



## MANAGED NETWORK SERVICES

FCX's suite of connectivity and managed network services solutions through various partner vendors allow for customized solutions. Choose the right solution by operation and site type. By bringing in different partner carriers, the most customized WAN set-up with suitable speeds, visibility, management levels and redundancy can be achieved for any size budget. The portfolio ranges from low-cost mobile kiosk solutions to the most secure type of services at highest available speeds with layered security and full visibility into node performance, as well as flexible remote management tools through use of a customer portal. FCX can offer remote site qualification through use of a fiber locator – your FCX consultant will provide an overview of services available at your site upon request for selection.

### PRODUCT HIGHLIGHTS:

- Affordable shared internet access: coax cable connectivity
- Affordable yet dedicated internet access: Ethernet DIA
- Fiber to Internet: Ethernet over Fiber (EoF), Fiber and FiOS
- Business WiFi wireless technology
- Static and Dynamic IP Addresses
- 4G LTE Cellular broadband connectivity
- 5G Cellular broadband connectivity
- Cloud connectivity using public internet and cloud prioritization Internet access
- Direct Ethernet Cloud Connect
- Multiprotocol Label Switching (MPLS). Stand-alone service.
- Software defined wide area network (SD-WAN). Stand-alone service.
- Secure Access Service Edge (SASE). Different components per provider.
- Internet Protocol Virtual Private Network (IP VPN)
- Highly secure private networks available:
  - ✓ Metro-E Advanced Private Line (MAPL)
  - ✓ E-Line
  - ✓ Ethernet Virtual Private Line (EVPL)
  - ✓ Ethernet Local Area network (E-LAN)
- Mitigation of the impact of distributed denial-of-service attacks (DDOS protection)
- Fixed wireless broadband
- Satellite broadband
- Dark fiber network connectivity
- Wavelength bandwidth connection
- Small cell for building owners available
- Towers for landowners available

# FIRSTLIGHT CLOUD XCHANGE

TECHNOLOGY DESCRIPTION	KEY FEATURE DESCRIPTION	SPECIFICATION
AFFORDABLE SHARED INTERNET ACCESS: COAX CABLE CONNECTIVITY.	Coax available from premier carriers such as Spectrum, RCN and Altice on a direct basis, or part of an aggregated package offered by an aggregator offering one bill for various services.	Coax: cable network connectivity available. Coax speed: Asymmetrical. Speeds: 10/35 MB up to 1 GIG/50 MB. Best effort service not suited for critical applications.
AFFORDABLE YET DEDICATED INTERNET ACCESS: ETHERNET DIA (ETHERNET OVER COPPER)	Most common form of internet access due to high availability and affordability levels. Includes transport and access to organization location.	Low-cost ethernet: Tier 3, 2 connectivity Enhanced ethernet: Connections to multiple Tier 1 peering points and data centers. IPv6- compatible, dual stack connection available, configuration of routing and primary/secondary DNS registration. Loop: Copper.  Last mile: Incumbent carrier or competitive carrier as well as dark fiber options. Speeds: 5 MB up to 20 MB. Can not exceed 20 MB.
FIBER TO INTERNET: • ETHERNET OVER FIBER (EOF) • FIBER • FIOS	Ethernet over Fiber leverages the carrier's fiber network and has higher capacity than a copper network. FiOS would be offered through Verizon Businesses' low cost, reliable fiber internet access option	Fiber Speeds: 1 GIG up to 10 GIG. Loop: Fiber.  Last mile: Depends on the building location; depending upon the facilities on organization location. Optical Transport from 1 GIG to 800 GIGS.  Router: Varies. Included. High-throughput, low-latency available. SLAs available.
BUSINESS WIFI WIRELESS TECHNOLOGY	Private WiFi for businesses with or without public network for guests.	Often comes as a package with coax of FIOS service.
STATIC AND DYNAMIC IP ADDRESSES	Static IP addresses for application allocation. Dynamic IP Addresses are more cost effective.	Amount: as many as needed per location.

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TECHNOLOGY DESCRIPTION	KEY FEATURE DESCRIPTION	SPECIFICATION
4G LTE CELLULAR BROADBAND CONNECTIVITY	Ideal for back-up. Automatic failover and failback options available. Professional installation, and hardware for back-up available. Secure signal.	Technology: Speeds: up to 10 Gbps symmetrical speed available. Hardware for back-up: DUAL SIM 4G LTE Wireless modem. Uninterruptable power supply (UPS) and indoor antenna.
5G CELLULAR BROADBAND CONNECTIVITY	Fast speeds allowing for IoT and reliable back-up services. Low latency; suitable for video applications. Dynamic spectrum sharing available (DSS) allowing carriers to transmit 4G and 5G on the same channels to increase flexibility. Portable options available. Hardware options available for fail-safe and disaster recovery purposes.	Technology: Speeds: up to 20 Gbps High-band frequency of millimeter wave available. Security: closed, dedicated tunnels and 3GPP 5G standard over the air encryption available.
CLOUD CONNECTIVITY USING PUBLIC INTERNET AND CLOUD PRIORITIZATION INTERNET ACCESS	Enables organizations to dynamically reserve a portion of normal internet bandwidth for select cloud applications. Traffic prioritization for both incoming and outgoing traffic. SLA-backed service for traffic to the cloud. Cloud prioritization to Microsoft cloud services.	Speeds: Client can decide how much bandwidth is allocated.
DIRECT ETHERNET CLOUD CONNECT	Direct cloud connectivity providing secure, high-performance end to end connectivity. Access AWS, Microsoft, Google directly without touching the internet. Direct connection between site and data center.	Speeds: 100 MB up to 10 GIG
MULTIPROTOCOL LABEL SWITCHING (MPLS)	Uses packet-forwarding technology and labels to make data-forwarding decisions for IP traffic on network. Based upon a routing technique that directs data from one node to the next based on labels rather than network addresses. Label is imposed between Layer 2 and Layer 3 headers which results in high quality service and reliability. Ideal for secure connectivity between headquarters and data center locations, in combination with SD-WAN for primary access for smaller and branch offices.	Speeds: 10 MB to 10 GIG. SLAs available. Types: Layer 2 VPNs, Layer 2 circuits, and Layer 3 VPNs Global service available.
SOFTWARE DEFINED WIDE AREA NETWORK (SD-WAN)	Virtual WAN architecture that allows organizations to use different types of transport (coax, ethernet, fiber etc.) to surely connect users to applications. Uses software-defined network technology whereby encrypted overlay tunnels ensure safe connectivity.	Types: Managed of overlay. Global service available. Speed: 100 MB to 10 GIG Multi-Platform available.

TECHNOLOGY DESCRIPTION	KEY FEATURE DESCRIPTION	SPECIFICATION
<p>SOFTWARE DEFINED WIDE AREA NETWORK (SD-WAN)</p> <p>(CONTINUED)</p>	<p>Overlay available: Partner carrier provides organization with a network edge device that contains the software necessary to run the SD-WAN technology.</p> <p>Managed SD-WAN available:</p> <ul style="list-style-type: none"> <li>• Monitoring, reporting, analytics</li> <li>• Same IP address failover</li> <li>• Application visibility and control in portal</li> <li>• Application QoS and SLA</li> <li>• Dynamic path selection for optimization of performance</li> <li>• Multiple WAN links options</li> <li>• Site to site VPN available</li> <li>• IPSec overlay</li> <li>• CGNAT, VLAN</li> <li>• DNS, DHCP, LAG on LAN</li> <li>• L4 stateful firewall available</li> <li>• Routing and load balancing available</li> <li>• Appropriate throughput for each individual case</li> <li>• Service chaining and gateway</li> <li>• High availability</li> <li>• FEC, cloning, striping</li> <li>• ZTP and remote management</li> <li>• SaaS optimization</li> </ul>	<p>Bring Your Own Broadband (BYOB) or Complete Network Management options available.</p> <p>slas available.</p> <p>HIPAA Compliant service for Managed SD-WAN available.</p>

## TECHNOLOGY DESCRIPTION

### SECURE ACCESS SERVICE EDGE (SASE)

## KEY FEATURE DESCRIPTION

Delivers wide area network and security controls as a cloud computing service directly to the source of connection rather than a data center.

An option for organizations where applications, users, and devices moved outside of the traditional corporate zone of control. It addresses the complexity of software-defined secure access and therewith reduces risk.

## SPECIFICATION

Capabilities and technologies as part of an overall solutions set:

WAN components:

- Software-Defined Wide Area Network (SD-WAN)

- Network functions virtualization (NFV)

Network Access:

- Secure Web Gateway (SWG)
- Cloud Access Security Broker (CASB)
- NGFW and Firewall as a Service (FWaaS)
- Zero Trust Network Access (ZTNA)

Centralized Management:

- Identity Management, Authorization, Authentication

Analytics:

- Security/Network OPS, SPoG

# FIRSTLIGHT CLOUD XCHANGE

TECHNOLOGY DESCRIPTION	KEY FEATURE DESCRIPTION	SPECIFICATION
INTERNET PROTOCOL VIRTUAL PRIVATE NETWORK (IP VPN)	IP VPN offers load balancing and allows for aggregation of multiple private, MPLS and public networks without additional equipment at the provider's site Centralized visibility, intuitive self-service control and automated features available.	<p>Options: On-net access, Off-net access, Point-of-Presence (PoP), Provider Edge (PE), PE card, Customer edge (CE) equipment.</p> <p>Access Types available:</p> <ul style="list-style-type: none"> <li>• Ethernet Switched</li> <li>• Wavelengths</li> <li>• Cross Connects</li> </ul> <p>Port types available:</p> <ul style="list-style-type: none"> <li>• Fast Ethernet</li> <li>• Gig Ethernet</li> <li>• 10 Gig Ethernet</li> <li>• 100 Gig Ethernet</li> </ul> <p>SLAs available. 24/7 monitoring available.</p> <p>Service providers who offer portal access for near real-time network views, SLA metrics and network management in FCX portfolio.</p>
METRO-E ADVANCED PRIVATE LINE (MAPL)	Comprises of point-to-point Ethernet virtual circuits over dedicated fiber. Dedicated fiber does not pass through public switches nor cloud. Ethernet switches deployed by provider on premises and managed by provider. Flexible in scalability	<p>Technology: Layer 2 Ethernet over fiber.</p> <p>Throughput: 1 Gbps-10Gbps</p> <p>Interface: 10GIGE</p> <p>Framing: Jumbo Frames up to 9100</p> <p>Network Management: 24/7 monitoring and surveillance</p> <p>Network Options: Metro Configurations</p> <p>Availability: US Metro Areas</p> <p>Architecture: Point-to-point</p>

# FIRSTLIGHT CLOUD XCHANGE

## TECHNOLOGY DESCRIPTION

## KEY FEATURE DESCRIPTION

## SPECIFICATION

### E-LINE

E-Line uses Ethernet over Multiprotocol Label Switching (MPLS), and over Dense Wave Division Multiplexing (DWDM) technology. This solution is cost effective, offers predictable latency and high priority traffic routing.

Technology: Layer 2 Ethernet over DWDM or fiber

Throughput: 50Mbps- 100Gbps

Interface: GigE or 10GigE

Framing: Jumbo Frames up to 9100

Network Management: 24/7 monitoring and surveillance

Network Options: Long-haul and metro configurations

Availability: Nation-wide in specific areas

Architecture: Point-to- point or point-to-multipoint

### ETHERNET VIRTUAL PRIVATE LINE (EVPL)

Ethernet virtual private line (EVPL), provides a point-to-point Ethernet virtual connection (EVC) between two UNIs (User-Network Interfaces), with an emphasis on transparency. An EVPL permits service multiplexing, allowing multiple EVCs to be supported at the UNI.

Technology: Layer 2 Ethernet over MPLS or fiber

Throughput: 10Mbps-10Gbps

Interface: GigE or 10GigE

Framing: Jumbo Frames up to 9100

Network Management: 24/7 monitoring and surveillance

Network Options: Long-haul and metro configurations

Availability: Nation-wide in specific areas

Architecture: Point-to- point, point-to-multipoint, multi-point to multi-point

# FIRSTLIGHT CLOUD XCHANGE

TECHNOLOGY DESCRIPTION	KEY FEATURE DESCRIPTION	SPECIFICATION
ETHERNET LOCAL AREA NETWORK (E-LAN)	Ethernet local-area network (ELAN), uses Ethernet cable to connect PCs, servers, printers and other devices that reside within a close geographical area, typically within a single office or building. An ELAN is designed to enable fast data transmissions among devices on the local-area network and to the Internet; it's seamless LAN to LAN connection.	<p>Transport: Copper or fiber optic Ethernet cables. Standards-based service with MEF 2.0 certifications available.</p> <p>Architecture: Single interconnection with hub. Interconnection aggregates all data traffic on a single network. All business locations can be linked.</p> <p>Data privacy available; information traverses a secure domain of a layer 2 point-to-point connection. Offers traffic separation.</p>
MITIGATION OF THE IMPACT OF DISTRIBUTED DENIAL-OF-SERVICE ATTACKS (DDOS PROTECTION)	Proactive monitoring of network specifically for data connectivity	Options; Application, Network and website protection. Often bundled with connectivity solution.
FIXED WIRELESS BROADBAND	Dedicated Internet Access over Microwave. Ideal for organizations located in brown spots and for events. 100% diverse. No underground wires. Installation within 5 days available. Combination with fiber connectivity available and automatic failover.	<p>Speeds: 10 MB to 1 GIG. 10 GIG also available; special built in serviceable area.</p> <p>Technology: Private Access Connection (layer 2 or layer 3). Not traversing the public Internet.Or managed enterprise network service (MENS). 24/7 monitoring.</p> <p>Event options available: obtain bandwidth at special venues for the duration of the event only.</p>
SATELLITE BROADBAND	In certain areas where broadband connection is not yet offered this is a viable option.	Speeds: 12 MB – 500 MB Modem included. Service has data caps.
DARK FIBER NETWORK CONNECTIVITY	High-capacity network solution for organizations needing unlimited bandwidth. Offers complete service control and reliability. Private physical network infrastructure on own dedicated strands of fiber. Own choice of equipment available. Scalable.	Speeds: 10 MB up to 1 Terrabite.