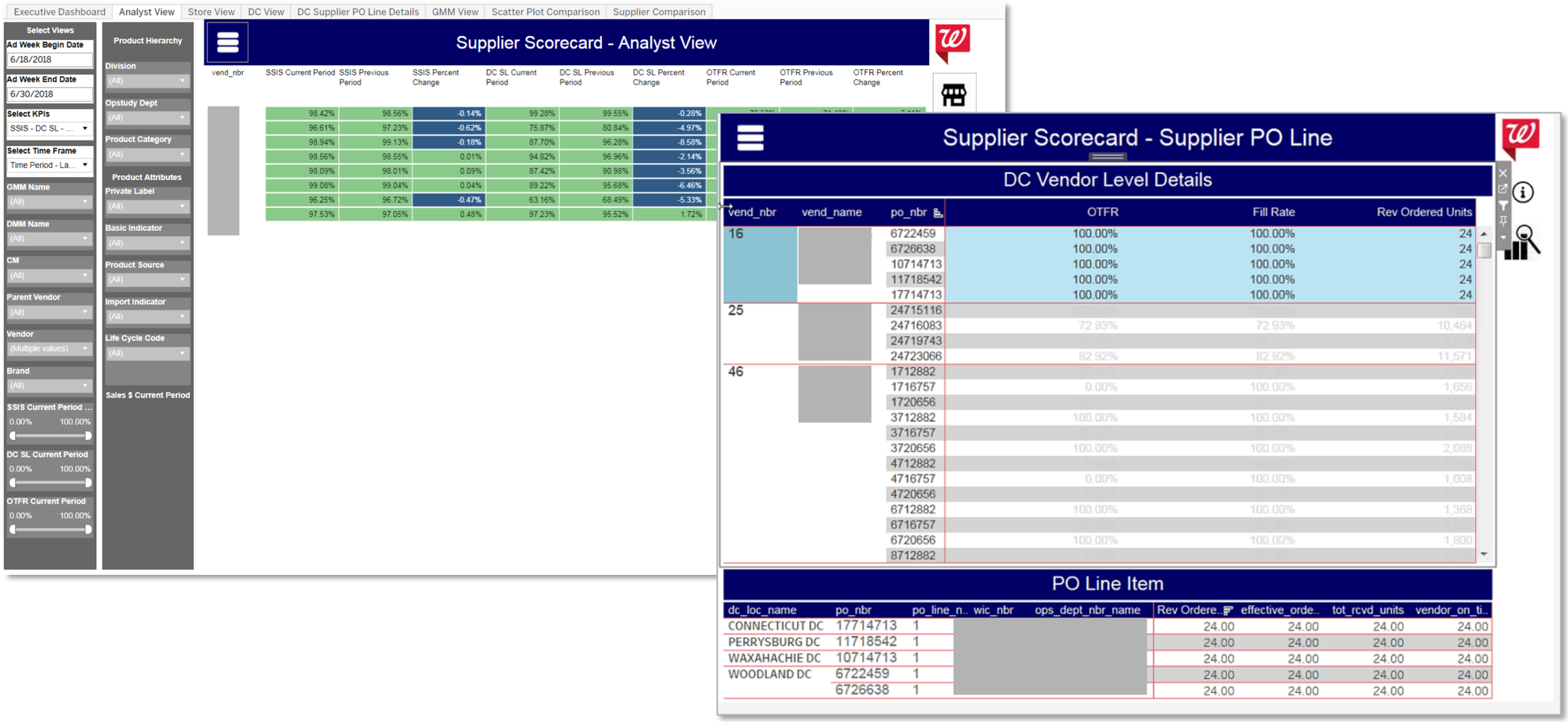
Supplier Performance Use Case

Scorecard updated weekly with drill down to PO Line and Shipment details by vendor



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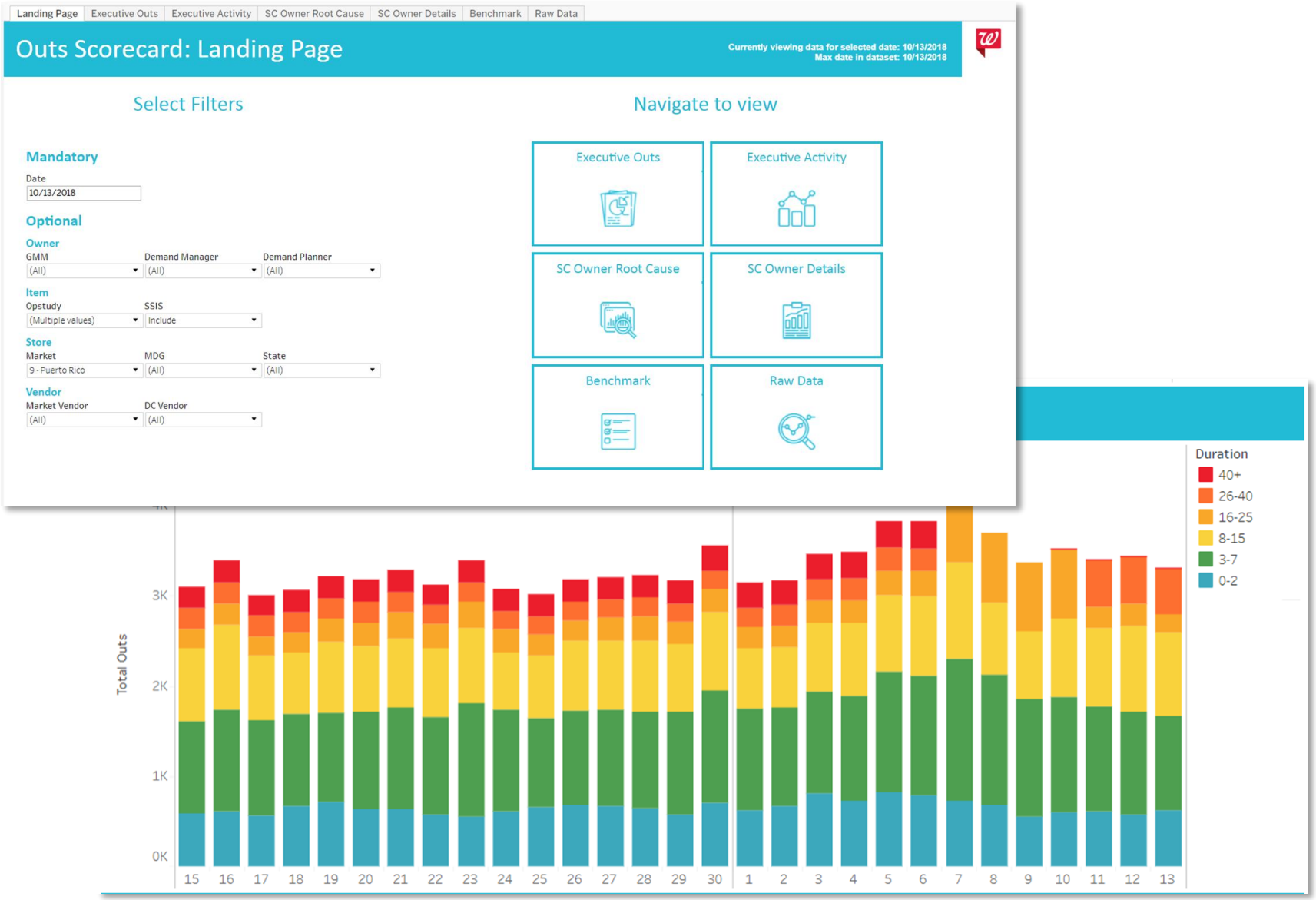
Supplier Performance Use Case

Side by Side Supplier Comparisons

Out of Stock Items

Out of Stock trends for Puerto Rico stores, filtered on selected OpStudies



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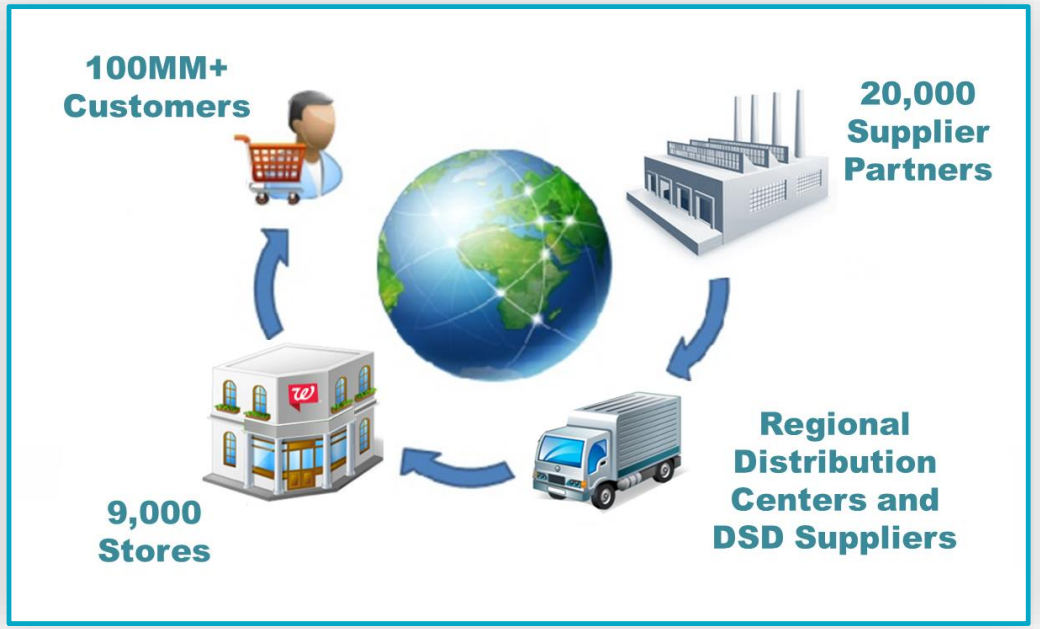
Inventory Purpose

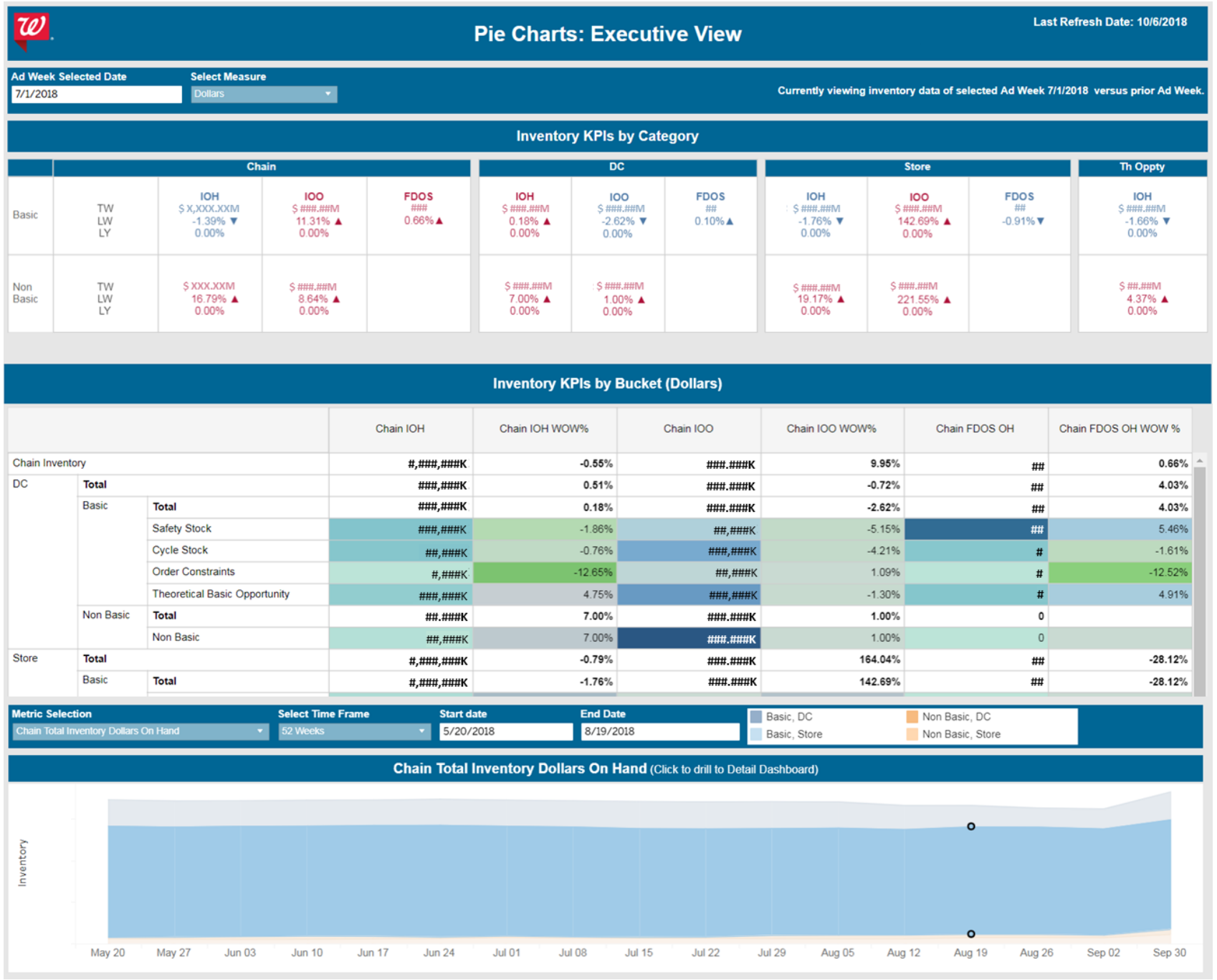
Objective: Identify ways to reduce excess days of supply across 9,000 stores by analyzing all products at the store and distribution center level.

- Critical component of Supply Chain
- Four business units–different planning and forecasting needs for each
- Need to engage vendors and merchants to stock the right SKUs
- Inventory Management flow–tracking inventory to DCs and stores for better customer experience



Inventory Purpose

- Current positions for all levels in the supply chain
  - YoY comparisons
  - WoW comparisons
  - Largest changes by category
- Visual guides to identify patterns, drill for details, make adjustments
- Chart builder tool to identify outliers, research issues



Pie Charts: Executive View

Last Refresh Date: 10/6/2018

Ad Week Selected Date: 7/1/2018 | Select Measure: Dollars

Currently viewing inventory data of selected Ad Week 7/1/2018 versus prior Ad Week.

Inventory KPIs by Category

	Chain				DC			Store			Th Oppty
		IOH	IOO	FDOS	IOH	IOO	FDOS	IOH	IOO	FDOS	IOH
Basic	TW LW LY	$ X,XXX.XXM -1.39% ▼ 0.00%	$ ###.##M 11.31% ▲ 0.00%	### 0.66% ▲	$ ###.##M 0.18% ▲ 0.00%	$ ###.##M -2.62% ▼ 0.00%	## 0.10% ▲	$ ###.##M -1.76% ▼ 0.00%	$ ###.##M 142.69% ▲ 0.00%	## -0.91% ▼	$ ###.##M -1.66% ▼ 0.00%
Non Basic	TW LW LY	$ XXX.XXM 16.79% ▲ 0.00%	$ ###.##M 8.64% ▲ 0.00%		$ ###.##M 7.00% ▲ 0.00%	$ ###.##M 1.00% ▲ 0.00%		$ ###.##M 19.17% ▲ 0.00%	$ ###.##M 221.55% ▲ 0.00%		$ ##.##M 4.37% ▲ 0.00%

Inventory KPIs by Bucket (Dollars)

			Chain IOH	Chain IOH WOW%	Chain IOO	Chain IOO WOW%	Chain FDOS OH	Chain FDOS OH WOW %
Chain Inventory			#,###,###K	-0.55%	###.###K	9.95%	##	0.66%
DC	**Total**		###,###K	0.51%	###.###K	-0.72%	##	4.03%
	Basic	**Total**	###,###K	0.18%	###.###K	-2.62%	##	4.03%
		Safety Stock	###,###K	-1.86%	##,###K	-5.15%	##	5.46%
		Cycle Stock	##,###K	-0.76%	###,###K	-4.21%	#	-1.61%
		Order Constraints	#,###K	-12.65%	##,###K	1.09%	#	-12.52%
		Theoretical Basic Opportunity	###,###K	4.75%	###,###K	-1.30%	#	4.91%
	Non Basic	**Total**	##.###K	7.00%	###.###K	1.00%	0	
		Non Basic	##,###K	7.00%	###.###K	1.00%	0	
Store	**Total**		#,###,###K	-0.79%	###.###K	164.04%	##	-28.12%
	Basic	**Total**	#,###,###K	-1.76%	###.###K	142.69%	##	-28.12%

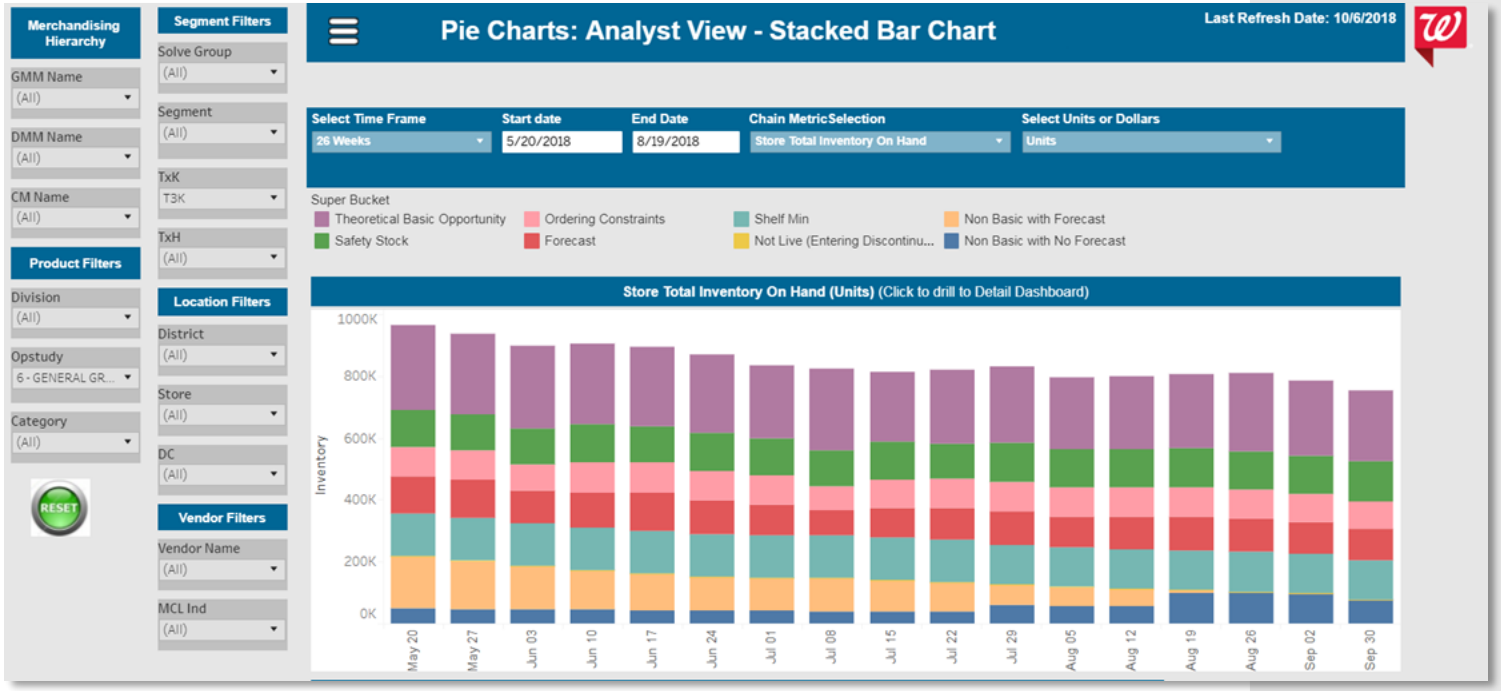
Metric Selection: Chain Total Inventory Dollars On Hand | Select Time Frame: 52 Weeks | Start date: 5/20/2018 | End Date: 8/19/2018

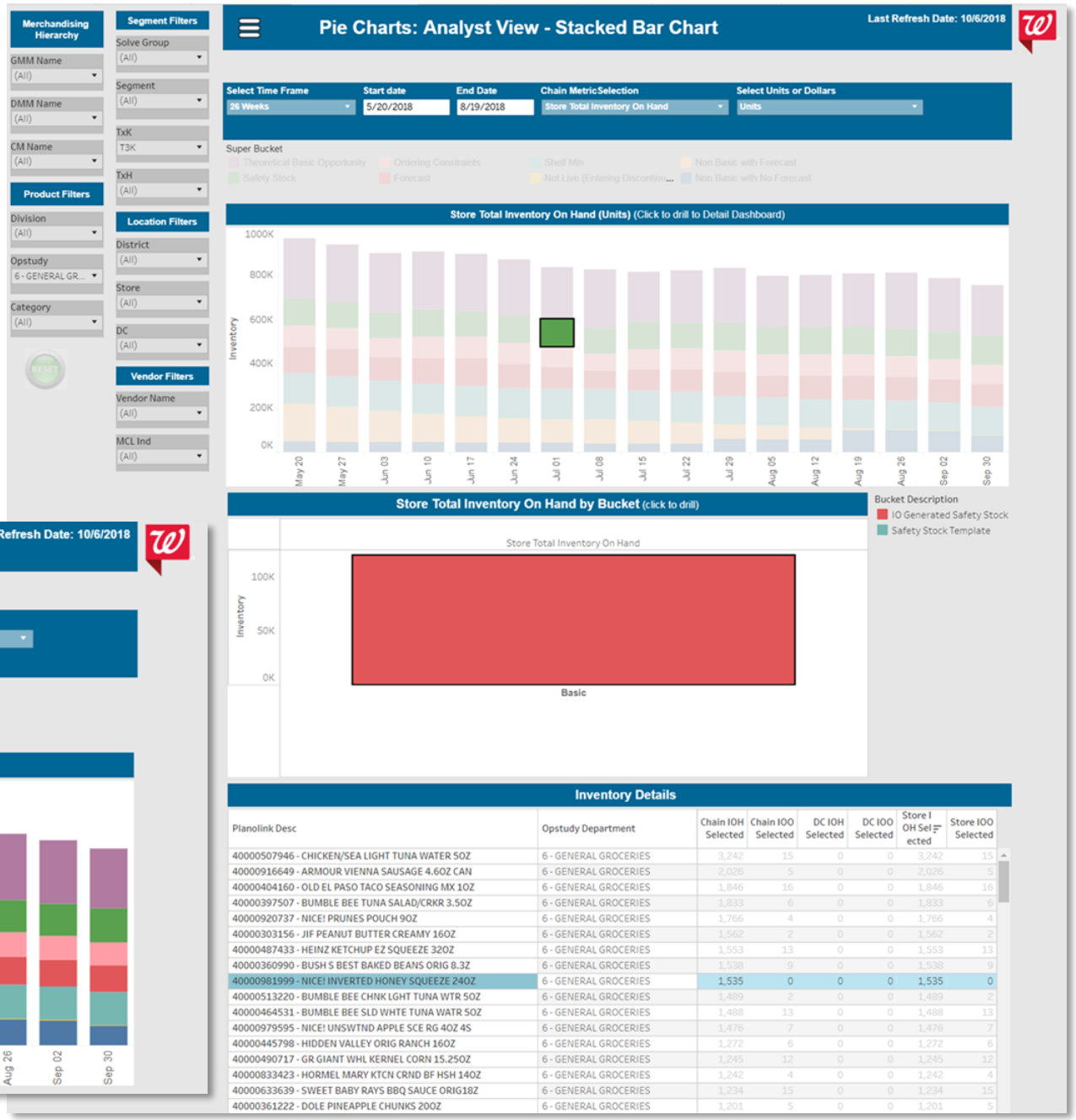
Basic, DC | Non Basic, DC | Basic, Store | Non Basic, Store

Chain Total Inventory Dollars On Hand (Click to drill to Detail Dashboard)

Inventory Purpose

Drilldown to details against
2 billion records per week





Performance: Tableau on Kyvos

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Inventory Purpose Example Introduction

- Filtering 30+B Inventory Records
- Across 17 weekly partitions
- For multiple store segments…
- In under 10 Seconds

Pie Charts: Analyst View - Stacked Bar Chart

Last Refresh Date: 10/6/2018

Merchandising Hierarchy

GMM Name: (All)

DMM Name: (All)

CM Name: (All)

Product Filters

Division: (All)

Opstudy: (All)

Category: (All)

RESET

Segment Filters

Solve Group: (All)

Segment: (All)

TxK: (All)

TxH: (All)

Location Filters

District: (All)

Store: (All)

DC: (All)

Vendor Filters

Vendor Name: (All)

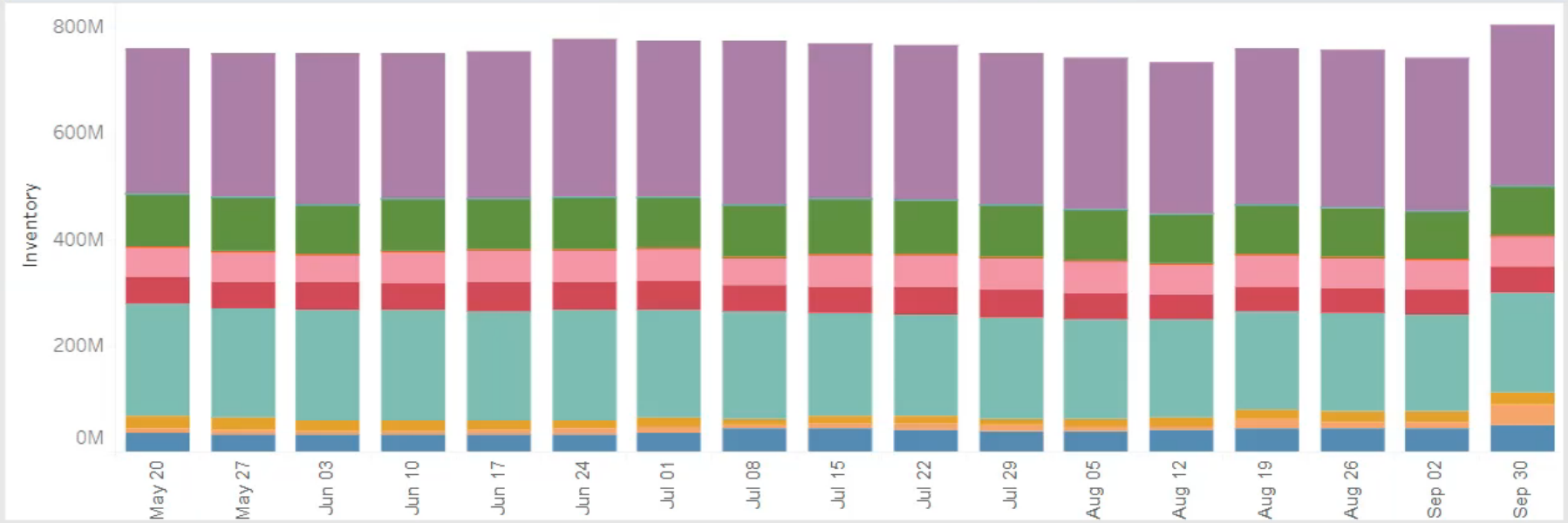
MCL Ind: (All)

Select Time Frame	Start date	End Date	Chain MetricSelection	Select Units or Dollars
26 Weeks	5/20/2018	8/19/2018	Store Total Inventory On Hand	Units

Super Bucket

Theoretical Basic Opportunity | Order Constraints | Cycle Stock | Safety Stock | Non Basic | Or

Store Total Inventory On Hand (Units) (Click to drill to Detail Dashboard)



Tableau/Kyvos Development Key Points

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- **Leverage the Strengths of both parts**
  - Pause/Resume when changing filters
  - Help users make good design tradeoffs (e.g. breadcrumbs, no. of filters)
- **Getting the data design right upfront is key**
  - Hierarchies must be fully qualified in Kyvos
  - Measures should be defined in advance
  - TDS file from Kyvos required to show hierarchy in Tableau
- **Appropriate partition schema is critical**
  - Optimize based on analyst use cases
  - Use Kyvos Partitioning to support fast query response time
- **Minimize Tableau layer calculations**
  - Weighted calculation using LOD function of Tableau
  - Data source joins

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Benefits

Technical

- Super fast response times on trillions of rows
- On-demand analysis
- Instant insights
- Single source of truth
- Minimal IT dependency
- Scheduled automated pre-aggregation
- Drill down to lowest level of granularity
- Tableau on steroids

Business

- Reduced time to insight
- Better forecasting visibility
- Granular drill down that was impossible before
- Improved supply planning
- Reducing out of stock items
- Cost savings on excess inventory
- Enhanced supplier collaboration
- Identify sales opportunities sooner
- Ability to share and collaborate across teams

Lessons Learned

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- A picture paints a thousand words
- It’s very important to provide accurate visualizations
- Criticality of data visualization at this scale
- Deliver essential information and make visualizations user friendly
- Focus on exact business requirements
- Technology stack is important, but correct infrastructure is more important
- Choosing the right technology partners

Q & A

Thank you!

Meet Kyvos Team at Booth #628

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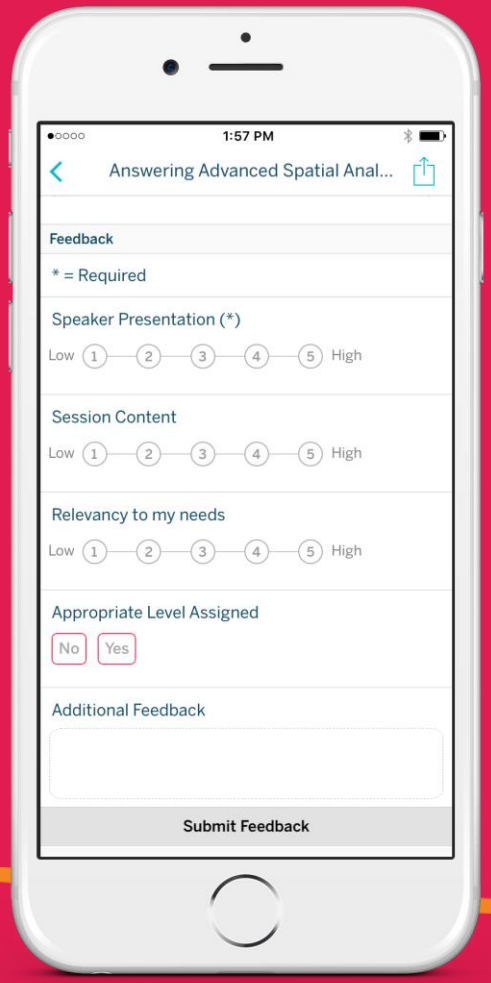

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