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The role of VDSL2 in a G.fast world

Michael Timmers - Fixed Networks Strategist

20 May 2015

FTTH has been the next breakthrough for decades

FIBER TO THE HOME: PRACTICALLY A REALITY

John Bourne

1988

BNR

INSTALLED FIRST COST ECONOMICS OF FIBER/BROADBAND ACCESS TO THE HOME

K. LU, R. WOLFF AND F. GRATZER

1988

BELL COMMUNICATIONS RESEARCH
445 SOUTH STREET, MORRISTOWN, NJ 07960

... It shows that fiber will be cost competitive for voice during the 1990's and predicts that Broadband access will become cost effective during the next 10 to 15 years ...

FIBER TO THE HOME : BIARRITZ (1984)... TWELVE CITIES (1988)

1988

Camille VEYRES (x) -- J. Jacques MAURO

Direction Générale des Télécommunications
FRANCE TELECOM - Service des Télécommunications
de l'Image - Paris - France

An Optimal Investment Strategy Model for Fiber to the Home

Marvin A. Sirbu and David P. Reed

1988

Carnegie Mellon University

Optical fibers reach into homes

1989

Paul W. Shumate Jr. Bell Communications Research Inc.

Today, FTTH is slowly ramping up,
but payback times are still over a decade at best

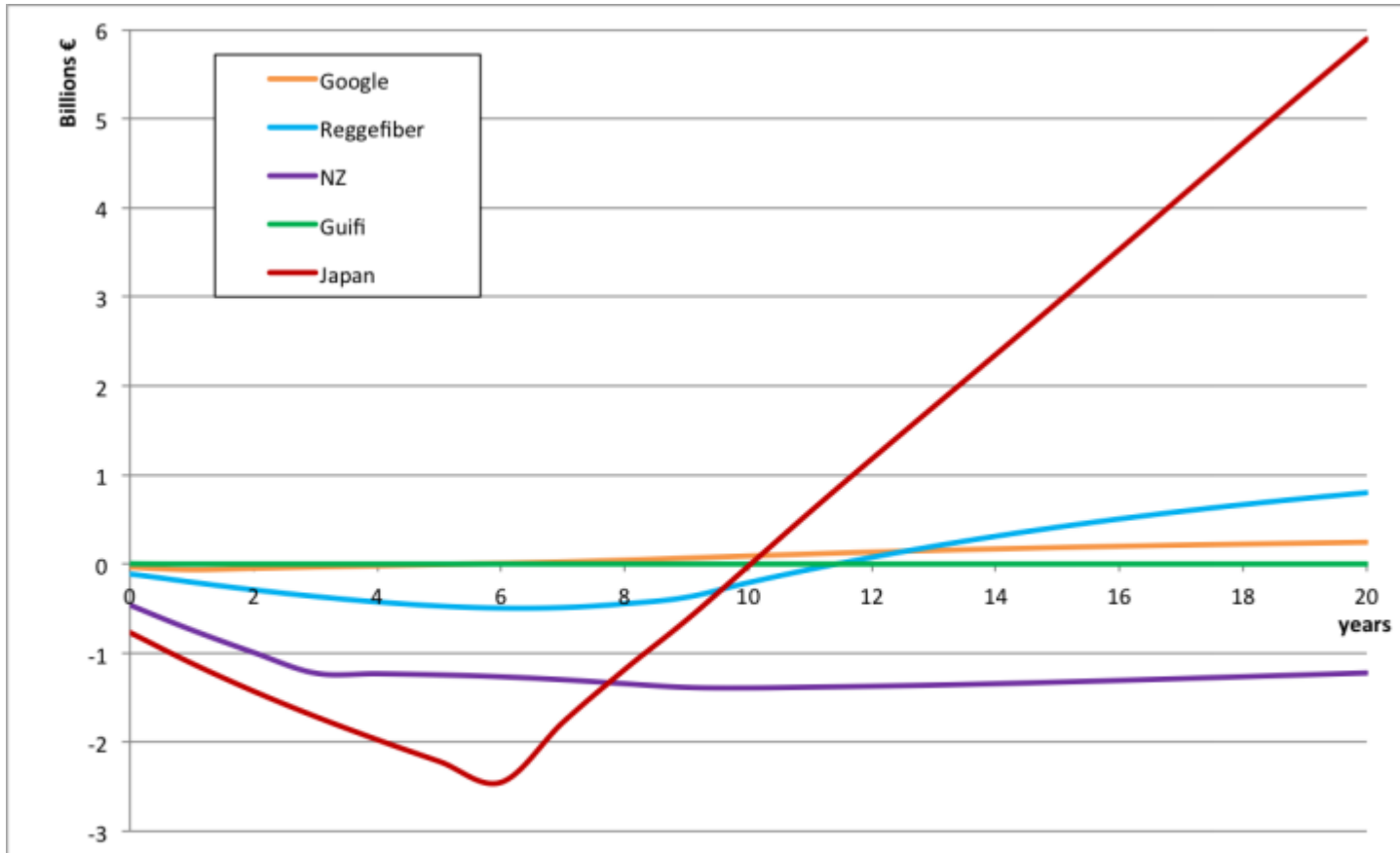
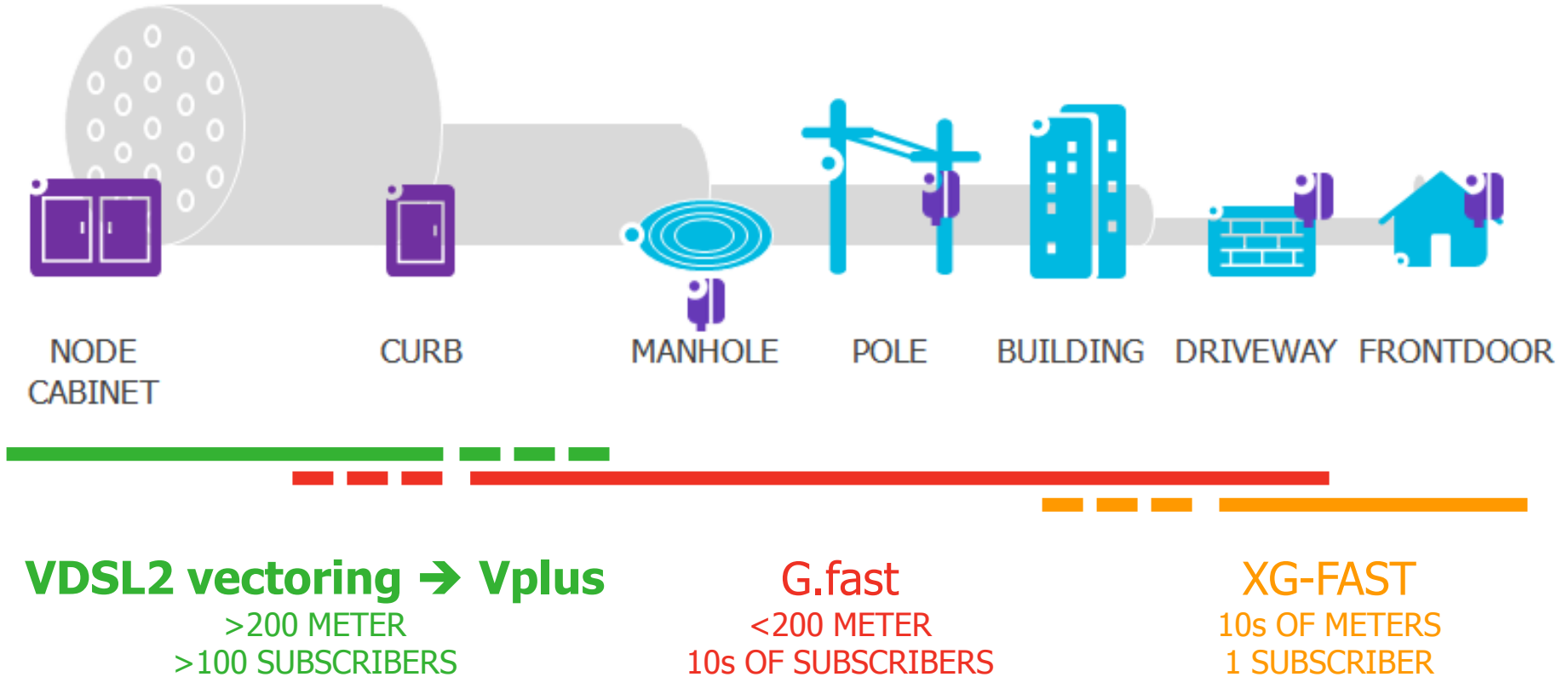


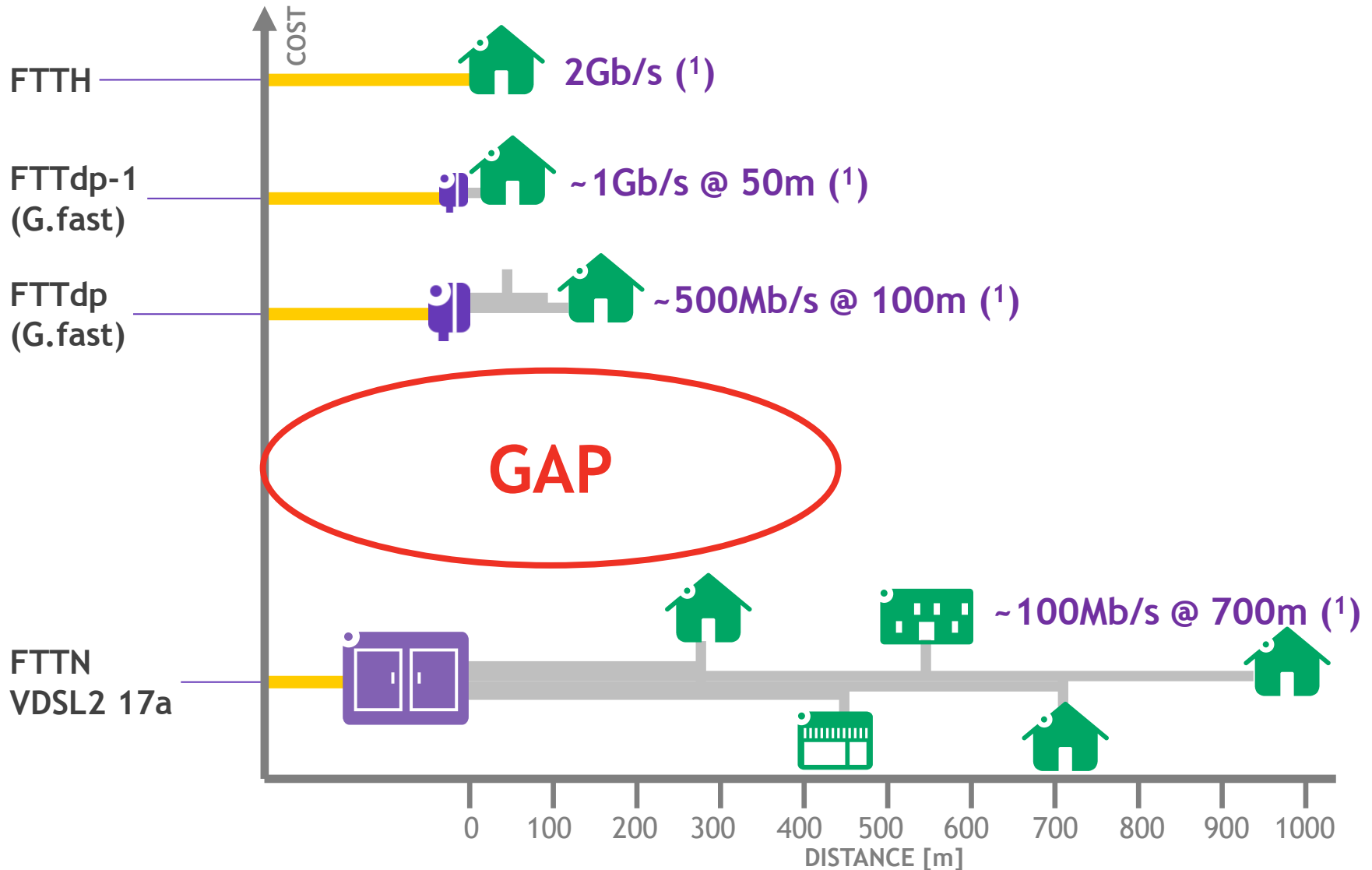
Figure 2: Overview of NPV curves based on the specified adoption forecasts for the different cases

[Domingo2014]

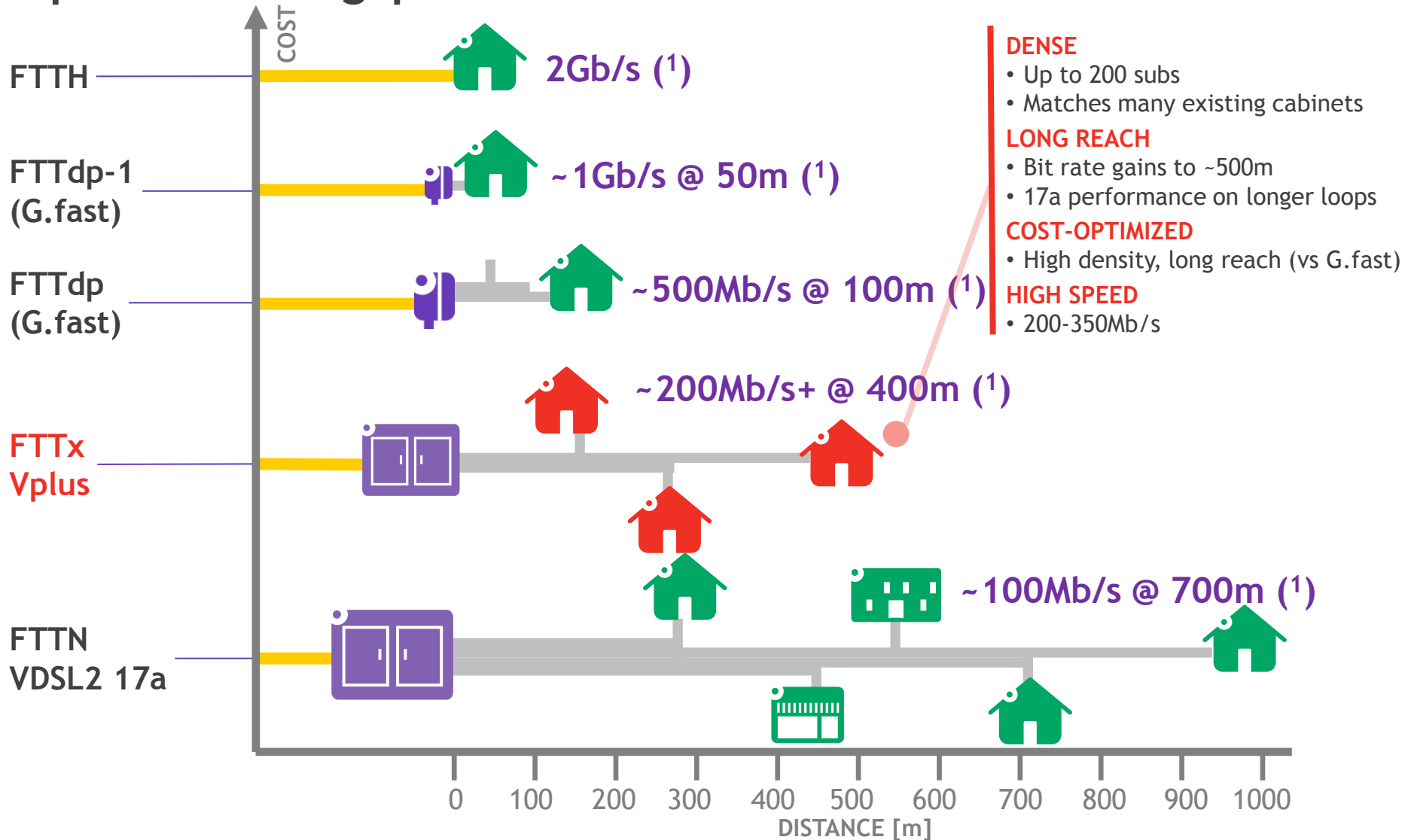
A sensible and field-proven approach: Fiber *closer* to the home



The operator's ultra-broadband toolkit

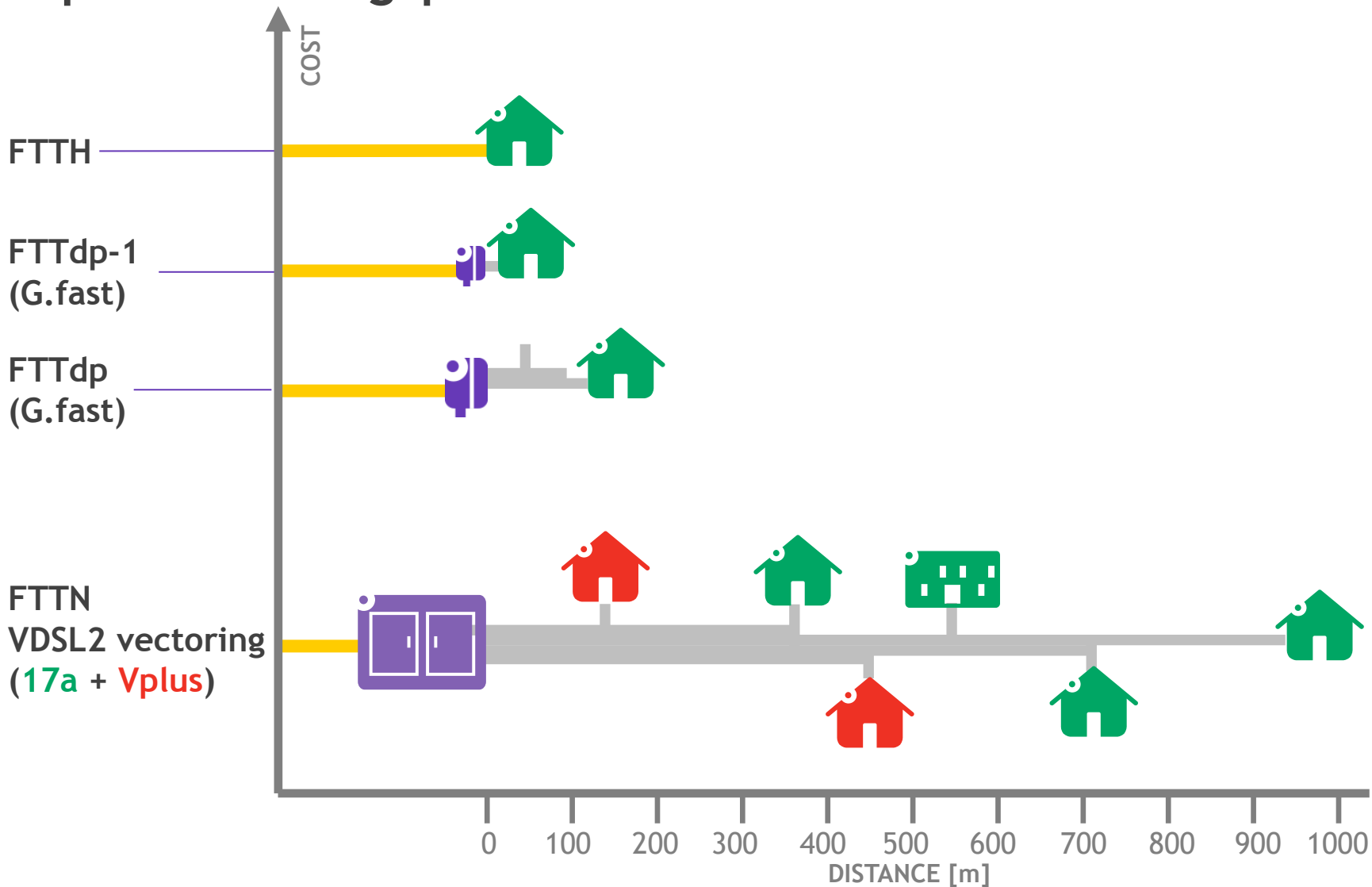


The operator's ultra-broadband toolkit: Vplus fills the gap

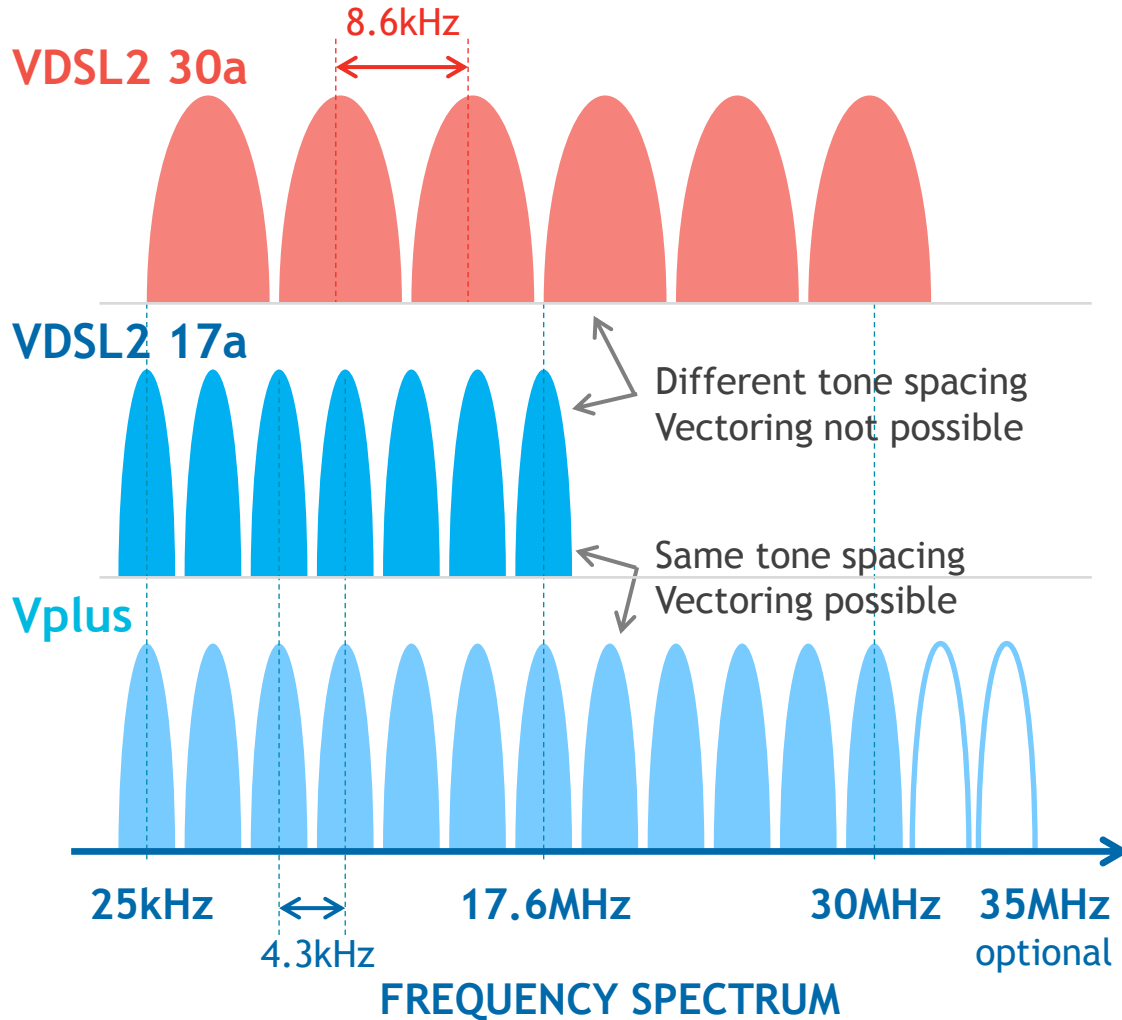


- DENSE**
 - Up to 200 subs
 - Matches many existing cabinets
- LONG REACH**
 - Bit rate gains to ~500m
 - 17a performance on longer loops
- COST-OPTIMIZED**
 - High density, long reach (vs G.fast)
- HIGH SPEED**
 - 200-350Mb/s

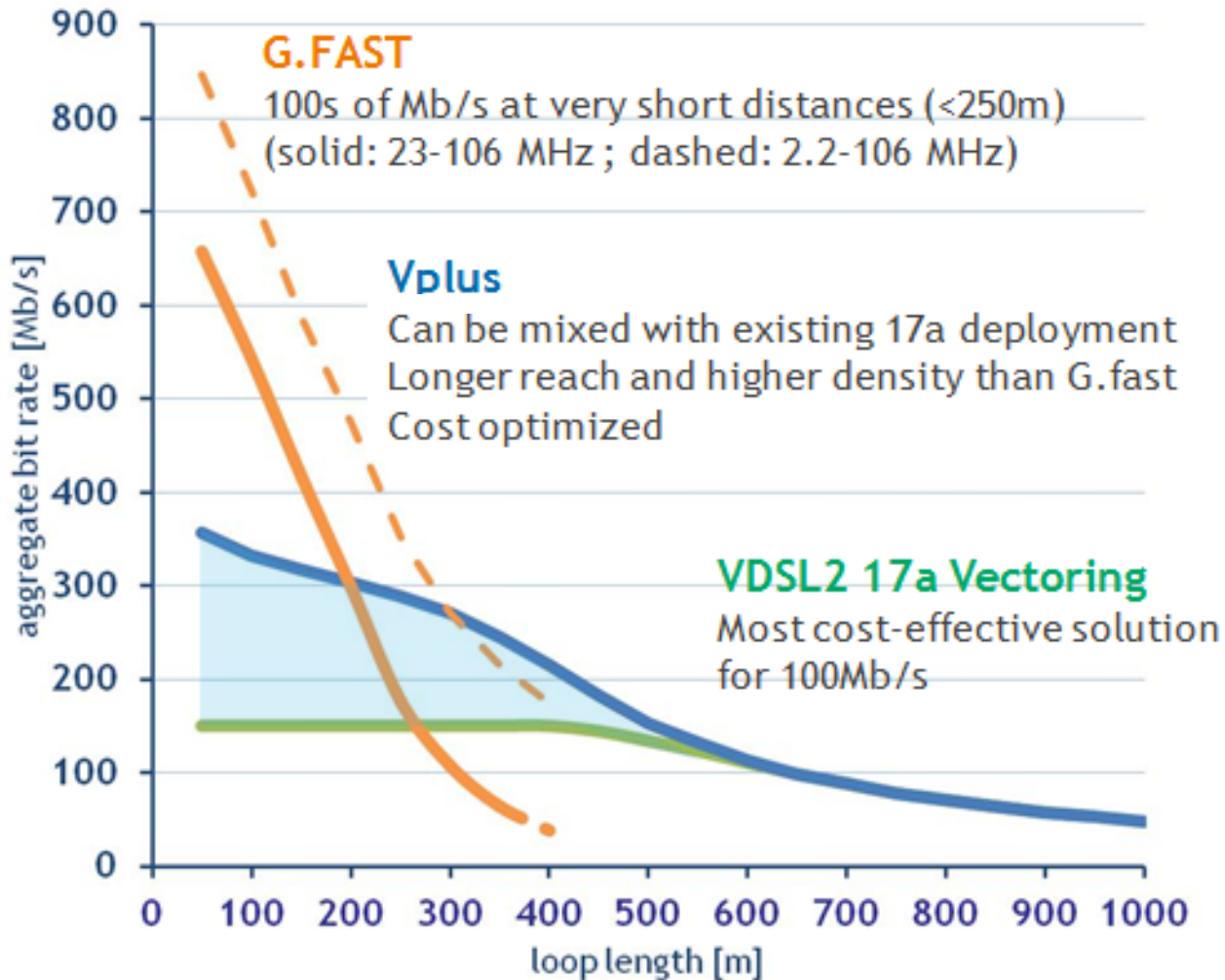
The operator's ultra-broadband toolkit: Vplus fills the gap



Vplus allows mixed vectoring with VDSL2 17a (not possible with VDSL2 30a)

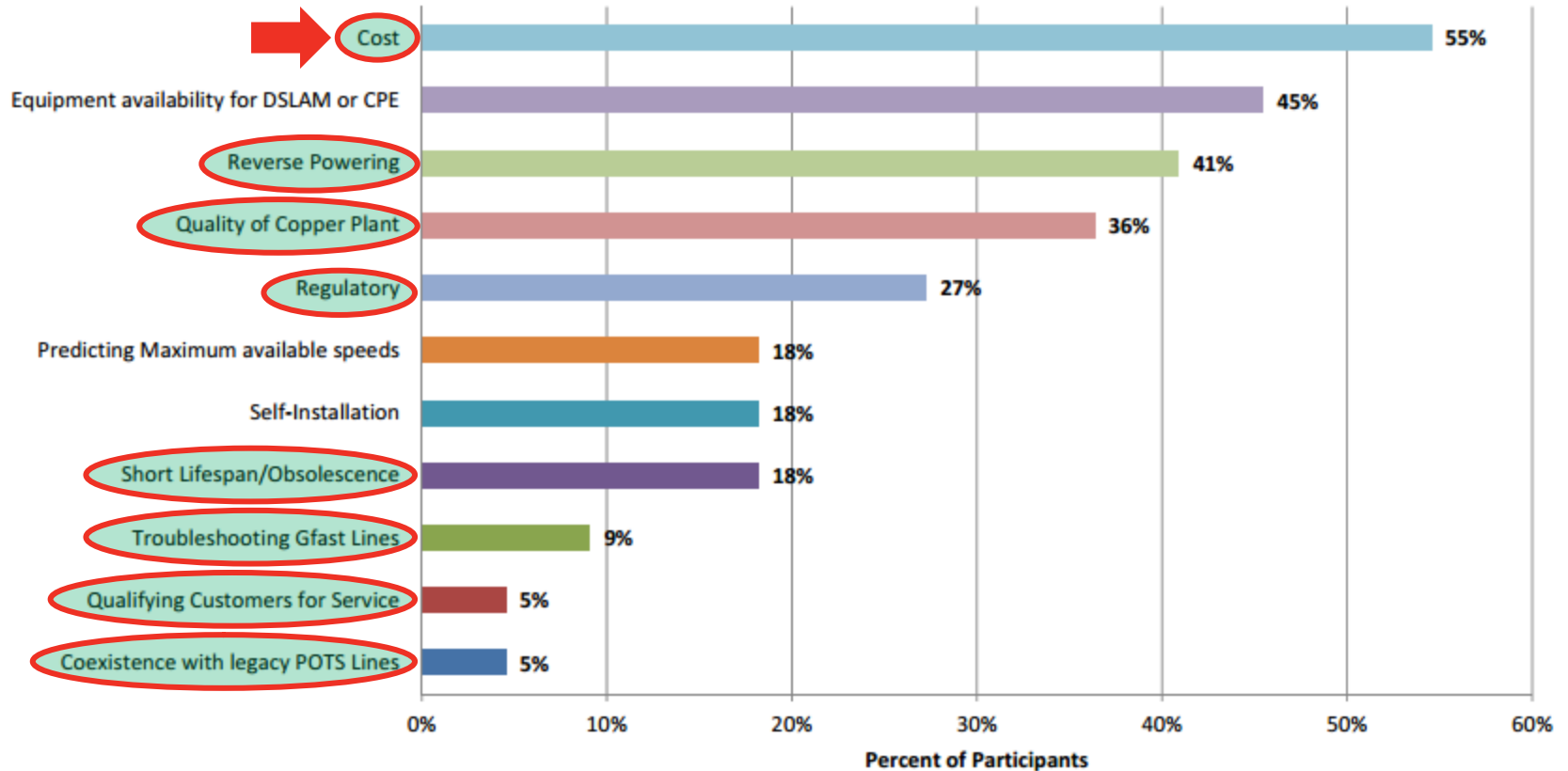


Vplus is cost-optimized for 200 m to 500 m



Vplus also addresses many *uncertainties* related to G.fast

Figure 9: Key Challenges for G.fast Deployment (n=31)



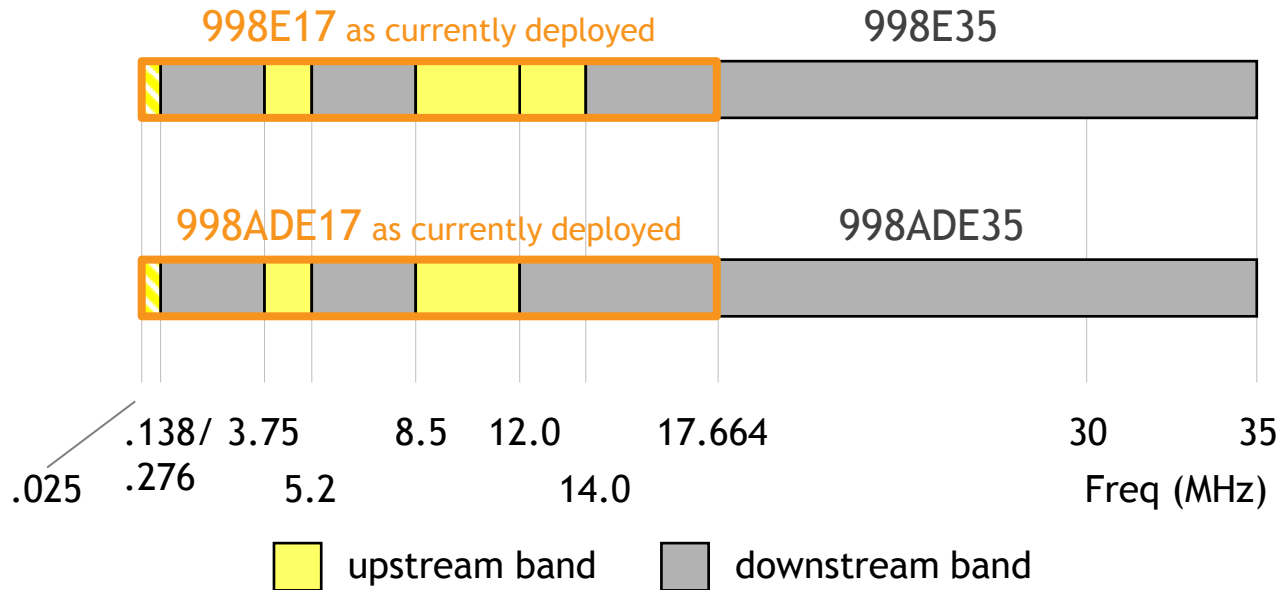
[BroadbandTrends2015]

Vplus is being standardized as VDSL2 profile 35b

- ITU SG15 Q4 currently standardizing ‘new Annex for enhanced data rates with vectoring compatibility with profile 17a’
 - Described in Annex Q of VDSL2 standard (G.993.2)
 - Describes a new profile ‘35b’
 - 4.3125kHz sub-carrier spacing (same as 17a)
 - 35.328 MHz bandwidth (8K tones)
 - Aggregate Achievable NDR of at least 355 Mb/s
 - Max ATP: 17dBm
 - 17dBm = 14.5dBm (17a) + 11 dBm (for extension from 17.664 to 30 MHz at -60 dBm/Hz) + 1 dB for overall performance optimization
 - extension from 30 to 35.328 MHz at G.9700 Limit PSD Mask does not require an additional Tx power allowance

Goal to consent: Feb/16 OR SOONER

The proposed bandplans extend deployed 17a bandplans with a full downstream band above 17 MHz



Limit PSD masks:

- At typical VDSL2 levels below 30 MHz
- Follows G.fast PSD mask (G.9700) above 30 MHz

Vplus prototype trialed at KPN



KPN heeft tijdens een succesvolle pilot, samen met Alcatel Lucent, met een nieuwe technologie een record snelheid op koper gehaald van ruim 230Mbit/s.

De pilot met de nieuwe techniek, Vplus genaamd, vond plaats in een testcentrum van KPN in Den Haag. KPN heeft de afgelopen jaren veel vooruitgang geboekt met hoge kwaliteit internet diensten. We investeren in onze netwerken en bieden internet aan dat voldoet aan de gebruikerseisen snelheid, stabiliteit en security.

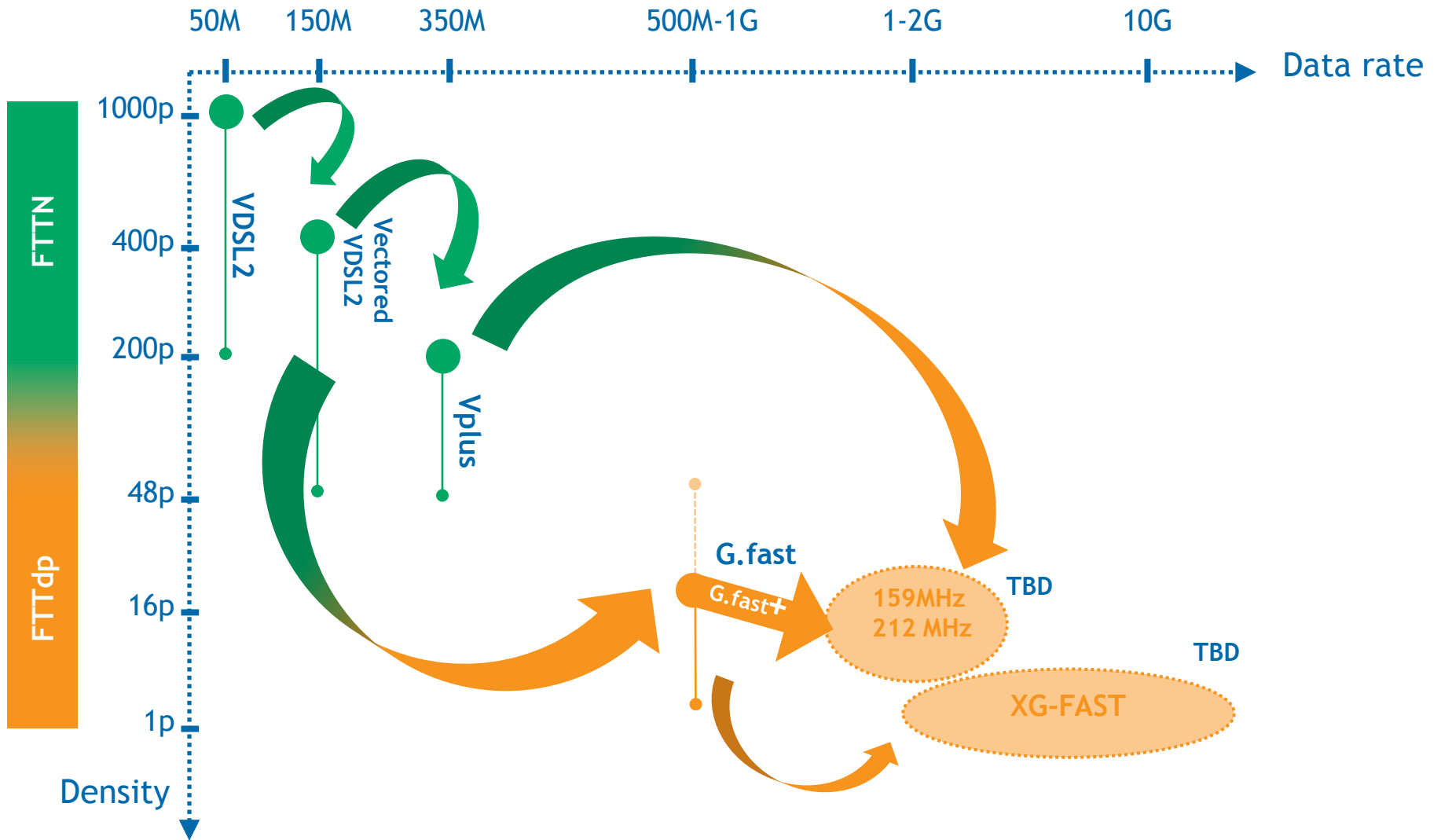


<http://corporate.kpn.com/kpn-actueel/nieuwsberichten-1/snelheidsrecord-op-koper-in-testomgeving-met-nieuwe-technologie.htm>

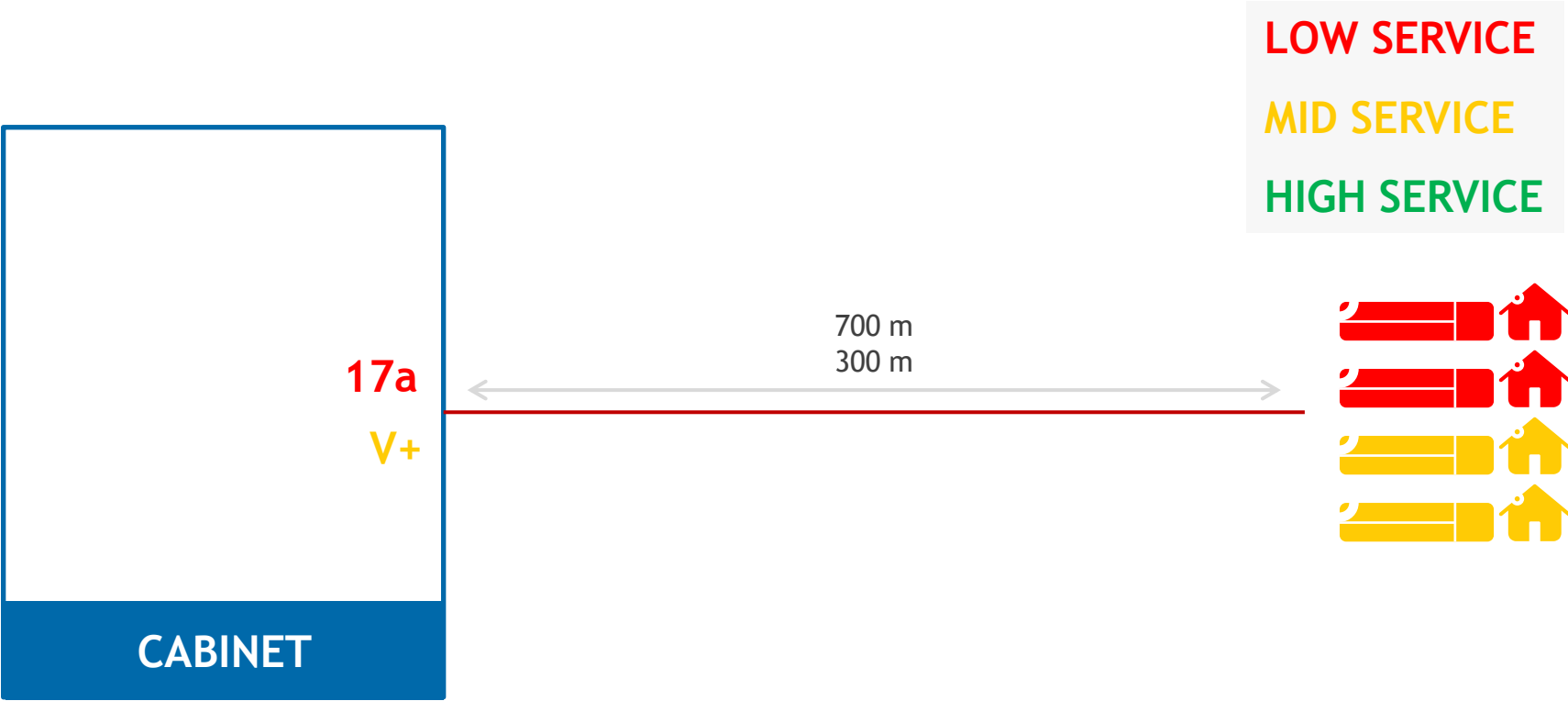
Choose the best tool for the job

	17a	Vplus	G.fast
Short loops ($\leq 250\text{m}$)	✓	✓✓	✓✓✓
Medium loops ($\leq 500\text{m}$)	✓✓	✓✓✓	
Long loops ($> 500\text{m}$)	✓✓✓	✓✓✓	
Density (max subs)	400p	200p	16-48p
Outside plant costs	\$	\$\$	\$\$\$\$
Standards	✓	draft text available	✓

Choose the best evolution path

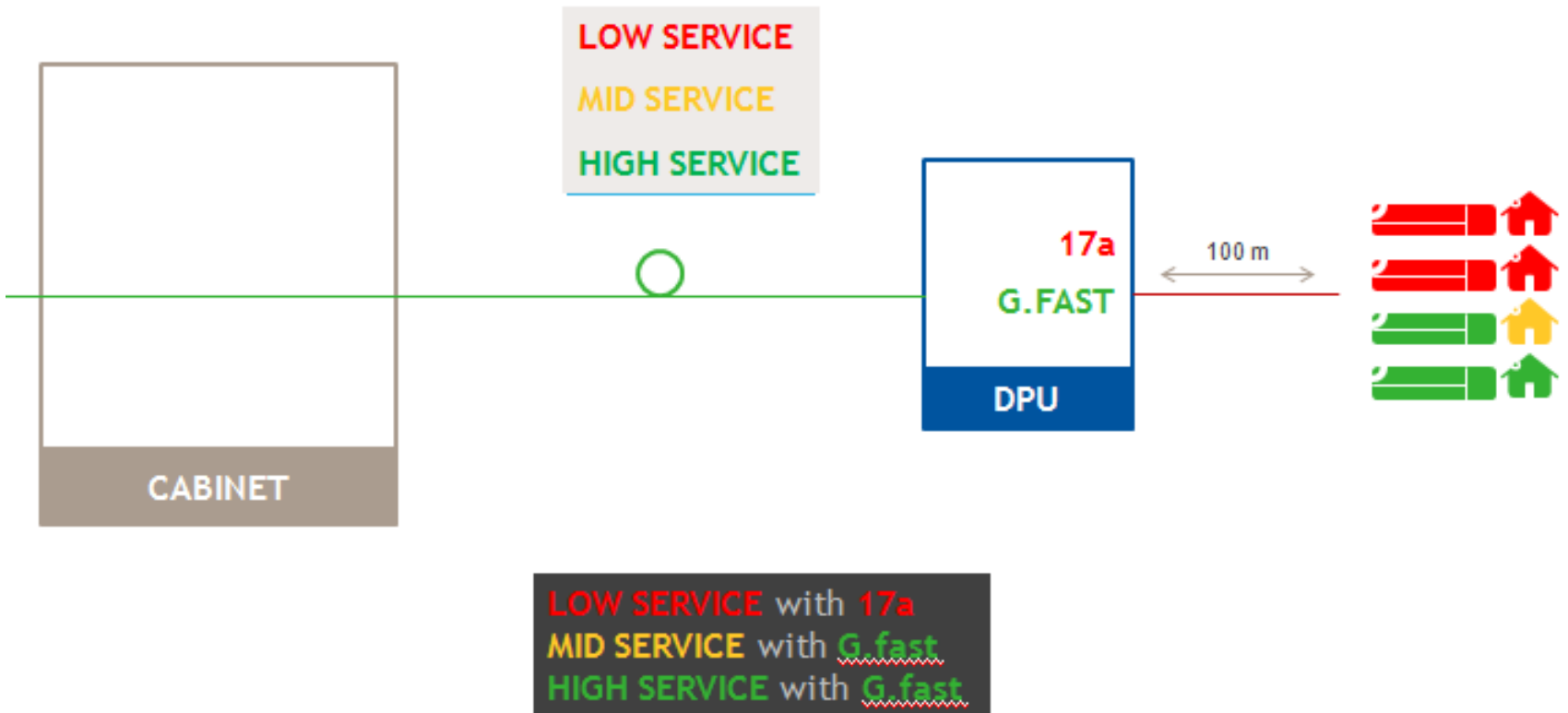


Alternative: prepare for G.fast introduction at Vplus introduction

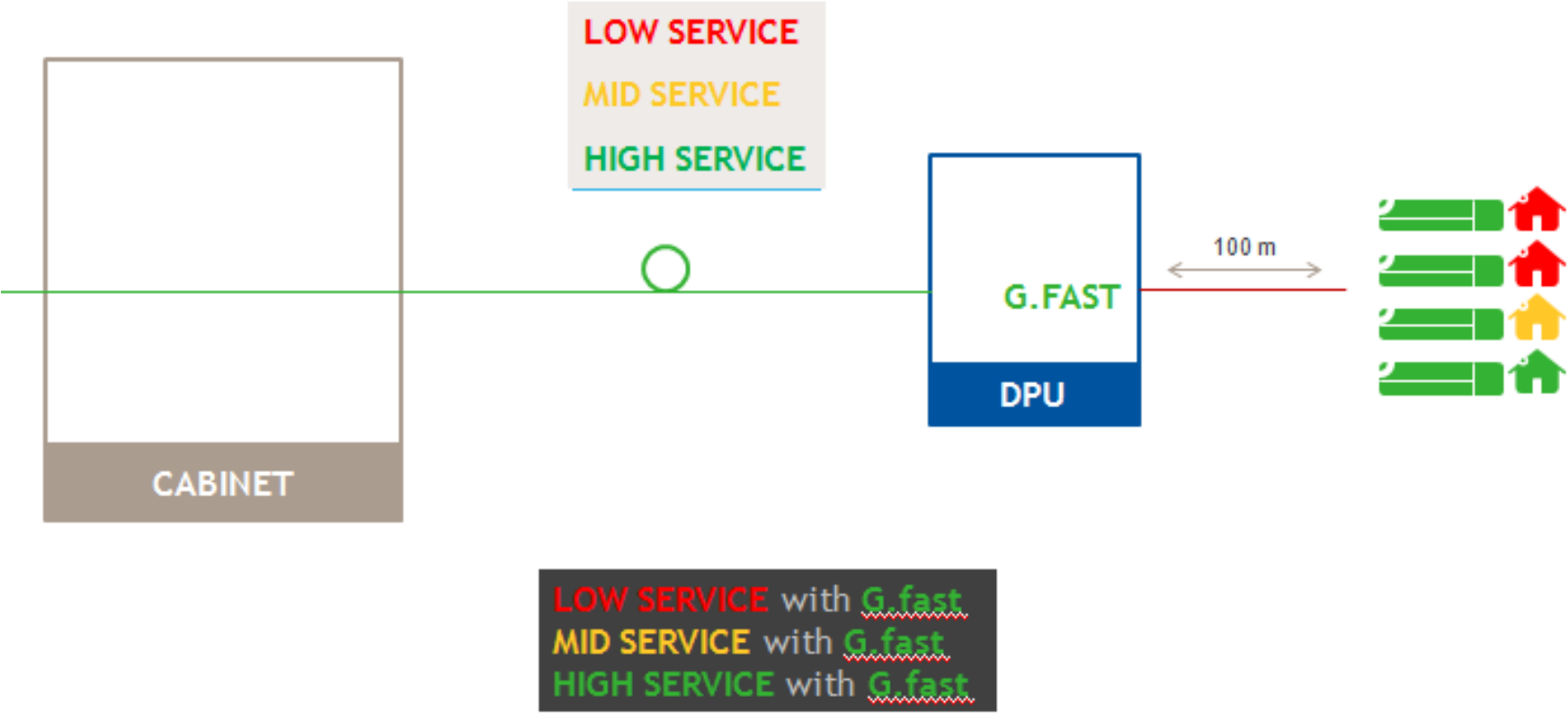


LOW SERVICE is delivered with **17a**
MID SERVICE is delivered with **V+**

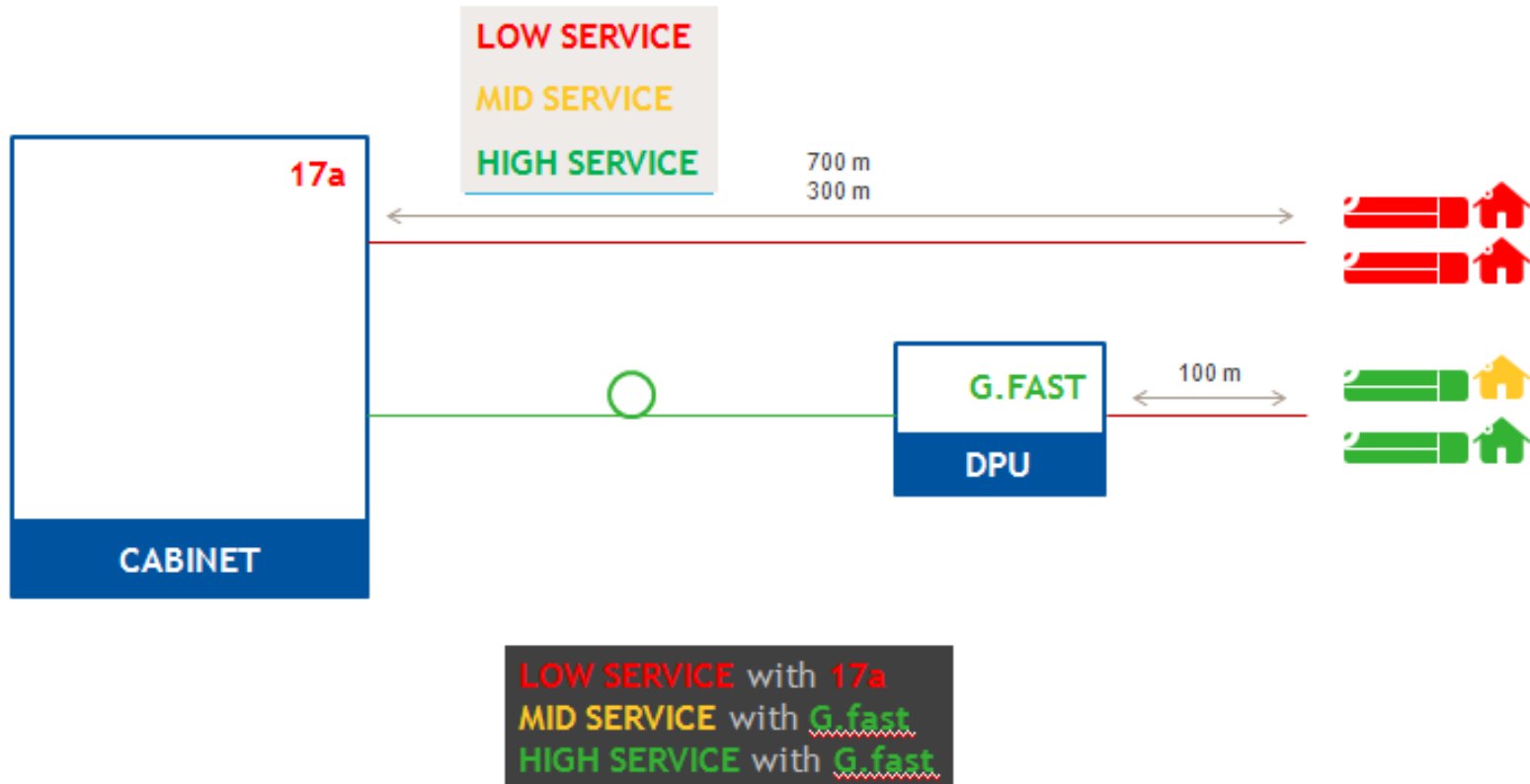
Dual-mode CPE with cable-cut DPU



Triple-mode CPE with cable-cut DPU



Dual-mode CPE with no cable-cut DPU



Every success
has its network