Real Time Situational Awareness and Historical Analysis Leveraging GIS at Burlington Hydro
Burlington Hydro Background
Burlington Hydro Background

Customers Served
• Over 60,000 Residential Customers
• Over 5,500 Commercial and Industrial Customers

Assets
• 32 Substations
• 1,600 kilometres of Low Voltage Distribution Lines
• 93 Full Time Employees
Leveraging Core Utility Data Systems with Real Time Data

- Topological Network (Lines and Stations)
- Asset Holdings e.g. Transformer Management / Annual Asset Inspection
- AMI
- SCADA
- Smart Sensors e.g. Self Healing Switches
- E.V. Charging
- Distributed Generation
- Customer Information Systems
- Engineering Analysis System

Requires Effective Real-Time Data Updates Across Most Key Systems
Burlington Hydro Background

- **GridSmartCity™ Initiatives**
  - Smart Automated Distribution Switching (Self Healing, High Reliability)
  - 65,000 Smart Meters deployed with Time-of-Use Billing
  - Distributed Renewable Generation is spreading
  - Electric Vehicle Charging Stations
  - Factory Ride-Through Systems
  - Battery-Based Electricity Storage as a deployable grid resource
BHI Smart Grid
Enterprise Approach “Why Go360”

Smart Grid has Focused Open Architecture as a Main Requirement for Utility I.T.

Multitude of Smart Devices and Integrated Systems
• AMI, SCADA, Smart Switches, Power Line Monitors etc.
• MDMR, CIS, ERP, Engineering Analysis etc
  • Proprietary GIS Systems Integration Very Costly and Inflexible
  • All BHI Data stored Directly in Oracle / Oracle Spatial

• Integration Effort Fast and Utilize Existing I.T. Resources
BHI Smart Grid
Enterprise Approach Foundation on GO360

Real-Time Bi-Directional Communications

• Advance Distribution Management Systems, Outage Management, Mobile etc.

“Big Data”

• Medium Size Utilities Generating Billions of Transactions / Records per Year

• Store, Access and Scale Quickly and Cost Effectively
Burlington Hydro I.T. Systems History

- Legacy CableCad Environment for Network Topology Management
  - Parent Child Connectivity Model
- Daffron ERP: Billing, Work Orders, Transformers Assets, Time Reporting etc.
- Dromey DESS: Engineering Analysis
- Asset Condition Assessment DB: Nameplate, Condition and Photo Data
- SCADA
- GridSmartCity™ Infrastructure (Phase 2): e.g. Smart Switching, AMI, EV Fleet Implementations, EV Charging Stations, Renewable Energy etc.
Go360Networks: Applications Through Integration
Facilitating Complete Lifecycle Asset Management
DATA ANALYTICS

Current Implementation at BHI

Go360Networks Power Database

Executive Dashboards
Mobile Asset Inspection
Mobile Cable Locator
Enterprise Viewer
LiveOps

Survalent SCADA
spatialNET Power
Daffron CIS & ERP
DESS Analysis
AMI & Intelli-team
Integrated and Accessible Solutions
For Your Business Users From a Single Common Database

Executive Dashboards
Smart Grid Analytics
Network Design / Connectivity Model
Mobile
Asset Management
DATA ANALYTICS
GO360Networks Live Applications
Integration and Deployment at BHI Examples
BHI Integrating Several Business Solutions to Enable Real-Time & Planning Applications

- Automating Network Pinning and Work Protection Tagging
  - Includes SCADA Integration and Future ICCP Integration
- Enhancing GO360 Asset Inspection to include Pole Testing & New Transformer Details
- Automating Outage Statistics CAIDI, SAIDI and SAIFI Reporting
- Complete OMS (LiveOps)
  - Smart Grid Enabled i.e. AMI, Self Healing Switches, other Smart Sensors
  - Integrates with Completed Pinning and Tagging
  - Manage Outages and Restoration including Crew Management
  - Re-configure Network via Engineering Switch Order Management
- Full Mobile Field Force Automation
  - Live Bi-Directional Communications with Operations including Automated Dispatch and Job Closing
- Asset Analytics for Engineering and Planning
  - E.g. Load and Asset Health
DATA ANALYTICS for UTILITIES

GO360LiveOps
GO360LiveOps: Automating Network Operations
“Pinning” and Work Protection Tagging

Geographic View

Allows for:
- Manual Operator Placement
- Substation SCADA (One Second Reads)
- Intelligent Self-Healing Switches (One Second Reads)
- Real Time AMI Reads
DATA ANALYTICS

GO360 LiveOps: Integrated Schematic View
DATA ANALYTICS

SCADA Integration – Breaker Event
Configured for ICCP Events with Hydro One
Google Street View Integration: View SCADA Mate Location of Event
### Self Configurable Reports

- Reporting for all Pin and Work Protection Tag Status's
  - Active
  - History
  - By Type
  - By Events
  - By Time
  - Etc.
- Generate Accurate Outage Reporting (CAIDI, SAIDI, SAIFI)
- Utilizes SCADA, AMI and Network Connectivity for Accurate Reporting

### GO360LiveOps Reports: Self Configurable

#### Report Active Pins by Type

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<tr>
<th>PIN_ID</th>
<th>REQUESTOR</th>
<th>USERID</th>
<th>TYPE</th>
<th>OWNER_ID</th>
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Results: 18

[Export Reports]
AMI Events for Hurricane Sandy

Time Based Outages

And

Outage Visualization Examples
Hurricane Sandy – Outages 12 AM

2012-10-30 00:10:00
DATA ANALYTICS

Hurricane Sandy – Outages 1 AM

2012-10-30 01:10:00
Hurricane Sandy – Outages 2 AM

2012-10-30 02:10:00
Hurricane Sandy – Outages 8 AM

2012-10-30 08:10:00
DATA ANALYTICS

Hurricane Sandy: GO360LiveOps Real-Time Outage View from AMI
DATA ANALYTICS

Hurricane Sandy: Customer-Level Feeder Outage
DATA ANALYTICS

Hurricane Sandy Outage Investigation: Cause by Blown Fuse F3836
DATA ANALYTICS
On-the-Fly Schematic Of Outages (Grey Transformers) and Downstream Equipment from Blown Fuse F3836
DATA ANALYTICS

Hurricane Sandy Outage Investigation: Outages from Tree Damage
Public Web View: Generalize to Address Privacy Concerns
AMI Derived Asset Analytics
Transformer Overloading
Asset Health &
Event Playback
AMI Derived Transformer Overloading – July 17th 2012
DATA ANALYTICS

AMI Derived Transformer Overloading – July 16th 2012

[Image of a map showing transformer overloading]
DATA ANALYTICS

AMI Derived Transformer Overloading – Zoom In
LiveOps – Transformer Overloading Detected through AMI and Network Connectivity

Includes Real-Time Event Reporting And Historical Analysis
DATA ANALYTICS
AMI Integration Example – Transformer Monitoring and Analysis Example
DATA ANALYTICS
Real-Time Smart Grid for Operations and Asset Analytics e.g. Overload Analysis Example
Detailed Geographic View. Transformer Overloading
Loading Profile at Transformer
Color Coded by % Overload In 15 min. Intervals

>110%
Overload: 64% of the time

Loss of Life: 1.11%
## Transformer Weekly Summary Report

### Transformer Number: OT3979

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<th>Description</th>
<th>Value</th>
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<tr>
<td>Peak Demand:</td>
<td>91.93 KVA</td>
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<tr>
<td>Peak Demand:</td>
<td>82.74 KWh</td>
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<td>Overload:</td>
<td>74%</td>
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<tr>
<td>Load Factor Rating:</td>
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<td>Use Factor Rating:</td>
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<td>Outage Count:</td>
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<td>Outage Duration:</td>
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<td>Loss of Life:</td>
<td>6.7%</td>
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<td>Coincidence Factor:</td>
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<td>Throughput:</td>
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**Overload: 74% of the time**

**Loss of Life: 6.7%**
Smart Grid for Real-Time Operations and Asset Analytics

- July 17th [Midnight]
- July 17th [5:45 AM]
- Temporary Outage Events
- July 17th [5 PM]
- July 17th [Midnight]
Integrate AMI Asset Analytics with OEB Asset Inspection and Work Accomplishment Data
DATA ANALYTICS for UTILITIES

Asset Health Analysis and Work & Accomplishment Reporting
BHI Spatially Enabled Open I.T. Architecture

Realizing our Vision

• One Centrally Maintained Asset Database to Serve Enterprise
  – Oracle and GO360Networks Software
  – Operations, Mobile Crews, Asset Management, Engineering, System Planning, Asset Inspection, Cable Locates, Executive

• Ease of System Integration
  – Within a very short period of time able to integrate CIS, ERP, SCADA, Smart Switches, AMI

• Live Solutions Enabling Efficient Operations Leveraging Smart Grid
  – Automate Operations, Enhanced Reliability, Enhance Asset and Energy Analytics

• Available to any Internal and Contract Staff including Mobile Solutions in A Secure Manner

• Operations
  – Outage Management with SCADA, Self Healing Switch and AMI Integration
  – Outage Statistic Reporting CAIDI, SAIDI, SAIFI – Pinpointing Cause of Problem Spatially for Accurate Reports

• Executive Dashboards
  – HR, Engineering, Financials, CIS, Call Centre, Scorecard
New or Future Initiatives

• Integrated OMS/ADMS
  – CIM Compliant XML Interface to Real Time State Estimation
  – Comprehensive interface for OMS/DMS

• Asset Analytics via Multiple Smart Grid Sensors
  – Transformer Monitoring (Theft)
  – Power Line Monitoring / Power quality
  – Advanced Asset Management Models
  – Network Constraints
  – Key KPI’s
  – Regulatory Reporting

• Advanced Real-Time Mobile Solutions
  – Work Force Management and Dispatch
  – Real-time Access

• Advanced Infrastructure Planning
  – Electric vehicles
  – Distributed Generation
  – Storage