CIGRE Study Committee B5

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG* N° B5.60	**Name of Convener :** Alexander Voloshin (RU) **E-mail address**: voloshinaa@mpei.ru
Technical Issues # (2):6	**Strategic Directions # (3): 1, 2**
The WG applies to distribution networks (4): Yes	
Title of the Group: Protection, Automation and Control Architectures with Functionality Independent of Hardware	

Scope, deliverables and proposed time schedule of the Group:

Background:

Today Protection, Automation and Control (PAC) functions are designed into hardware. PAC hardware has a relatively short lifecycle of 10 to 15 years, much shorter than the lifecycle of primary equipment. Also, new PAC devices often come with several functionalities and therefore retrofitting hardware sometimes forces redesign of PAC systems. This re-design cycle may repeat several times throughout the life of the primary equipment.

At the same time power systems do not change that fast and PAC functions can and should be used over a much longer time period than the lifecycle of a PAC device. PAC functions could be implemented as software applications and in this case, have a potential of a longer life. However, due to the hardware dependence, until now, users cannot keep their PAC applications for the life span of the primary equipment. The separation of applications and hardware will allow development of new architectures of PACs and new approaches to designing, commissioning, and maintaining PAC systems.
New features of this kind of PAC systems can be defined as follows.

- Application based functions, independent of hardware, and portable across new hardware platforms. This allows keeping a function operational over the life span of primary equipment (or longer, if required).
- Flexible function re-allocation, including real-time operational functional assignment of functions.
- Cost-efficient hardware redundancy independent of functional redundancy.
- New approaches to redundancy (functional re-assignment rather than hardware duplication on per function basis).
- PAC functions may become applications running on generic platforms.
- PAC functions may reach unprecedented maturity levels by being in operation for decades without being modified or changed as a part of hardware upgrade.
- New options for allocating PAC applications (from multiple devices to a “station in a box”)
- New opportunities for remote engineering and reduced local workforce requirements opening new business models for providing protection, automation and control.

Scope

The scope of the Working Group is:

- Propose new PAC architectures with I/O (Input/Output), processing hardware and functionality separated for optimum life cycles.
- Elaborate criteria and conditions to be able to use hardware independent software application for PAC functions, including
    - Characteristics and constraints of the hardware platform,
    - Characteristics and constraints of analog inputs for protection applications,

- Characteristics and constraints of Digital I/O for PAC applications,
- General characteristics and constraints for the functional applications.

- Elaborate Use Cases based on protection and control applications.
- Describe and quantify practical technical and business benefits of the new architectures.
- Identify technical and business challenges for potential transition to the new architectures.
- Identify areas for standardization vs areas of innovation and competition.

Interaction with other B5 WGs and with other SCs

Interaction with WGs working on cybersecurity issues will be required.

Deliverables:

- Technical Brochure
- Summary in Electra
- Abstract for Electra
- Tutorial Proposal Forms and Power Point slides

Time Schedule: start : 2017 **Final report** : 2019

Approval by CIGRE Technical Committee Chairman: M. Wald
Date : 17/01/2017

(1) Joint Working Group (JWG) - (2) See attached table 1 – (3) See attached table 2
(4) Delete as appropriate

Table 1: Technical Issues of the TC project “Network of the Future” (cf. Electra 256 June 2011)

1	Active Distribution Networks resulting in bidirectional flows within distribution level and to the upstream network.
2	The application of advanced metering and resulting massive need for exchange of information.
3	The growth in the application of HVDC and power electronics at all voltage levels and its impact on power quality, system control, and system security, and standardisation.
4	The need for the development and massive installation of energy storage systems, and the impact this can have on the power system development and operation.
5	New concepts for system operation and control to take account of active customer interactions and different generation types.
6	New concepts for protection to respond to the developing grid and different characteristics of generation.
7	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
9	Increase of right of way capacity and use of overhead, underground and subsea infrastructure, and its consequence on the technical performance and reliability of the network.
10	An increasing need for keeping Stakeholders aware of the technical and commercial consequences and keeping them engaged during the development of the network of the future.

Table 2: Strategic directions of the TC (cf. Electra 249 April 2010)

1	The electrical power system of the future
2	Making the best use of the existing system
3	Focus on the environment and sustainability
4	Preparation of material readable for non-technical audience