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New Tools for Managing Smart Switching Devices

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Cigré Smart Switching Devices



 PulseClosers, Reclosers, Automated Switches

- Communications-enabled
- Performs power quality measurements (voltage, current, power factor, etc.)
- Uses on-board logic to determine necessary switching actions
- Provides status information to higher-level systems

Benefits of Smart Switching Devices



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Increased reliability

- SAIDI, SAIFI, CMI, etc.

- Increased efficiency
 - Increased operational visibility
 Real-time operational status and power quality measurements



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Operational Challenges

- Maintaining electronic controls
 - settings

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- firmware
- batteries
- Data deluge
 - operational logs
 - time series data
 - device events, alarms

New Management Tool

- Capable of collecting operational and event driven data from multiple devices
 - more than just "DNP/SCADA" data
 - Presents data in human readable formats
 - charts, tables, graphs, etc.
 - Performs event correlation and advanced data analytics
 - intelligent alerts, operational trending, etc.
 - Handles mass firmware updates and device settings changes
 - removes the need to visit individual controls

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Visual Aids for Operational Status

Example 1:

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An easy-to-understand visualization of a 90-device, self-healing system, during a major storm event.



Last Refresh Time: Fri Apr 25 21:42:49 UTC 2014







Typical Operational Experience

- Operator gets DNP status information that a device has operated (i.e. tripped, locked out, etc.)
- During major events, multiple devices send this information and the Operator must correlate it all to determine the overall system state
 - delays crew deployment to affected areas
 - increases outage time to repair circuits
 - prone to human error



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New Operational Experience

- New Management Tool collects operational data and provides it in a easy-to-read summary view
 - tool shows which devices are in a faulted state and what circuits are affected
 - Operator assess the situation and determines what areas are affected and dispatches crews immediately to repair circuits



cigré New Operational Experience



Last Refresh Time: Tue Jul 22 14:51:59 UTC 2014

With this single chart, operations personnel received a quick and useful indication of all 90 devices throughout the storm event. Page 9

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Bre Remote Engineering Access

- Trying to analyze event data from multiple devices is becoming a big challenge with large automation systems
- Management tool provides the capability to download event files and waveform captures from multiple devices remotely
 - helps assess the root cause of outages and system disturbances
 - provides "big picture" view of events
 - helps determine if simultaneous events are related or not and overall sequence-of-events

Example 2:

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The Management tool is used by an Engineer to download waveform captures and event files from multiple devices on the same circuit to assess whether or not the events were correlated

Waveform capture from the upstream device shows a fault event, but it was temporary and service is restored

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Waveform capture from the downstream device shows a fault event, but it's permanent so the device locks out to isolate the fault



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- In this example the Management tool helped the Engineer determine that the events were related
 - retrieved the event files and waveform captures remotely
 - provided the time series of events
- The evolution of the tool is to download event data and to conduct the assessment of the event automatically
 - Engineer logs in, reviews the event report

Decreases the time to analyze the event and determine root cause and next steps!

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Beyond SCADA Data

- Smart switching devices have a limited number of SCADA/DNP points that can be utilized for operational visibility
- In order to add/change these points, new firmware is required and this has to be applied to all devices in the field
 - labor intensive process
 - requires changes to SCADA system to access new points

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Adding New SCADA Points

Example 3:

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The utility would like to know if the voltage angle difference is outside the desired switching limits.



Old Process

- 1. Manufacturer needs to understand the request, accept it, and specify it
- 2. Manufacturer needs to add three new SCADA points for Δ Voltage Angle in firmware
- 3. Manufacturer needs to add support for the new SCADA points in the configuration software
- 4. Manufacturer needs to update and publish literature reflecting the new SCADA points
- Manufacturer needs to wait for next software release cycle and then post the new SCADA points for customer use
- 6. Utility needs to download the updated software
- 7. Utility needs to install the updated software on appropriate users' PCs

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Old Process Continued

- 8. Utility needs to install new firmware on all smart switching device controls
- 9. Utility needs to update control settings to add the new SCADA points
- 10. Utility needs to update the SCADA system to poll the new points
- 11. Utility needs to view SCADA points, one device at a time, to determine status

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New Process

- 1. Manufacturer needs to understand the request, accept it, and specify it
- 2. Manufacturer needs to update the Management tool software to retrieve Δ Voltage Angle from device
- 3. Manufacturer needs to post the updated software
- 4. Utility needs to download and install the updated software (one instance)
- 5. Utility needs to go to updated dashboard display to view Δ Voltage Angle charts and graphs for all devices

Much simpler and streamlined process!

What's Next?

 Ability to track and assess the benefits of smart switching devices

- calculate SAIDI, SAIFI, CMI saved

 provide economic dashboard of system savings

 trending switching activity to report on the overall performance of the system

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Summary

- As more smart switching devices are deployed, it is becoming more difficult to maintain and manage these devices
- Operators cannot assess things quickly as they are overwhelmed with the data deluge

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 New Management tools are now required to provide better operational visibility and to provide event correlations

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