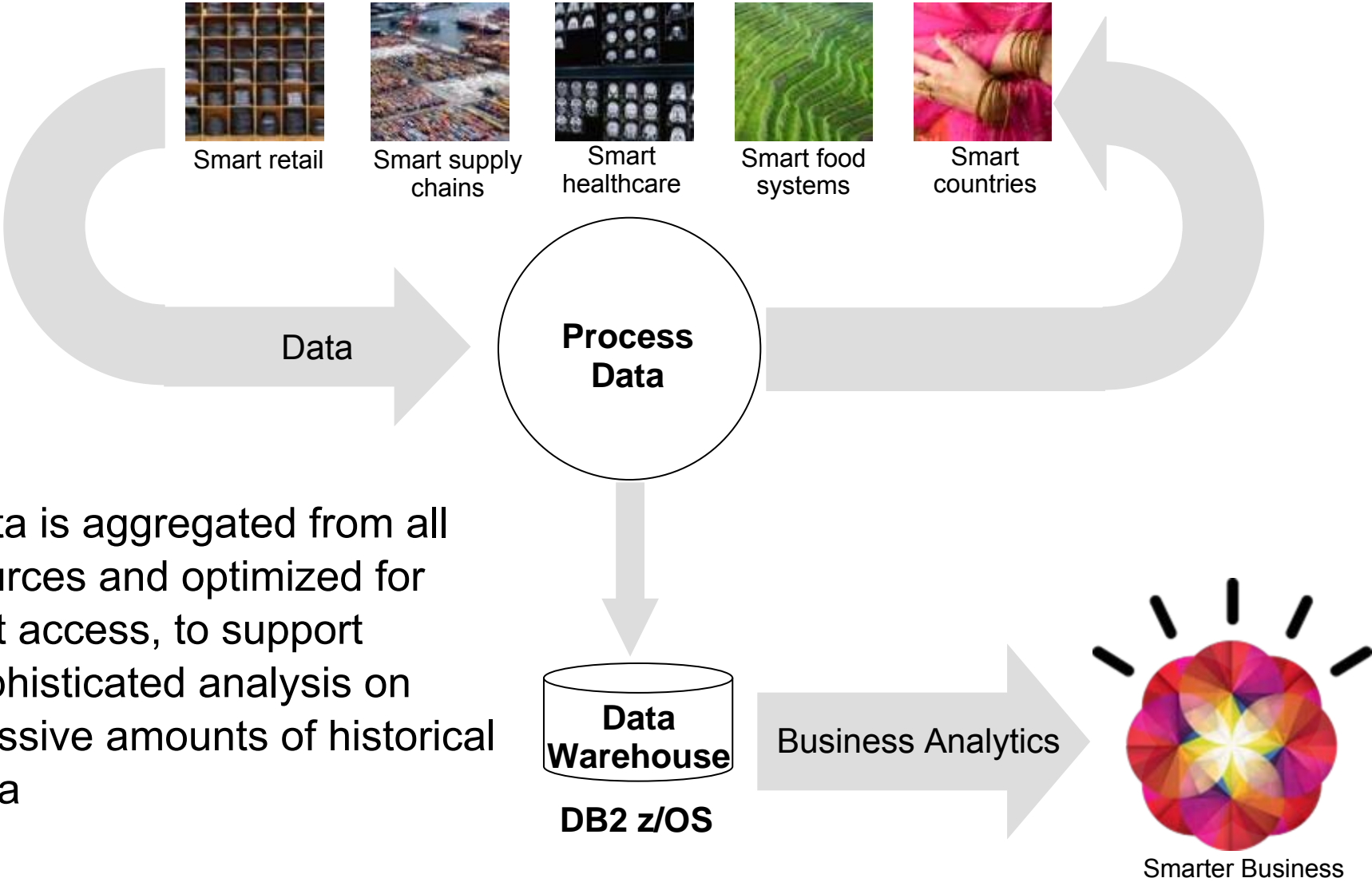# zEnterprise –
An Ideal Basis For
Smarter Computing

System z – Best Place For Business Analytics

Business Analytics Are A Source Of New Business Intelligence In A Smarter Planet

Smart retail

Smart supply chains

Smart healthcare

Smart food systems

Smart countries

Data

Process Data

Data is aggregated from all sources and optimized for fast access, to support sophisticated analysis on massive amounts of historical data

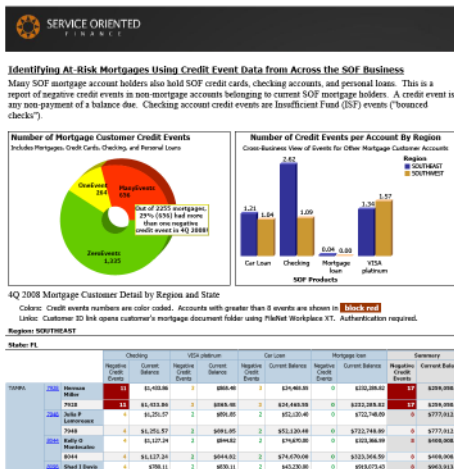**Data Warehouse**

DB2 z/OS

Business Analytics

Smarter Business

Businesses Analytics Answers Key Questions That Drive A Competitive Edge

How are we doing?	*Why are we on/off track?*	*What should we do next?*
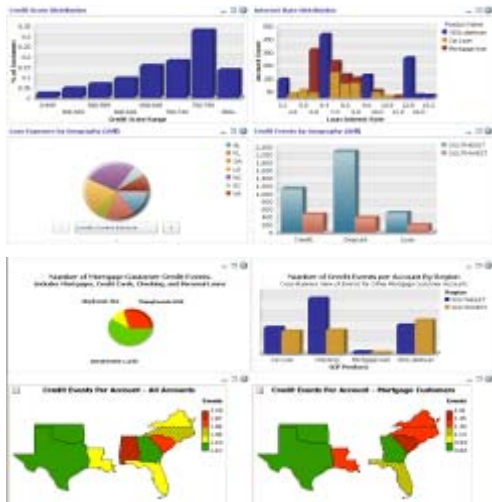
Dashboard
Operational or Strategic

Query and Reporting
Exploratory Analysis
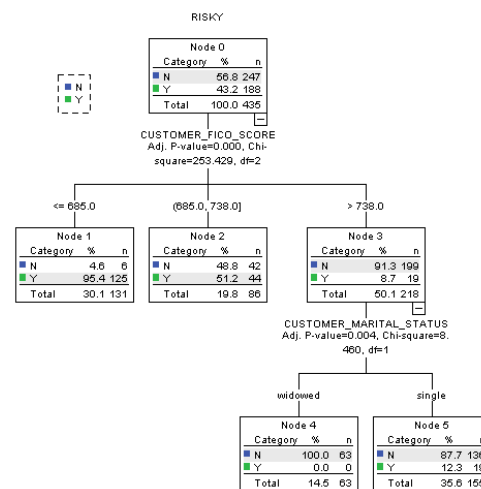
Analytics
Statistics and Predictive Analytics

Executive **Business Manager** **Casual Business User** **Line Manager** **Business Analyst** **Financial Analyst**

Businesses Benefit By Using An Analytic Approach Over Intuition

40% decline in homicide rates

600% increase in cross-sell campaign

$13.8 Million in cost savings

1000's of Reps run their daily business using IBM Business Analytics

80% decrease in reporting time on top of Oracle e-business suite
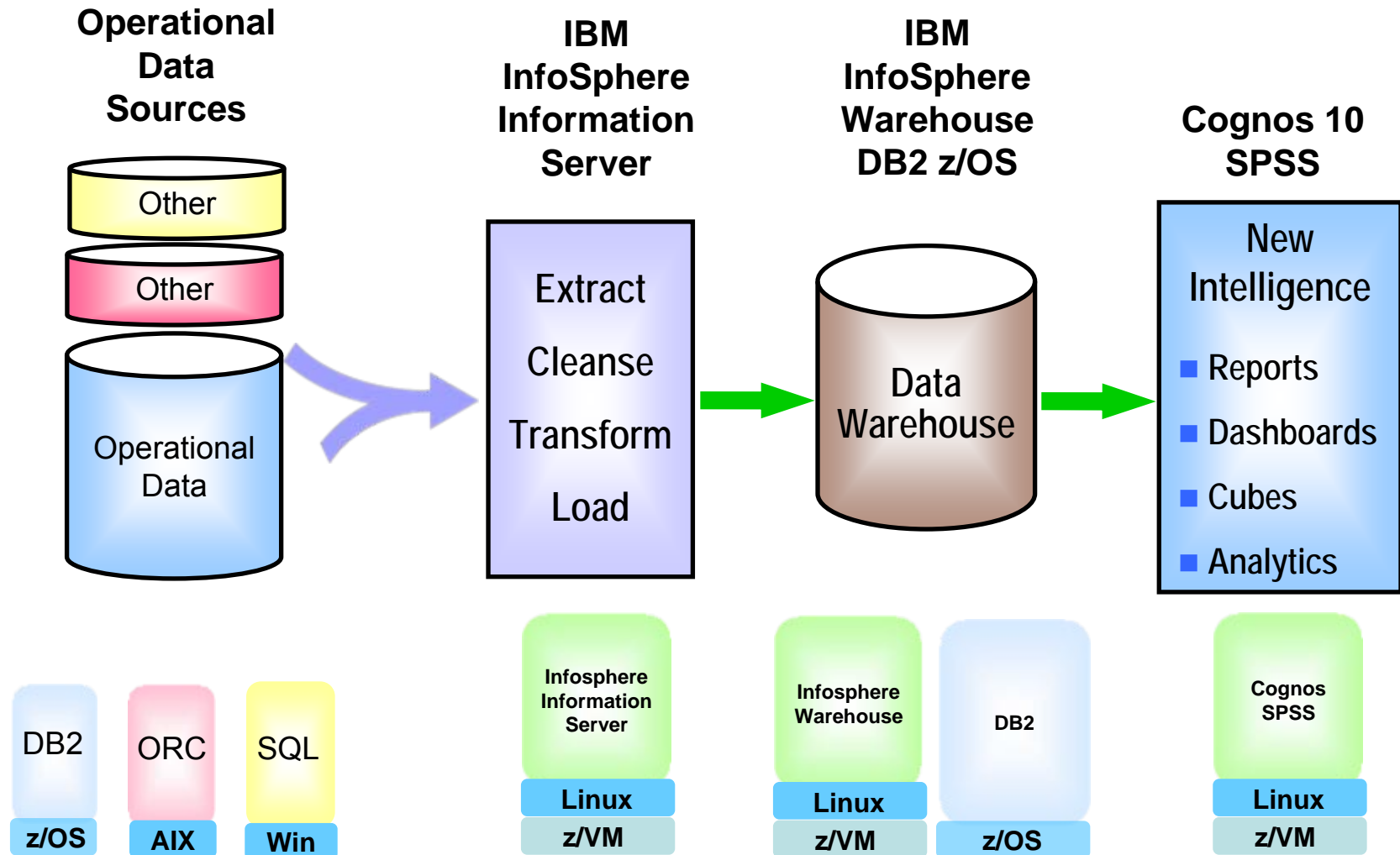
$200 Million increase in cash flow

The more analytics a business uses, the better it performs

# Implementing A Business Analytics Solution Involves 3 Primary Steps

- Load data from Operational data stores in frequent intervals into a large unified historical data repository known as a Data Warehouse
  - ▶ Apply Extract, Cleanse, Transform, Load processes
- Create Reports and Dashboards to answer a variety of what-if questions
  - ▶ Run simple, intermediate or complex queries that can take a few seconds, minutes, to several hours to run
- Use Predictive Analytics to gain insights and convert them to actions
  - ▶ Using data from past, score the likelihood of outcomes for future events

zEnterprise Now Provides All Of The Components You Need For A Complete Analytic Solution In One Platform

Operational Data Sources

Other

Other

Operational Data

IBM InfoSphere Information Server

Extract

Cleanse

Transform

Load

IBM InfoSphere Warehouse DB2 z/OS

Data Warehouse

Cognos 10 SPSS

New Intelligence

- Reports
- Dashboards
- Cubes
- Analytics

DB2

z/OS

ORC

AIX

SQL

Win

Infosphere Information Server

Linux

z/VM

Infosphere Warehouse

Linux

z/VM

DB2

z/OS

Cognos SPSS

Linux

z/VM

IBM Smart Analytics System 9700 – A Comprehensive Package For Business Analytics

- Pre-configured appliance-like solution with aggressive solution edition pricing
- Hardware/OS
  - ▶ IBM zEnterprise z196 technology
  - ▶ IBM System Storage DS8800 Intelligent Disk controller
    - − Large controller cache and 3 Tier disk offering
  - ▶ z/OS 1.12
- Unique Software
  - ▶ DB2 10 for z/OS
  - ▶ Cognos 10 BI (Linux on System z)
  - ▶ InfoSphere Warehouse (Linux on System z)
  - ▶ SPSS Modeler (Linux on System z)
- Optional Components
  - ▶ IBM DB2 Analytics Accelerator
  - ▶ Solid State drives, integrated within DS8800
   - − Easy Tier to identify and migrate "hot data" to SSD

Infosphere Warehouse Cognos SPSS	DB2 for z/OS
z/VM	z/OS

Storage
Storage
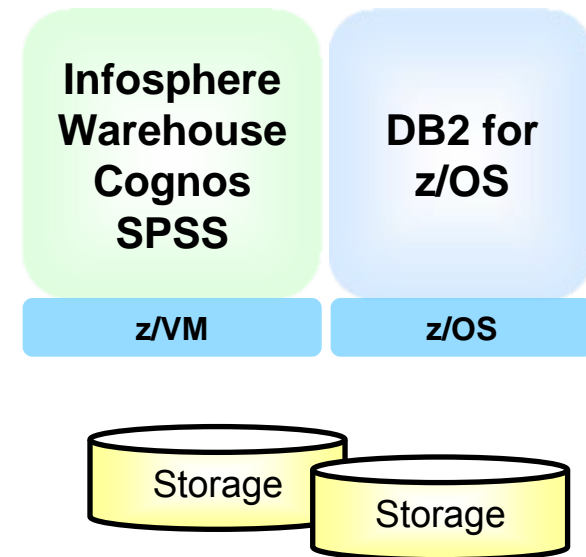
Create Reports And Dashboards Using IBM Cognos

- **People-centric**
  - ▶ Server based business analytics accessed via browser
  - ▶ Consistent user interface for different analytic activities
  - ▶ Reuse new intelligence assets
  - ▶ Built-in collaboration and social networking
 - ▶ Threaded discussions, activities, and notifications

- **Easy to deploy and manage**
  - ▶ Implemented in Java, runs on WebSphere
  - ▶ Scales up and out across heterogeneous hardware and operating systems
  - ▶ Runs on Linux on System z

User Browser

IBM Cognos server

Query   Report   OLAP
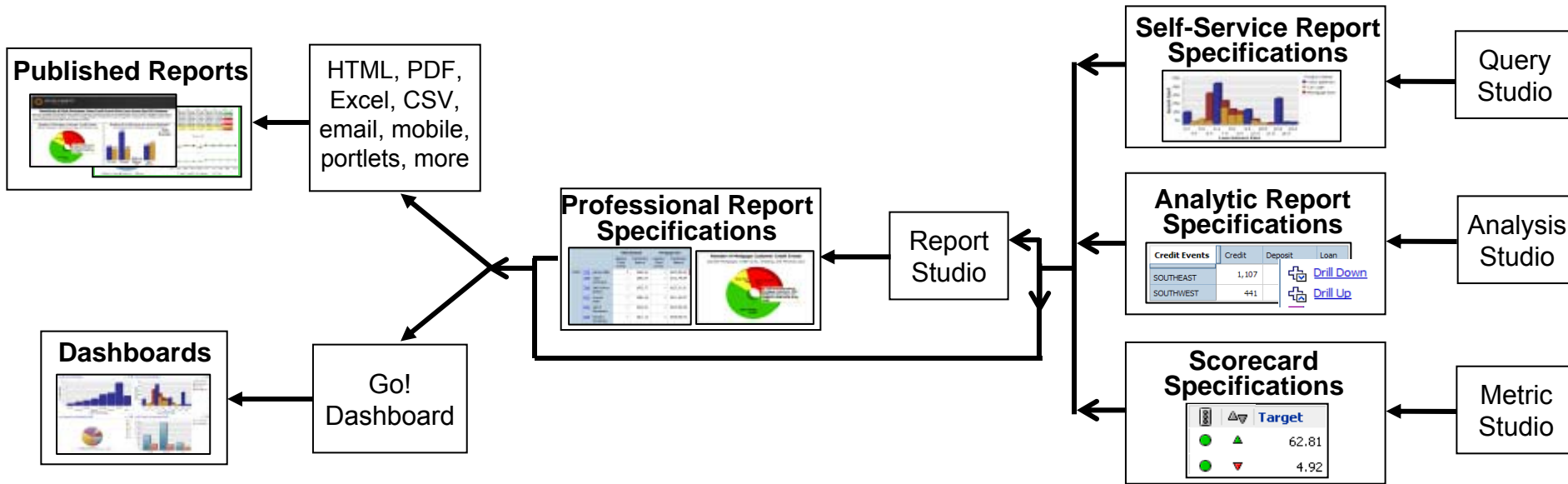
Metadata Model

Data Warehouse
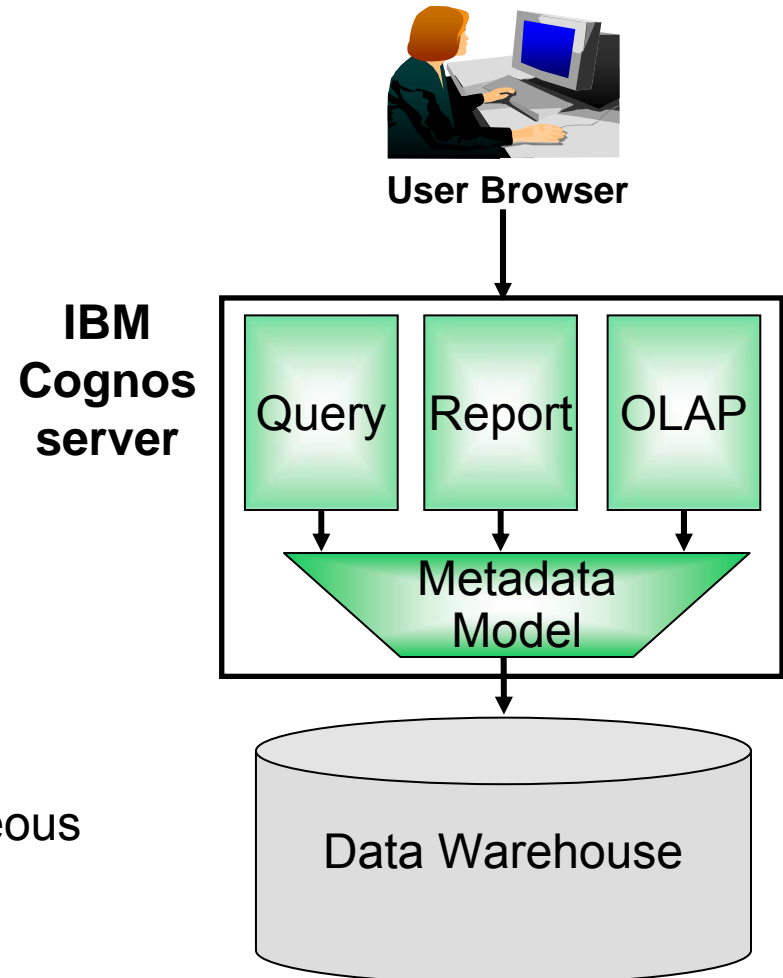
IBM Cognos Provides A Unified Workspace

- All activities from one place, without jumping to different interfaces
  - ▶ Dashboards for summary overview
  - ▶ Reports for tracking progress
  - ▶ Ad hoc queries and drill down for analysis and what if scenarios
  - ▶ Statistics and predictive analysis
- Progressive interaction – Interact and analyze information based on role
- Form decision networks for collaborative business analytics

UNIFIED WORKSPACE

| Dashboards | Reporting | Query | Analysis | What If & Planning | Stats & Predictive |
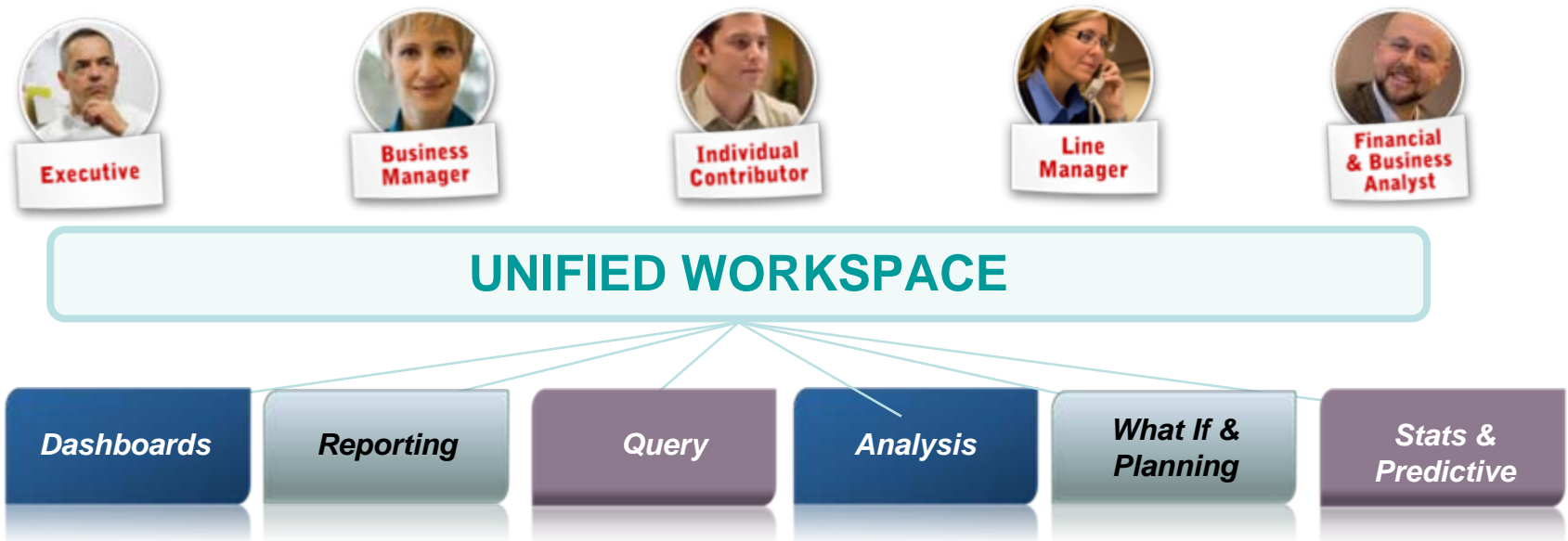
Reuse Prior Assets In New Deliverables

- Author once, consume anywhere

- All analytic assets share a common metadata model and a common multilingual report specification

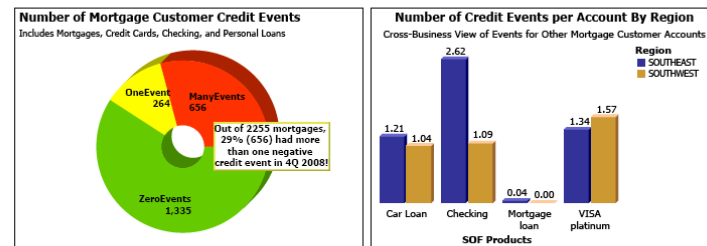- Ensures consistent information and enables reuse across platform functions

DEMO: Use Cognos To Identify New Business Insights From The Data Warehouse

1. Show report generated in Cognos Report Studio in PDF format

2. Report identifies high-risk mortgages by looking at negative credit events in other customer accounts (CC, Checking, etc…)

3. Report uses both structured and unstructured data (link to mortgage data stored in FileNet)

4. Use Dashboard to monitor the business operations

At risk customers are identified

Miami Dade County Runs Cognos On Linux On System z

Requirements:

- Demand for BI has really taken off
  - New Federal reporting requirements
  - Every new system, every new solution, every new application is having a business intelligence component
- Multiple Cognos 8 BI deployments
- Wanted an enterprise BI standardized solution, but
  - Needed higher capacity – grow from approx 400 to 1000 users
  - Do more with less - less researchers, less software, less hardware, same staff
  - Had available IFL's on System z

Results:

- 11 days to move from distributed to System z deployment model for Cognos 8 BI
  - Quickly and easily meet new requirements
- Consolidate multiple BI deployments on to a single platform
- Single point for BI administration
- Consolidate multiple disparate data sources
- Ensure 99.999% availability
- Offer a complete disaster recovery plan
- Additional green savings

SPSS Enables Customers To Predict Future Events And Drive Better Business Outcomes

Capture

Data Collection delivers an accurate view of customer attitudes and opinions

IBMSPSS Data Collection

Predict

Predictive capabilities bring repeatability to ongoing decision making, and drive confidence in your results and decisions

IBM SPSS
Statistics*/Modeler*/Text Analytics

Act

Unique deployment technologies and methodologies maximize the impact of analytics in youir operation

IBM SPSS
Decision Management
Collaboration & Deployment *

Text Analytics

Data Mining

Statistics
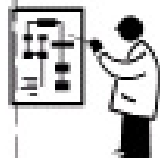
Platform

Pre-built Content

Attract

Up-sell

Retain
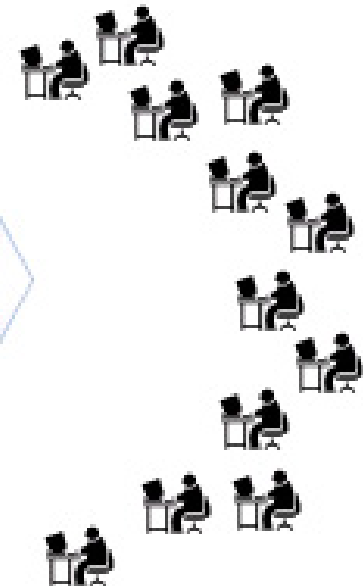
* Runs on Linux on System z

DEMO: Discover Rules For Identifying Risky Customers Using SPSS Statistics

1. Load data from Data Warehouse on DB2 for z/OS into SPSS Statistics

2. Pre-process the data to create new attributes for quantifying negative credit events across different product lines and create a risk flag for mortgage

3. Run Comparison of Means and Decision Tree to discover rules for characterizing risky customers
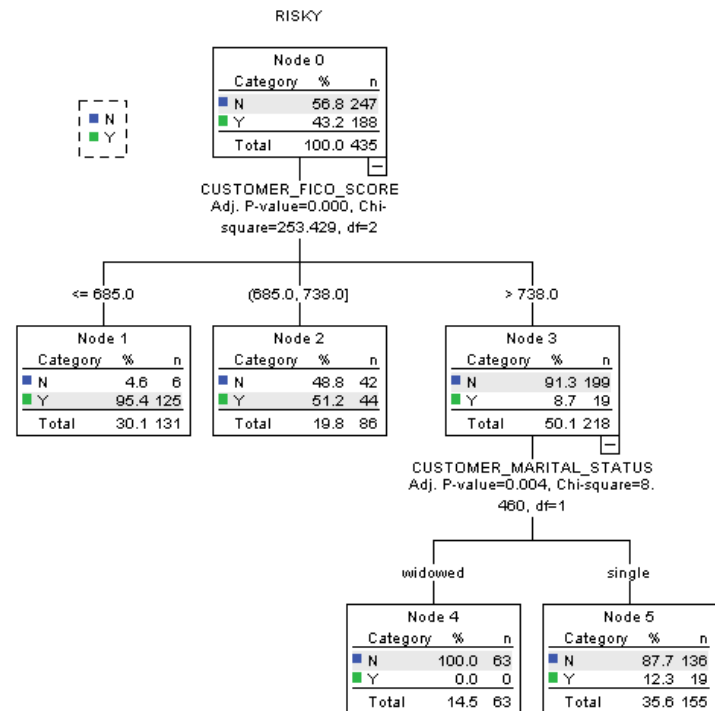
- Credit Limits identified for characterizing risky customers
- Use these credit limits for automated loan approval process

The Data Warehouse Is At The Heart Of A Business Analytics Solution

Operational Data Sources

Other

Other

Operational Data

IBM InfoSphere Information Server

Extract

Cleanse

Transform

Load

IBM InfoSphere Warehouse DB2 z/OS

Data Warehouse

Cognos 10 SPSS

New Intelligence

- Reports
- Dashboards
- Cubes
- Analytics

DB2	ORC	SQL
z/OS	AIX	Win

Infosphere Information Server

Linux

z/VM

Infosphere Warehouse	DB2
Linux	
z/VM	z/OS

Cognos SPSS

Linux

z/VM
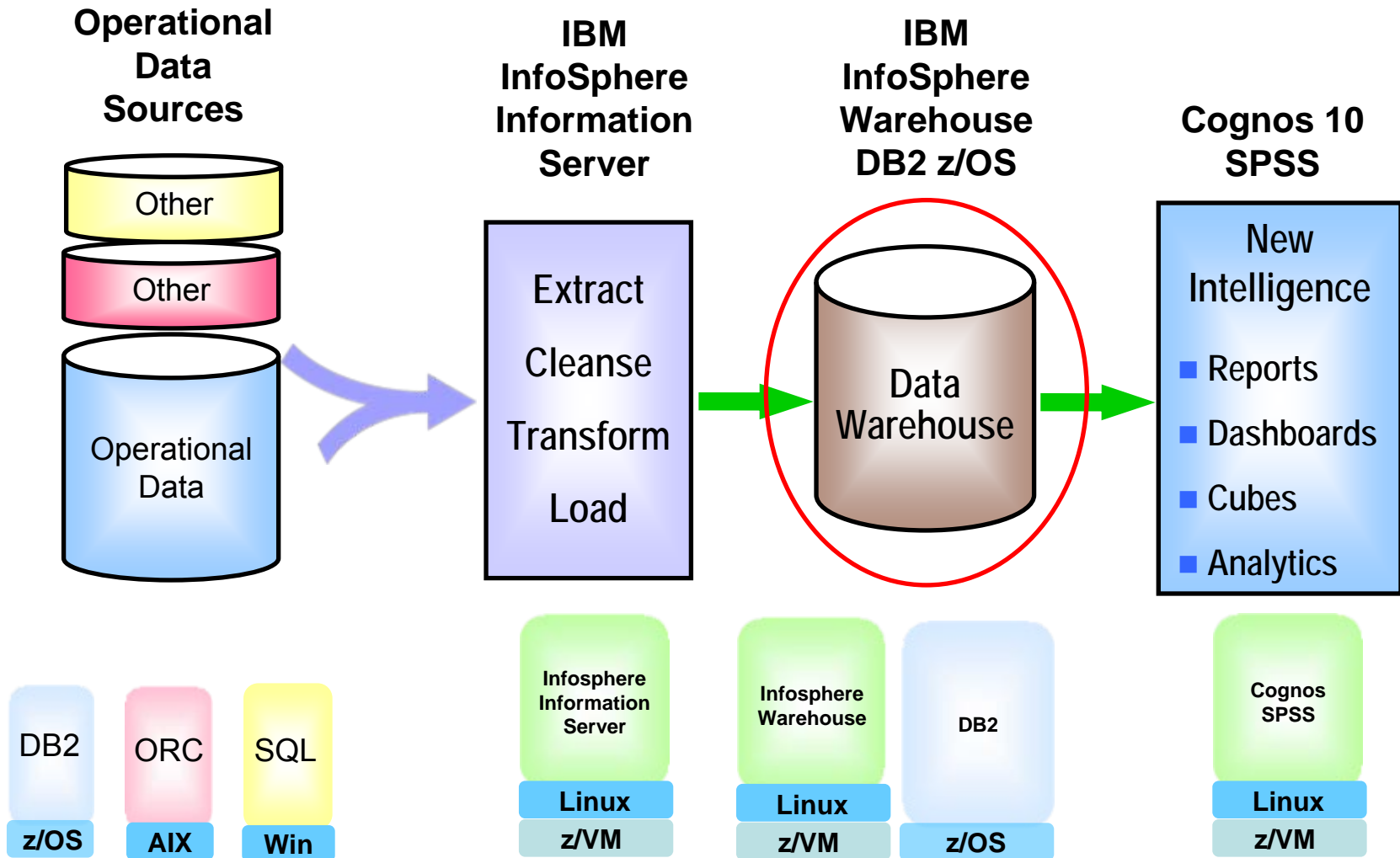
Data Warehouses Typically Organize Data In A Star Schema Format

- De-Normalized schema reduces joins to provide faster full table scan access
- Use Materialized Query Tables (MQTs) to pre-compute aggregations across dimensions

Dimension Table
Account

Dimension Table
Branch

Dimension Table
Product

Fact Table
Balance
Fees
Credit
Events

Dimension Table
Customer

Dimension Table
Date
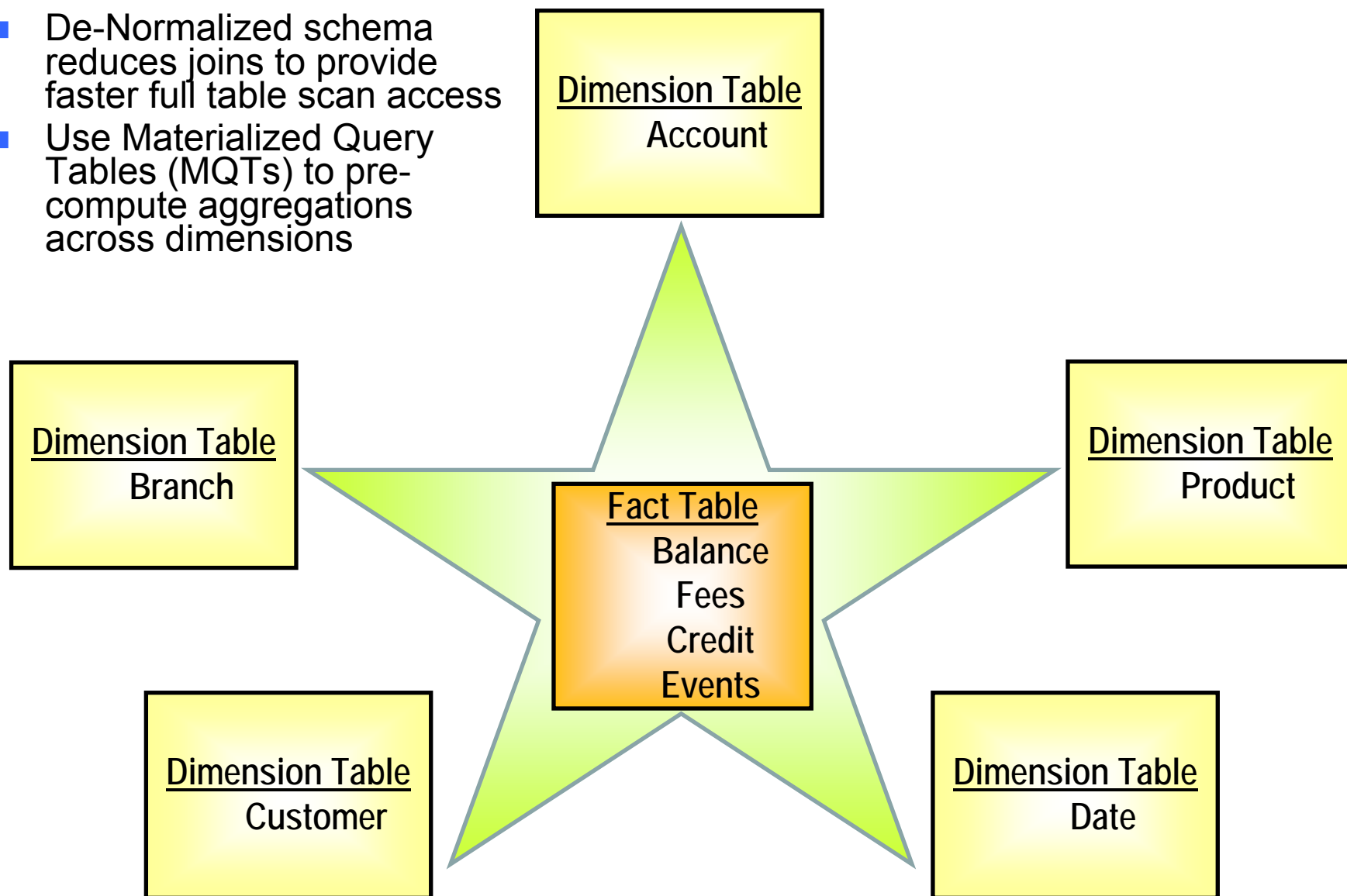
DB2 For z/OS Is Optimized For Data Warehouse Workloads

- Data Warehouse Workloads typically include a mix of simple, intermediate and complex queries

- Data is partitioned to increase parallelism and compressed to increase I/O performance

- DB2 for z/OS Cost Based Optimizer decides best execution plan for each query
  - ▶ Simple queries typically assigned to a single processing thread
  - ▶ Complex queries may be decomposed into operations that execute in parallel
  - ▶ Queries may be automatically rewritten to take advantage of pre-computed partial results in materialized query tables (MQT)

- Result: Optimum Throughput

z/OS Is Optimized For Data Warehouse Workloads

- More processors, memory and cache than other enterprise servers provides high concurrency

- I/O offloaded to the Dedicated I/O Sub-system

- Parallel Sysplex clustering designed for near linear scaling

- Hardware compression

- Optimized resource sharing for mixed queries with WLM

- DS8000 delivers high storage bandwidth with caching

- Unmatched scalability

- Systematic Disaster Recovery

- Attractive pricing with IBM Smart Analytics Solution 9700

Add IBM DB2 Analytics Accelerator For Even More Optimization

- *A workload-optimized, blade-based appliance with storage integrated into the hardware rack and based on Netezza Technology*

- *Deeply integrated with DB2 for z/OS and transparent to applications*

- *Significantly speeds up the response time for a wide variety of complex queries using massively parallel processing architecture and patented data filtering technology at streaming speed using Field Programmable Gate Arrays (FPGAs)*

- *Drives down the costs of data warehousing and business analytics*

Breakthrough Technology Enabling New Opportunities

IDAA Leverages Massively Parallel Processing To Speed Up Complex Queries

Fact Table

Partitioning data into physical disks and assigning dedicated processors to each disk – throughput scales linearly with partitions
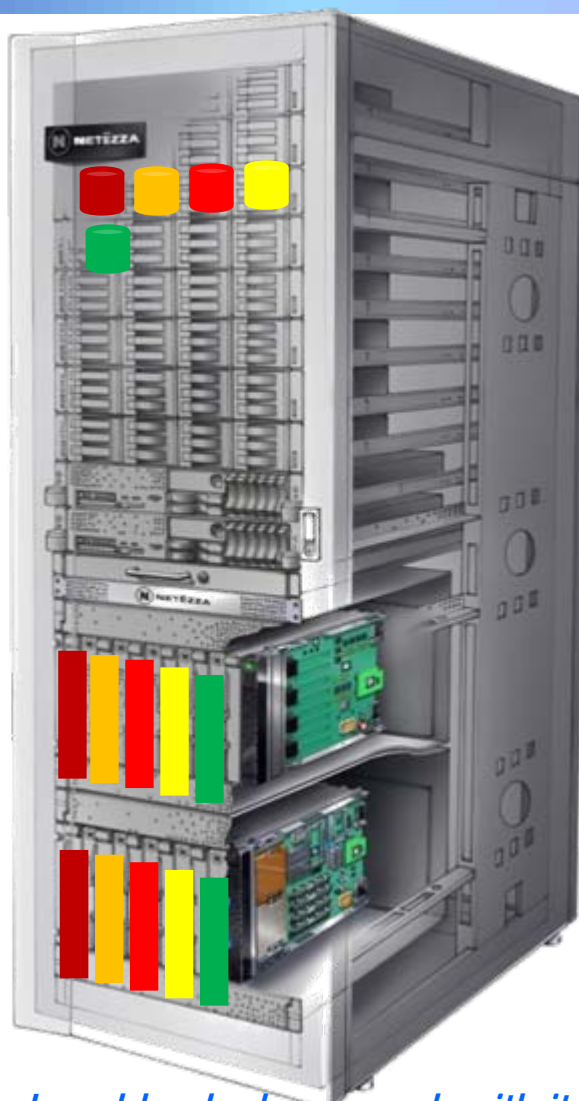
Storage

SMP Hosts

FPGA

CPU

"…when something took 24 hours I could only do so much with it, but when something takes 10 seconds, I may be able to completely rethink the business… ", SVP, Nielsen

Outstanding Customer Results With IDAA

Query	Total Rows Reviewed	Total Rows Returned		DB2 Only			DB2 with IDAA			Times Faster
				Hours	Sec(s)		Hours	Sec(s)		
Query 1	2,813,571	853,320		2:39	9,540		0.0	5		1,908
Query 2	2,813,571	585,780		2:16	8,220		0.0	5		1,644
Query 3	8,260,214	274		1:16	4,560		0.0	6		760
Query 4	2,813,571	601,197		1:08	4,080		0.0	5		816
Query 5	3,422,765	508		0:57	4,080		0.0	70		58
Query 6	4,290,648	165		0:53	3,180		0.0	6		530
Query 7	361,521	58,236		0:51	3,120		0.0	4		780
Query 8	3,425.29	724		0:44	2,640		0.0	2		1,320
Query 9	4,130,107	137		0:42	2,520		0.1	193		13

Speed Ups Ranging From 13x to 1,908x

Actual customer results, October 2011

Customers Are Excited About Business Analytics On zEnterprise

DB2 Analytics Accelerator: "we had this up and running in days with queries that ran over 1000 times faster"

DB2 Analytics Accelerator: "we expect ROI in less than 4 months"

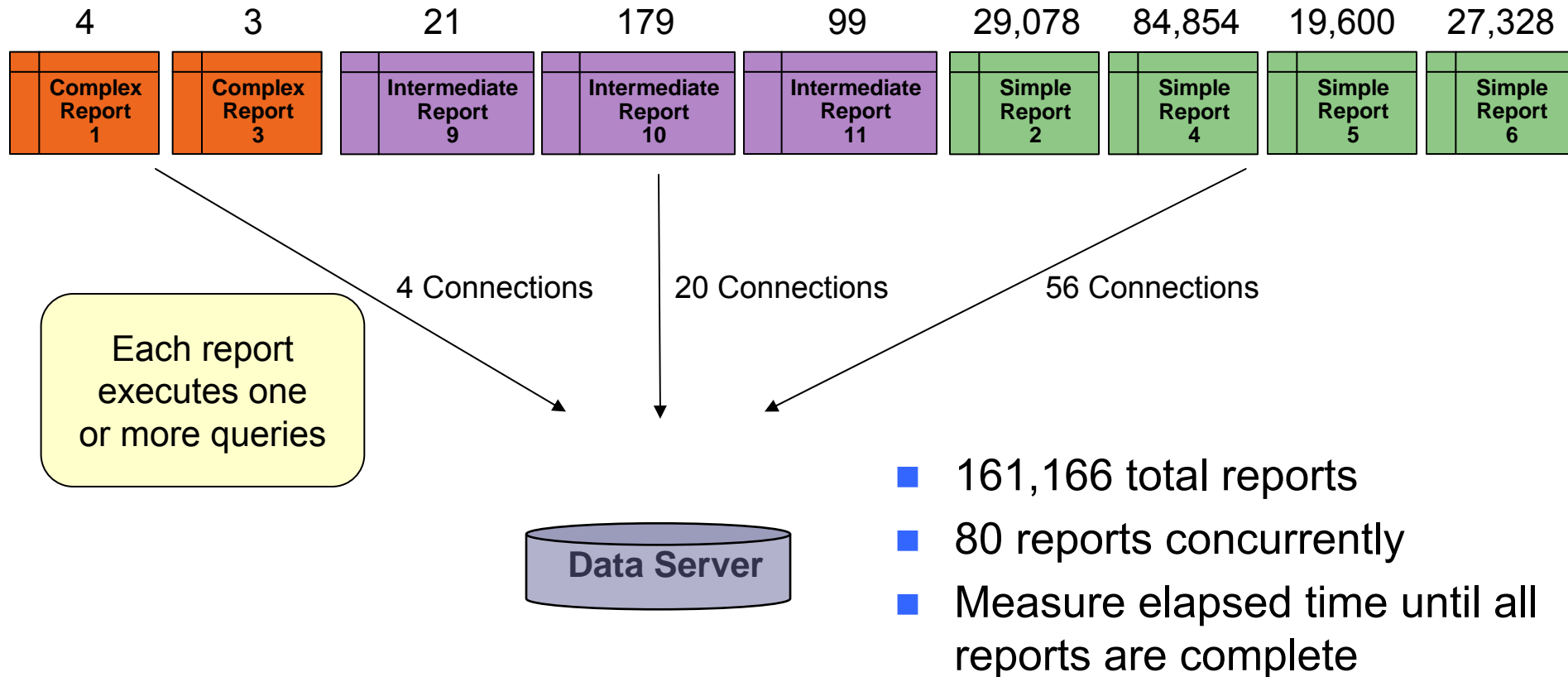**Cognos BI for System z** "We didn't have to justify a higher cost for putting this on the mainframe, *it was cheaper!*"

Analyst Claudia Imhoff "the industry pendulum in swinging towards centralization and there is no better platform than the mainframe"

Example: BI Day Fixed-Set Operational Reports Run Concurrently On A Periodic Schedule

4	3	21	179	99	29,078	84,854	19,600	27,328
Complex Report 1	Complex Report 3	Intermediate Report 9	Intermediate Report 10	Intermediate Report 11	Simple Report 2	Simple Report 4	Simple Report 5	Simple Report 6

4 Connections   20 Connections   56 Connections

Each report executes one or more queries

Data Server

- 161,166 total reports
- 80 reports concurrently
- Measure elapsed time until all reports are complete

Note: Distribution of complex, intermediate, and simple workloads based on Forrester Research, Profiling the Analytic End User for Business Intelligence, 2004

BI Day Fixed-Set Operational Reports Run Concurrently On A Periodic Schedule

- CASE 1:
  Run concurrently 160,860 simple reports and 306 intermediate and complex reports on Competitor ¼ Rack

- CASE 2:
  Run concurrently 160,860 simple reports and 306 intermediate and complex reports on IBM Smart Analytics System 9700 with dedicated 24-cores

- CASE 3:
  Run concurrently 160,860 simples reports on IBM Smart Analytics System 9700 10-cores and in parallel offload 306 intermediate and complex reports serially to IDAA (Twinfin 12)

IBM DB2 Analytics Accelerator Makes A Great Analytics Solution Even Better

Time To Completion For Fixed Size Concurrent Workload – 1 TB
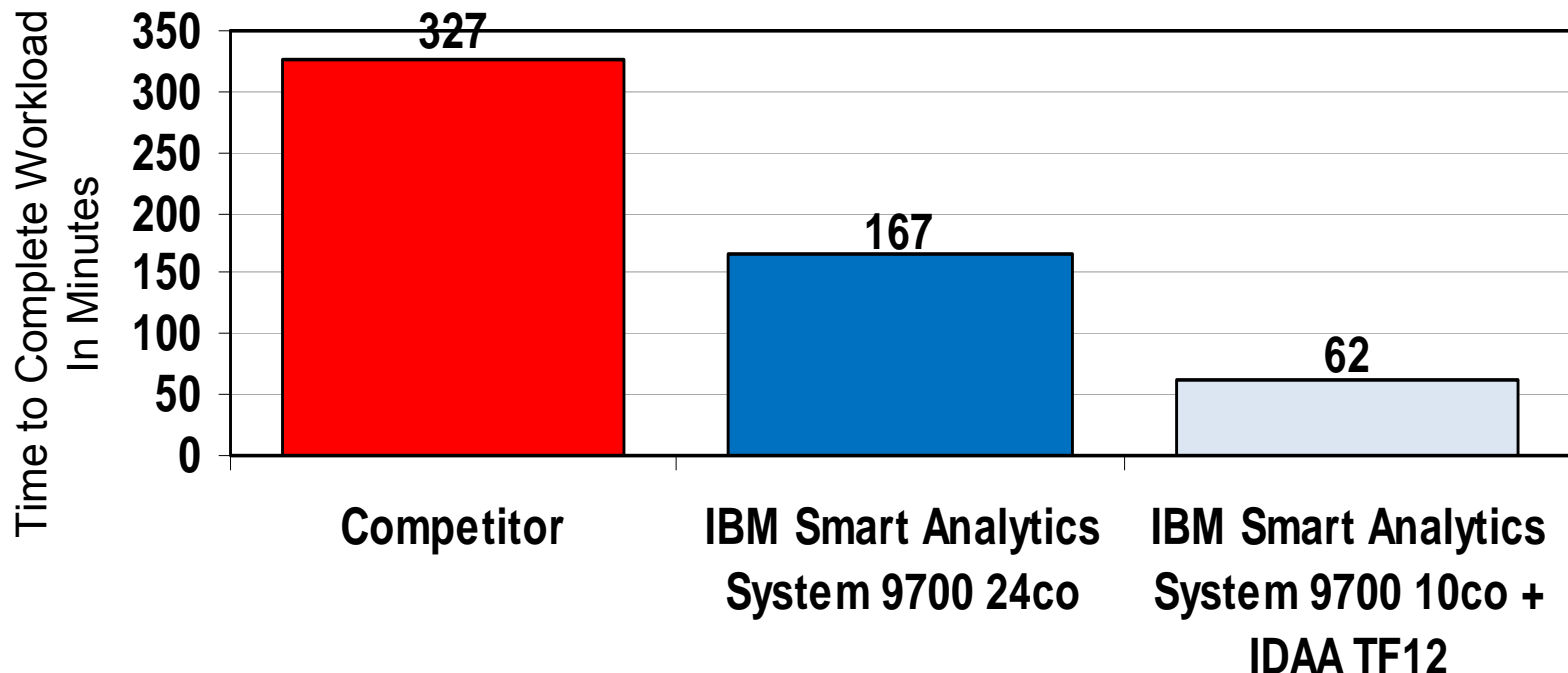
Lower is better

Test measures time to complete a fixed number of 161,166 concurrently executing reports

Based on BI Day Tests. Performance numbers may vary based on workload profiles. IBM Smart Analytics System + IDAA performance estimated from IBM Smart Analytics System running simple reports and NZ TF12 running intermediate + complex reports

Running Analytics On Optimized zEnterprise Platform Saves 75% Over Competition

Competitor

Quarter Rack

IBM Smart Analytics System 9700

DB2
(IBM Smart Analytics System 9700)

z/OS
12 GP+12 zIIP

IBM Smart Analytics System 9700 + IDAA

DB2
(IBM Smart Analytics System 9700)

z/OS
5 GP+5 zIIP

Netezza
TwinFin 12

Unit Cost (3yr TCA) **$97/RpH**

RpH (Reports/Hour)	29,572
Competitor ¼ Rack (HW+SW+Storage)	$2,857,500

Unit Cost (3yr TCA) **$62/RpH**

RpH (Reports/Hour)	57,904
IBM Smart Analytics System 9700 24-co (HW+SW+Storage)	$3,600,000

Unit Cost (3yr TCA) **$24/RpH**

RpH (Reports/Hour)	154,893
IBM Smart Analytics System 9700 10-co (HW+SW+Storage)	$1,500,000
NZ TF12 (HW+SW+Storage)	$2,140,600

5X performance
4X price performance

Source: Customer Study running 161,166 concurrent operational reports. Intermediate/Complex Reports offloaded to IDAA for serial execution. Results may vary based on customer workload profiles/characteristics.

Added Cost Of Transferring Data Makes The Competitor Solution Even More Expensive

Operational Data Store

1TB Send file

Enterprise WAN

Competitor Data Mart Server

1TB Receive file

5TB provisioned
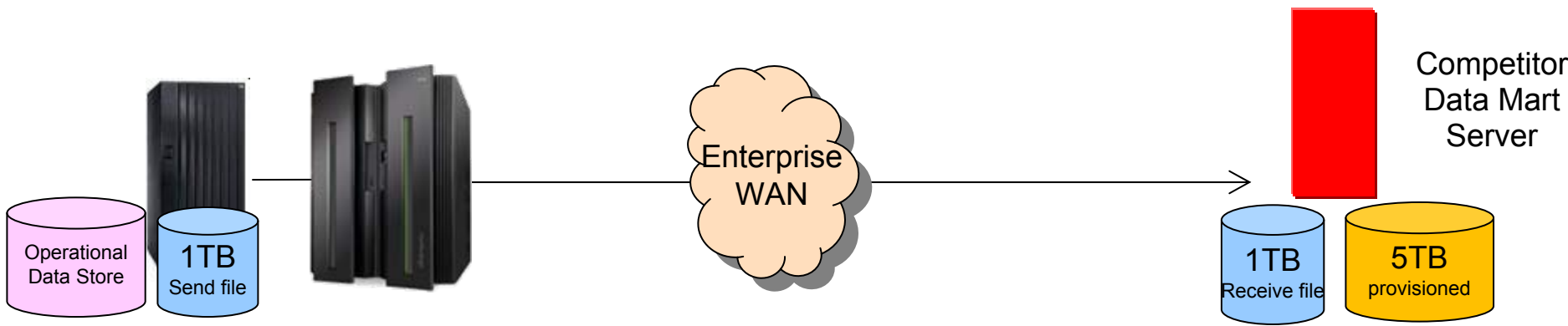
Unit Cost (3yr TCA) **$194/RpH**

Cost of storage - send file $12.33/GB x 1,024 GB	$13K

Storage acquisition cost
$13K

System z CPU extract $1.38/GB x 1,024 GB x 365	$515K
System z CPU cost FTP $0.58/GB x 1,024 GB x 365	$217K

On Premises Network $0.0024/GB x 1,024 GB x 4 hops x 365	$3.6K
Off Premises Network $0.29/GB x 1,024 GB x 2 hops x 365	$217K

Annual Transfer Costs
$953K

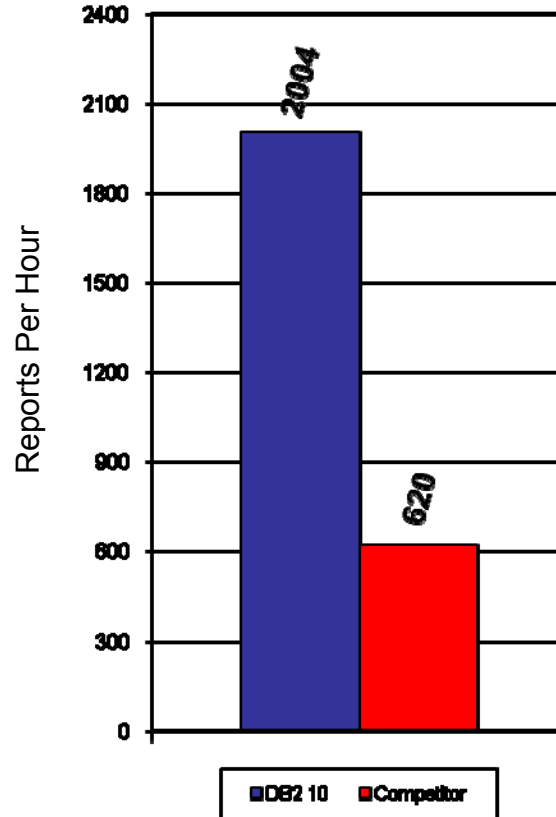# A Large US Financial Institution Achieved Higher Throughput By Running Operational BI On System z
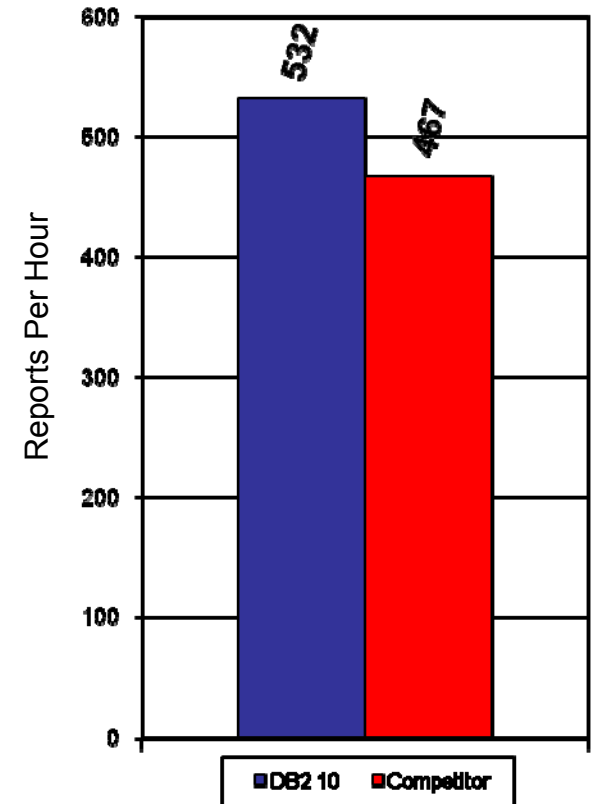

1.2X Fewer Small Reports	3.2X More Medium Reports	1.1X More Large Reports
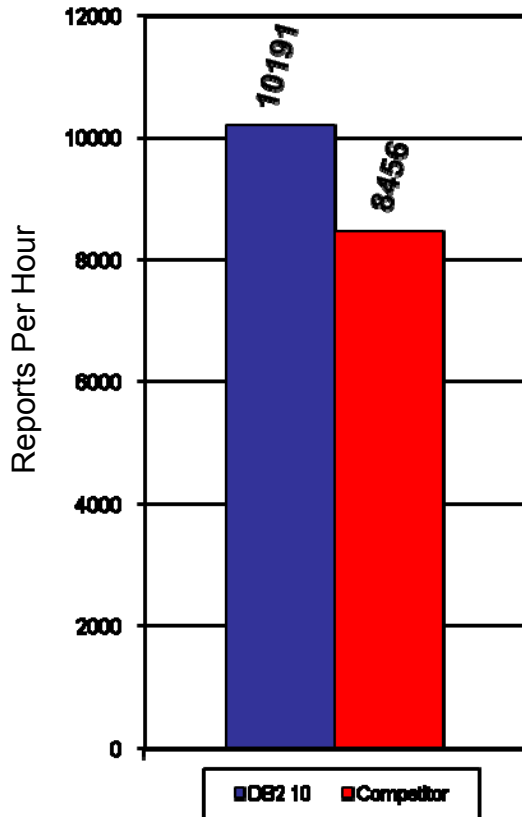
Reports Per Hour at 750GB data size (Higher is Better)

Run End-To-End BI On zEnterprise To Reduce Costs And Improve Reliability

- 60-70% of operational data resides on System z*

- Copying data from System z to another platform for business intelligence
  - ▶ Is costly
  - ▶ Introduces security concerns

- zEnterprise offers a fully integrated, holistic solution from operational data to business analytics in one platform

- Consolidating data warehouses and data marts on IBM Smart Analytics 9700 with IDAA can reduce costs by 75%

* Source http://www.ibmsystemsmag.com/mainframe/trends/whatsnew/The-Mainframe-at-a-Crossroads/