

# Automation Network Management Solutions

**e-terra** products for  
Voltage coordination on  
High Voltage Grids

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# Network Management Solutions - Our Mission



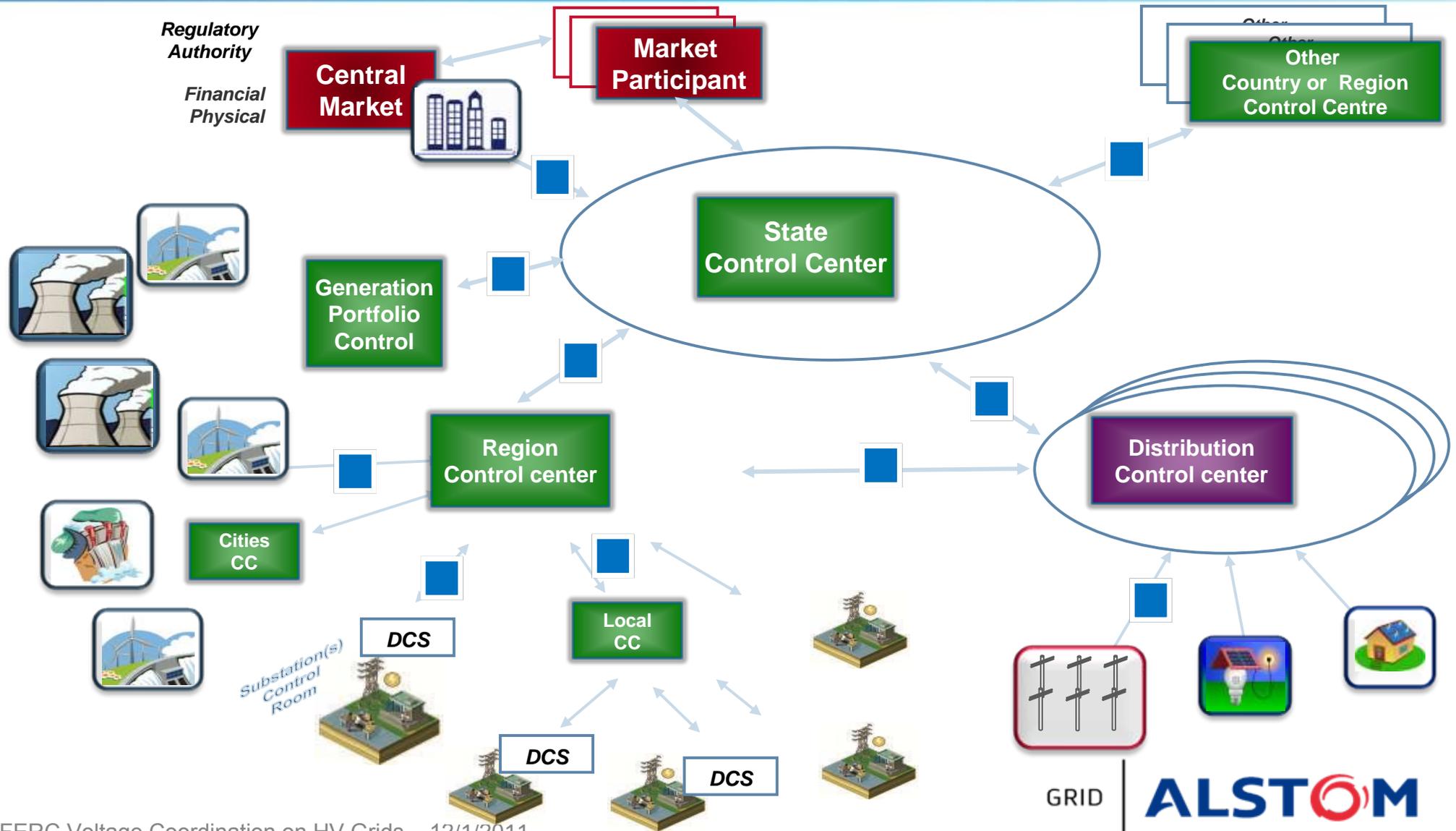
To provide **mission-critical solutions** to manage transmission and distribution electrical grids, including telecom and energy trading management



# Network Management Solutions

## Traditional Grid control structure

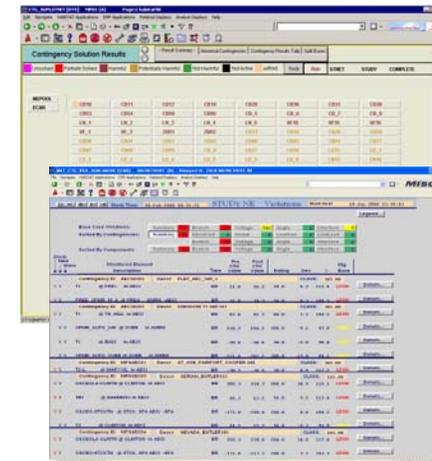
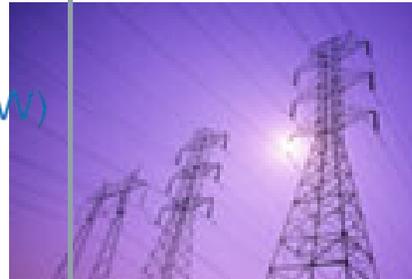
- e-terramarket
- ▲ e-terraplatform
- ◆ e-terradistribution
- e-terragridcom



# e-terratransmission e-terrageration

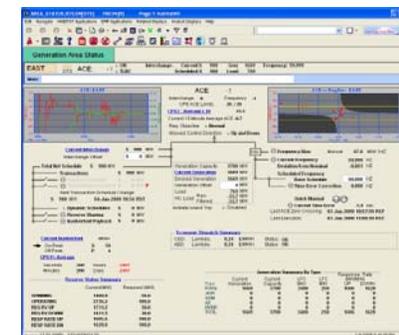
## TRANSMISSION : e-terratransmission in Real-time & Study operation

- Load flow calculation (PWRFLW)
- **State Estimator (RTNET)**
- **Contingency Analysis (RTCA)**
- **Optimal Power Flow (OPF)**
- Short-Circuit Analysis (RTSCT)
- Security Enhancement (RTSENH)
- **Voltage/VAR dispatch (VVD)**
- Dynamic Simulation (VSAT/TSAT)
- **Study Multi-Time Points (SMTNET)**



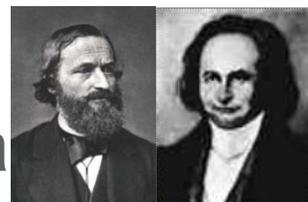
## GENERATION : e-terrageration in Real-time & Study operation

- Automatic Generation Control (AGC)
- Reserve Monitor
- Economic Dispatch
- Transaction scheduling
- Real Time and Study Modes



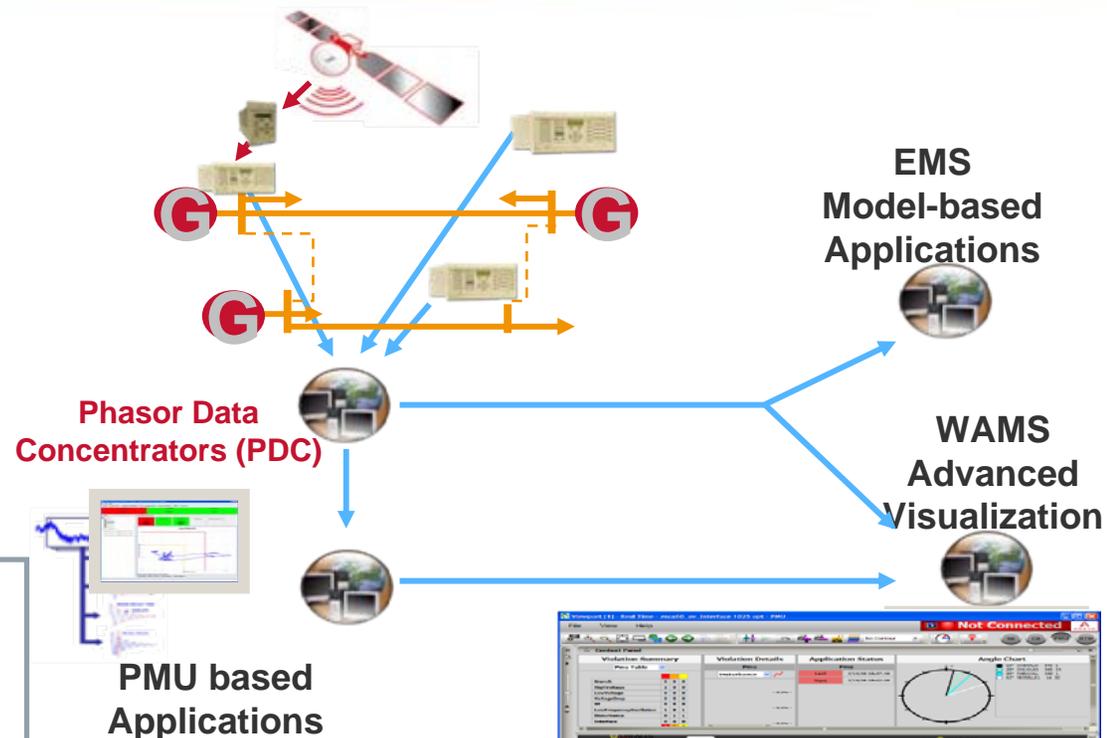
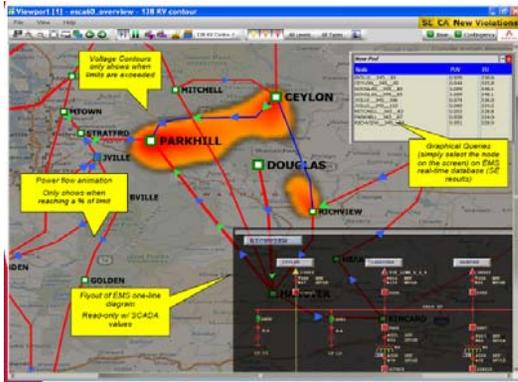
# Classic EMS Application Characteristics

- Model based
- KCL Jacobian sensitivity analysis
- Domain specific and IBM CPLEX solvers
- Controls: Generators voltages and reactive, SVC, taps, caps, loads
- Constraints: Voltage magnitudes, reactive flows, reactive area reserve, with contingencies
- VSAT on-line integration
- Analysis through time



$$P_k = \sum_{j=1}^N |V_k| |V_j| (G_{kj} \cos(\theta_k - \theta_j) + B_{kj} \sin(\theta_k - \theta_j))$$
$$Q_k = \sum_{j=1}^N |V_k| |V_j| (G_{kj} \sin(\theta_k - \theta_j) - B_{kj} \cos(\theta_k - \theta_j))$$

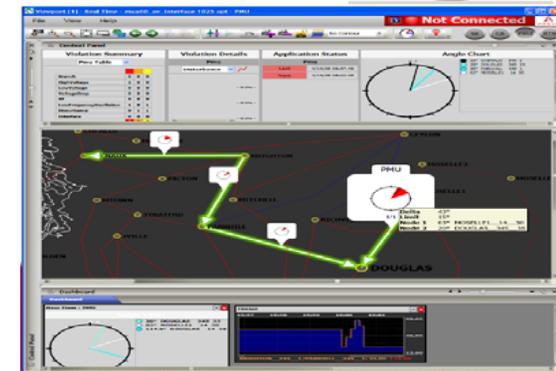




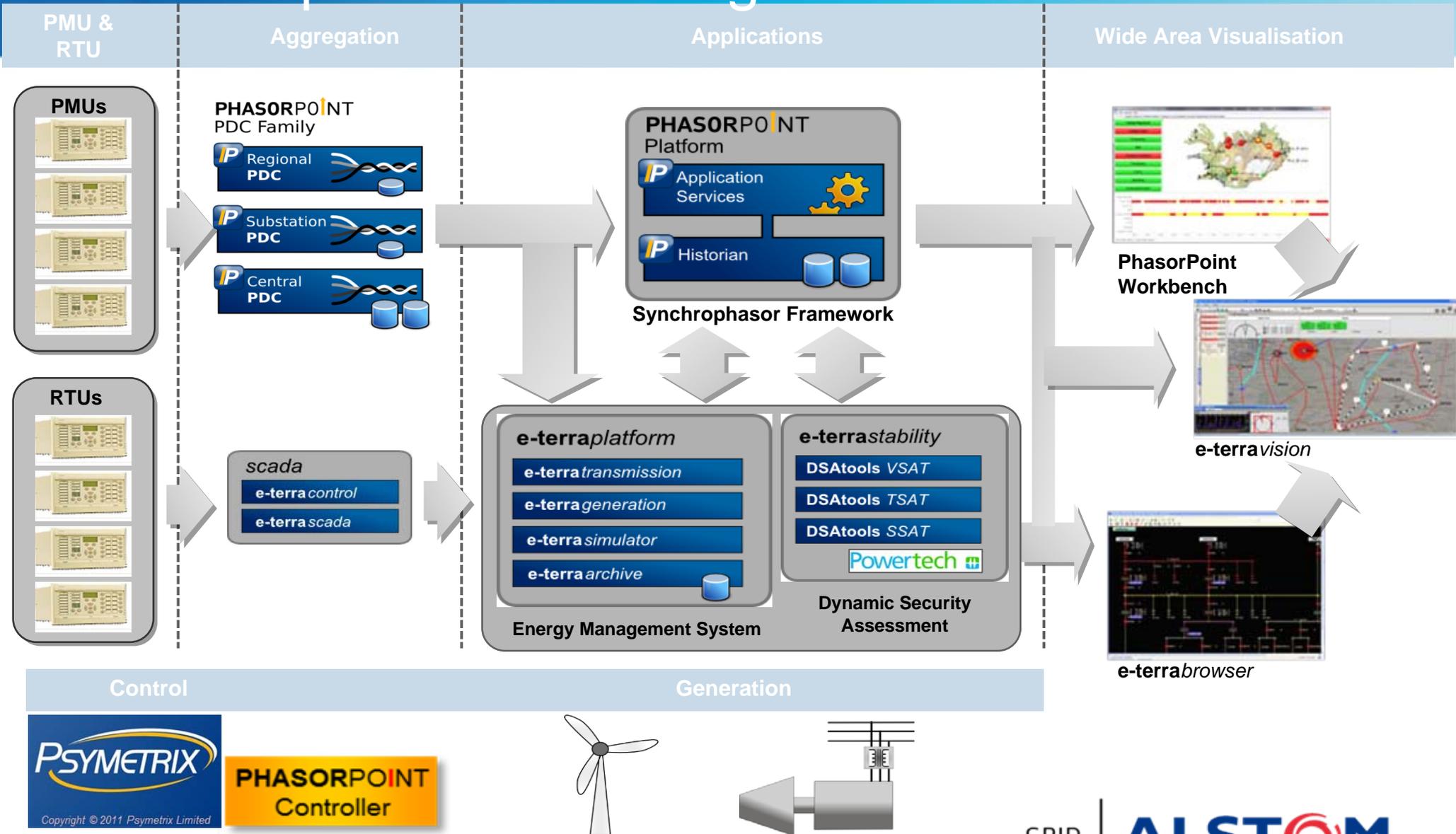
Situational Awareness  
*e-terravision* extended to On-line  
Stability

- Management of Phasor data & Alarms
- PMU-based applications (OSM, ..)
- Voltage Stability

**e-terra**  
**a strong move for Grid  
reliability**



# PMU captures fast voltage transients

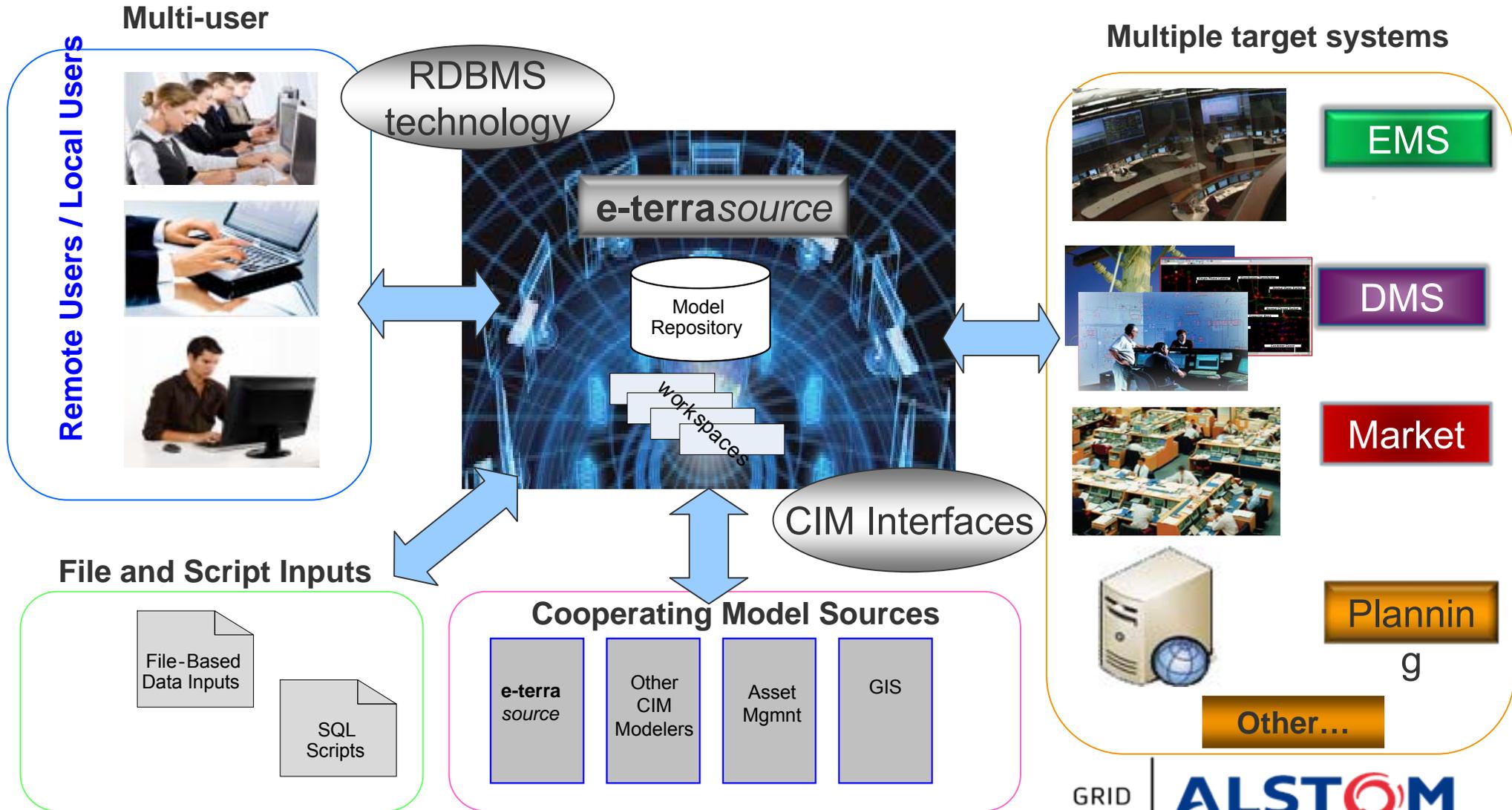


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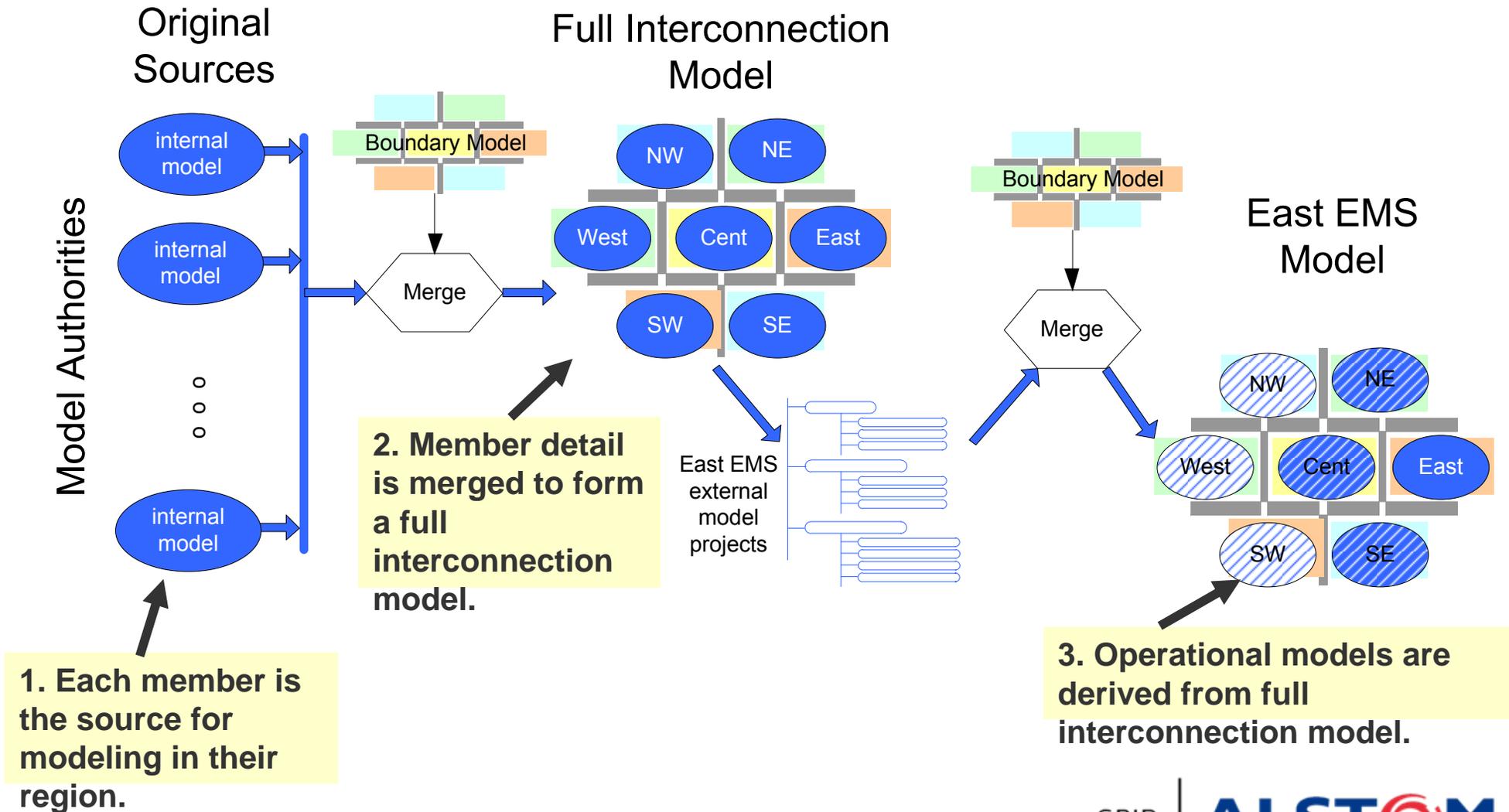
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# e-terra*source*

## Modeling as an independent enterprise component



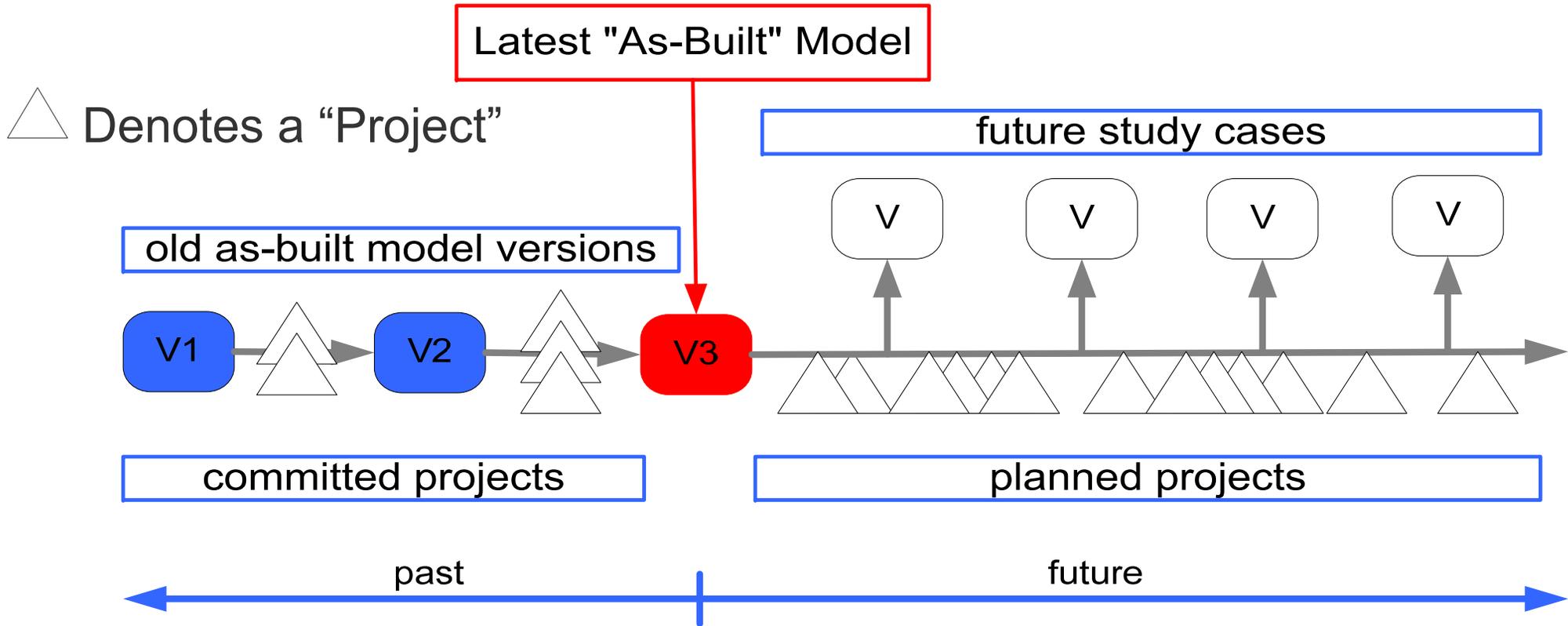
## CIM standards facilitate building of external models



# e-terrasource - annotated, auditable, composable, standardized and exchangeable sets of changes

annotated, auditable, standardized, exchangeable sets of changes

Models may be generated for past, present or future conditions.

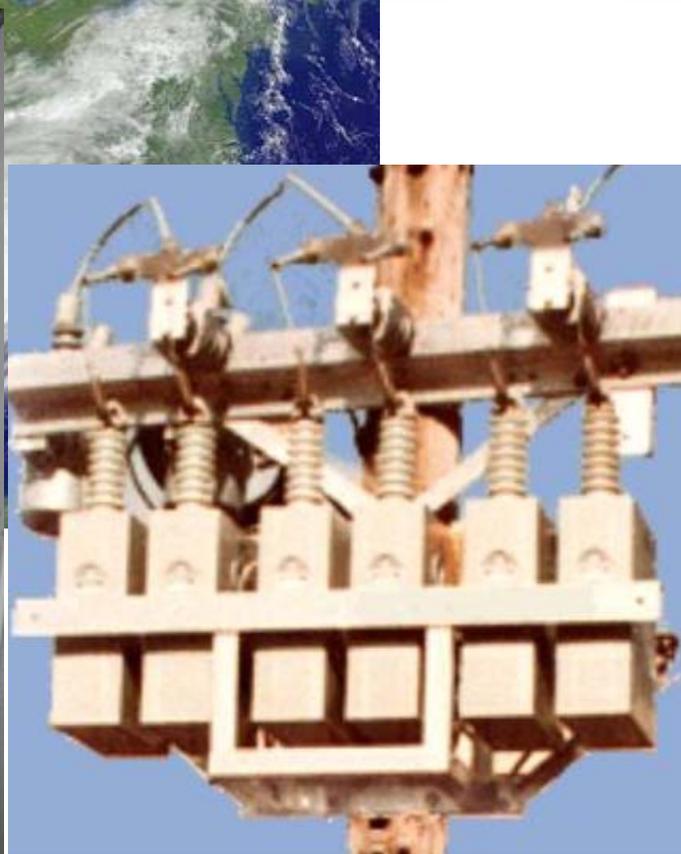


# DMS optimization supporting transmission

- Model based – distribution model as extension
- KCL Jacobian sensitivity analysis
- Switching optimization
- Controls: Generators voltages and reactive, SVC, taps, caps, loads, distributed DR programs, switching
- Constraints: Voltage magnitudes, branch flows, topology
- Objectives: feeder head demand, active, reactive, power factor

# e-terradistribution

## Powerful solutions to manage challenging situations



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# NMS Users Community



## Users Group Conferences

- 4 conferences are held every year in North America, Europe, Middle-East and Asia-Pacific
- Technical symposiums, keynote speeches, live demos, workshops and panel sessions.

## Customer Days

- Local event in several countries to meet product experts

## Users Community Forum

- Peer-to-peer exchange, technical discussions and best practices sharing

## Technical Newsletter, Web Portal

- Project examples, Technical tips, Industry news
- Weekly updates on product info and cyber-security



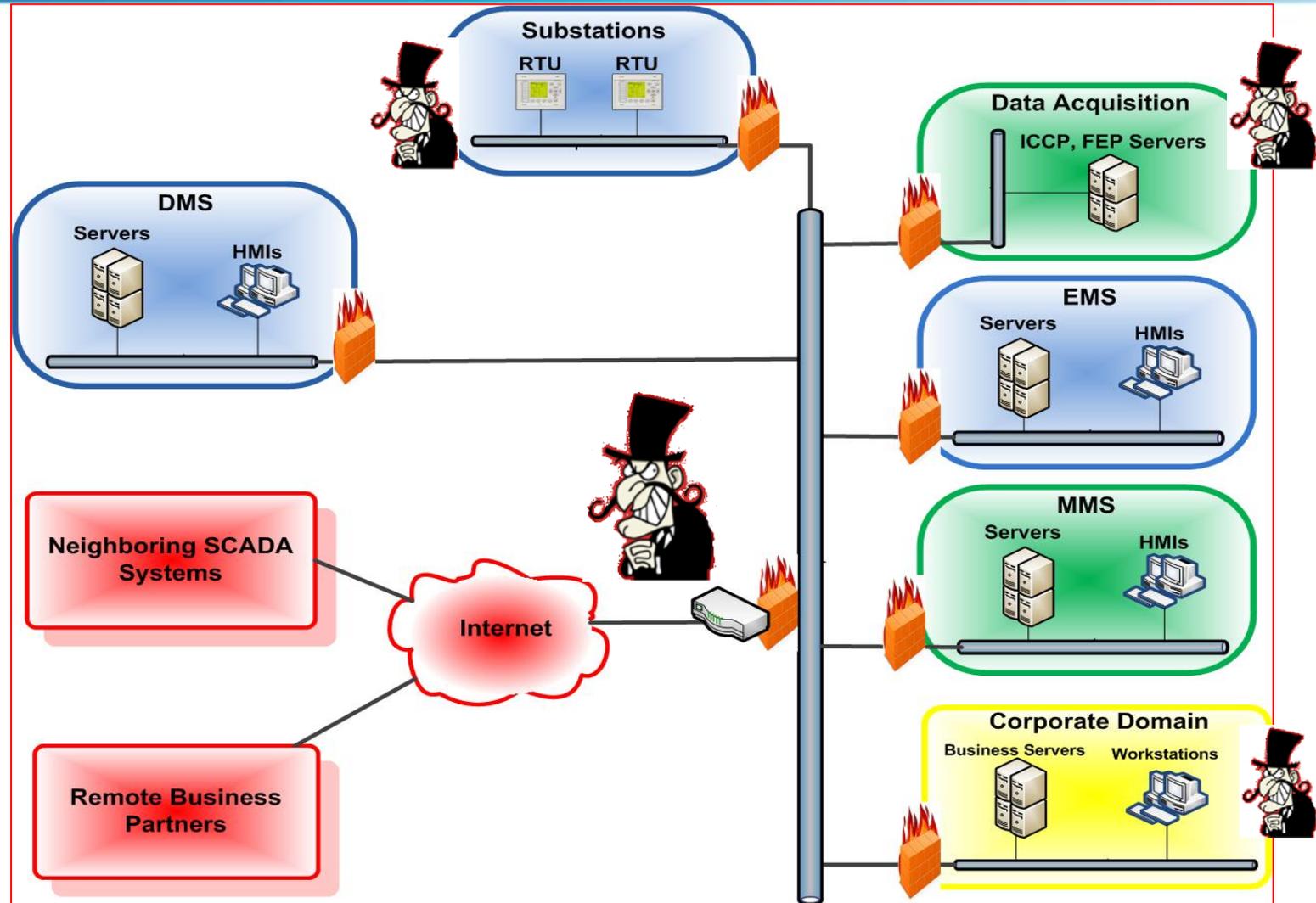
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# Cyber Security

## 4 protection axes

1. *Perimeter*
2. *Servers & WS*
3. *Applications*
4. *Data on Wires*

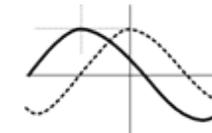
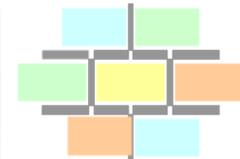
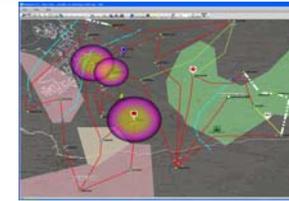


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# Summary

- It's a system problem, context important
- Model quality - SE, standards based (CIM) exchange of vetted models
- PMU - fast data, also non-model analysis
- DMS, DR, DER, contribution to solution (exchange standards)
- Secure, innovative, open based ecosystem



Thank You

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