



Accelerating FTTH Deployments Economically - One Meter at a Time

Current FTTH Landscape



- Investment Continues
 - Europe sees 15 Million FTTH Connections
 - Approximately 7% of households
 - Middle East
 - Approaching 2 Million Connected Homes.
 - UAE The Significant Leader with ~1M homes.
 - Consideration for % of Green Field vs Brown Field during the last 20 Years
 - KSA is largely Brown Field where Progress is Slower
 - North & South Africa
 - Modest Levels of FTTH Deployments
 - Regulatory Environments can Prevent Competitive Investment
 - Largely Cherry Picking Gated Communities & Affluent MDUs.

When Can we expect Parity with Copper?

- Subscriber Apathy
 - Current services meets majority needs
- Subscriber Resistance
 - Sorry, I don't want you to drill my walls, or run cables through my house
- Landlord Issues
 - Opportunistic Fees for Right of Way Access
 - Uncontactable to Secure Permissions
 - Legacy Exclusivity Arrangements
- Culture Related Delays
 - Installations only possible with the Master of the household present.
- Portfolio Alignment
 - Full Suite of Business Services on Copper but not Fibre
 - OSS Challenges – Cost Justification given current Scale
- Government Planning Challenges
 - Road Closing License Costs & Delays
 - Inappropriate reinstatement requirements
- Market Confusion
 - Fibre Powered Broadband anyone????

Applications Pushing Towards Ultrafast

- Current Landscape
 - Real Time Entertainment as high as 67% of Peak Traffic*
 - 43% of Peak Download across Europe
 - 4K in its Infancy today – But will Grow Quickly
 - 63% Media Executives Expect 4K ** to be Mainstream in 5 to 7 Years
 - Digital Cinema & OTT 60% of Initial Use Cases
 - 4K Content Capture Democratized
 - 4K Sports Cameras Sub €500



- Future Trends

- Virtual Reality – “See What I See”
 - Education – Enterprise – Entertainment – Conferences
 - 360° 4K Immersive Entertainment

- Cloud Network Functions

- Streaming Storage Driving Upload
- Repeated Download / Streaming

Source: *Sandvine Global Internet Phenomena H2 2014 **Intelsat 4K UHD TV Adoption Survey

Palaiseau

- Identified by Orange France for 100% FTTP Experiment*
 - Learn by Doing Identified as a Primary Goal
- Key Goals
 - 100% Homes Passed by end of 2013
 - Withdrawal of Copper Commercial Offers by end of 2013
 - 100% Homes connected by end of 2014 (16,900 Households)
- Achievements
 - 99% of Homes Connected by October 2014
- Lessons
 - Market Education Critical
 - Focused Selling, Local Lobbying & Education, Availability
 - Pareto 80:20 rule holds strong



Google At A Glance

- Founded 1998 (2004 IPO)
- \$ 38 B → 50 B REV (2011 → 2012)
- \$ 4.5 B annual capex
- \$ 28 B for Google Fiber (Estimated)
- 54 k employees
- Targeting 50k to 500k homes (FTTH)



Targeting Underserved

- Google Fiber in Kansas City Metro
 - Announced KC project March 2011,
 - Launched service July 2012

Disruptive Entrance

- 1 Gbps speeds offered in 180 Fiberhoods
 - \$300 fee for Free Internet 5/1 Mbps
 - \$75/mo for Gigabit Internet 1000/1000 Mbps
 - \$120/mo for Gigabit Internet + TV
- Social Networking Generating Social Pressure Driving higher take rates in neighborhoods.

Repeat

- Additional cities announced
 - [Austin TX](#), [Provo UT](#),
 - [Atlanta GA](#), [Charlotte NC](#), [Nashville TN](#), [Salt Lake City UT](#),
 - [Phoenix AZ](#), [Portland OR](#), [San Antonio TX](#), [San Jose CA](#)



Cornwall

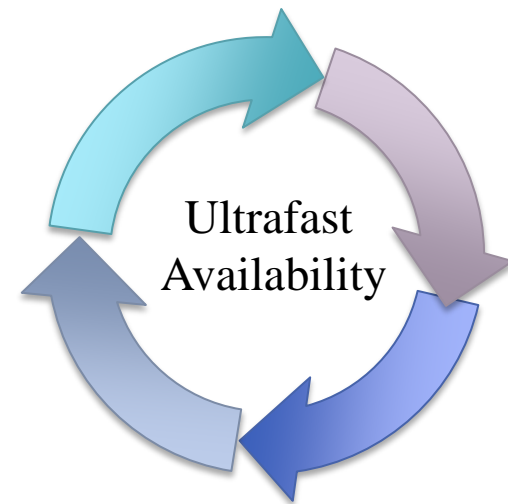
- Region with 253,000 premises, largely underserved
 - Public Private Partnership between BT Openreach & EU
- Key Goals
 - 80% of homes served with Fibre Based Broadband
 - Extending to 99% Coverage by March 2019
- Achievements by July 2014
 - ~62,000 Direct Fibre Connected Homes
 - Circa ¼ of all UK FTTP Connections
 - >192,000 Homes within the Fibre Based Broadband Footprint.
- Lessons Learned
 - Greatest Demand from the Worst Served
 - Rural Demonstrated Strong Demand vs Urban
 - Not always about having more - Frequently the priority is about having enough



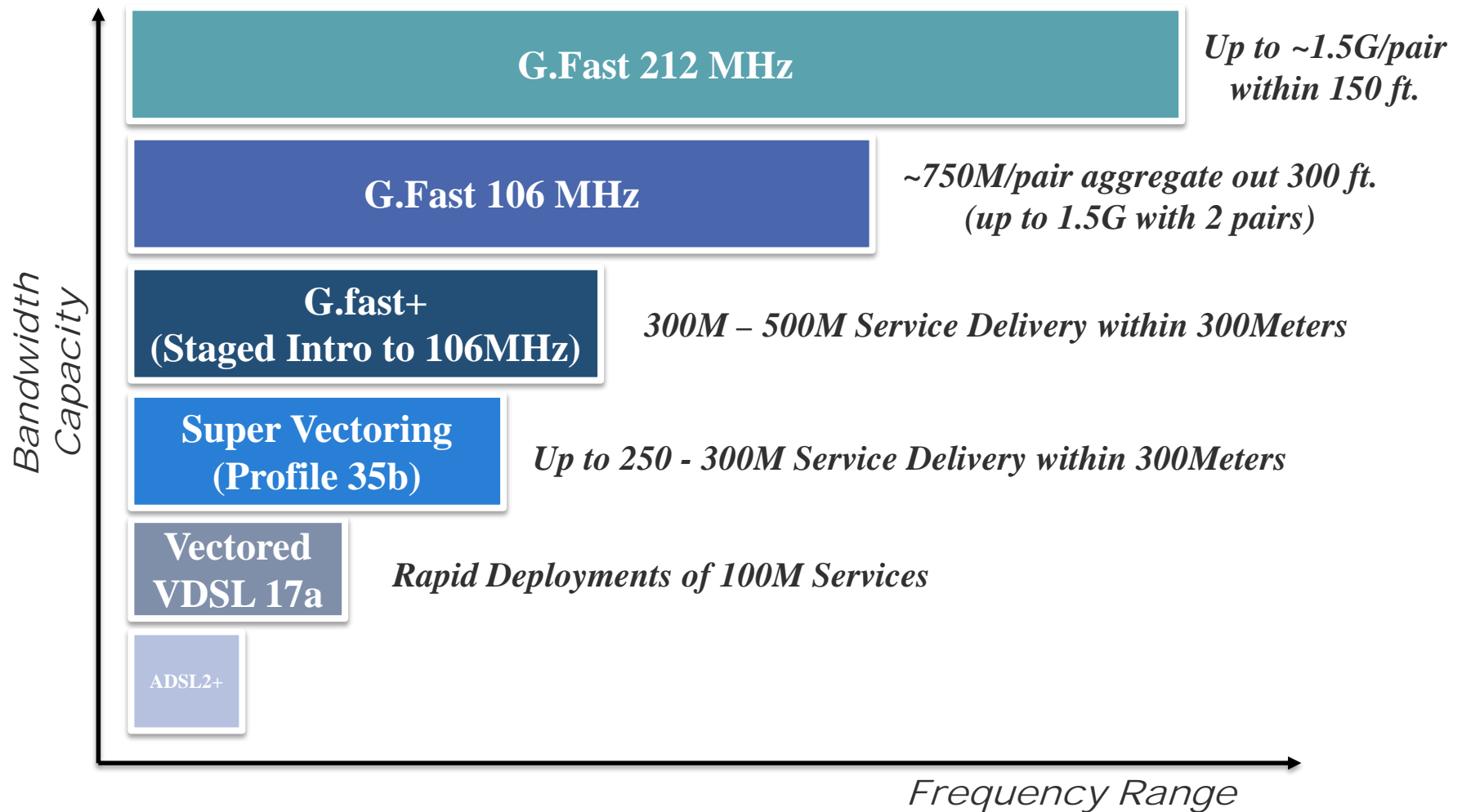
- Broadband is a Source of National Competitive Advantage
 - Broadband Infrastructure Must be Elevated to Equal Status
 - Roads, Railways, Electrical Grids, Water Networks
 - None Built without Government Investment
- Market Education Required to Increase the Pull Effect
 - Government Campaigns, like Safe Driving, Healthy Eating, Computer Literacy, Anti-Smoking
 - Sometimes we need to lead the Horse to Water
- Legislation to Remove Barriers
 - Opportunistic charging by land and building owners outlawed
 - Right of Way laws Modified to Discourage Blocking
 - MDU Access Rules Modified to Permit Installation in Absence of Landlord

How To Stimulate Change?

- Applications Emerging to Consume new Capacity
 - Broadband becoming More Mission Critical for Consumers
 - Our Connected Homes and Devices are becoming more intertwined with our Lives
- Acceptance that the Broadband Pipe is an Enabler.
 - Greater Adoption Rates = More Ultrafast Consumers
 - More Ultrafast Consumers = Larger Markets
 - Larger Markets = More Innovation
 - More Innovation Drives Consumer Demand



Can Copper Assist with Increasing Demand? **ADTRAN**



*Significant bandwidth scalability options available
Moore's Law Assisting Innovation*

- Copper Enjoys Ubiquity in Most Mature Markets
 - Installed Today It Avoids The Majority Of Challenges Fibre Faces
 - Offers a Significantly Reduced Time to Market for Ubiquitous Ultrafast Broadband
 - Loop Reconfiguration can Yield Substantial Time to Market & Deployment Cost Improvements

- Innovations in Copper can Support the Next Wave of Connected applications
 - Paving the Way for Even Higher Capacity Applications
 - Driving Awareness
 - Increasing Demand
 - Opening the Door for FTTH

- Satisfying Demand - Reduces Churn
- Eliminate Underserved - Raises Entrance Barriers
- Greater Capacity Facilitates New Service Introduction
- Increased Bundle Density - Increases Stickiness



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