ORACLE®

Exalytics In-Memory Machine

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Oracle Engineered Systems

Hardware and Software Engineered to Work Together

"We will accelerate the Engineered Systems trend…new engineered systems will optimally combine Oracle software, Oracle silicon and Oracle hardware to deliver extreme performance, fault-tolerant reliability and improved ease of use."

Larry Ellison, Q1 FY12 Earnings Call, September 20, 2011

Oracle Engineered Systems

- Engineered
- Tested
- Certified
- Deployed
- Upgraded
- Managed
- Supported

Together

Value Proposition

- Fastest time to market
- Highest performance
- Easiest to manage
- Lowest TCO
- Maximum innovation: Focus of Oracle R&D

Oracle designs engineered systems that are pre-integrated to reduce the cost and complexity of IT infrastructures while increasing productivity and performance!

The Exa* Story Evolves…

Engineered Systems for Increased Business Value

- **Oracle Exadata** – best machine for:
  - Data warehousing, OLTP
  - Database consolidation
  - Cloud Computing (DB)
- **Oracle Exalogic** – best machine for:
  - Oracle Business Apps., Oracle FM & Java
  - OLTP apps.
  - Application consolidation
  - Cloud computing (Apps)
- **Oracle Exalytics** – best machine for:
  - Instantaneous Business Intelligence
  - Speed-of-thought analysis
  - Financial and Operational Planning

Oracle Exalytics - First Engineered System for Analytics

- **Extreme performance In-Memory analytics**
- Everything runs faster if you keep it in DRAM
- hw&sw with parallel in-mem.db, and parallel in-mem.analysis on top + parallel machine
- hw&sw engineered together to deliver data analysis at a speed of tought
- Instantaneous results, faster than you can type... as fast as you can think
- Analysis is instantaneous ‘cause all the data you are anylyzing are in the memory
- In-memory database

Exalytics Hardware

RAM Machine Optimized to Run BI Foundation Suite

Memory

1 TB RAM, 1033 MHz

Compute

- 4 Intel® Xeon® E7-4870 series processors,
-each processor supports 10 compute cores,
- 40 cores total

H/W physical scan rate of 200 Gigabytes per second

Scan compressed 5 TB Database in 5 seconds

Networking

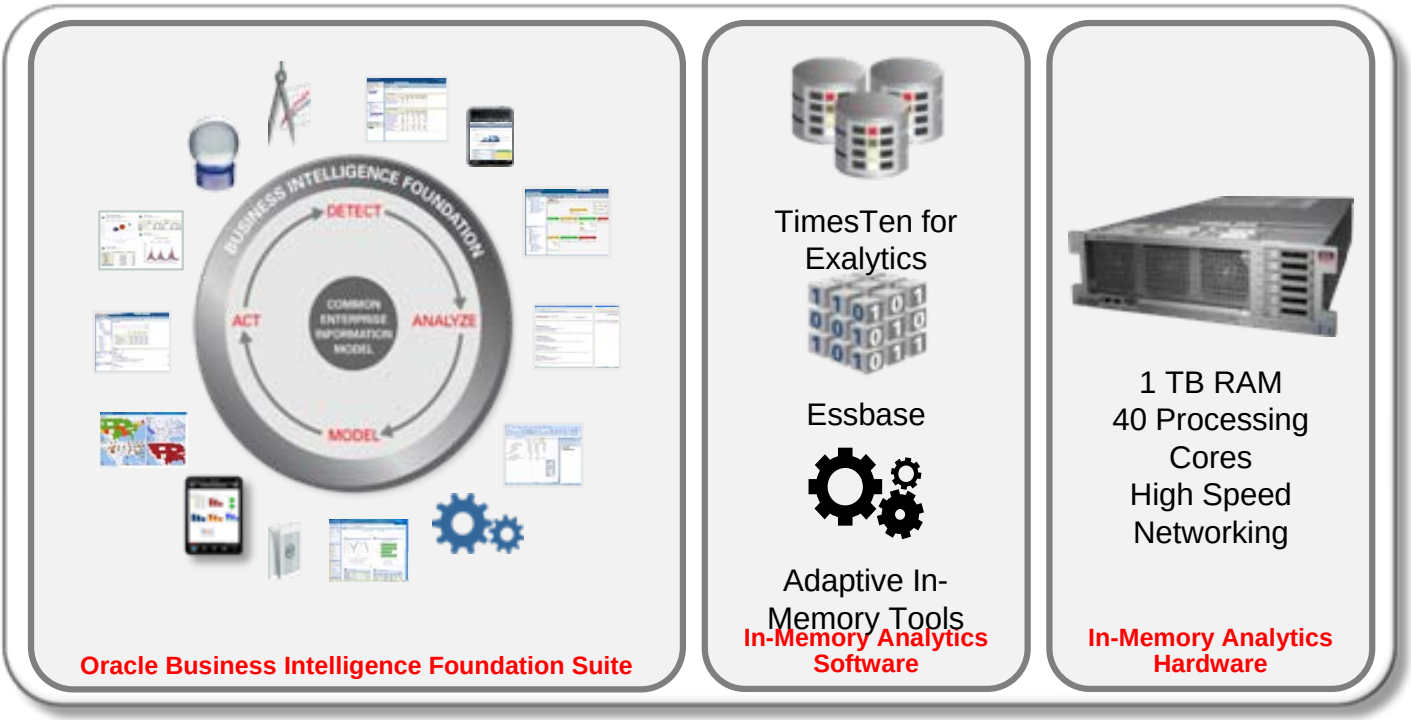
- 40 Gbps InfiniBand – 2 ports → integral part of private Exadata InfiniBand network; high-speed, low-latency access to Oracle database
- 10 Gbps Ethernet – 2 ports → for connecting enterprise data sources and for client access
- 1 Gbps Ethernet – 4 ports → available for client access

Storage

- high-performance direct attached storage system including high performance RAID HBA and 3.6 TB HDD Capacity

Exalytics Software

New In-Memory Parallel Versions of OBI, Essbase, and TimesTen

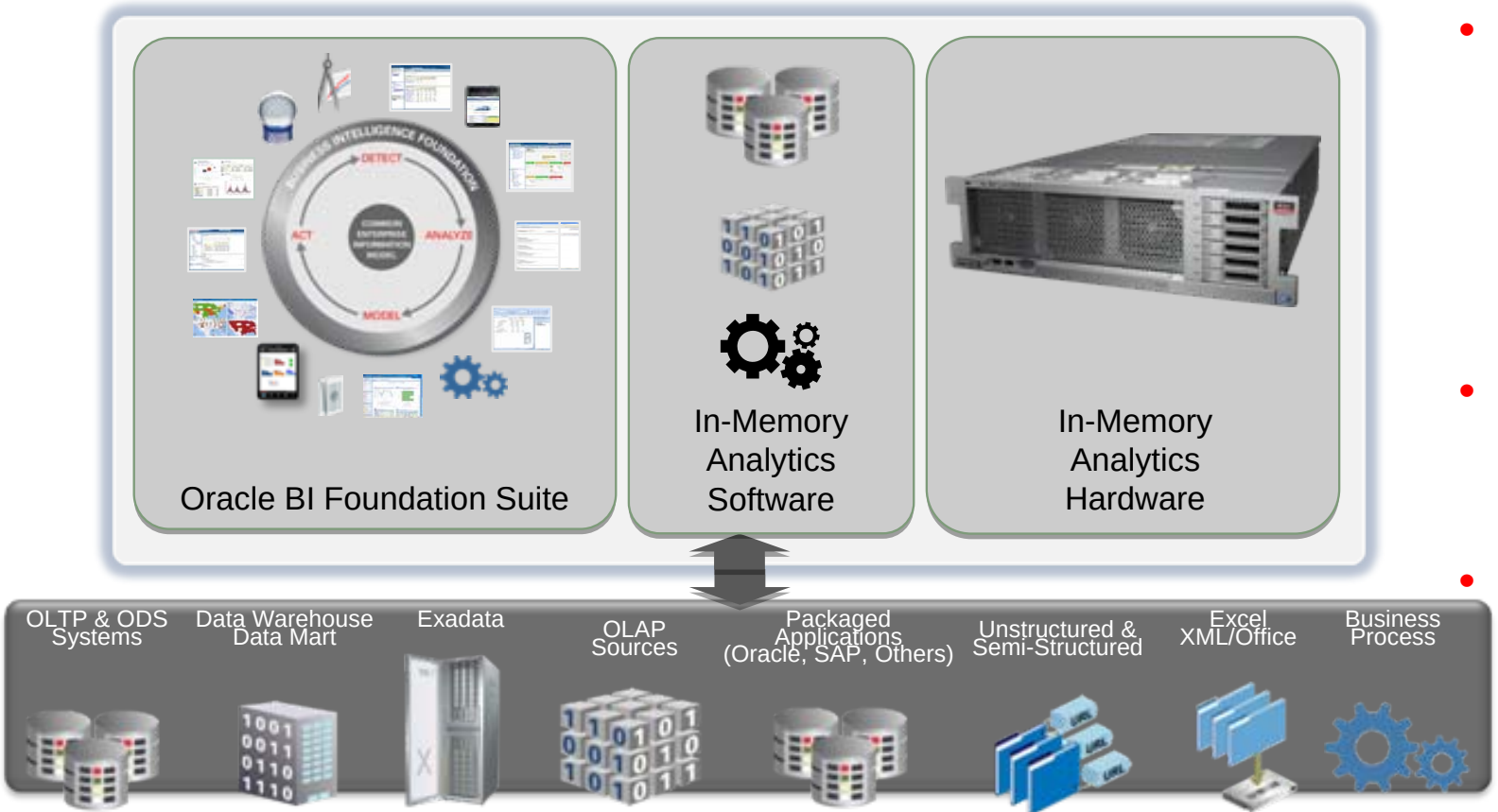


- TT: in-mem. parallel db with Adaptive In-Memory Caching and Columnar Compression: stores data in main memory; response time dramatically faster with no network latency or disk I/O
- enhancements to Essbase for In-mem.parallel multidim.analysis, improvements to overall storage layer performance, enh.to parallel operations, enh.MDX syntax and high performance MDX query engine, 16X faster query execution – 6X writeback & calculations inlcuding batch processes
- In-memory optimizations for BI and EPM applications

- BI Server supports in-mem.intelligent result caching
- OBI Presentation Services now provides highly interactive visualizations, data exploration and high-density visualizations.
- Runs existing BI apps without change

Analyze Any and All Data Sources

Relational and Multidimensional Sources in any Combination



- handles not only relational or multidim.data, but also unstructured data or whatever data you take at a speed of tought
- everything is in DRAM, compressed, operates in parallel
- no response time - instantaneous

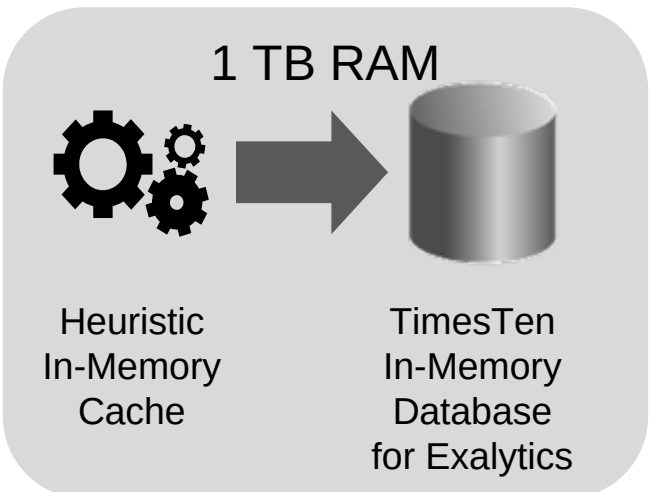
In-Memory Analytics

2 In-Memory Database Engines

- Parallel TimesTen Database
- Parallel Essbase

4 Techniques for leveraging data mgmt engines

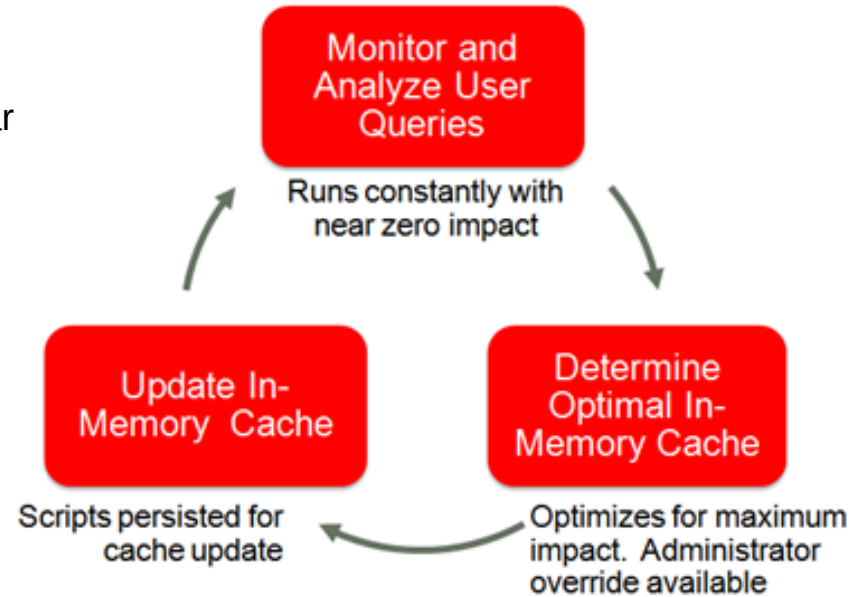
- In-Memory Data Replication
  - When data can entirely fit in memory
  - OBI Server can replicate entire dw into TT in-mem. db
- In-Memory Adaptive Data Mart
  - with Automated Mgmt
  - for automatic identifying and mgmt of “hot” large data sets/marts
- In-Memory Intelligent Results Cache
  - populated with results of previous logical queries generated by the server
  - providing data for repeated queries, and “sub-sets” of these queries
  - Exalytics provides tools to analyze usage, identify and automate the pre-seeding of result caches for instant query responsiveness at run time
- In-Memory Cubes



Adaptive In-Memory Technology

In-Memory Analytics

- Adaptive Summary Intelligence
  - Based on proven Oracle In-Memory technology, enhanced with columnar compression & analytic functions
  - Decides what gets stored in-memory
  - Identifying and creating a data mart for the relevant “hot” data
  - Implementing in-mem. data mart in TT – provides the most effective improvement in query response time for large data sets
  - Adapts to change in analytic workloads
  - Optimizes performance for best responsiveness
- Automated Management
  - Reduces tuning time and effort by providing automation that identifies, creates and maintains the best-fit in-mem. data mart for certain BI deployment
  - Administrator can overide adaptive cache (“I want to keep these summaries in the mem.all the time...”)
  - If administrator doesn’t do tuning, it will tune itself
  - Offload DW query load with high performance cache for any number of users



Exalytics Optimized to work with Exadata

Extreme Performance: Query Processing & Analytics

InfiniBand

• 40Gb/s of dedicated connectivity to Oracle Exadata's private InfiniBand network via 2-port InfiniBand interface

50X Faster Query Performance

Extreme performance via pre-integrated, optimized Oracle database platform

Instantaneous Analytics

•supports optimum SQL generation for Exadata

• where the DW can't entirely fit into Exalytics in-mem.cache - benefit by leveraging Exadata's massively parallel processing and extreme performance capabilities

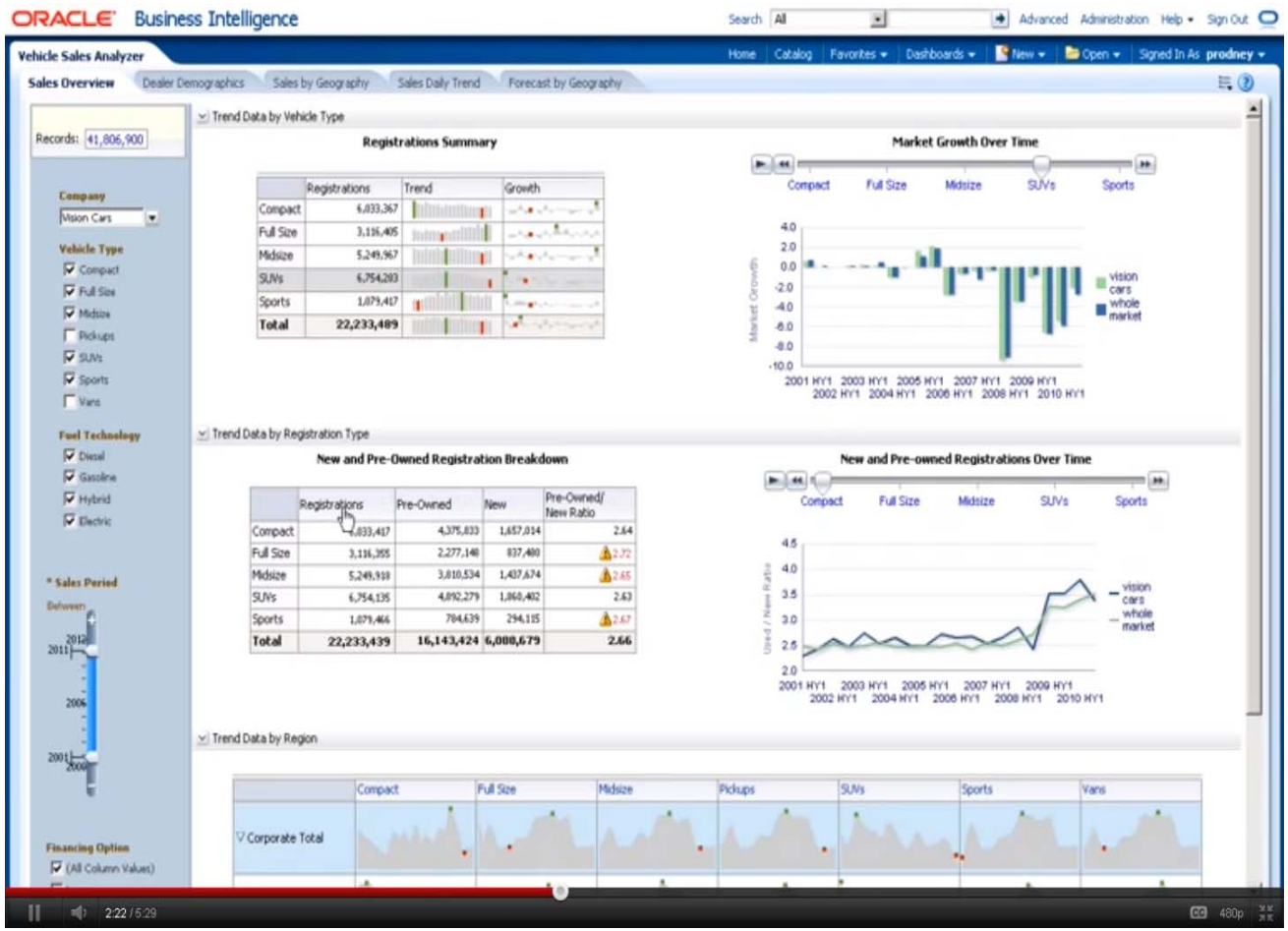
• also, Exalytics can use Exadata as an extension to its in-memory cache/data mart

End-user Experience with Exalytics

"Speed of Thought" Interactive Analysis

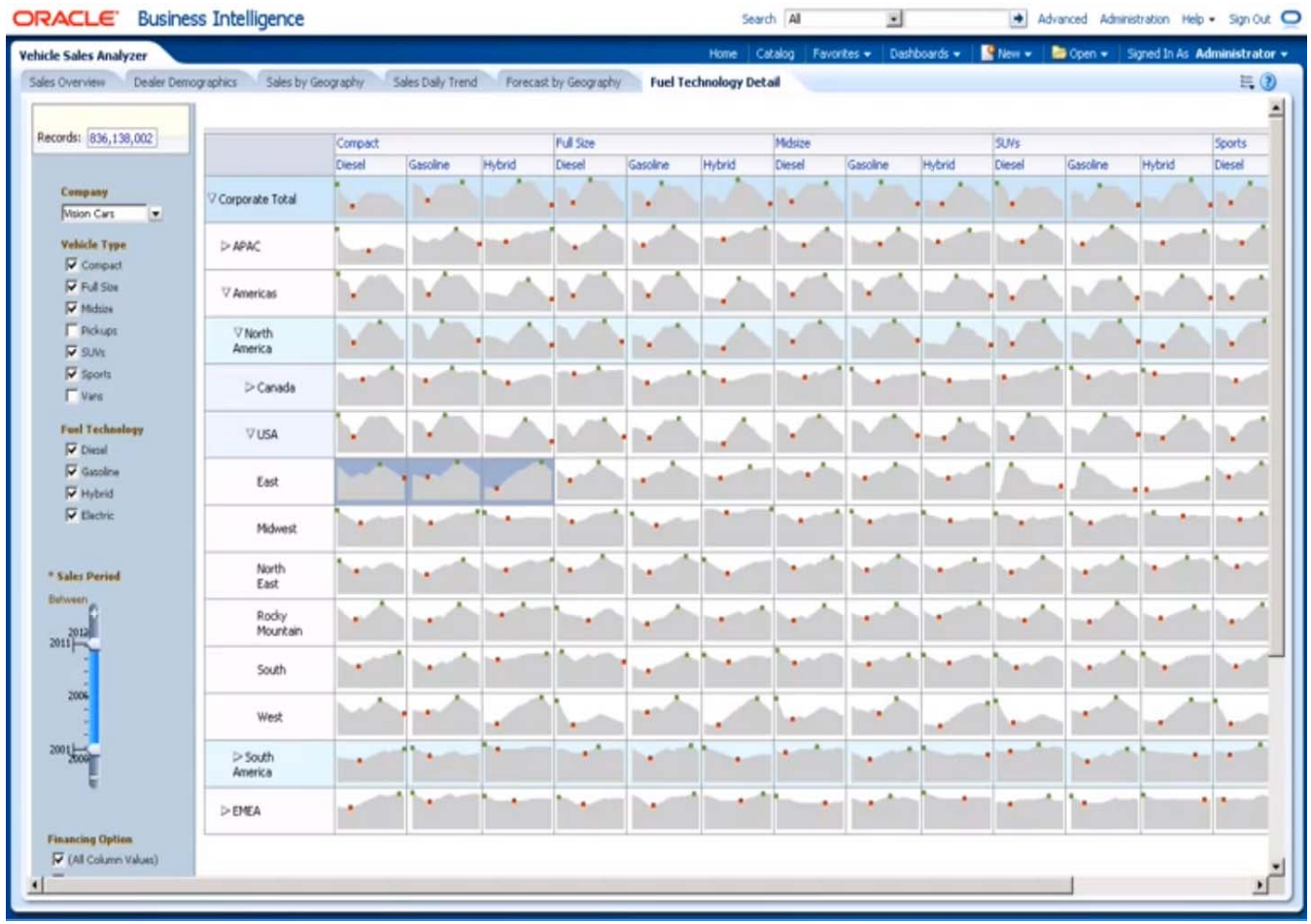
- **Highly interactive analysis:** Dimension browsing, go-less prompts, auto complete search, partial refreshes etc. that make dashboards inviting and usable.
- **Free-form data exploration:** Contextual operations, master-detail linking, display suggestions allow a BI user to explore and discover data that could not be easily done before.
- **High density visualizations:** High density visualizations like micro charts, trellis, etc. allow quick and intuitive navigation of large amount of data.

High density visualizations : Micro Charts



- High density visualizations like micro charts, trellis, etc. allow quick and intuitive navigation of large amount of data.
- Micro-Chart (Trend: lowest value - red, highest - green)

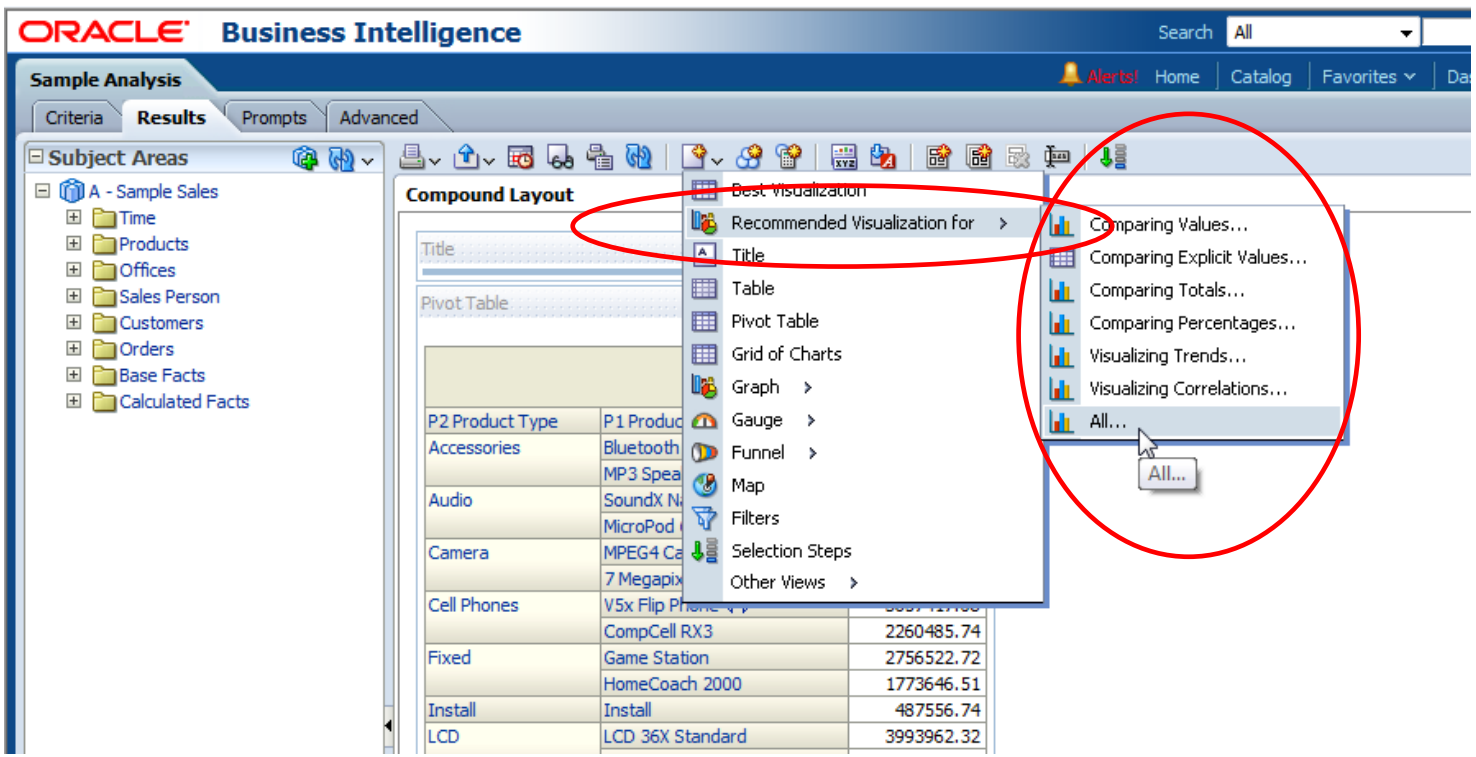
High density visualizations : Trellis Chart



- High density visualizations like micro charts, trellis, etc. allow quick and intuitive navigation of large amount of data.
- Multi-panel Trellis Chart (particularly effective at displaying multiple visualizations across a common axis scale for easy comparison, to see a trend and quickly gain insights)

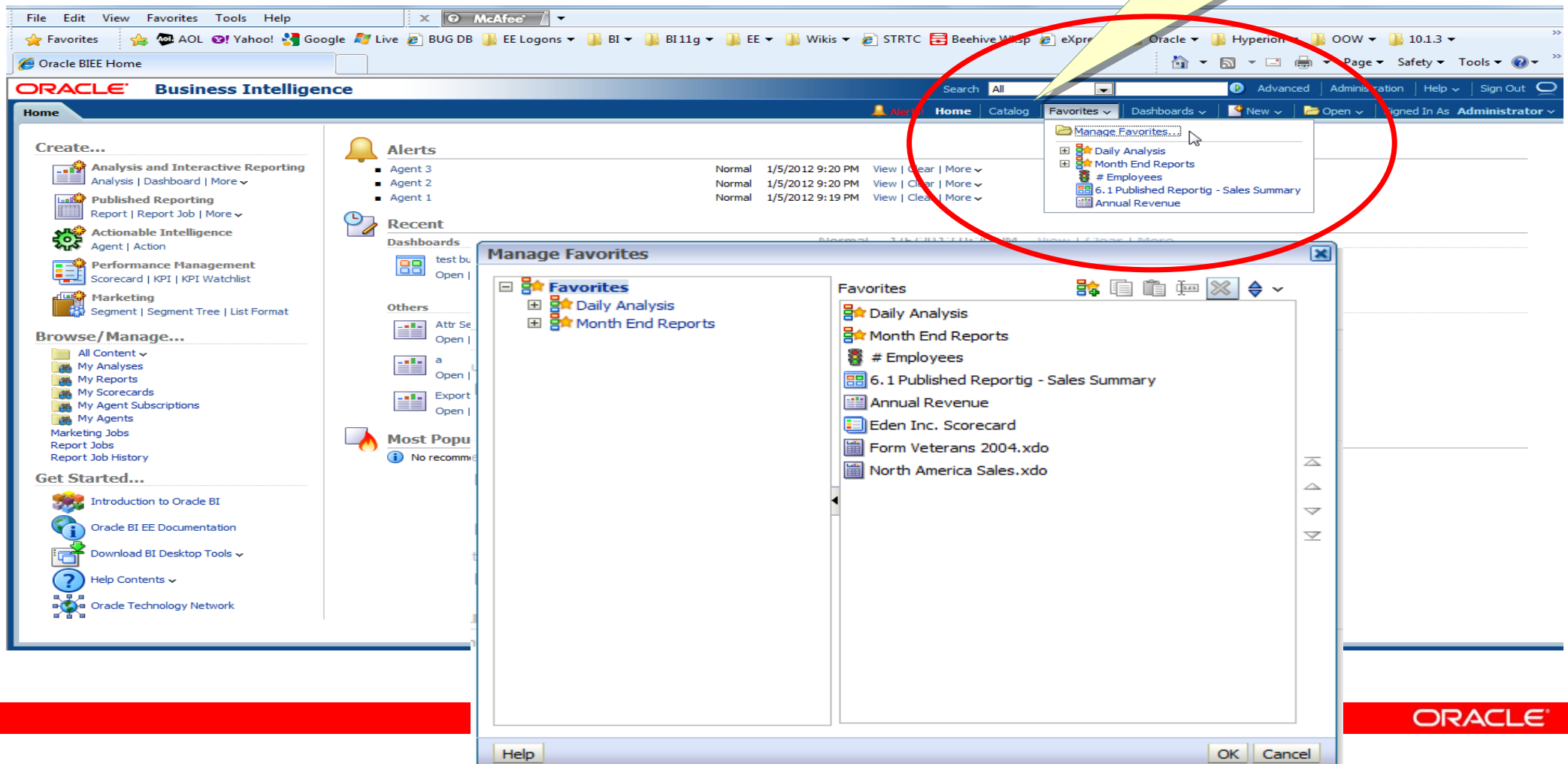
Presentation Suggestion Engine (PSE)

- Exalytics promotes self-service analytics
- PSE makes it easier to develop analytics content by providing recommendations on type of visualizations to use to best represent data set

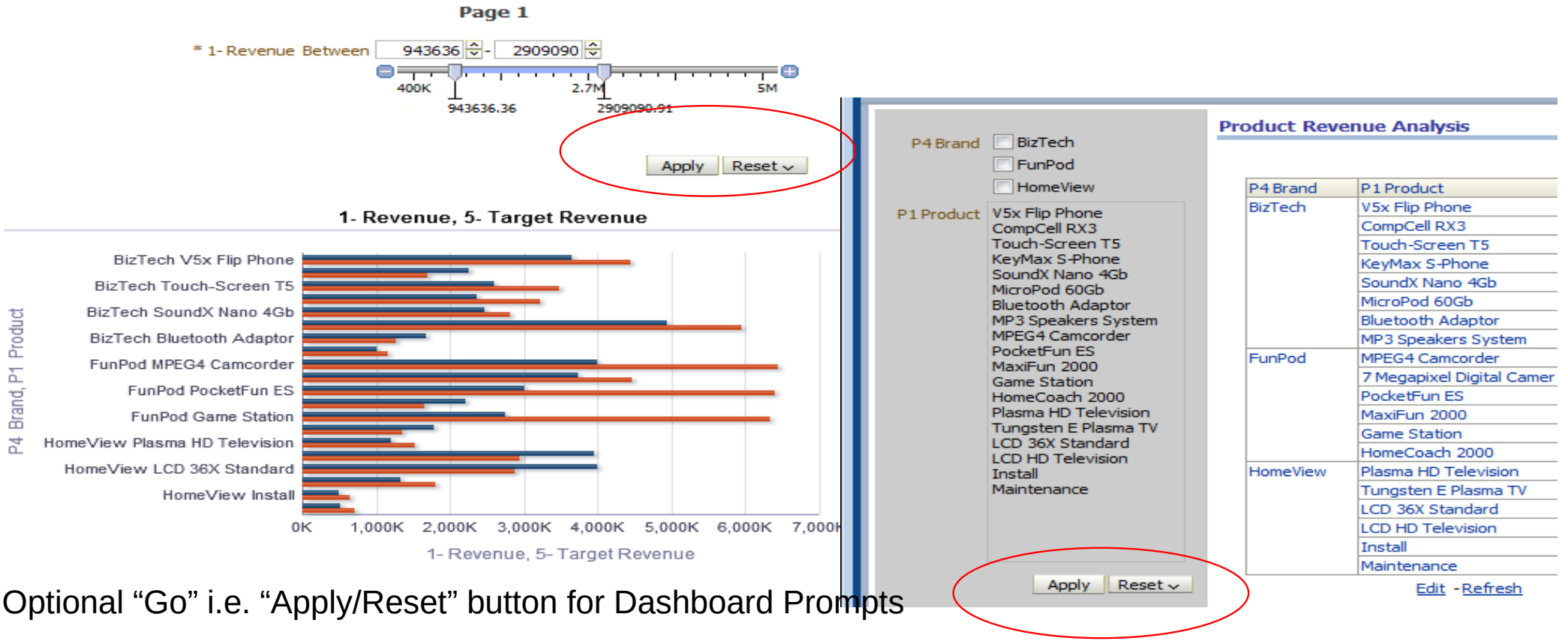


Bookmark Favorites

•Mark frequently used objects as a Favorite for easy retrieval.

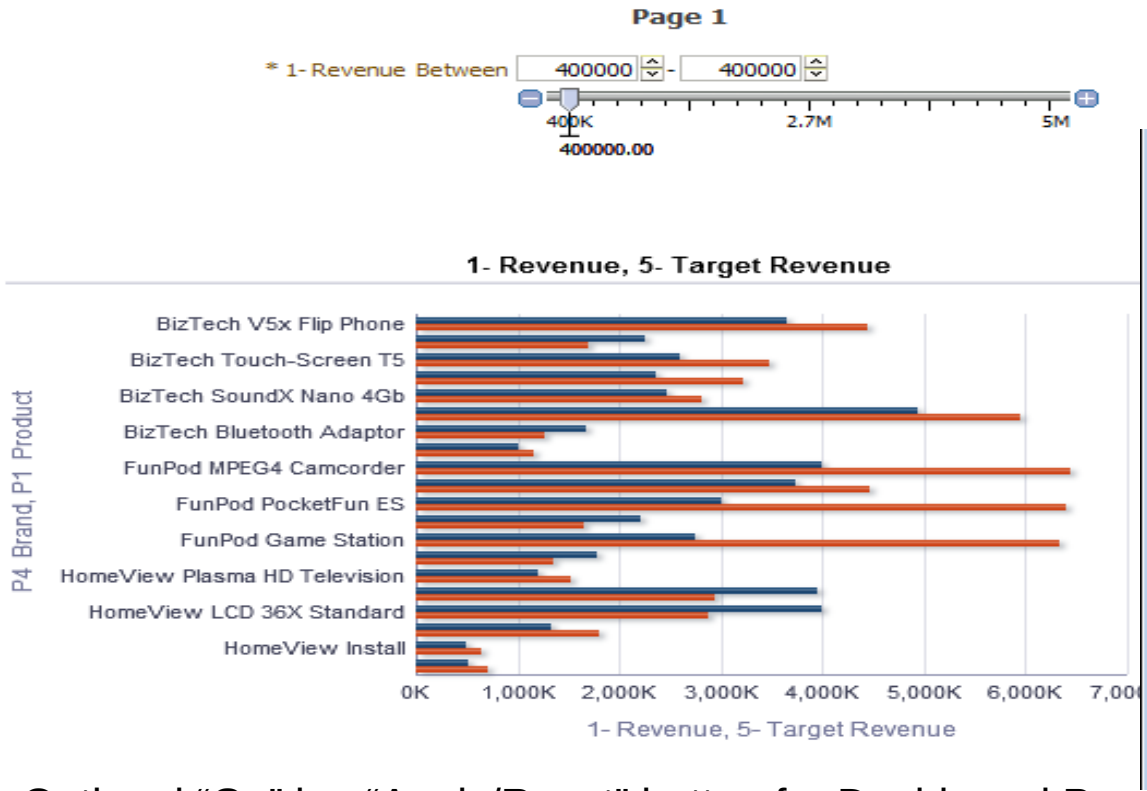


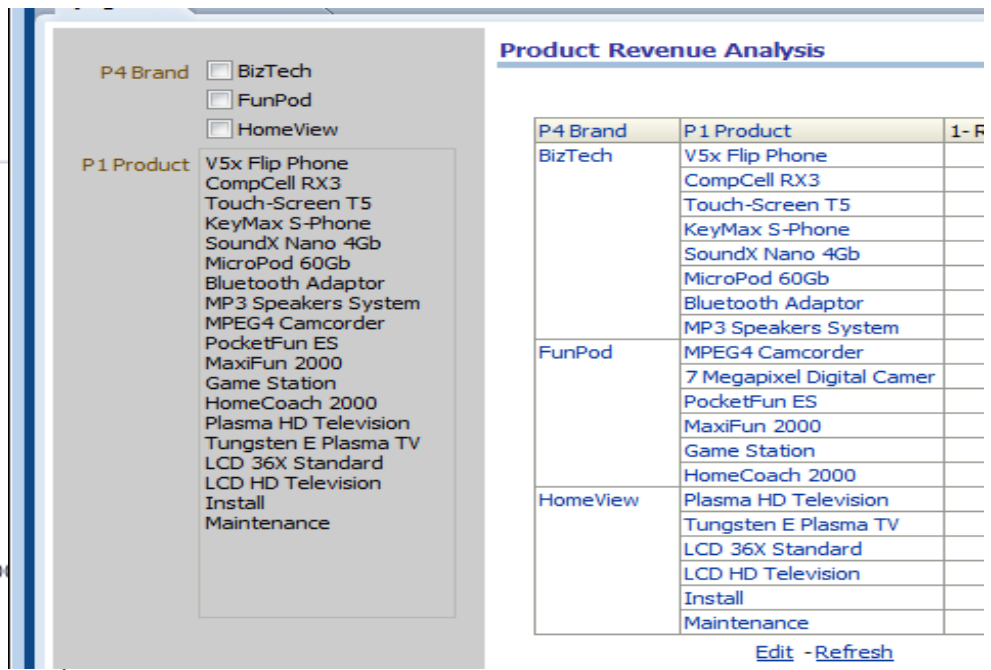
Dashboard Interactions: “Go” Less Prompt



- Optional “Go” i.e. “Apply/Reset” button for Dashboard Prompts
- Enables:
  - Rapid feedback (views and cascaded prompts)
  - Responsive user interaction

Dashboard Interactions: “Go” Less Prompt





P4 Brand	P1 Product	1- R
BizTech	V5x Flip Phone	
	CompCell RX3	
	Touch-Screen T5	
	KeyMax S-Phone	
	SoundX Nano 4Gb	
	MicroPod 60Gb	
	Bluetooth Adaptor	
	MP3 Speakers System	
FunPod	MPEG4 Camcorder	
	7 Megapixel Digital Camer	
	PocketFun ES	
	MaxiFun 2000	
	Game Station	
	HomeCoach 2000	
HomeView	Plasma HD Television	
	Tungsten E Plasma TV	
	LCD 36X Standard	
	LCD HD Television	
	Install	
	Maintenance	

- Optional “Go” i.e. “Apply/Reset” button for Dashboard Prompts
- Enables:
  - Rapid feedback (views and cascaded prompts)
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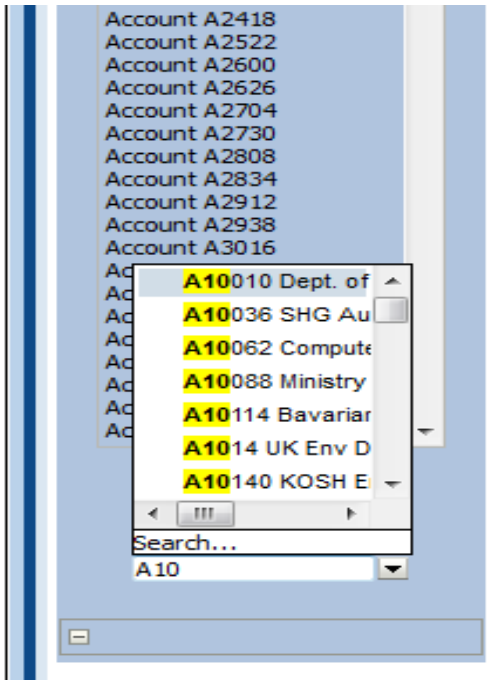
Dashboard Interactions: Partial Dashboard Refresh

- Componentize the UI elements
- Re-load the views that are listening to the prompt
- Enables:
  - High performance
  - Intuitive contextual analysis
  - Solid application feel

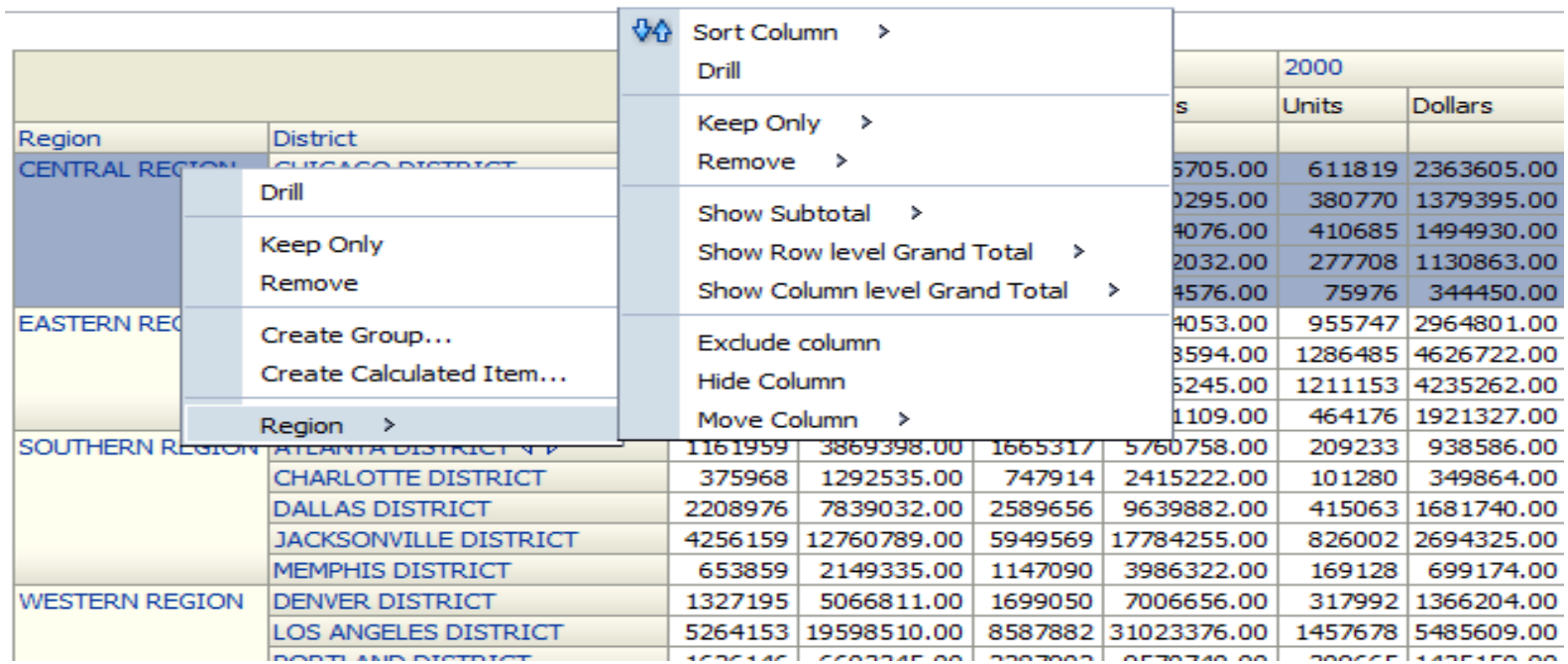
Dashboard Interactions: Auto-Complete Prompt

- Google style auto-text complete
- Auto-complete for
  - Dashboard Prompts (similar to recommendation on Web)
  - Prompt Search Dialog
- Available for
  - Choice List with typing enabled
  - Varchar data only



Dashboard Interactions: Right-Click Interactions

- Contextual Right-Click interactions (i.e. Menu)
- Can be invoked directly on a Dashboard (without going to the edit mode)



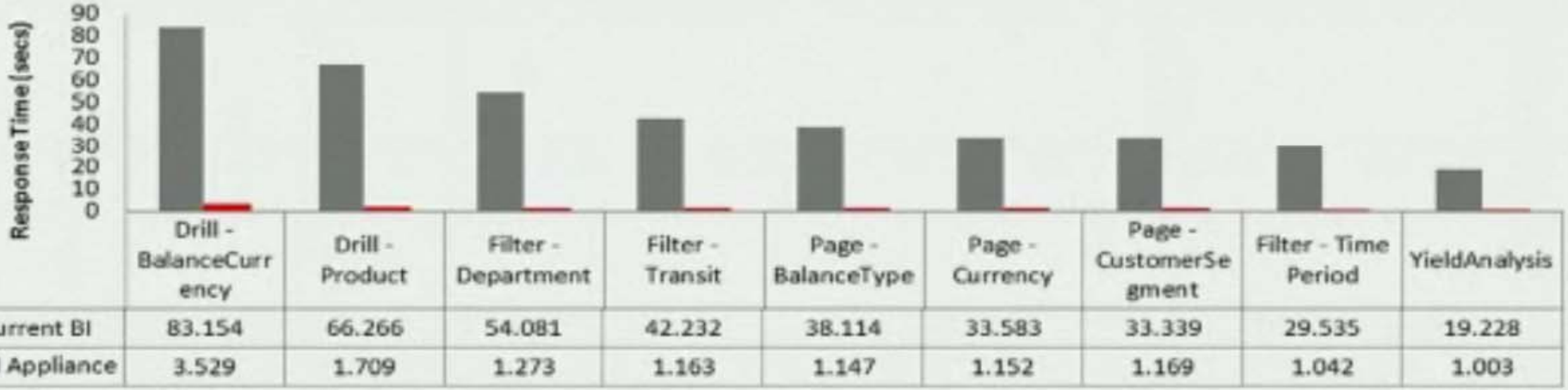
Mobile Enablement

- **All BI content instantly available to mobile users with zero extra development**
- **Speed-of-thought analysis available anywhere**

Performance: Exalytics vs. Current BI

Data Source: Non-Exadata Oracle Database

Response Time Comparisons for long running analytic queries

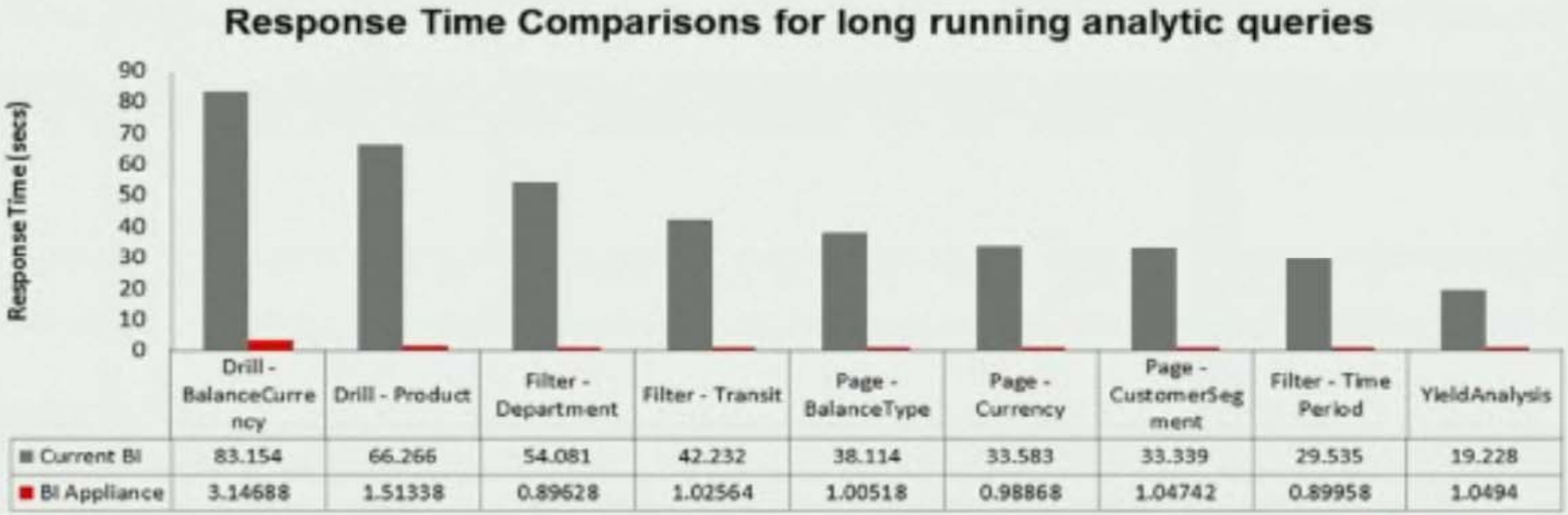


	Drill - BalanceCurrency	Drill - Product	Filter - Department	Filter - Transit	Page - BalanceType	Page - Currency	Page - CustomerSegment	Filter - Time Period	YieldAnalysis
Current BI	83.154	66.266	54.081	42.232	38.114	33.583	33.339	29.535	19.228
BI Appliance	3.529	1.709	1.273	1.163	1.147	1.152	1.169	1.042	1.003

Average response time improvement = **18X**

Performance: Exalytics vs. Current BI

Data Source: Exadata Oracle Database



	Drill - BalanceCurrency	Drill - Product	Filter - Department	Filter - Transit	Page - BalanceType	Page - Currency	Page - CustomerSegment	Filter - Time Period	YieldAnalysis
Current BI	83.154	66.266	54.081	42.232	38.114	33.583	33.339	29.535	19.228
BI Appliance	3.14688	1.51338	0.89628	1.02564	1.00518	0.98868	1.04742	0.89958	1.0494

Average response time improvement = **23X**

Performance: Exalytics Essbase (MOLAP)

Planning/Reporting Workload – Response Time Improvements

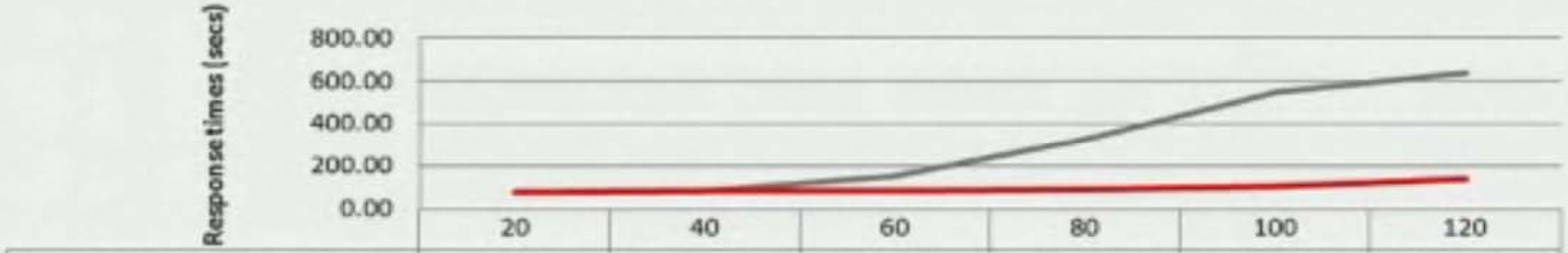
	Fix 0 (Baseline)	Fix 7	Fix 8	Fix 10	Fix 11
Transactions	Avg, sec	Avg, sec	Avg, sec	Avg, sec	Avg, sec
MDX_100x10	6.37	0.05	0.03	0.02	0.02
MDX_100x100	42.59	0.16	0.10	0.07	0.07
MDX_NONEMPTY	7.85	1.70	0.94	0.64	0.63
Total RT for MDX Query	56.81	1.90	1.06	0.74	0.72
CALC_ADD	40.13	7.48	6.94	4.44	3.08
CALC_DELETE	20.65	0.93	0.93	0.52	0.34
CALC_ALLOCATE	116.62	42.31	42.61	11.60	7.61
Total RT for Calc	177.40	50.72	50.48	16.56	11.04
Total RT for MDX+Calc	234.21	52.62	51.54	17.30	11.76

16X improvement in response time for interactive planning flows

Performance: Exalytics Essbase (MOLAP)

Oracle EPM Planning Workload – Response Time Improvements

Response Time with increasing user loads



	20	40	60	80	100	120
11.1.2.1 on Current Essbase	76.36	77.99	151.69	322.43	543.14	640.19
11.1.2.2 on BI Appliance	74.34	80.73	78.66	87.26	102.75	138.43

- **5X** improvement in response time at 120 User load
- Improved scale-up characteristics

Oracle Exalytics

Impressive Results from Early Customer Benchmarks

Nykredit

- Largest mortgage provider in Denmark, major private bond issuer in Europe
- Need to deliver outstanding performance for summary and transaction grain analysis
- **35x to 70x** faster with Exadata + Exalytics

Polk

- Supplies automotive industry with market intelligence "*PolkInsight*"
- Need highly interactive dashboards and visualizations for global analyst community
- **> 10x** faster on average and up to **100x** faster in specific cases

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Key Energy Services

- Large oilfield services company with about ~860 rigs deployed around the world
- Need to drive usage of packaged BI Applications across the organization
- **5x** shorter time to develop; **50x** faster than a custom report (without tuning)

SAVVIS

- Large cloud infrastructure services company
- Need highly interactive visualizations for large numbers of individual analyst data sets
- Consistent **Sub-second** interactivity on par with **desktop tools** down from ~30 secs

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A Global CPG Company

- Global consumer pre-packaged foods company
- Need more frequent planning and budgeting cycles for 2000+ users
- **6x** faster cycle time - **4 hours** down from more than **24 hours**

Exalytics

Feature Summary

- **Extreme Performance**
  - In-Memory Relational & In-Memory Multi-Dimensional OLAP
  - Data Warehouses & Data Marts
- **Instantaneous Speed-of-Thought Analytics**
  - Prediction, Decisioning, Simulation, Scorecards, Advanced Visualizations
- **Powerful New User Interface**
  - Identical UI Runs on PCs, iPads & i Phones

Hardware and Software

ORACLE

Engineered to Work Together

http://www.oracle.com/exalytics