



ATLANTA, GA
OCTOBER 11-14

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2021 Fall
Technical Forum
SCTE • NCTA • CABLELABS

Wireline Access Network

Maximizing Returns on the Path to DOCSIS 4.0

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Shaw)



#1

Fastest Broadband in Canada

Ookla ranked Shaw the fastest fixed broadband provider in Canada in Q2 2021

90%

Mid-Split Complete

Shaw began upgrading the HFC network to 1GHz/85MHz in 2017 and expects to be complete within a year

.1%

Network Congestion

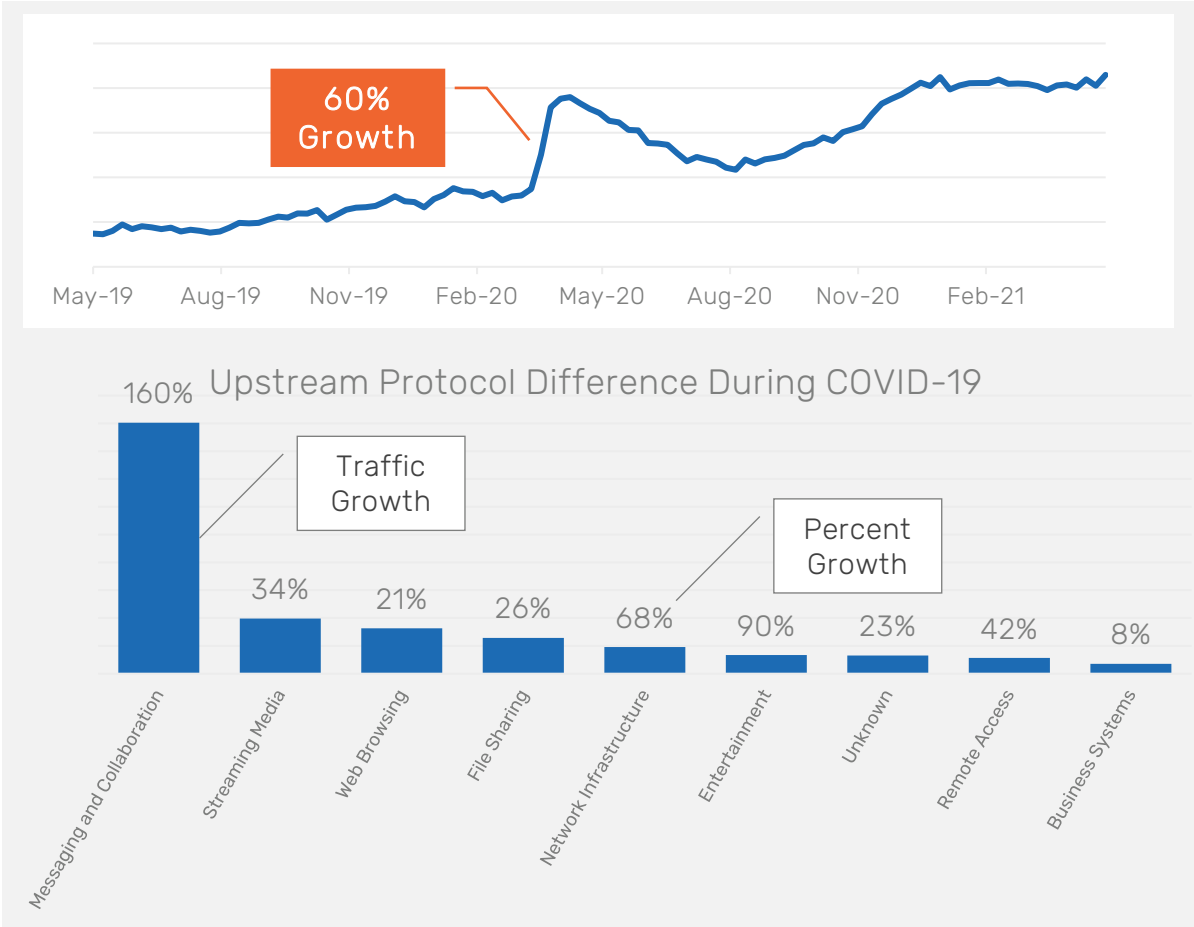
Network congestion has been at historic lows and did not materially change during the COVID-19 pandemic

1Gbps

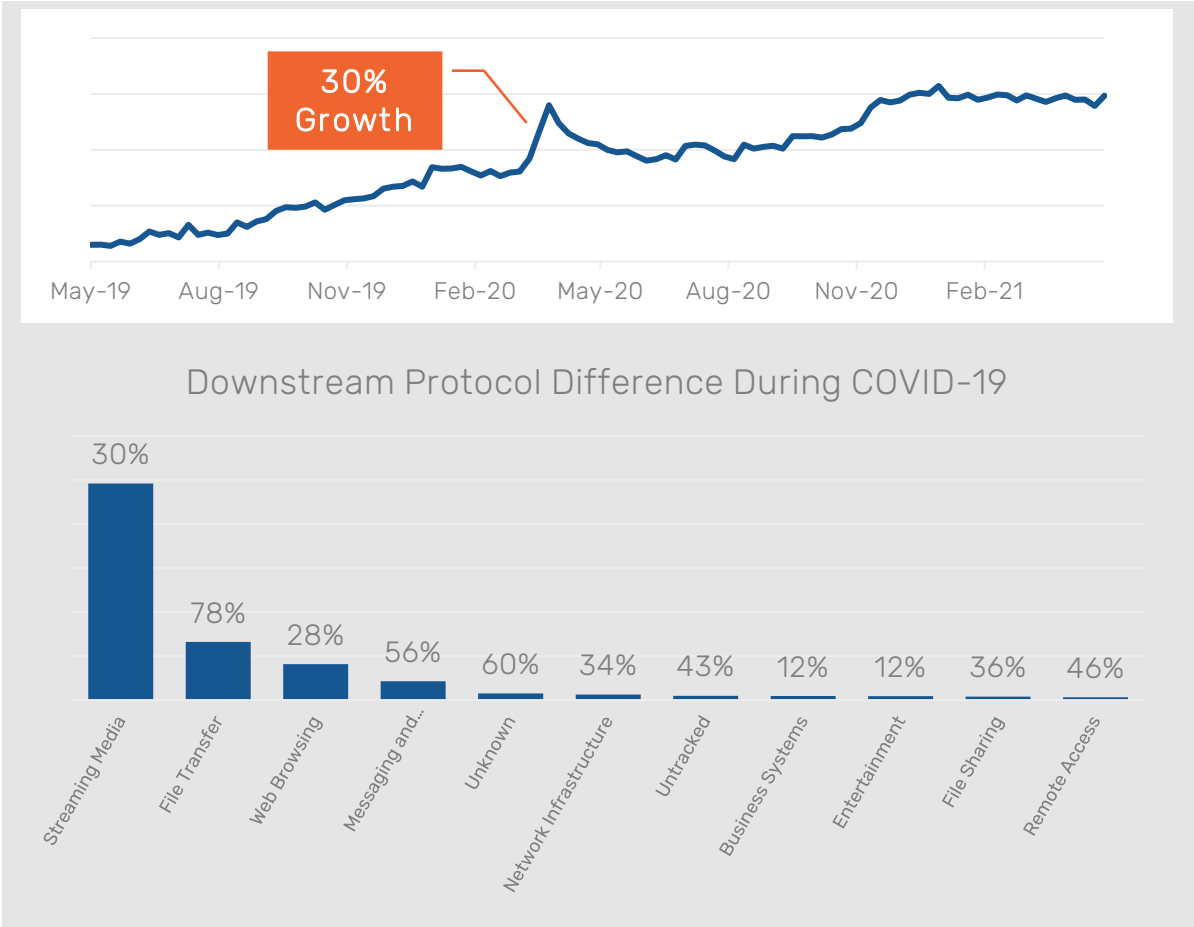
Tier Available to 99% of the Network

In mid-split areas a 1Gbps/100Mbps tier is offered. A 1.5Gbps/100Mbps tier is available to 80% of the network

The Path to DOCSIS 4.0 | COVID-19 Performance



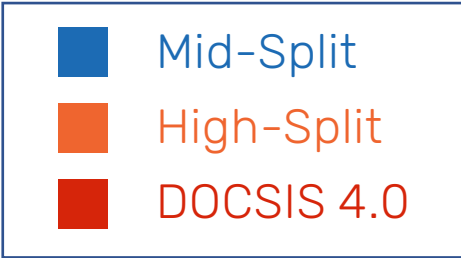
Upstream



Downstream

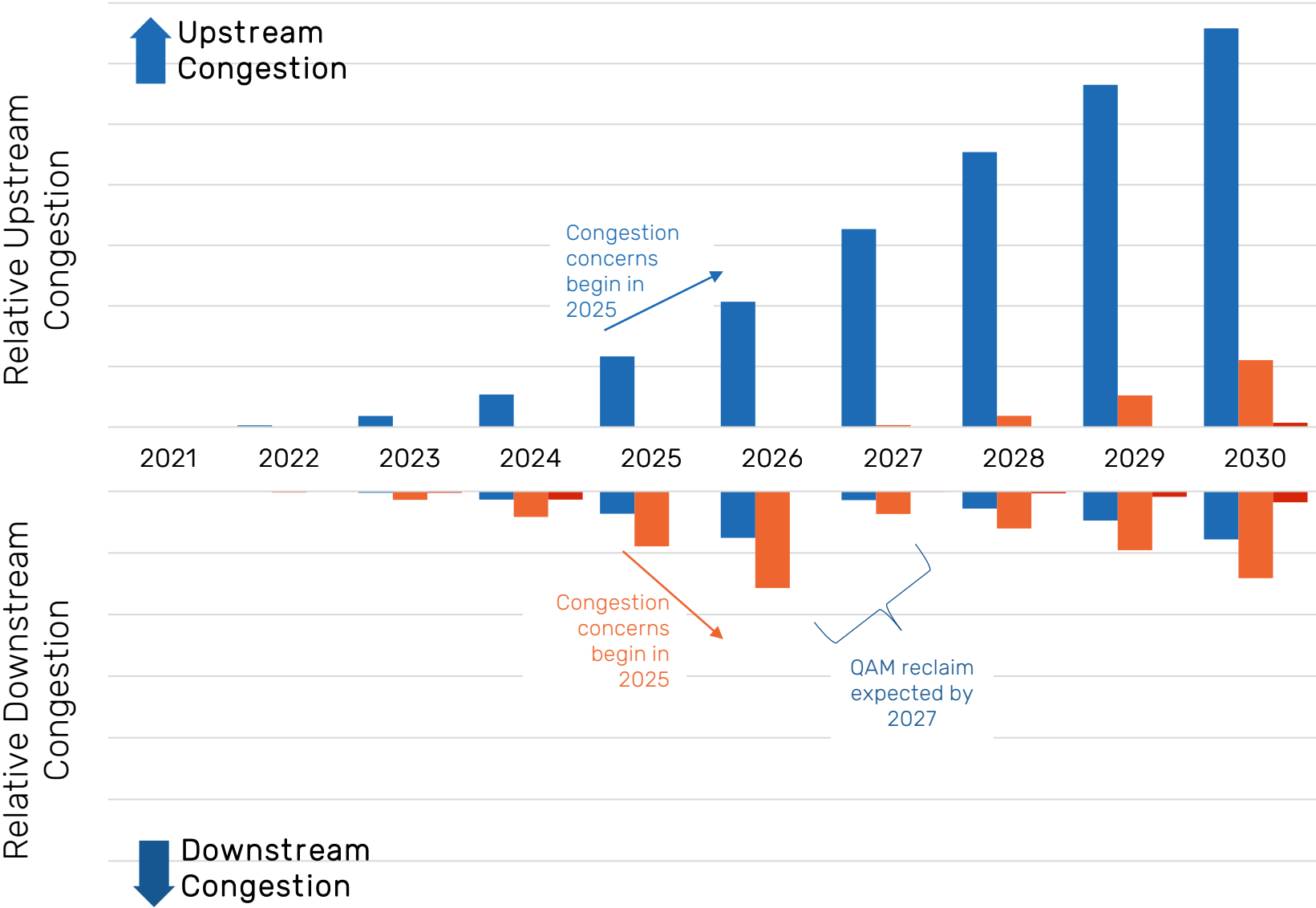
The Path to DOCSIS 4.0 | Need for Upgrade

- In the mid-split and high-split scenarios congestion rises until QAM reclaim in 2027
- Mid-split begins see significant congestion beginning in 2025
- D4.0 keeps congestion under control



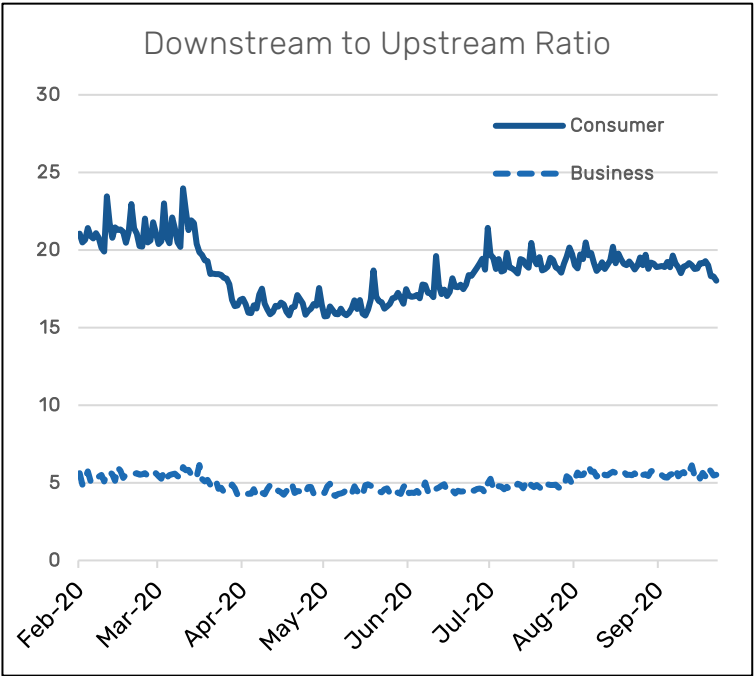
Forecasts assumes

- 15% Downstream Broadband CAGR + IPTV transition
- 25% Upstream Broadband CAGR + IPTV transition



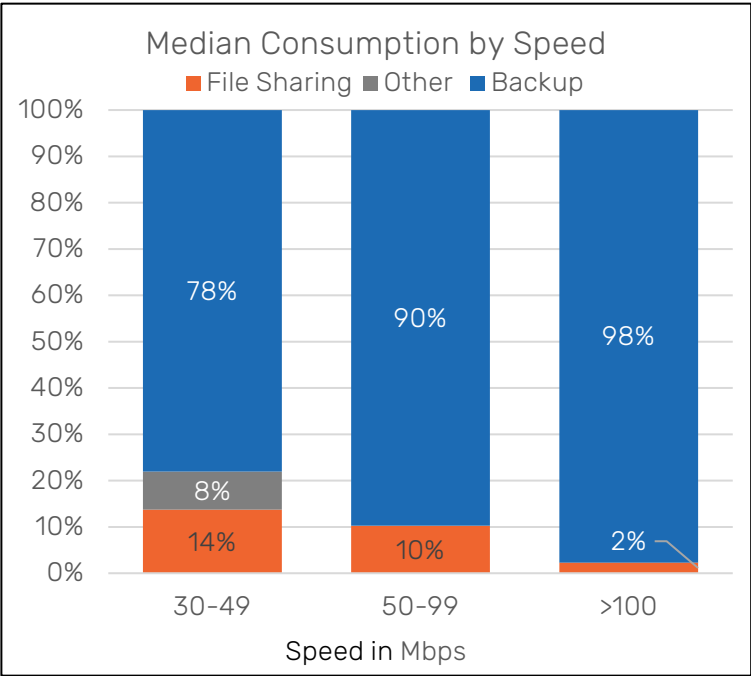
Traffic Symmetry

Even during COVID-19 the downstream-to-upstream ratio observed on our network was above 15:1 for consumer and stayed close to 5:1 for business



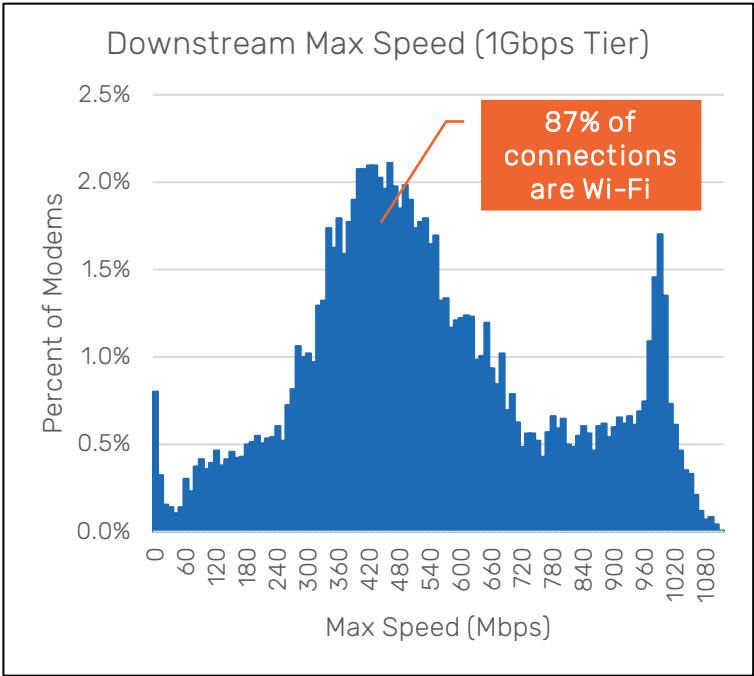
Upstream Usage

The majority of consumption on our higher upstream tiers was backup and file sharing, both background applications that may not impact the customer experience



Downstream Capability

There is a bottleneck, likely due to in-home Wi-Fi that is currently limiting the majority of customers on a 1Gbps tier from hitting their peak speed



Competitive Environment



Aggressive Fibre to the Home

Canadian telcos have been aggressive in FTTP builds, which now represent 81% of Telus' broadband homes passed



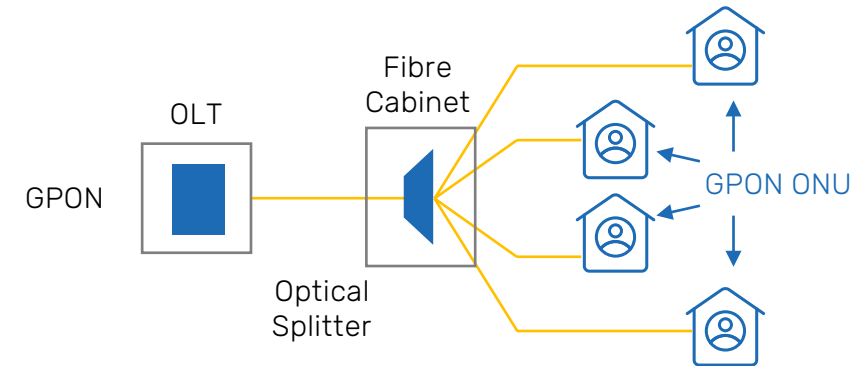
Symmetric Tier Offerings

Using GPON they are offering symmetric or near symmetric tiers, with a high tier of 1.5Gbps/940Mbps in most markets

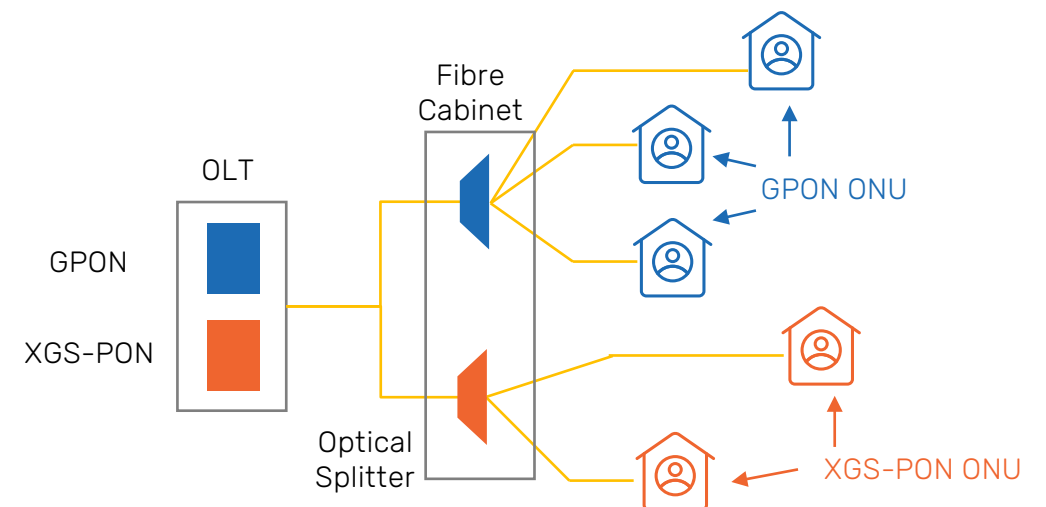


Simplified Upgrade Path










The FTTP network is future-proof and enables an upgrade to new PON technologies such as XGS-PON, which is 10Gbps capable, without plant re-work

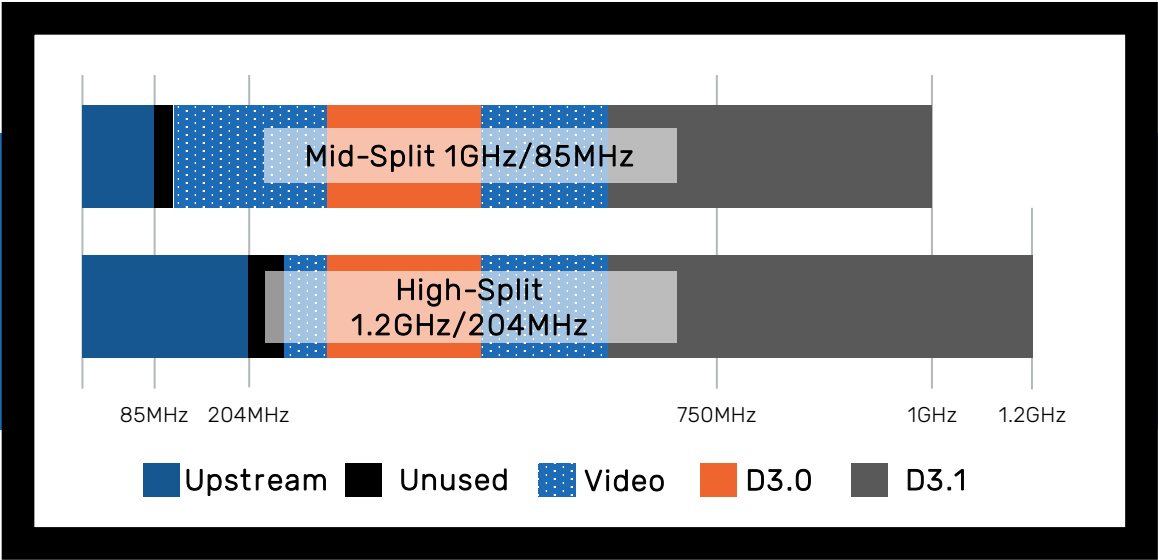


PON Coexistence



The Path to DOCSIS 4.0 | Upgrade Options

	Mid-Split	High-Split	D4.0 FDD	D4.0 FDX	FTTP
	Current State	Available Now	Beyond 2022	Beyond 2022	Strategic Option
 Technology	Mid-Split +1 GHz Module Upgrades & DOCSIS 3.1	DAA Nodes & Module Upgrades for Amp & Taps + OOB Removal	D4.0 FDD Upgrade of All Nodes & Amps to 1.8 GHz	N+0 Build (removal of all amplifiers)	Extensive Fibre Over- Build to All Homes
 Cost Per HP	\$	\$	\$	\$\$\$	\$\$\$\$
 Upgrade Rate					
 Capacity Created	4G / 400	4G / 1G	8G / 3G	7G / 5G	10G+ / 10G+



High-split upgrade increases US spectrum by 149% and DS spectrum by 7%



Out of Band Removal

Video set top boxes requiring the use of the OOB must be removed prior to upgrade



Signal Leakage

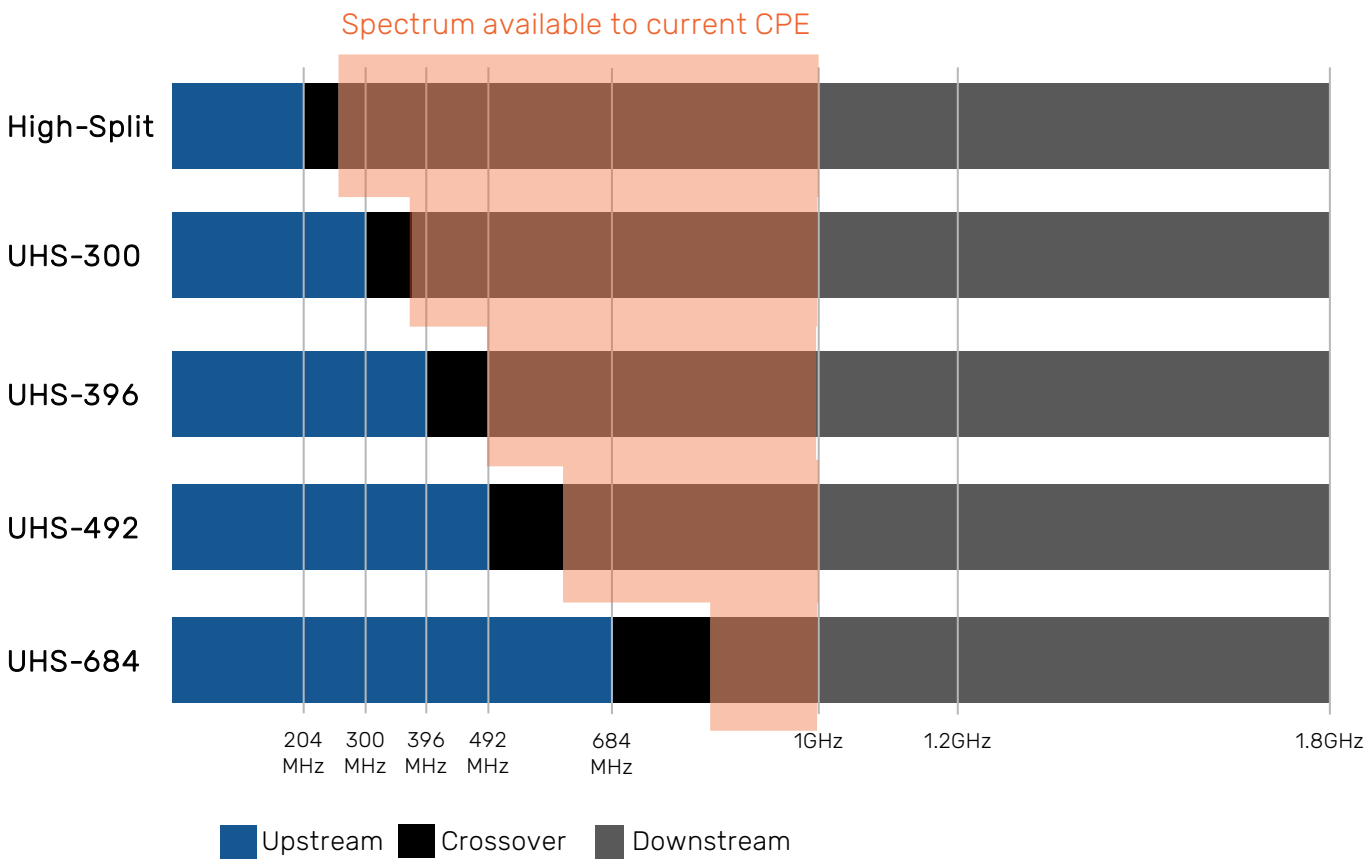
Signal leakage in the aeronautical band becomes an upstream issue for which a solution is required



MoCA

MoCA signals are used by whole-home video solutions and must be considered

DOCSIS 4.0 FDD increases downstream spectrum to 1.8GHz and allows for multiple duplex frequencies



Plant Characteristics

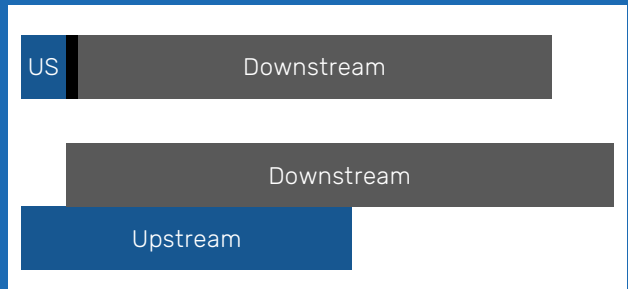
- A drop-in upgrade is expected to work in current plant cascades and spacings
- Performance gains can be realized as fibre is deployed deeper into the network



Band Plan

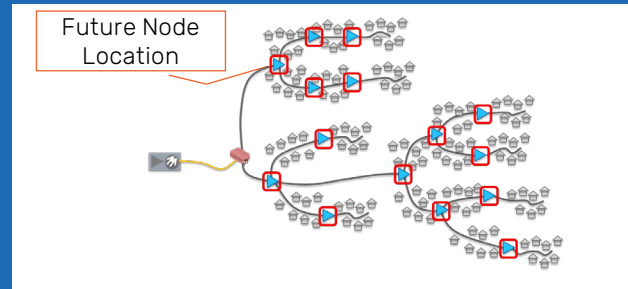
- For capacity purposes it is best to have a spectrum split similar to traffic ratios
- For competitive purposes it may be beneficial to offer symmetrical or near-symmetrical tiers

Spectrum Overlap



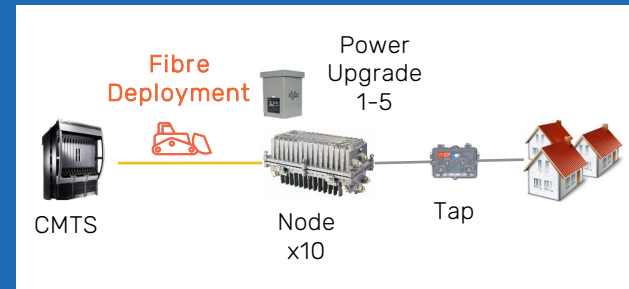
FDX allows US and DS spectrum to be overlapped, effectively doubling the spectral efficiency

N+0 Architecture



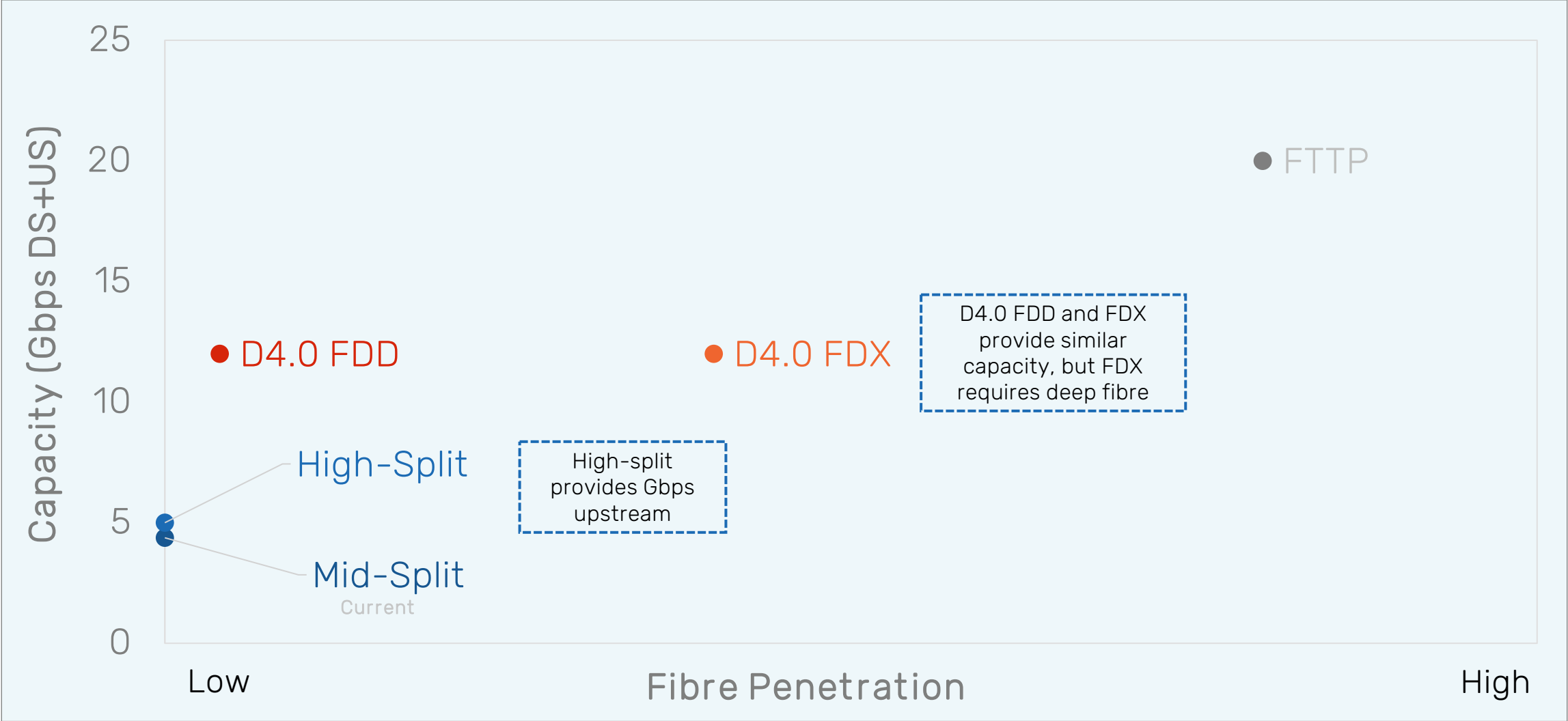
FDX requires an N+0 upgrade, the cost and speed of which is dependent on the mix of infrastructure types and agreements

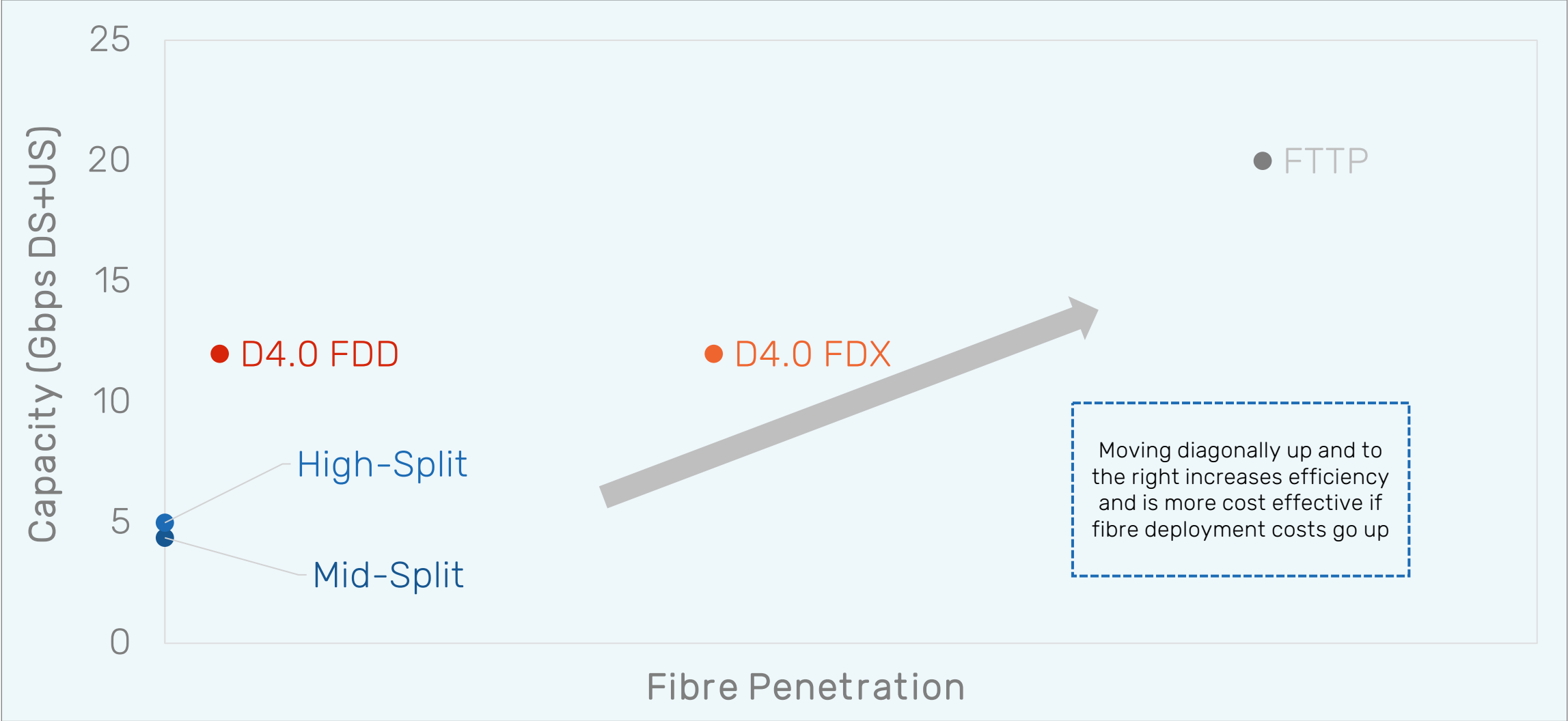
Operational Implications

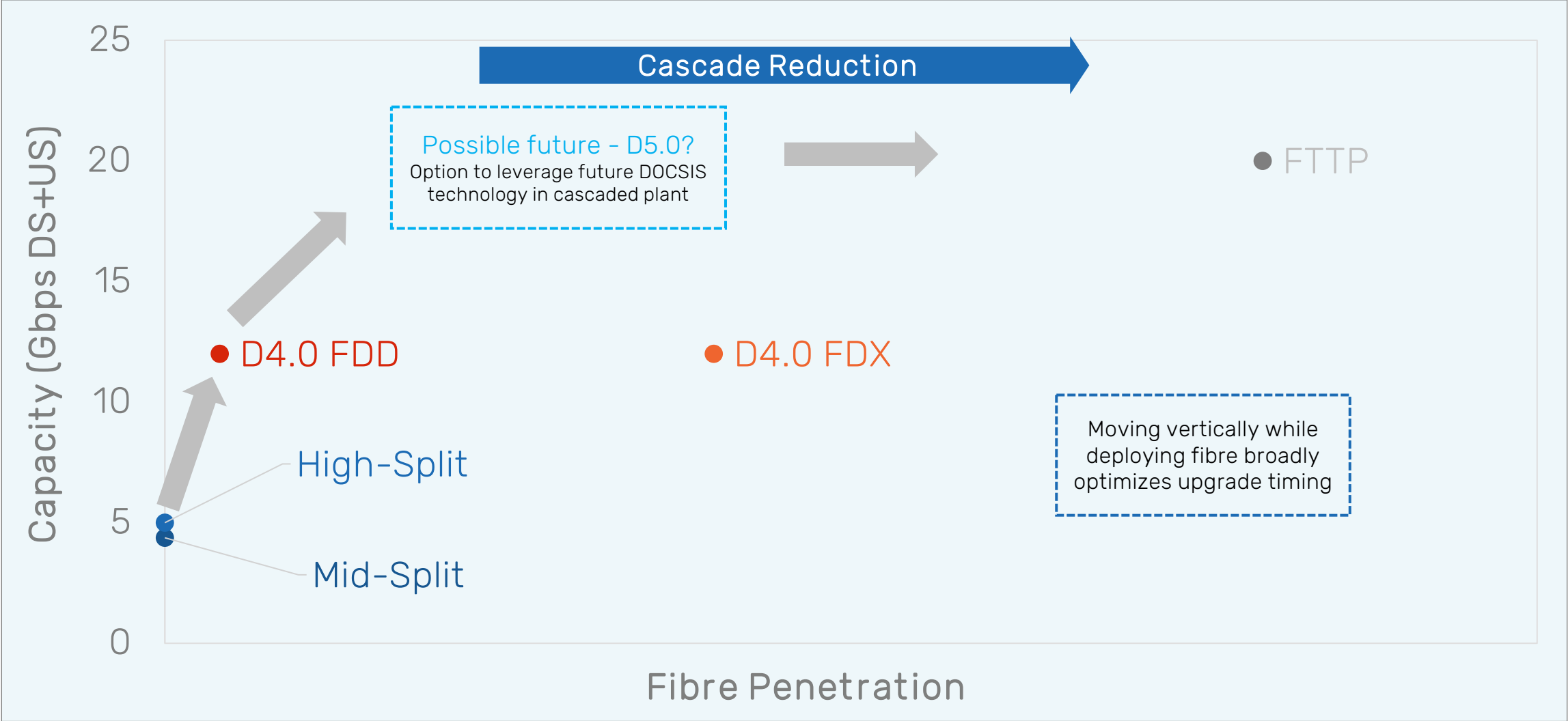


Required fibre builds are simpler in owned aerial infrastructure when compared to underground

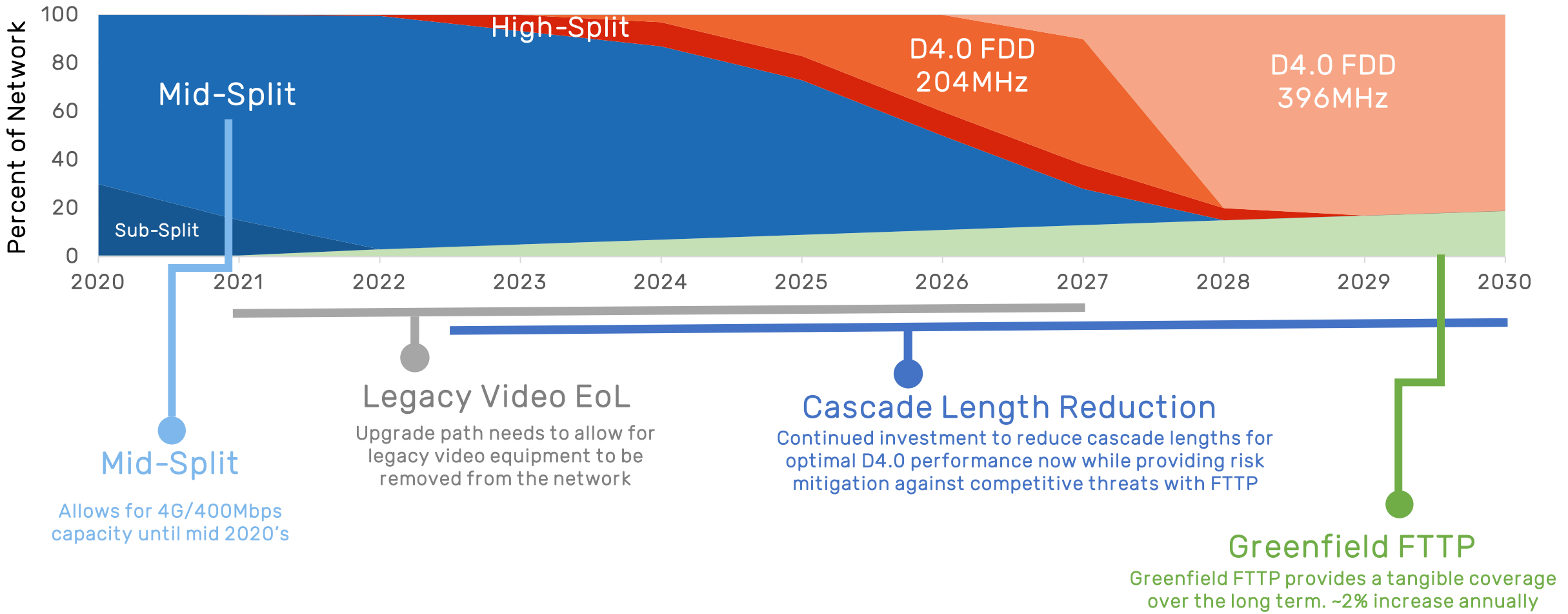
FDX uses spectrum efficiently, but requires extensive fibre builds







The Path to DOCSIS 4.0 | Potential Path





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Thank You!

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