



WAMS SOLUTIONS

GE Synchrophasor Solutions

*30th October 2019, Richmond VA
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Wide-Area Monitoring, Protection & Control

Our WAMS Products

Wide-Area Monitoring

Data Concentrator, Analysis, Presentation, Historian

PhasorPoint

WAMS+EMS : Hybrid Applications

Measurements + Model + Contingencies

Stability

Engineering Analysis

WAMS, SCADA, Simulation, Disturbance Recordings

PhasorAnalytics

Wide-Area Control

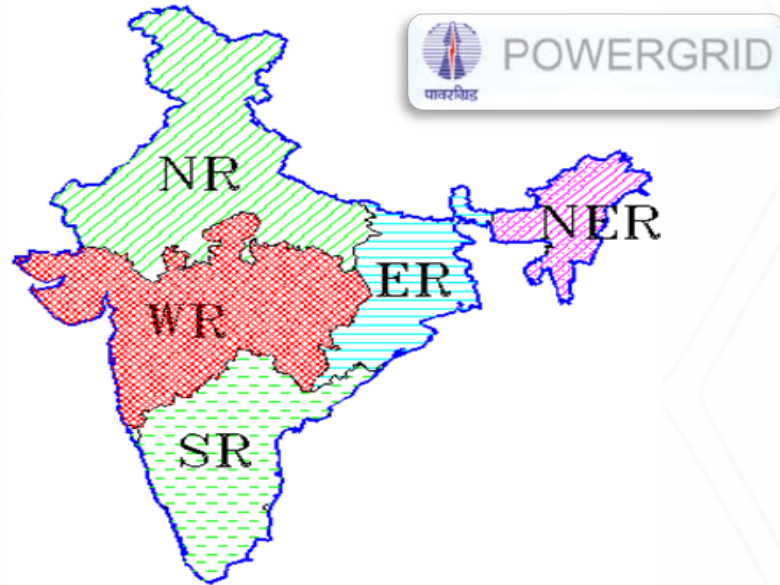
Fast, flexible control platform

PhasorController



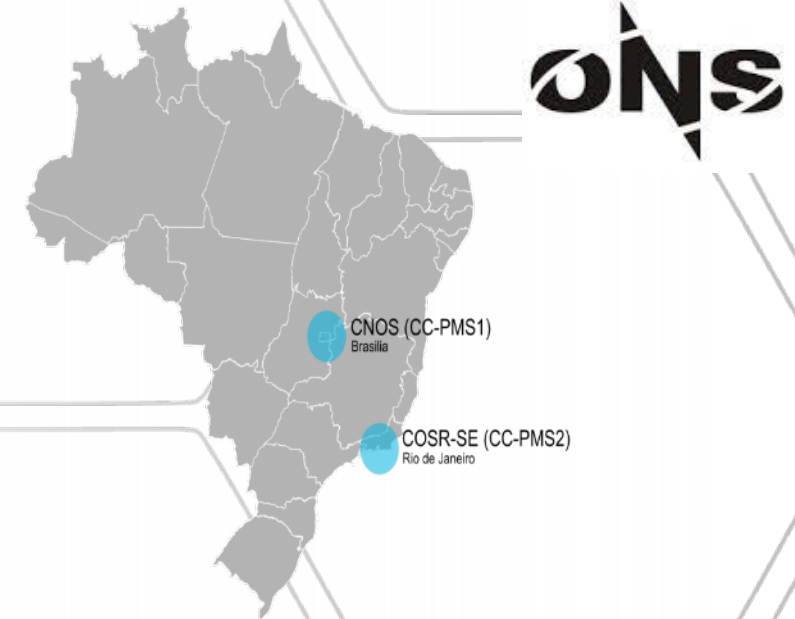
PowerGrid India - URTDSM

Unified Real Time Dynamic State Measurement



ONS Brazil - SMS

Synchronized Measurement System



WORLDS 1st LARGEST WAMS

- 33 PDCs: 26 States; 5 Regions; 2 National Control Centers
- 359 Substations with 3,400 PMUs sending 25 samples/second
- Over 25,000 synchrophasors (positive sequence, 3 phases, voltage and current, MW and MVAR)
- 1 Year of long term data: 0.5 Peta Bytes

WORLDS 2nd LARGEST WAMS

- 1000 PMUs; 2 National Control Centers
- 2.2 Million measurements/second monitoring 1000 line terminals
- Full suite of Real-Time and Engineering Applications
- Integration of WAMS with EMS



PhasorProcessor

A Phasor Data Concentrator (PDC) receives multiple PMU data streams, performs stream data rate conversion where required, time aligns the stream and repacks the streams into one or more output streams for transmission to other systems requiring synchrophasor data.

GE provides a full range of software PDC solutions, including:

Substation PDC

For substation environment



Regional PDC

Standalone server



Central PDC

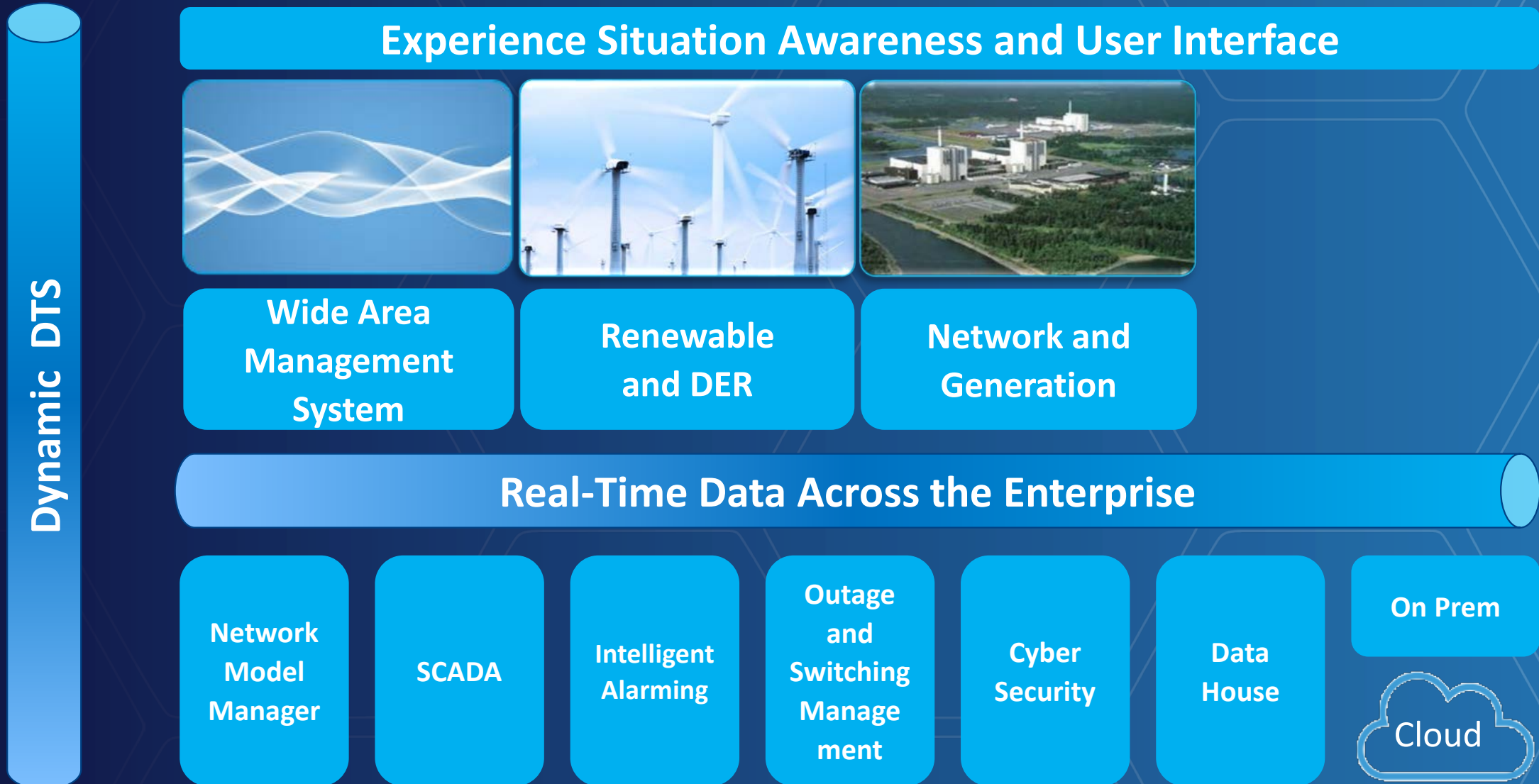
Integrated with e-terraphasorpoint server



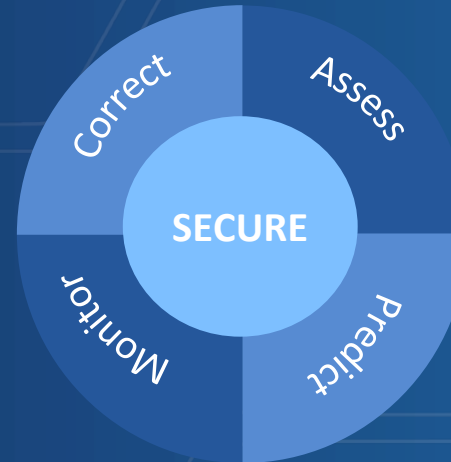
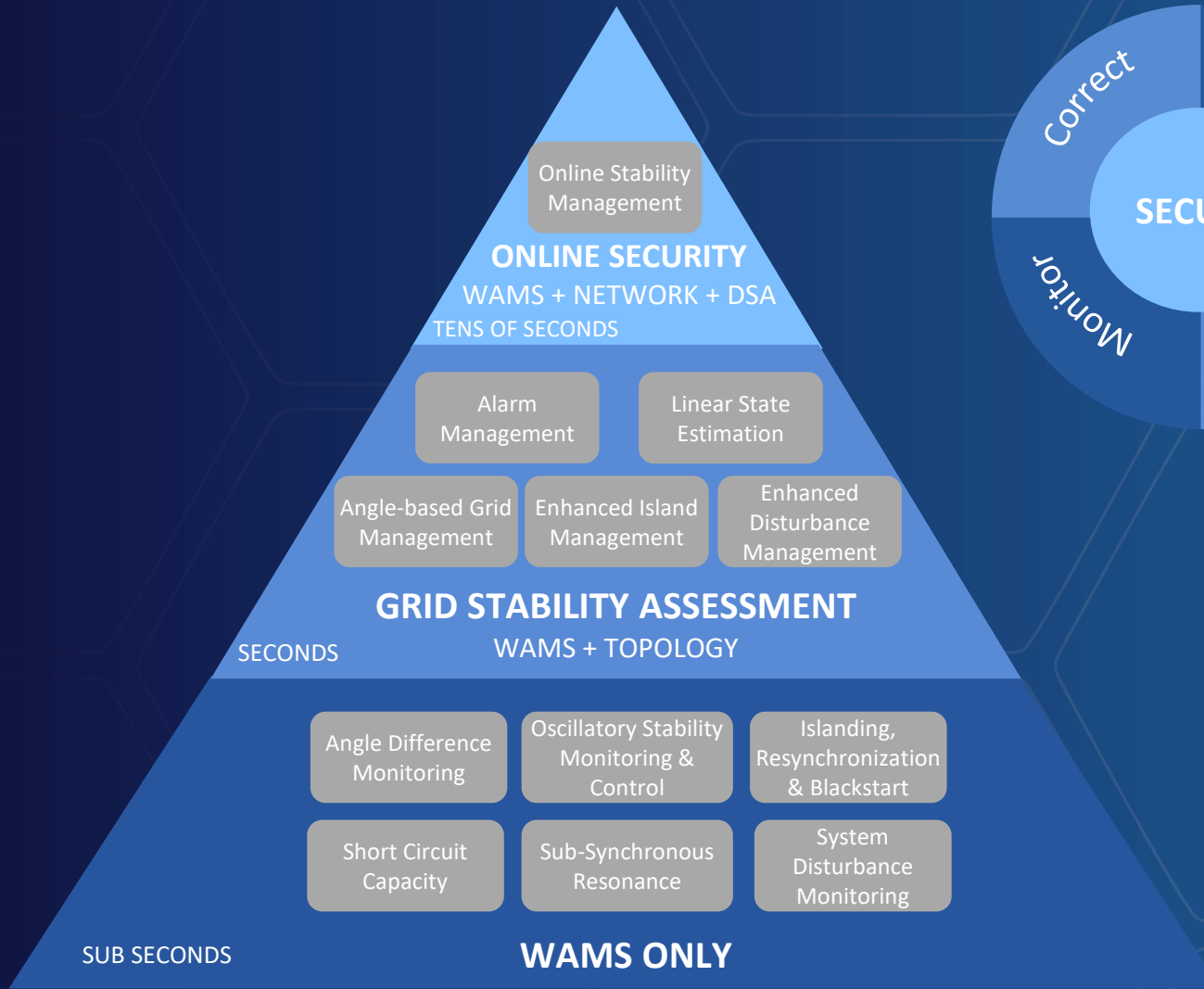
These PDCs allow C37.118-2005/2011/2014 data streams to be consolidated and buffered, sample rates may be changed and multiple output streams may be securely generated, thus enabling system configuration, cyber security and communications issues to be addressed. All **PhasorPoint** PDC systems have the ability to buffer and recover data from other **PhasorPoint** systems in the case of server or communications failures.



Advanced Energy Management System – EMS – DER - WAMS



EMS – WAMS - TIMING AND AUTOMATION



Impact of PhasorAnalytics apps into further optimization and risk reduction

Impact of Hybrid phasor apps into existing apps and network utilization and EMS automation

Impact of PhasorControl on EMS fast automation and monitoring



AEMS - WAMS Management

Managing Dynamics

Wide Area Management

- Angle-based Grid Management
- Islanding Monitoring & Management
- Enhanced Island Management
- Disturbance Monitoring & Management
- Enhanced Disturbance Management
- Linear State Estimation
- Short-Circuit Capacity

Online Stability Management

- Dynamic Angle Limits
- Fast Voltage Stability Management

Angle based Grid Management



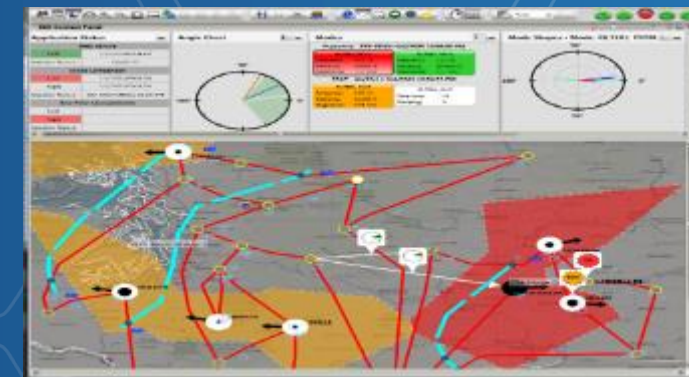
Enhanced Islanding Management



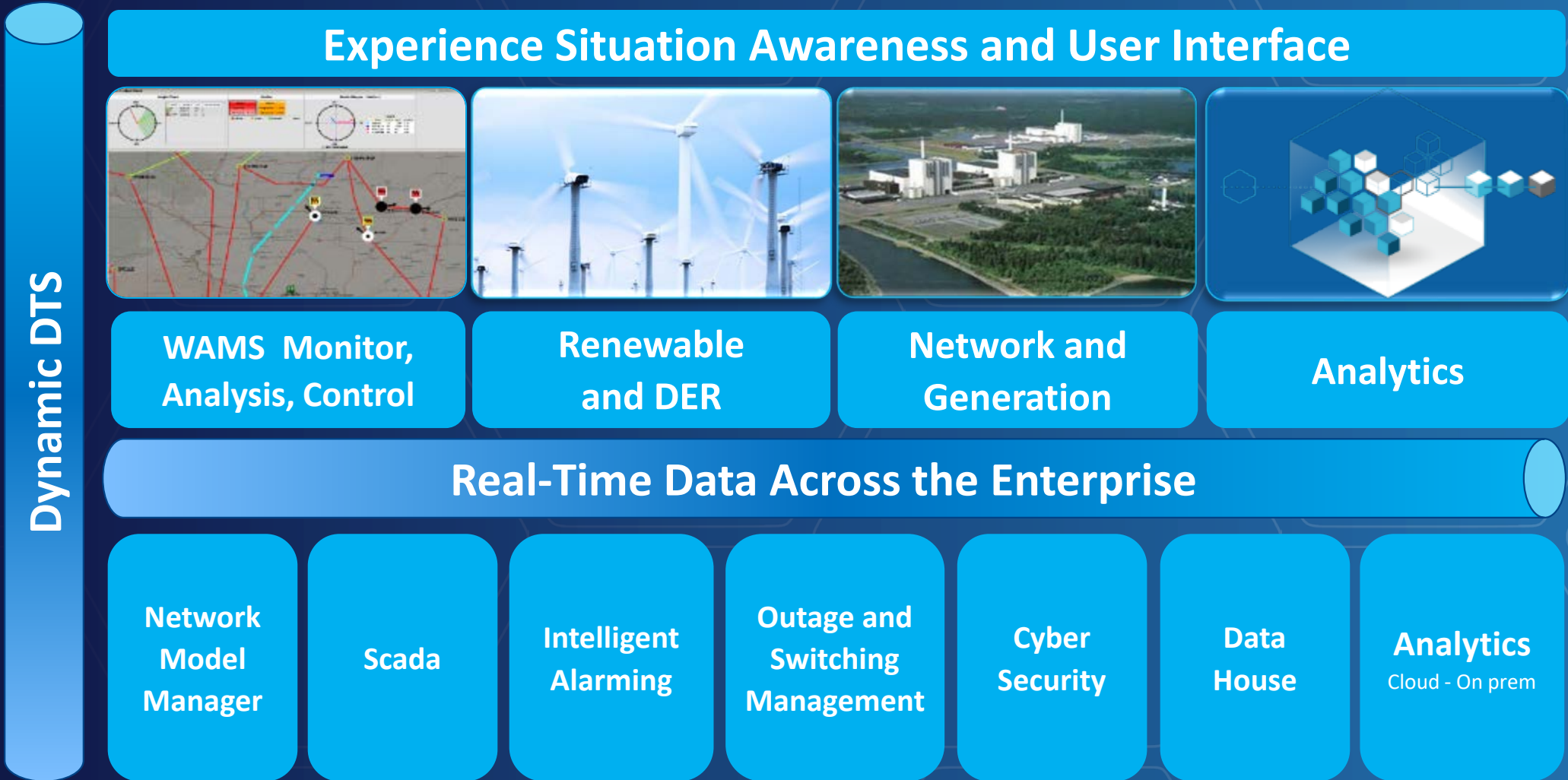
Reliance integrated with PhasorPoint



Platform integrated with PhasorPoint

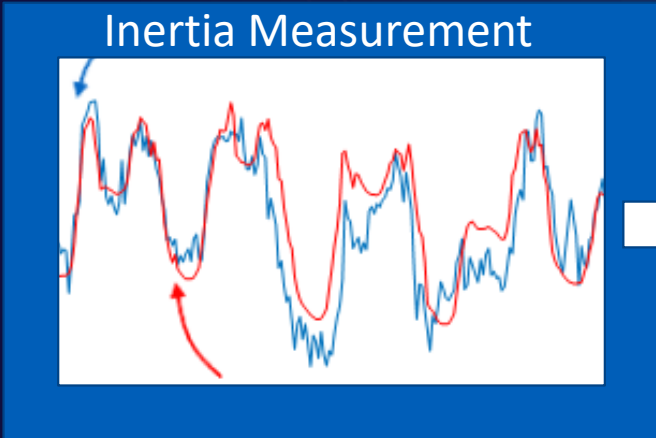


Advanced Energy Management System – The new EMS

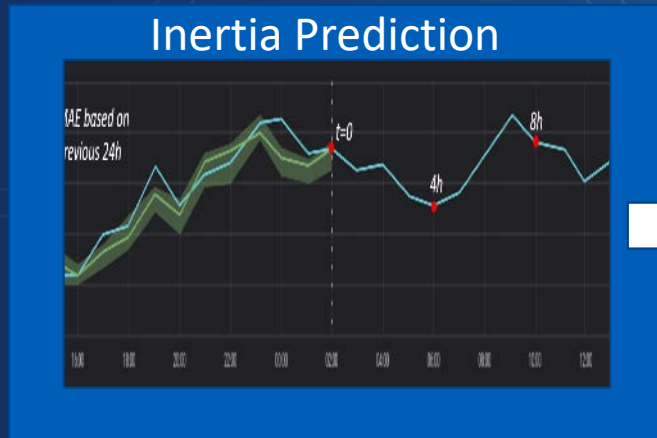


Effective Regional Inertia Management

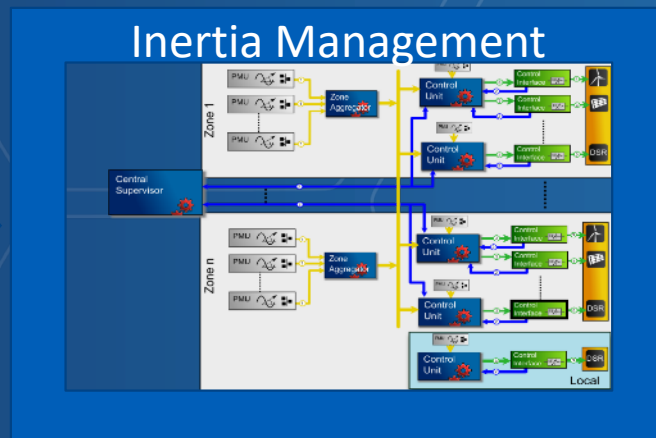
Wind/Solar Generation Forecast from Renewables Forecast
Conventional Generation/Load Forecast from EMS/Markets



Pure WAMS



Machine Learning Model from Grid Analytics



EMS model

Cheapest / Greenest mix of generation possible

Max Security

