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北京四方继保自动化股份有限公司
BEIJING SIFANG AUTOMATION CO.,LTD.

An Application of Protection Management System

EPCC 11

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by

Ge Liang, Wang Liding

北京四方继保自动化股份有限公司

BEIJING SIFANG AUTOMATION CO.,LTD.

Overview

- Introduction
- Application to analyze grid fault
- Going forward
- Summary



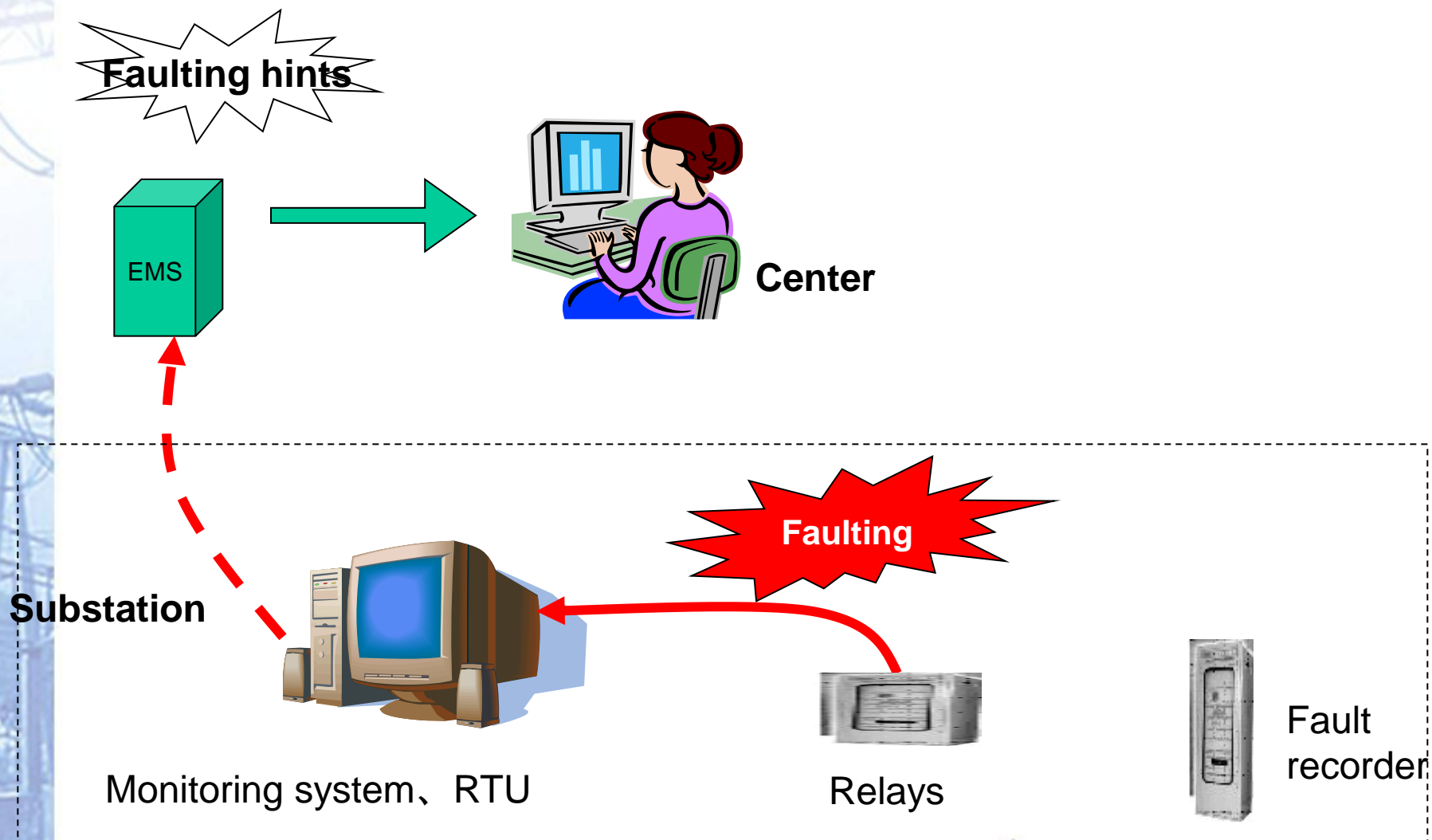
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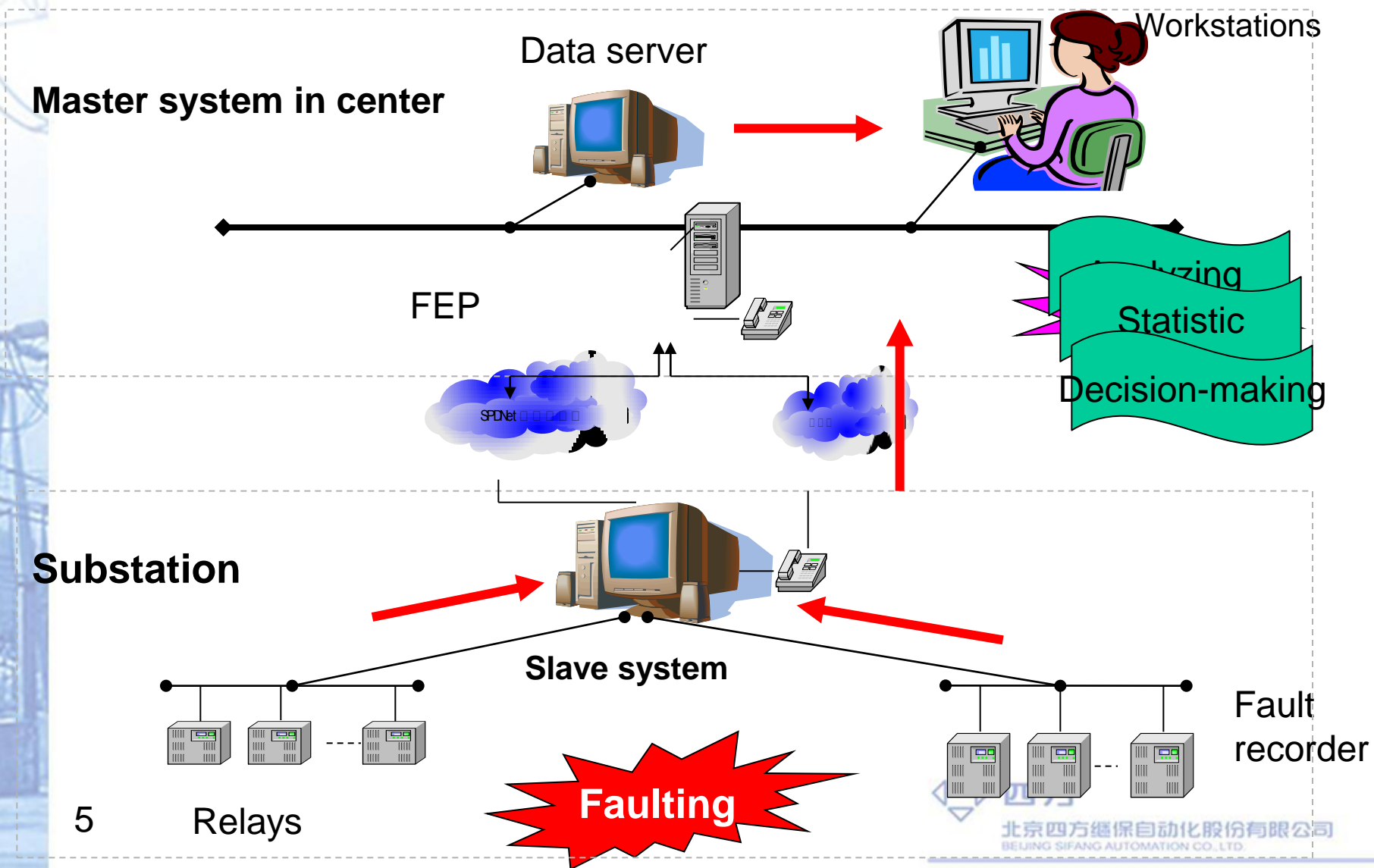
Background

- In case of fault in power grid, dispatchers want to get fault information of acting relays and fault recorders in several minutes;
 - Dispatchers need to know the relays running state;
 - Dispatchers need information about alarms of the relays;
 - Using the information to analyze the accident and do some decision to resume the grid;
 - EMS in the dispatching center can't provide the information; PMS meets the requirement.
-
- Conditions:
 - Nowadays, most of protection relays are digital;
 - Communication and computer technology is developing rapidly;

Background—Traditional Mode



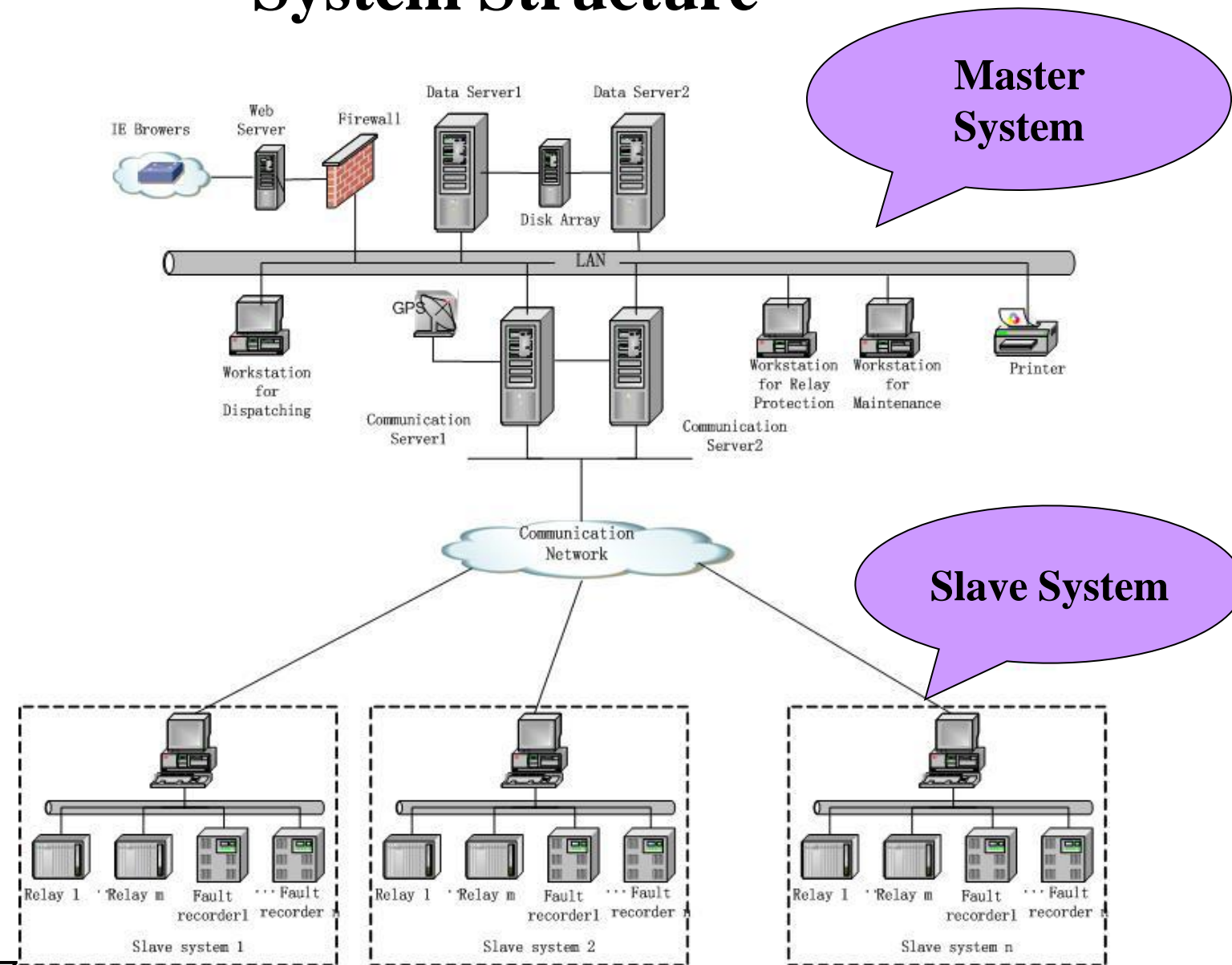
Background— PMS Mode



Purpose

- Monitoring the relays and fault recorders in the substations remotely;
- Providing the running state of IEDs to the dispatcher;
- Providing the alarm messages to the dispatcher;
- Providing the fault information to the dispatcher;
- Providing some tools to analyze, count and assist decision-making;
- The best benefit: Collecting the grid fault information rapidly, instead of travelling to substation.

System Structure



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What information can we have

■ Protection Relays

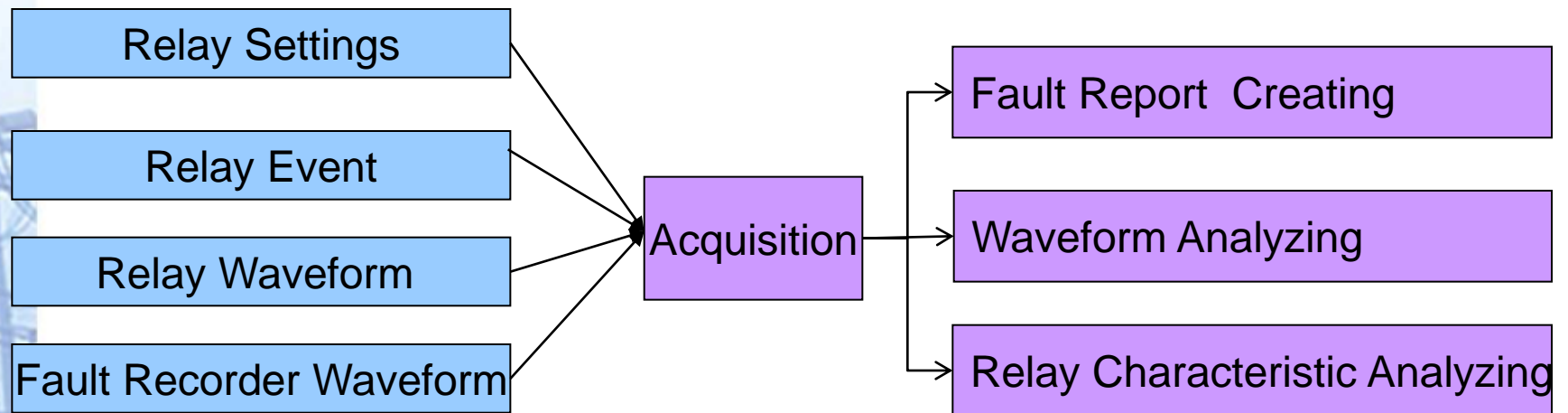
- Digital inputs;
- Digital outputs;
- Analog;
- Settings;
- Alarm (hardware or software);
- Trip event;
- Sample value for faults;

■ Fault recorders

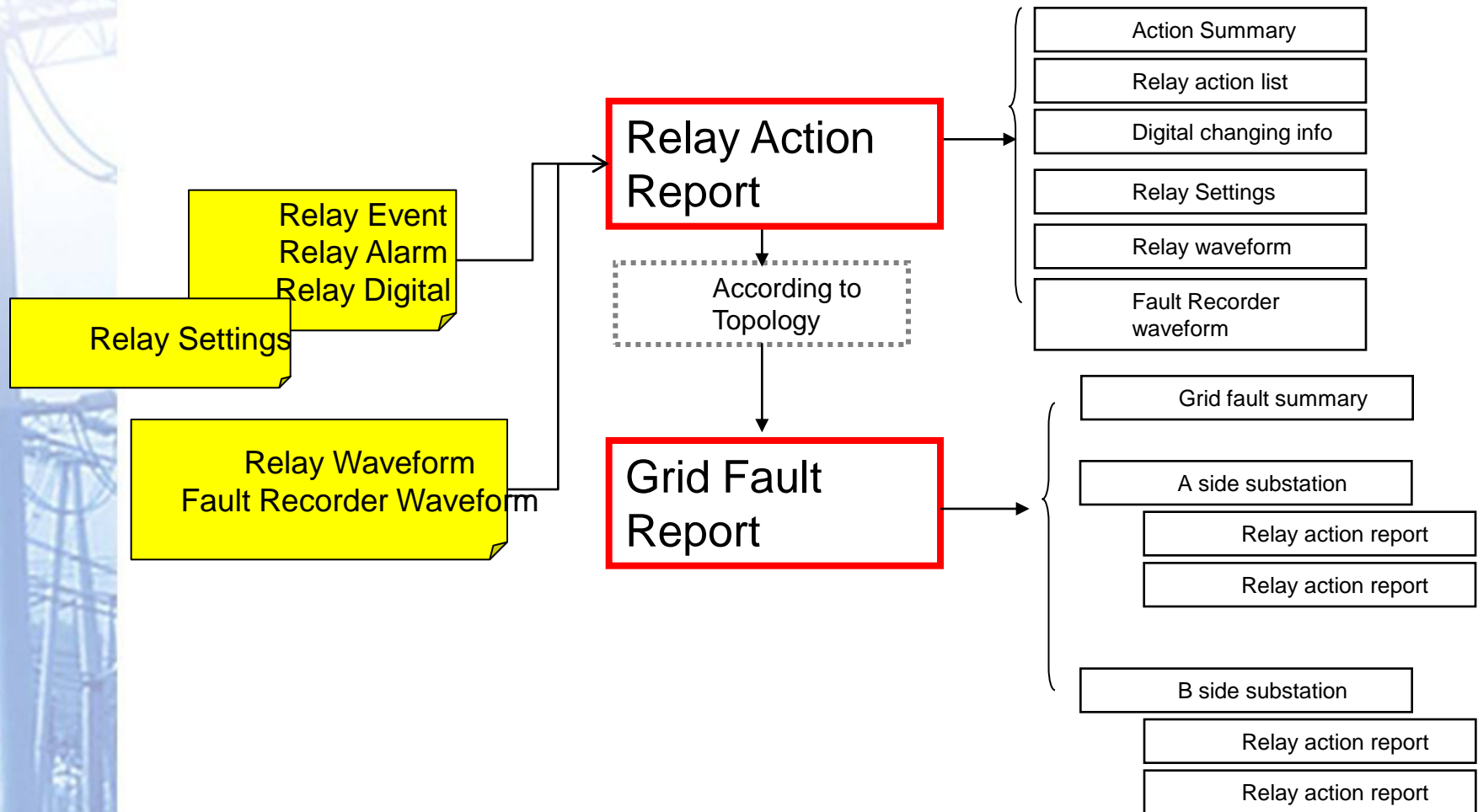
- Event list;
- Waveform file (COMTRADE format file);
- Settings;



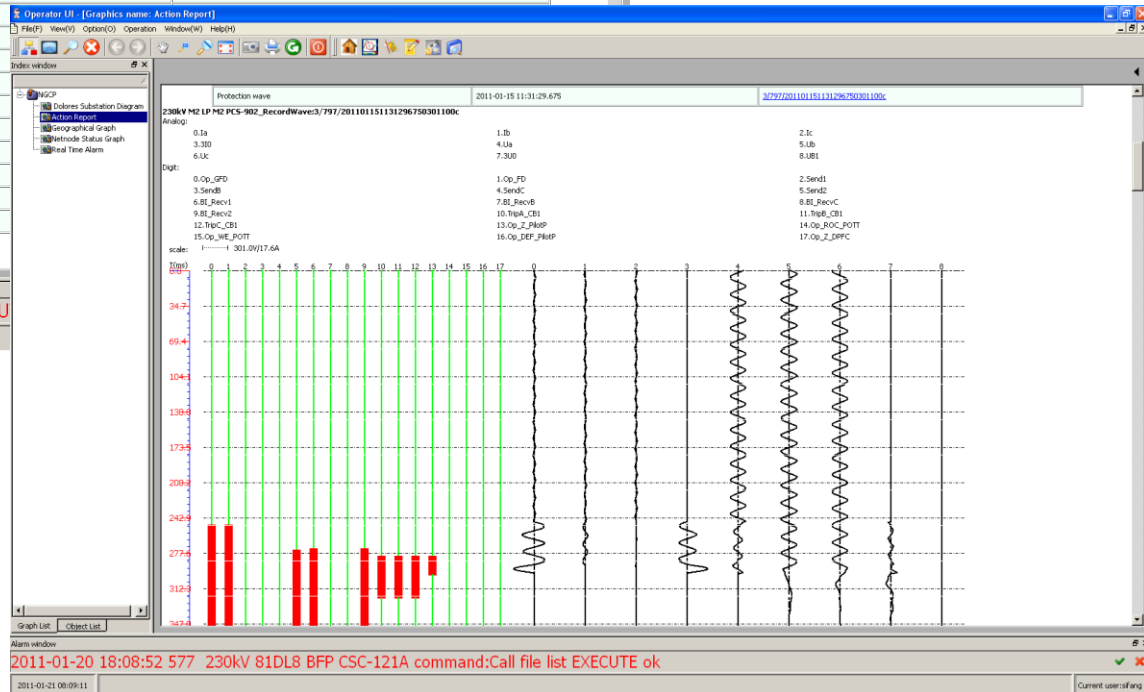
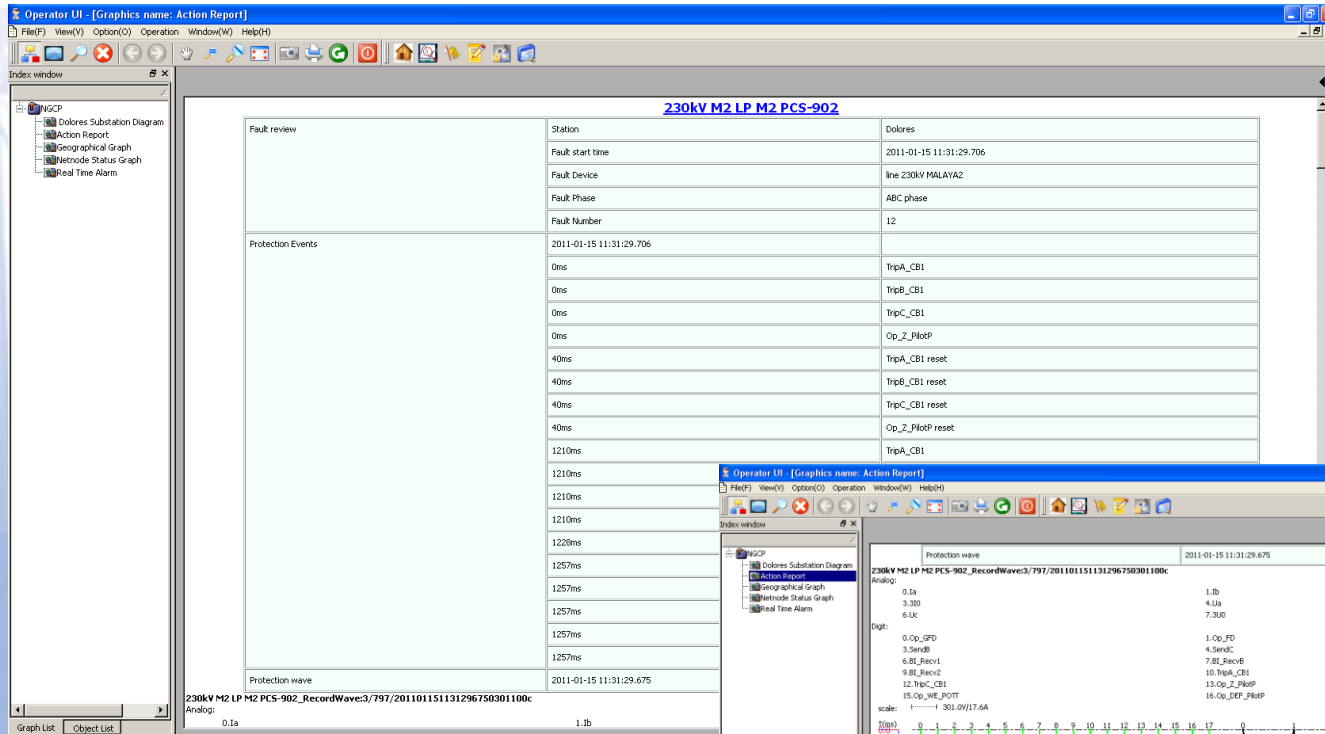
Fault Analyzing Application



Fault Report Creating



Relay Action Report



Alarms window
 2011-01-20 18:08:52 577 230kV 81DL8 BFP CSC-121A command:Call file list EXECU
 2011-01-21 08:07:07

Alarm window
 2011-01-20 18:08:52 577 230kV 81DL8 BFP CSC-121A command:Call file list EXECUTE ok
 2011-01-21 08:09:11

Power Grid Fault Report

Operator UI - [Graphics name: Action Report]

File(F) View(V) Option(O) Operation Window(W) Help(H)

Index window

- NGCP
 - Dolores Substation Diagram
 - Action Report**
 - Geographical Graph
 - Netnode Status Graph
 - Real Time Alarm

Network Fault Report

FaultName: 230kV MALAYA2 ABC phase fault **FaultTime:** 2011-01-15 11:31:29.706

FaultDevice: line 230kV MALAYA2 **Station:** Dolores.

Station	IED	TriggleTime	TriggleInfo
Dolores	230kV M2 LP M2 PCS-902	2011-01-15 11:31:29.706	<p>IED Report</p> <p>0ms TripA_CB1 0ms TripB_CB1 0ms TripC_CB1 0ms Op_Z_PilotP 0ms ... , TripPhase=A; 40ms TripA_CB1 reset 40ms TripB_CB1 reset 40ms TripC_CB1 reset 40ms Op_Z_PilotP reset 1210ms TripA_CB1 1210ms TripB_CB1 1210ms ... , TripPhase=ABC; 1210ms Op_Z_SOTF 1210ms TripC_CB1 1228ms Op_Z1 1228ms ... , TripPhase=ABC; 1257ms TripA_CB1 reset 1257ms TripB_CB1 reset 1257ms Op_Z_SOTF reset 1257ms Op_Z1 reset 1257ms TripC_CB1 reset 4552ms ... , Fault Number=12; RecordWave: 3/297/201101151131296750301100c HDR report</p>
	230kV M2 LP M1 CSC-103A	2011-01-15 11:31:29.675	<p>IED Report</p> <p>0ms Relay Startup 6ms Sample SYN OK 9ms C/D Trip 9ms Channel A Data 9ms C/D Phase Trip</p>

Graph List Object List

2011-01-21 14:44:59 Current user:sifang

Relay

Report organised by PMS

Details of the wave file

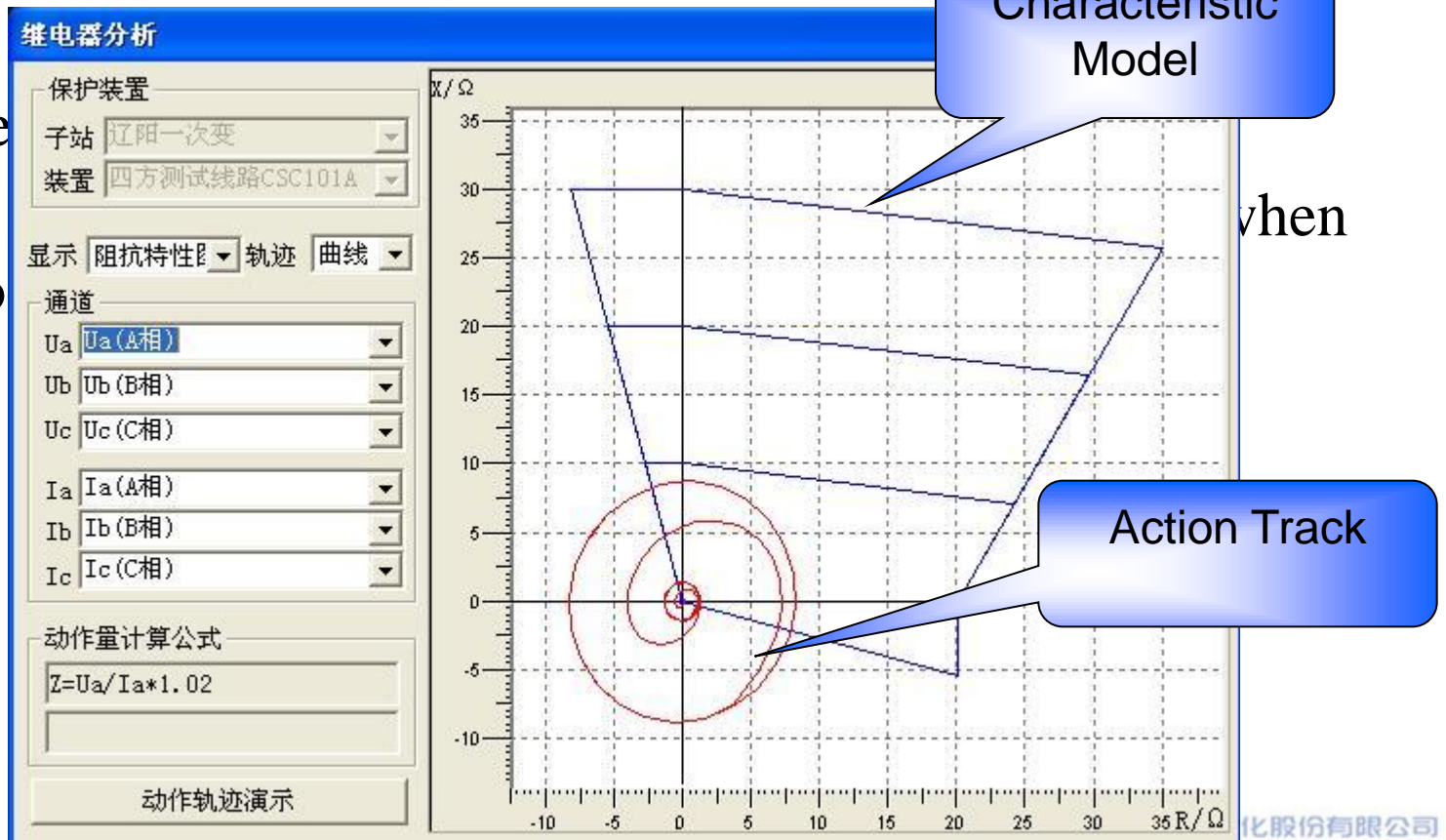
Relay

Relay Characteristic Analyzing

■ Provide common relay characteristic model, such as quadrangle characteristic, circle characteristic, direction characteristic;

■ Using character

■ Using relay go



Waveform Analyzing Toolkit

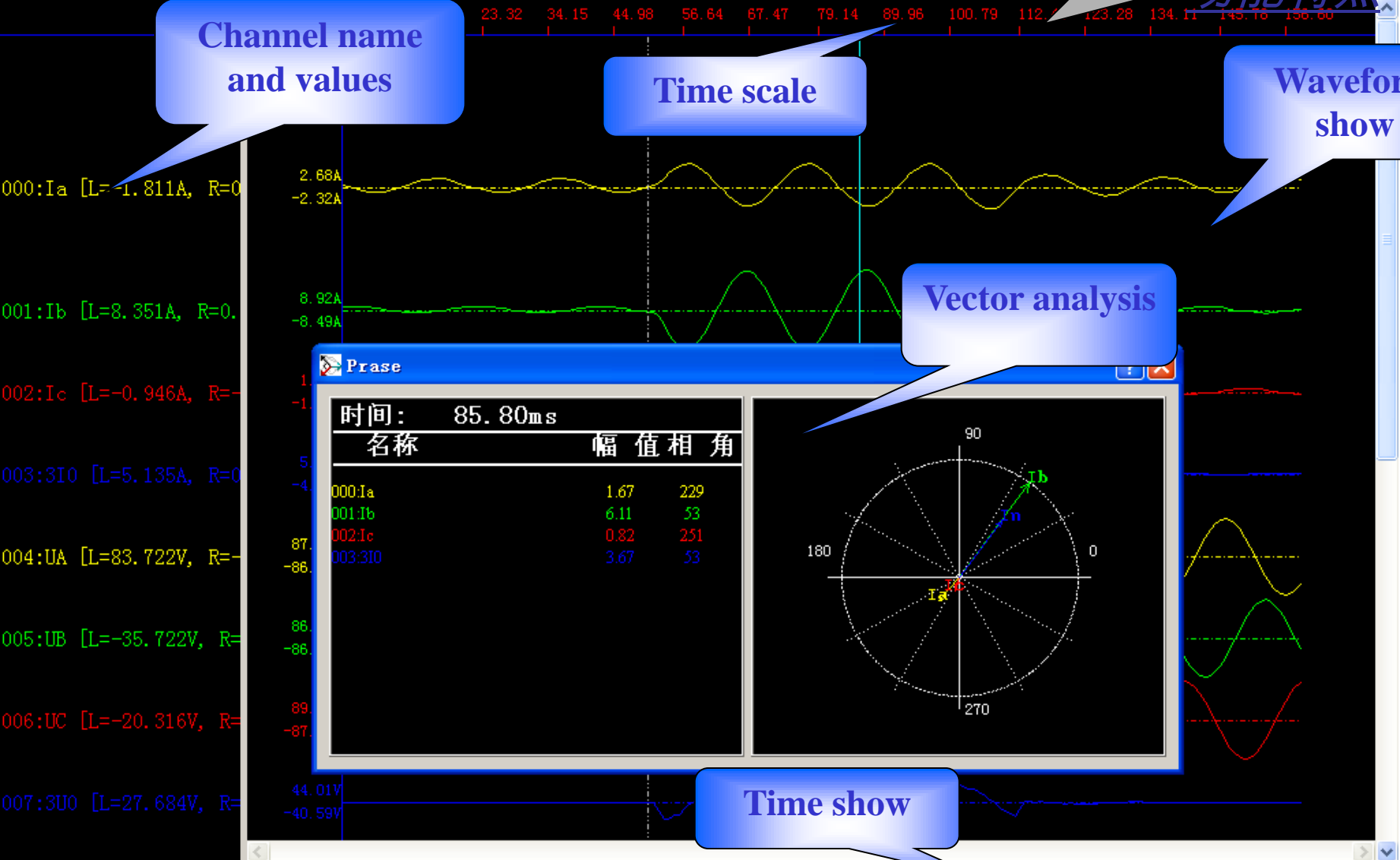
- The toolkit can analyze COMTRADE format file from relay or fault recorder;
- Provide some functions as follows:
 - Drawing of curve graphic;
 - Vector analysis;
 - Harmonic analysis ;
 - Sequence component calculation,
 - Fault location calculation;

Waveform Analyzing Toolkit

Channel name and values

Time scale

Waveform show



Vector analysis

Prase

时间: 85.80ms

名称	幅值	相角
000:Ia	1.67	229
001:Ib	6.11	53
002:Ic	0.82	251
003:UO	3.67	53

Time show

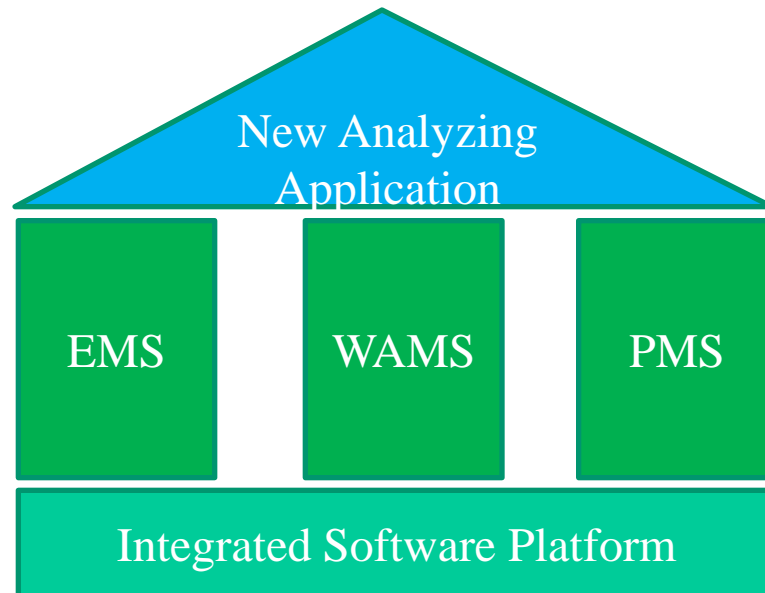
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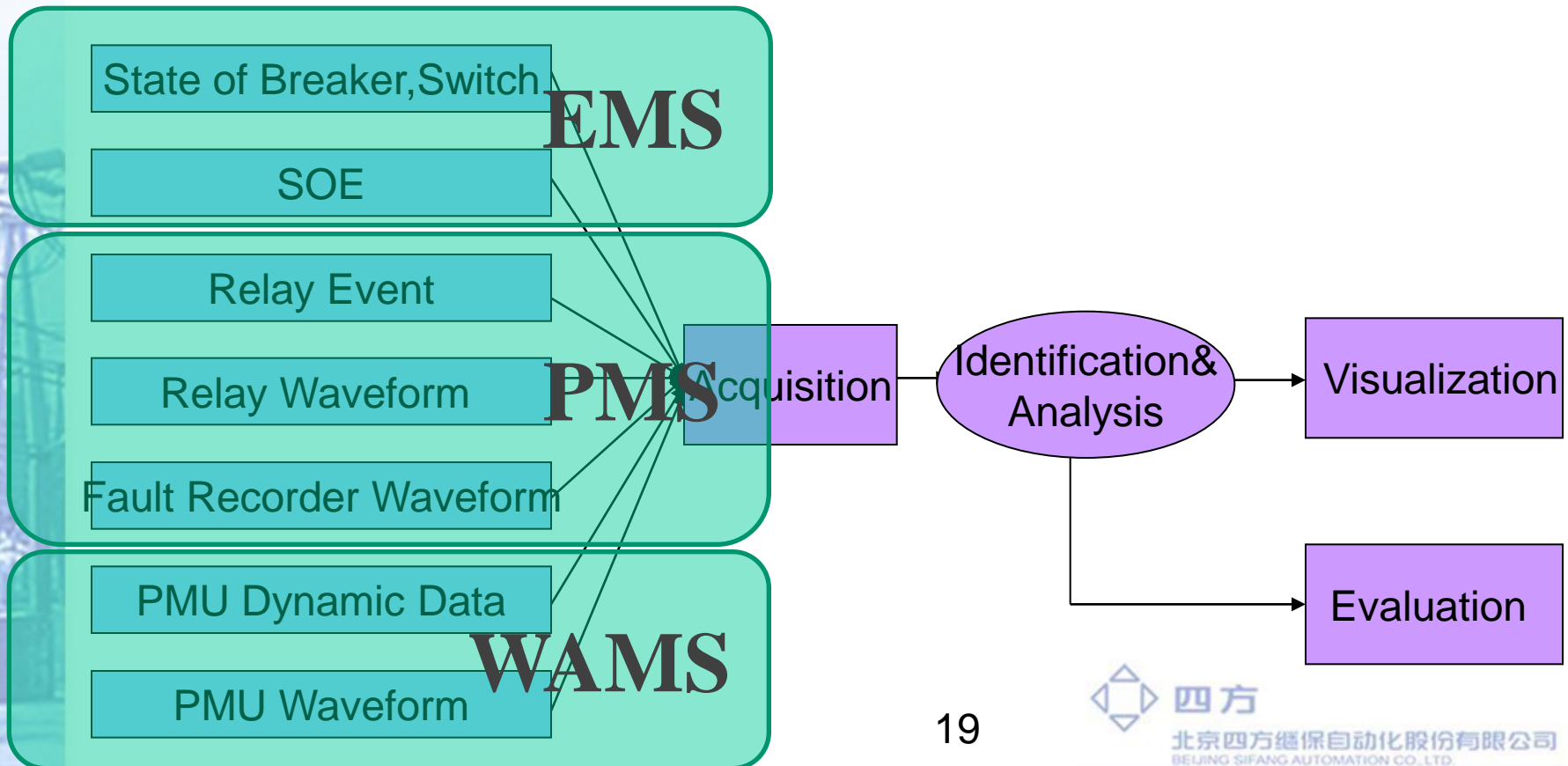
Going forward

- Limitation: Analyzing application only based on information from relays and fault recorders;
- Could we combine EMS/WAMS with PMS to analyze grid fault more comprehensively and smartly?



Going forward

- Based on multi-source data
- Logic judgement & electrical measurement calculation
- Providing comprehensive result to dispatchers



Summary

- In China, many PMS projects have been established in some large power grid;
- These projects prove that PMS is an efficient approach to acquire information of protection relays and fault recorders in real time;
- The dispatchers could get more fault information to identify in case of power grid disturbance.
- For more comprehensively and smartly, fault analyzing function should combine data from PMS with EMS and WAMS to enhance the analyzing ability.



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Thanks a lot!



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