

GAP Usecase – Autorecloser function modeling - TST

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1. Introduction

This document describes a IEC61850 modeling usecase, trying to explain the modeling of a basic autorecloser function. Different options will be described, as well as suggestions for standard enhancements (namespace extension).

It is requested that this usecase is discussed in WG10 and leads to guidelines and/or standard extensions in order to standardise the approach of this type of usecases.

This usecase is the result of a modeling exercise for the OSMOSE project which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773406

For this usecase a HV interconnection is imagined protected by a distance protection (with different protection zones) and equipped with an autorecloser and synchrocheck (only for 3ph autoreclosing) function

2. Usecase Setup

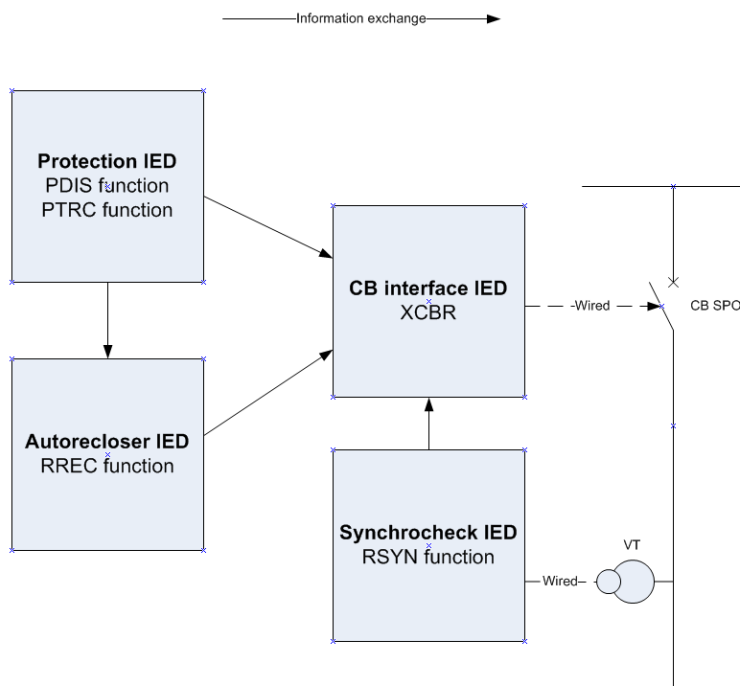


Figure 1 – Usecase setup

Protection IED:

IED containing a distance protection function with different zone settings.

PDIS zone 1 = PDIS instance covering the internal faults with protection time setting $t = 0s$

Autorecloser IED:

IED containing the autorecloser RREC function

The autorecloser function is equipped with different dead time settings for single and multiphase trips, and can only be activated for internal faults of the interconnection.

Only 1 autoreclosing attempt is applied, whereafter a reclaim time is applied. After the reclaim time, the autorecloser function will accept new activations.

Autoreclosing can only be activated, when an internal fault has been detected, and the trip signal to the circuit breaker has been issued.

The autorecloser function is not able to define, based on the protection and trip signals, if the fault is single or multiphase. The autorecloser function needs a specific activation of the single phase or multiphase sequence.

In case of multiphase autoreclosing, synchronisation needs to be checked in order to close the CB

CB interface IED:

Providing the IEC61850 interface of the circuit breaker

Synchrocheck IED:

IED containing synchrocheck function, providing a release to the autorecloser function, for the closing of the circuit breaker

3. Modeling Options

1. Modeling Variant 1 – As proposed by OSMOSE project

Create specific PDIS and PTRC instances for single or multiphase faults in order to differentiate at the source if a trip is single or multiphase. Use a specific GAPC to activate single or three phase autoreclosing.

+ The current IEC61850-7-4 datamodel can be used. No namespace extensions are required

- Protection IEDs need to have the possibility to be configured with specific PDIS instances for single and multiphase faults
- More complex configuration of the distance protection function in the distance protection IED

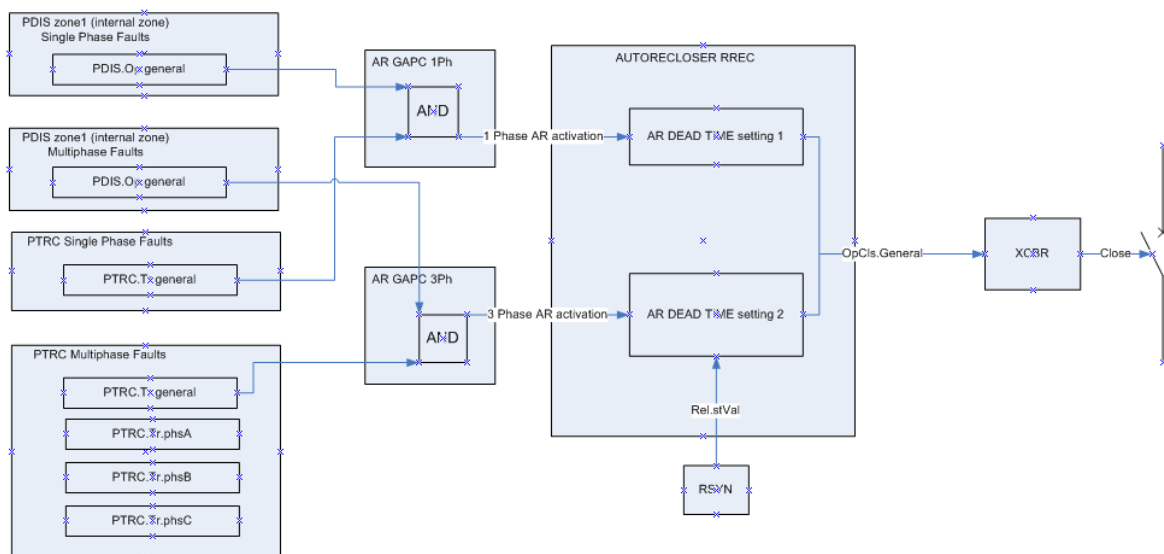


Figure 2 - Modeling Variant 1

2. Modeling Variant 2

Extend PDIS and PTRC LNs with specific data objects (SPS) for single and multiphase trips. Use a specific GAPC to activate single or three phase autoreclosing.

Regarding the datamodel extension there are 2 possible solutions:

1. Extend with data-objects for each possible combination

StrAN / StrBN / StrCN / StrAB / StrBC / StrAC

OpAN / OpBN / OpCN / OpAB / OpBC / OpAC

TrAN / TrBN / TrCN / TrAB / TrBC / TrAC

2. Extend with data objects which define if its a single or multipole event.

Str1Ph / Str3Ph

Op1Ph / Op3Ph

Tr1Ph / Tr3Ph

+ No need to multiply PDIS and PTRC instances, straight forward distance protection configuration in the protection IED

+ Datamodel extensions cover also the needs of other usecases (see 4)

- Extension of the protection and trip LN data model is needed

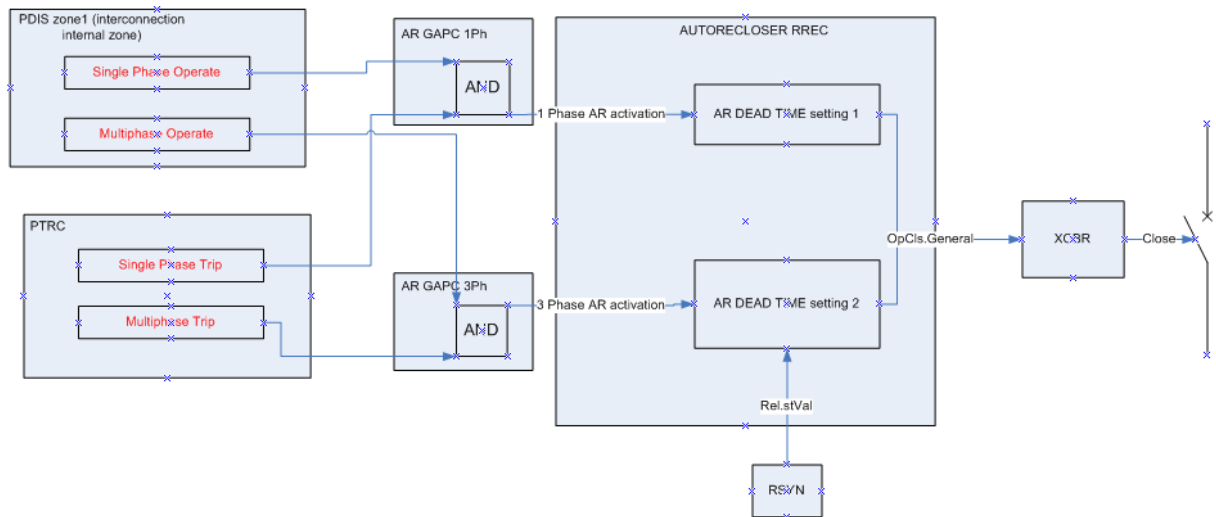


Figure 3 – Modeling Variant 2

A possible variant of this solution is to extend the RREC LN with the content of the proposed GAPCs.

3. Modeling Variant 3

Create a dedicated GAPC LN with a logic which takes the signals coming from the protection and trip LNs and creates the needed signals for the autorecloser function

- + The current IEC61850-7-4 datamodel can be used. No namespace extensions are required (standard GAPC model is used)
- + A single generic logic could be created and instanciated multiple times
- More modeling and configuration is needed (creation of an extra custom logic)

The image below describes the principle and a detail of the single phase detection function GAPC. The multiphase detection function GAPC has a similar behavior.

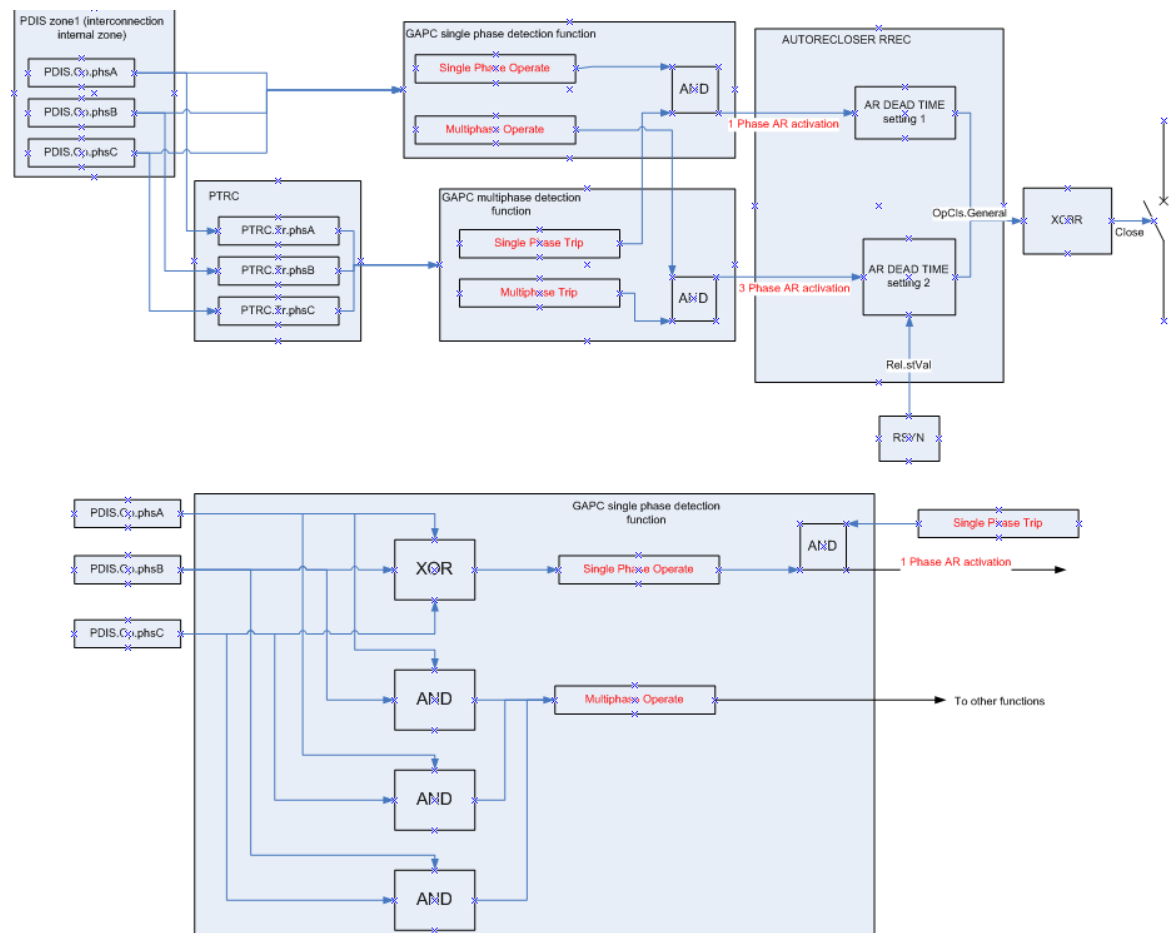


Figure 4 - Modeling Variant 3

4. Modeling Variant 4

Extend PTRC with the requested model for autorecloser interface

- + No GAPC needs to be created
- + Only 1 LN needs to be extended with new logic/datamodel
- Extra logics need to be integrated in PTRC
- Datamodel extension covers only trips, not the operate outputs from the protection functions. This limited solution does possibly not cover all usecases.

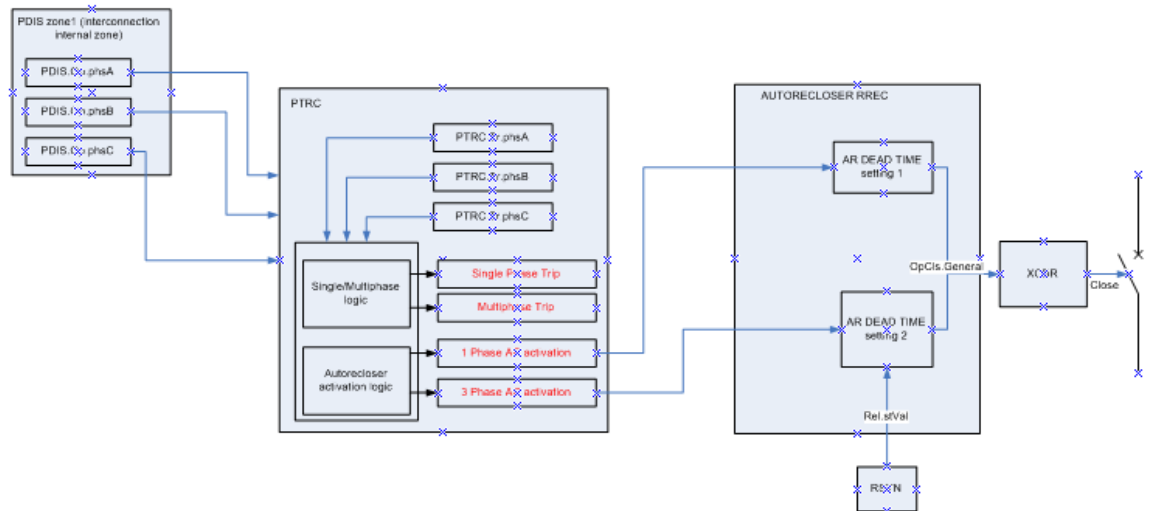


Figure 5 – Modeling Variant 4

4. Other possible usecases

There are some other protection and automation functions which behave differently for single phase and multiphase faults. For these functions, similar usecases can be described.

1Ph/3Ph Zone extension: extension of the internal protection zone of an interconnection when teleprotection and autorecloser functions are in service and working correct. This function needs to identify if a fault is single or multiphase in order apply the correct behavior.

Trip logic: The trip logic monitors the autorecloser function in order to decide if a single phase fault results in a single phase or 3phase trip. When the autorecloser is out of service, all single phase faults need to lead to a three phase trip.

Backup function: the protection back-up function (which trips all busbar connected circuit breakers if a single bay circuit breaker fails to trip) behaves differently depending on the type of fault.

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