Cluster Digital Substation

Sk Participant

OVERVIEW

Cluster Digital Substation (CDS) is a novel hardware & software solution for electrical power substation automation, based on the **Functionally Dynamical Architecture** technology.

KEY FEATURES

The following are the major objectives of a CDS:

- **Economical**: CAPEX and OPEX reduction;
- **Reliability:** Improvement of automation infrastructure fault-tolerance and reliability.

TECHNICAL ASPECTS OF SOLUTION

CDS is based on:

- **Unified computational modules.**

The cIEDs (compact Intellectual Electronic Devices) are the microprocessor modules serving as the computational core of CDS. They perform all the functions of substation automation (relay protection, control, measurements). Allocation/distribution of these functions between cIEDs can be based on dynamic, static, or mixed rules.

- **Industrial chassis for cIED installation**.

The chassis provides mechanical fastening, power supply, and backplane inter-cIED communication.

ECONOMICAL ASPECTS OF SOLUTION

CDS solution has the reduced price, compared to traditional approach:

- Reduced price of production for the unified cIEDs, compared to traditional ones;
- Low costs of software development and maintenance, achieved by open architecture and availability of development tools;
- Reduced price of cIED cluster, achieved by centralization of functions, communications and power supply inside the chassis;
- Reduced operational costs, based on easy replaceable unified hardware and self-configuration and self-restoring properties provided by the Functionally Dynamical Architecture.

PROJECT STATUS

We have a prototype solution, with a ready to use hardware platform and much of the software core algorithms. We have obtained patents on the key elements of the technology. Now we are searching for investors to push the technology to the market stage.

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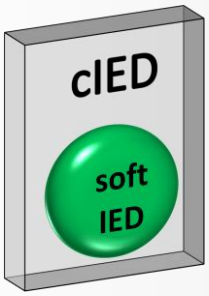


SOFTWARE COMPONENTS

CDS is a unified computational platform with **open architecture**. Software Development Kit (SDK) will be available for the third-party organizations (equipment manufacturers, universities, etc.) so they can develop their own algorithms for substation authomation based on this platform.

The result (softIED) is a software product which is intended to run on the cIED platform. It can be distributed pre-installed with hardware or as a separate solution. Open architecture and the ability to deliver own software product to the market provides for functional diversity, applicability and novelty of proposed solutions.

FUNCTIONALLY DYNAMICAL ARCHITECTURE (FDA)

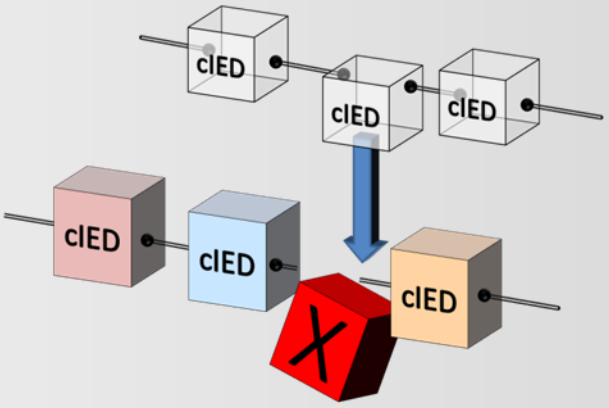
FDA is based on the following principles:

- Software is **independent** of the cIED its running on;
- FDA system is **decentralized**, i.e. has no dedicated point of decision;
- Decisions about running or halting software instance (softIED) are made by decentralized system **automatically** as a response for external or internal events (e.g. fault in one of cIEDs) according to current behavior model or by the operator's command.

The FDA use-cases, illustrating the methods of reliability and fault-tolerance improvement:

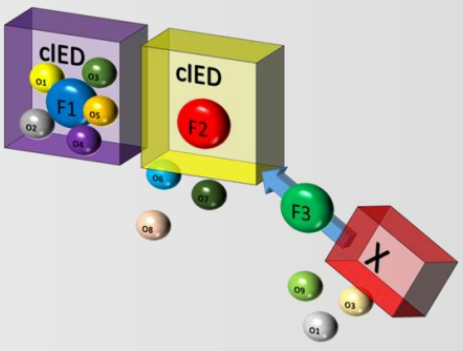
«SLIDING RESERVE»

«Spare» cIED Devices are in the «sliding reserve» and automatically pick up the functions of the faulty device. This scheme does not require doubling the equipment – cIED in the «sliding reserve» can back up the group of devices with different functionality.



«PREEMPTIVE RESERVE»

If the cIED device is faulty, the FDA system finds the device which can execute its function, and which is currently running the less privileged task. In this case the softIED from the faulty device is run on another cIED device, forcing the halt of the previous function.



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