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Deployment Choices and Trade-offs in FTTH Distribution Networks

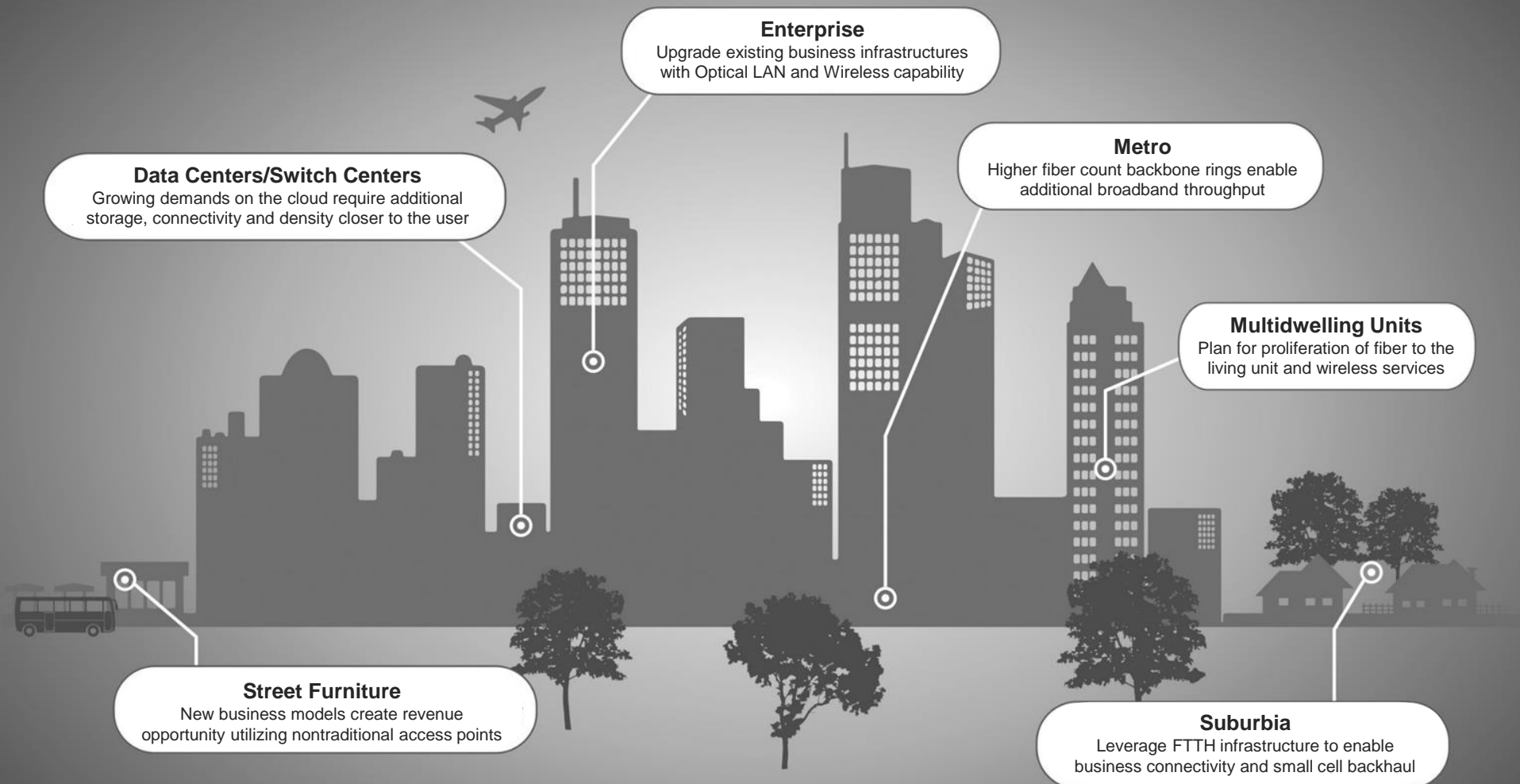
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Fiber to the Home (FTTH)
The right choice for communities



FTTH

A natural extension of the Fiber Network



Pain Points in FTTH Deployments



Speed

Optimization of contractor resources and management of skill bottlenecks

Cost

Management of complex and variable infrastructure deployments

Quality

Consistent delivery of aesthetically pleasing, low consumer impact, high quality networks

Skilled Labor Availability and Expense are Paramount

Solution centers around advanced “plug and play” solutions that require less skilled labor, opening the door for a wider range of laborers

Mitigate risk of deployment variation with unskilled labor by using preconnectorized technology





Before you Begin... the Business Case

- Fundamentals of the scope of the build must be set forth:
 - Number of available residential subscribers
 - Competitive offerings
 - Expected take rates
 - Business/anchor institution needs
 - Future services (wireless, security, smart grid, etc.)
 - Population growth
 - Service offerings and ARPU

FTTH

Considerations, Choices and Trade-offs

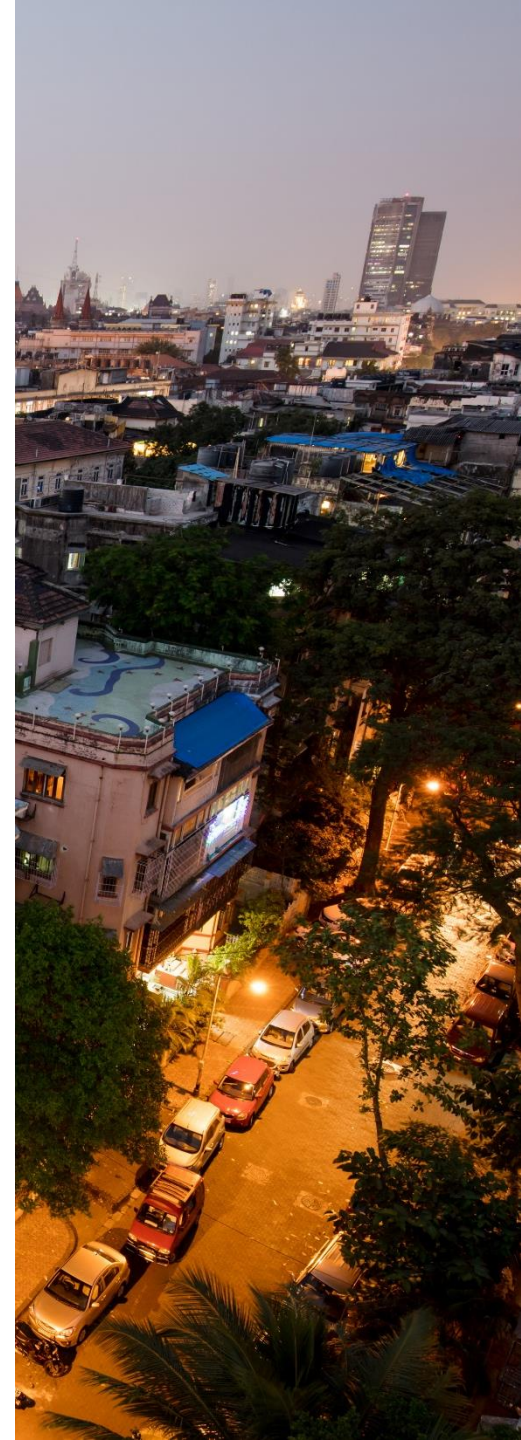
Connector Technology

Network Architectures

Deployment Methods

Network Elements

Subscriber Premise



Let's Step Back... to 2004

Average speed in 2004
was measured in kbps

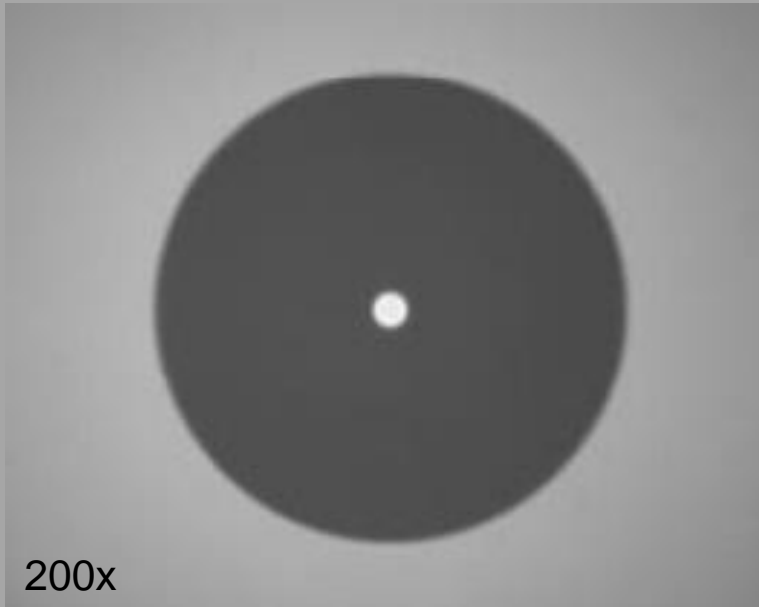


Hardened connectors were
first used in FTTH



A Natural Fear of Something New

How do you achieve this level of cleanliness...



...in an environment like this?



One Operator Saw the Potential...

...and it paid off!

*“The drop is accomplished by employing a **hardened connector** to reduce maintenance issues. The cost per drop may be initially higher than a splice, though it can be **done quicker and requires less skill** and auxiliary equipment.”*

– Verizon, FTTP: Lessons Learned, OFC 2005

Paving the way for millions of homes passed globally!



Homes Connected
and Growing

Global Adoption of Hardened Connector Technology



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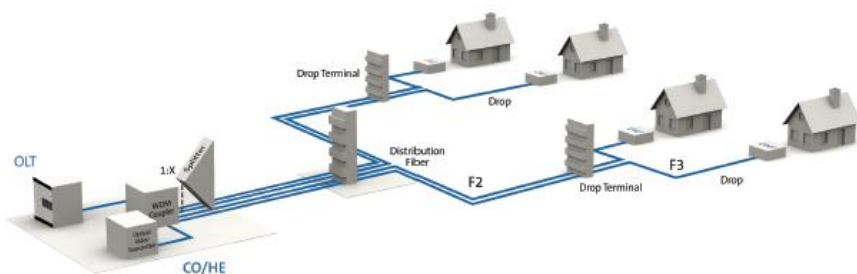
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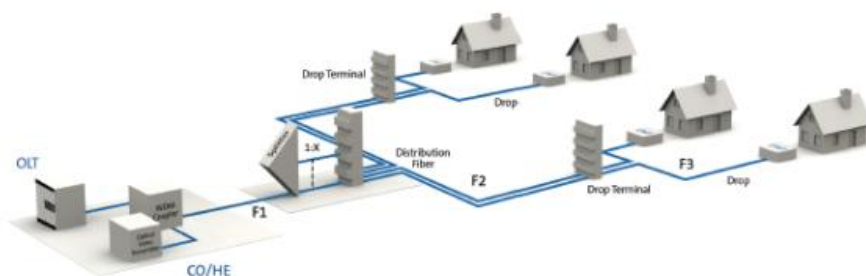


FTTH Network Architectures

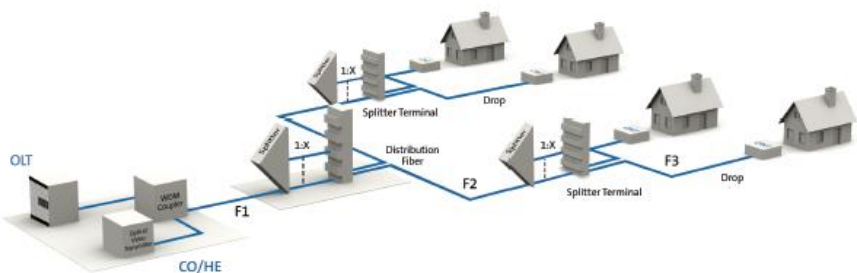
Home Run



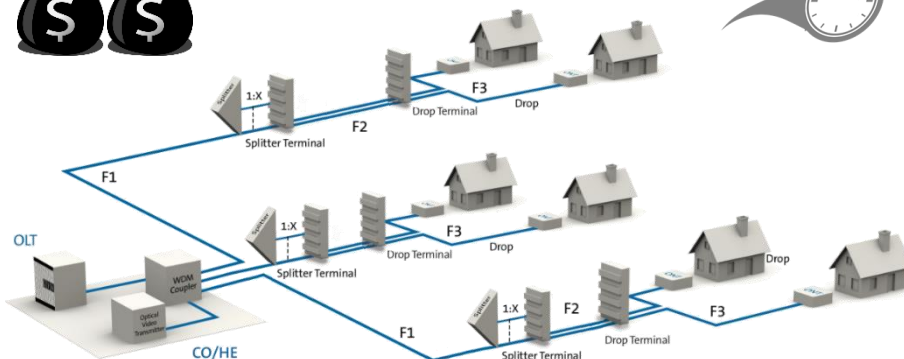
Centralized Split



Distributed (Cascaded) Split



Segmented Split



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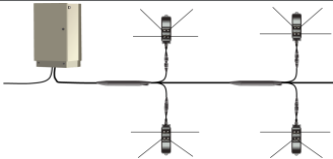
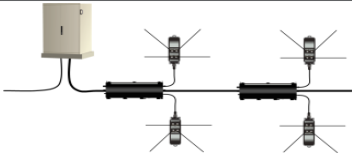
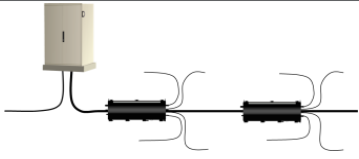
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Deployment Methods – Decision Factors

	Fully Preconnectrized	Preconnectorized	Fully Spliced
			
Speed of Deployment	Fast	Slow	Slow
Subscriber Connection Speed	Fast	Fast	Slow
Type of build	Aerial, Duct	Aerial, Duct, Direct Buried	Aerial, Duct, Direct Buried
Design verification/planning	High	Moderate	Low
Level of Risk	Low	Moderate	Moderate to High
Splices in the field	Low	High	High
Labor Skill Level	Low	Moderate	High
Deferability	High	Moderate	Low

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FTTH Network Elements

Consider

Implications

Split Ratios

Bandwidth per subscriber; OLT costs

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As fiber goes further inside...






Product selections shift

	Yesterday	Today	Tomorrow
Demarc	Outdoor ONT as demarcation	Terminal/outlet with simple adapter	Depends on testing requirements, link loss tolerance and drop choice
ONT	Façade of SFUs/MDUs	Just inside SFUs/MDUs (garage, basement or media panel)	Living room media center
Drops	Fully hardened precon jumpers	Hardened/SCAPC jumpers or pigtails Bend insensitive cable	Less conspicuous invisible drops Indoor/outdoor dual purpose cables

Product choices - Drops

Type	Shared Features	Con
 <p>Rugged 4.8 mm</p>	<p>Durable Indoor/Outdoor Self-bend limiting Neutral color (off-white) Stapled along molding/trim</p>	<p>Most conspicuous</p>
 <p>Compact 2.9 mm</p>	<p>Bend Insensitive Fiber</p> <p>Discrete Compatible with field- installable connectors Neutral color (off-white) Anchored along molding/trim</p>	<p>Less robust Requires curved staples or rounded clips</p>
 <p>Invisible 900um</p>	<p>Clear/colorless Clipped along trim or in wall/ceiling corners Least conspicuous</p>	<p>Least protected from possible damage</p>

Product choices - Demarc

Type	Pro	Con
 Outdoor Terminals	Compatible with all drops Access point for testing Variety of sizes Provides slack storage	Incremental expense Introduces IL with extra connector pair
 Indoor Terminals	Small form factor Neutral color (off-white) Supports indoor (900 um to 4.8 mm) drops	Aesthetics: protrudes from wall Minimal slack storage
 Wall Plates	Flush mount with wall Least conspicuous	Potentially complex installation (brownfield) No slack storage

Practices/services may change

	Possibilities	Implications/Considerations
Pass	MDUs: deploying to the interior premise wall jack (green or brownfield overbuild)	Higher costs to pre-provision MDUs without service revenue Access to Living Units
Connect	Eliminate battery backup Self-install Home Connect kits	Increased emergency support Variety of user abilities; Link loss Technician dispatch may still be required
Service & Repair	Eliminate demarcation transition Monetize “in-home” service contracts	Access to Living Unit for testing/troubleshooting required

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