

Advanced Fault Location and Fault Visualization system

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Overview

- Real-time automated fault location
- Software system architecture & data requirements
- Fault information delivery and advanced fault visualization
- Key benefits

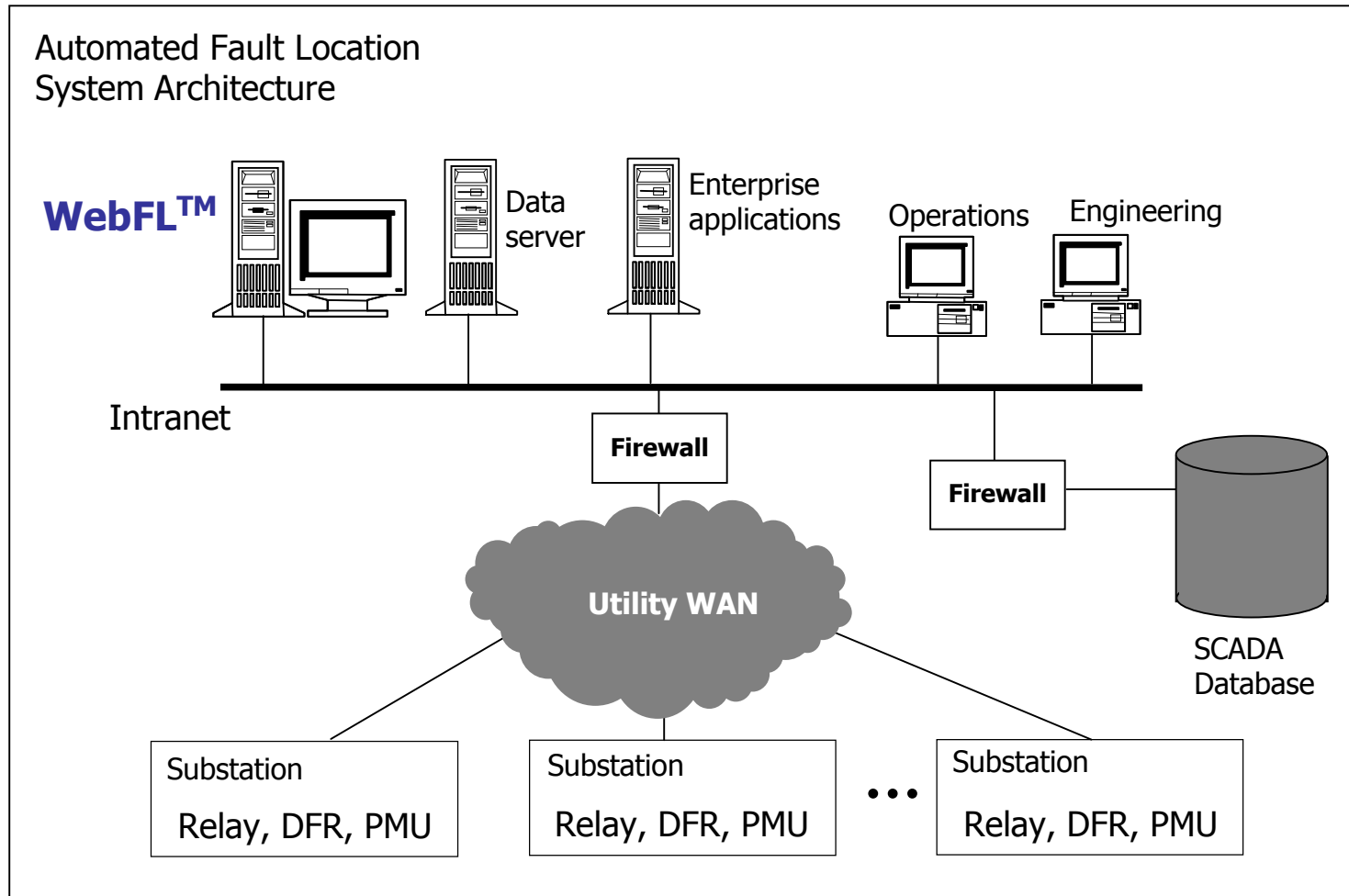
Real-time Fault Location & Analysis

- Improving reliability
- Improving efficiency
- Saving costs
- Conventional tools no longer satisfying the requirements from new environment
 - ❑ Real-time monitoring, analysis, and visualization
 - ❑ Enterprise-wide access to information

Real-time Fault Location & Analysis (cont'd)

- System operators
 - Decision support tool
 - Faster restoration
 - Improved situational awareness
- Protection (analysis) engineers
 - Improve productivity
 - Avoid time-consuming analysis of system conditions
 - Receive information in a timely manner
- Maintenance crew
 - Optimize the availability of transmission infrastructure
 - Minimize helicopter patrolling area

Software System Architecture



Data Requirements

- System data
 - ❑ Line parameters
 - ❑ Substation and line connections
 - ❑ IED (DFR, Relay, PMU, etc.) installation
 - ❑ GIS (for advanced visualization)
- Fault or disturbance data
 - ❑ Recorded by IEDs
 - ❑ COMTRADE or proprietary



Fault Information Delivery

- To system operators
 - ❑ Web interface
 - ❑ Advanced visualization
 - ❑ Integration to existing visualization tools
- To analysis (protection) engineers
 - ❑ Web interface
 - ❑ Advanced visualization

Web Interface

Fault information real-time display

- Automated update
- Accessible to all user levels
- Selectable double-ended and single-ended display
- Ajax technologies

WebFL Real-Time Display

From (mm dd/yyyy) 12/13/2000 To (mm dd/yyyy) 12/13/2008 08:53:18 08:53:18 Autoupdate ☒ DoubleEnded ☐
Interval: 30 sec

Date & Time	Fault Type	Fault Location	Substation	Line
12/12/2008 19:53:43	BG	3.77 (mi)	Sub 1	line-2
03/14/2008 19:06:02 779	BCG	3.62 (mi)	Sub 3	line-5
05/09/2007 19:23:50 486	BG	4.2 (mi)	Sub 4	line-tap
05/09/2007 17:20:55 884	BG	18.5 (mi)	Sub 4	line-tap
04/12/2006 19:07:46 425	ABG	6.94 (mi)	Sub 3	line-4
03/04/2006 19:06:02 779	BCG	3.99 (mi)	Sub 3	line-5-m
04/03/2005 01:08:38 188	BG	6.49 (mi)	Sub 1	line-1
05/20/2003 01:18:5 425	ABG	7.85 (mi)	Sub 3	line-5-m

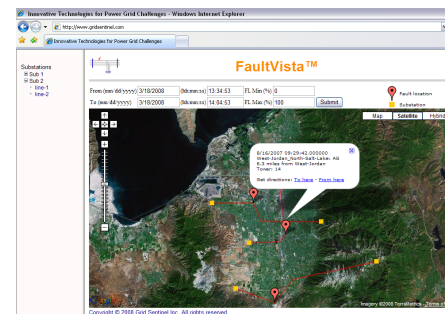
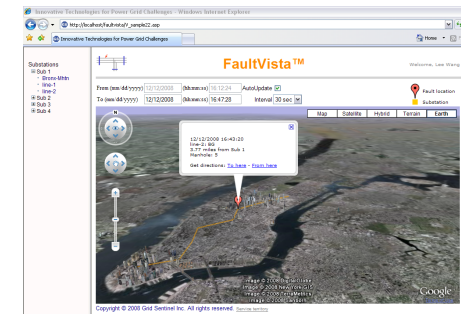
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Advanced Fault Visualization

- Overlay accurate fault information on GIS-based visualization tools
- Show faulted towers
- Improve situational awareness
 - ❑ Nearest cross roads
 - ❑ Mountains
 - ❑ Terrains
 - ❑ Forests
 - ❑ Deserts
 - ❑ etc.

Advanced Fault Visualization (cont'd)

Advanced fault visualization tool
based on Grid Sentinel's WebFL
and Google Earth/Maps



Innovative Technologies for Power Grid Challenges - Windows Internet Explorer

http://localhost

Innovative Technologies for Power Grid Challenges

Home



Substations

- sub-1
- sub-2

FaultVista™

From (mm/dd/yyyy) 3/6/2009 (hh:mm:ss) 14:18:59 AutoUpdate ☐

To (mm/dd/yyyy) 3/6/2009 (hh:mm:ss) 14:51:26 Interval 30 sec

 Fault location
 Substation

Map Satellite Hybrid Terrain Earth

03/06/2009 14:49:47
line2: BG
3.43 miles from Sub 1
Tower: 9
Get directions: [To here](#) - [From here](#)

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Key Benefits

- **Improves reliability & saves costs** by helping system operators achieve fast and correct service restorations with real-time fault location
- **Improves efficiency** by helping maintenance crew quickly locate and repair problems
- **Saves** protection engineers **time** through automated fault diagnosis and relay performance evaluation

Questions?

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