

A Few Facts on IEC61850-based Substation Integration & Automation in China.

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Since 2005, there are more than ten thousand of substations from 35KV to 1000KV in China have 100% digital IEDs with IEC 61850 as substation communication bones, about a hundred of those of those substations also have 61850 process bus with digital optical CT and VT , as so called “digital/smart” substations.

1. IEC 61850 applications in China

a. Main milestones:

- i. By end of 2004, China had contacted 6 multiple vendors' interoperability tests.*
- ii. In 2005, China officially adapted the IEC 61850 as China national standard DL/T860.*
- iii. The IEC 61850 test lab was set up with KEMA in NCQTR - China National Center of Quality Supervision & Testing of Relays, which was extension of the existing IEC 69870-5 interoperability testing lab.*
- iv. March 2006, the first fully digital substation with the process bus (110KV substation) is in operation*
- v. About sometime in 2013, 10,000 substations from 35KV to 1000KV with 100% 61850 based IEDs are in operation.*
- vi. By end of 2013, there are 893 fully digital substations with process bus are in operation.*

b. The players:

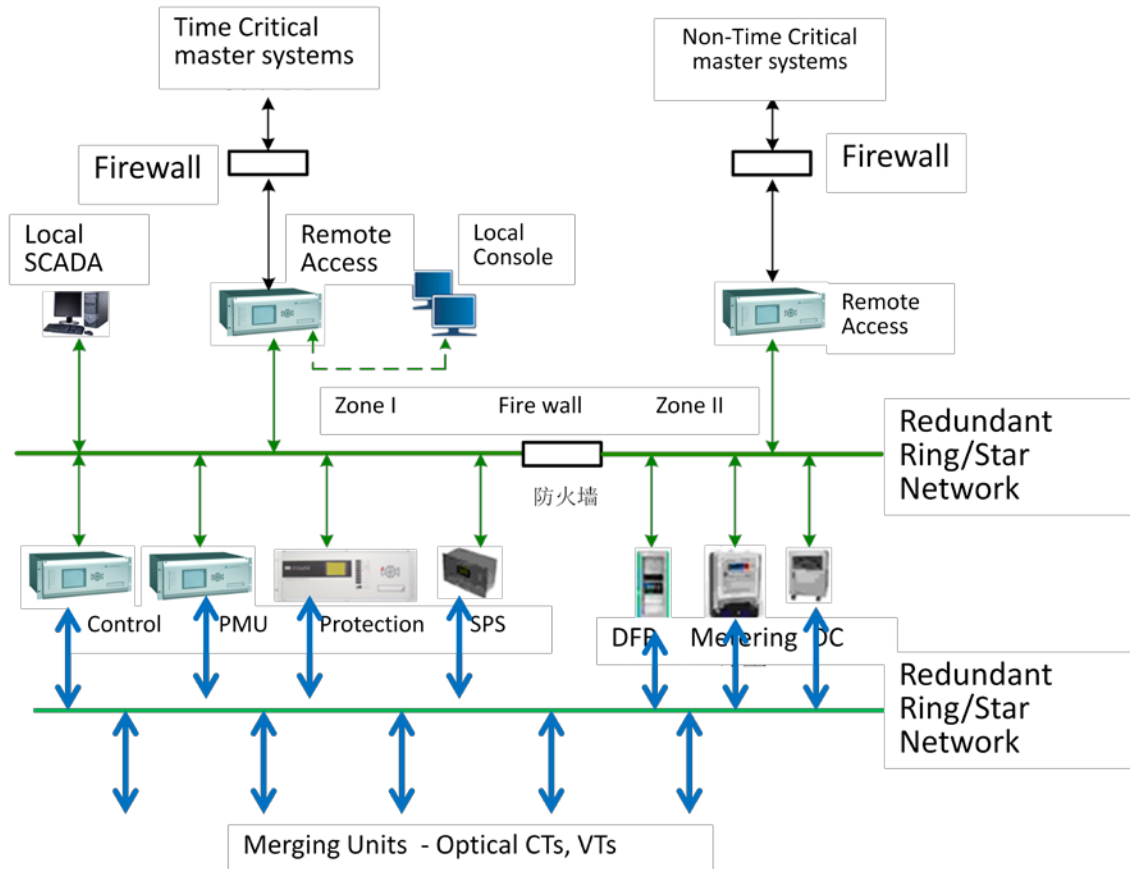
There are more than 20 domestic vendors. The top fours are NARI, SIFANG, XJ, SAC. All of those four are publicly listed company. And both NARI and XJ are owned by the State Grid Corp of China - SGCC. Each of them can proudly say that they have more than 10,000 61850-based IEDs are in operation now.

2. Typical 61850 digital substation architectures

- a. Redundant fiber optic Ethernet network - either ring or star configuration*
- b. Report to two master stations: SCADA/EMS and Relay/Fault Analysis Management*
- c. Two network security zones- critical and non-critical IEDs, connected via a firewall*
- d. Up to a hundred of IEC 61850 IEDs each system*
- e. Up to 15 IED vendors in each system*
- f. Several digital CT, VT vendors in one system*

3. Future challenges

- a. Improve substation network management and security
- b. What is IED's condition monitoring/maintenance policy
- c. How can the IEC 61850 incorporate the relay settings management ?
- d. How to handle a future possible retrofit/expansion with different version of IEC 61850 ?



Typical IEC 61850-based Schematic Substation Network Configuration in China