Oracle Utilities Partner Summit

ORACLE®

UTILITIES

ORACLE THIRTY YEARS 30

Oracle Network Management System - Overview

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February 6, 2009

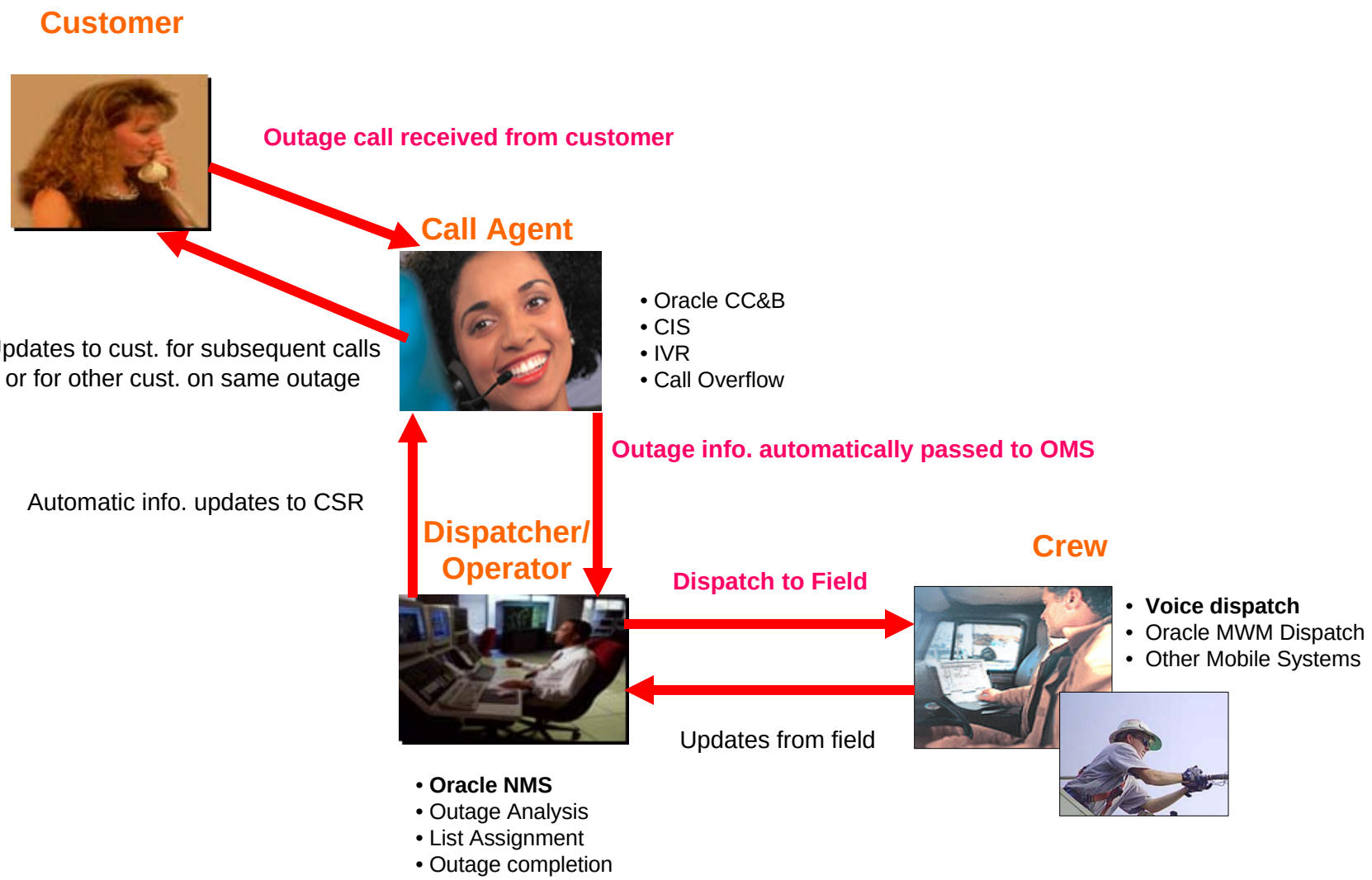
Electric Distribution Operations

- **Objective**: Operate the electric distribution network in a safe and reliable manner.
  - Restore Outages due to
    - Storms
    - Network damage
  - Avoid overloads during peak conditions
  - Perform planned maintenance and track safety measures

Operational Applications

- **Outage Management (OMS)**
- **Distribution Management (DMS)**
- SCADA
- AMR/AMI
- Mobile Dispatch

Outage Lifecycle



Integrated Business Process in Action

Meter "Last Gasp" Power Off

IVR

Outage Event Status

AMI Server

Oracle CC&B

Customer reports outage

Customer

Customer is informed that the utility is aware of:
- The Outage
- Crew Dispatch
- Estimated Time of Restoration

Lightening strikes power line causing power outage

Outage Detection

Outage Event Status

Outage Event Status

Outage Jobs & Status

Oracle OMS

Oracle MWM

Damage Assessment

Appropriate Repair Crew Determination

Press

Management

Storm Statistics

Outage Analysis

Oracle Storm Management

Outage Cause is Determined and Reported

Outage Status

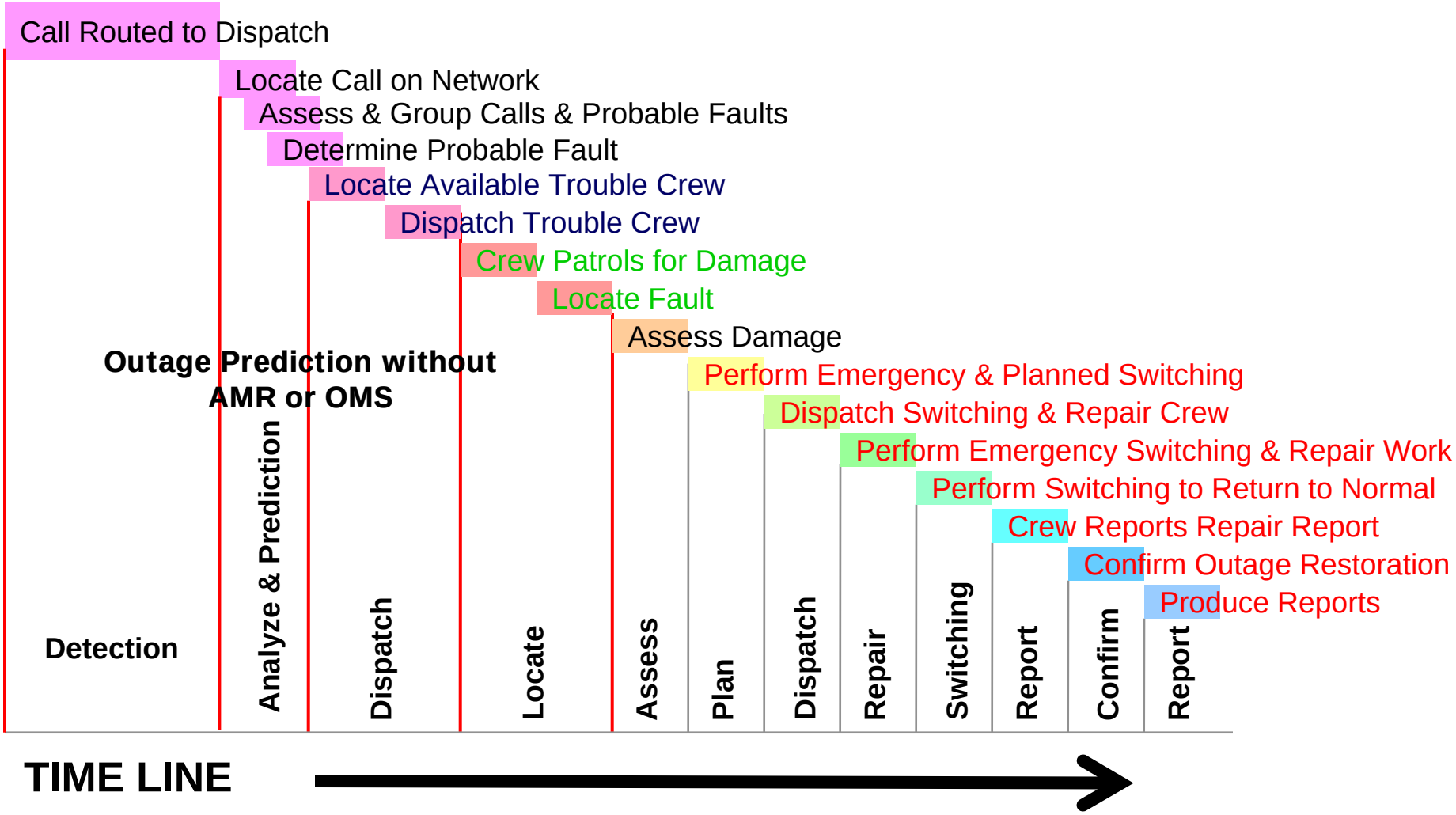
Dispatch Repair Crew

Outage History & KPIs

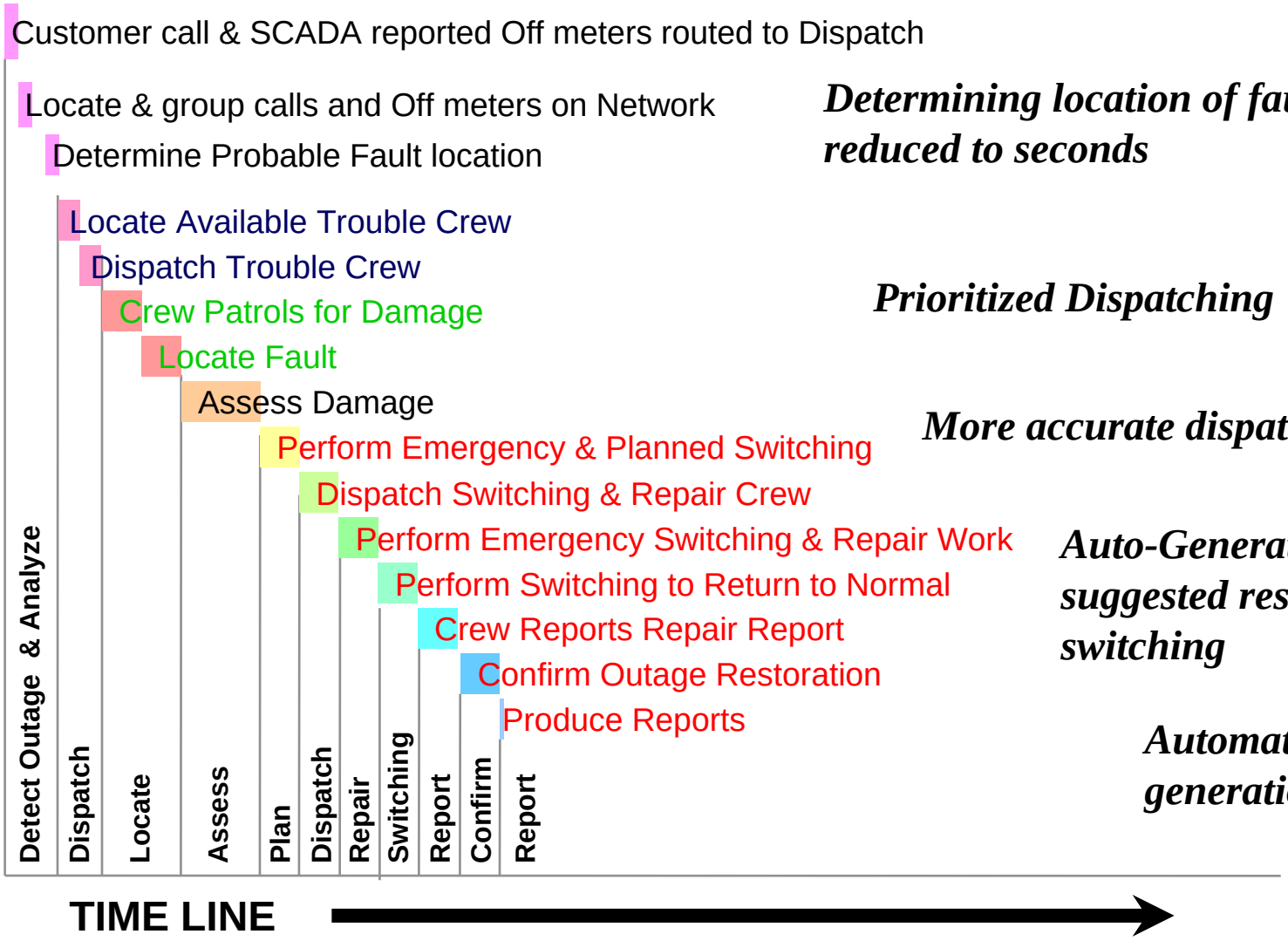
Oracle Utilities Business Intelligence

Verify outage causes, initiate repair work order

Outage Management without OMS



OMS Enabled Outage Management



Determining location of fault reduced to seconds

Prioritized Dispatching

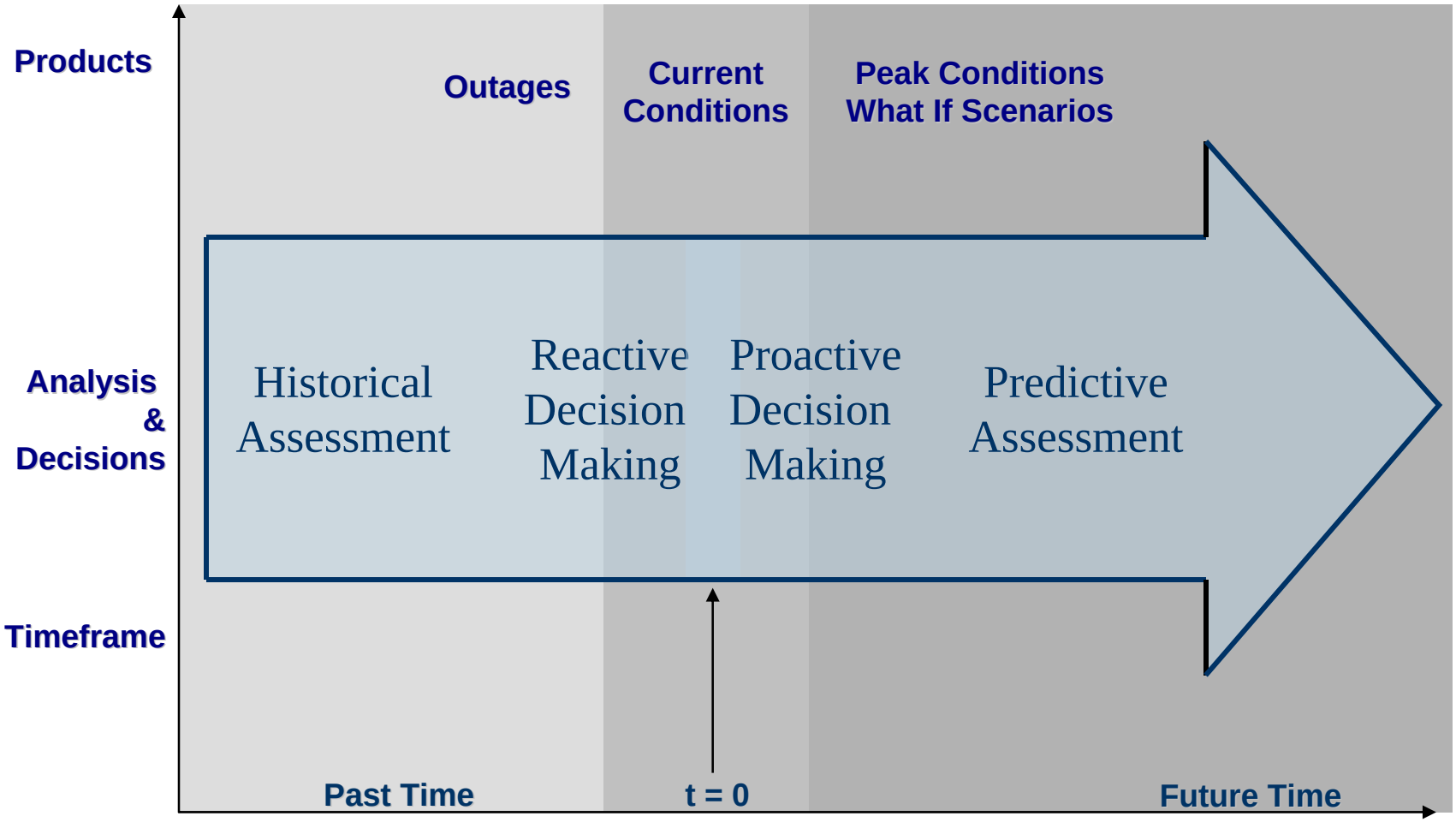
More accurate dispatch

Auto-Generation of suggested restoration switching

Automatic report generation

From Reactive to Proactive

Ops Objectives: Act faster, act smarter



Oracle Utilities at a Glance

A Global Business Unit of Oracle Corporation

Corporation Business Units

- Financial Services
- Health Sciences
- Communications
- **Utilities**
- Retail
- **Oracle Technology / Applications**

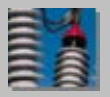
Utilities Global Business Unit

Software

Consulting
Training
Support

Sales /
Partners

Utilities-specific Applications

- **Network Management System** 
- **Customer Care and Billing** 
- **Mobile Workforce Management** 
- **Meter Data Management** 
- **Work and Asset Management** 

Oracle Utilities NMS

- Oracle Utilities Outage Management System (OMS)
  - Call Taking
  - Analyze inputs for predicted outage locations and customers
  - Outage Status Tracking, feedback to Call Agents
  - Dispatching of crews/resources
  - Tracking of outage times, customers, work and causes
- Oracle Utilities Distribution Management System (DMS)
  - Switch Plan tracking (Emergency and Planned)
  - Powerflow analysis to assist in switching decisions
  - Suggested Switching to automatically calculate switching options for Restoration/Isolation
  - Volt/Var Optimization analysis – Loss minimization

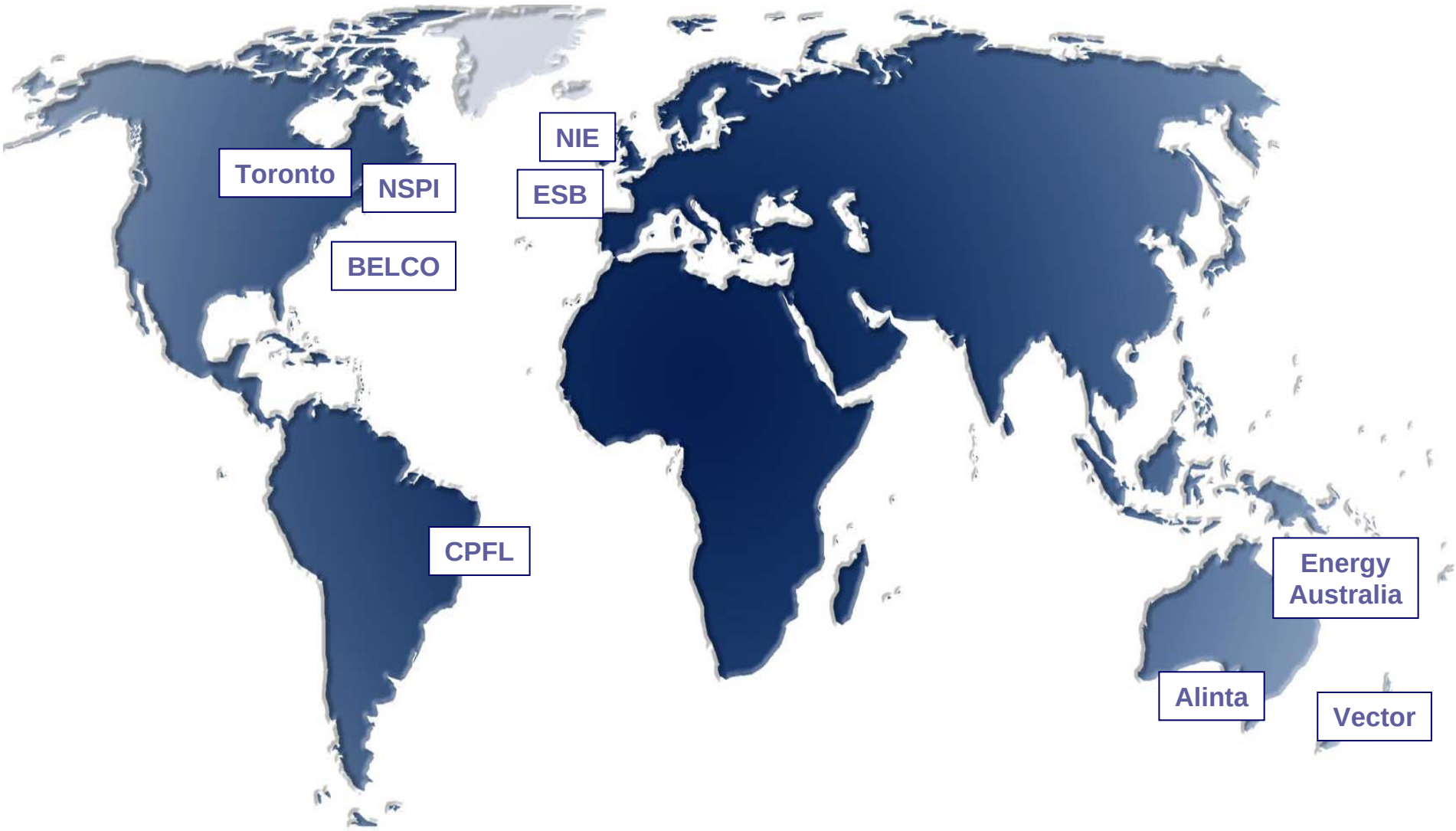
The #1 OMS Product In The Market

Source: Gartner

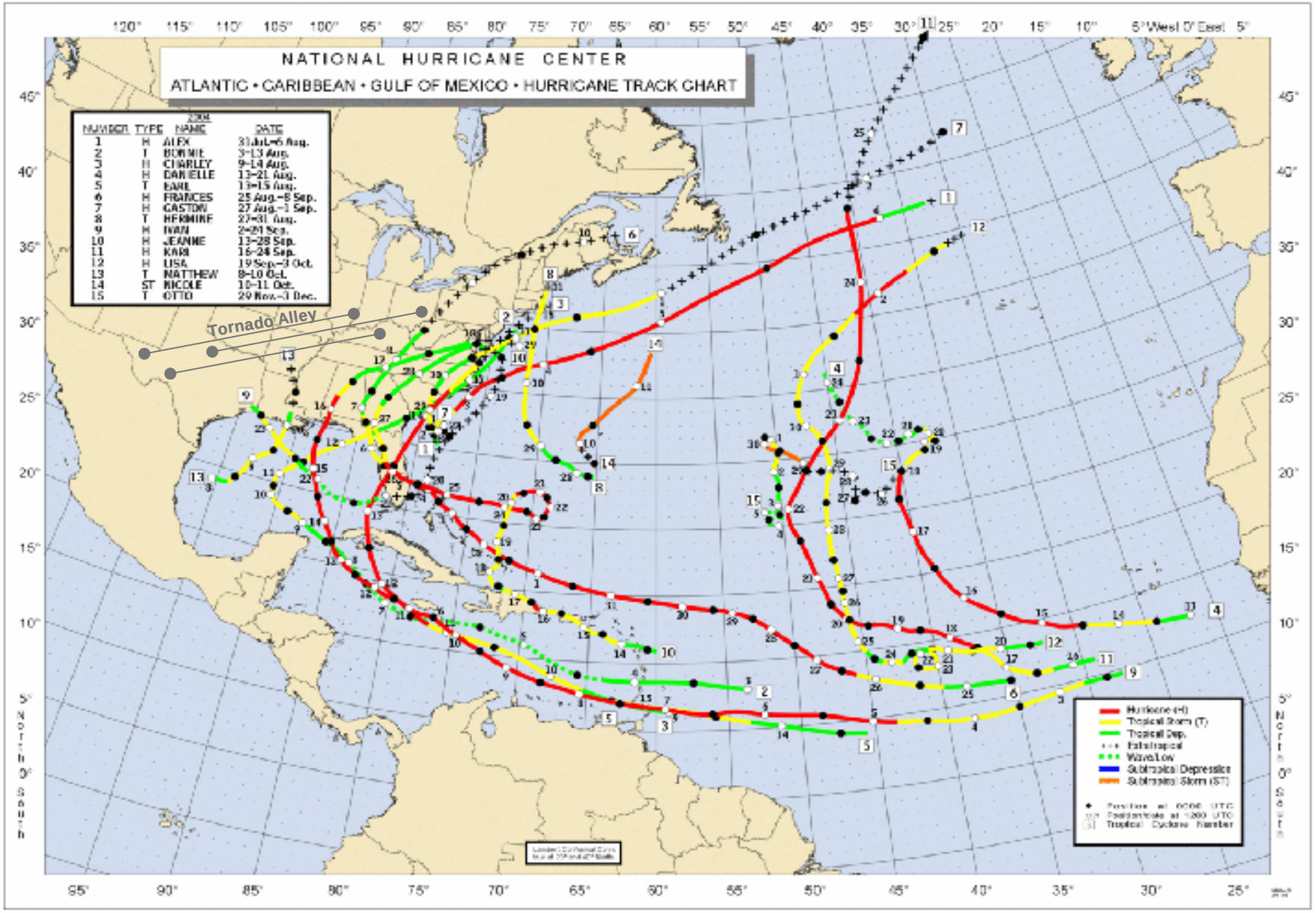
Outage Management Customer Showcase

1. Alinta (AUS)
2. Atlantic City Electric
3. Baltimore Gas & Electric
4. Bermuda Electric Light Company
5. Centerpoint Energy
6. Cincinnati Gas & Electric Company
7. Connecticut Light & Power
8. Consolidated Edison
9. CPFL (Brazil)
10. Delmarva Power & Light
11. Duke Energy
12. Electricity Supply Board (IRL)
13. Energy Australia
14. Energy United
15. Georgia Power Company
16. Gulf Power Company
17. Hawaiian Electric Company
18. Idaho Power Company
19. Interstate Power
20. Iowa Electric Service
21. Kansas City Power & Light
22. Kentucky Utilities
23. Louisville Gas & Electric
24. Mid-Carolina Electric COOP
25. Mississippi Power
26. Northern Ireland Electric (IRL)
27. Northern States Power Company
28. Nova Scotia Power
29. Potomac Electric Power Co
30. Public Service Company of CO
31. Public Service New Mexico
32. Rappahannock Electric Cooperative Inc.
33. Sam Houston Electric Co-op
34. Savannah Electric & Power Company
35. South Carolina Electric & Gas
36. Toronto Hydro
37. United Illuminating
38. Vector (NZ)
39. Western Mass Electric Company
40. Wisconsin Power & Light

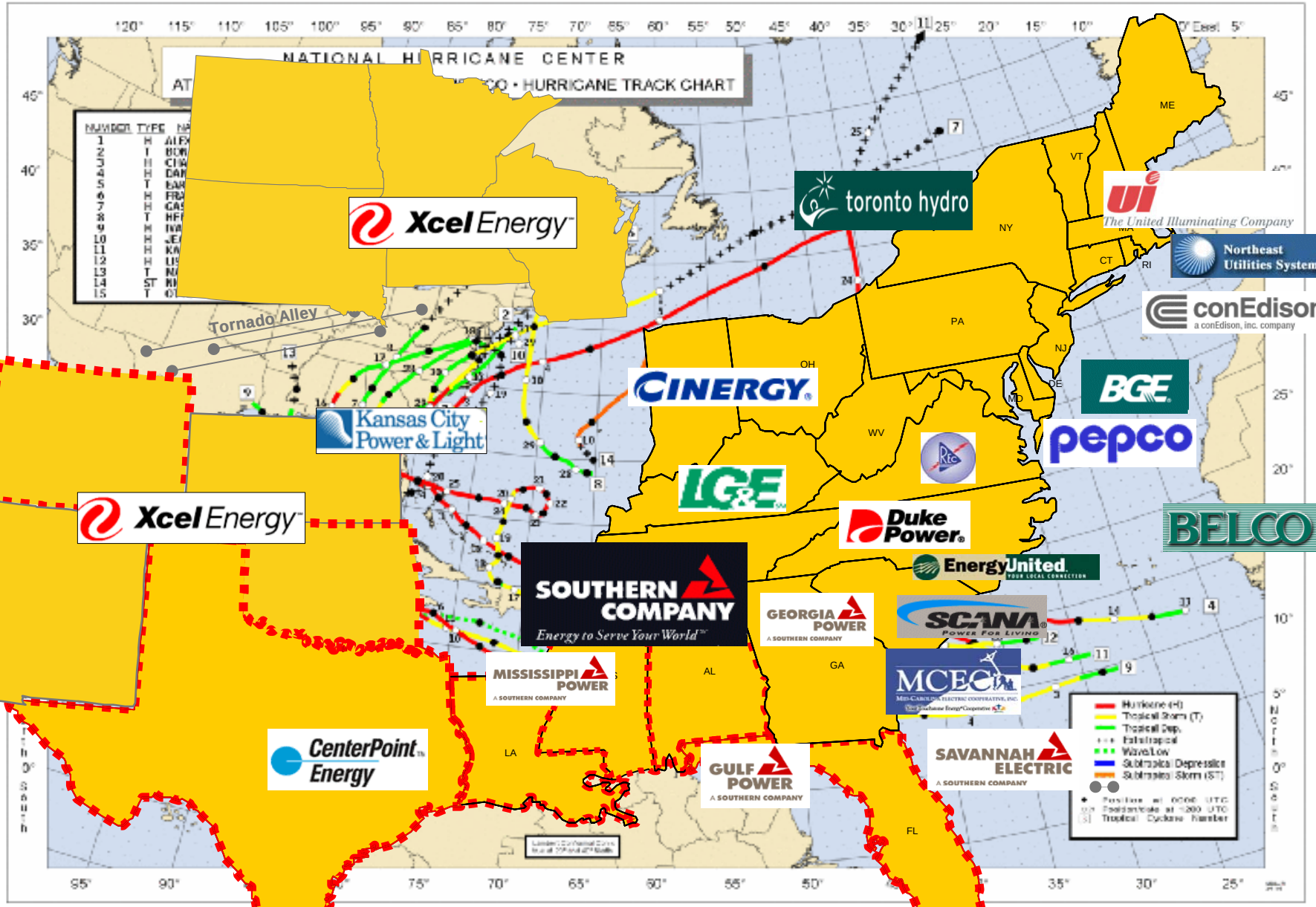
International Oracle NMS Customers



Outage Management Customer Showcase



Outage Management Customer Showcase



Oracle NMS Case Study

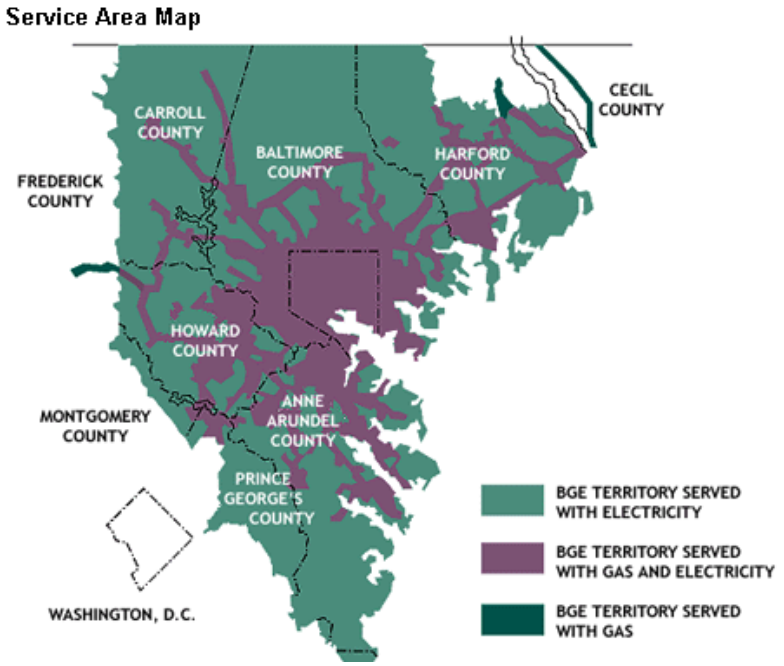
Statistics:

- Customers Served: **1,100,000**
- Network Area: **2,300 Square Miles (3,400Sq.km)**
- D/T Lines: **22,000 Miles**

Project Profile:

• Installed:	**2003**	**2008**
• Oracle NMS Release:	**1.6.1.4**	**1.7.5**
• Max Full Client Users:	**60**	
• Max Exec. Dashboard Users:	**100**	
• Max Calls/hr:	**40,000**	
• Max dev ops/hr:	**300**	

- Operating Environment: **HP-UX, Oracle, Smallworld**



*"With the Oracle NMS solution we are able to **pinpoint where problems are on our network**, which in turn helps us **more effectively prioritize work and optimally dispatch our crews**. "The system allows us to **better serve our customers** because we can provide them with accurate information about the length of time it will take to restore power, as well as providing timely feedback on the cause of the outage and the dispatch and crew assignment information."*

Ken DeFontes, President & CEO

Oracle NMS Case Study

Experience with Hurricane Isabelle: *"the system paid for itself during Isabelle."*

- *790,000 customers out*
- *over 80 people on the system at any one time*
- *over 23,000 individual jobs*
- *Restored power in 8 days to all the affected customers*

BGE believes it was at least two days shorter than if they did not have Oracle NMS

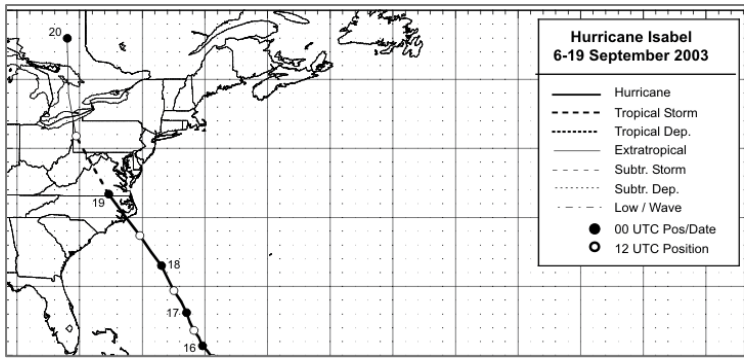


Table 1. Storm Comparison

	Isabel	Floyd
Duration	8 days	8 days
Customers Affected	790,000	503,000
Phone Calls	712,000	290,000
Cases of Trouble	23,612	16,000
Total Personnel	6400	3300
Poles replaced	450	350
Transformers	306	210

Oracle NMS Case Study

BGE recently went live with Oracle Utilities NMS Release 1.7.5.

One of the major improvements was verbose switching steps as documented actions for safe and secure operations.

Switching Management module has enabled a fully paperless environment for submitting, preparing and executing Switch Sheets with the NMS for planned and unplanned outages.

Oracle NMS Case Study

Statistics:

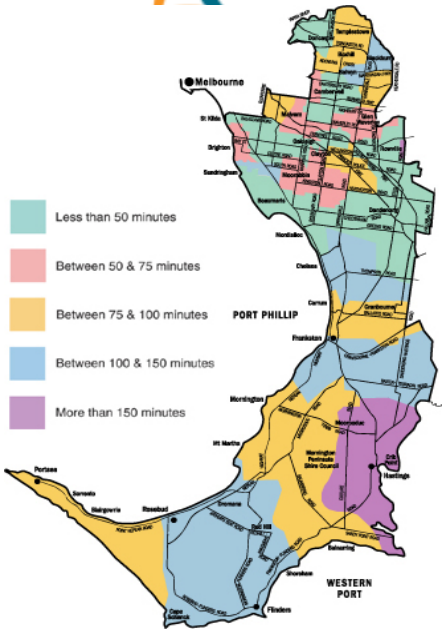
- Customers Served: **600,000**
- Network Area: **2,300 Square Miles (3,400Sq.km)**
- D/T Lines: **5,000 Miles**

Project Profile:

- Installed: **1999 (1.6.1.4 H), Upgraded 2008 (1.7.10)**
- Network: **Gas, Electric**
- Number of Users: **30**
- Operating Environment: **IBM/AIX, Oracle**

Assisted Oracle Utilities with the definition and development of automated Fault Location, Isolation and Service Restoration (FLISR). Identifies faulted sections in the field via SCADA integration.

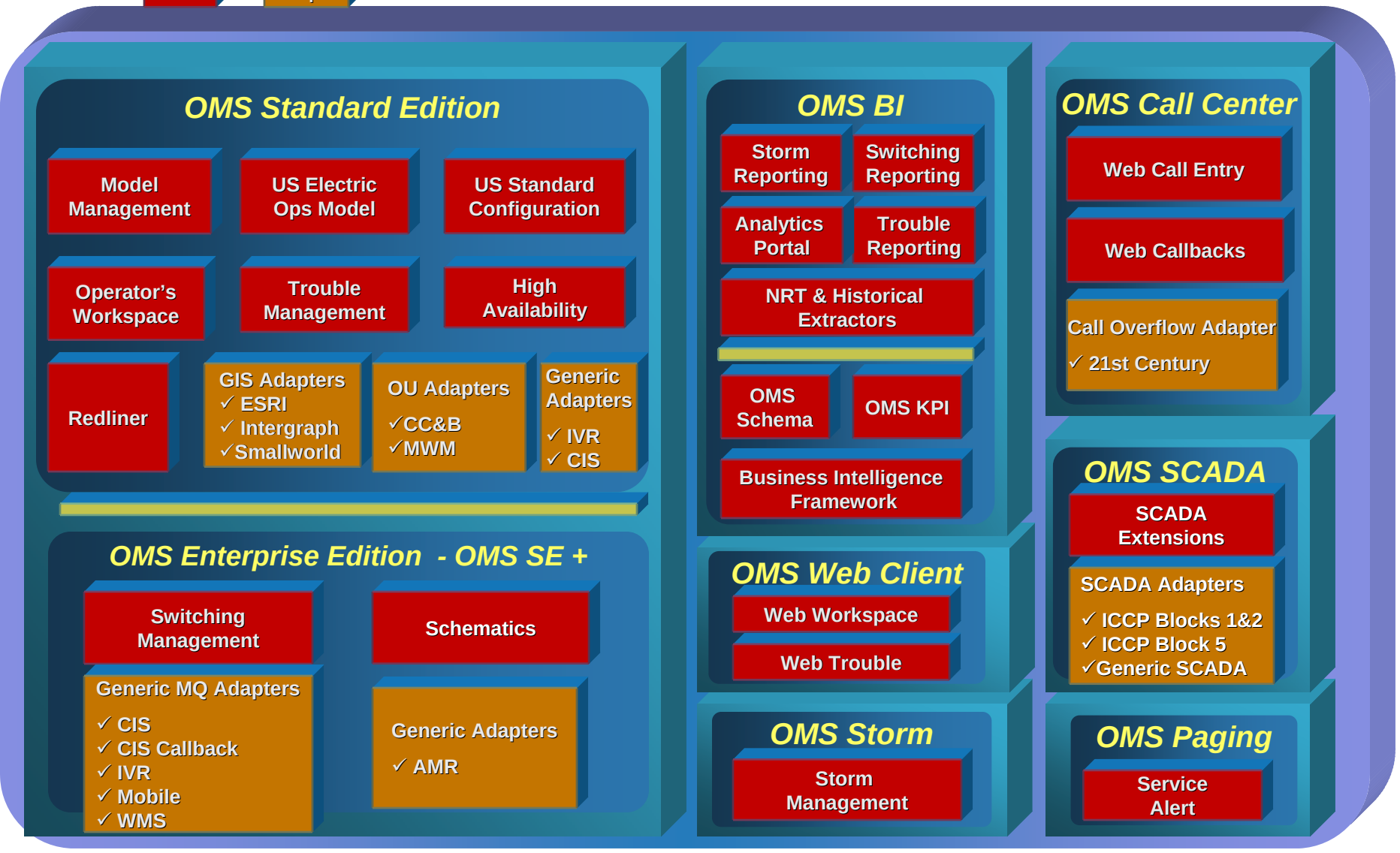
Automatically prepares switching steps and issues actions via SCADA. Allows Alinta to avoid sustained outages by completing restoration actions within 1 minute, treating these events as momentaries.



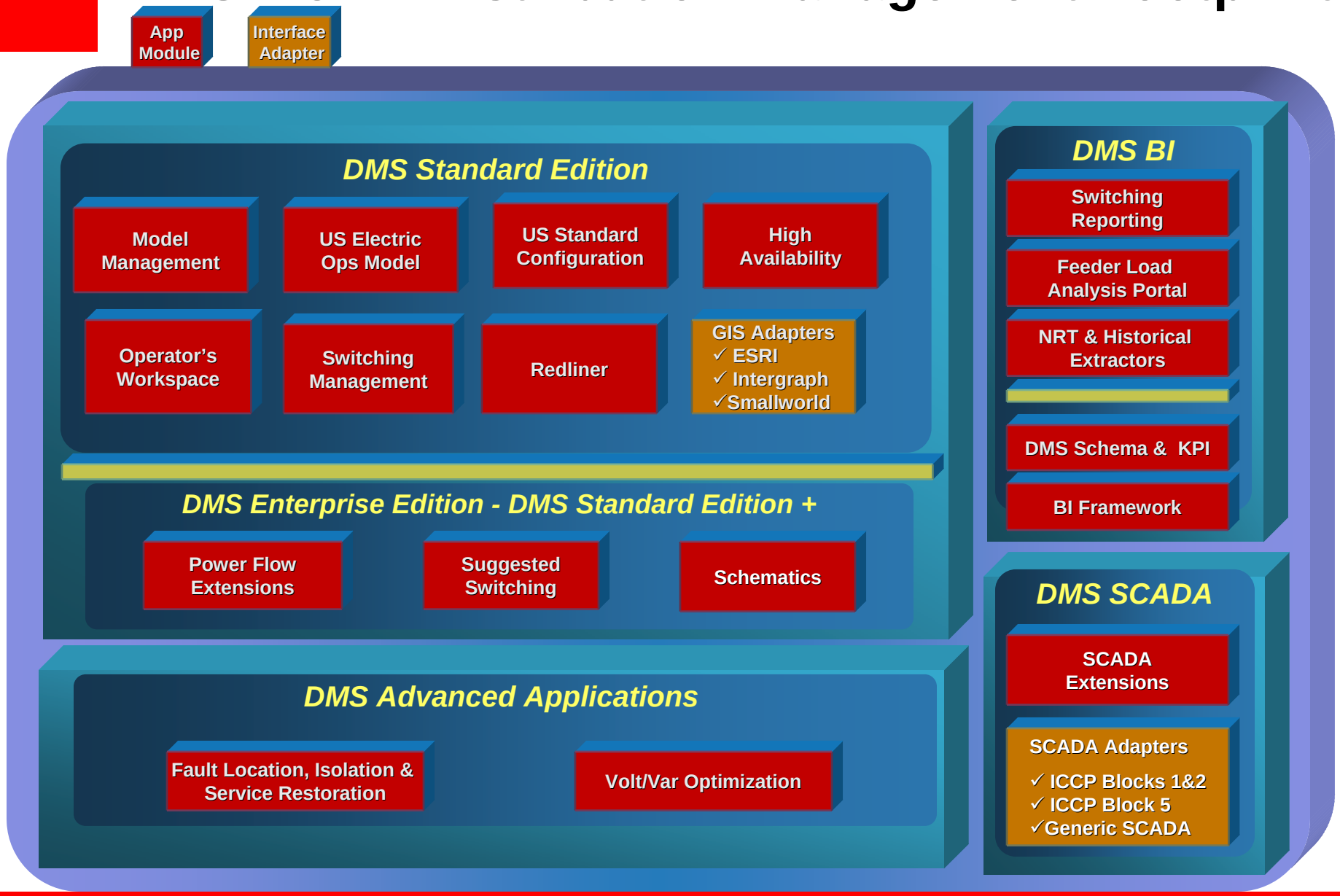
NMS 1.8.1 - Outage Management Footprint

App Module

Interface Adapter



NMS 1.8.1 - Distribution Management Footprint



Oracle NMS DMS Customers

- Customers with Switching Management Implemented

- CPFL
- ESB
- NIE (1999)
- Toronto Hydro (1997)

- Alinta
- BGE
- E.ON
- SCANA
- Pepco

- Toronto Hydro

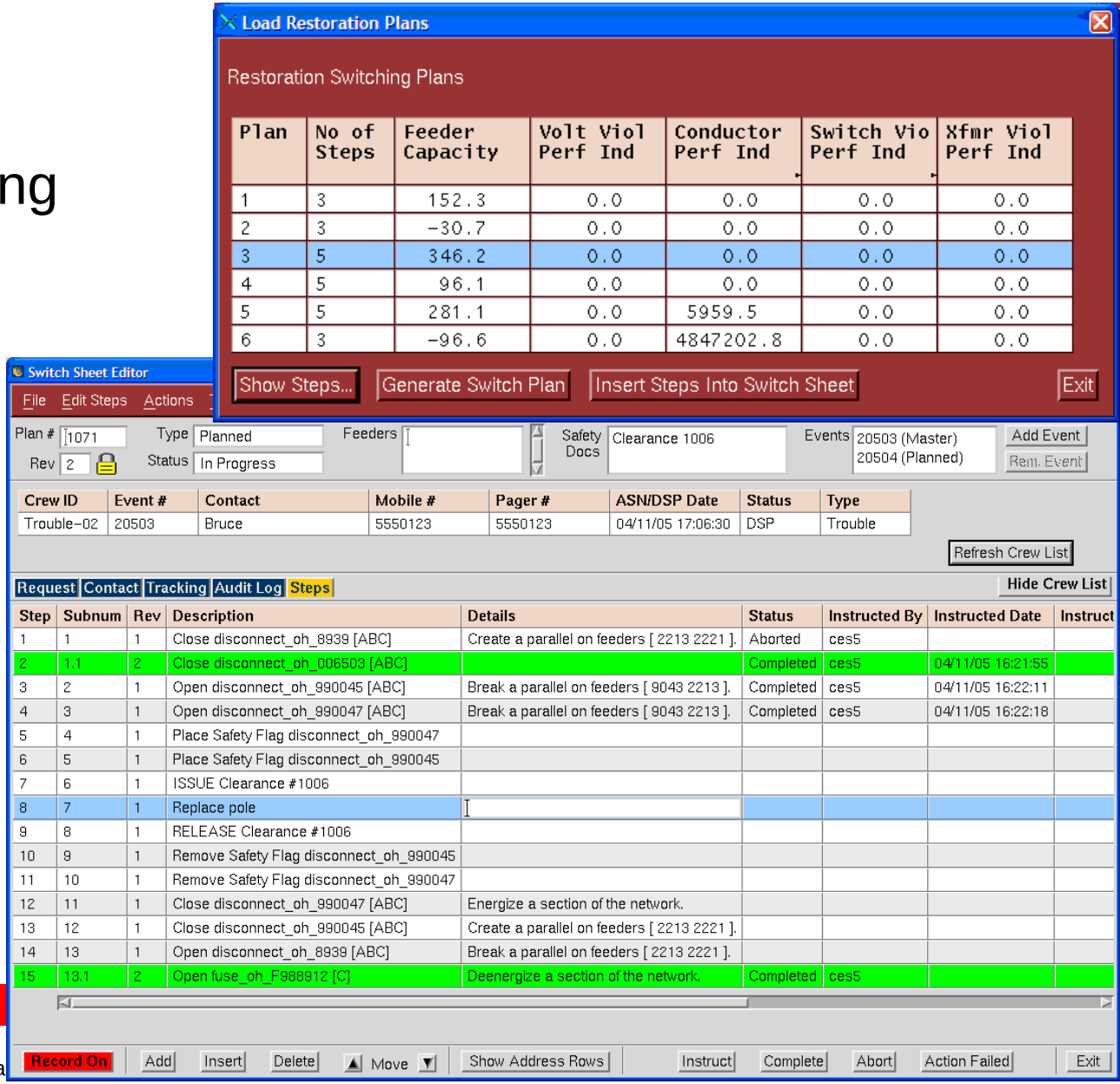
- Our operators run “what if” scenarios to make sure switching plans and other network actions are safe and optimized. North York Hydro (now part of Toronto Hydro) reported a 25% drop in aborted switching operations as a result of switching management

- Power Flow & Suggested Switching:

Hawaiian Electric Company, Inc.

Oracle DMS Functionality

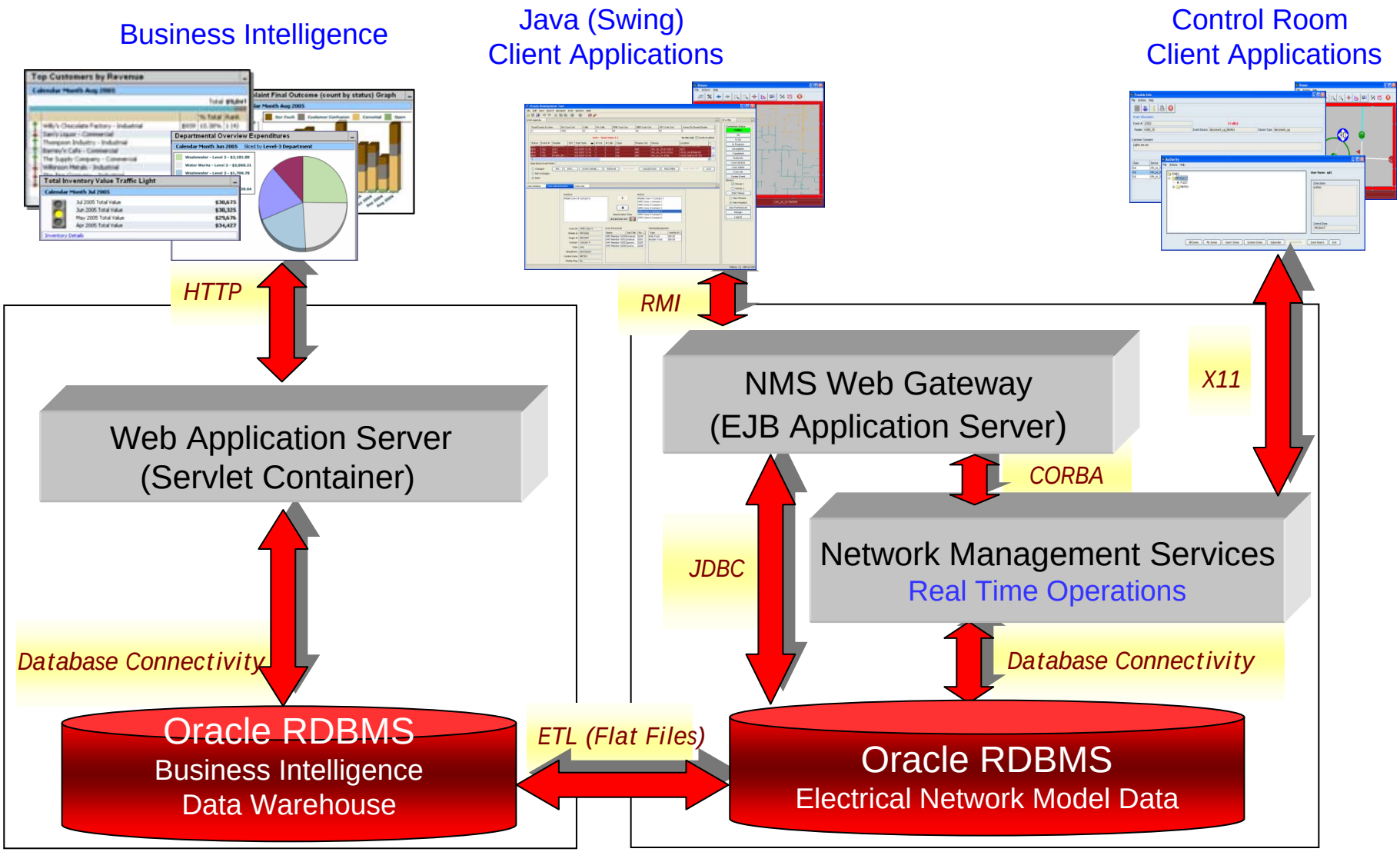
- Switching
- Suggested Switching
- Powerflow
- Overload Relief
- Volt/VAR Optimization



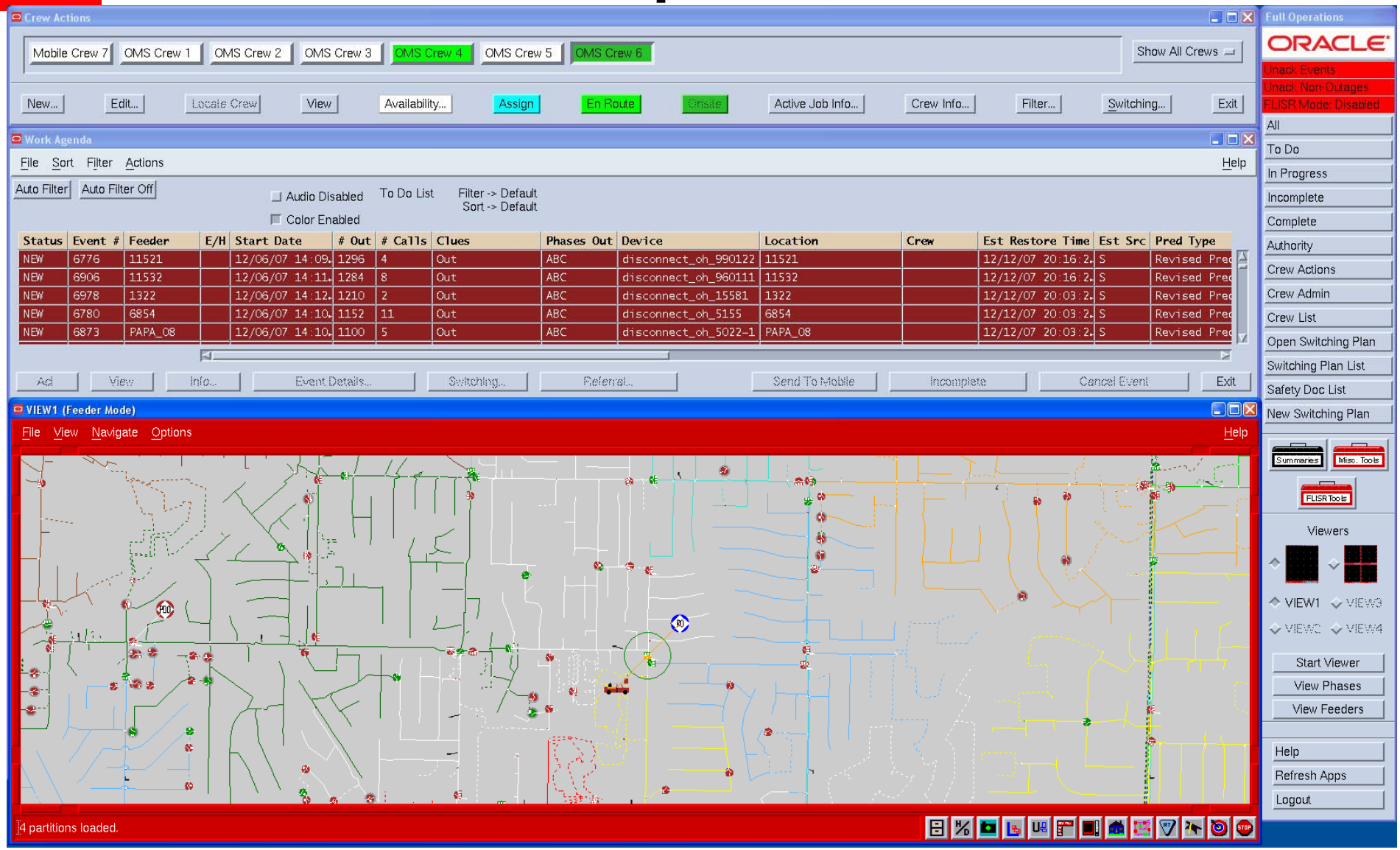
Product Architecture – OMS / DMS

- Single Electric Operations Model
- Persistent Data Store is the Oracle RDBMS
  - Configuration Parameters
  - Connectivity & State
  - Business Intelligence – Oracle Data Warehouse
- Common OMS/DMS System Services
  - Database Access, Object Naming Service
  - Dynamic Data, Connectivity, Outage Analysis (Jobs)
  - Power Flow Engine
- Applications subscribe for information needs
  - Pub/Sub with system services

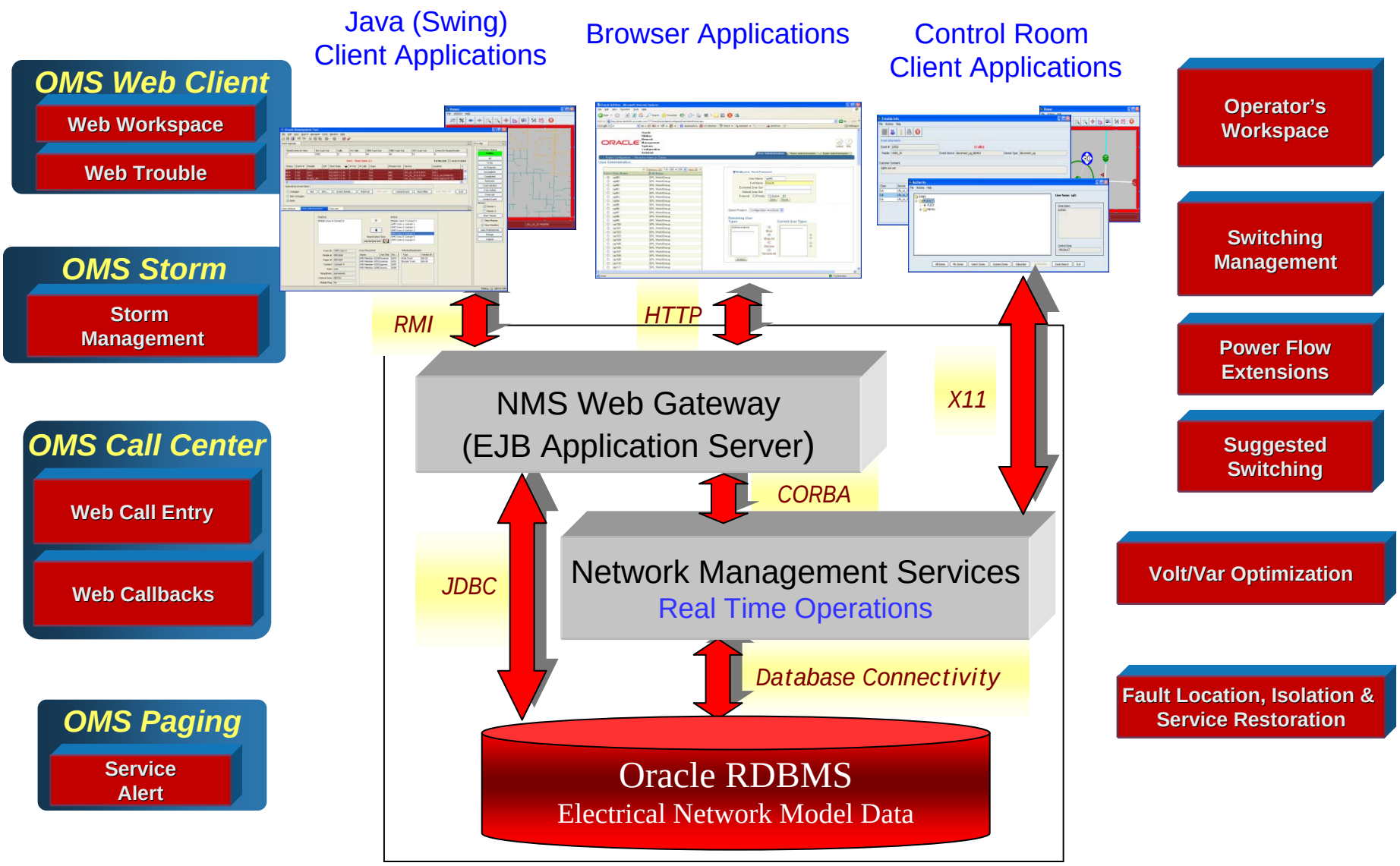
NMS Architecture - Overview



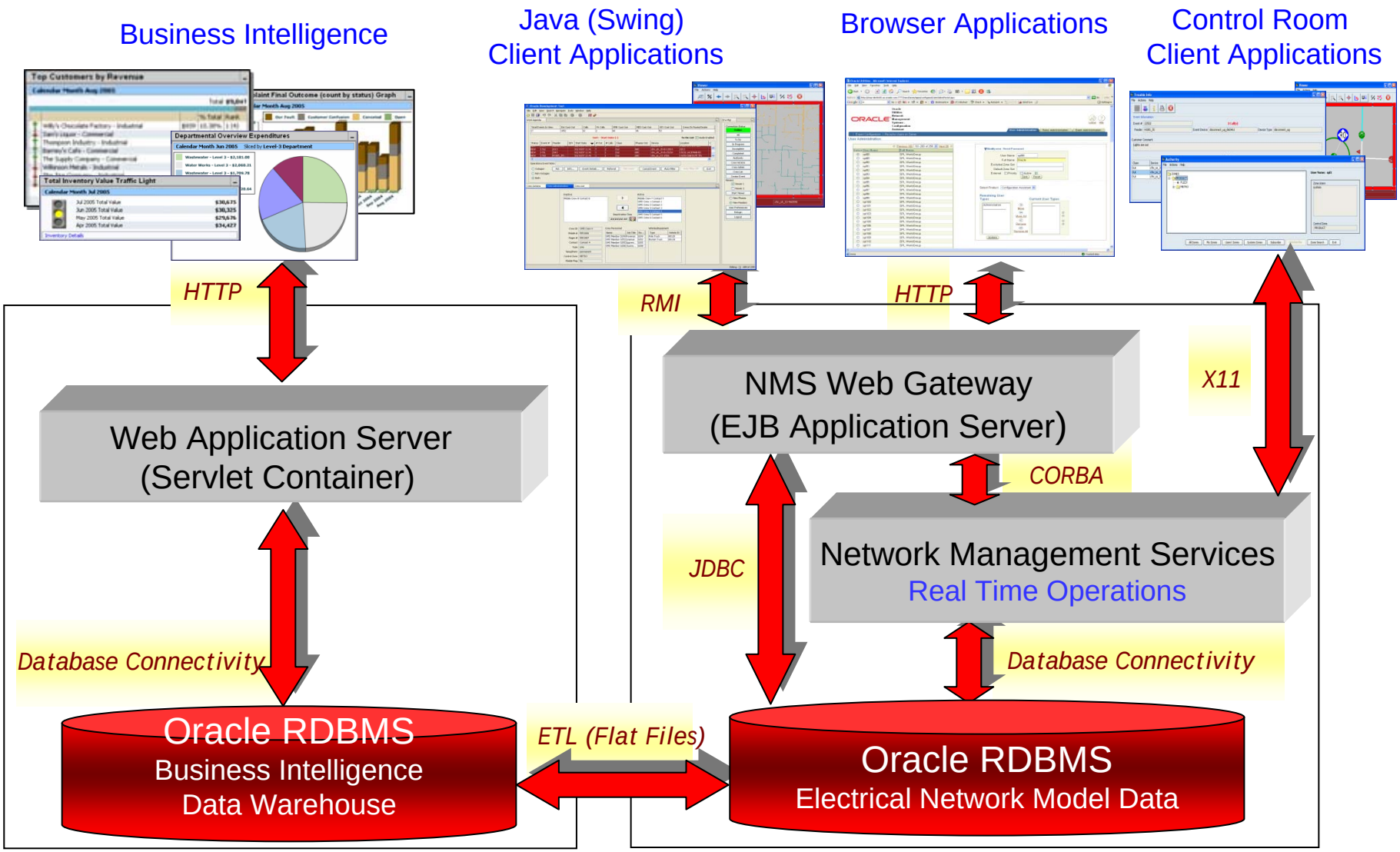
Oracle NMS – Dispatcher Environment



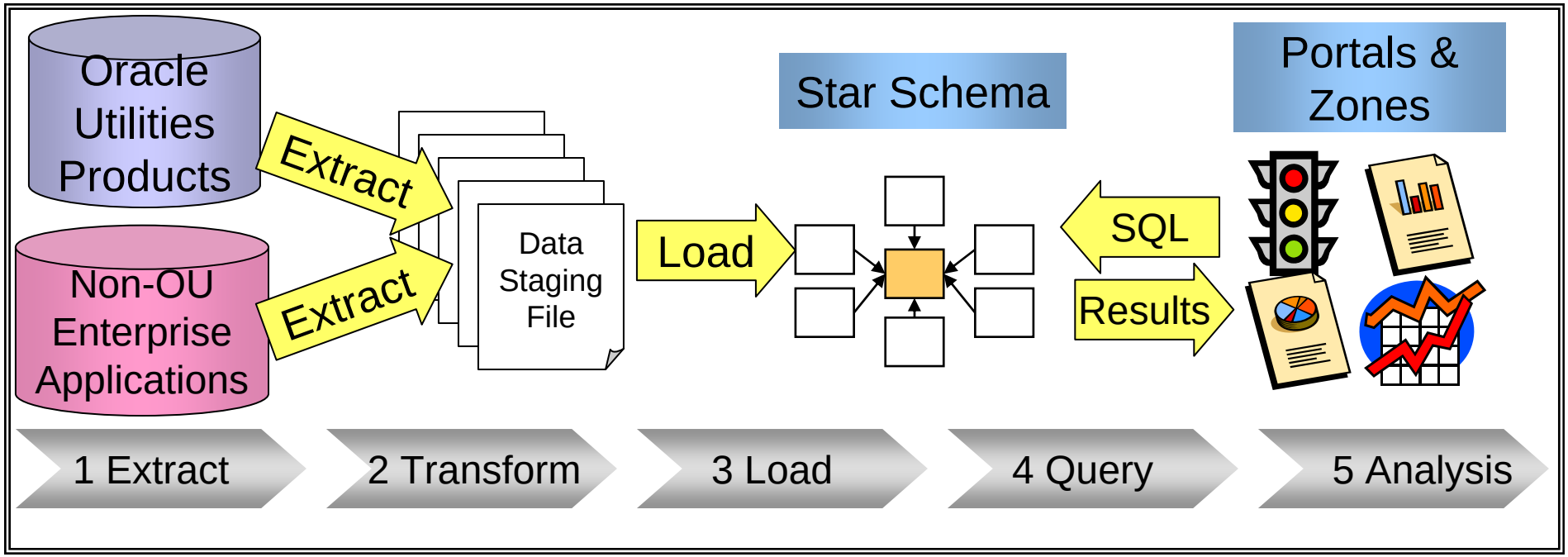
NMS Architecture - Overview



NMS Architecture - Overview

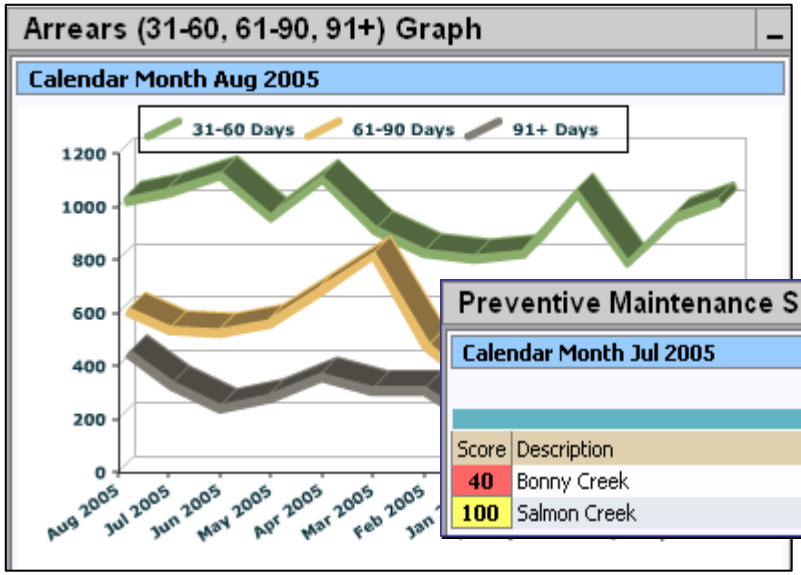


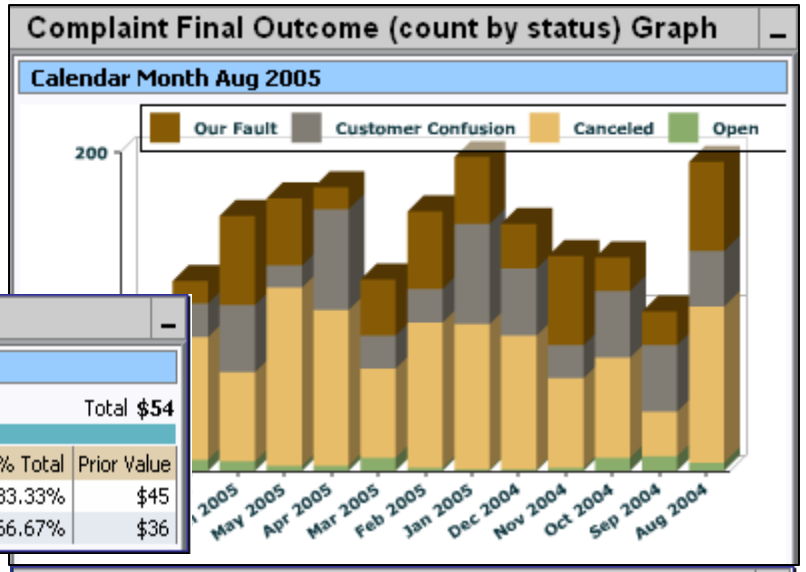
BI consists of ETL, a Star Schema and a GUI

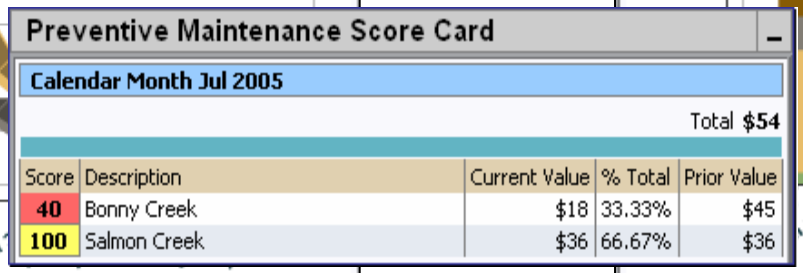


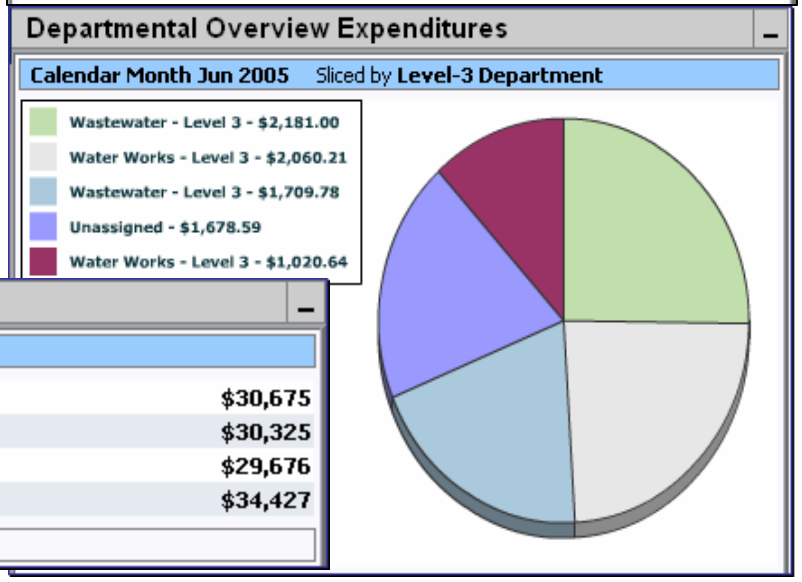
- Oracle Utilities Business Intelligence consist of:
  - Programs and triggers to extract data from the source system (e.g., CC&B, EAM,OMS, non-Oracle Utilities applications)
  - Rules to load the star schemas in the Oracle Utilities data warehouse with the extracted data (using Oracle Warehouse Builder)
  - Graphical Services to support querying of the data in the star schemas

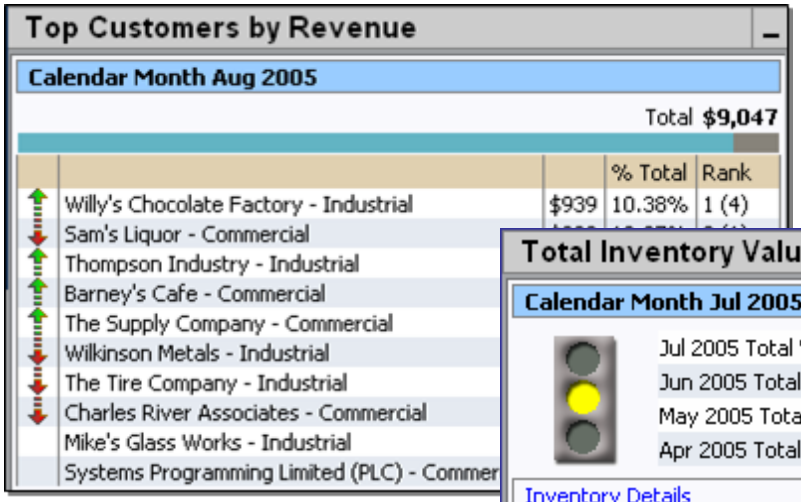
Business Intelligence Visual Metaphors

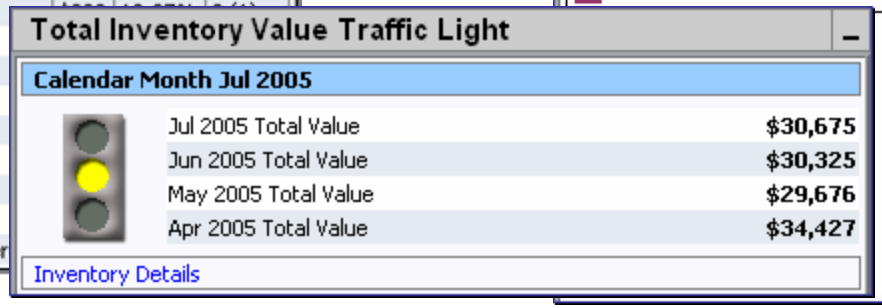








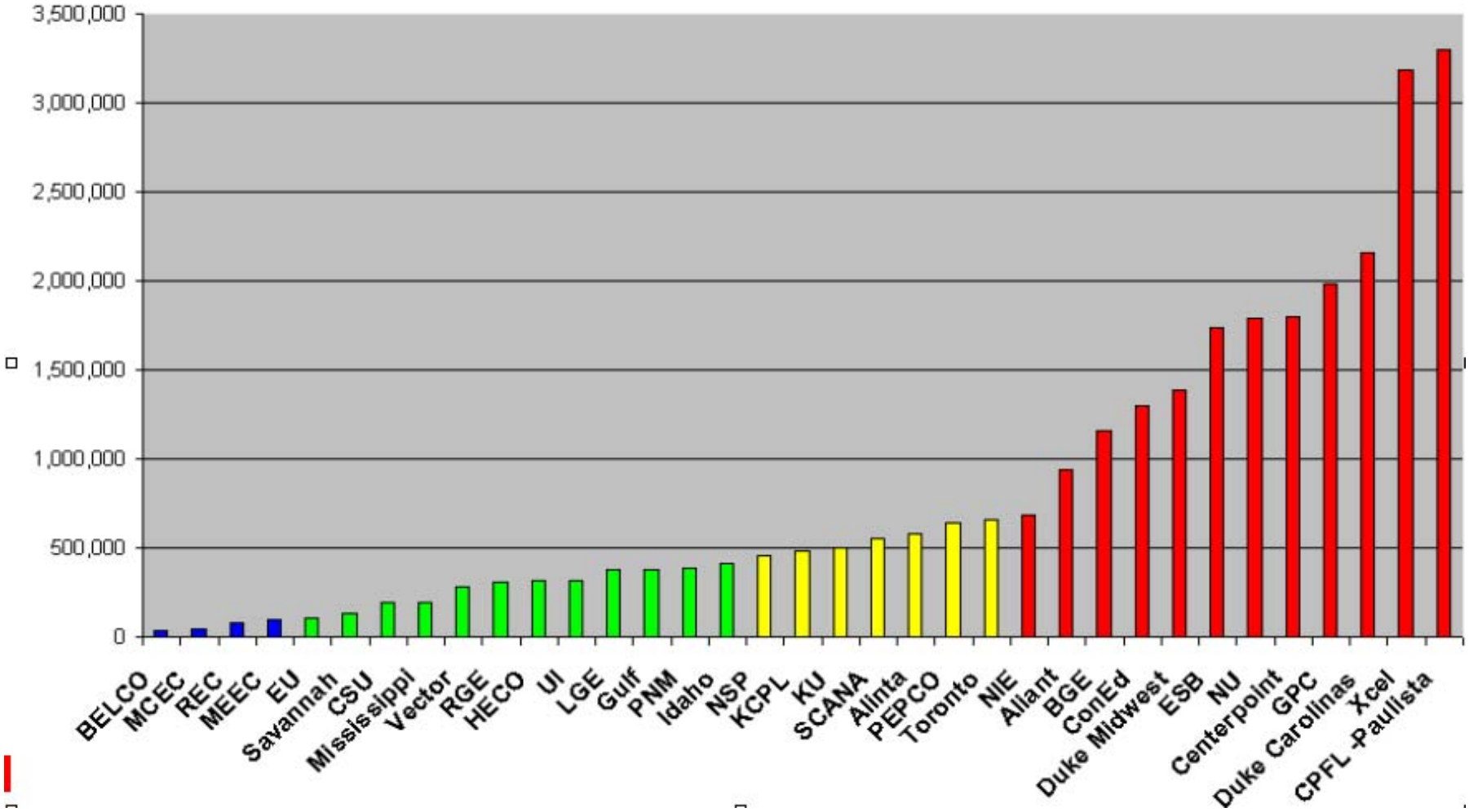




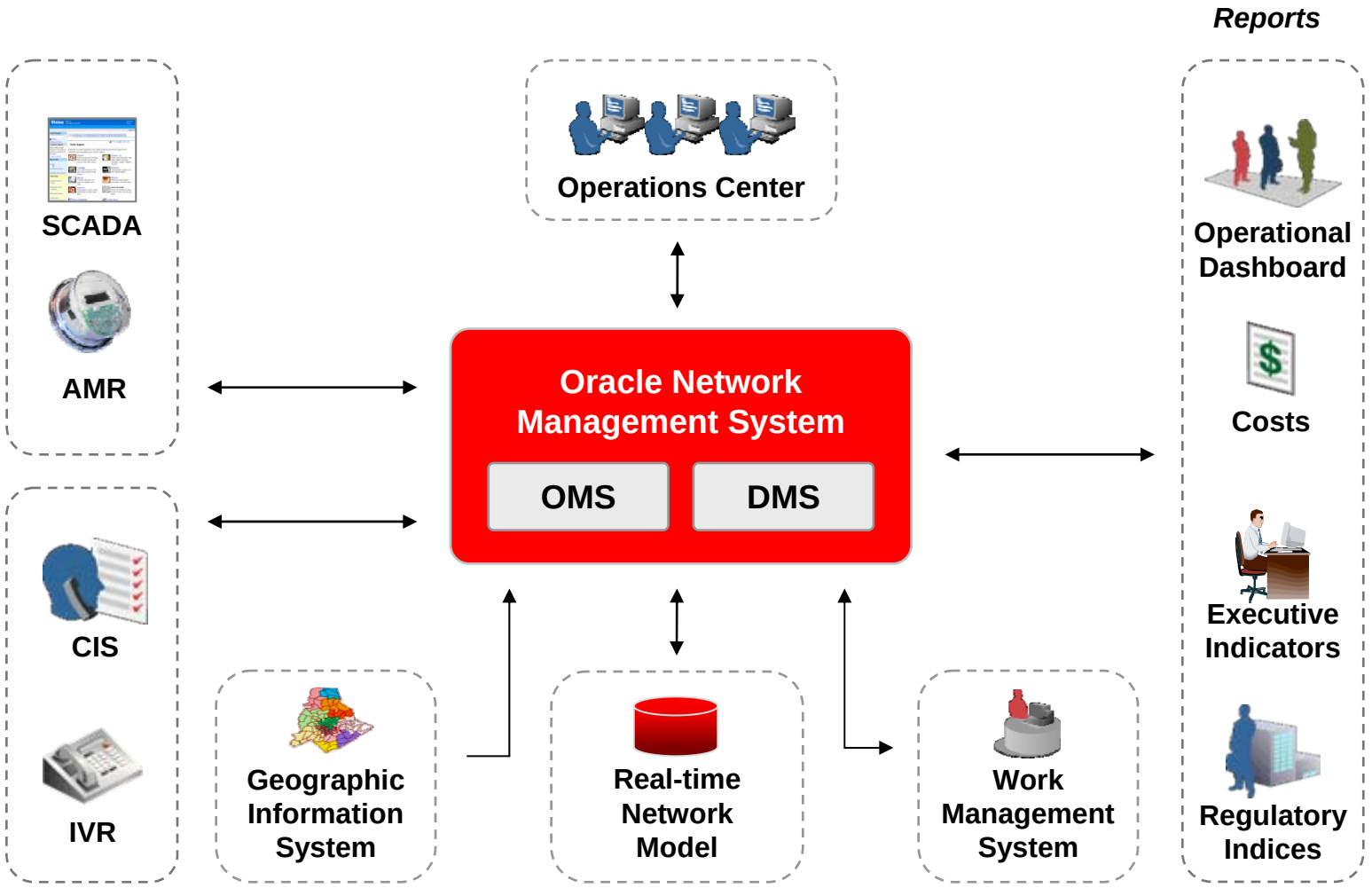
Performance & Scalability

- Each Year PEPCO Certifies OUNMS to PUC
- Certifies the system as “Storm Ready”
- Simulates:
  - Major Storm Event (Hurricane Isabel) – captured calls.
  - Injects calls to NMS
  - Simulates Operations Users
    - Viewer Focuses, Map Loads/Unloads
    - Crew Dispatches
    - Device Operations (Open/Close)
- Actual Users
- Measures Wall Clock Times

Oracle NMS Customer Installation Sizes



Technology & Solution Architecture

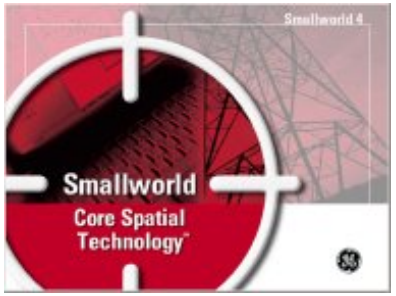


SCADA: *Supervisory Control And Data Acquisition*
AMR: *Automated Meter Reading*

CIS: *Customer Information System*
IVR: *Interactive Voice Response*

Pre-built Integration Adapters

- GIS
  - Standard Adapters and processes for major platforms
    - ESRI
    - Intergraph
    - Smallworld



UGBU Product Integration Adapters

- CC&B Adapter
  - Oracle Shared Table Constructs
  - Materialized Views
  - Stored Procedures
  - Call Input, Outage Status

- MWM
  - Web Services exchanging XML documents
  - Over 30 data flows
  - Outage Events to MWM
  - Either NMS or MWM can be the dispatch environment
  - Crew Management

Pre-built Integration Adapters

- CIS/IVR Generic Adapter
  - Support incoming calls
  - Outage status (customer as part of existing outage, crew dispatched, ERT)
  - Callbacks

- HVCA – Twenty First Century Communications
  - Trouble calls (Customer calls) from TFCC
  - Callback request from Oracle OMS when the outage is restored
  - Callback response from TFCC

Pre-built Integration Adapters

- **Generic MQ Adapters.** Oracle Utilities NMS offers versions of its generic integration adapters that can be used with IBM WebSphere MQ Series middleware. These include adapters for:

  - Customer Information Systems (CIS) / CIS Callbacks
  - Interactive Voice Response (IVR)
  - Mobile Workforce Management (MWM)
  - Work Management Systems (WMS)

Pre-built Integration Adapters

- SCADA
  - Support for ICCP Blocks 1,2 (1-way) & Block 5 (2-way)
  - Generic Adapter
- NMS AVL Web Services Integration
  - Supports One-Way Data Flow
  - Location
  - Direction
  - Speed
- AMI Adapter
  - Supports Outage detection, verification, and restoration

UTILITIES

Integrated Business Process in Action

Meter Ping & Response Status

AMI Server

Restoration Verification

Oracle CC&B

Restoration Verification

Call back to customer if requested

Customer

Outage Status

Oracle OMS

Repairs Completed

Oracle MWM

Verify Outage Restoration and initiate customer call backs

Outage Status

Repairs completed

Or Initiate Meter "Pings"

Strategic Needs Addressed

- Improve Customer Care
- Accurate Outage Statistics
- Reduce Crew Follow-Ups
- Track Partial Restorations
- Verify Service Outages

Agenda

- Fault Location Isolation & Service Restoration:
  - Why FLISR?
  - What is FLISR?
- FLISR Operational Requirements:
  - What does it do?
- FLISR Operational Scenario:
  - How does it work?
- Demonstration

Fault Location, Isolation & Service Restoration

Why FLISR?

- Mandated by the Australia Victoria Government.
- Service Reliability Targets: Per customer, of unplanned interruptions
  - Less than 1.2 sustained outages per year.
  - Less than 1.06 occurances of supply lost for longer than 1 minute
  - Less than 1.21 times of supply lost for less than 1 minute
- Financial Incentives for Reliability:
  - Urban customers with more than 9 interruptions of one minute or longer in a calendar year are credited $80.
  - If the reliability of supply exceeds agreed target, the maximum allowed revenue dollars are increased.
- Developed, delivered, and in production in 2006 at Alinta Energy, Melbourne, AU
- Custom application integrated tightly with the Alinta's Distribution Management System from Oracle

Fault Location, Isolation & Service Restoration

What is FLISR?

- Fault Isolation and Restoration software application is integrated with distribution automation
  - Determine and execute fault isolation
  - Determine and execute best practice service restoration
  - Switch actions execute closed loop without interaction
  - Complete Alinta's event sequence objective of 60 seconds
- Determination of actions is managed within the Oracle Distribution Management System
- Automated execution is managed by the Oracle DMS
- Execution results are detailed within the Oracle DMS

FLISR Operational Requirements

What does it do?

- Fault Isolation and Restoration software application
  - Process protection trips of SCADA switches (CBs and ACRs).
  - Accurately locate fault.
  - Determine isolation steps given a tripped breaker status and fault indication status.
  - Isolate the fault using SCADA control devices
  - Automatically generate restoration steps
    - Determine approximate KVA flow
    - Determine feeder tie capacity
    - Identify KVA overloads and feeder margins
  - Restore service to affected customers using SCADA control devices
  - Complete Alinta's event sequence objective in 60 seconds

FLISR Operator's Environment

- Oracle Utilities NMS Work Agenda window
  - Work Agenda window displays FLISR status of each outage
  - Work Agenda event number color indicates the FLISR status
    - Yellow event # color indicates FLISR executing
    - Green event # color indicates FLISR successfully identified isolation and restoration plan safely without any devices limit overloads
    - Blue event # color indicates FLISR identified isolation and restoration plan with resulting device limit overloads

FLISR Feeder Visualization