

# ***B***

## **USE CASE 5 – PROTECTION ENGINEER CHANGES SETTINGS ACROSS A NETWORK**

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### **Use Case Title**

Protection Engineer changes settings across network

### **Use Case Summary**

The utility decides to implement a new operating or protection philosophy and this requires the change of the settings of a specific set of functions throughout the network. The change is entered into the engineering tool(s) at the network level. At the network level the setting change is initiated and the specific functions are instructed through the communication network to update their settings. Automatically the configuration files at IED, Substation and System level are updated to reflect the change.

### **Use Case Detailed Narrative**

#### ***Task***

The utility decides to implement a new operating or protection philosophy and this requires the change of the settings of a specific set of functions installed throughout the high voltage network. The change is entered into the engineering tool(s) at the network level. At the network level the setting change is initiated and the specific functions are instructed through the communication network to update their settings. Automatically the configuration files at IED, Substation and System level are updated to reflect the change.

The use case includes the following steps:

1. The settings are determined / calculate and entered in to the engineering tool.
2. The protection functions to be changed are selected and the settings are updated
3. The updated setting are automatically entered into the configuration files at IED, Substation and System level

### **1. The settings are determined / calculate and entered in to the engineering tool.**

Based on all the necessary Power System parameters the protection engineer calculates the new settings for the protection functions. The new settings are then entered by the protection engineer in the engineering tool for the settings that contains the entire object model of the function to be changed.

After validation by the engineering tool and the protection engineer that the settings are entered correctly, the tool generates a protection function setting file. This file will be used to change the settings of all protection functions to be changed that are installed throughout the high voltage network.

### **2. The protection functions to be changed are selected and the settings are updated**

The protection engineer accesses the Network Protection Application responsible for the configuration and setting management of the field equipment and selects the protection functions to be changed. After validation by the Network Protection Application that all available protection functions that are to be changed are selected the protection engineer initiates the settings change on the Network Protection Application.

The Network Protection Application contacts the protection functions and downloads the new settings into them.

After validation that the settings have been correctly received the Network Protection Application responsible for the configuration and setting management of the field equipment activates the new settings inside the protection functions

### **3. The updated setting are automatically entered into the configuration files at IED, Substation and System level**

The Network Protection Application responsible for the configuration and setting management of the field equipment then updates all the individual protection function configuration files, the substation configuration files and the system level configuration files and updates the relevant databases and applications with the new setting data.

#### **Harmonization tasks**

The following harmonization tasks have been identified:

1. The engineering tools able to engineer settings of protection functions shall be available at network level and the data to be set/changed shall be available in CIM
2. The selection of the protection functions from a central tool shall be supported over the WAN.
3. The 61850 communication information of an object in CIM needs to be available from CIM

4. The updated setting shall be retrievable from the protection functions and automatic updates of the IEC 61850 and CIM configuration files shall be possible

### Extension of the use case

The use case can be further extended to not only change settings but also to change configurations dynamically over the network. The procedure can basically be the same as above, using the right tools, information of IEDs, of logical devices and of logical nodes; however a higher level of consistency checks and functional verification will be required.

This creates an additional requirement for the harmonization:

1. the CIM model needs to be able to include information about substation functions, IEDs, logical devices and logical nodes

## Business Rules and Assumptions

## ACTORS

<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
Protection Engineer	Person	Designs, tests, verifies, and analyses protection schemes (could be a team)
Protection IED	Device	Monitors system parameters in order to detect fault conditions within its zone of protection and take action to clear the fault.
Network Protection Application	System	System uses CIM and IEC 61850 data to read, create and verify protection settings files.
Protection Coordination Tool	System	Tool for the calculation of short circuit currents and voltages and checking of the coordination of protection relays settings
Field Device Communication Interface	System	Generic architectural component that communicates with substation and field devices using IEC 61850. This system can translate IEC 61850 services to GID services.
CIM Model Server	System	

## STEP BY STEP ANALYSIS OF EACH SCENARIO

### Scenario Description

<b>Triggering Event</b>	<b>Primary Actor</b>	<b>Pre-Condition</b>	<b>Post-Condition</b>
<i>(Identify the name of the event that start the scenario)</i>	<i>(Identify the actor whose point-of-view is primarily used to describe the steps)</i>	<i>(Identify any pre-conditions or actor states necessary for the scenario to start)</i>	<i>(Identify the post-conditions or significant results required to consider the scenario complete)</i>
Protection Engineer needs to update the protection system	Protection Engineer	A model of the protection system exists.	Protection settings are updated

### Steps for this scenario

<b>Step #</b>	<b>Actor</b>	<b>Description of the Step</b>	<b>Additional Notes</b>
#	<i>What actor, either primary or secondary is responsible for the activity in this step?</i>	<i>Describe the actions that take place in this step including the information to be exchanged. The step should be described in active, present tense.</i>	<i>Elaborate on any additional description or value of the step to help support the descriptions. Short notes on architecture challenges, etc. may also be noted in this column.</i>
1	Protection Engineer	Protection Engineer uses Protection Coordination Tool to build system configuration model	
1.1	Protection Coordination Tool	Protection Coordination Tool loads existing system model from CIM Model Server	CIM
1.2	Protection Coordination Tool	Protection Engineer uses Protection Coordination Tool to calculate settings for Protection IEDs	
1.3	Protection Coordination Tool	Protection Coordination Tool sends protection model changes to CIM Model Server	CIM XML
2	Protection Coordination Tool	Protection Coordination Tool creates relay setting files.	
3	Protection Engineer	Protection Engineer uses Network Protection Application to select Protection IEDs to receive new relay setting files	
4	Network Protection Application	Network Protection Application validates the selection of Protection IEDs	
5	Network Protection Application	Network Protection Application downloads settings files to Protection IEDs	

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# REQUIREMENTS

## Functional Requirements

<i>Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>

## Non-functional Requirements

<i>Non-Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>

