

CRITICAL INFRASTRUCTURE - ENERGY PRIVACY, SECURITY AND INTERNET OF THINGS

DIANE GROTH

LAETARE CYBERSECURTY, LLC

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- **CRITICAL INFRASTRUCTURES**
 - **ENERGY INFRASTRUCTURE**
 - **PRIVACY AS A MATTER OF CONCERN**
 - **SECURITY AS A MATTER OF CONCERN**
 - **NATIONAL SECURITY**
 - **WHY YOU SHOULD BE CONCERNED ABOUT THE ENERGY CRITICAL INFRASTRUCTURE**

WHAT'S CRITICAL ABOUT CRITICAL INFRASTRUCTURES?

- The United States and all the citizens depend upon the nation's critical infrastructures for our lifestyles.
- Terrorist attacks, sabotage, disasters affect our social and economic well-being and national security.
- Lifestyles valued by communities/people, places, and the way we live, work, social/cultural events



POWER GRID: US

About This Map »

Roll over the dots for detailed information about each power plant. Use the dropdown below to filter power plants by type.

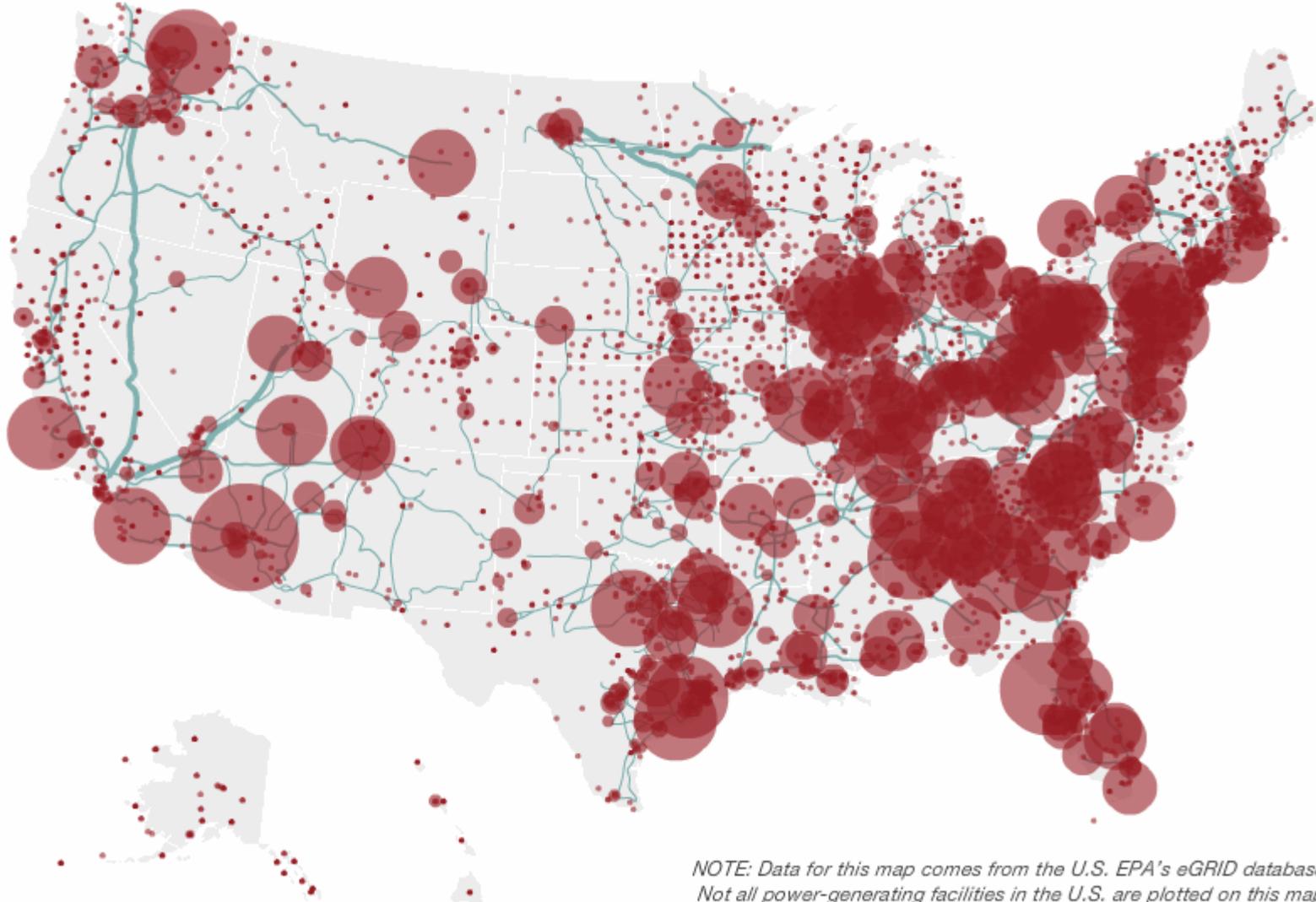
POWER PLANTS

All plants ▼

Dots are sized with respect to each plant's annual net generation of power.

EXISTING LINES

Existing electric power grid

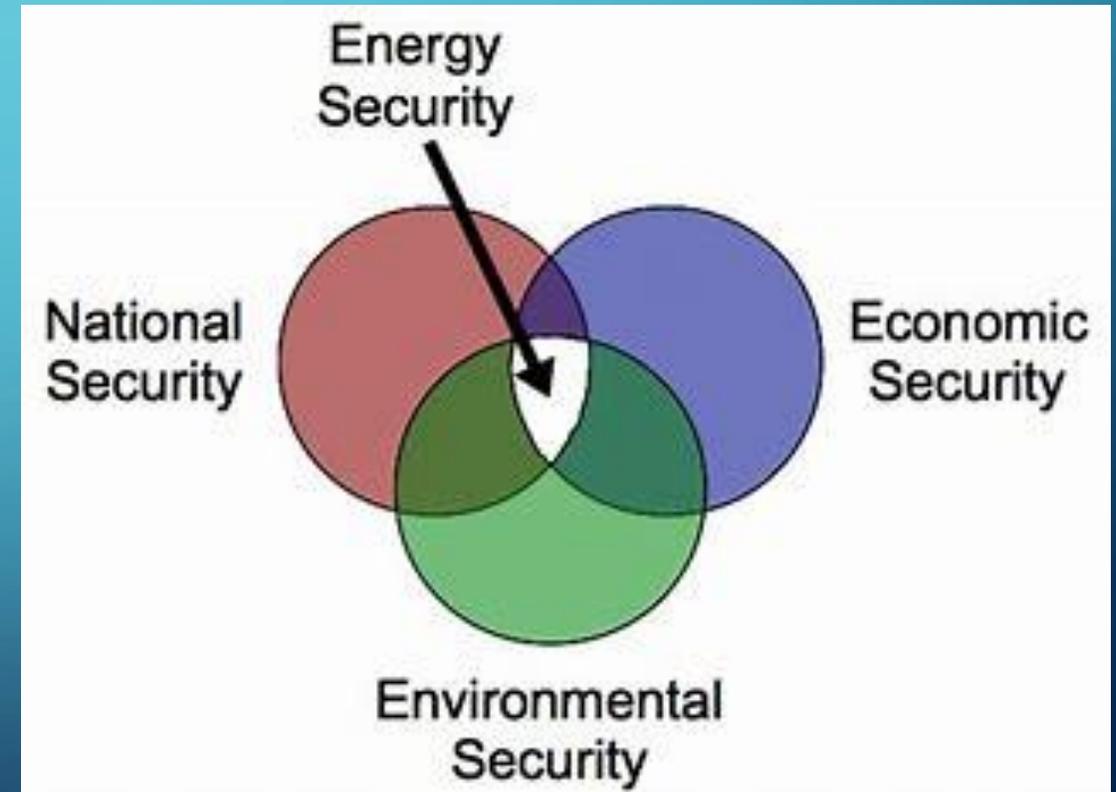


NOTE: Data for this map comes from the U.S. EPA's eGRID database. Not all power-generating facilities in the U.S. are plotted on this map.

NATIONAL SECURITY

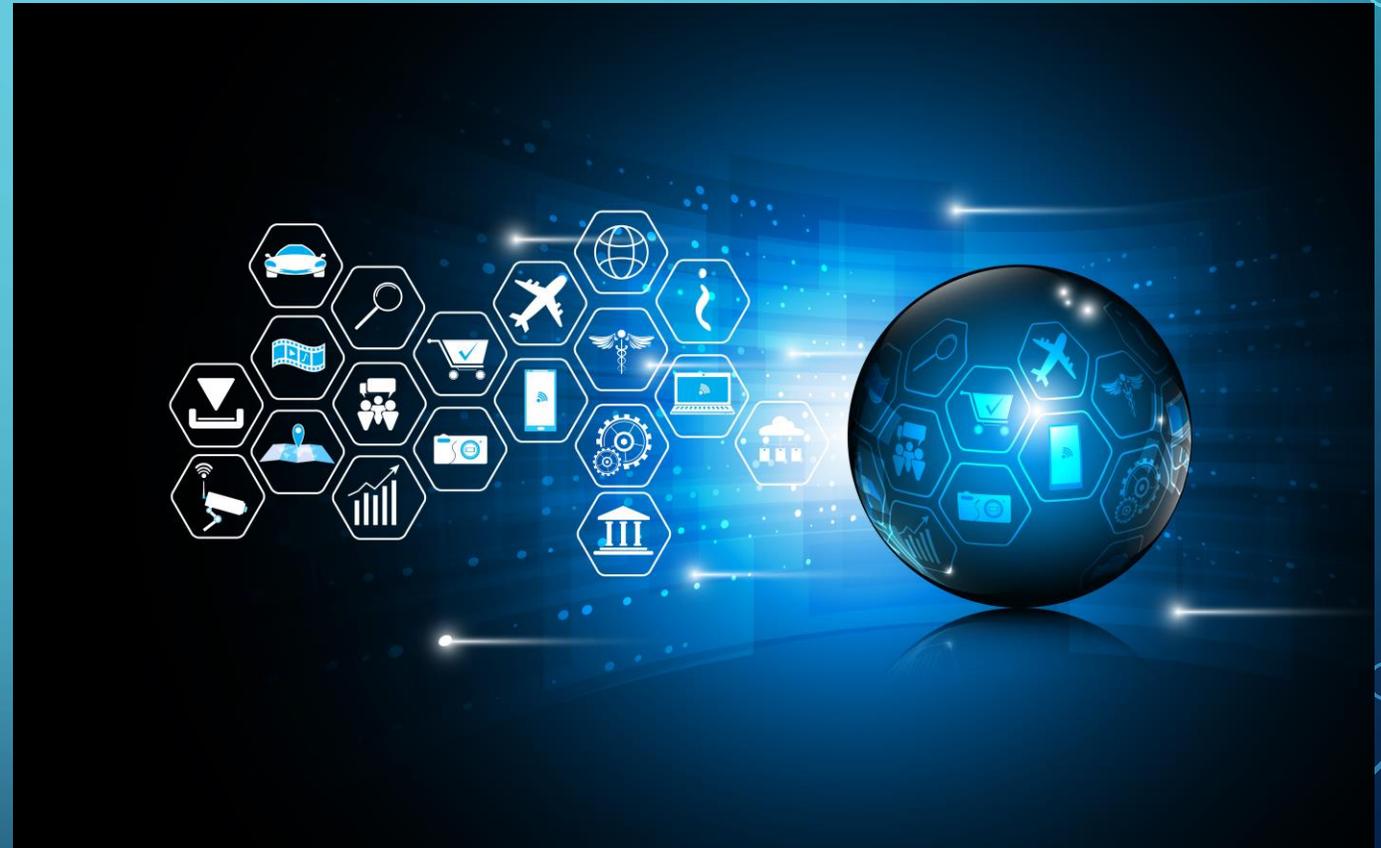
The U.S. national power grid faces physical or online attacks approximately “once every four days,” according to a new investigation by USA Today, threatening to plunge parts of the country into darkness.

- Cyber attacks
- Physical attacks
- Disasters
- Sabotage by disgruntled employees
- All caused power outages



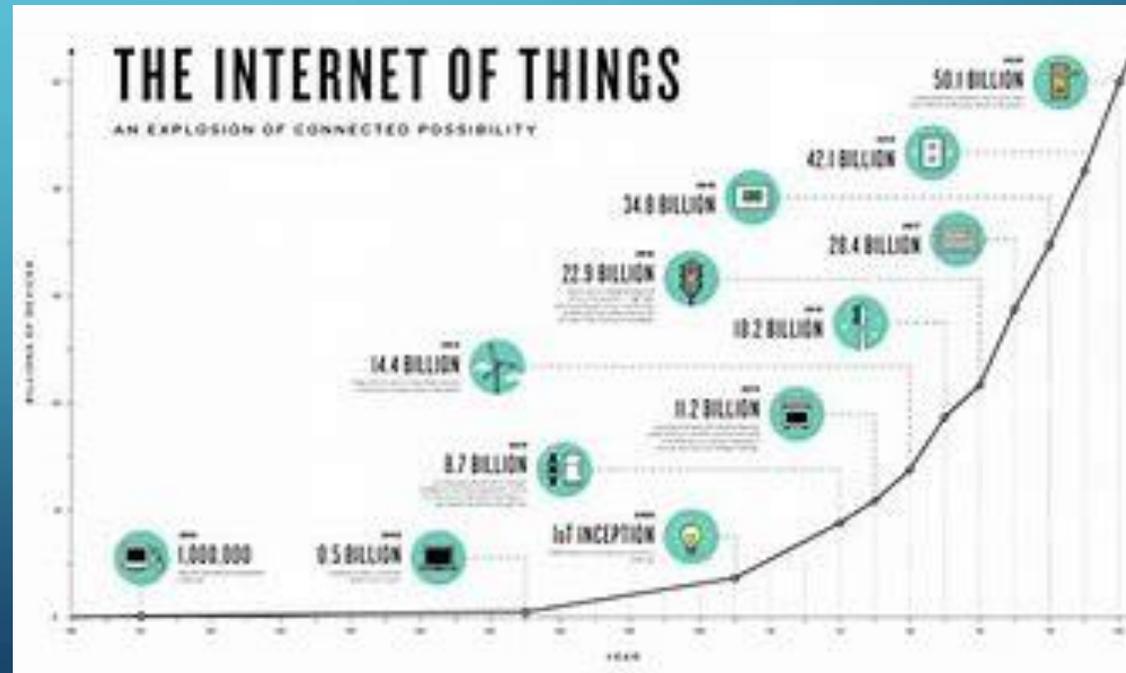
PRIVACY IN ENERGY SMART GRIDS: A MATTER OF CONCERN

- Privacy = our personal liberty in our private sanctuary (home)
- Our lives depend on privacy: - all connected through sensors
 - Homes, media, vehicles, lifestyles
 - Medical devices
 - Athletic equipment / wearables
 - Messaging / communications
 - Military and industry
- Personal behavior and patterns are monitored, recorded, and collected by electric appliance usage through sensors
- Our private information is collected in five, ten, fifteen minute increments, including in our homes.

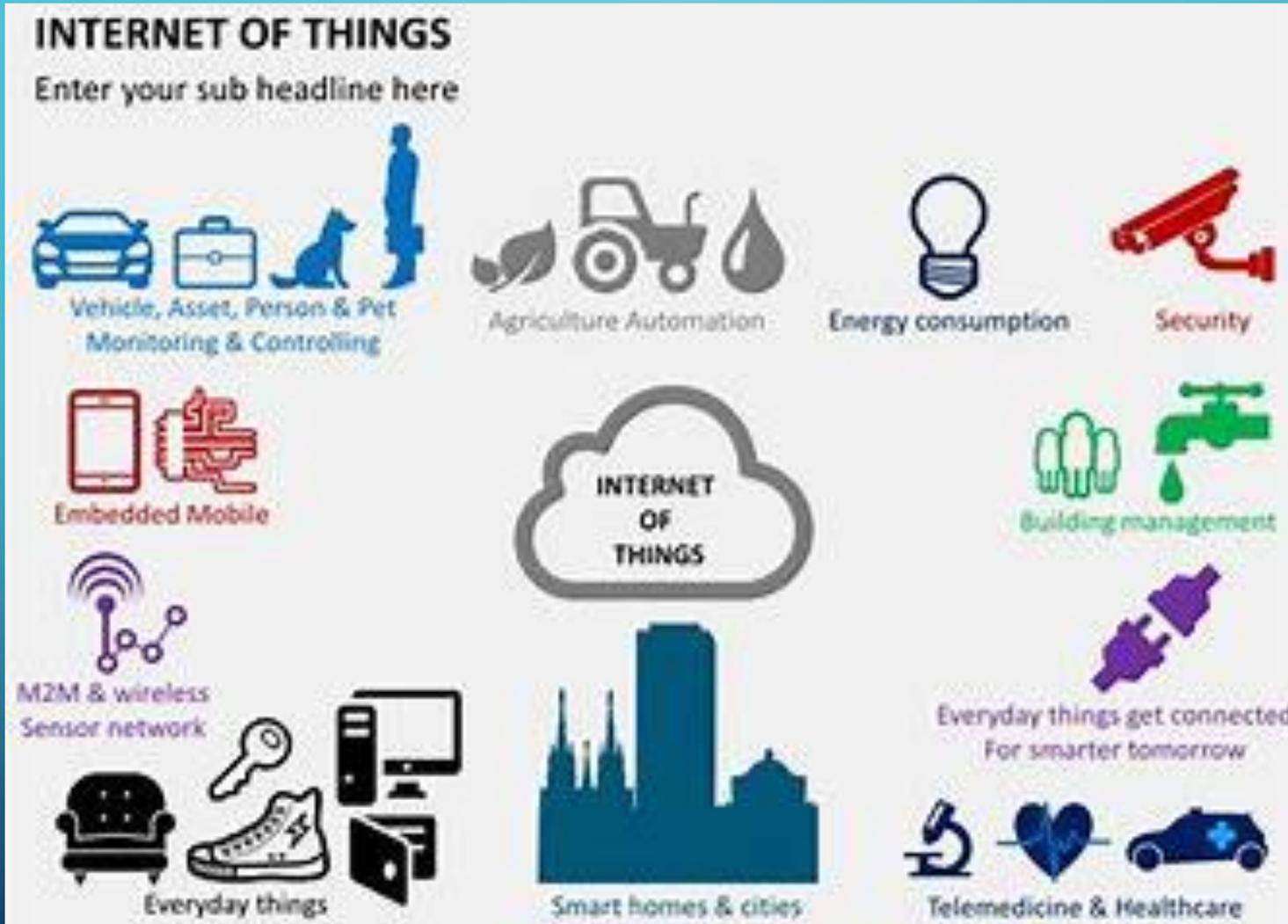


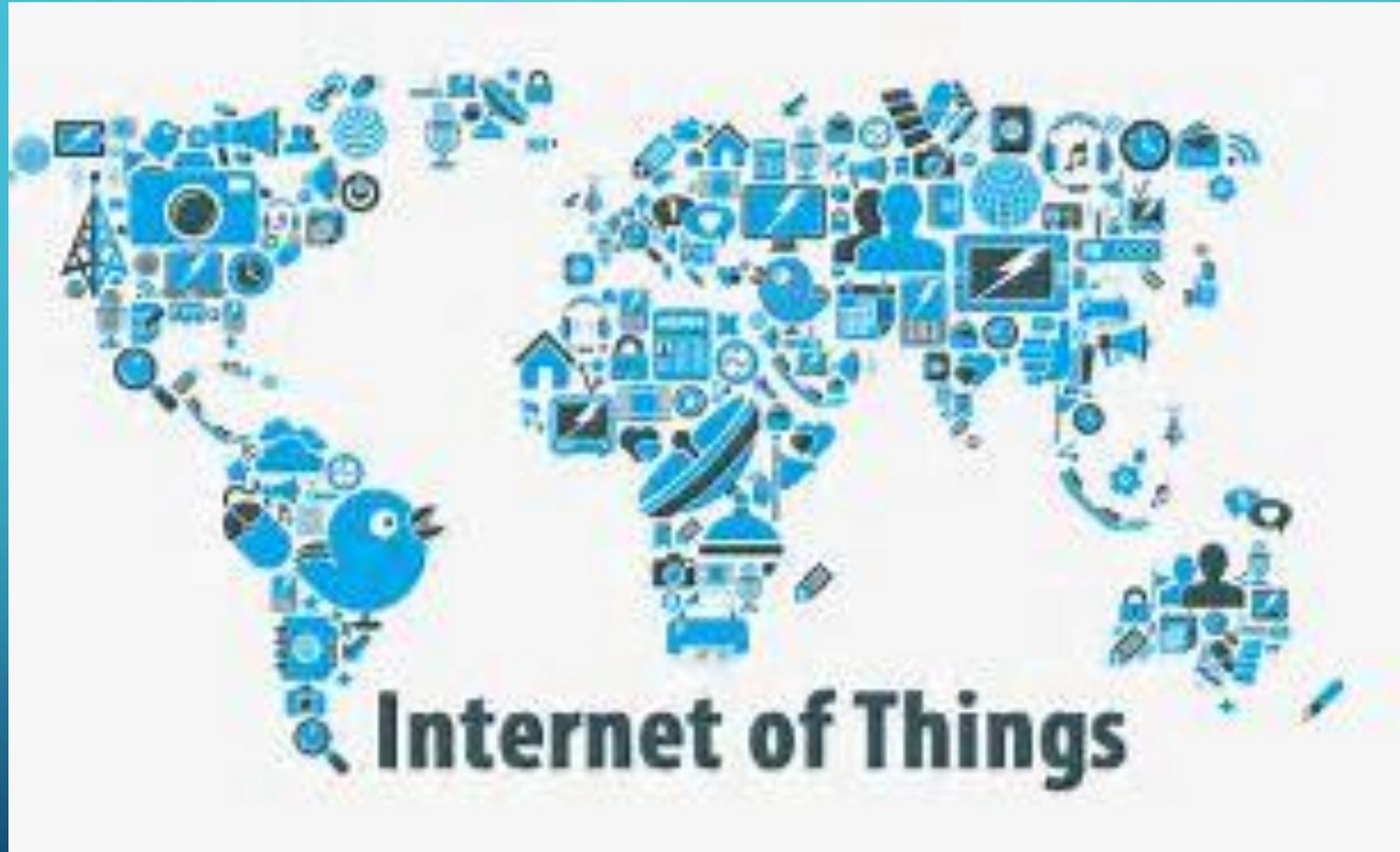
SMART GRIDS: PRIVACY AND SECURITY

- People sacrificing convenience and technology for privacy of home, lifestyle, data.
- Personal data recorded five, ten, fifteen, thirty-minute increments – daily habits = lifelogging.



INTERCONNECTED LIFESTYLE ... ALL MONITORED

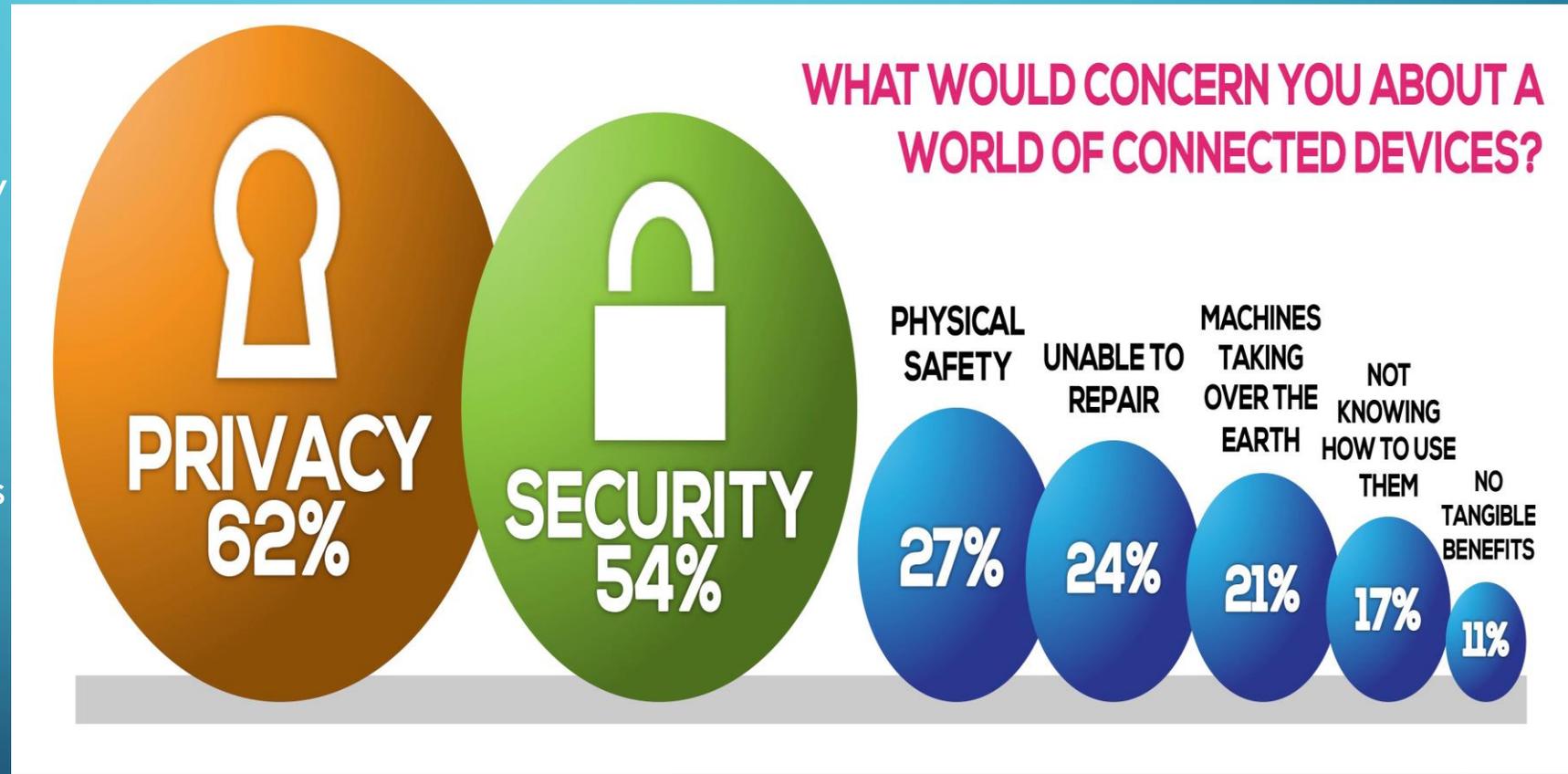




Internet of Things

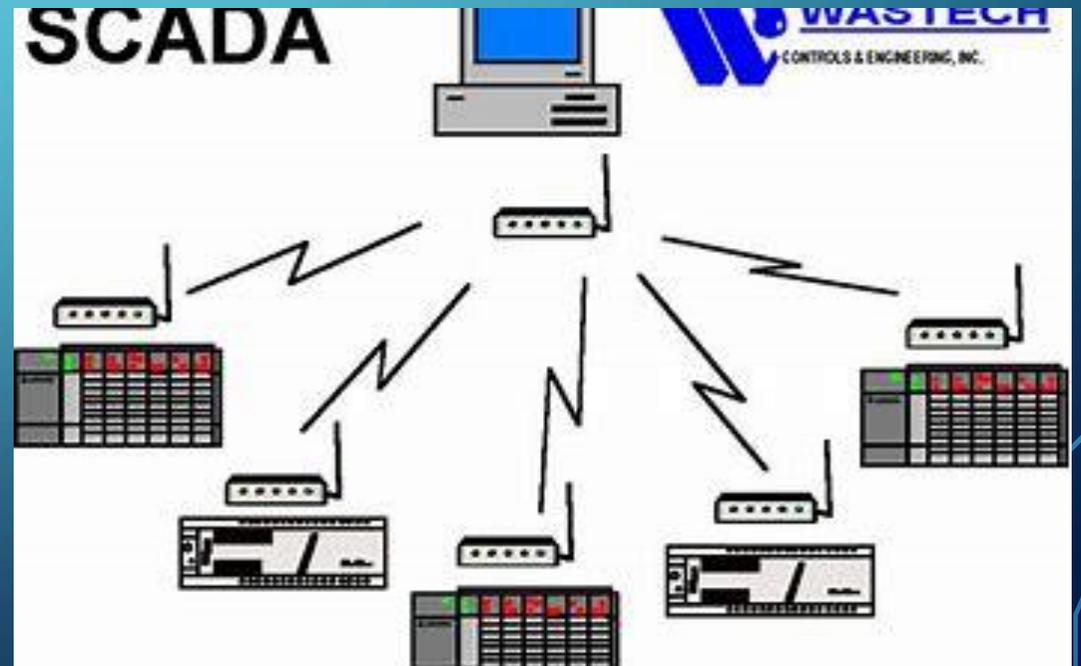
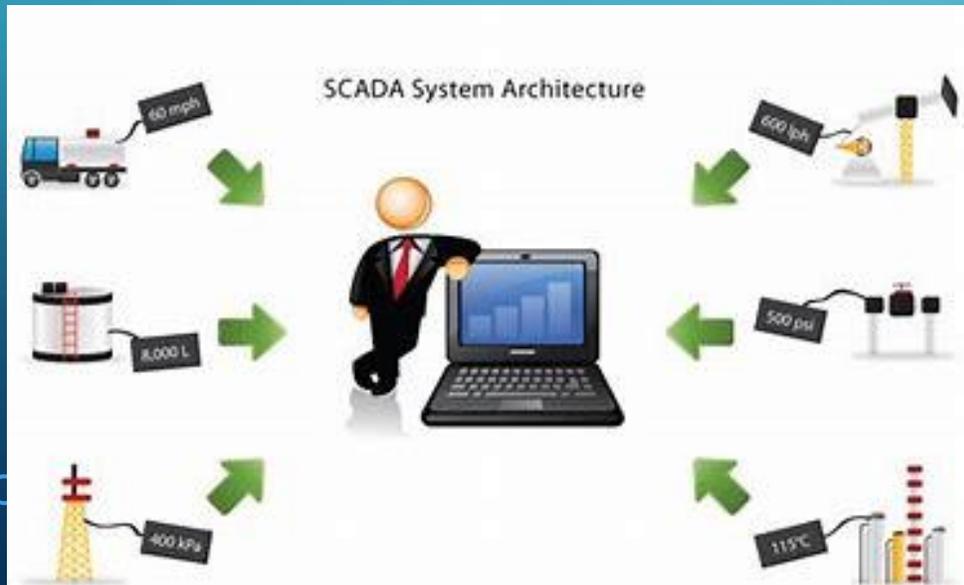
COUNTERMEASURES TO PROTECT DATA PRIVACY

- Transport layer security
- Encryption
- Virtual Private Networks
- Onion routing (encrypts and merges internet traffic from various sources); numerous layers of encryption. Diffie-Hellman key exchange;

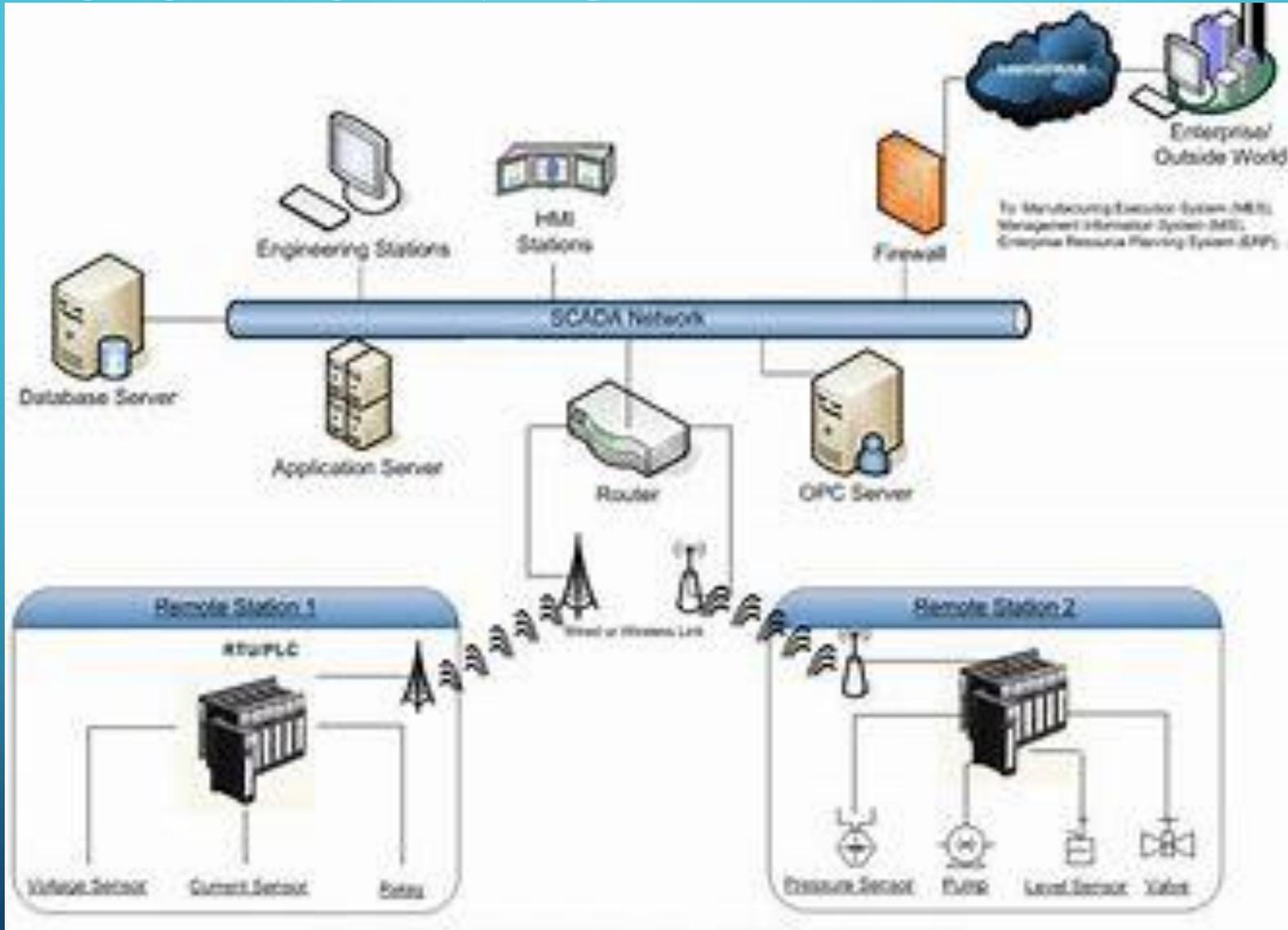


SCADA SYSTEMS (SUPERVISORY CONTROL AND DATA ACQUISITION)

- Remote data monitoring and control for automation to process data
- Computers, network data communications, graphical user interfaces
- Employs industrial control systems for automation
- Power systems, communications

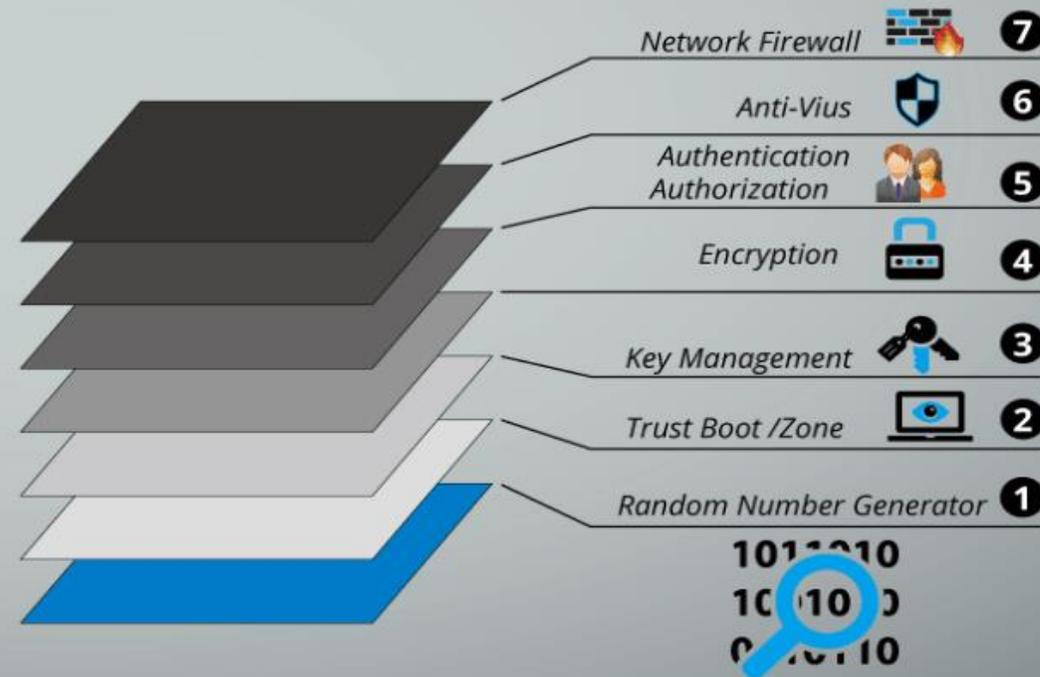
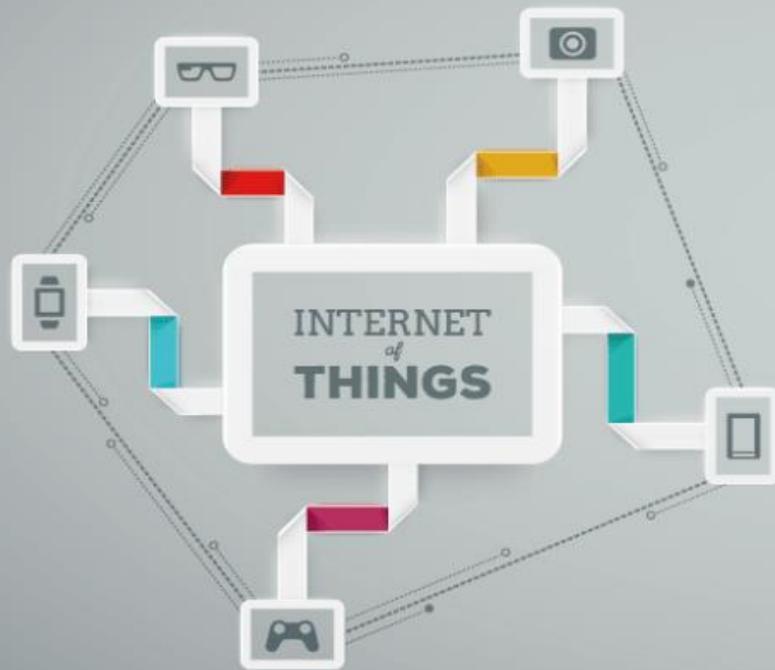


SCADA SYSTEMS -ENERGY



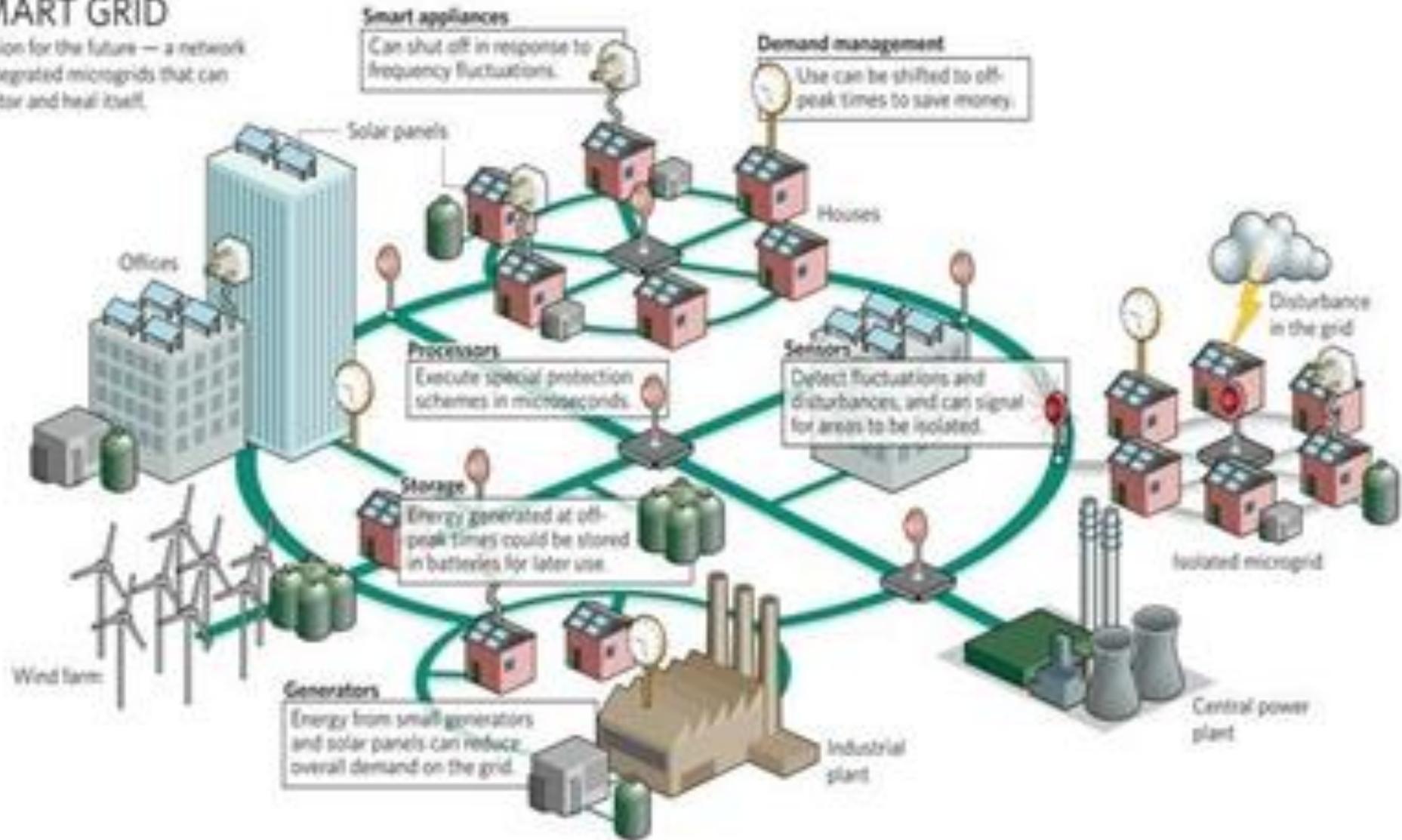
SECURITY IN THE ENERGY CRITICAL INFRASTRUCTURE: A MATTER OF CONCERN

Internet of Things (IoT) Security - 7 Security Layers Structure



SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.

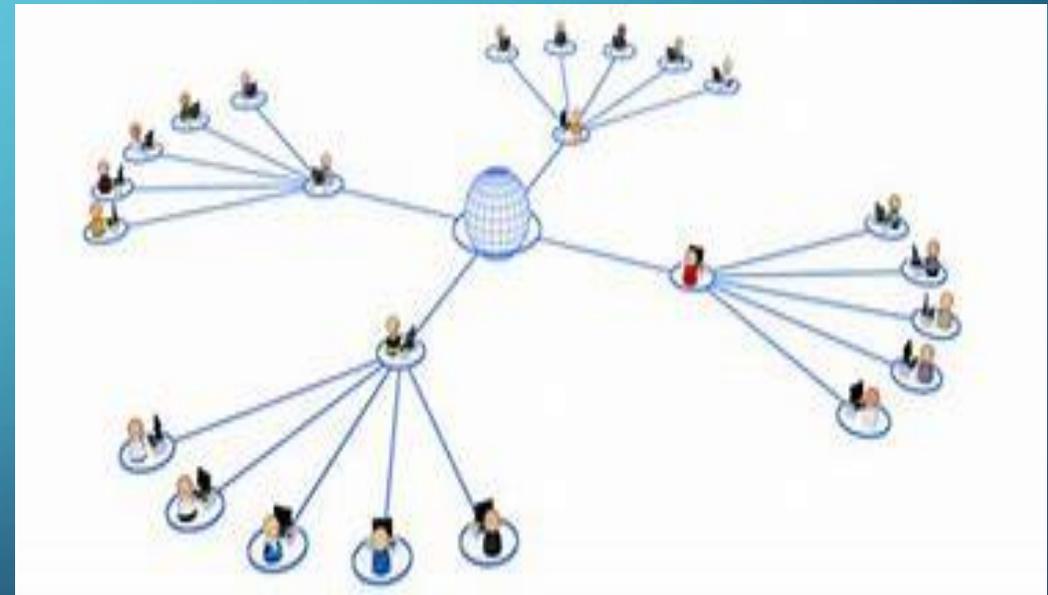
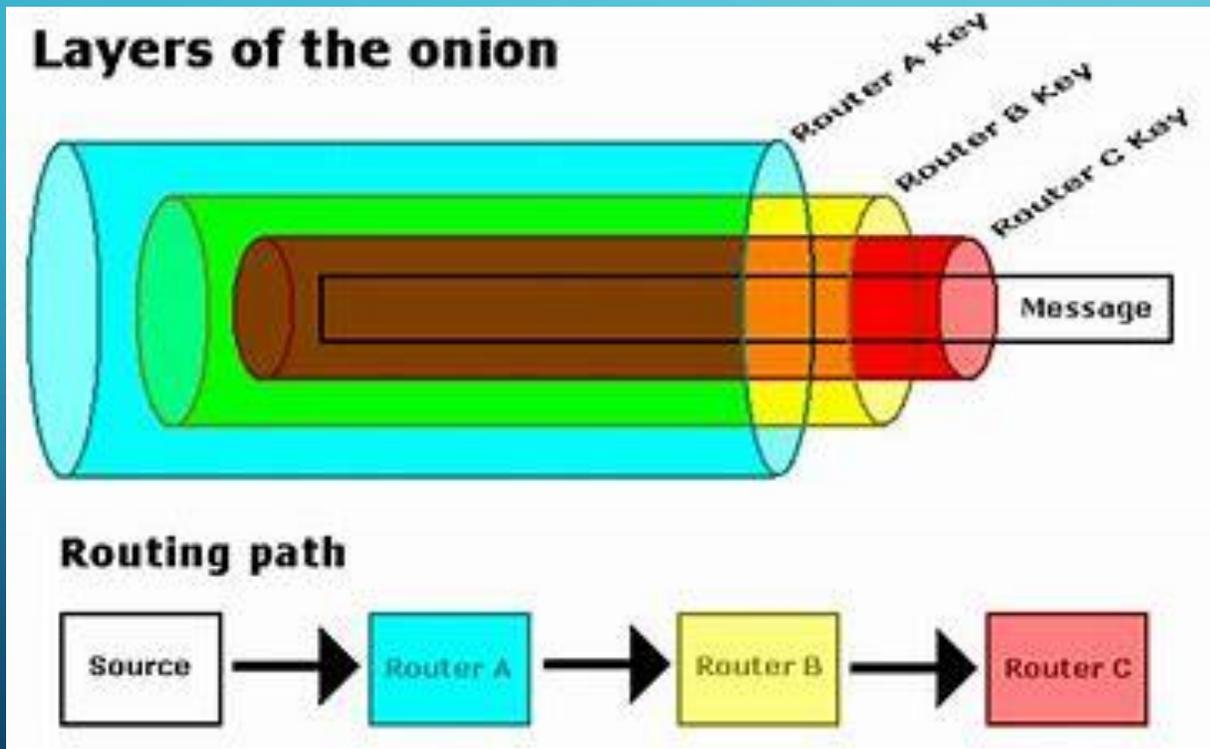


ENERGY CYBER ATTACKS: IMPACTED BY ALL

- Industrial Control Systems (industrial processing of energy, gas, oil, nuclear) targeted
- Physical disruption of systems/operations
- Cyber induced outages



ONION ROUTING: ENCRYPTION



ONION ROUTING:

"WRAPPING" A MESSAGE WITH SUCCESSIVE LAYERS OF ENCRYPTION TO BE DECRYPTED

Messages are encapsulated in layers of encryption, analogous to layers of an onion.

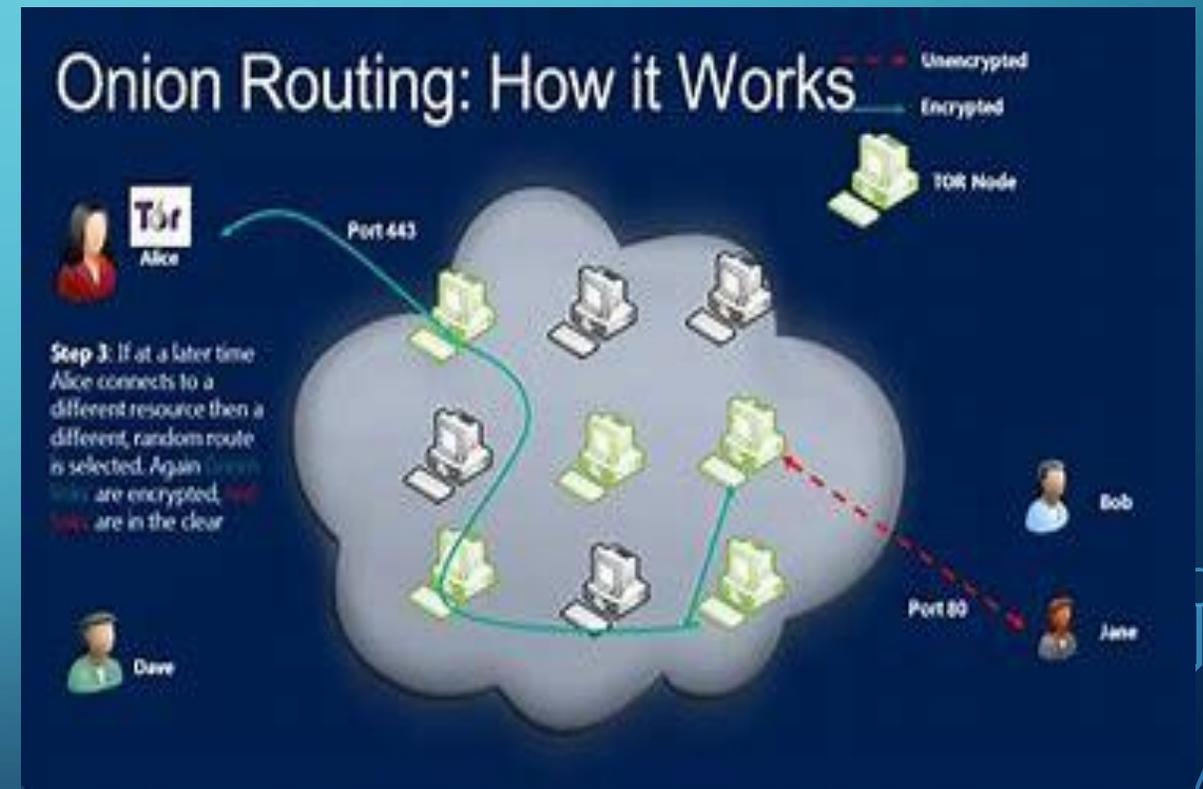
The encrypted data is transmitted through a series of network nodes called onion routers,

Each "peels" away a single layer, uncovering the data's next destination.

When the final layer is decrypted, the message arrives at its destination.

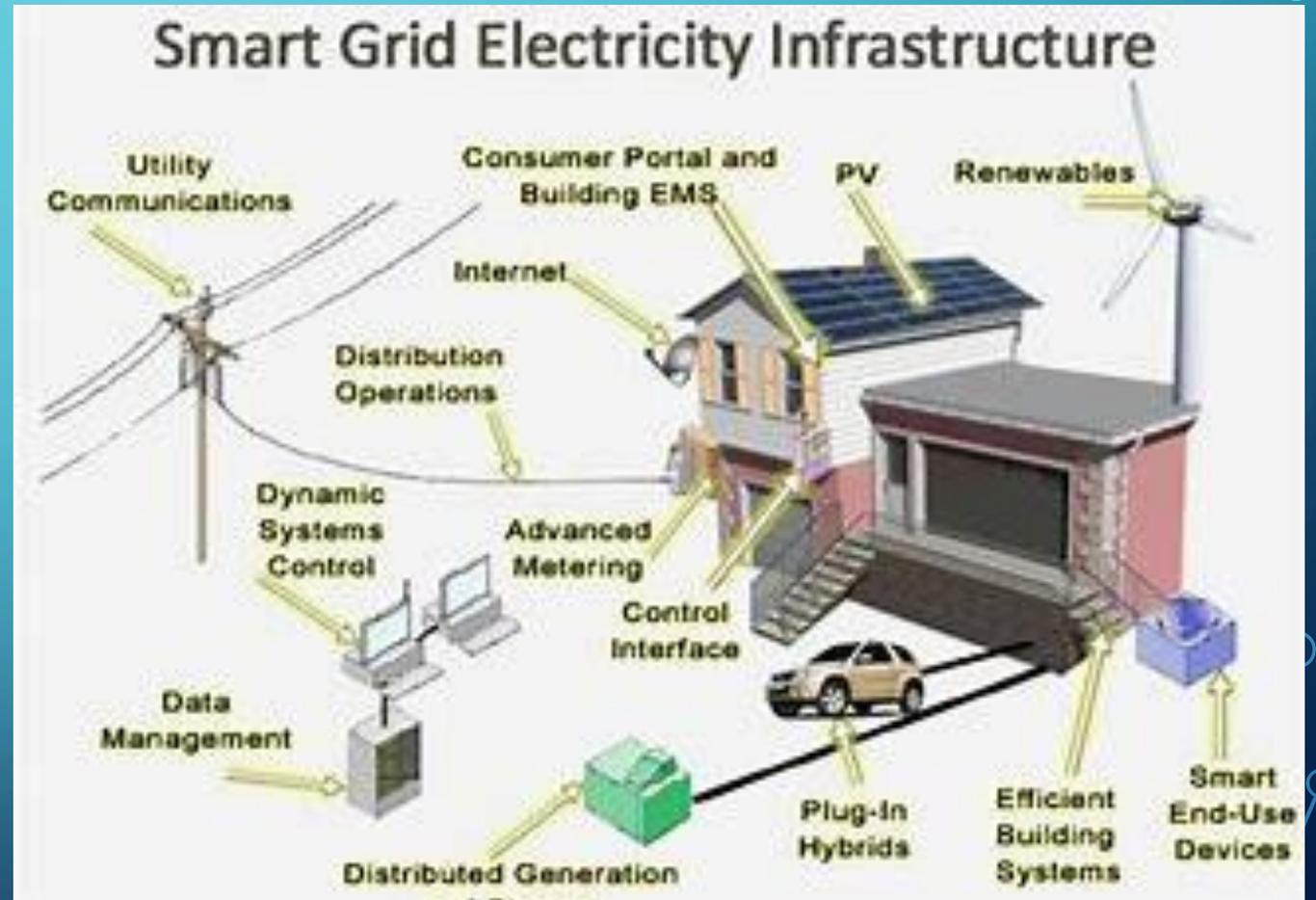
The sender remains anonymous.
Each intermediary knows only the location of the immediately preceding and following nodes

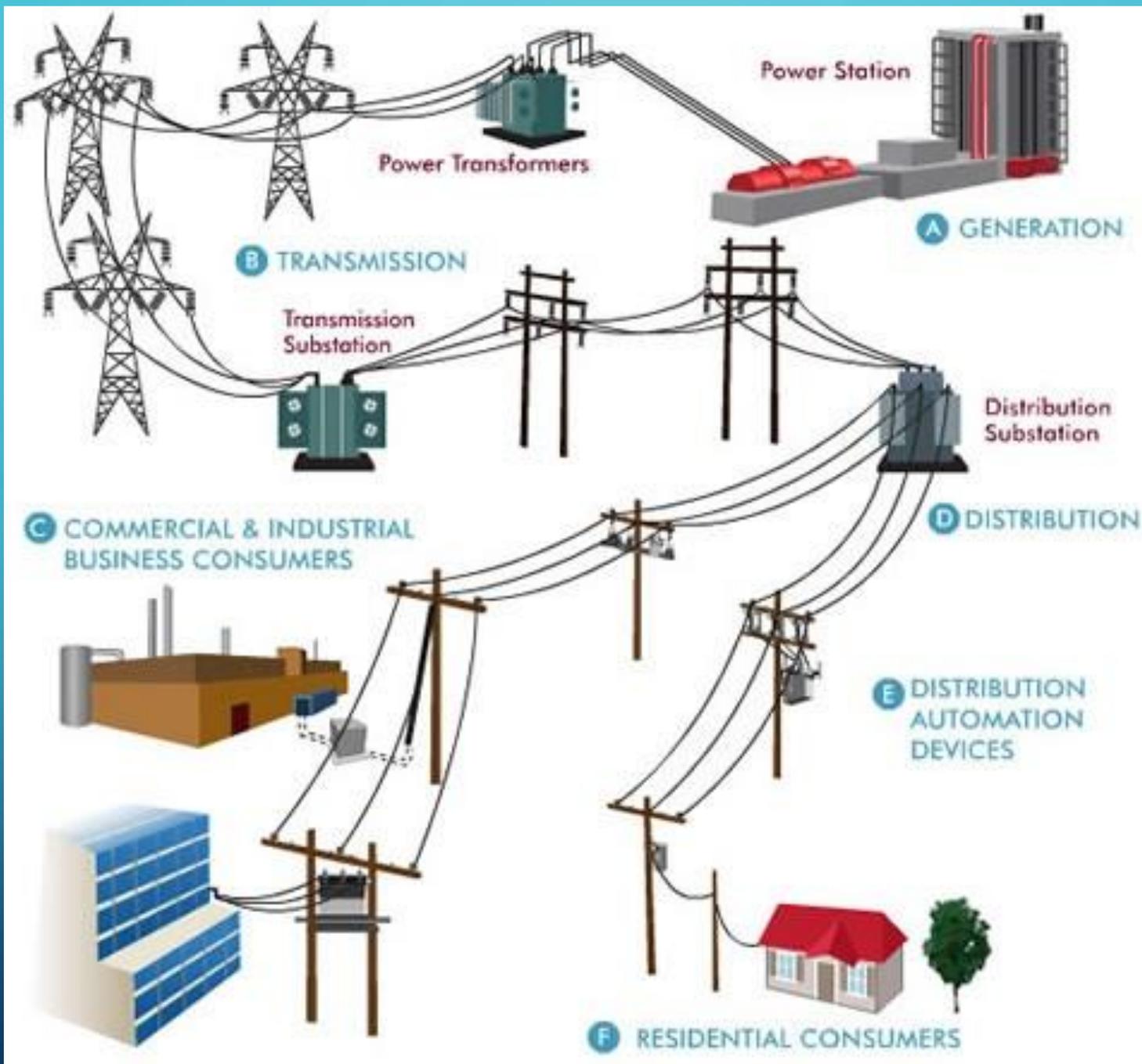
Network packets transmitted anonymously over Internet; encrypt and decrypt for each destination



SMART GRID INFRASTRUCTURE: AT RISK

- Identification
- Authentication
- Data Management
- Heterogeneity – multiple devices:
incompatibility, latency, speed





ENERGY SECTOR: INTERCONNECTED VIA SENSORS





QUESTIONS?



CONTACT INFO

Diane Groth

Laetare Cybersecurity
1001 Frederick Road
Catonsville, MD 21228

www.laetarecyber.com

dmgroth@laetarecyber.com

443-844-9149 (cell)

