KPN: experiences first OCP deployment

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OPEN. FOR BUSINESS

OCP SUMMIT

About KPN

Consolidated Customers numbers

Mobile postpaid: 5.826 m (Residential, Business & Wholesale)

Broadband lines: 3.232 m (Residential & Business)

Residential Interactive TV: 2.136 m

Residential Fixed-mobile phone households: 1.2599 m

Business multi-play workstations (SME) 525,000 workstations

Brands

KPN	Telfort	XS4ALL	Simyo	iBasis
The name of the parent company and of our principal brand.	Good quality at fantastic low prices.	Top quality internet. For professionals and exacting consumers.	The brand for those who know exactly what they want.	Active on the wholesale market for global telephony services.

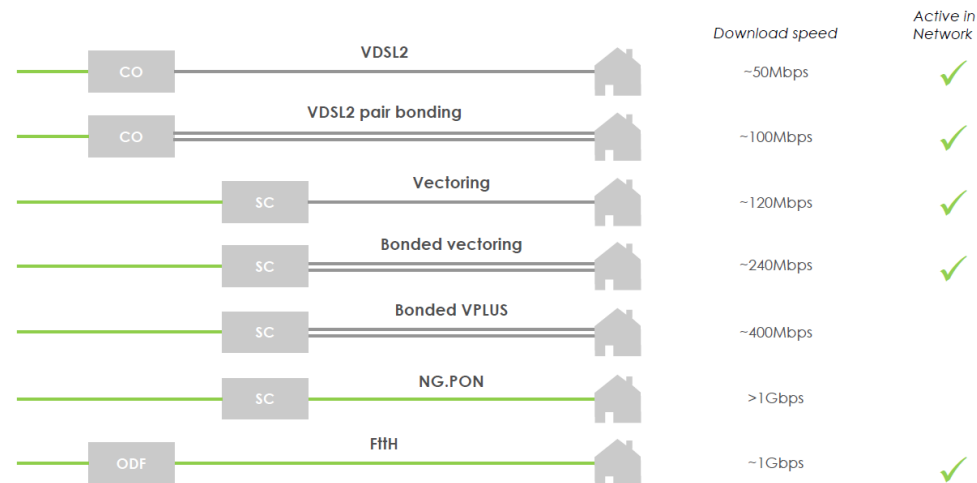| Yes telecom	Ortel Mobile	Argeweb	CAM IT	Solcon	KPN Interned Services	RoutIT	Divider

Fixed Infrastructure

	Download speed	Active in Network
VDSL2	~50Mbps	✓
VDSL2 pair bonding	~100Mbps	✓
Vectoring	~120Mbps	✓
Bonded vectoring	~240Mbps	✓
Bonded VPLUS	~400Mbps	
NG.PON	>1Gbps	
FttH	~1Gbps	✓

Simplify
We are streamlining our portfolio and standardizing our work processes.

Grow
We are increasing value for the customer and KPN through customer-focused investment.
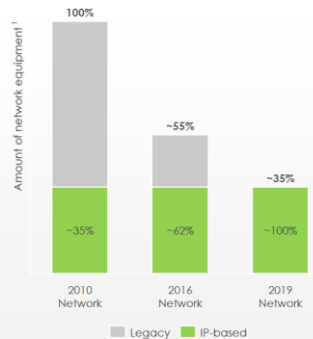
Innovate
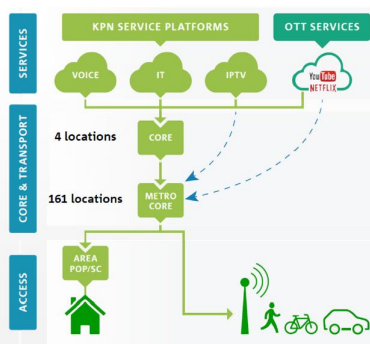We are innovating for the best customer experience today and in the future.
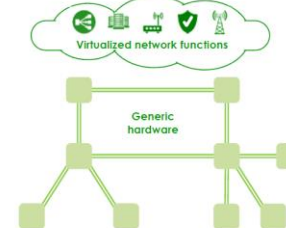

Rationalize

IP transformation on track

Decentralize

Decentralize, bringing services closer to customers

Virtualize

ON-DEMAND VIRTUALIZED SERVICES
- Fast delivery
- Real-time scaling
- Intuitive user experience
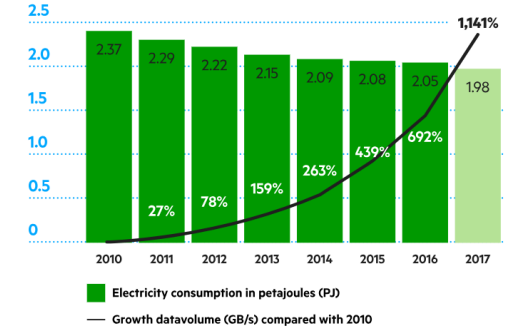- Near real-time updates

DRIVING PERFORMANCE
- Infrastructure as a Service
- Flexible capacity
- Highly automated maintenance
- Self-healing and self-optimizing networks

Source: Yearly report 2017 & Investor presentation May2018

WHY OCP?

- Good match: KPN Goals & OCP tenets[1]

  - **Efficiency & Impact**: *"KPN is industry leader" in the telecommunications category of the Dow Jones Sustainability Index. The independent experts consider KPN the most sustainable telecom company in the world as it outranks all others in the index"*[2]

  - **Scalability**: The data traffic on our networks is growing, on average, by 45 percent per year, through the use of internet, video, and social media. OCP based solutions will make it easier to expand in, also in cost efficient manner.

  - **Openness**: KPN wants to benefits from Open Hardware & Open software.

- **This deployment: investigation to see how OCP Facebook spec hardware matches possible KPN needs**

MEMBER OF
Dow Jones
Sustainability Indices
In Collaboration with RobecoSAM

#1
Industry
Leader
Most sustainable
Telco in the world

Electricity consumption in petajoules (PJ)
— Growth datavolume (GB/s) compared with 2010

1: The OCP tenets
2: KPN: worlds greentest Telco

5

- Strong preference for "OCP Accepted"

- This deployment in KPN lab environment:
  - Facebook OCP spec servers & storage
  - Facebook OCP v2 spec racks
  - Whitebox P4 programmable OCP switches

- # Central Telco DC (4):
  - ## Starting with a few, will increase over time
- # Metro Core (161):
  - ## CORD based
  - ## Just a few racks @ each site
  - ## Servers:
    - ### Controller layer for our programmable whitebox switches
    - ### KPN Edge Network services

Decentralize, bringing services closer to customers
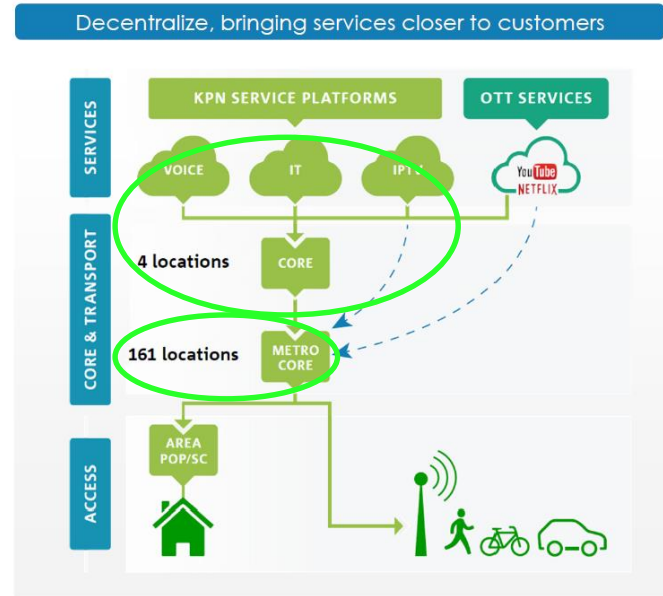
- Pre-configured, pre-build, pre-cabled for "quick" upright rollout into KPN Telco DC:
  ⇒ Not possible

- Learning(s):
  - Not upright but sideways
  - Smaller Rack: will make things easier (~1,80M)

Example 1

Example 2

- KPN ordered 380V power shelves
- 380V: "special" in KPN Telco DC
- Rack design: power entry: Top of Rack
- KPN 380V: only below the lifted floor.

- Learning(s):
  - Use 48V power
  - Power entry: Top of Rack

- Cabling conflicts with easy access to servers
- Biggest headache: Rigid DAC cabling

- Learning:
  - Use Flexible DAC cables
  - Rack Layout: huge impact on cabling complexity

- Using OCP Facebook spec based equipment offers large advantage, also for Telcos (like KPN).

  - However, using this in Telco (legacy) locations creates multiple challenges.

  - However, most challenges can be overcome with solutions available.
  - (Co-)creating a Telco/legacy specific Rack specification seems a good step to take.