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Evolution in the Use of Adaptive Signal Control for Smaller Scale Applications

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Presentation Agenda

- Adaptive System Control
- System Evolution
- Systems Engineering Process
- Lessons Learned
- Communications
- Summary

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What is an adaptive signal system?

An adaptive signal system is a type of system that receives and processors data from sensors to optimize signal timing settings to improve efficiency at an individual intersection as well as to facilitate traffic flow throughout the project area. System adjustment time periods can range from a cycle by cycle basis to several minutes in duration.

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Adaptive Signal Control Technology (ASCT) Benefits

- Automatically adapt to unexpected changes in traffic conditions
- Improve travel time reliability
- Reduce congestion and fuel consumption
- Prolong the effectiveness of traffic signal timing.
- Reduce the complaints that agencies receive in response to outdated signal timing.
- Make traffic signal operations proactive by monitoring and responding to gaps in performance.

Source: https://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/pdf/asct_brochure.pdf

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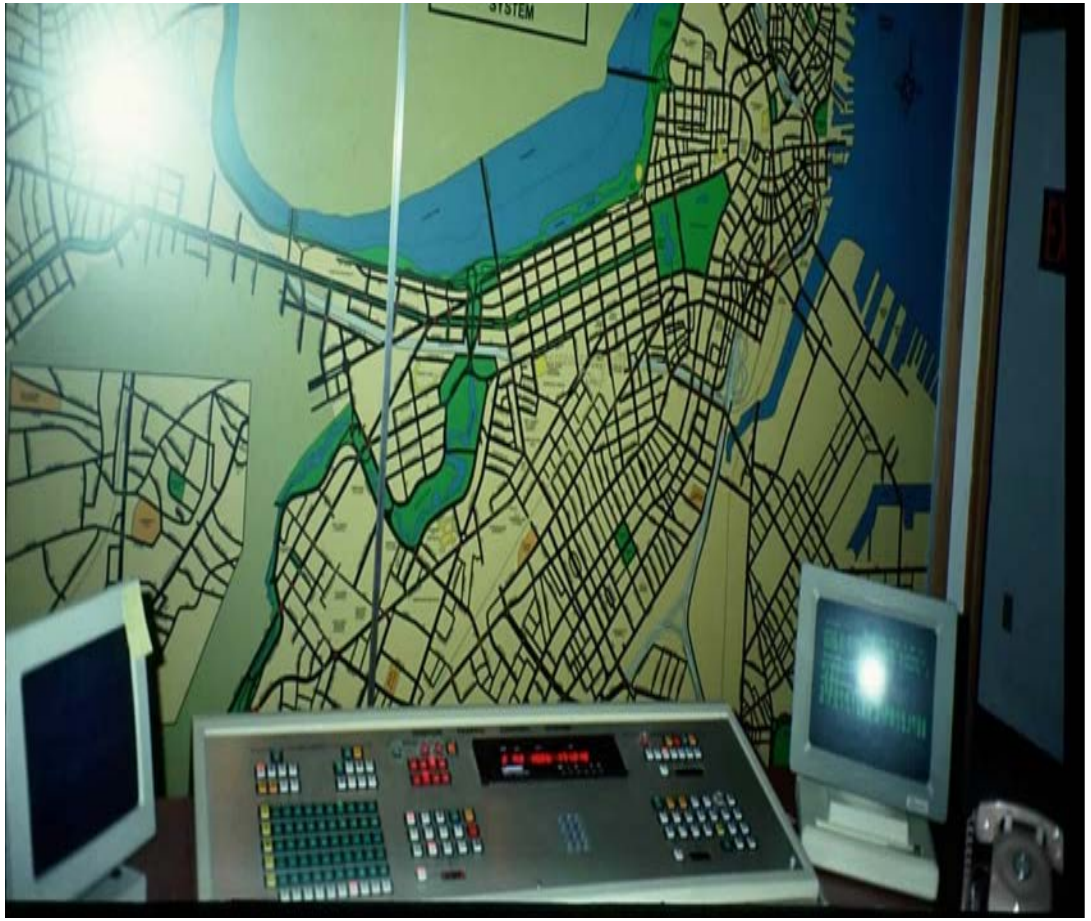
Adaptive Signal Control Technology (ASCT) Evolution



- Began development on the 1970's
- U.S. & International systems
  - SCOOT
  - SCAT
  - SPOT
  - RT-TRACS
  - OPEC
  - RHODES
- Specialized local intersection control devices
- Large mainframe computer stations

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ACS-Lite

- ACS Lite, a reduced-scale version of the Federal Highway Administration's (FHWA) Adaptive Control Software (ACS), offers small and medium-size communities a low-cost traffic control system that operates in real time, adjusting signal timing to accommodate changing traffic patterns and ease traffic congestion
- ACS Lite can be used with new signals or to retrofit existing traffic signals
- It is designed for closed-loop systems, providing cycle-by-cycle control

Source: www.fhwa.dot.gov/publications/research/operations/06083/index.cfm

Sampling of Available ASCT Systems

SurTrac

RHYTHM ENGINEERING

ACS LITE lab edition

RHODES

Centracs® Adaptive

ECONOLITE Group, Inc.

OPAC

Trafficware Engineered by Naztec SynchroGreen

SIEMENS
SCOOT / TACTICS Adaptive System

IQCENTRAL

ACDS

PEEK TRAFFIC

SPOT / UTOPIA

SCATS®

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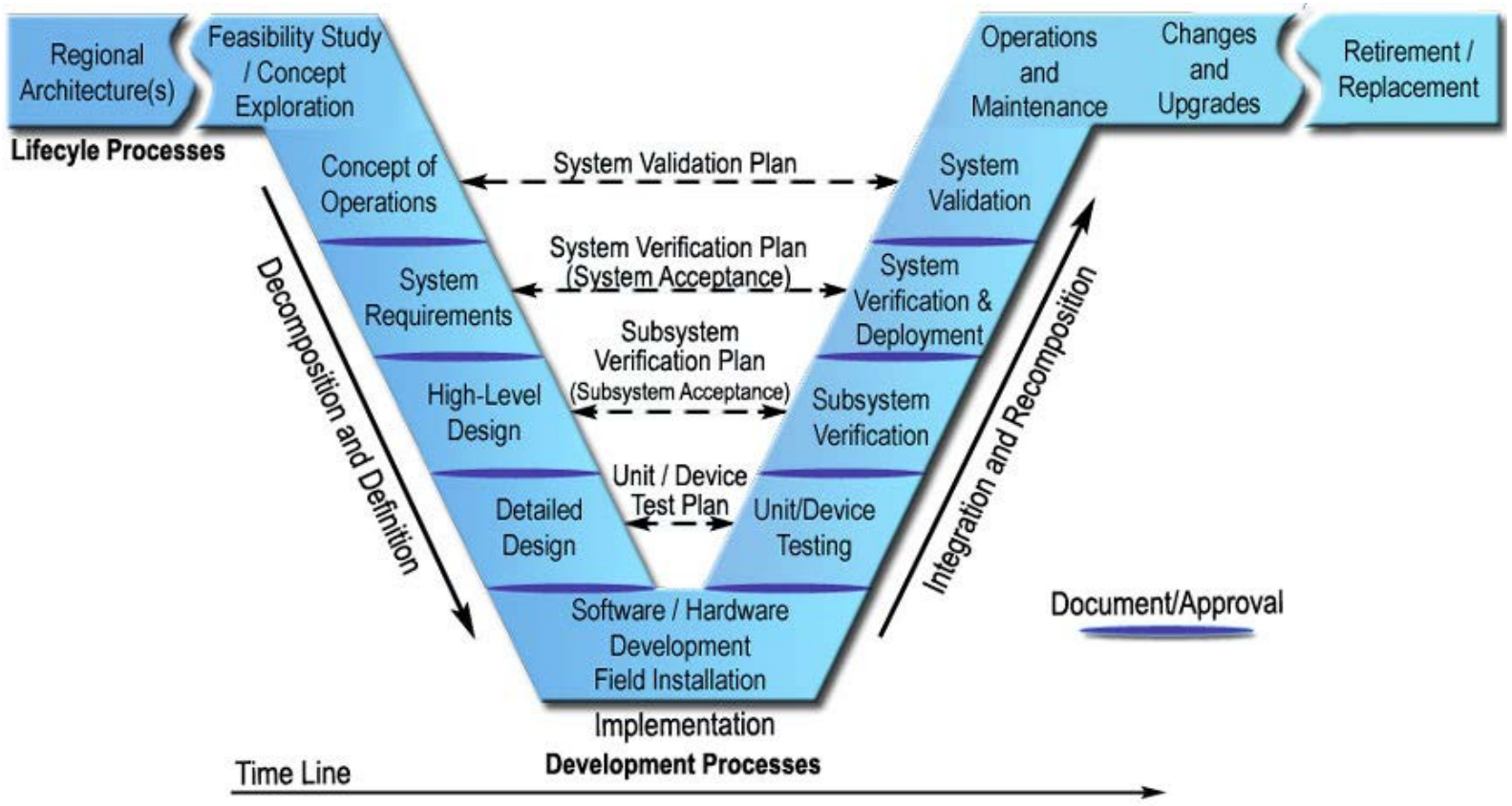
Systems Engineering Process



Source: https://ops.fhwa.dot.gov/publications/seitsguide/section3.htm

Lessons Learned

- Clearly define as many of the operational requirements as possible from the beginning
- Determine if existing infrastructure is being reused
- Don’t discount emerging technologies and how they apply to you specific needs
- Understand that whatever you design will have to be operated and maintained
- If possible, utilize existing agency standards
- A well designed and installed communications network is critical for the success of the project

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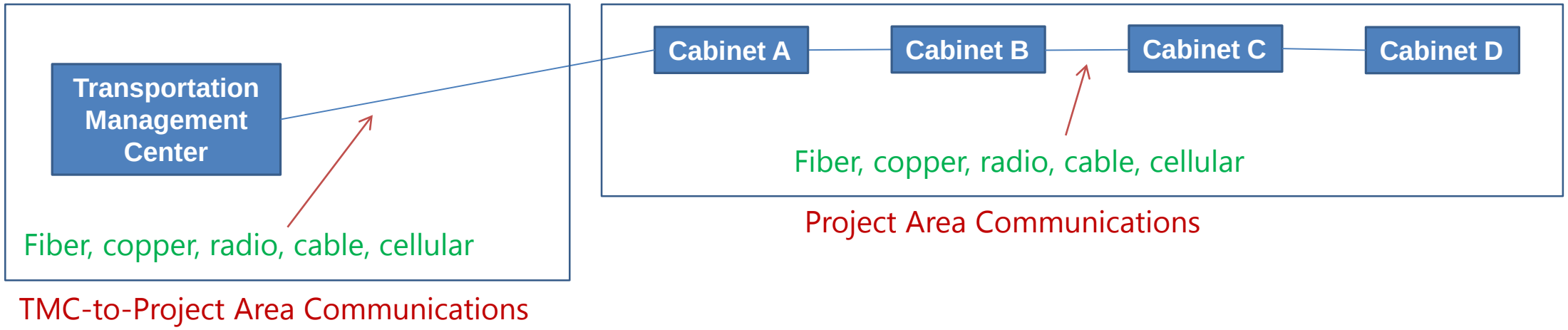
Communications Options for the Rural Environment



5 x 5 = 25 combinations of communications choices

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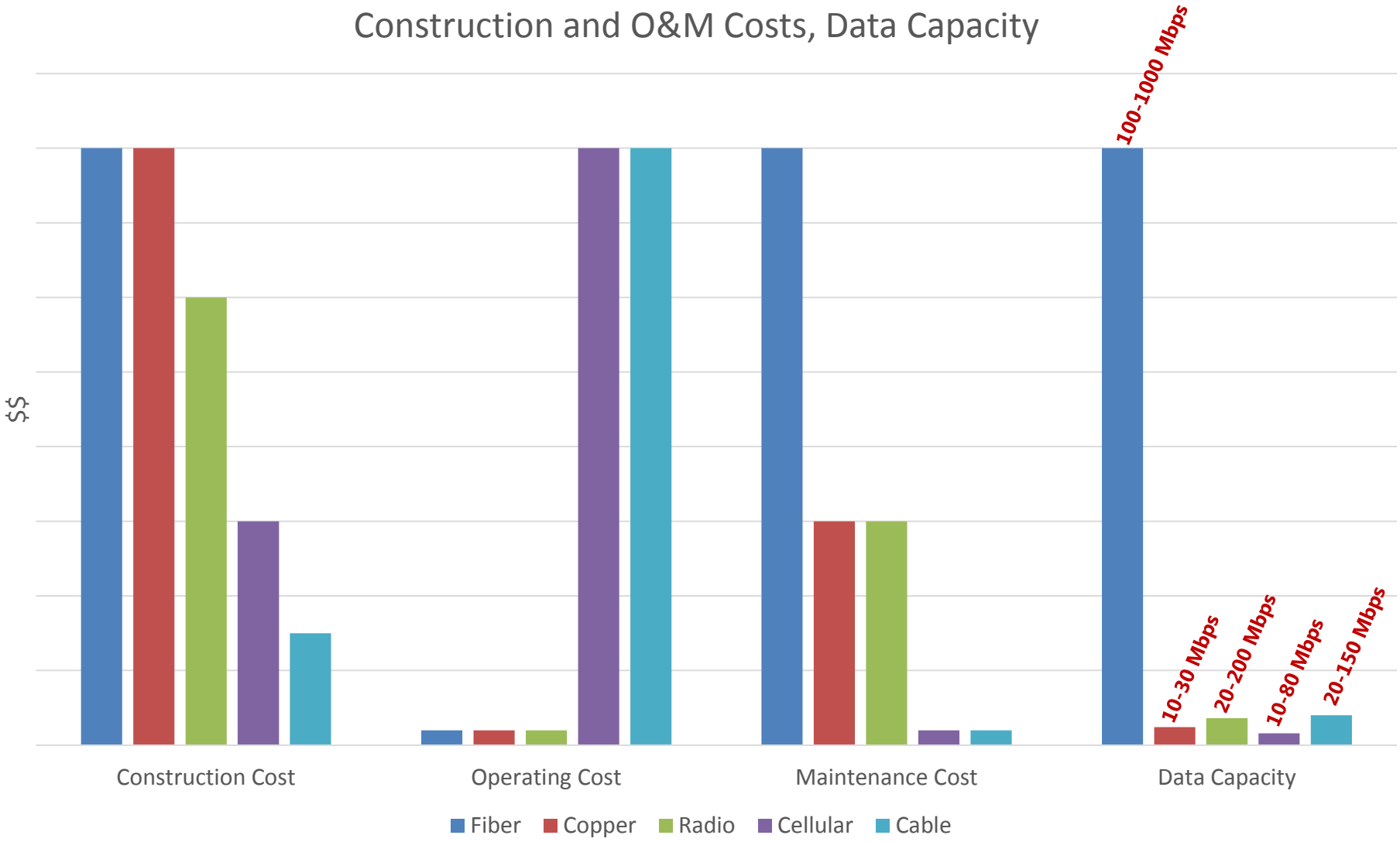
Communications Issues in the Rural Environment



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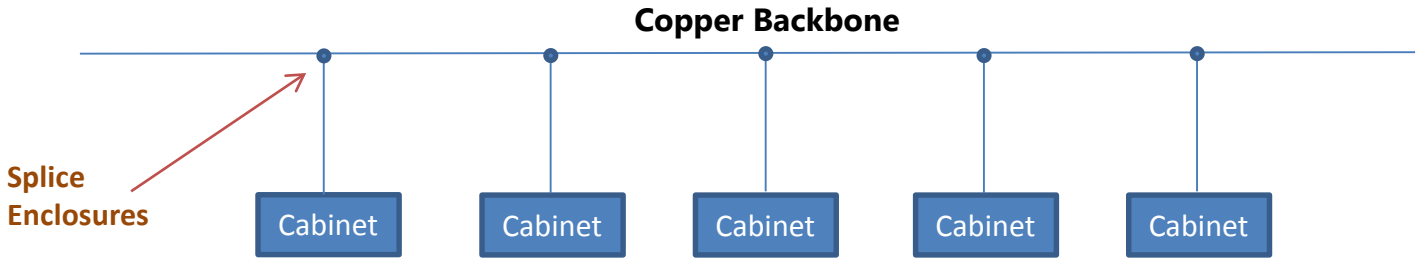
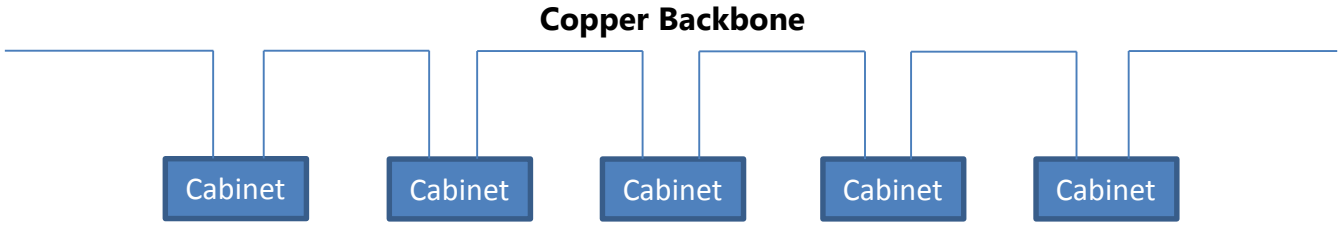
Copper Cable Systems

- Types of copper systems



T-Tap Architecture



Daisy Chain Architecture

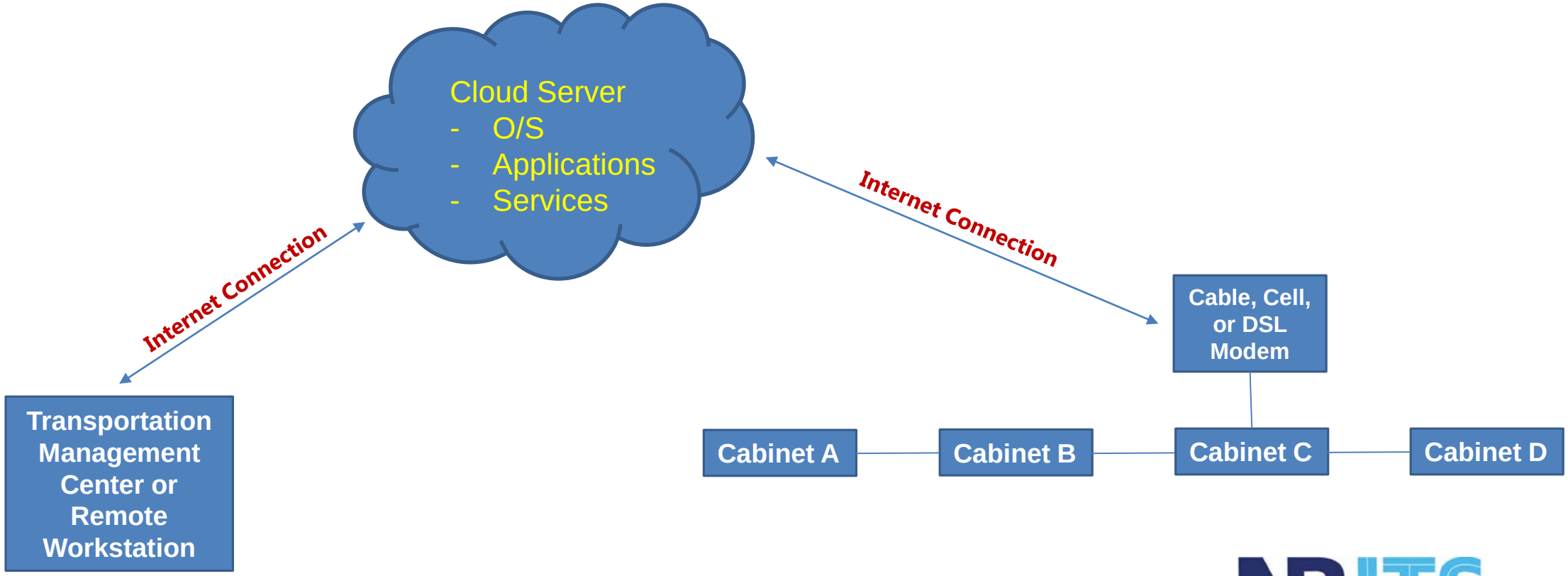
→ Daisy Chain Architecture provides optimal opportunity for reuse

Case Study

- Last six VHB designed adaptive signal projects:

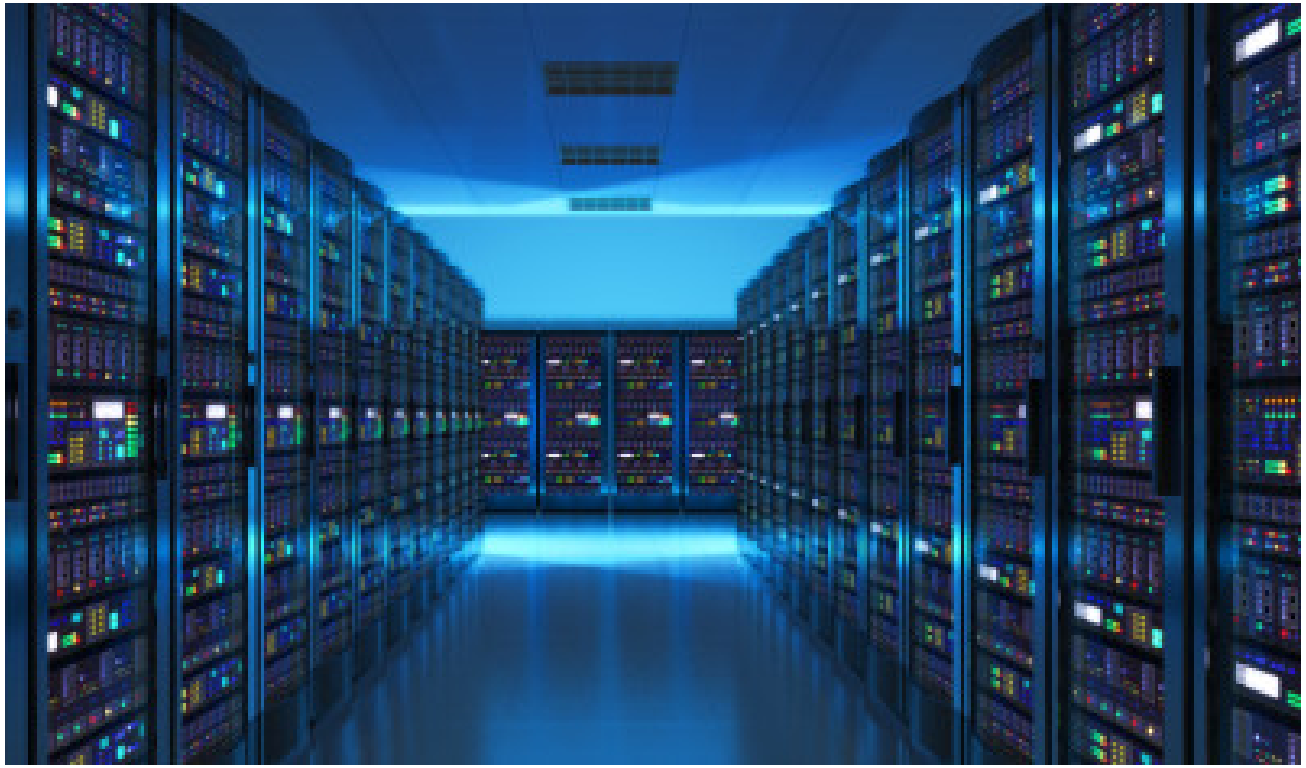
Project	Project Area Comm.	TMC-to-Project Area Comm.
Urban #1	Fiber (new)	Cloud (via cable modem)
Rural #1	Copper (exist.)	Cloud (via cable modem)
Rural #2	Copper (new)	none
Rural #3	Copper (exist.), Fiber (new), Radio (new)	Cloud (via cable modem)
Rural #4	Fiber (new)	Cloud (via cable modem)
Rural #5	Fiber (new)	Cloud (via cable modem)

Cloud Server Approach



Cloud Server Approach – Why?

- Who?
  - Adaptive system manufacturer
  - Generic cloud services provider, e.g., Microsoft, Amazon, Google
- Why?
  - User access
  - Application support
  - Maintenance & backup
  - Reliability
  - Security
  - Cost



Source: https://www.google.com/search?q=amazon+aws+data+center+pictures

Presentation Summary

- ✓ Adaptive Control is no longer a system that is limited to large scale applications
- ✓ Advances in technology have allowed this level of signal control to be used on smaller scale projects
- ✓ The system engineering process is needed to identify requirements and to define the validation and verification process
- ✓ Reliable communications is critical to the success of the project
- ✓ Your existing twisted pair copper communications plant may be suitable for reuse
- ✓ Putting the TMC server and applications in the cloud provides benefits in a rural environment, and is rapidly growing in popularity

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Questions……

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