



# **FirstNet Architecture Solutions**

**Historical perspectives and future trends**

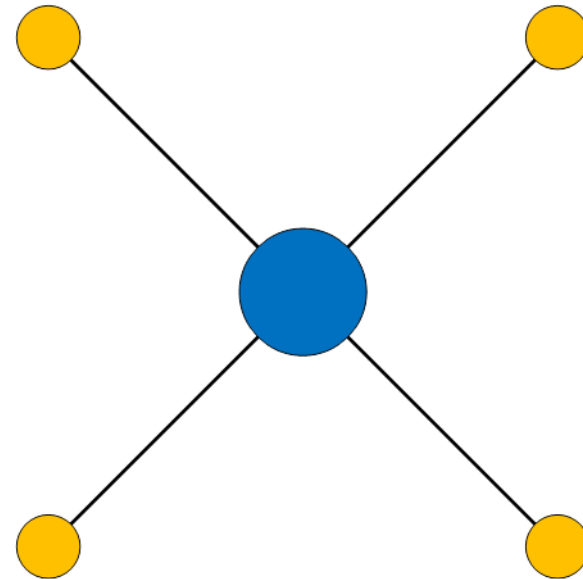
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APCO Broadband Summit  
Washington DC  
13 May 2013

# Hub and Spoke

- ▶ Traditional telecommunications architecture dating to earliest days of telephony
- ▶ “Central Office” in landline telephony
- ▶ “Mobile Telephone Switching Office” or “Mobile Switching Center” in cellular telephony
- ▶ Network vulnerable to single point failure
  - Black Swan events
- ▶ Usually a hardened location
  - Cold War saw CO’s placed in nuclear bunkers

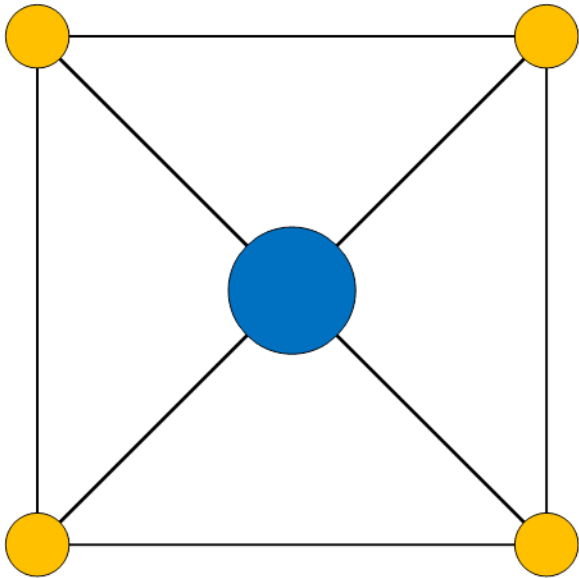


# Limits of Hardening

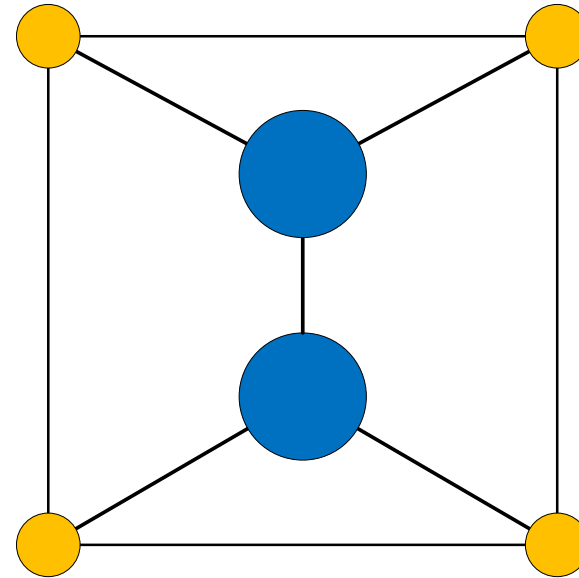
- ▶ Broadway and 18<sup>th</sup> Street Central Office fire, New York, 1892
- ▶ Second Avenue Central Office fire, New York, 1975
- ▶ Central Office fire, Hinsdale, IL, 1988
- ▶ Central Office flooding, Rochelle Park, NJ, 1999
- ▶ Central Office 9/11 damage, New York, 2001
- ▶ Central Office power failure, Arlington, Virginia, 2012
- ▶ Central Office Hurricane Sandy flooding, New York, 2012



## Adding Network Redundancy to Links or Core



- ▶ Greatly improves reliability since link failure is most common problem in most networks
- ▶ Link redundancy doesn't directly solve hub single point failure vulnerability



- ▶ Duplicate facilities provides much better reliability but at higher cost
- ▶ Commonly used for key network elements like STP's, supported by SAE EPC

# Distributed Network

- ▶ SAE adds distributed network architecture that can move key EPC elements (GW's, MME, PCRF) to each site for local authentication and call setup
- ▶ Good for rapid augmentation, satellite deployments and disaster recovery
- ▶ Isolated sites or groups of sites can still handle local traffic
- ▶ Each site can provide traffic offload to avoid traffic aggregation at the central hub
- ▶ Eases network backhaul requirements as LTE migrates to LTE-A

