# Cybersecurity Research Needs

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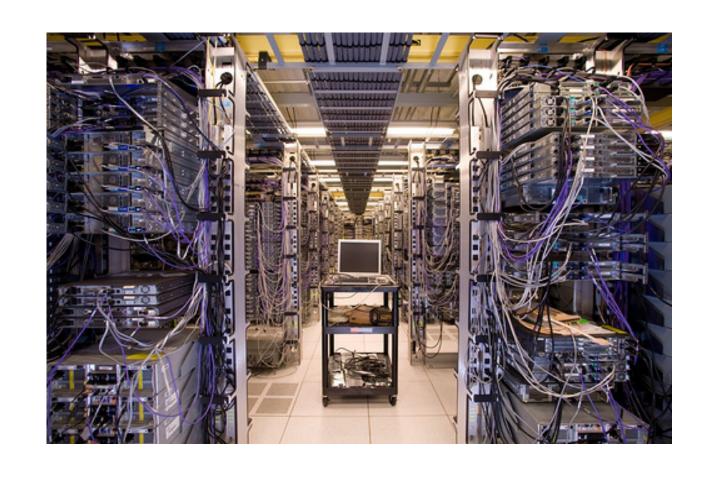


## From Roots of Trust... to the Dangers of Today

1969 – ARPANET

1982 – Internet

2017 – Unsafe at any speed



Q: Which one of those cables goes to the Internet?

A: Ask the Bad Guys! They know!

#### Enterprise Network LEVEL 5 Firewall/VPN Perimeter LEVEL 4 **Switch** SCADA PC HMI Directory Service Configuration LEVEL 3 Firewall Access **TDM** TDM Device Spans LEVEL 2 **Automation Switch** Switch Spans Relay **Comm Proc** Levels 2-3 LEVEL 1 **Port Server** Serial Radio -Protection Meter Relay DIGITAL LEVEL 0 52 **Physical**

# Defense-in-Depth Infrastructure Approach

Defining
Cybersecurity
Best Practices

## Research with Operational Technology Focus

- Reduce Cost
- Decrease Complexity
- Design for Distributed M2M Systems
- Monitor Systems Continuously
- Interoperate at boundaries ... Standards lag Innovation







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