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# Technology's Role in Enabling Smart Grid


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- Smart Grid Defined
- Telecom Experience
- Security
- Conclusion


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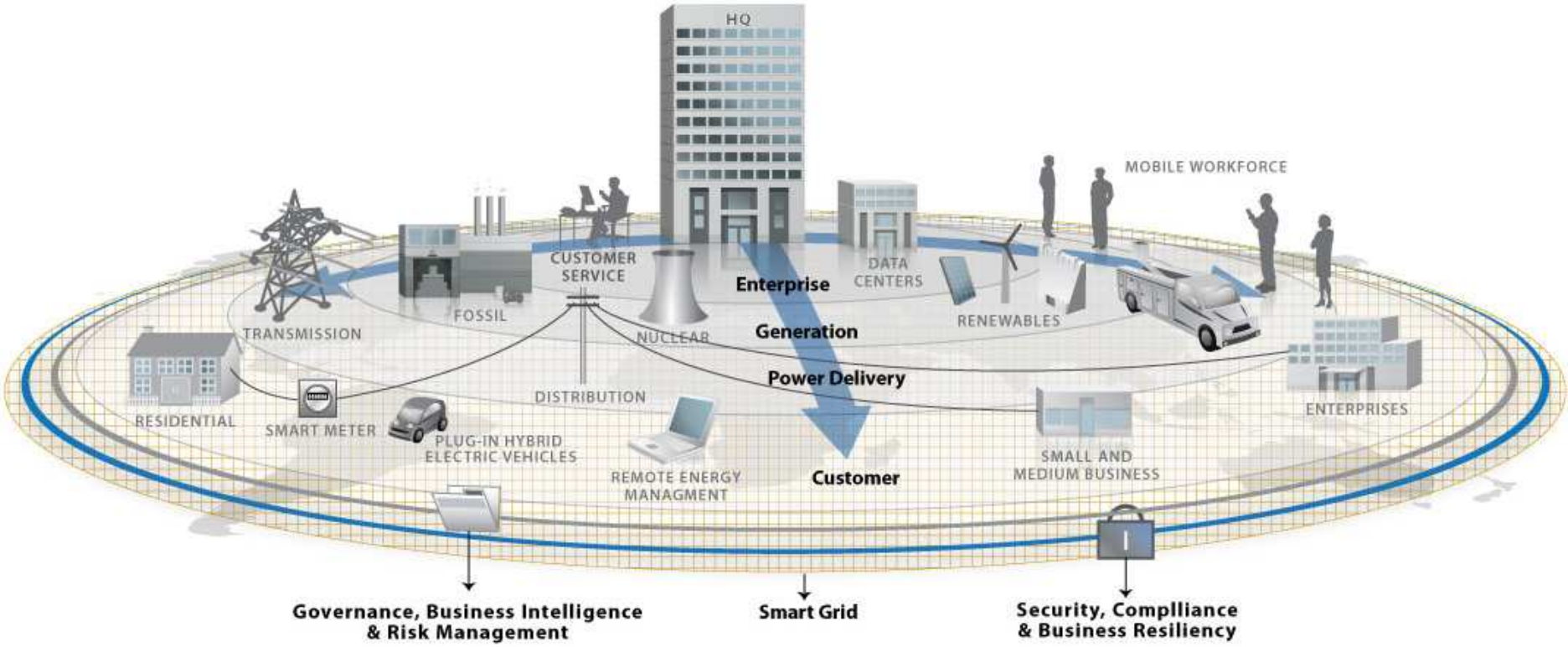
# If a tree falls…



# Utility Extended Enterprise





# Definition



Smart Grid. The integration of real-time monitoring, advanced sensing, and communications, utilizing analytics and control, enabling the dynamic flow of both energy and information to accommodate existing and new forms of supply, delivery, and use in a secure and reliable electric power system, from generation source to end-user.

- North American Electric Reliability Corporation (NERC)

# Definition



The integration of real-time monitoring, advanced sensing, and communications…

- Digital Meters with Two-Way Communication
- Sensors
- Communication Network
- New Applications for Real-Time Monitoring

# Definition



…utilizing analytics and control…

- Find Areas of Power Loss
- Monitor Usage by Neighborhood
- Reroute Power Flow

# Definition



…enabling the dynamic flow of both energy and information to accommodate existing and new forms of supply, delivery, and use…

- Integration of Renewables
- Selling Back to the Utility
- Demand Response and Peak Shaving
- New Rate Plans
- Usage Information Available to Third Parties

Google powermeter

# Definition



…in a secure and reliable electric power system, from generation source to end-user.

- Critical Infrastructure
- Control and Monitoring

# Benefits



| | |
|---|---|
| Utilities | • Additional insight into and control over operations<br>• Improved outage detection and resolution<br>• Reduced investment<br>• Distributed generation |
| Customers | • Insight into energy usage, enabling better decisions<br>• Smart meters enable new pricing plans |
| Environment | • Integration of alternate and renewable energy sources<br>• Lower consumption leads to fewer fossil fuels burned |

# Challenges



| | |
|---|---|
| Explosion Of Data | • Meters communicate every 15 minutes (now 30 days)<br>• Robust communication networks required<br>• Systems need to be expanded to process and store |
| Increased Need for Security | • Devices used for grid control<br>• Meters offer greater insight into the home<br>• Need to prevent unauthorized access and control |
| Rapid Introduction of New Devices | • Wide introduction of "smart" devices and appliances<br>• Some sold directly to consumers<br>• Utilities need to evaluate, connect, and support them |
| Changing Customer Interaction | • Technology has altered consumer expectations<br>• Smart devices enable richer customer experience |

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# Industry Transformations



| Event | Impact |
| --- | --- |
| The telecommunications industry experienced a transformational technology and regulatory change | The industry was deregulated, launched new products and services, and strengthened customer relationships |
| The utility industry is facing a similar game-changer with Smart Grid technologies | Utilities can leverage these technologies to become more efficient, effective, and customer-oriented |

Microwave communications transformed the telecom industry, forcing providers to differentiate themselves and focus on the value of their core businesses

# Utility Transformation



- Smart Grid includes a host of technologies that give utilities better insight into operations and customers

**Impact on Consumers**

- Expect a richer interaction
- Need guidance on managing usage, choosing pricing plans, and adopting energy efficiency programs

**Impact on Utilities**

- Customer Service Representatives need access to usage data
- Need robust customer systems and databases
- Gain the ability to understand customers' behavior through analytics

# Applicable Telecom Experience



1. Maintaining and expanding communications networks (wired and wireless)
2. Testing devices for network compatibility
3. Securing networks
4. Maintaining regulatory compliance
5. Billing and Computing as a Service solutions

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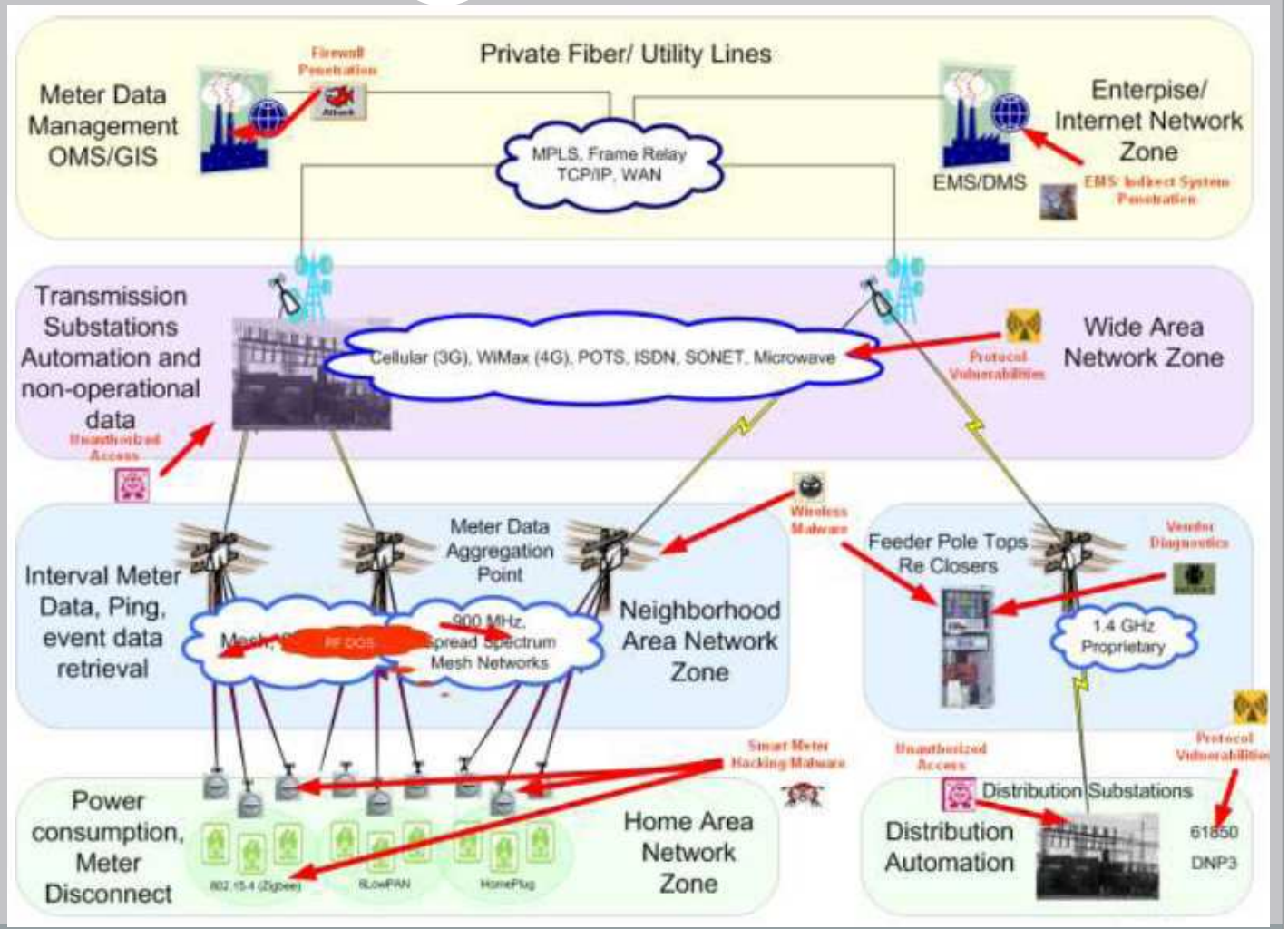
# An Attacker's View of the Smart Grid



- **What to attack?**
  - **Communications**
  - **Meters / Relays**
  - **Head Ends**
  - **Transmission Substations**
  - **Distribution Substations**
  - **Corporate Network**
- **How to attack?**
  - **Physical Attacks**
  - **General Manipulation and Disruption**
  - **Theft**
  - **Denial of Service**
  - **Control**
  - **Blackmail**
  - **Stalking**




**Source:** InGuardians, Industrial Defender

# Smart Grid Communications Network



Plug In Electric Hybrid Vehicles

Sensors and Grid Control

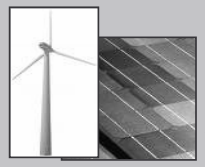
Regulatory Policy and Rule-making

Guided By…

Enhanced Flexibility & Control

Congestion Management

Distributed And Renewable Energy

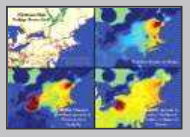


SGCN

Results…

Energy Efficiency

Demand Response



Data, Analytics, and Information

Supported By…

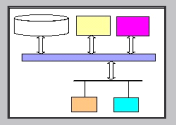
Smart Meters and Communications

Security

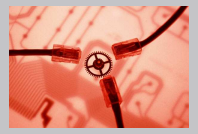
Open and Ubiquitous Communication

New Devices and Systems

Generation



Custom Applications

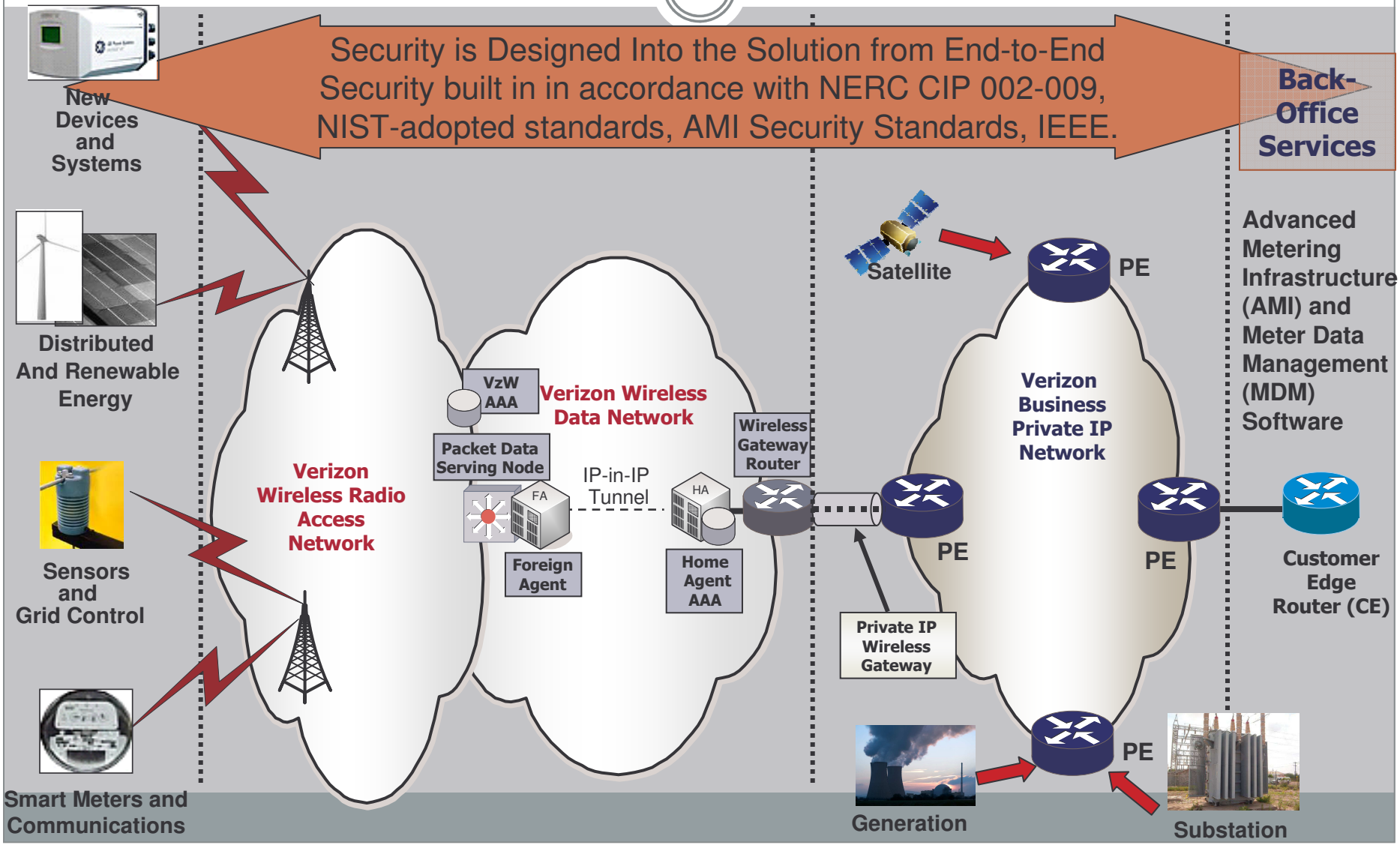


Enterprise Integration

Voltage Stability

# EVDO to Private IP Architecture





# Security Drivers for Smart Grid



- **FERC**
  - **Smart Grid Policy Statement**
- **NERC**
  - **Critical Infrastructure Protection (CIP) Reliability and Security Standards (CIP-002 to CIP-009)****
  - **Frequently Asked Questions – NERC CIP Reliability and Security Standards (CIP-002 to CIP-009)**
- **NIST**
  - **IR 7628, Smart Grid Cyber Security Strategy and Requirements (DRAFT 2)**
  - **Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0 (DRAFT)**
- **Advanced Metering Infrastructure (AMI) System Security Requirements**
- **International Standards Organization (ISO)**
  - **27001 / 27002**
- **International Information Systems Security Certification Consortium (ISC)**
  - **Common Body of Knowledge**
- **International Electrotechnical Commission (IEC)**
  - **62351 1-8, Data and Communication Security**

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# Conclusion



1. Smart Grid is a set of disruptive technologies that will change the way utilities do business
2. Telecom companies have gone through a similar transformation; they can offer insights in how to transform and help build the communication networks required to communicate with all these devices
3. The far-reaching nature of Smart Grid requires a heavy focus on physical and cyber security

# Questions?




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