



# Ethernet over Copper

## Enhancing Productivity using Existing Infrastructure

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# Agenda

- Who are we?
- EFM Copper Long Reach (EFMC-LR) Overview
- EFMC-LR Products
- EFMC-LR Applications



# Actelis as a Company

- Founded in October of 1998 to focus on the delivery of high quality broadband services over copper
- Customers in the North America, Europe and Asia:
  - Major service providers
  - Government, military and campus customers with private copper networks
- Standard EFM Platforms powered by Actelis' patent-pending MetaLOOP<sup>®</sup> technology to deliver more high quality bandwidth over longer copper loops than any other approach
- Highly active in standardization committees (IEEE, ANSI, ETSI, ITU-T)





# EFM Copper Long Reach Track





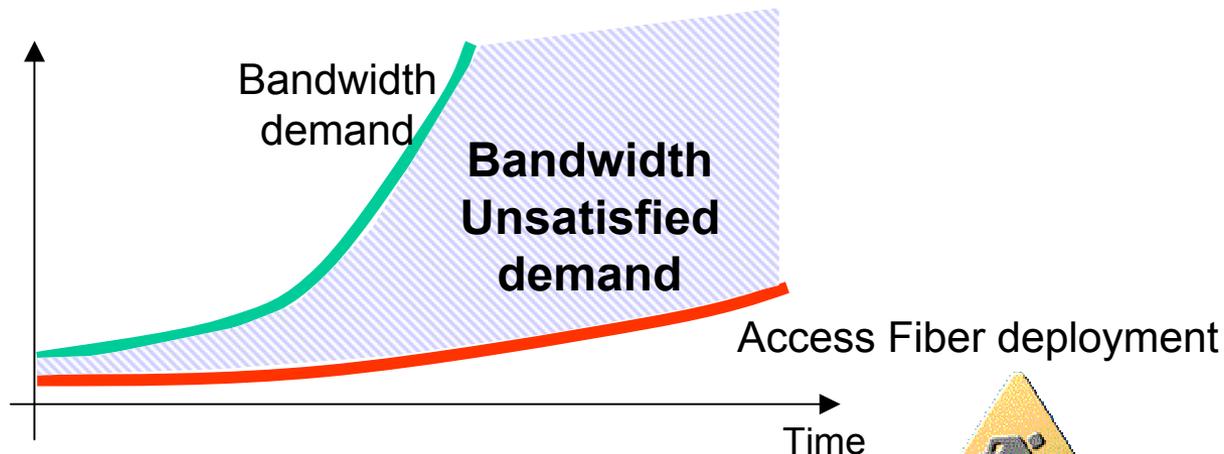
# Why “Ethernet over Copper”?

**“Despite aggressive deployment of fiber, today only 11% of US businesses are served by fiber”**

Source: RHK & Vertical Systems

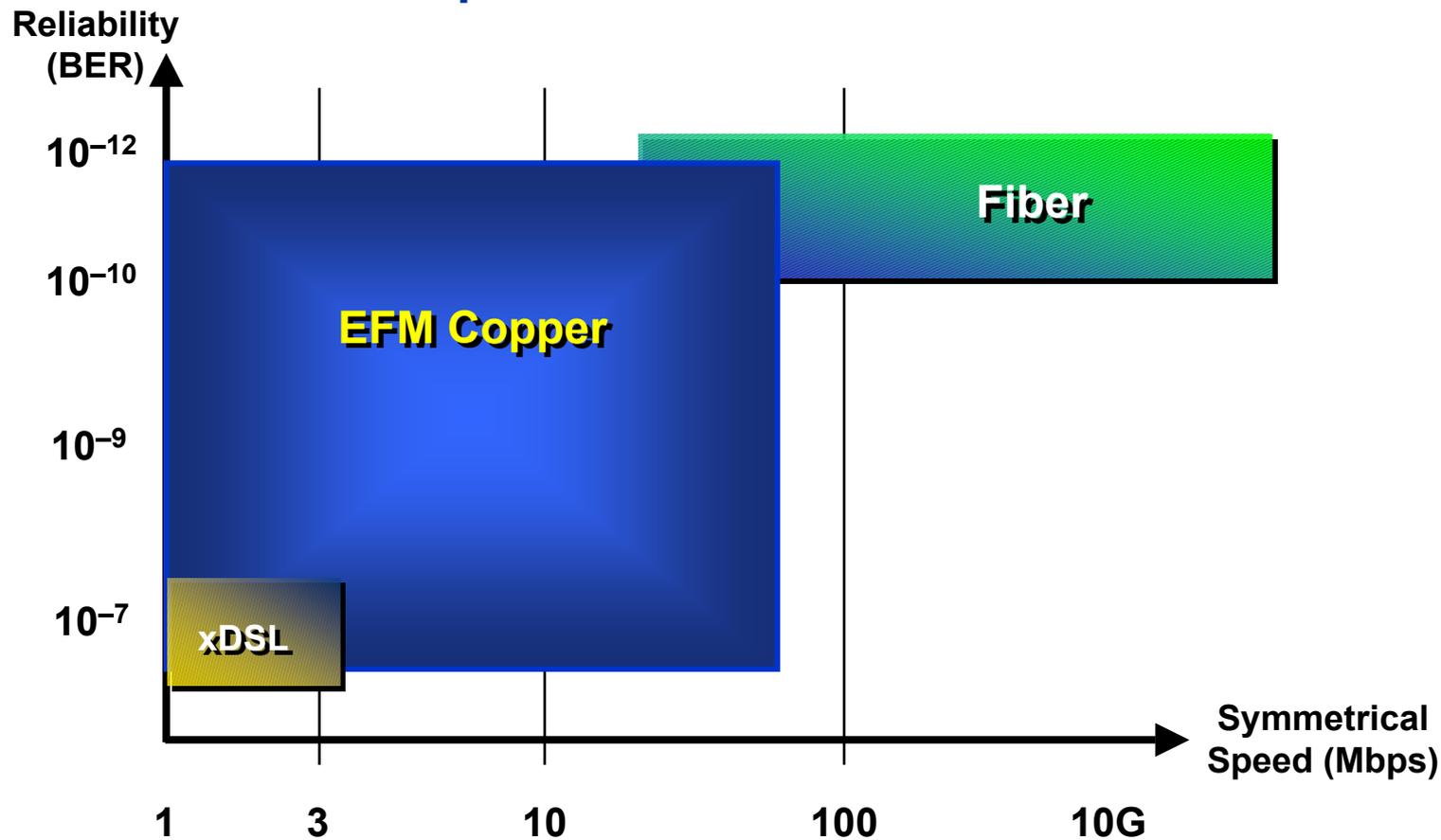
**“With fiber only reaching 10 to 12 percent of businesses, carriers will look to Ethernet over copper solutions to bridge bandwidth gap”**

Source: Yankee Group, March 04





# The Service Gap

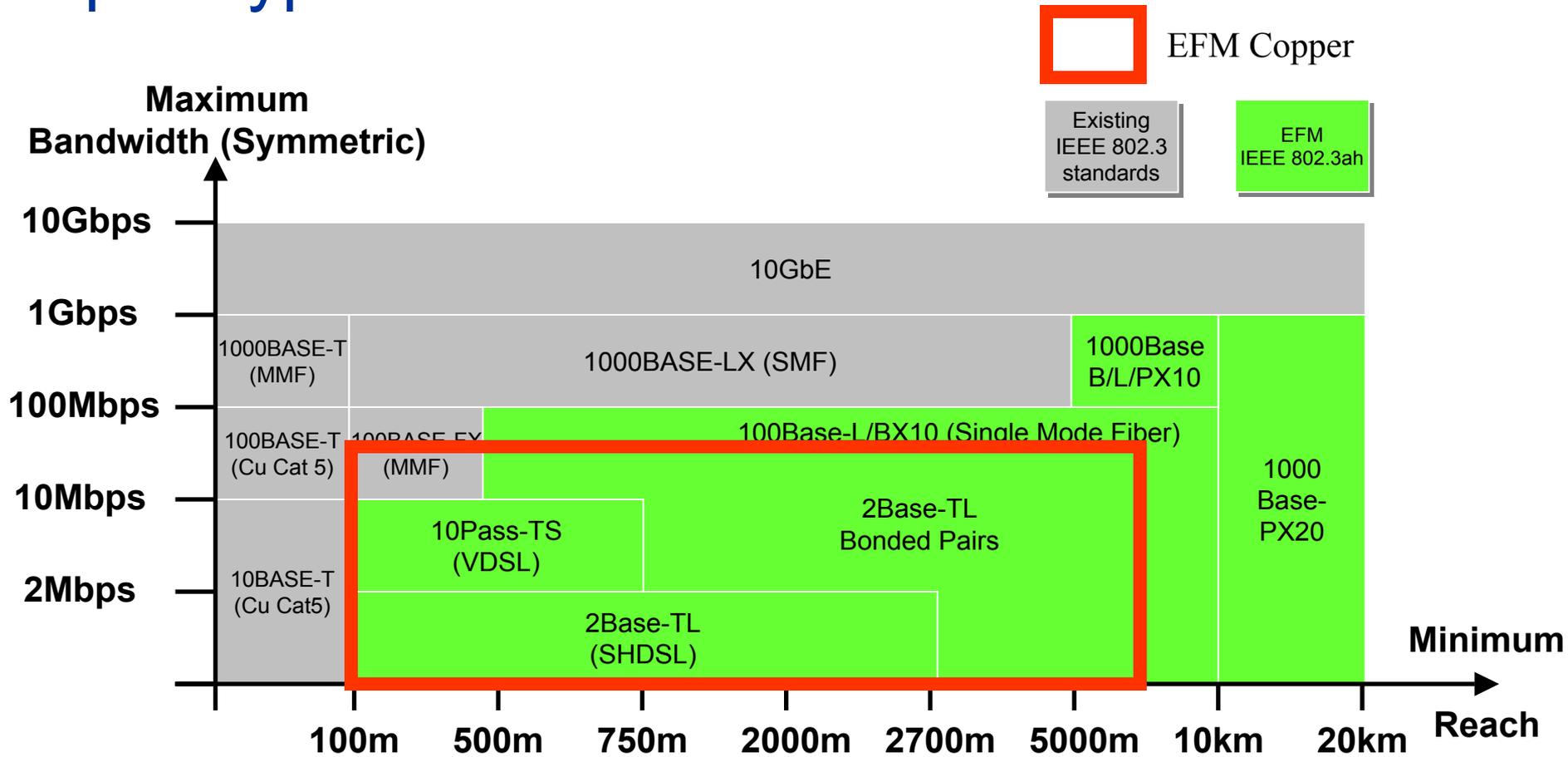


EFMC products are Bridging the Service Gap





# Comprehensive suite of Standard First Mile port types



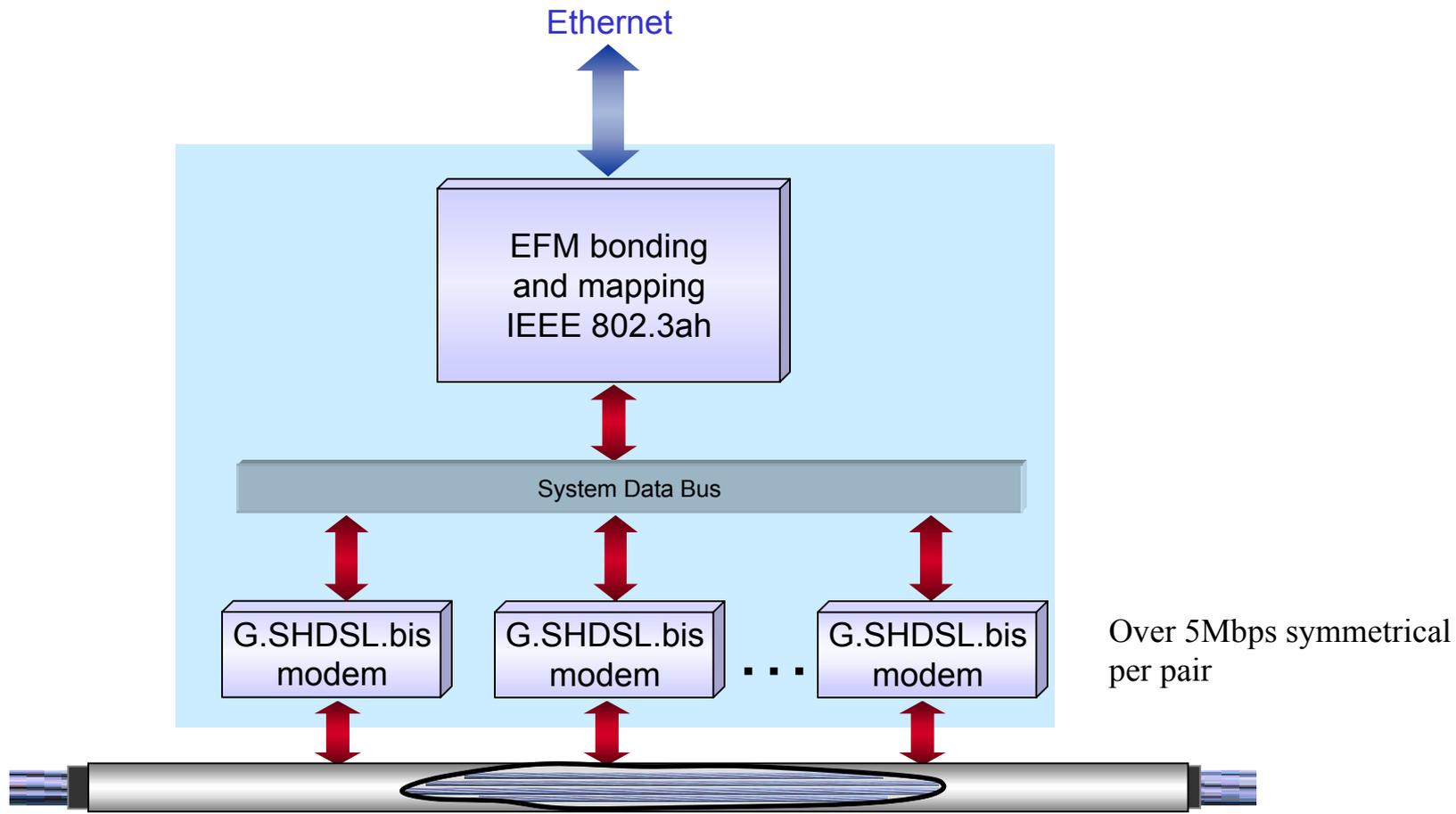


# EFMC Long/Short Reach and Bonding





# EFM Architecture





# EFM is the Right Bonding Scheme for an Efficient and Reliable Service

	<b>IEEE EFM</b>	<b>IMA</b>	<b>ETSI M-pair</b>
<b>Various modem rates</b>	Yes	No (equal modem rates only)	No (equal modem rates only)
<b>Immunity to interference</b>	Excellent Optimize rate at start up Adaptive link maintenance	Poor Lowest Common Denominator at startup Loose pair due to interference	Poor Lowest Common Denominator at startup Single pair hit drops the link
<b>Pair Failure Protection</b>	Yes	No	No

EFM – IEEE 802.3ah Ethernet in the First Mile

IMA – Inverse Multiplexing for ATM

M-pair – according to G.SHDSL standard



# The Copper Challenge





# Important Attributes of a Good EFMC System (not covered by the standard)

- **Ease of Deployment/Maintenance**
- **High Performance** - more BW on less copper pairs saves CAPEX
- **QoS** - traffic management and prioritization
- **Scalability** - minimal upfront CAPEX requirements
- **Carrier Grade Robustness**



# Actelis EFM Products





# Actelis MetaLIGHT Product Portfolio

**MetaLIGHT 1300**



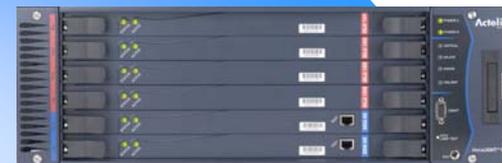
**MetaLIGHT 100E/L**



**MetaLIGHT 100E1**



**MetaLIGHT 1500**



**MetaLIGHT 150**



**Actelis  
Core  
Technology**

**MetaLIGHT EFM  
Product Line –  
the Ethernet Edge**

**MetaLIGHT 130**



**MetaLIGHT 51**



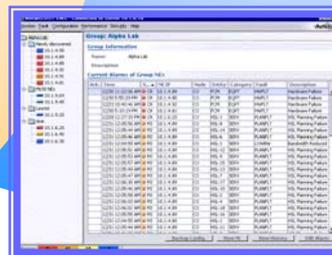
**MetaLIGHT 52**



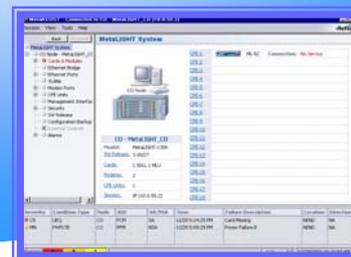
**MetaLIGHT 54**



**MetaLIGHT 58**



**MetaASSIST EMS**



**MetaASSIST View**



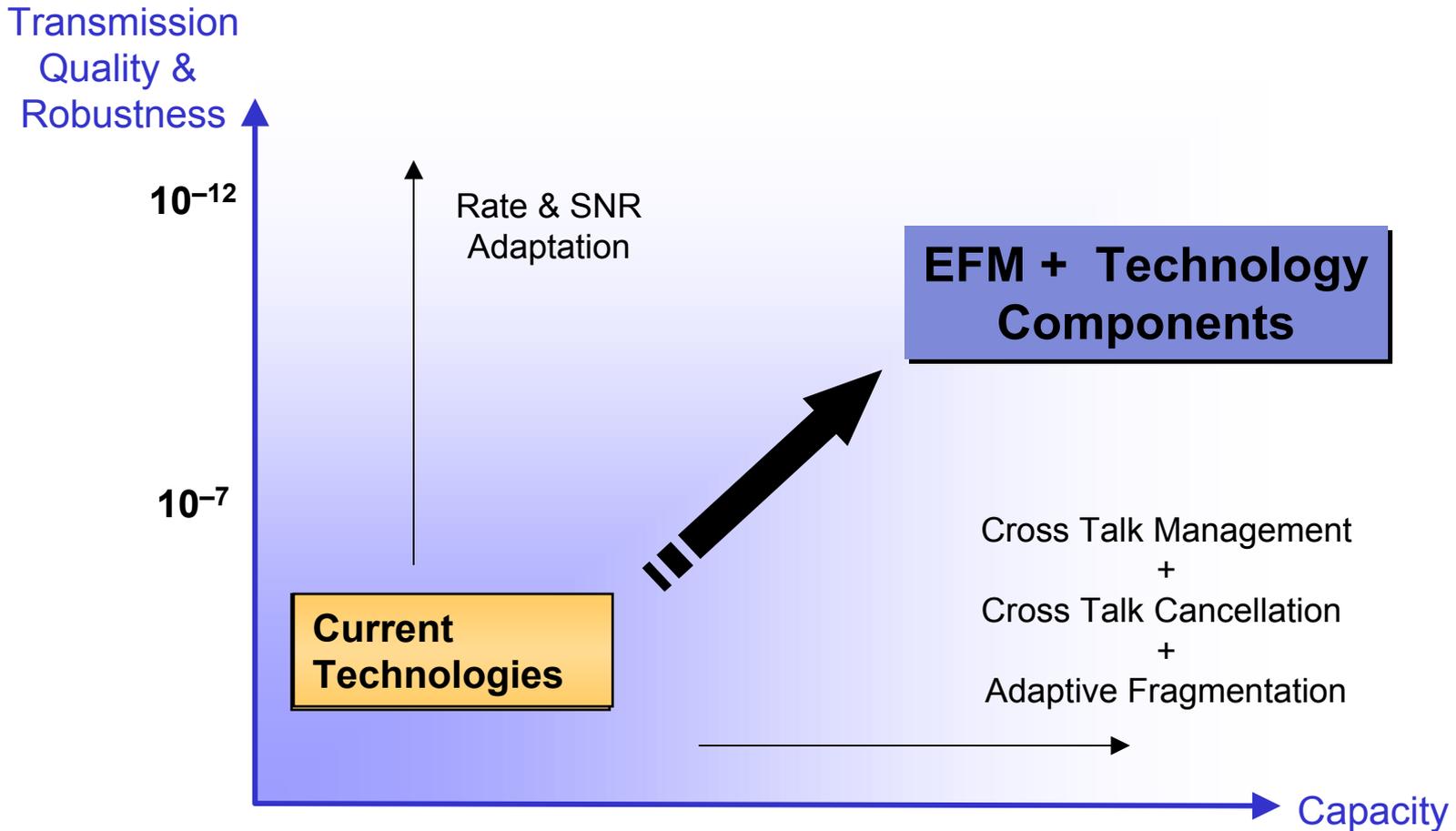


# Actelis EFM Copper Products

- Full 802.3ah compliance
- Actelis superior EFM implementation
  - ITU-T G.991.2.bis (G.SHDSL.bis) bit-rates – up to 5.1Mbps per pair
  - Automatic line pre-qualification
  - Adaptive fragmentation (low overhead)
- Actelis patented performance enhancements (compatible with the IEEE EFM standard)
  - Cross-Talk Management
  - Cross-Talk Cancellation



# Technology Components Benefits





# MetaLIGHT EFMC-LR Performance

	5kft	10kft	15kft
2 pairs	10Mbps	9Mbps	6Mbps
4 pairs	20Mbps	17Mbps	12Mbps
8 pairs	40Mbps	34Mbps	24Mbps

Copper performance are dependent in many factors and may vary from the above. Service providers may apply additional restrictions on copper transmission.



# MetaLIGHT Products are Available for Federal Agencies

- Fully certified (FCC, UL, NEBS Level 3)
- On Federal Supply Schedule Group 70 (GS-35F-0876P)
- Approved by the Army's Technology Integration Center (TIC)



# Field Experience of EFM Copper LR

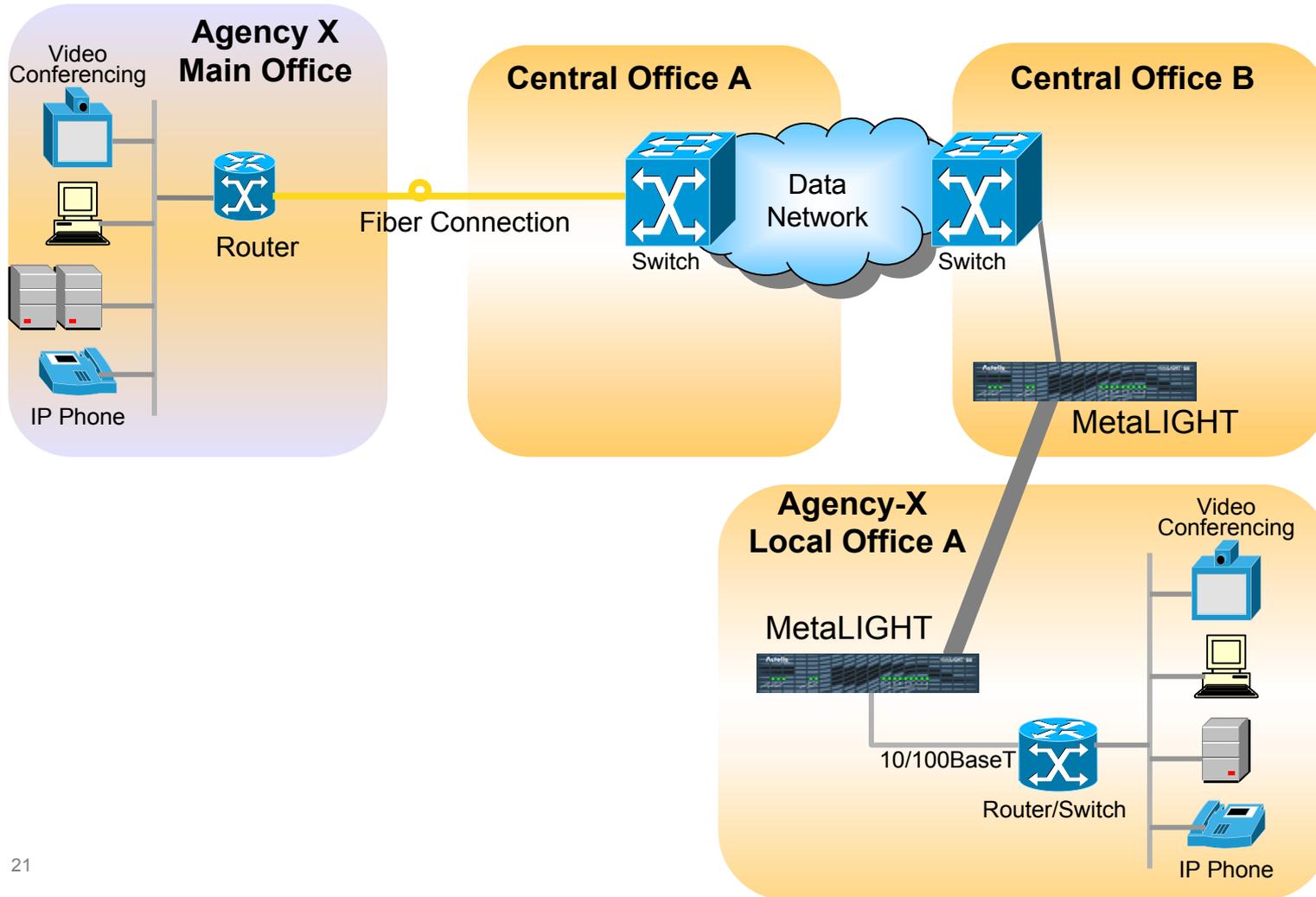
- Multiple service providers – examples:
  - Allied Telecom
  - North Pittsburgh Telecom
  - Internet Express
- US Military – multiple installations
- NATO - Supreme HQ Allied Power Europe (SHAPE)
- Municipalities – multiple installations, example:
  - City of Cedar Rapids, Iowa
- Private Organizations

# Applications and Case Studies





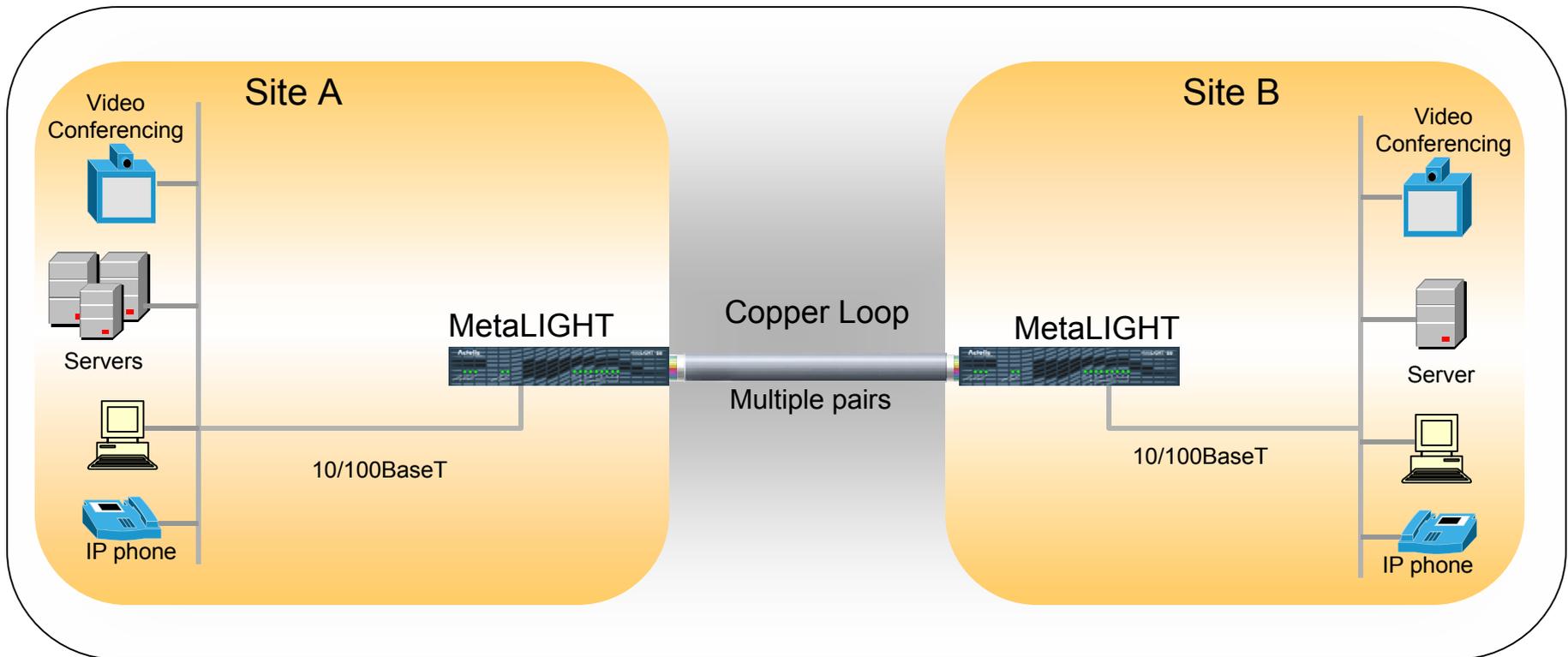
# Service Provider Deliver Ethernet Services over Copper





# Site interconnection over IP – Voice, Data, Video & LAN services

Army Base, Utility Company, Transportation, Health care facility, etc.



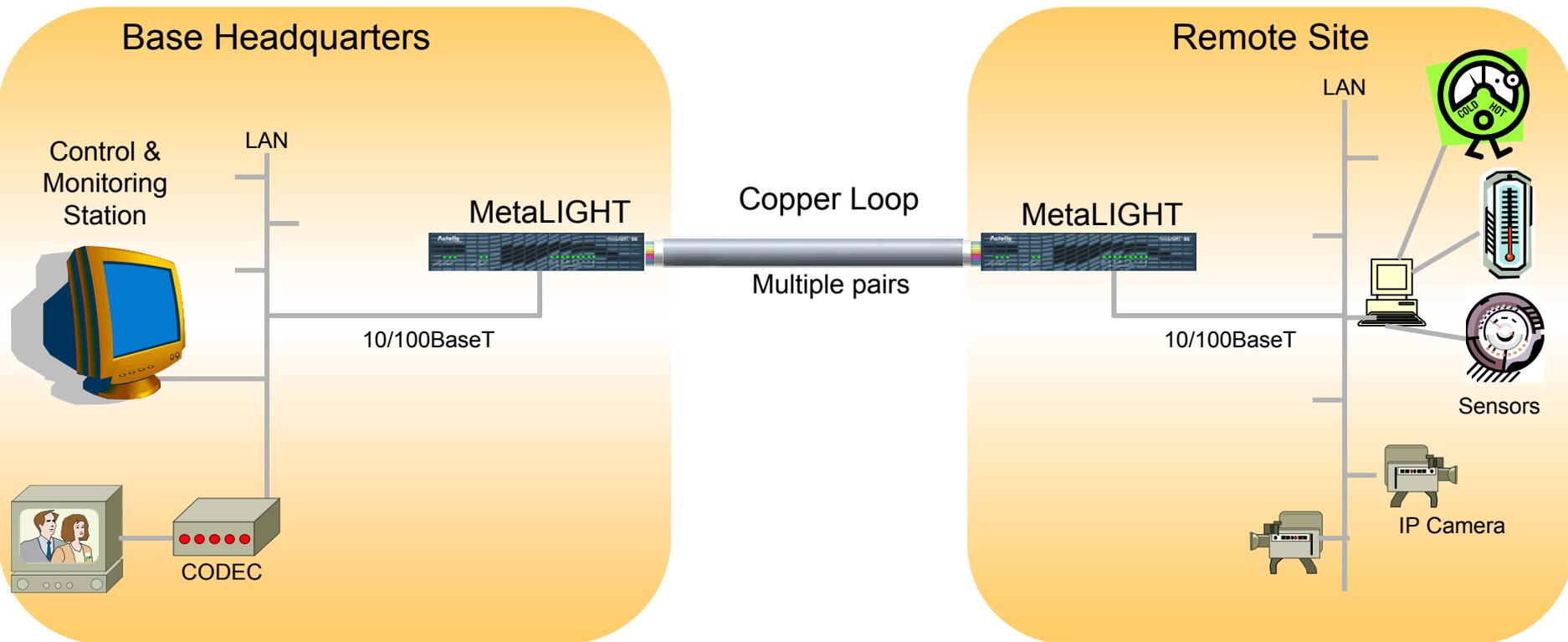
**A full 10Mbps Connection over just 2 pairs  
Up to 40Mbps over 8 pairs**





# Remote Site Control

## Remote Video Surveillance

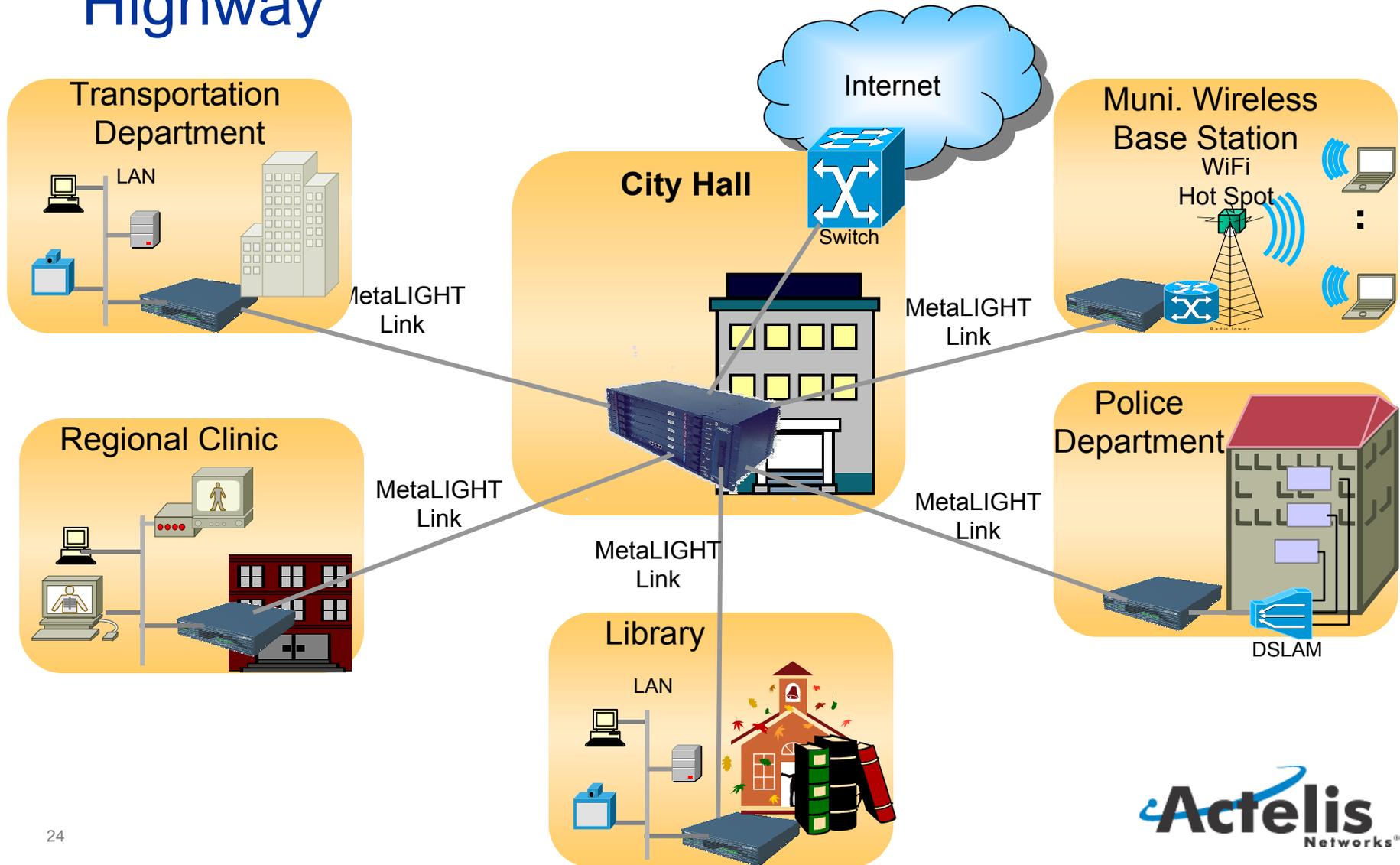


High resolution video monitoring may require 5Mbps link  
Can be served over 1 pair with EFMC LR !



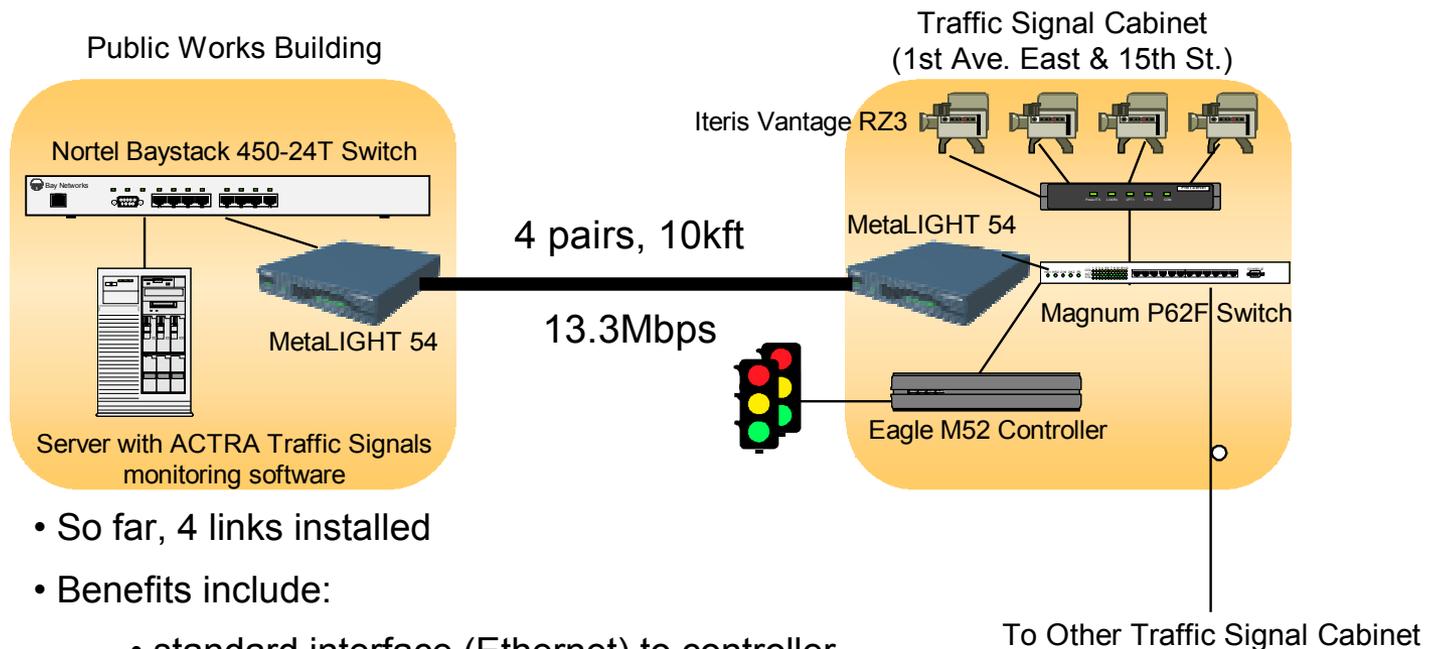


# Taking Municipalities to the Information Highway





# City of Cedar Rapids, Iowa – EFMC Serving Transportation Technology

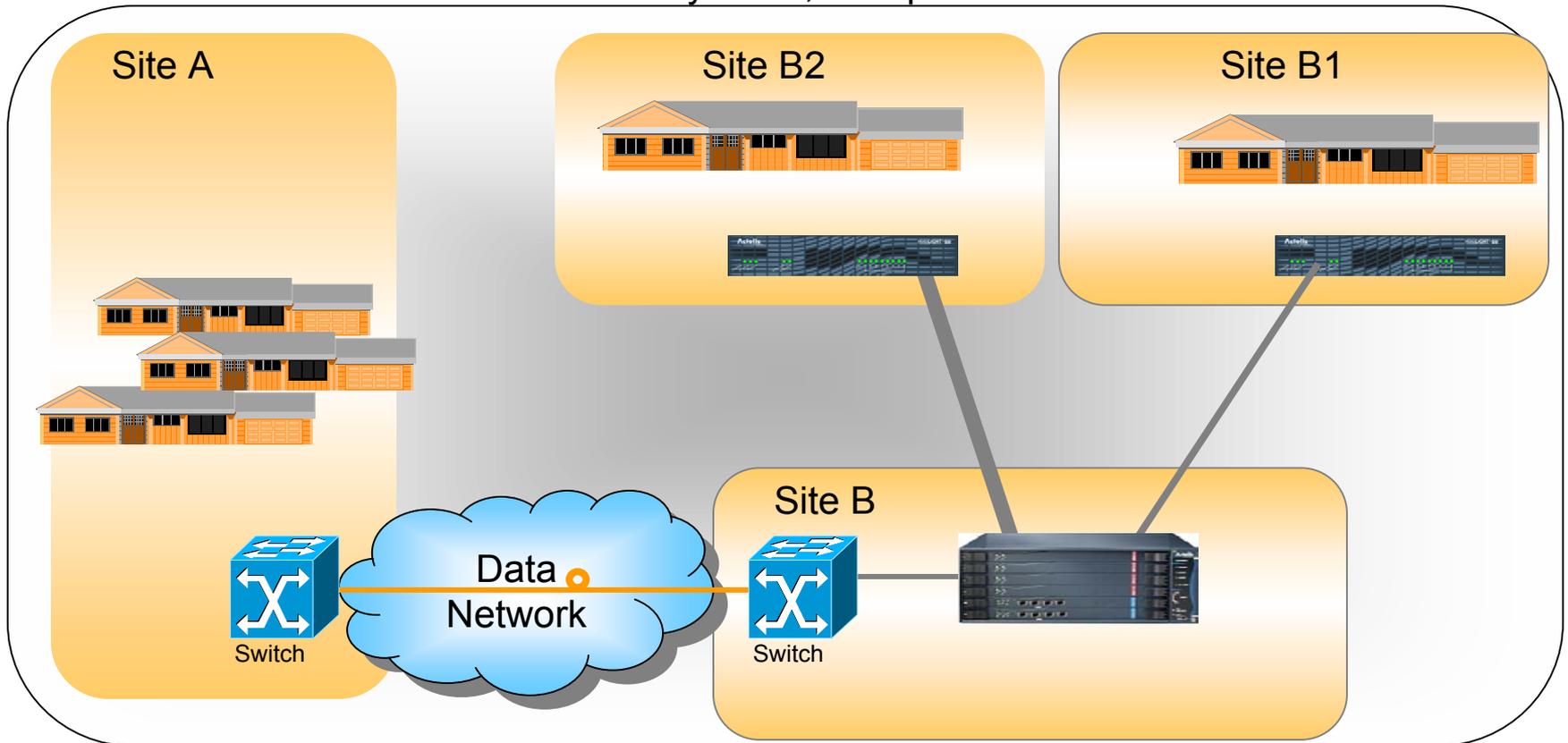


- So far, 4 links installed
- Benefits include:
  - standard interface (Ethernet) to controller
  - backhauling of video detectors signals for high quality live video (over 20FPS) monitoring
  - Car count information
  - WiFi base stations connectivity
  - Additional future security applications



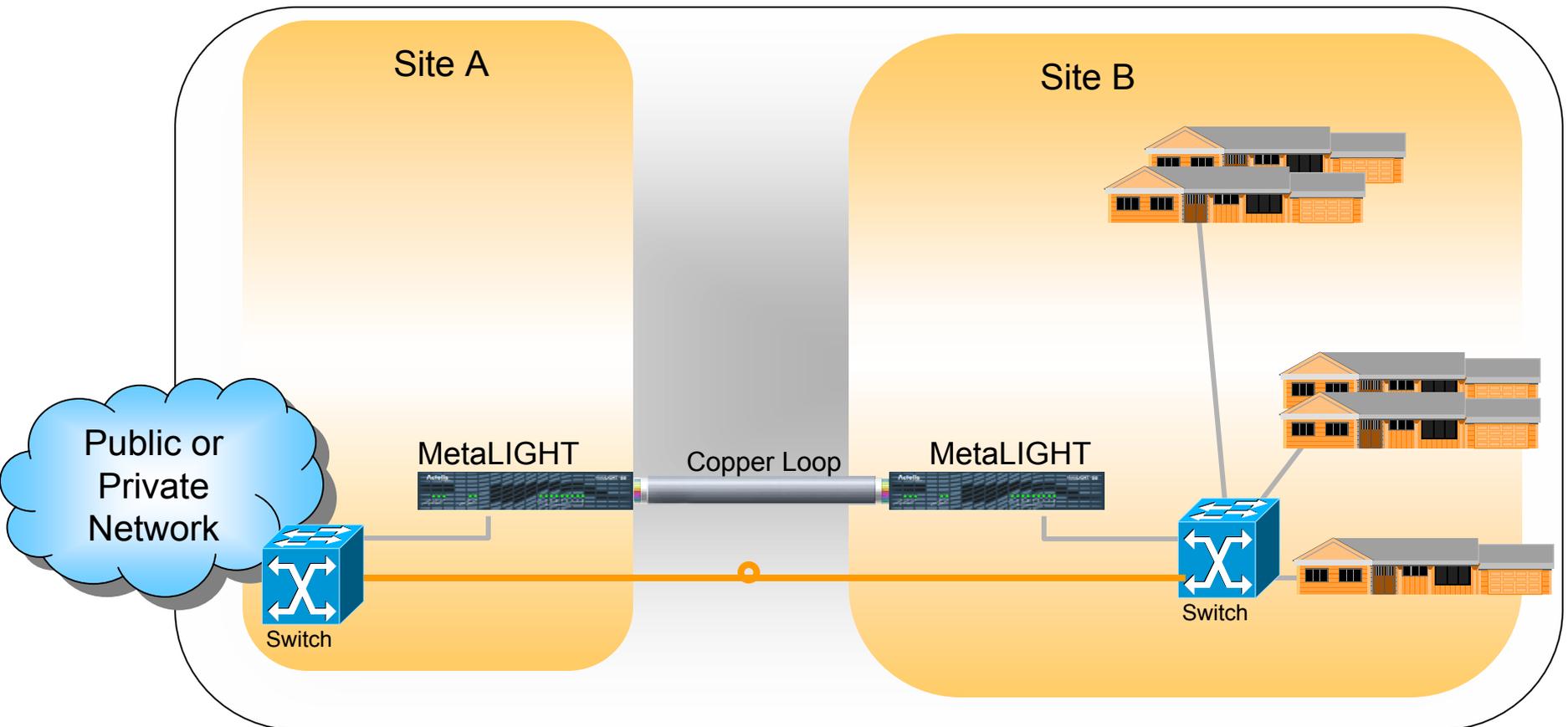
# Service Distribution within Base/Campus or between Bases/Sites

Army Base, Campus



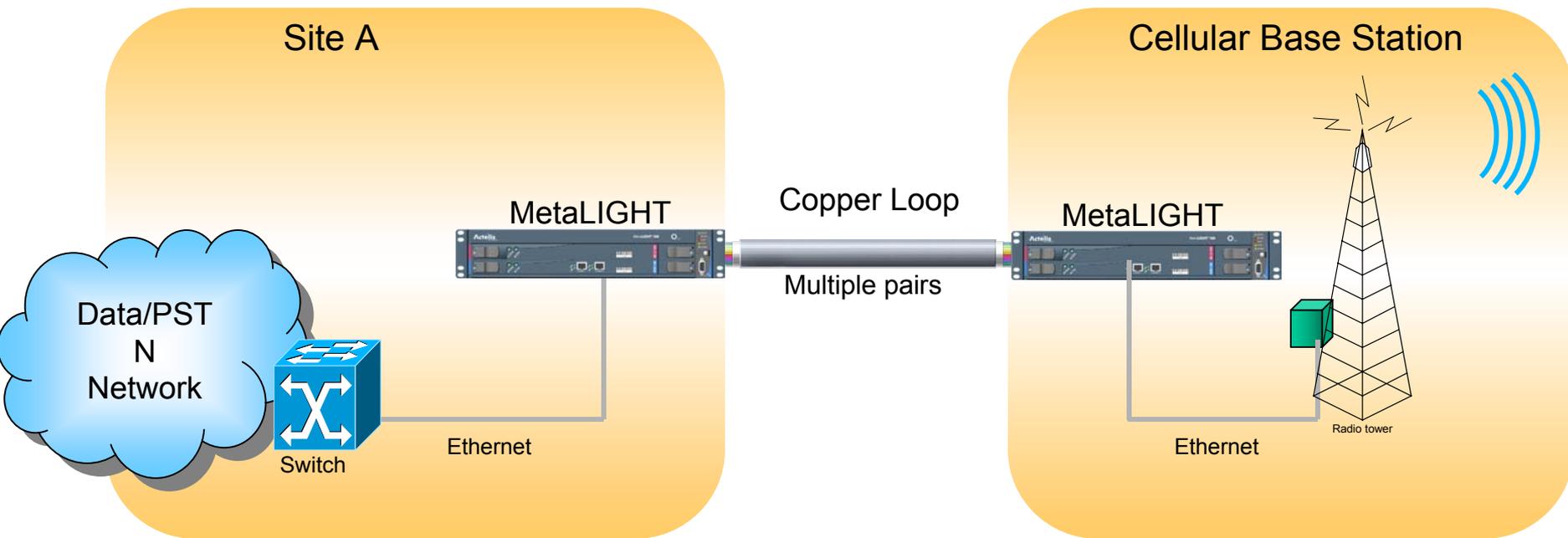


# Alternate routing – backup for fiber





# Cellular Base Station Backhaul





# Summary

- EFMC LR is a new Ethernet interface
- Allows ubiquitous Ethernet deployment over existing copper
- Long reach allows practical intra-building connectivity
- Exists and deployed today – field proven
- EFMC LR changes the campus networking architecture and increase productivity and efficiency



# Thank You!

[www.actelis.com](http://www.actelis.com)

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