



SIEMENS



Rugged Communications for the Electric Power Grid

RUGGEDCOM Smart Grid

What is a Smart Grid?

Smart grid (n.)

Digitally enabled electrical grid that **gathers**, **distributes**, and **acts** on **information** about the behaviour of all participants (suppliers and consumers) in order to **improve** the **efficiency**, **reliability**, **economics** and **sustainability** of electricity services.



What is the RUGGEDCOM Smart Grid?

More than just communications

1. **Utility grade communications backbone**
2. **Cyber security**
3. **Data management, visualization, analytics**

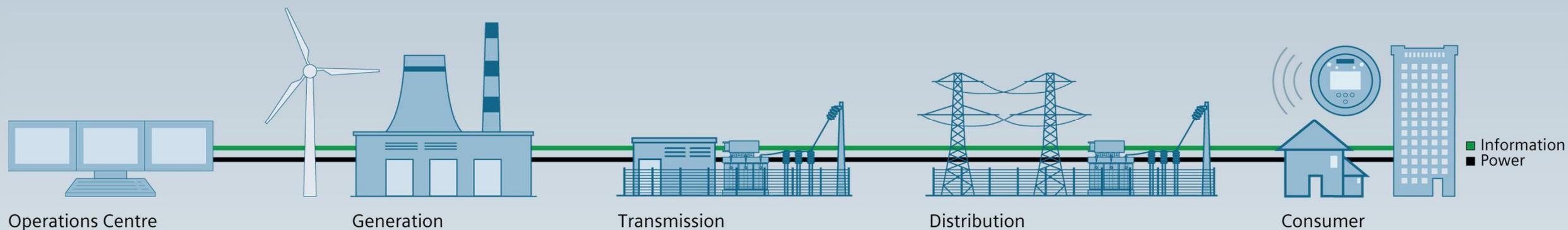


Advantages of the Smart Grid



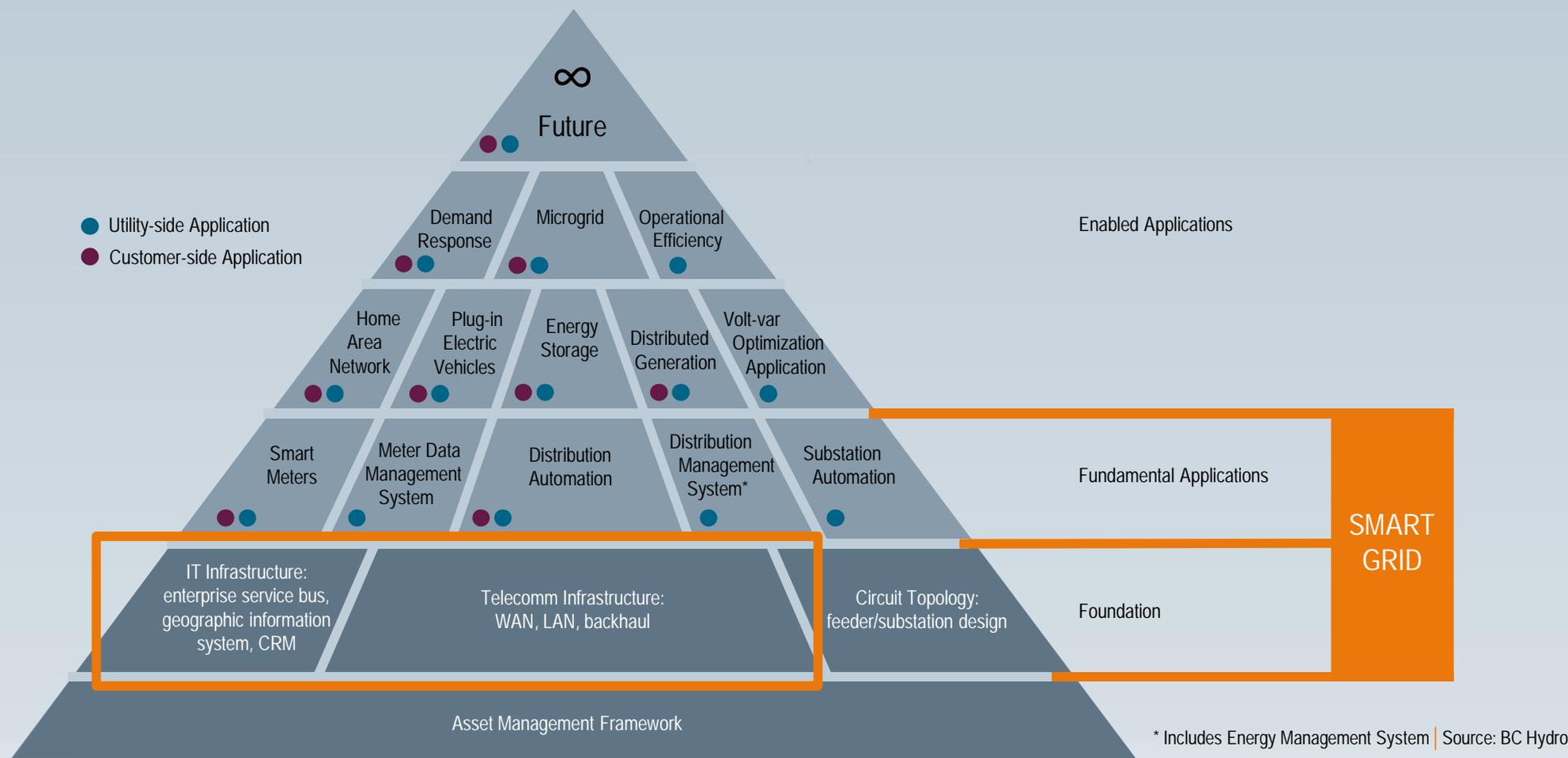
- Improved **reliability & efficiency**
- Enabling of **renewables & cleantech** apps
- Increased **consumer engagement**

Key Requirement

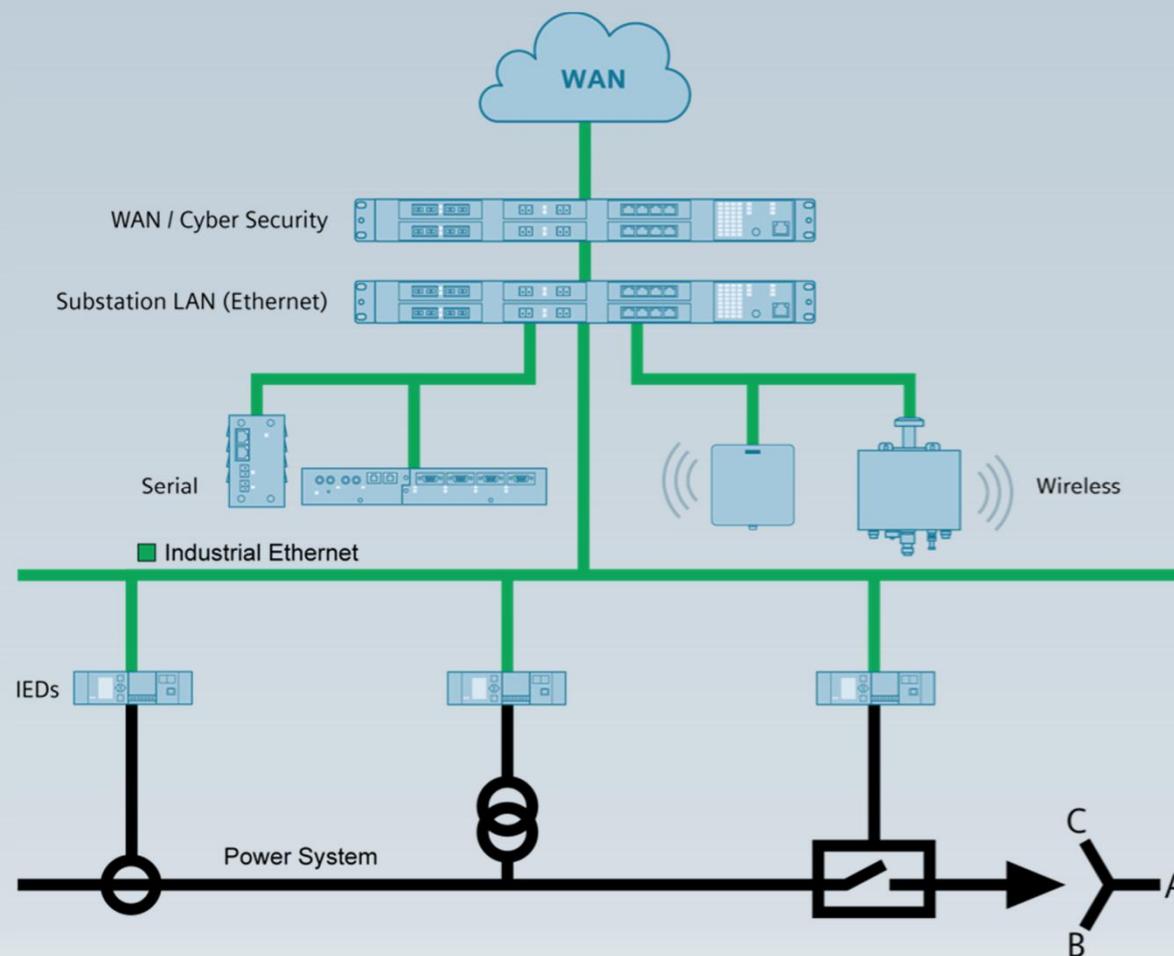


- An integrated communications and power system infrastructure

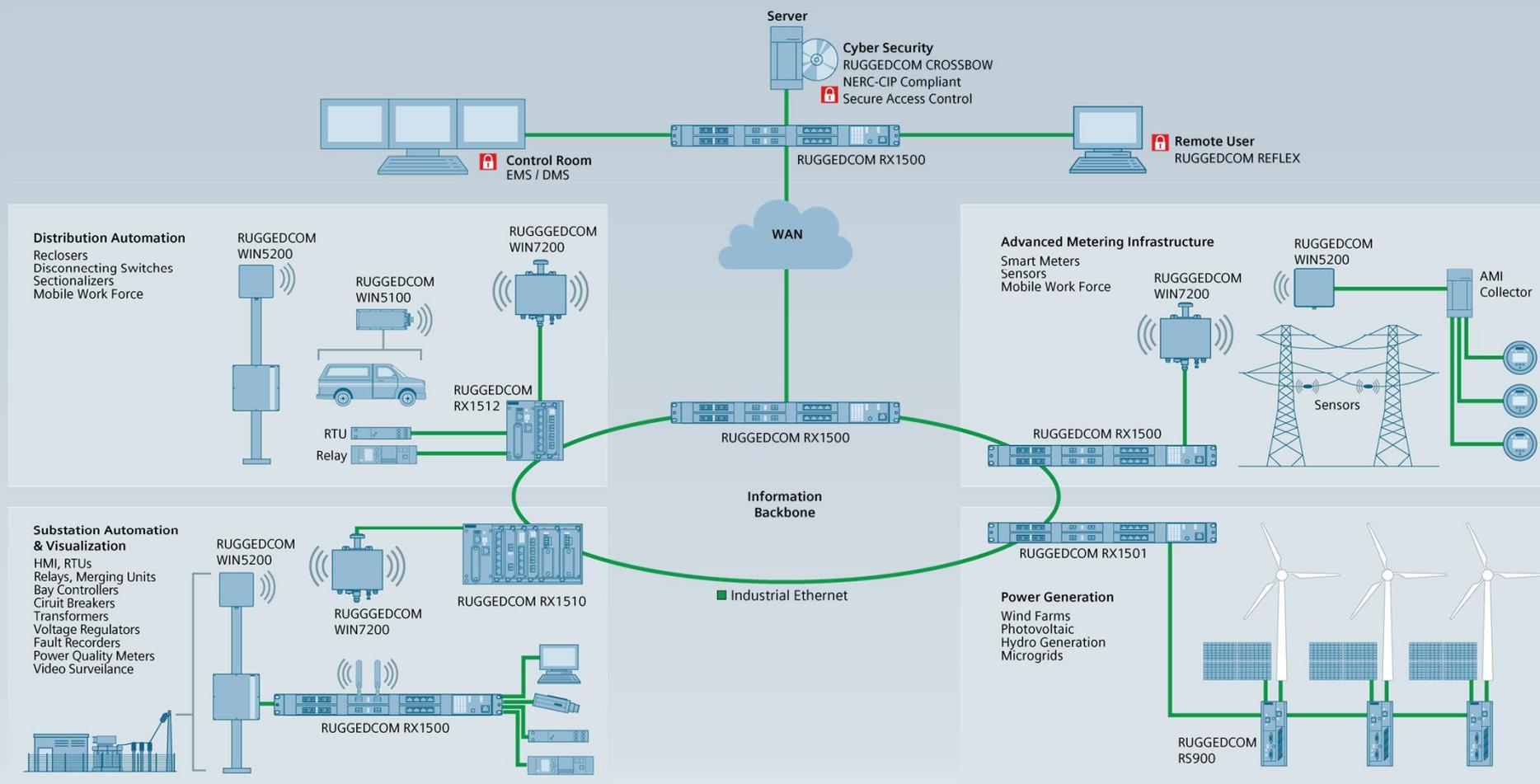
The Smart Grid Pyramid



Qualities of Utility Grade Communications



Utility Grade Applications



Most Comprehensive Solution

Utility Grade Requirements

- Fully IEC 61850-3 Compliant
- IEEE 1613 Class 2 performance
- Extended temperature: -40 to +85° C
- High reliability: MTBF > 1,000,000 hours
- High availability: > 99.9999%
- Wireline & wireless for WAN, MAN, NAN and LAN
- Standards based: IEEE, IEC, IETF, NERC...



Most Comprehensive Solution

Zero Packet Loss

- Immunity to EMI in utility environments:
IEC 61850-3, IEEE 1613
- 15 **destructive** type tests
- **IEEE 1613 Class 2** performance
- **Vital for Mission critical** networks used for protection & control



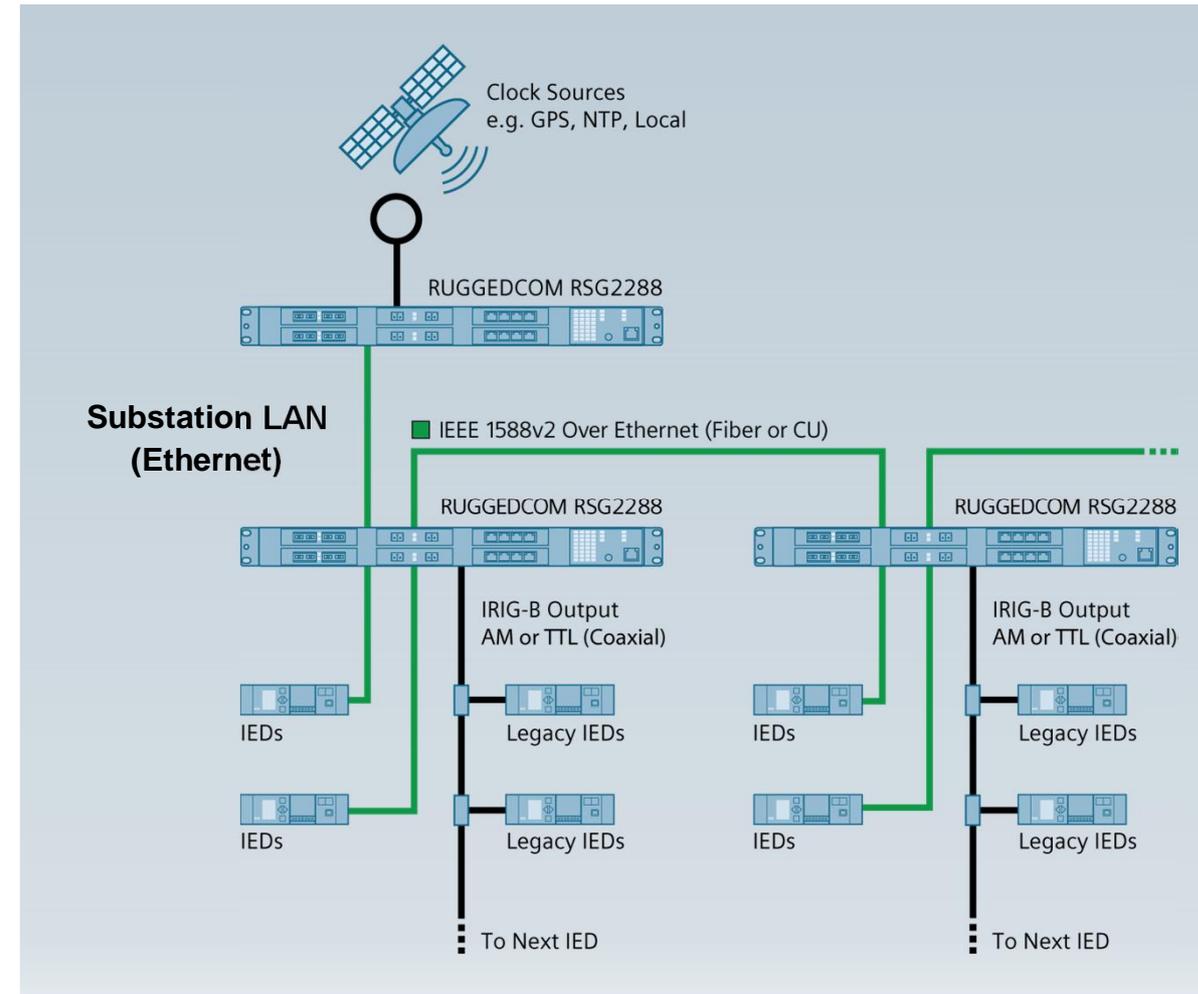
Packets IN

Packets OUT

Most Comprehensive Solution

Precision Time Sync

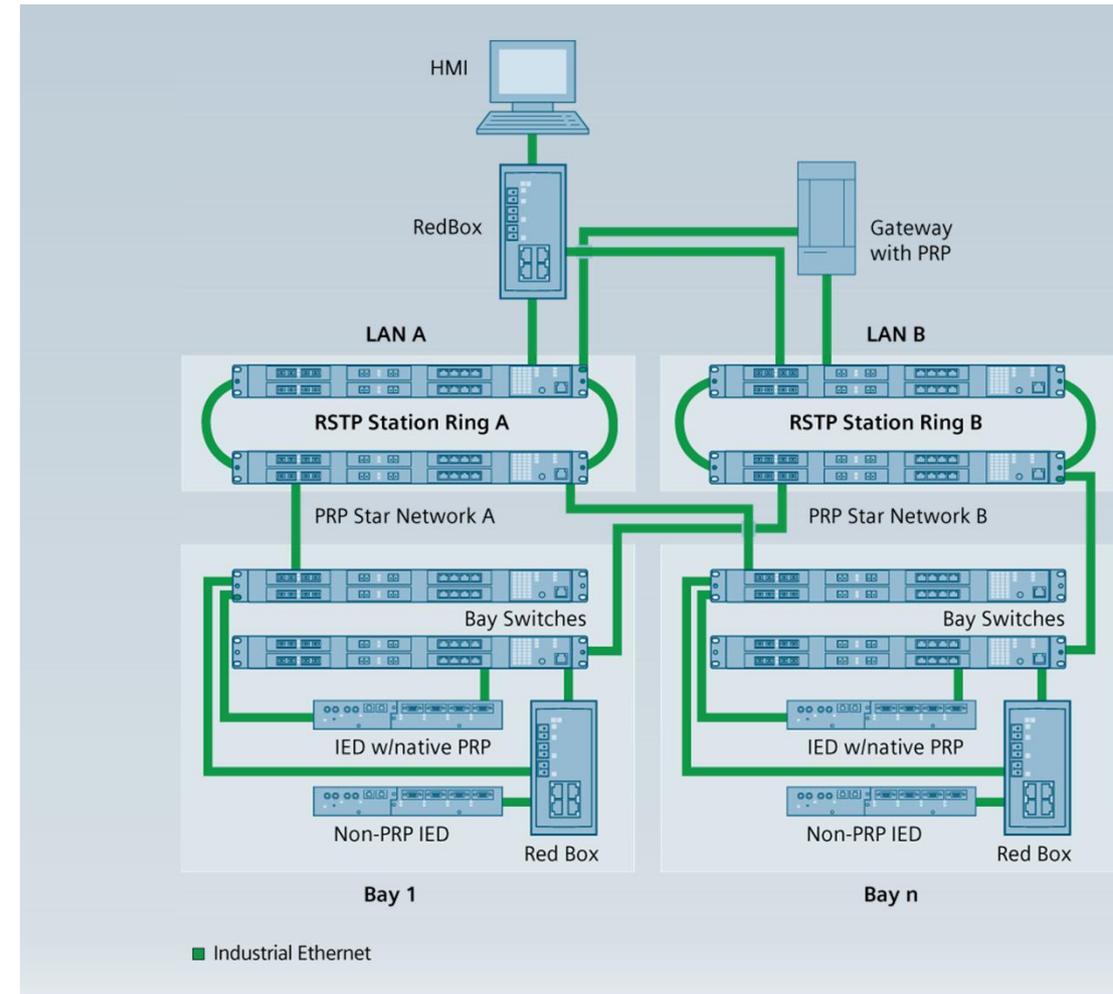
- **IEEE 1588 v2** precision timing protocol over Ethernet
- **Synchronize** substation IEDs to sub **microsecond** accuracy
- **Accurate** time stamping of system events and data



Most Comprehensive Solution

High Availability Ethernet: IEC 62439

- Parallel Redundancy Protocol (PRP)
- Guaranteed Zero-Packet-Loss™ for any single point of failure
- HSR/PRP included in IEC 61850 for mission critical substation networks



Most Comprehensive Solution

RUGGEDCOM WIN

Utility Grade, Wide Area Private Wireless Solution:

- Standards based WiMAX certified **IEEE 802.16e Wave 2**
- Designed for the substation as per: **IEEE 1613, IEC 61850-3**
- **Stand-alone mode** - no ASN gateway required
- **Low latency** (<30ms), suitable for **Distribution Automation**
- Distance: **>20km NLOS**
- QoS for **real-time** data
- Data rate: **>10Mbps delivered in the field**
- **Scalable** by design
- **Cost-effective**, small form factor base stations



Most Comprehensive Solution

RX1500 Multi-Service Platform

- Modular Layer 2 and Layer 3 Switch and Router
- Field replaceable modules, hot-swap power supplies
- High immunity and emissions ratings
- WAN – T1/E1, EVDO, HSPA, Frame Relay, PPP
- Routing – OSPF, BGP, RIP, VRRP, MPLS
- Serial Server – RS232 / 422 / 485
- Application Processing Engine



Most Comprehensive Solution

RUGEDCOM RSG2488

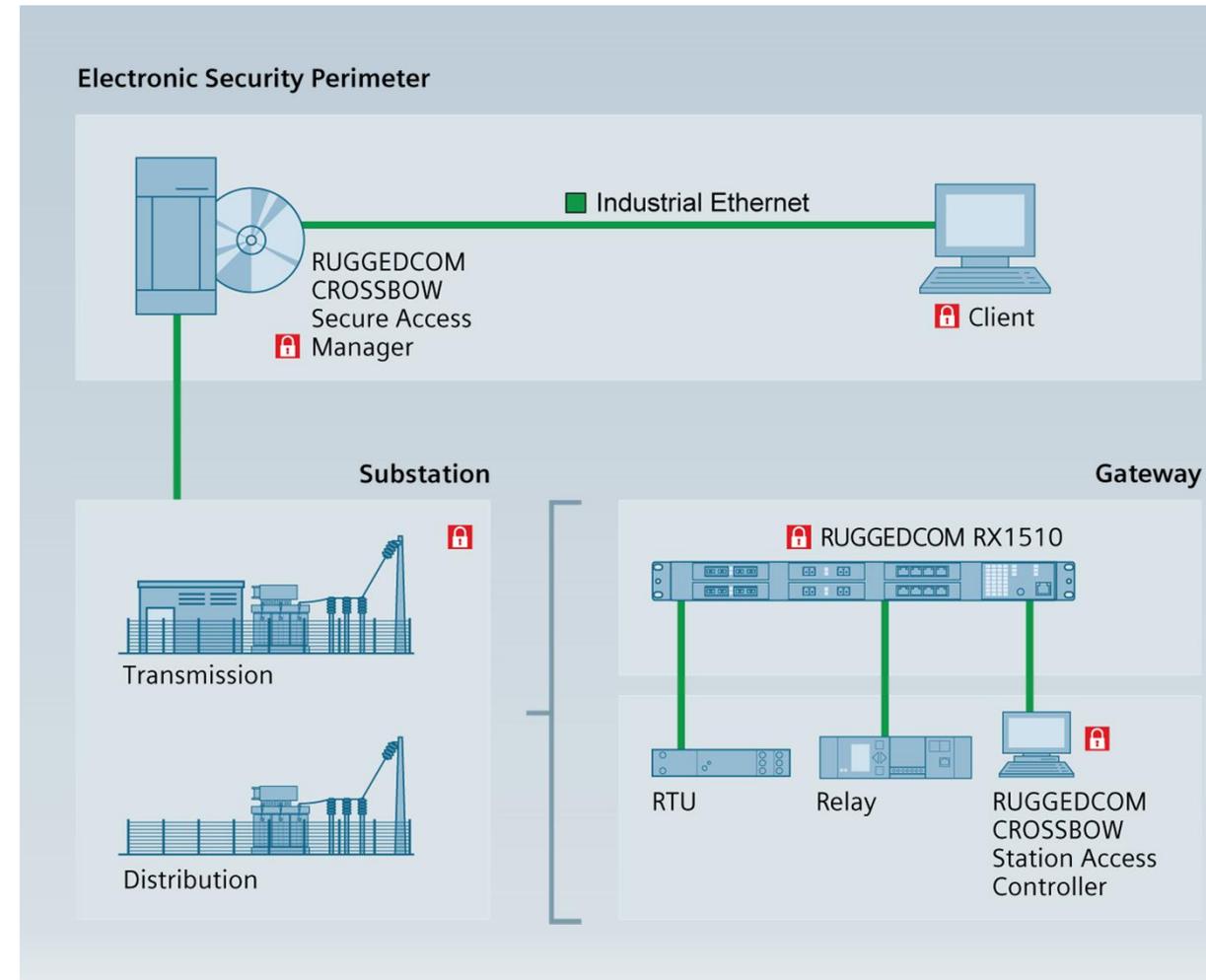
- The RSG2488 is innovation in the field of utility grade switching in a robust, cost-effective 1U form factor.
- The RSG2488 offers
 - 28 non-blocking 1Gig ports
 - 100M & Gig ports can be mixed (granularity = 2)
 - Fiber & copper can be mixed (granularity = 2)
 - 1588 V2 Time Synchronization
 - Increased Network Availability
 - Reduced Sparing Costs
 - Minimal Time To Repair
 - Lowest Overall Cost Of Ownership



Secure Remote IED Access

RUGGEDCOM CROSSBOW

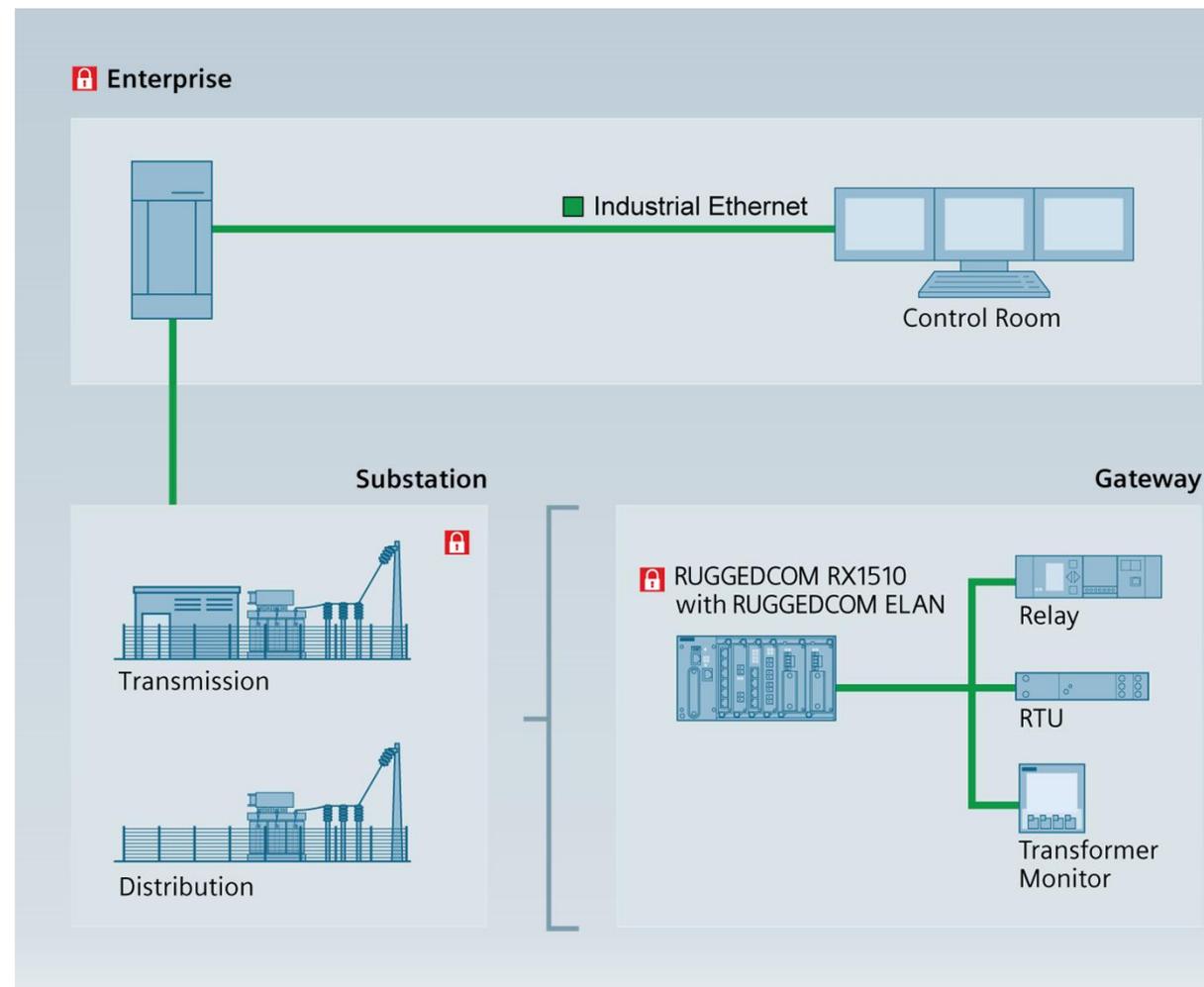
- Secure remote IED and network connectivity
- RSA SecurID, Active Directory & Radius authentication
- NERC CIP compliant activity logging
- IED Password Management
- Seamless, redundant architecture
- Fault & Event Data Retrieval
- IED Configuration Management



Data Management

RUGGEDCOM ELAN

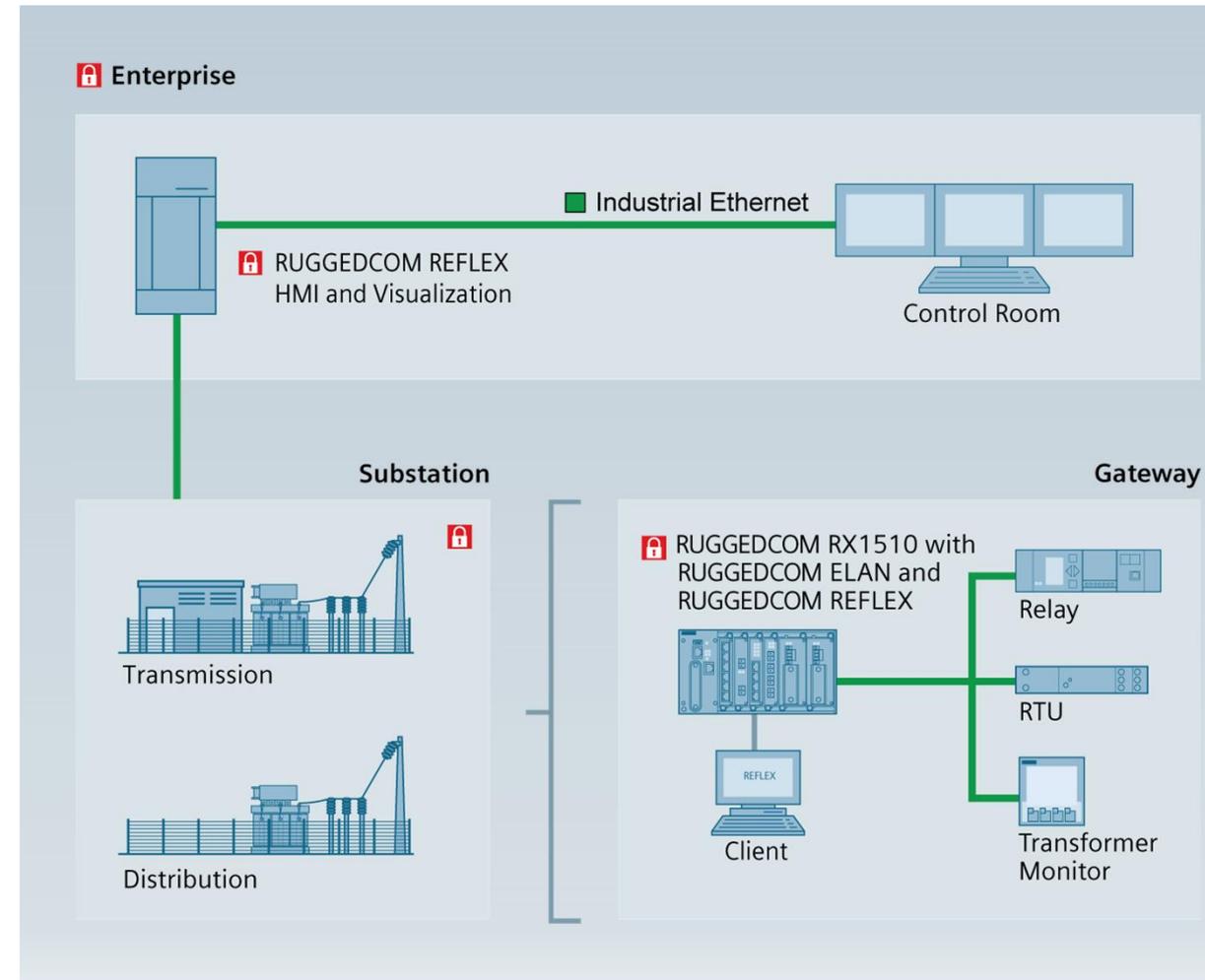
- Automated IED file management
- Protocol conversion
- Data concentration
- Integrated into RUGGEDCOM



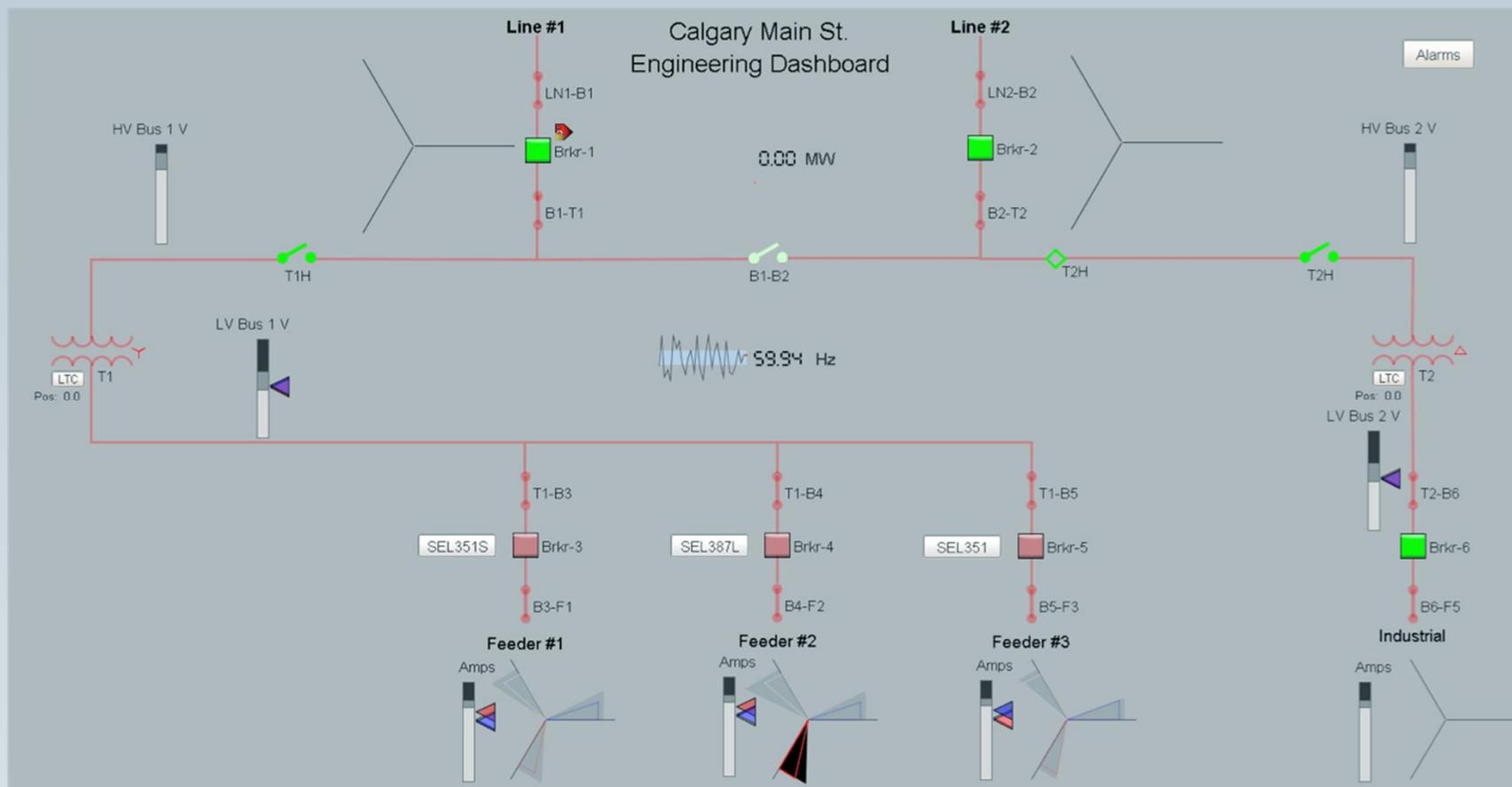
Data Visualization and Control

RUGGEDCOM REFLEX

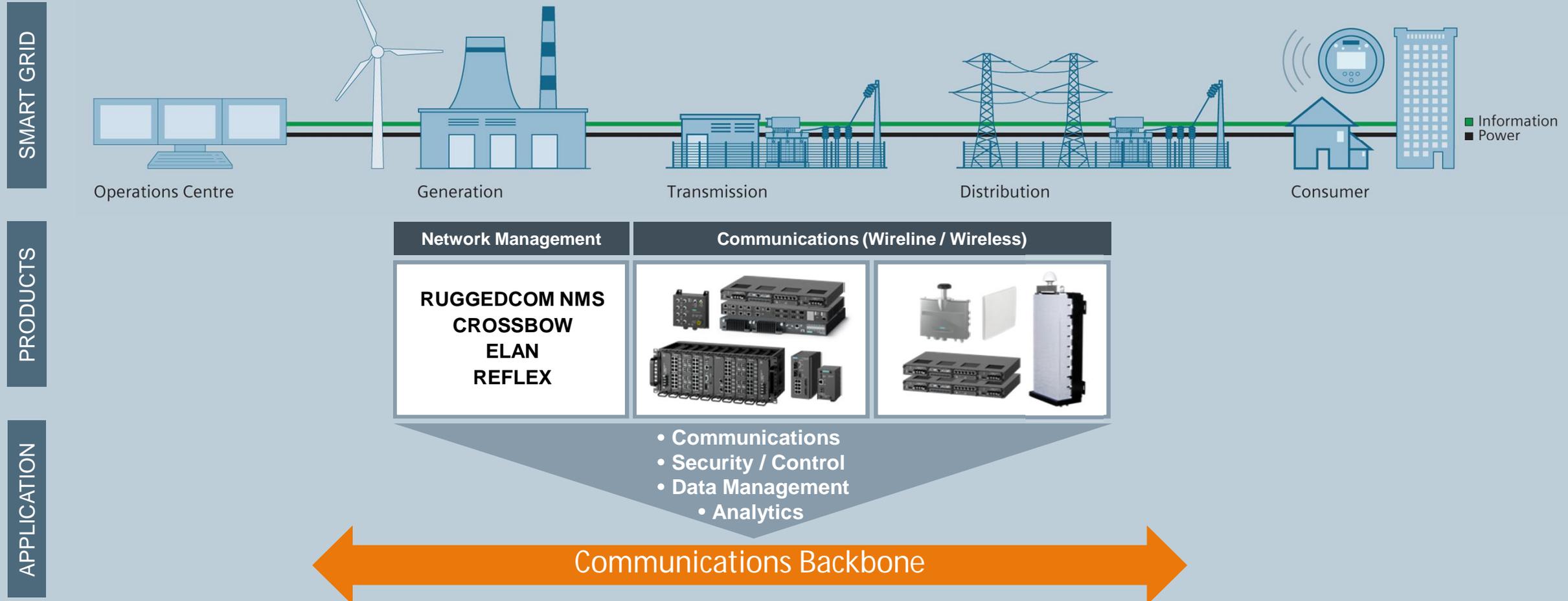
- Single line system visualization
- Graphical trending of values
- Control logic
- Report generation
- Historian



RUGGEDCOM REFLEX: Single-Line Diagram



RUGGEDCOM Smart Grid Architecture

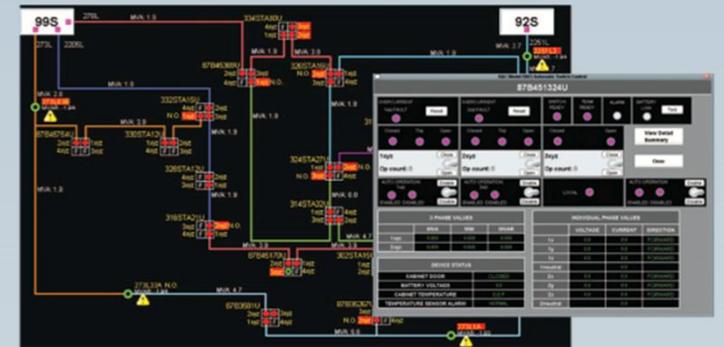


Smart Grid Apps



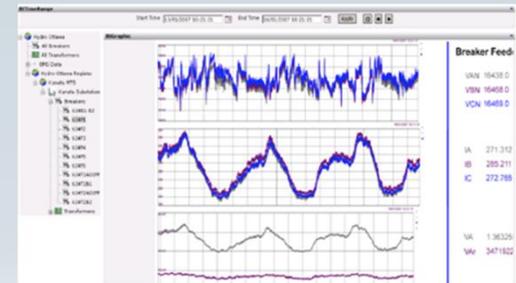
RUGGEDCOM APE Line Module

- Intel Atom E660 CPU @1.3GHz
- 1GB DDR2 (up to 2GB supported)
- 8GB SATA (up to 16GB supported)



3rd Party Applications:

- Utilities
- System Integrators
- Engineering Firms
- Consultants



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Thank You.