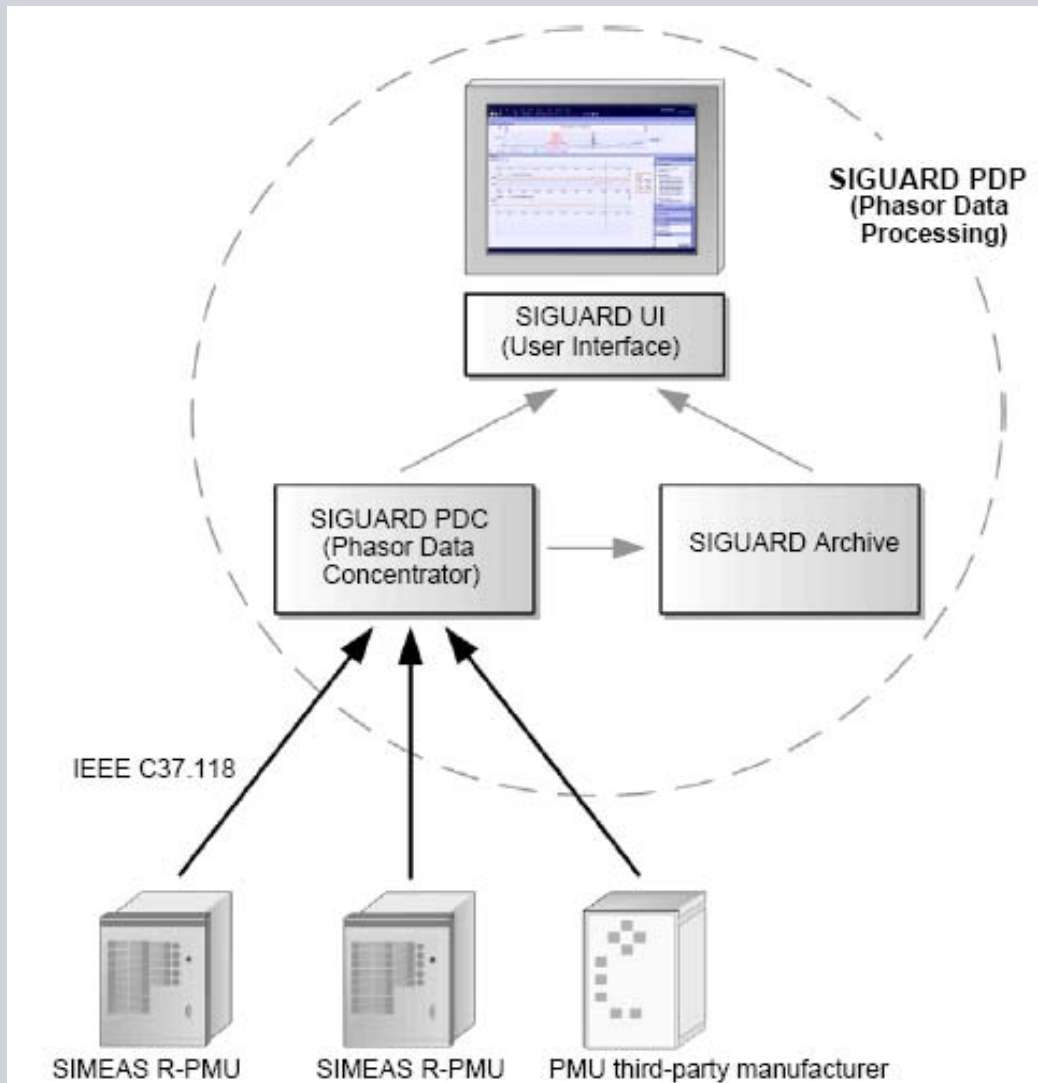


SIGUARD System for Phasor Data Processing

Real Time Visualization and Disturbance Recording

Dan Murray
Siemens Energy, Inc.

SIGUARD Phasor Data Processing System System Description



SIGUARD is a software-based

- Phasor Data Concentrator
- Data Archive
- User Interface

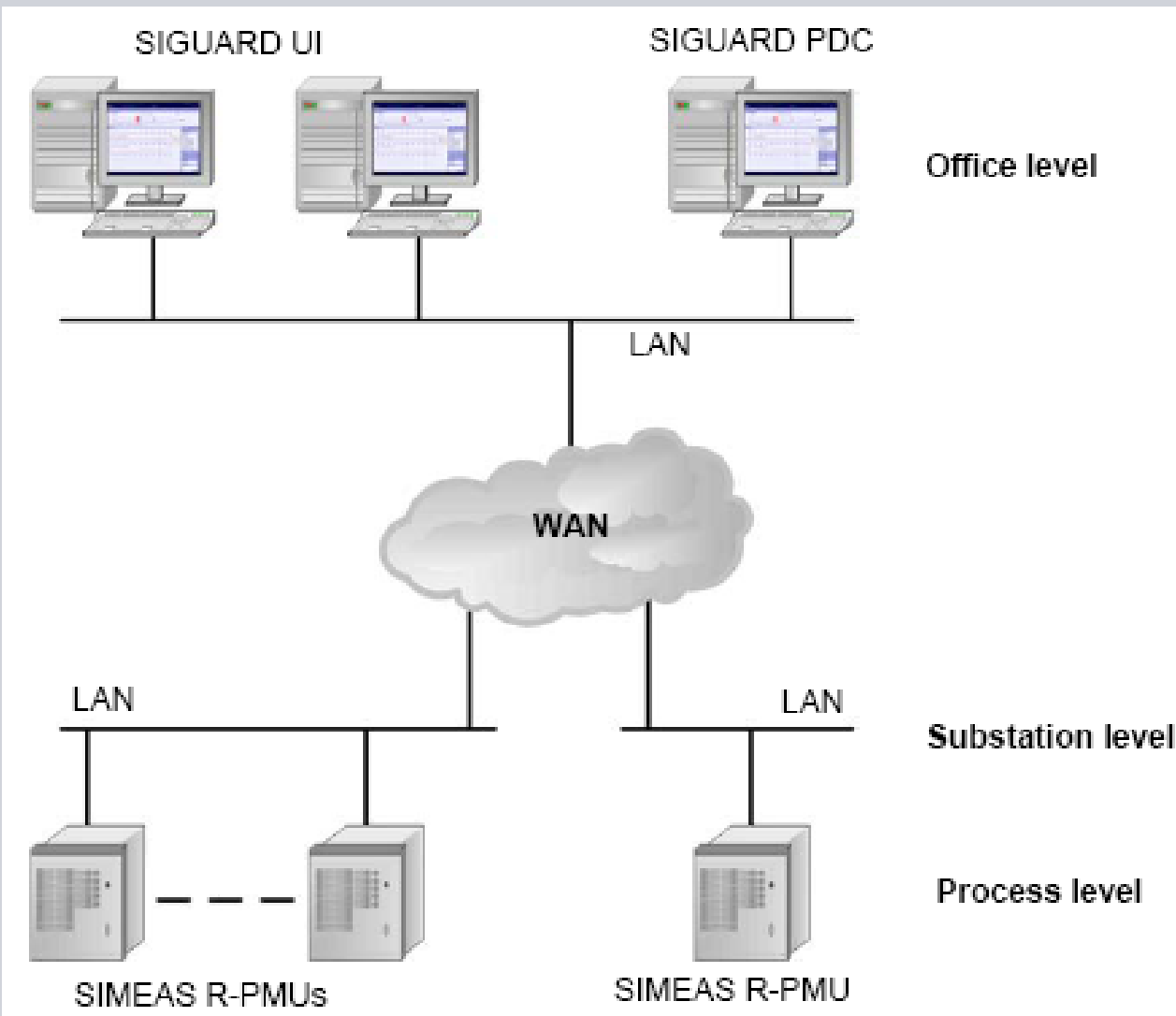
Users

- System operators
- Power system analysts

Modes of Operation

- Online: Real-time operation
- Offline: Post event analysis

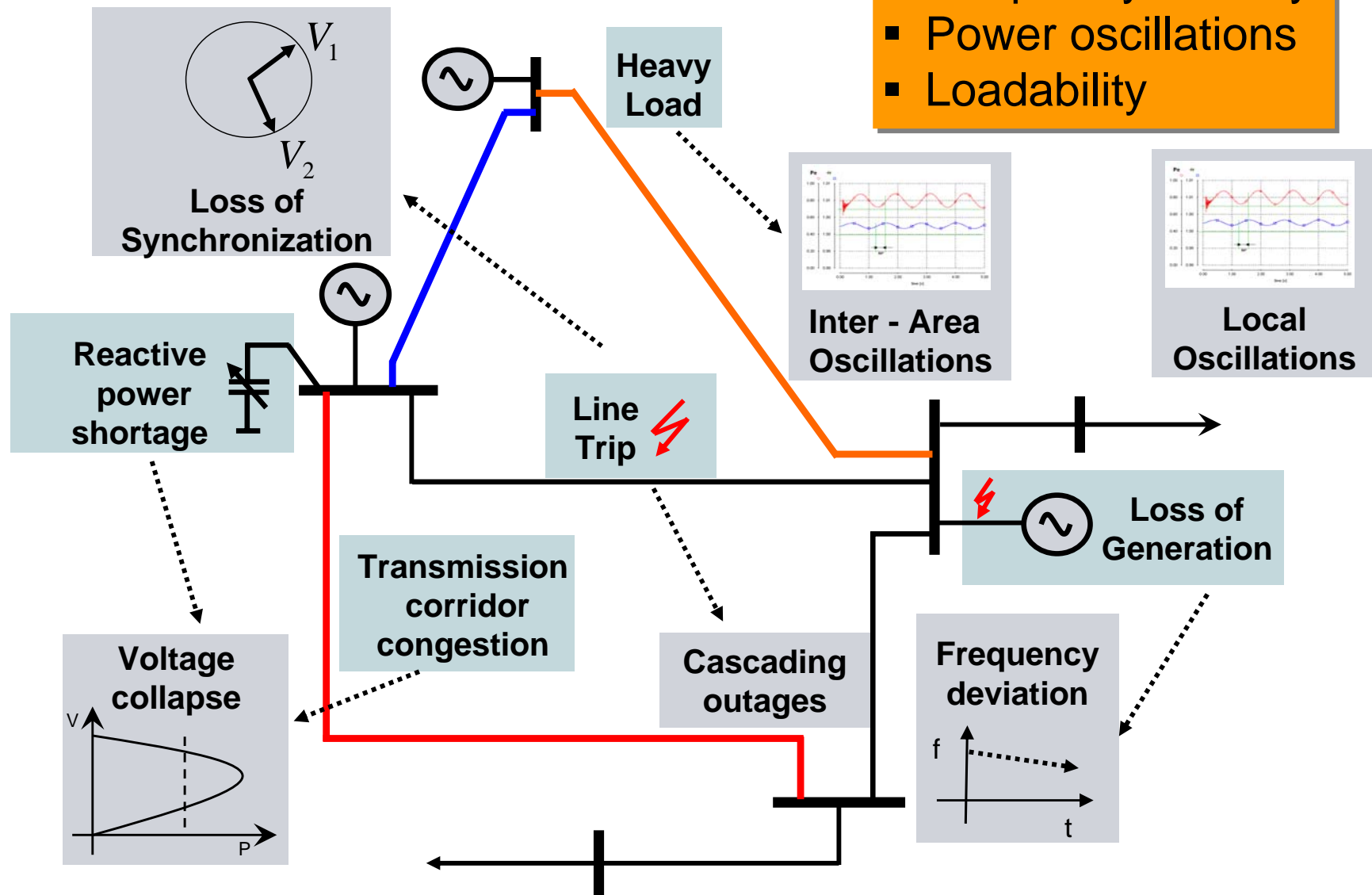
SIGUARD Phasor Data Processing System System Architecture



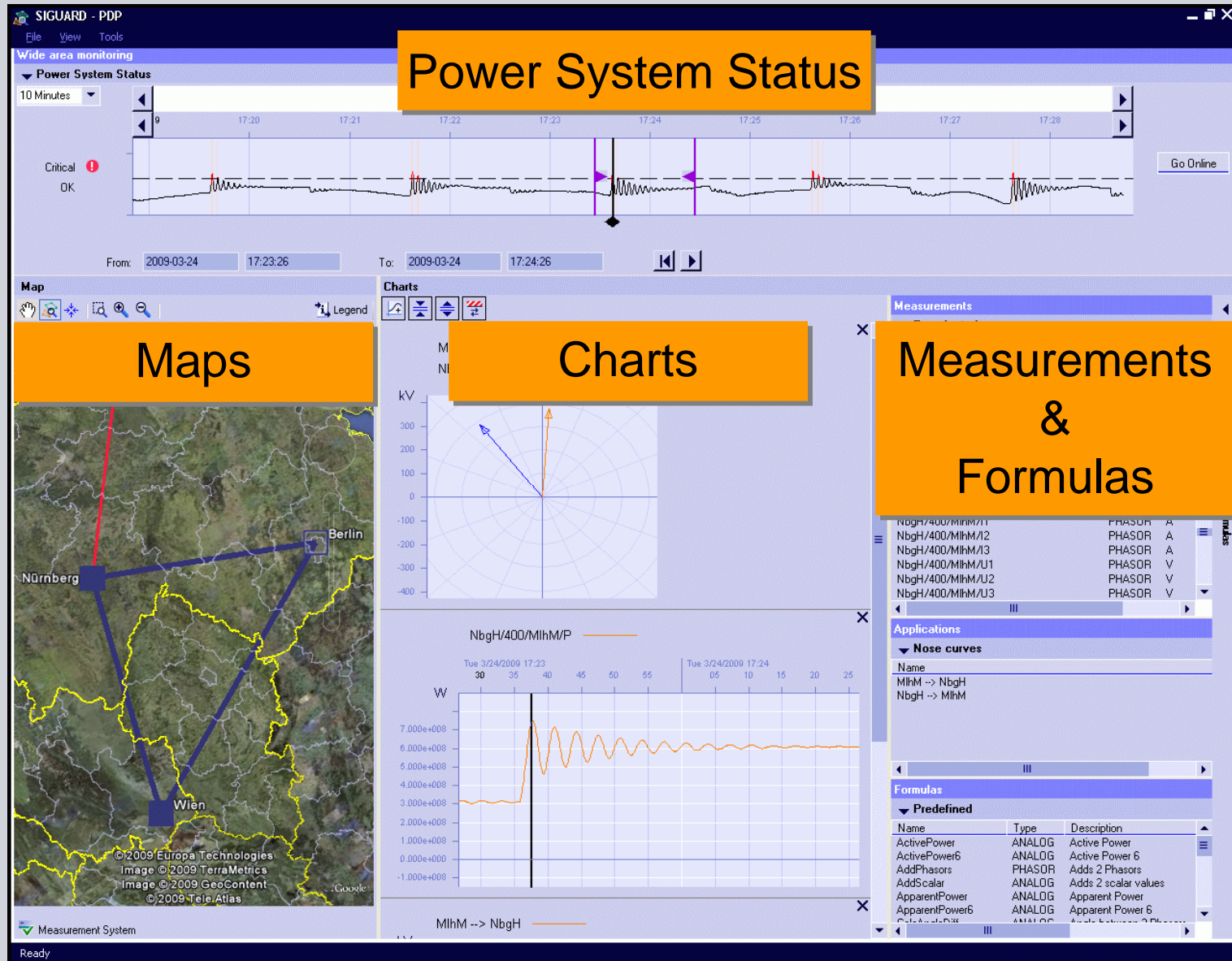
- Install on single PC or multiple PCs
- Supports multiple User Interfaces (UI)
- Works with all PMUs strictly conforming to IEEE C37.118 Standard

SIGUARD Phasor Data Processing System Application Areas

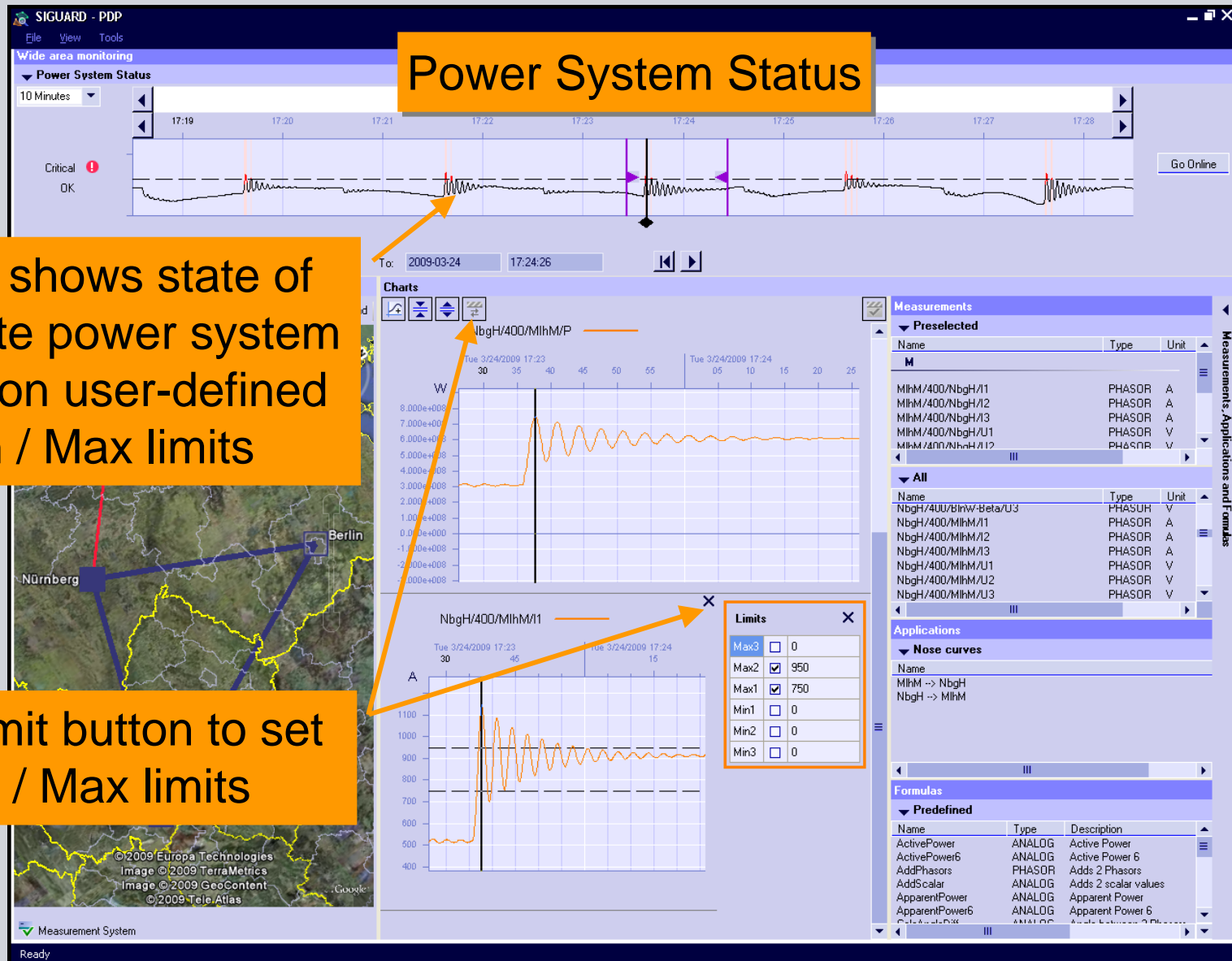
- Voltage stability
- Frequency stability
- Power oscillations
- Loadability



SIGUARD Phasor Data Processing System User Interface



SIGUARD Phasor Data Processing System User Interface

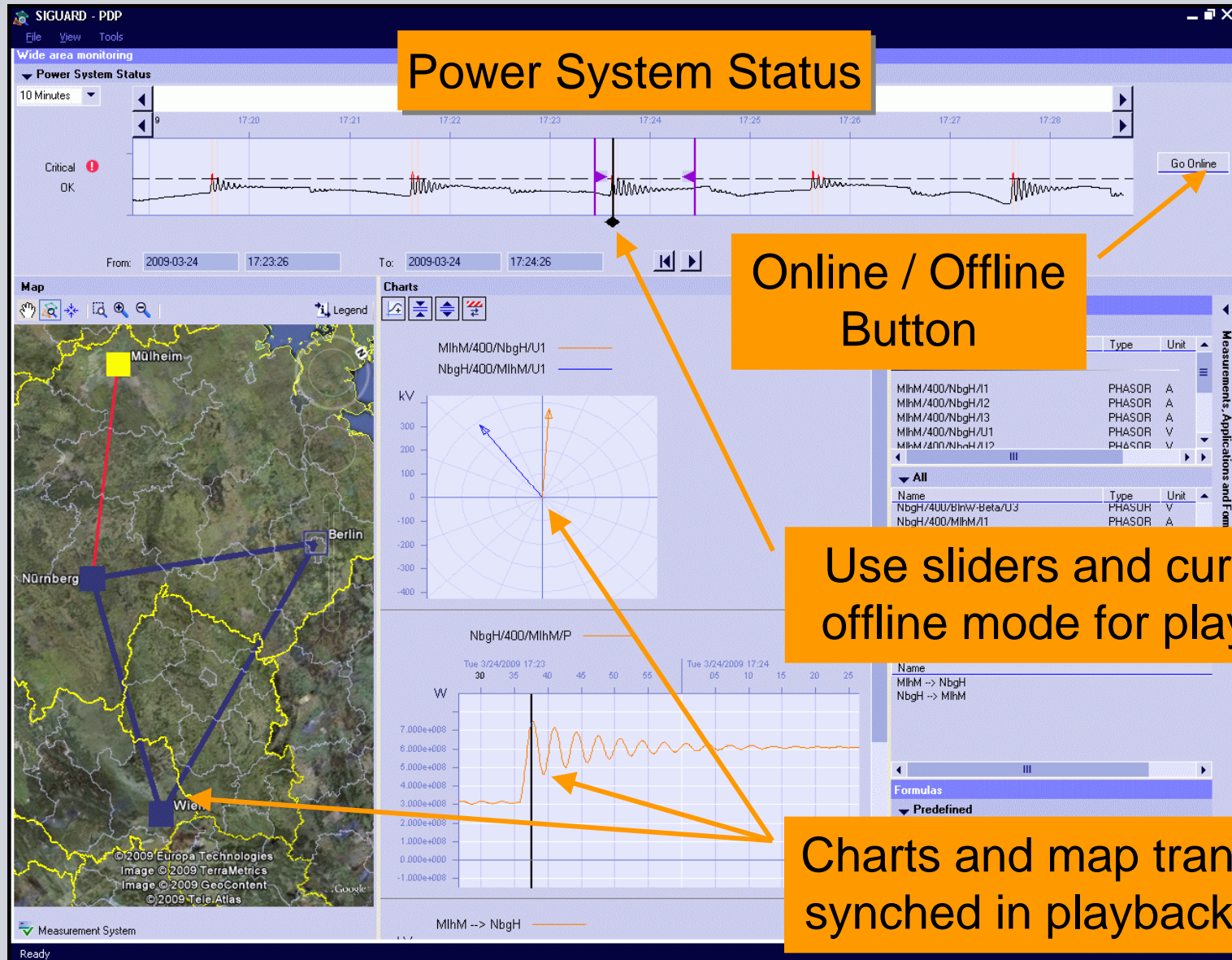


Power System Status

Curve shows state of complete power system based on user-defined Min / Max limits

Use Limit button to set Min / Max limits

SIGUARD Phasor Data Processing System User Interface



SIGUARD Phasor Data Processing System User Interface

The screenshot displays the SIGUARD PDP interface with several key components:

- Wide area monitoring:** Includes a 'Power System Status' section with a '10 Minutes' time range and a 'Critical' indicator.
- Map:** A satellite map showing a power network between Nürnberg, Berlin, and Wien. A legend indicates object colors: Blue for Normal, Yellow for Near critical, and Red for Critical.
- Measurement section:** A table of preselected measurements with columns for 'Type' and 'Unit'.

Type	Unit
PHASOR	A
PHASOR	A
PHASOR	A
PHASOR	V
PHASOR	V
PHASOR	V
PHASOR	V
- Phasor plot:** A polar plot showing voltage phasors in kV.
- Waveform plot:** A time-domain plot showing power fluctuations.
- Defined measurements table:**

Type	Description
ANALOG	Active Power
ANALOG	Active Power 6
PHASOR	Adds 2 Phasors
ANALOG	Adds 2 scalar values
ANALOG	Apparent Power
ANALOG	Apparent Power 6

Click on "Preselect" button, drag mouse over map and just those preselected data points appear in Measurement section

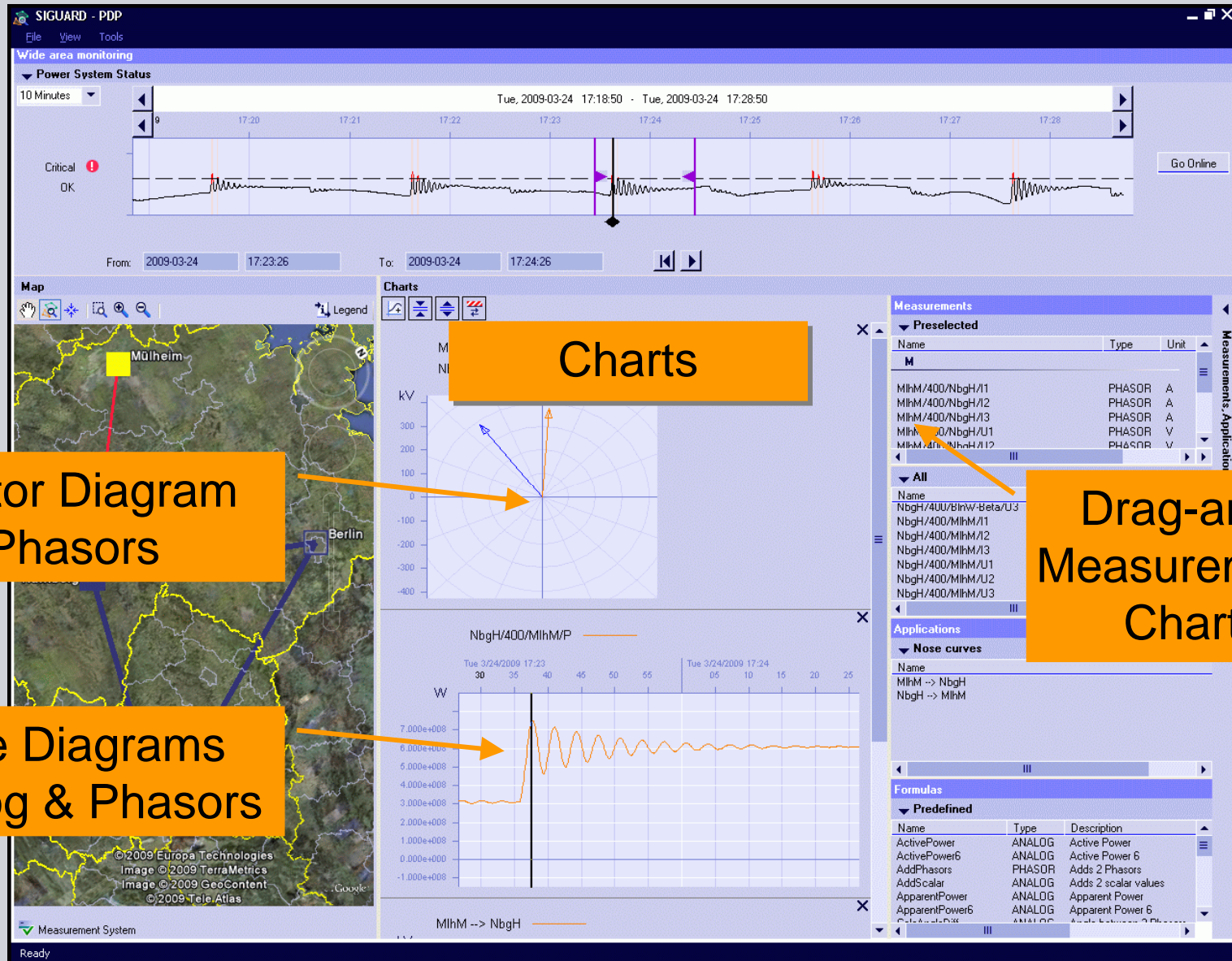
Maps

Legend: Object Color

- Blue – Normal
- Yellow – Near critical
- Red – Critical

Quickly create one-lines in Google Earth tool

SIGUARD Phasor Data Processing System User Interface



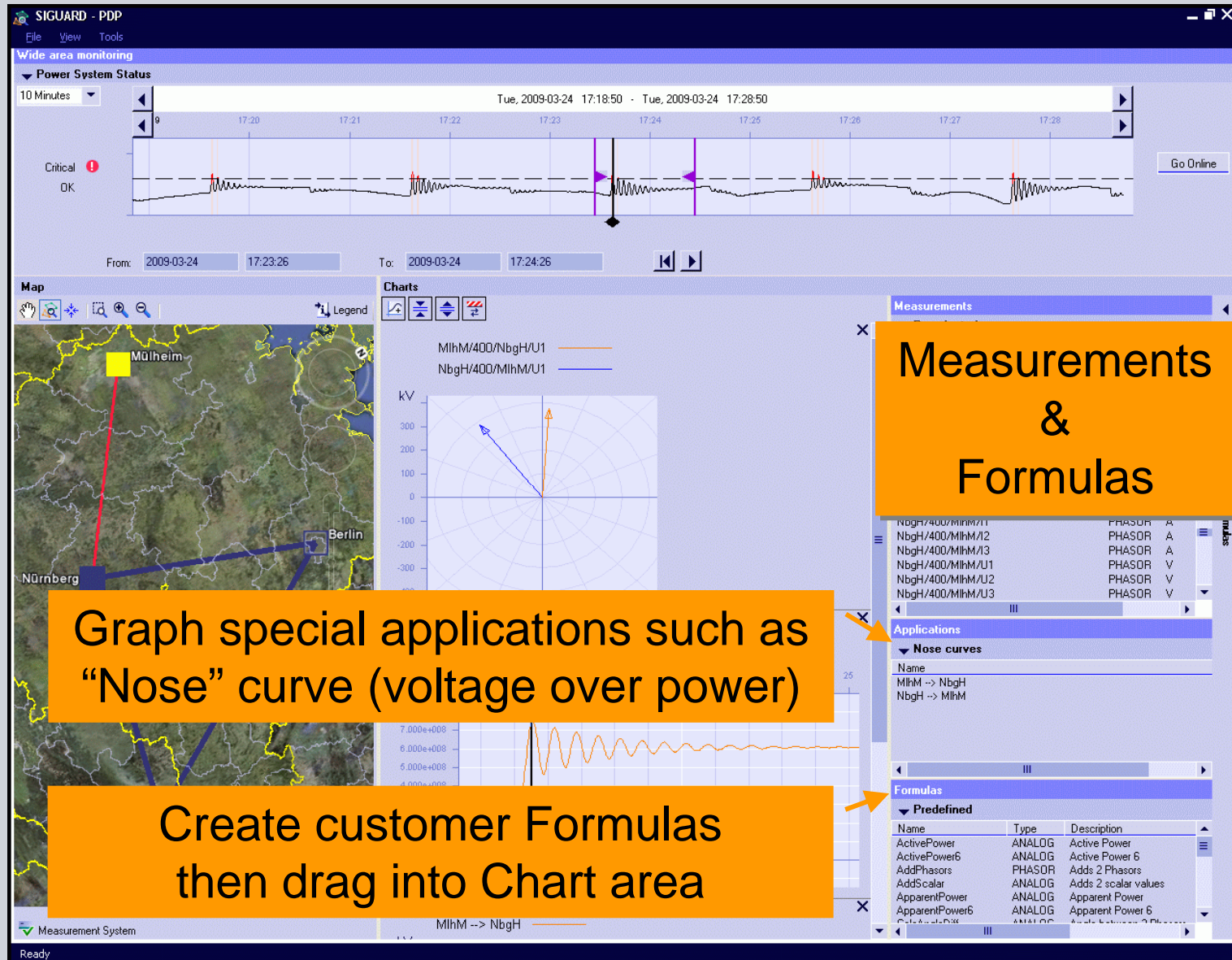
Charts

Vector Diagram Phasors

Line Diagrams Analog & Phasors

Drag-and-Drop Measurements into Chart Area

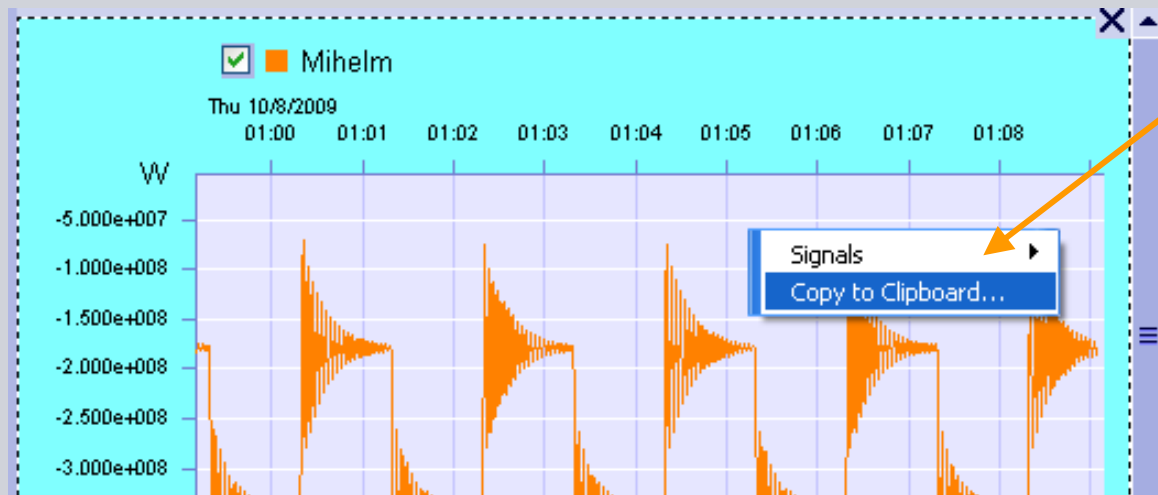
SIGUARD Phasor Data Processing System User Interface



SIGUARD Phasor Data Processing System Reporting



Copy and Paste



Right-click on Chart

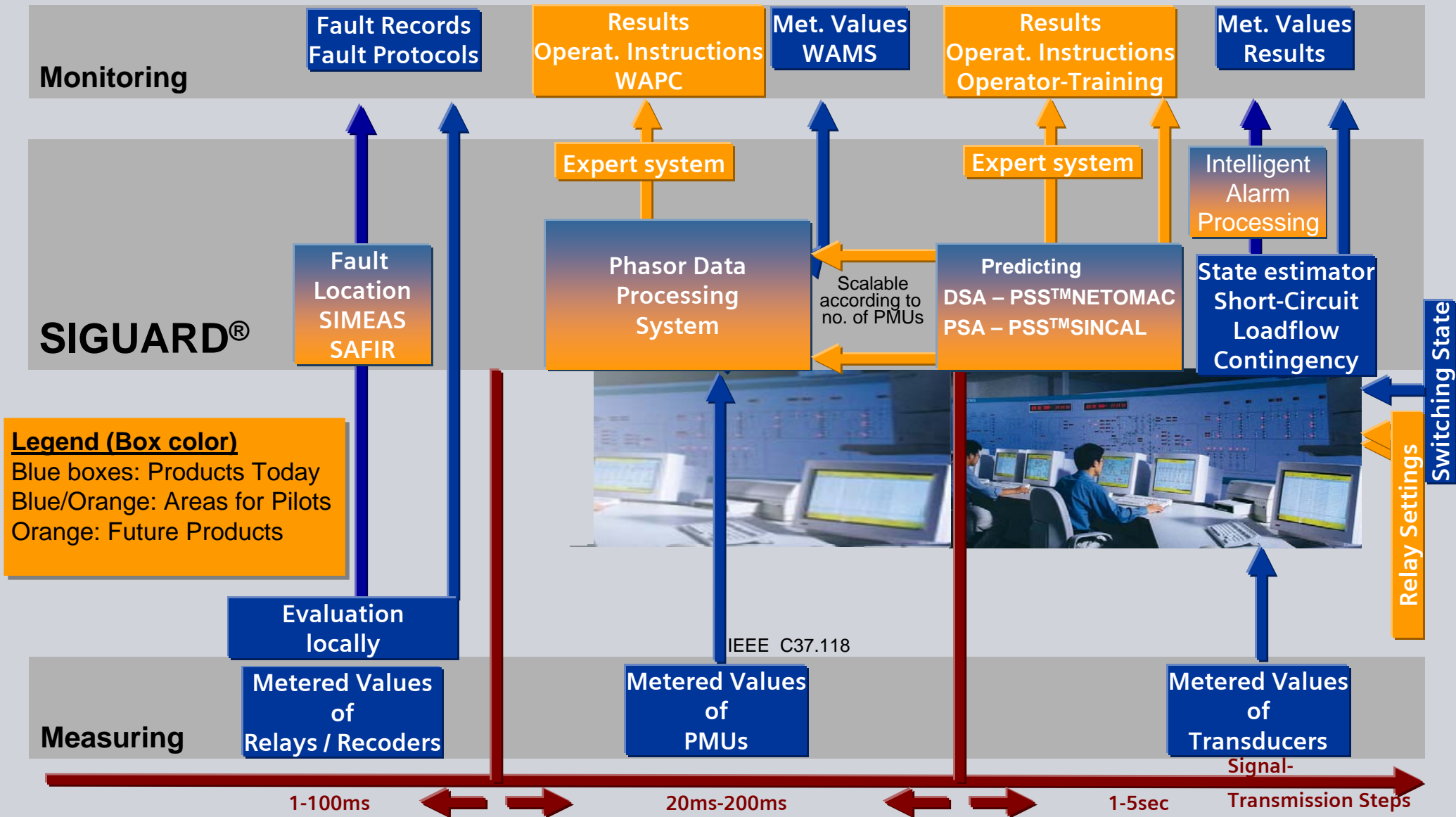
*.csv Report

TimeStamp	Mihelm/400/NbgH/dt	Mihelm/400/NbgH/dt.qual	Mihelm/400/NbgH/f	Mihelm/400/NbgH/f.qual	Mihelm/400/NbgH/f1.val	Mihelm/400/NbgH/f1.deg	Mihelm/400/NbgH/f1.qual	Mihelm/400/NbgH/f2.val
Wed Mar 25 11:54:40:900 2009	-0.002033		49.999756		876	-24.165001	H1V	874
Wed Mar 25 11:54:41:000 2009	-0.002219		49.999798		890	-24.365999	H1V	890
Wed Mar 25 11:54:41:100 2009	-0.001661		49.999779		906	-24.479	H1V	905
Wed Mar 25 11:54:41:200 2009	-0.001533	DAI	49.999832	DAI	917	-24.656002	DAI	917
Wed Mar 25 11:54:41:300 2009	-0.001403	DAI	49.999847	DAI	930	-24.820999	DAI	929

Data Quality Codes

SIGUARD Phasor Data Processing System

Product Roadmap & Areas of Interest for Pilot Projects



SIGUARD Phasor Data Processing System

Conclusion



Primary Application Areas

- Voltage stability
- Frequency stability
- Power oscillations
- Loadability

Customer Benefits

- Operational support for preventing blackouts
- Close information gap between protection & SCADA measurements
- Greater loading of transmission lines while maintaining stability
- Fast analysis of power swings; quickly generate disturbance reports

Phasor measurement technology leads to future Smart Grid app's

- System integrity protection schemes (SIPS)
- Power oscillation damping devices (FACTS, fast valving)
- Real time state estimator