



*Industrial Data Communication Experts*

# Redundant Wireless Data Communication Systems

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**GE FANUC**

# DATA-LINC Overview

- GE Fanuc *Accompany Partner*
- Manufacturer of communication solutions for industrial markets
- Broad line of solutions (private RF, dial-up/leased line, dedicated wire & fiber optics)
- Factory pre-configuration prior to shipping
- On-site GE PLCs for testing & support

# Wireless Technology

- Why consider wireless?
  - ◆ Cable installation/maintenance is expensive (ROI)
  - ◆ Cable installation is impossible
    - ◆ Moving/spinning platforms
    - ◆ Remote locations
  - ◆ Phone company reliability is questionable
  - ◆ RF back-up to a wired system

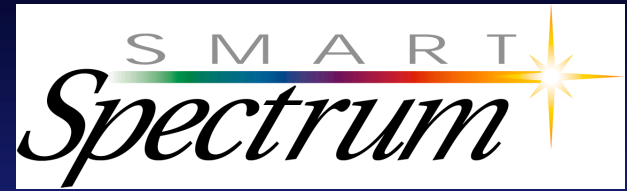
# Wireless Technology



## *Smart Spectrum*<sup>™</sup>

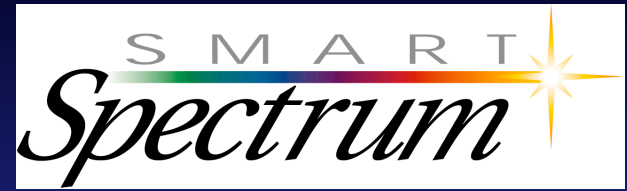
- √ Designed for industrial applications
- Spread spectrum (no FCC/DOC site license)
  - ◆ 902-928 MHz or 2.4 GHz band
- Advanced frequency hopping techniques
- Field proven predictable performance in high interference and harsh environments
- Range to 20 miles without repeaters

# Wireless Technology



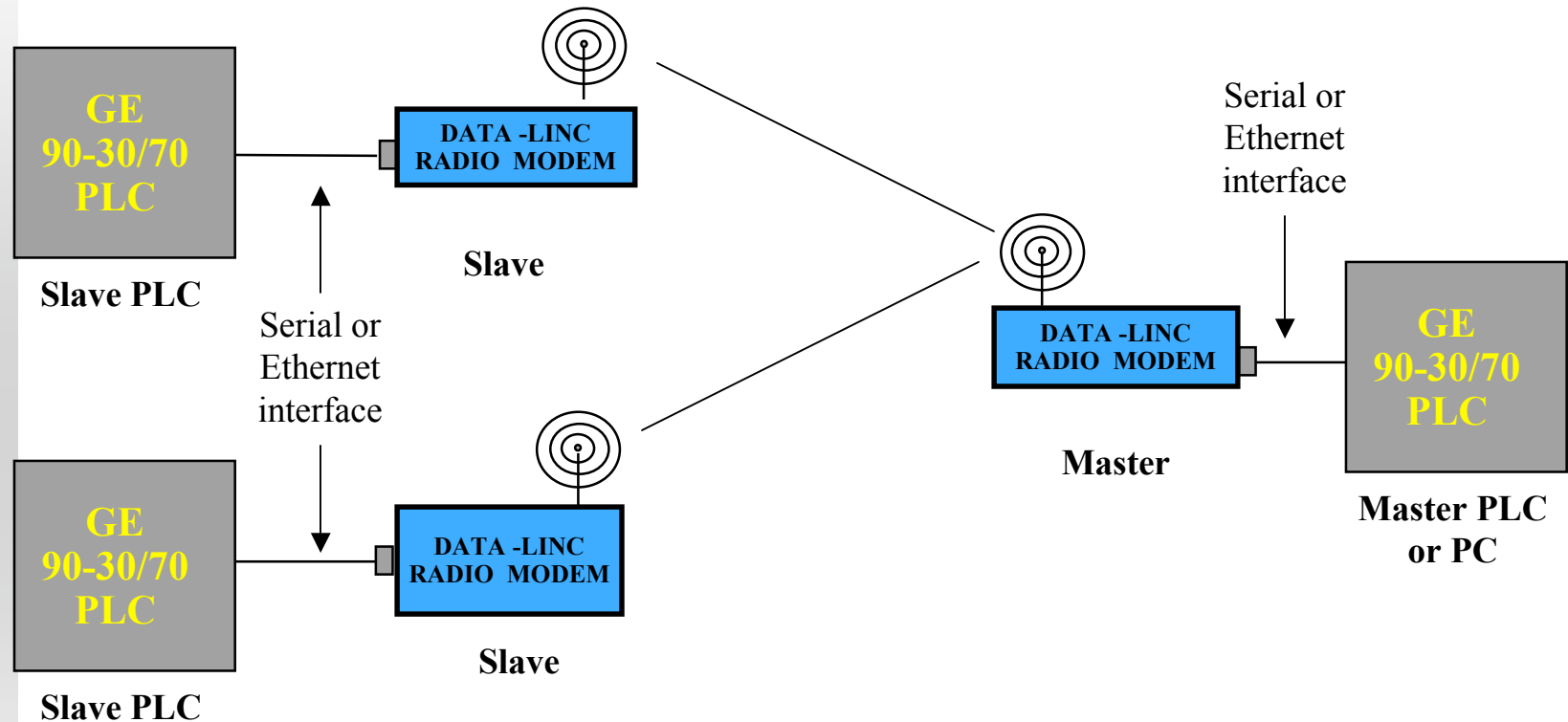
- Tolerant of multi-path reflections for indoor applications
- Supports 15 separate systems in the same location (ideal for redundancy)
- Provides automatic modem linking
  - ◆ Back-up modem connects without intervention

# Wireless Technology



- Radio modems for SNP, CCM, Modbus ASCII/RTU (SRM6000) and Ethernet (SRM6200E)
- Non-deterministic by nature (10-30 msec latency-varies based on interference level)
- Ideal for 90-30 & 90-70 PLC SCADA, remote diagnostics/programming and control applications

# Multi-point Wireless PLC Example

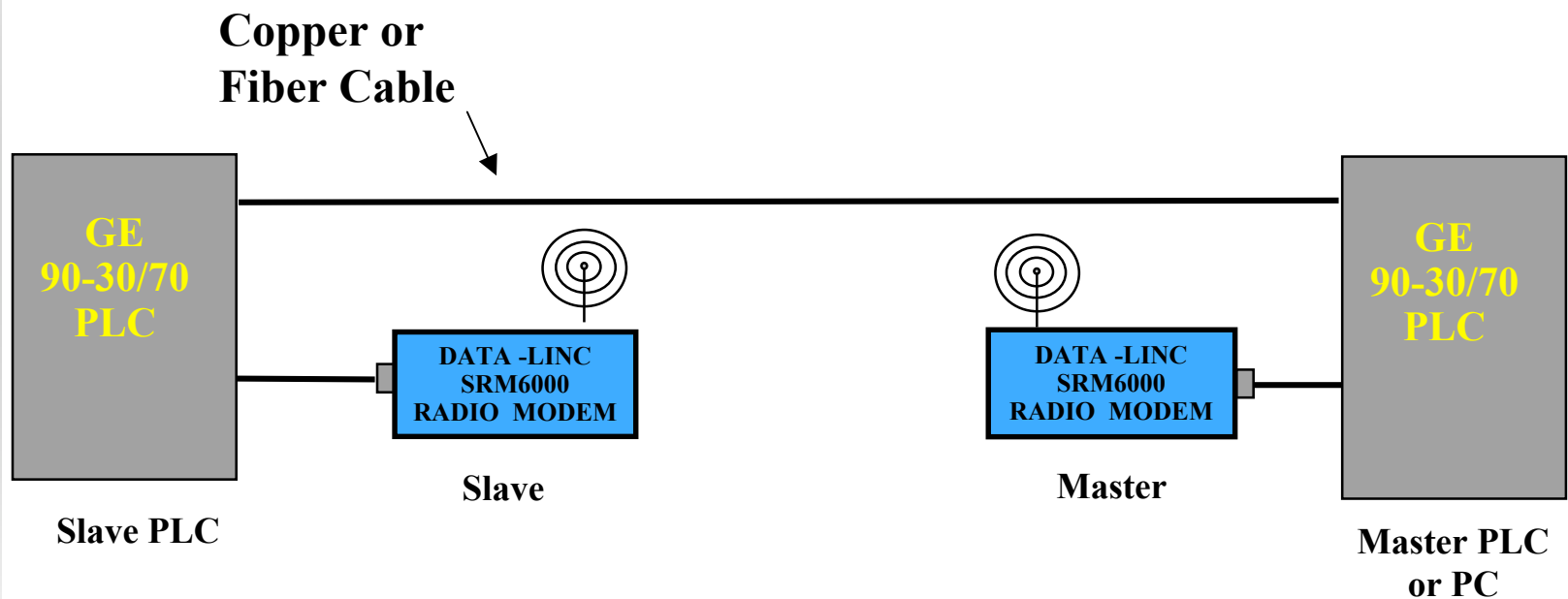


**Range of 20 miles with line-of-sight antenna placement**

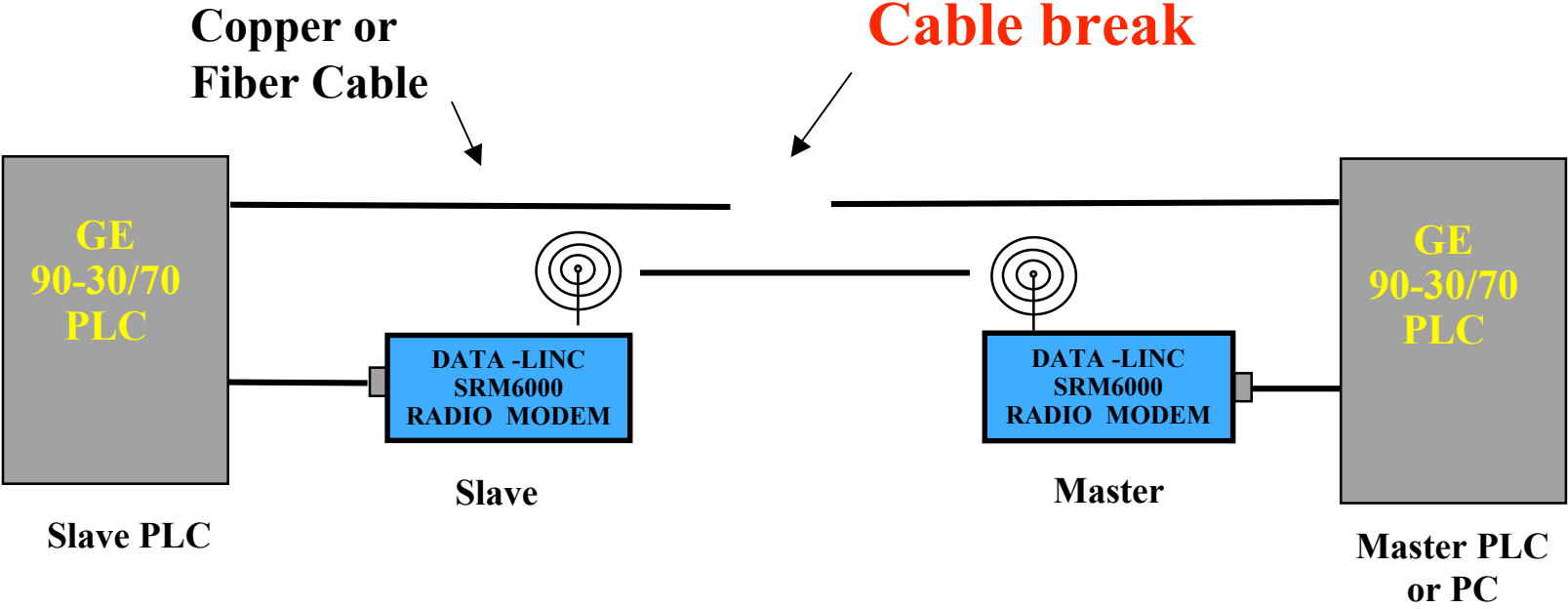
# Wireless as a Back-up

- Radio modems may be used to back-up a hard wired system
- Provides insurance in case of cable damage

# Wireless Back-up of PLC Communications



# Wireless Back-up of PLC Communications

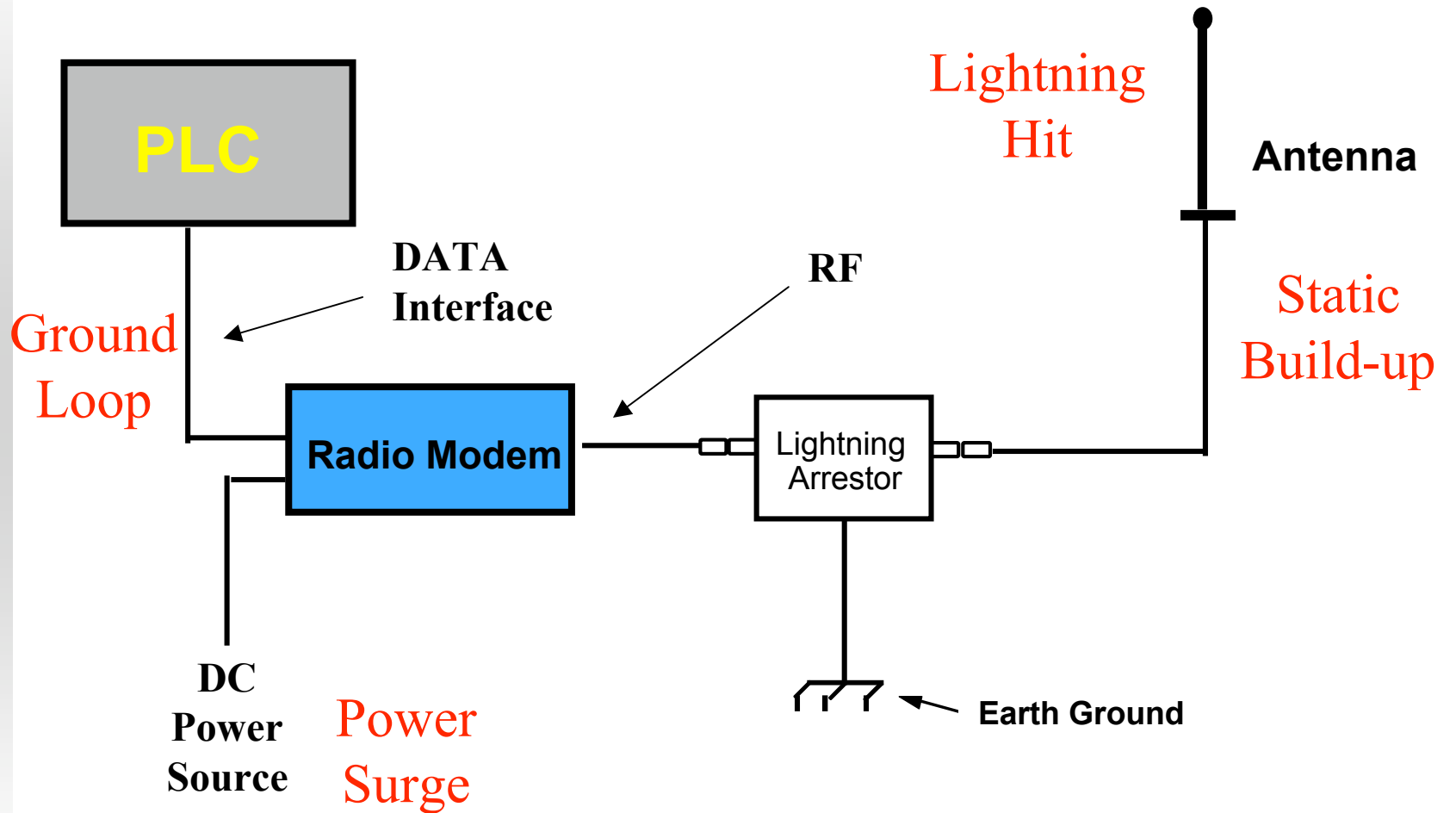


**Back-up Mode Over RF Link**

# Radio Modem Redundancy

- Most common radio modem failures:
  - ◆ Lightning hit on/near antenna
  - ◆ Static electricity build-up on antenna
  - ◆ Surge from power source
  - ◆ Ground loop surges via interface cable
- Redundancy should take into account these causes

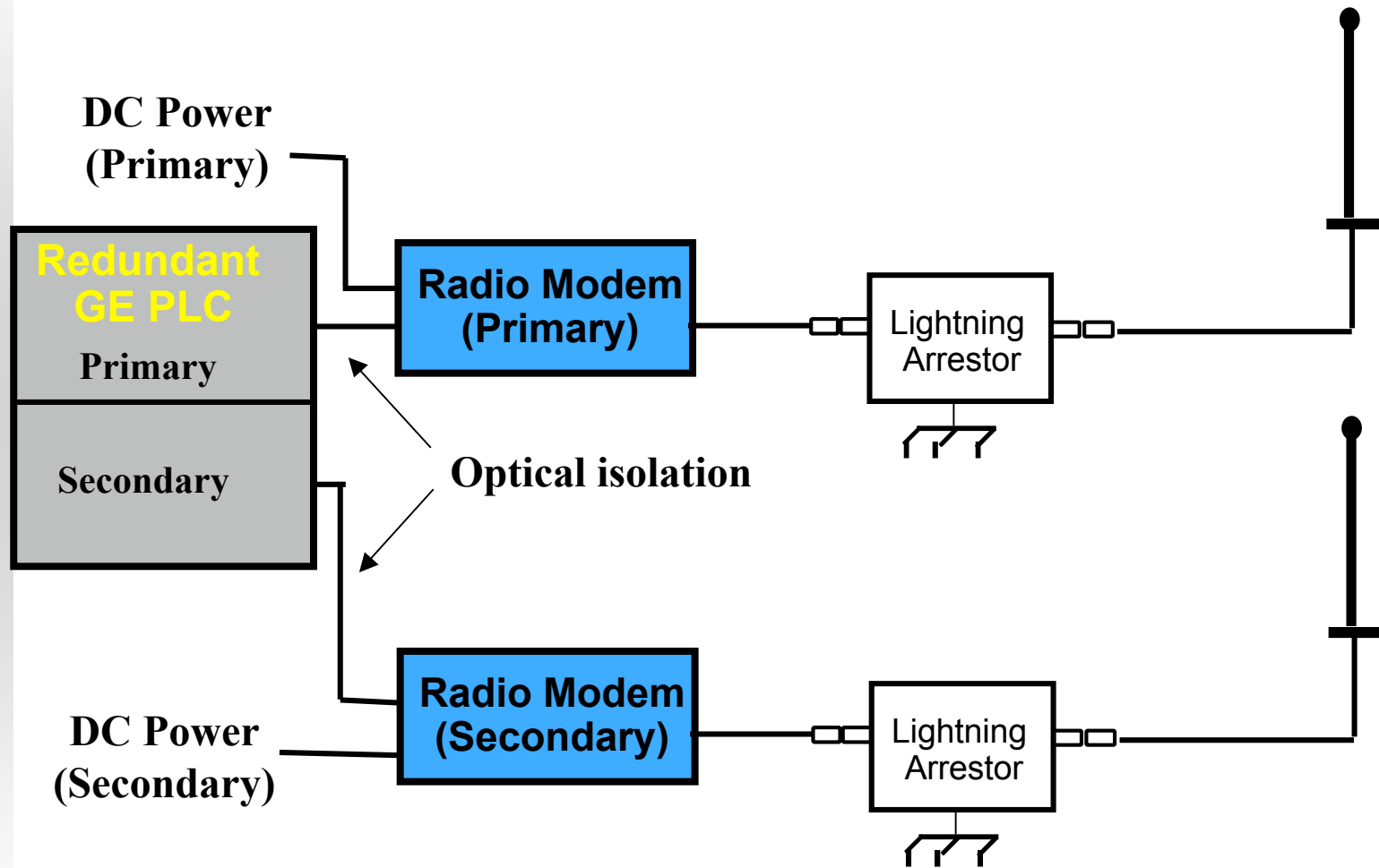
# Common Causes of Communications Failure



# Radio Modem Redundancy

- Ideal radio modem redundancy
  - ◆ Separate primary/secondary radio modems
  - ◆ Separate antennas with masts at least 50 feet apart
  - ◆ Separate power sources
  - ◆ Optical isolation on data interfaces (especially on long cable runs)

# Ideal Radio Modem Redundancy



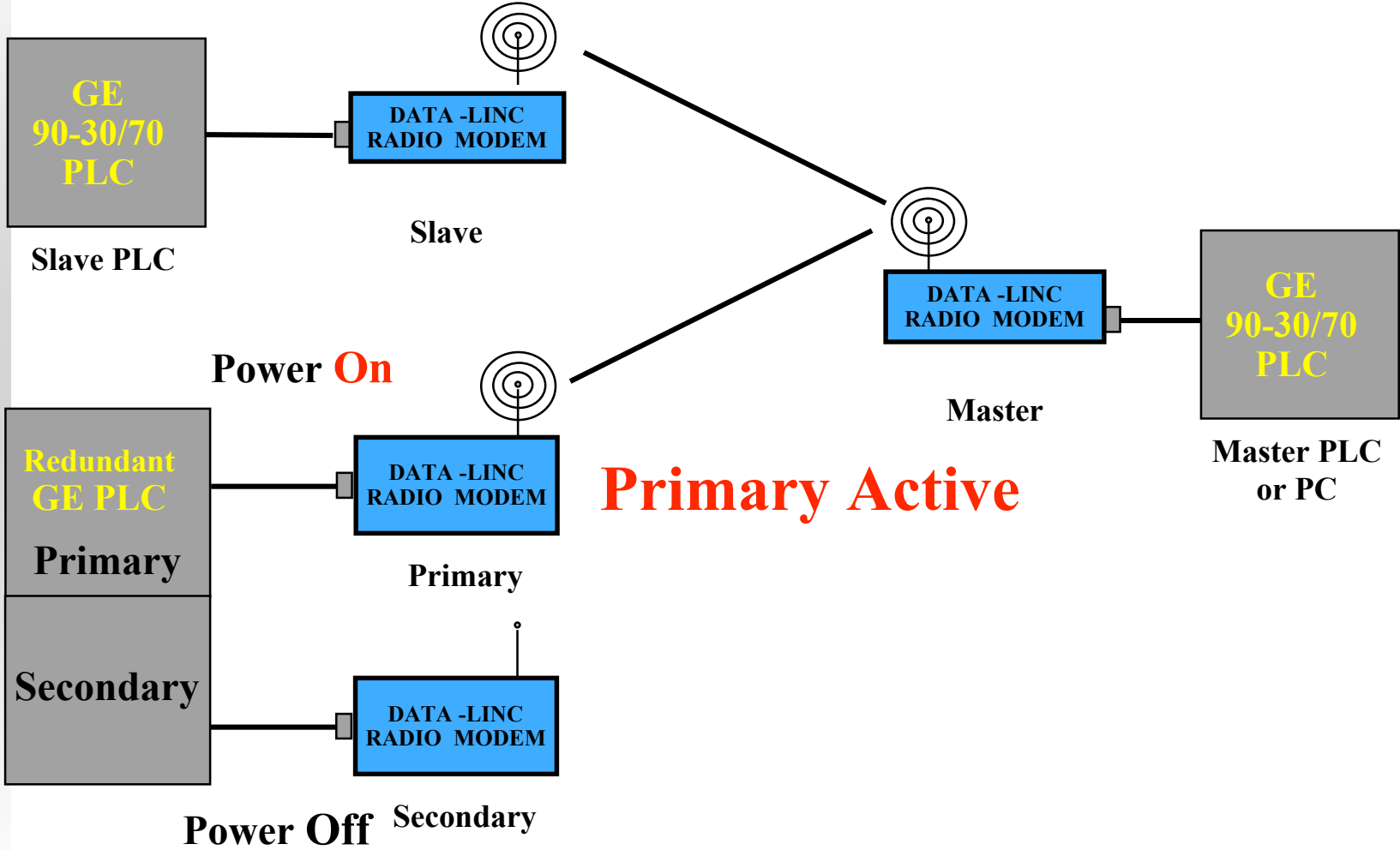
# Radio Modem Redundancy

## ■ Modem activation methods

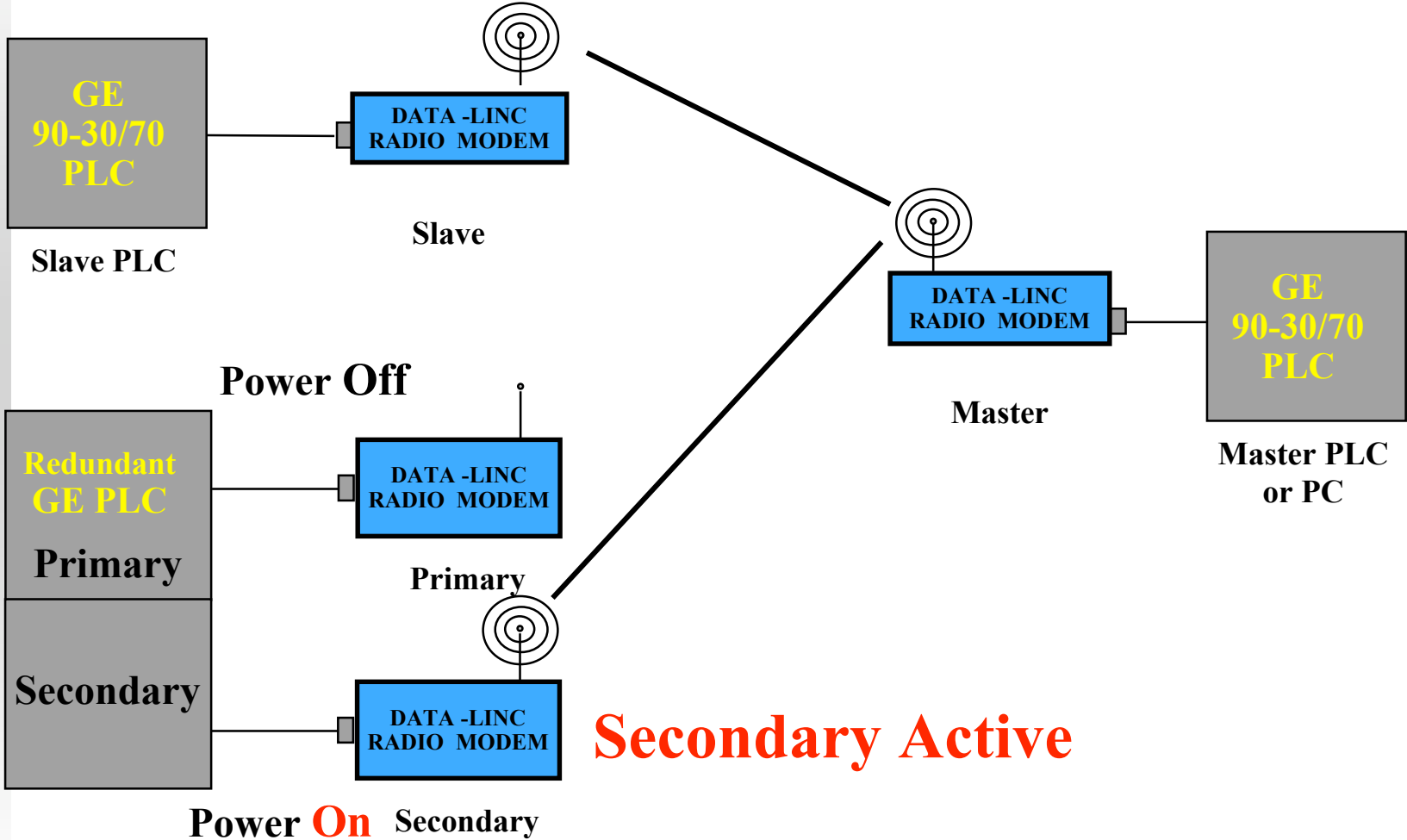
- ◆ PLC program controls modem power

  - ◆ Apply power to the appropriate modem

# Redundant Slave with Power Switching



# PLC System with Redundant Slave



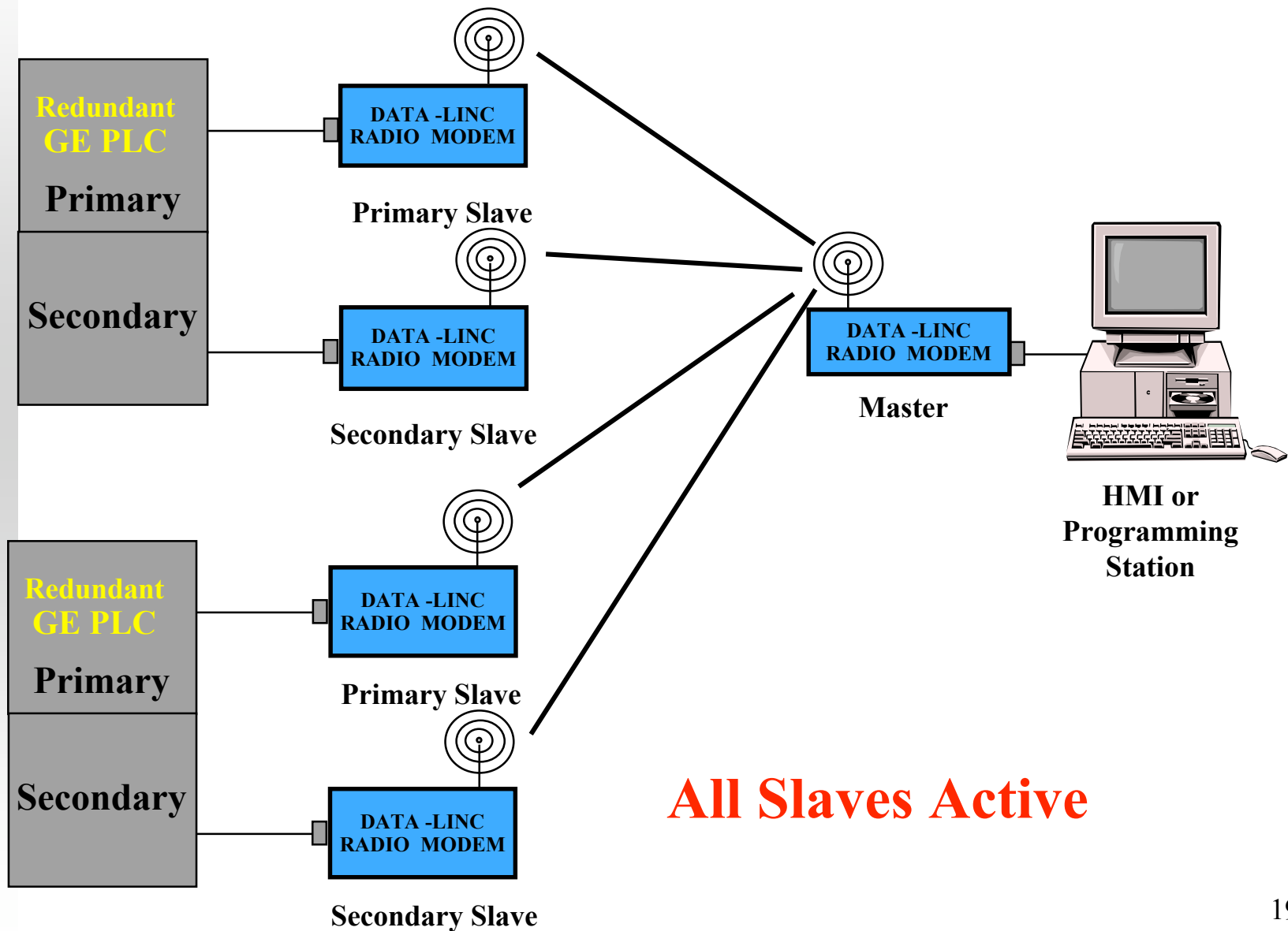
# Radio Modem Redundancy

## ■ Modem activation methods (continued)

### ◆ All slave modems active

- ◆ Master PLC/PC must poll appropriate slave PLC
- ◆ Only one slave PLC may respond at a time

# PLC System with Redundant Slaves



# Radio Modem Redundancy

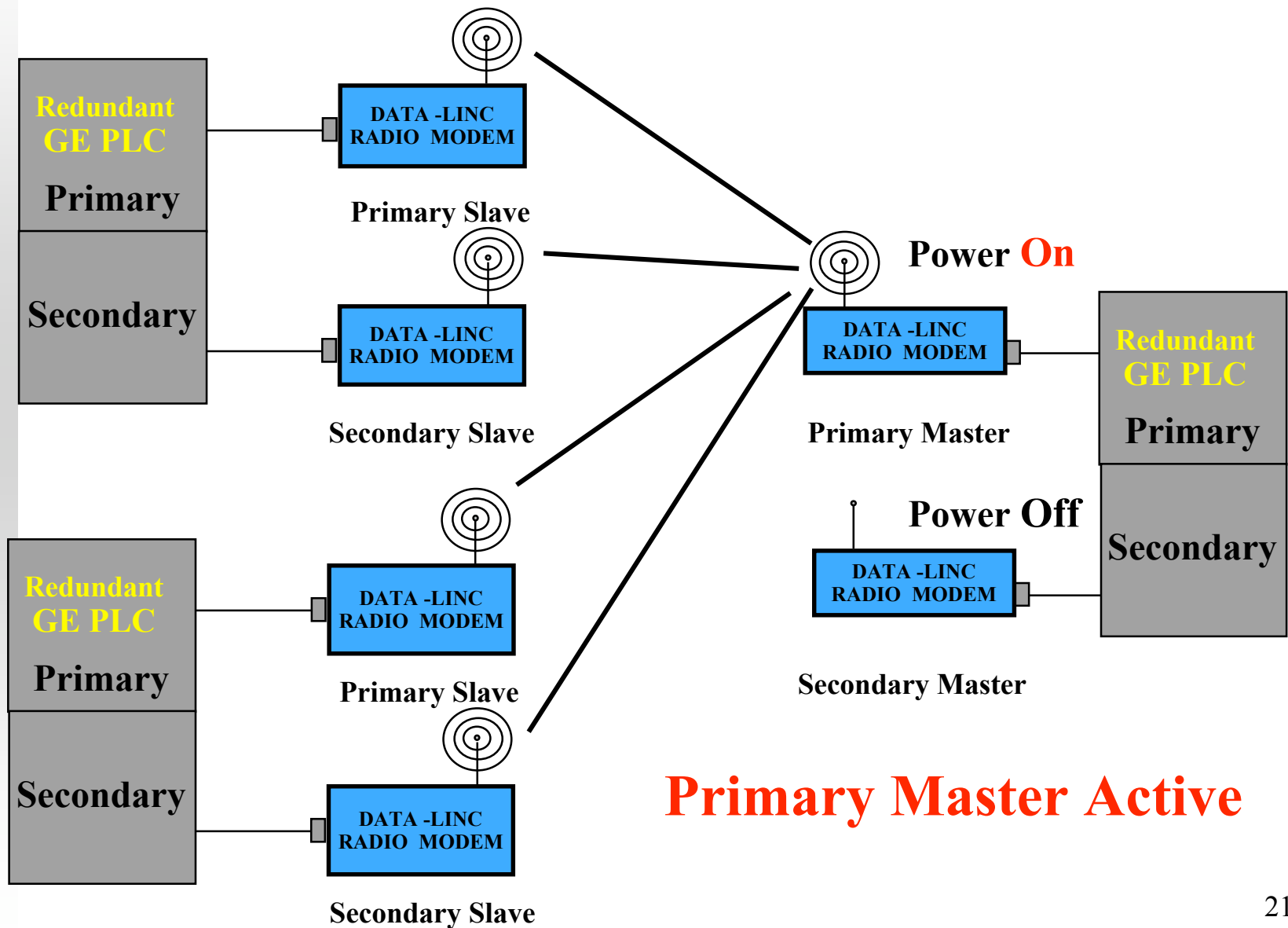
## ■ Modem activation methods (continued)

### ◆ Combination master & slave

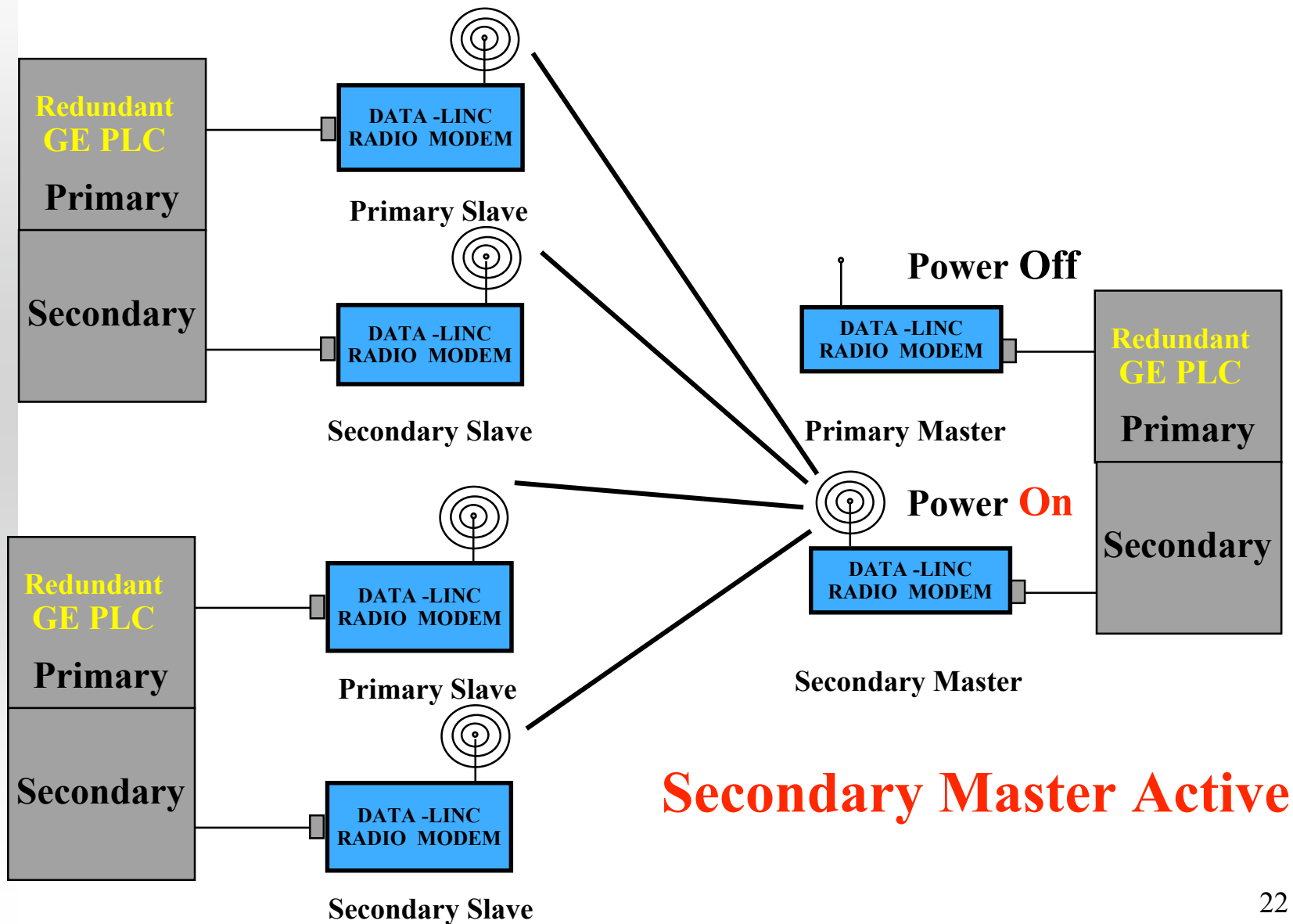
- ◆ Master selected by power

- ◆ All slaves active

# PLC System with Redundant Master & Slave



# PLC System with Redundant Master & Slave



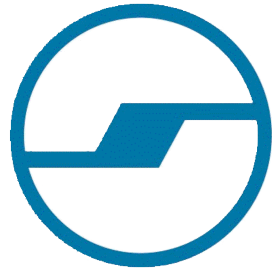
# Summary

- RF may be an effective back-up to copper or fiber optic cable
- *Smart Spectrum* ideal for redundant PLC applications
  - ◆ Linking technique provides automatic modem synchronization
  - ◆ 15 separate systems may operate in same area

# Summary

## ■ Future *DATA-LINC* Product Innovations

- ◆ The SRM6000 & SRM6200E are intelligent micro-processor controlled modems
- ◆ Modem features can be added via firmware program changes
- ◆ **What are your requirements?**



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