

WEBINAR VDSL-VECTURING

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HOST



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EXPERTS



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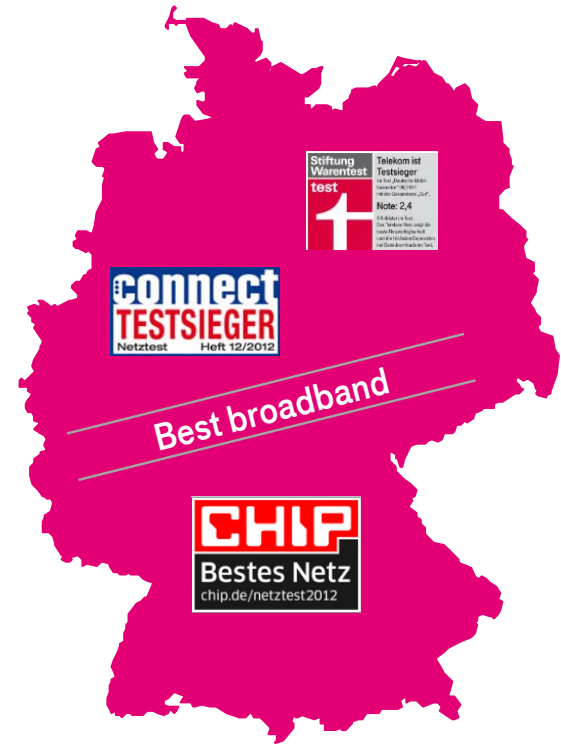
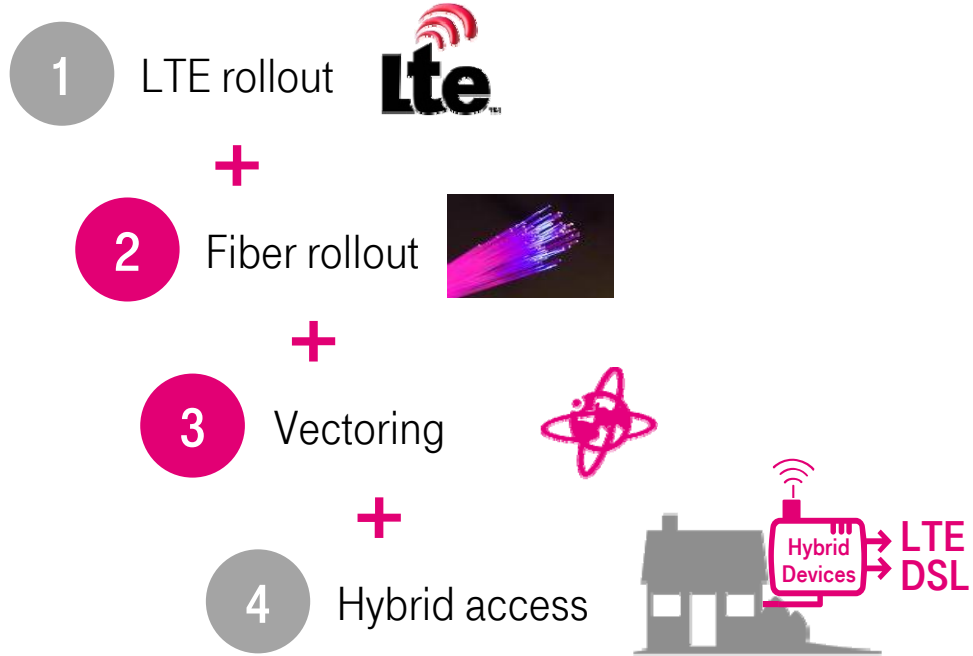
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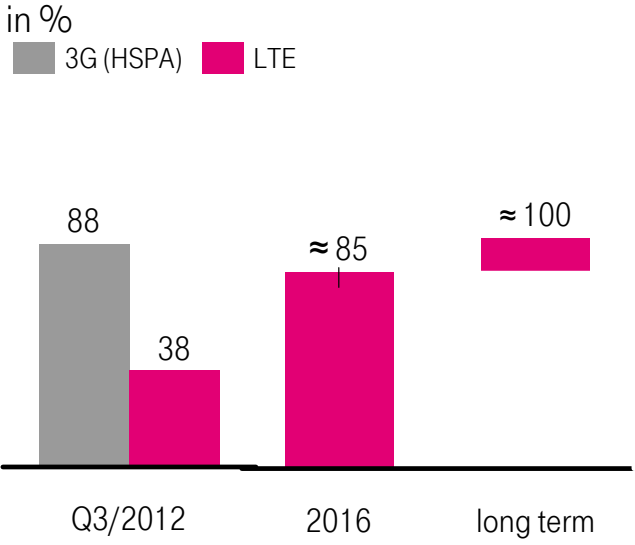
INTEGRATED NETWORK STRATEGY (INS) SMART APPROACH ON OUR WAY TO FTTH



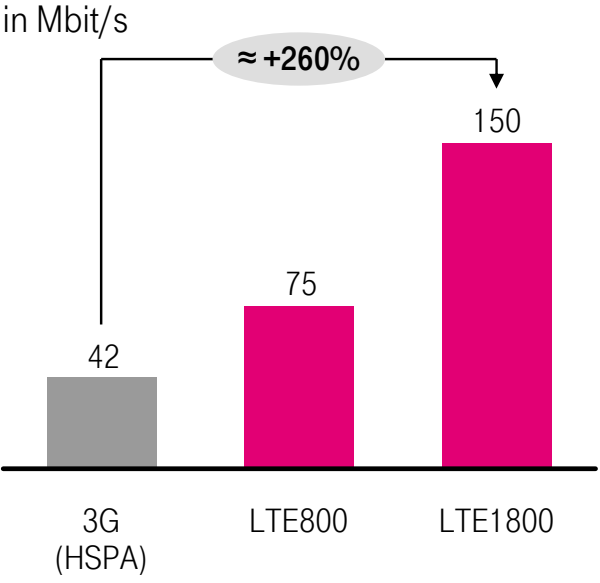
1 INS: CAPEX EFFICIENT AND RAPID ROLLOUT OF BEST-IN-CLASS LTE NETWORK

LTE

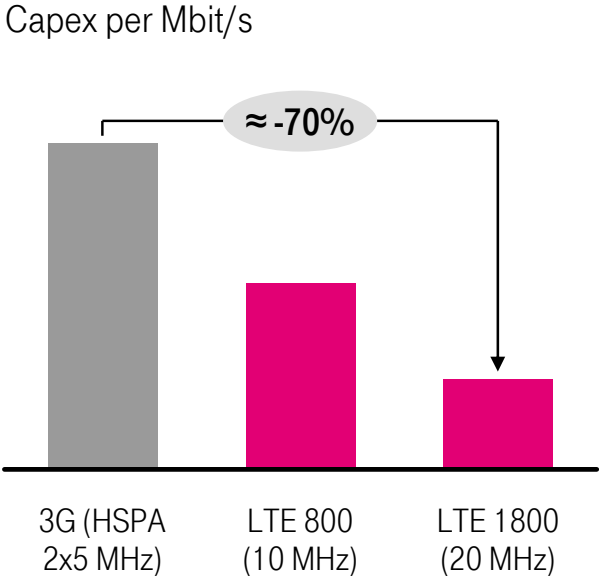
LTE rollout plan - Outdoor pop coverage



Peak performance



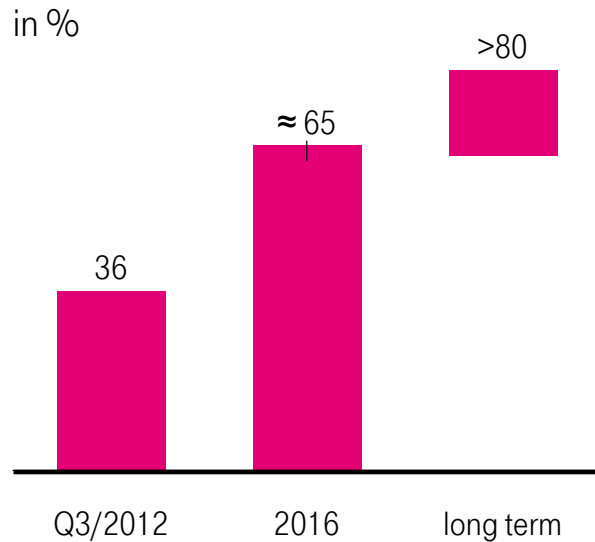
Higher capex efficiency



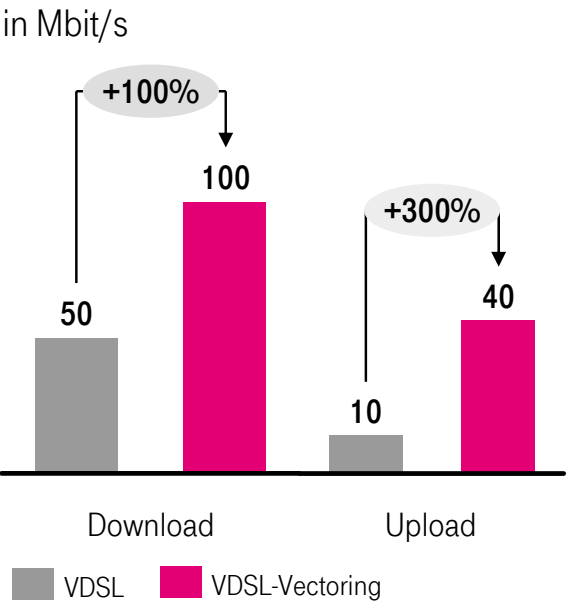
②③ INS: FIBER UPGRADE OF FIXED NETWORK IS A SMART “NO REGRET MOVE” TO FTTH

Fiber

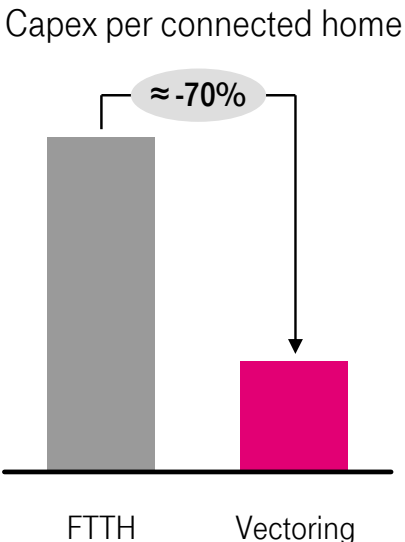
Fiber rollout plan – Coverage



Vectoring performance upgrade¹



Higher coverage with lower capex

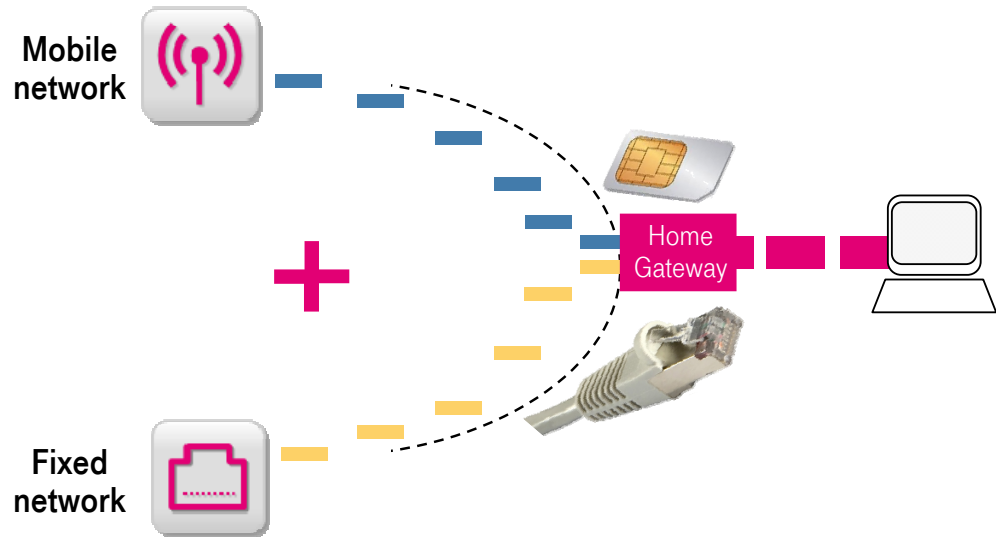


1) with short distribution cable length

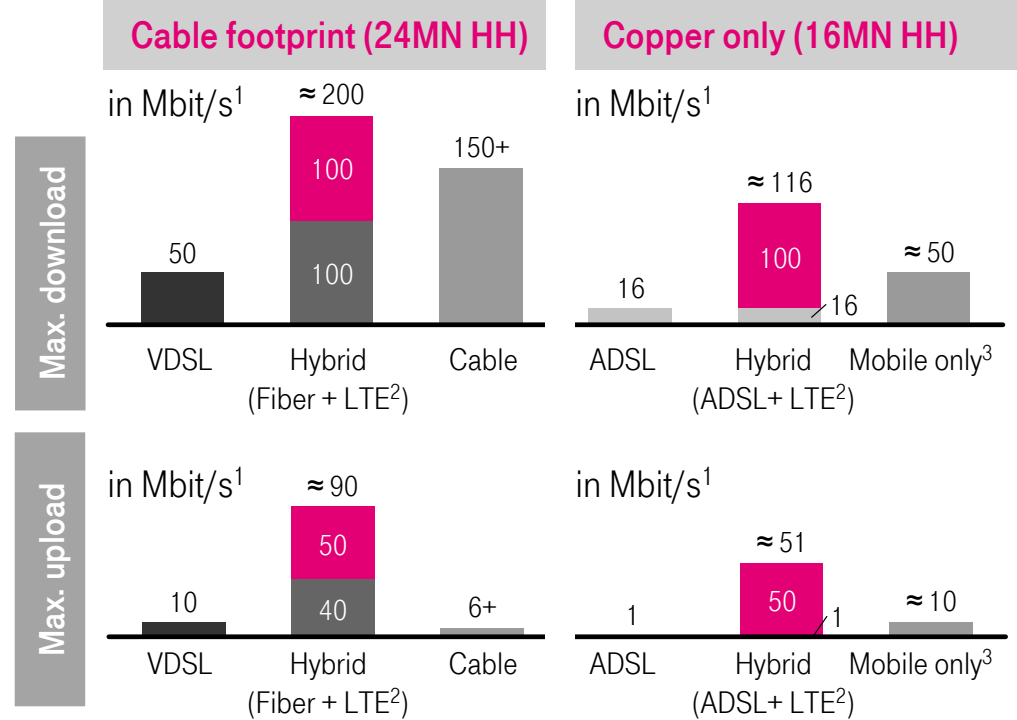
4 INS: HYBRID REVOLUTION THROUGH COMBINATION OF FIXED AND MOBILE FOR SUPERIOR SPEED EXPERIENCE

Hybrid

Superior offering for customers...



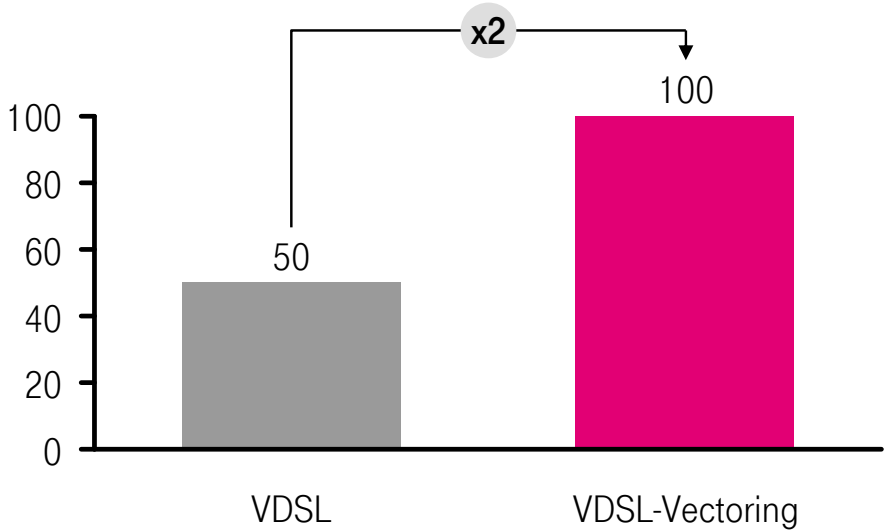
1) broadband speed communication for consumer 2) LTE 1800Mhz 3) Vodafone LTE Zuhause



VDSL-VECTORING BANDWIDTH INCREASES SIGNIFICANTLY COMPARED TO VDSL...

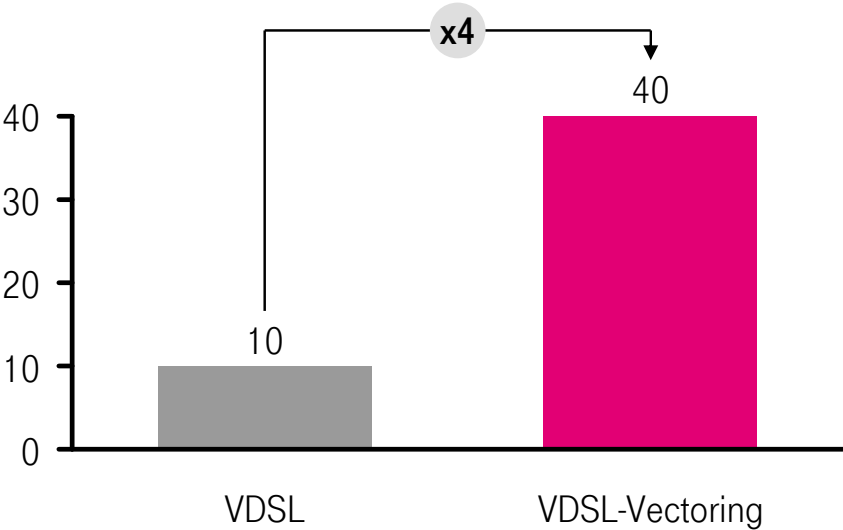
Downlink data rates¹

in Mbit/s



Uplink data rates¹

in Mbit/s

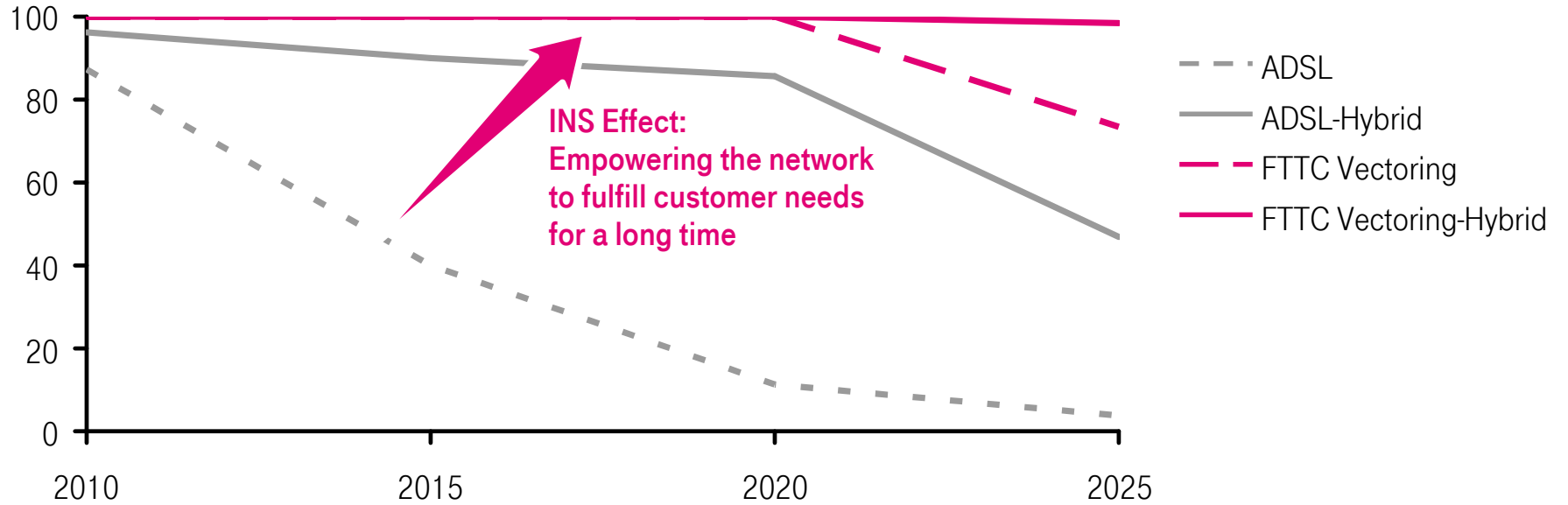


1) Real life performance depending on copper cable length

VECTORIZING AND HYBRID PROLONGATE THE COPPER LIFECYCLE UP TO 10 YEARS

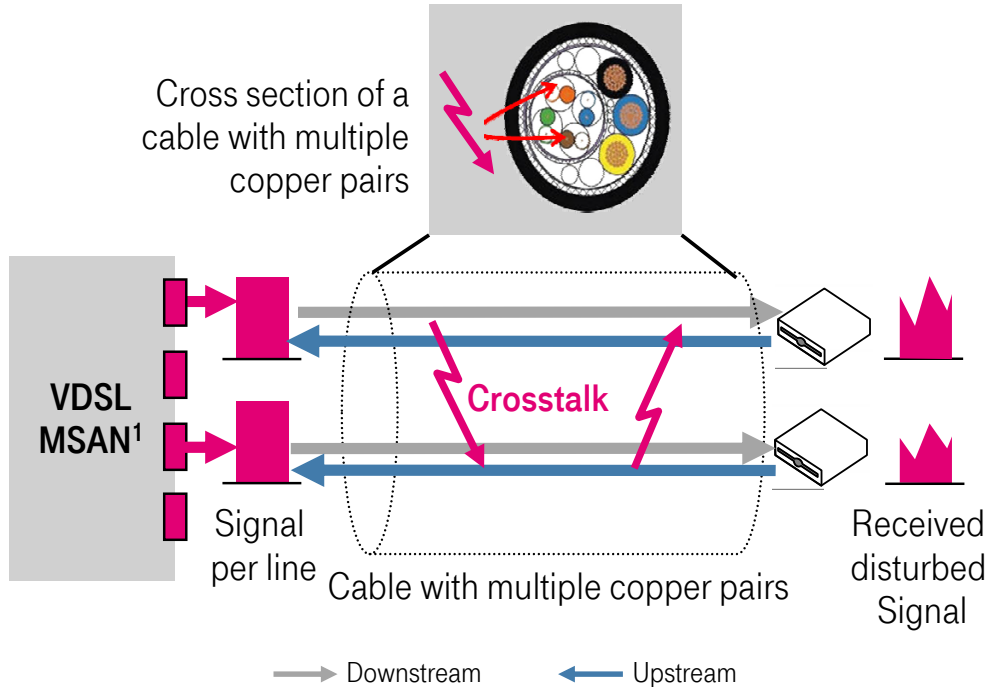
INS fully covers customer use cases for the next decade

% of households satisfied by DT's bandwidth plans



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MUTUAL INTERFERENCE BETWEEN ADJACENT COPPER PAIRS IN A CABLE IS THE MAJOR LIMITATION OF VDSL



1) Real life performance depending on copper cable length

What is the matter with crosstalk?

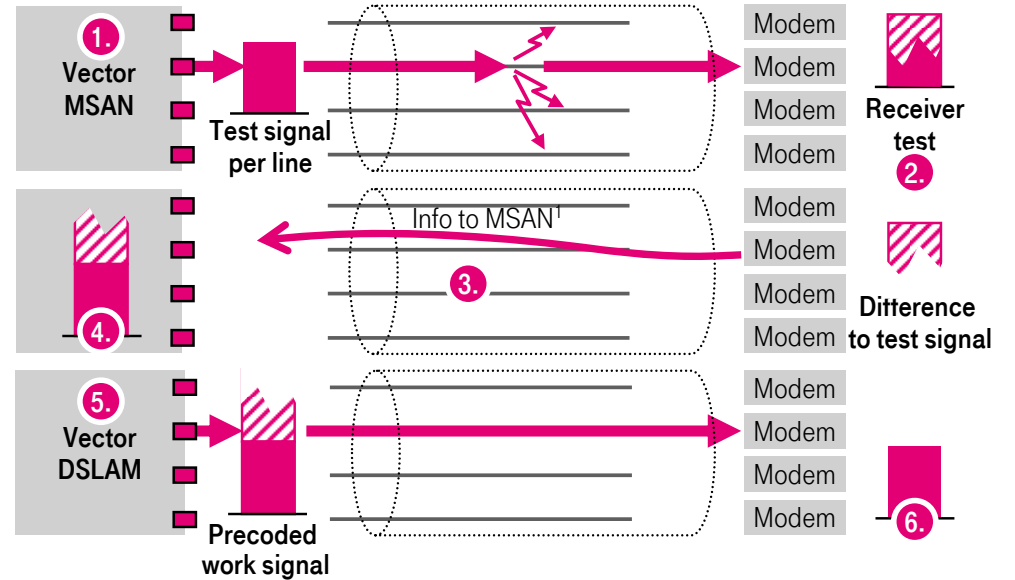
- Crosstalk: Electric signal on each copper pair creates “noise”
- Noise disturbs signal transmission of neighboring pairs
- The wider the band of frequencies used the more crosstalk: VDSL with factor 8x over ADSL2+
- Result: Bandwidth on each pair is reduced by crosstalk effects of others

VDSL-VECTORING EQUIPMENT OPTIMIZES SIGNALS BY INTERACTING WITH CONNECTED MODEMS

Noise cancellation for you and me...



Noise cancellation for copper lines...



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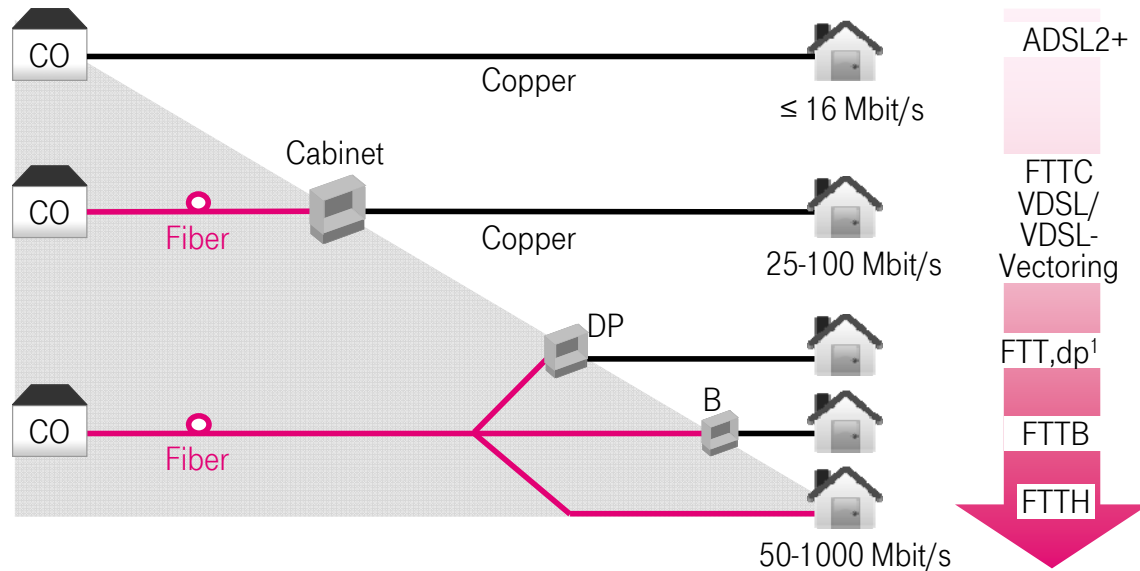
BASED ON FTTC, VDSL-VECTORING IS AN IMPORTANT STEP TO BRING FIBER TOWARDS THE CUSTOMER...

Gradual fiber rollout

Fiber to the Central Office - ADSL2+
"Classic"

Fiber to the Cabinet - VDSL/VDSL-
Vectoring (Rollout focus of INS)

Fiber near or to the home

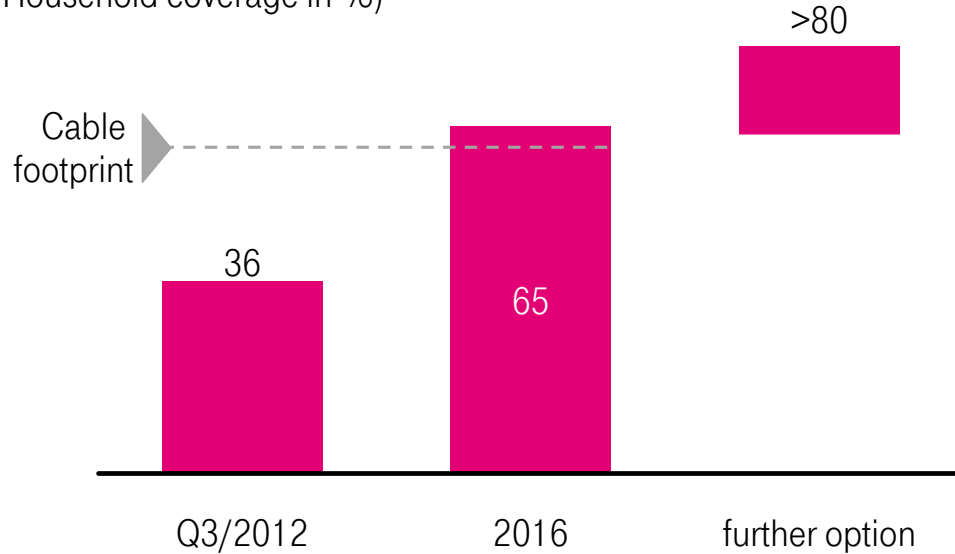


1) „Distribution Point“ currently not part of the Telekom access network

ADVANTAGES OF THE FTTC/VECTORIZING ROLLOUT FOR DEUTSCHE TELEKOM

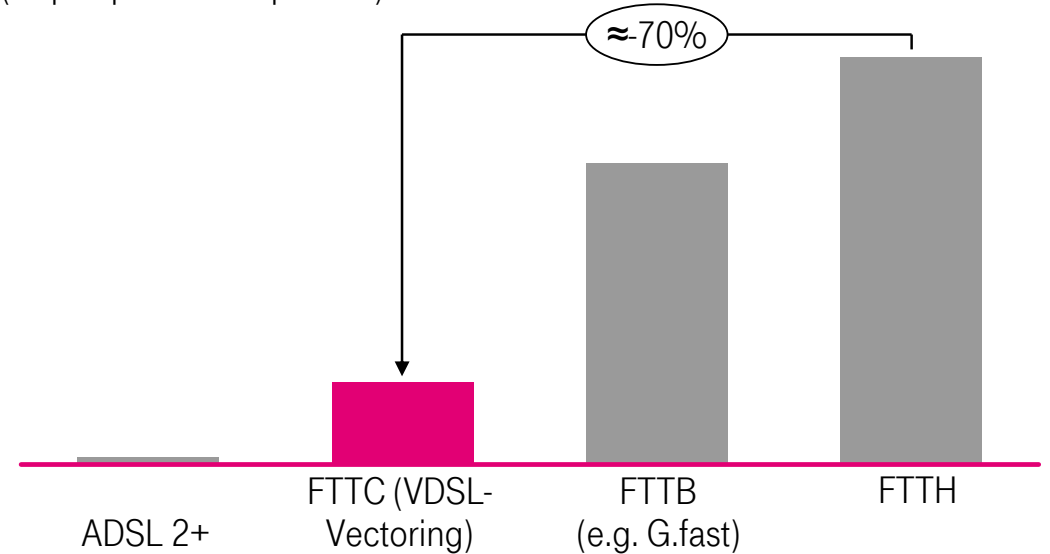
Time to market: Rapid expansion of broadband coverage...

(Household coverage in %)



...at affordable costs

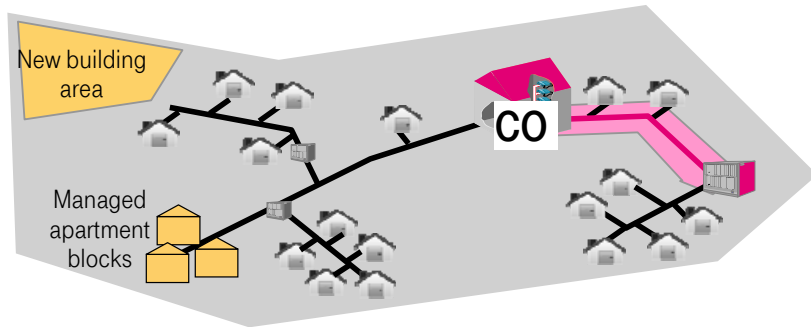
(Capex per homes passed)



LEVERAGING POTENTIAL SYNERGIES WITH OTHER ACCESS NETWORK ROLLOUT PROJECTS

Illustrative

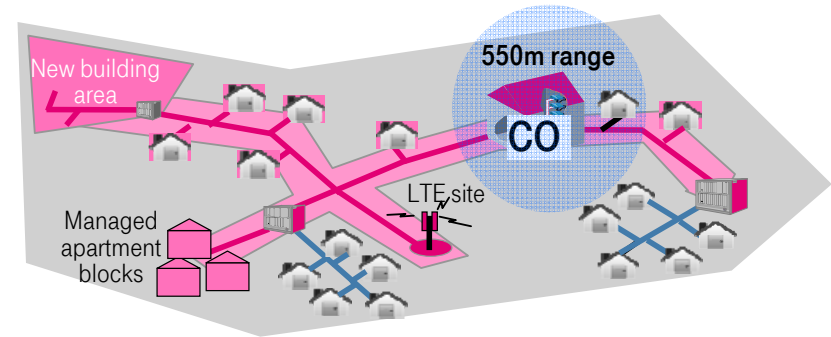
Access network today




- ADSL provisioning from CO site via copper (copper in main & distribution cable)
- Limited FTTC footprint with VDSL2 technology

— Copper  Passive Cabinet

Target structure after VDSL-Vectoring rollout



- VDSL-Vectoring provisioning from cabinet site (Fiber in main, copper in distribution cable)
- Synergistic fiber connection of bypassing commercial & new building areas, apartment blocks, LTE sites etc
- Opportunistic FTTH rollout & TV Grundversorgung rollout

— Fiber — VDSL-Vectoring enabled copper  Active Cabinet

CURRENT REGULATORY ACCESS REGIME

Competitor's xDSL access points today

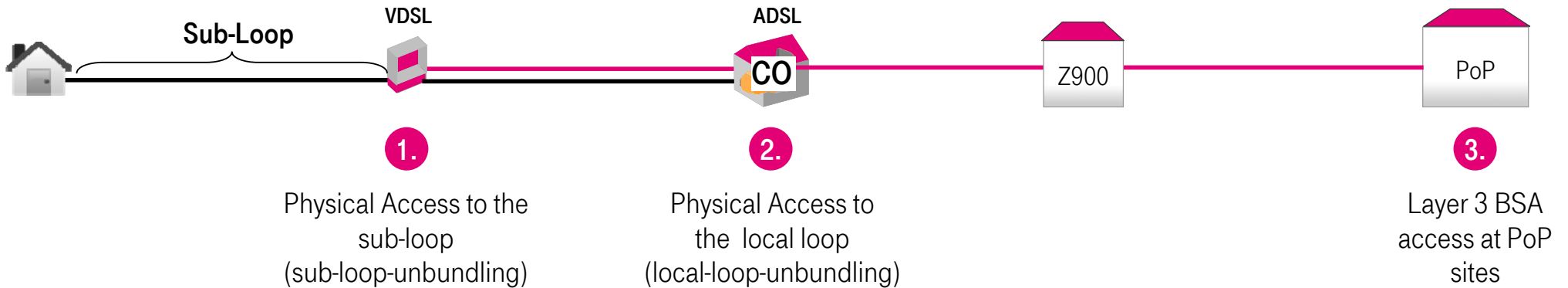
Household/APL

Cabinet

Central Office

Regional Hub
(900 site)

Central Hub
(73 site)



— Copper

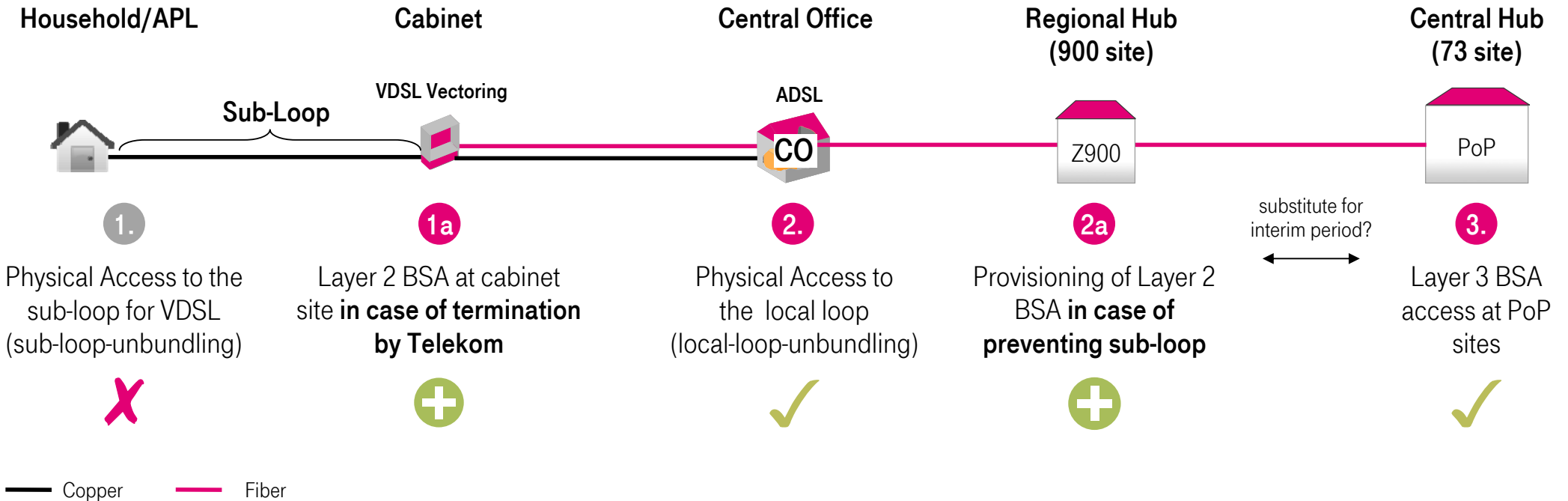
— Fiber



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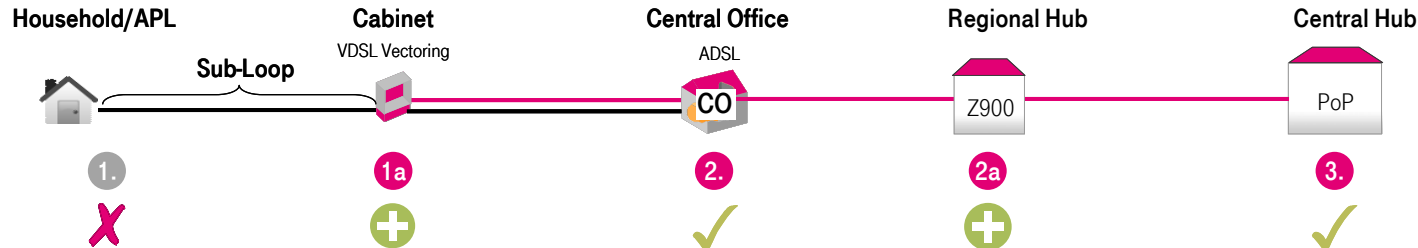
BNETZA PROPOSAL FOR VECTORING: OVERVIEW

Competitor's access options in VDSL Vectoring areas



BNETZA PROPOSAL: AREAS WITH 2ND INFRASTRUCTURE

Access options for Vectoring



1a Right of termination (only for Telekom)

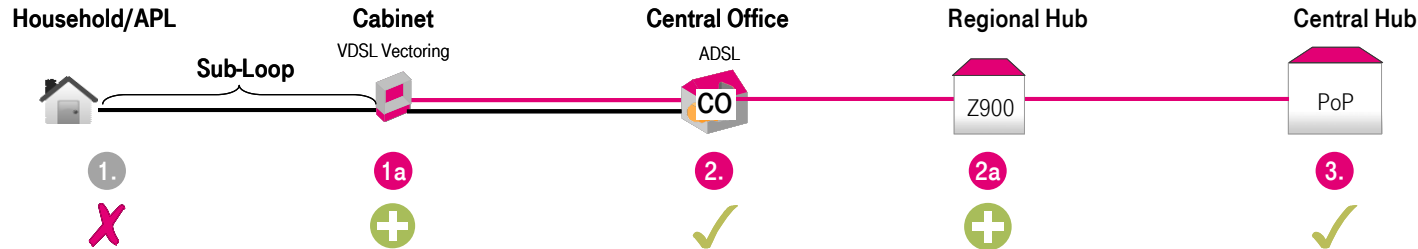
- Requires L2 BSA at/close to street cabinet
- Termination of **already existing competitor street cabinets** if carrier refuses to upgrade to Vectoring (not before 2017)
- Termination of **newly established street cabinets** with 12 months notice if:
 - ✓ $\geq 75\%$ of buildings in street cabinet area are connected to parallel infrastructure (cable/fiber operator)
 - ✓ Telekom has rolled out more street cabinets than competitors
 - ✓ Availability of L2-BSA at street cabinet at the same price as sub-loop (= EUR 6.79)

2a Preventing sub-loop

- Prerequisite for preventing access to sup-loop: "Suitable" **L2 BSA**
- Pricing: No provisions (ex-post regulation) yet
- In discussion:
 - L2 BSA will be available in 2016
 - Will L3 BSA as an **interim solution** be accepted?

BNETZA PROPOSAL: AREAS WITHOUT 2ND INFRASTRUCTURE

Access options for Vectoring

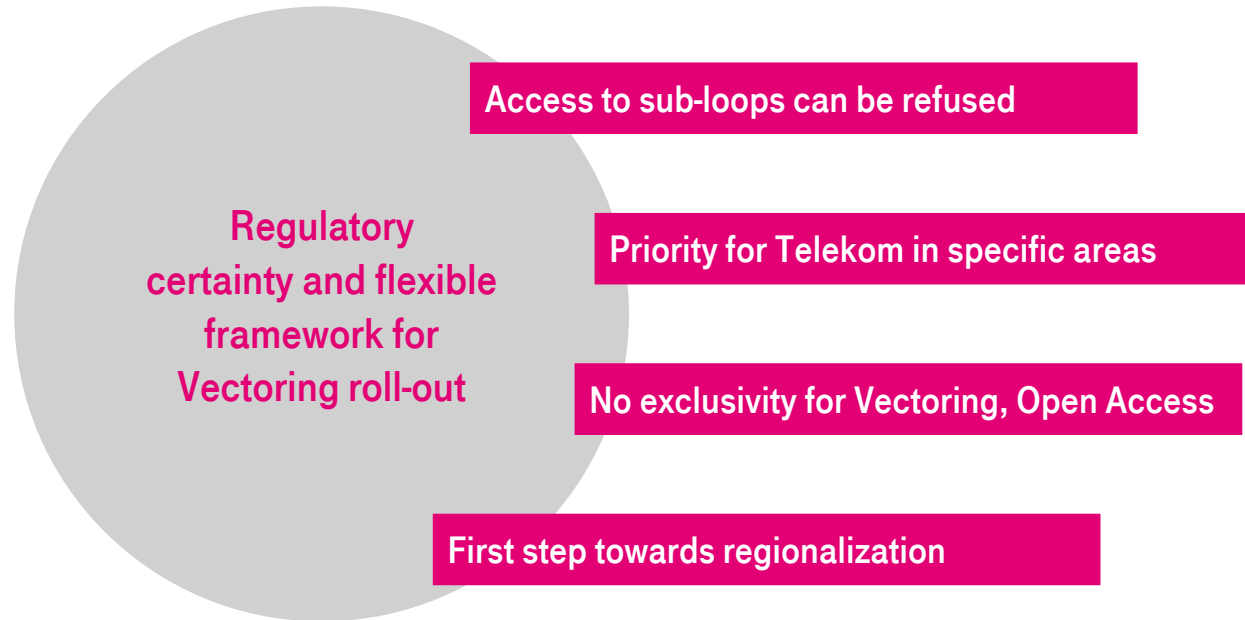


2a Preventing sub-loop

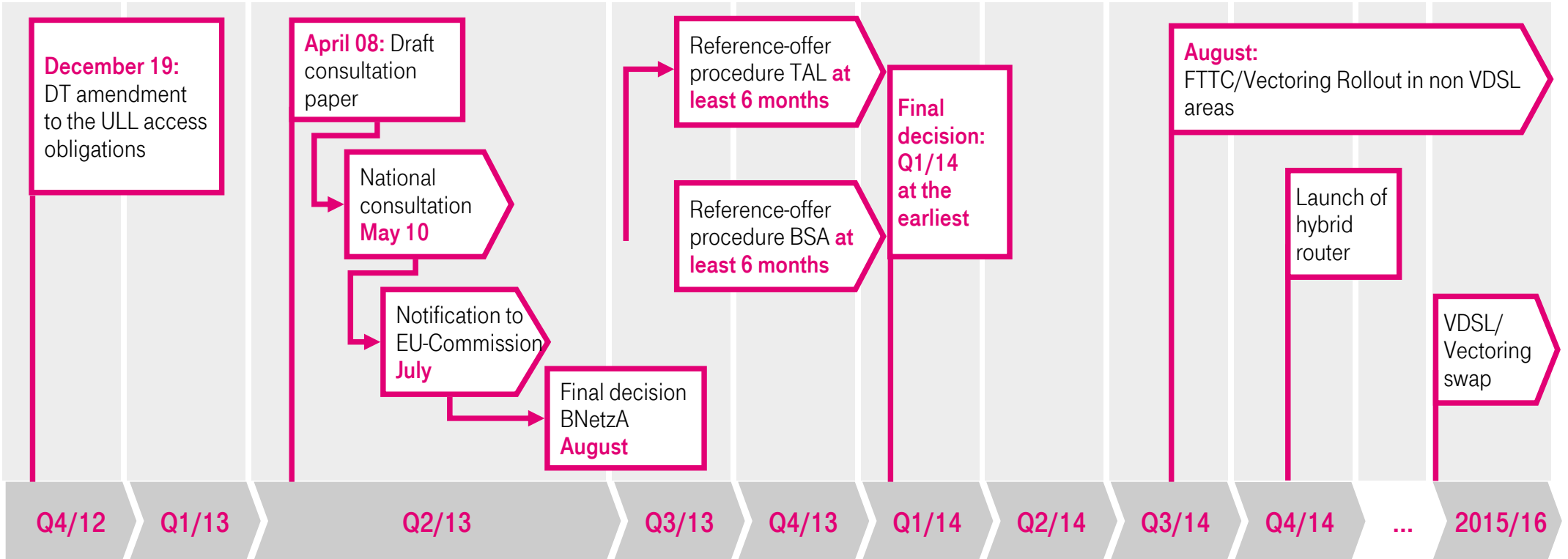
- Telekom is not able to terminate, but to prevent sub-loop
- First operator rolling out vectoring is privileged and investments are protected
- Prerequisite: All companies must offer L2 BSA as substitute
- “Cherry picking” in rural areas may lead to a Greyhound racing, but expected only in lucrative spots
- Full coverage of rural areas is unlikely

- No regional monopolies are permitted, obligations are generally symmetrical
- For first time, regulator imposes reciprocal, open access

BNETZA FRAMEWORK ALLOWS USE OF VECTORING



TIMEFRAME VECTORING



WEBINAR VDSL-VECTORIZING

Q&A



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