WEBINAR
IP-TRANSFORMATION

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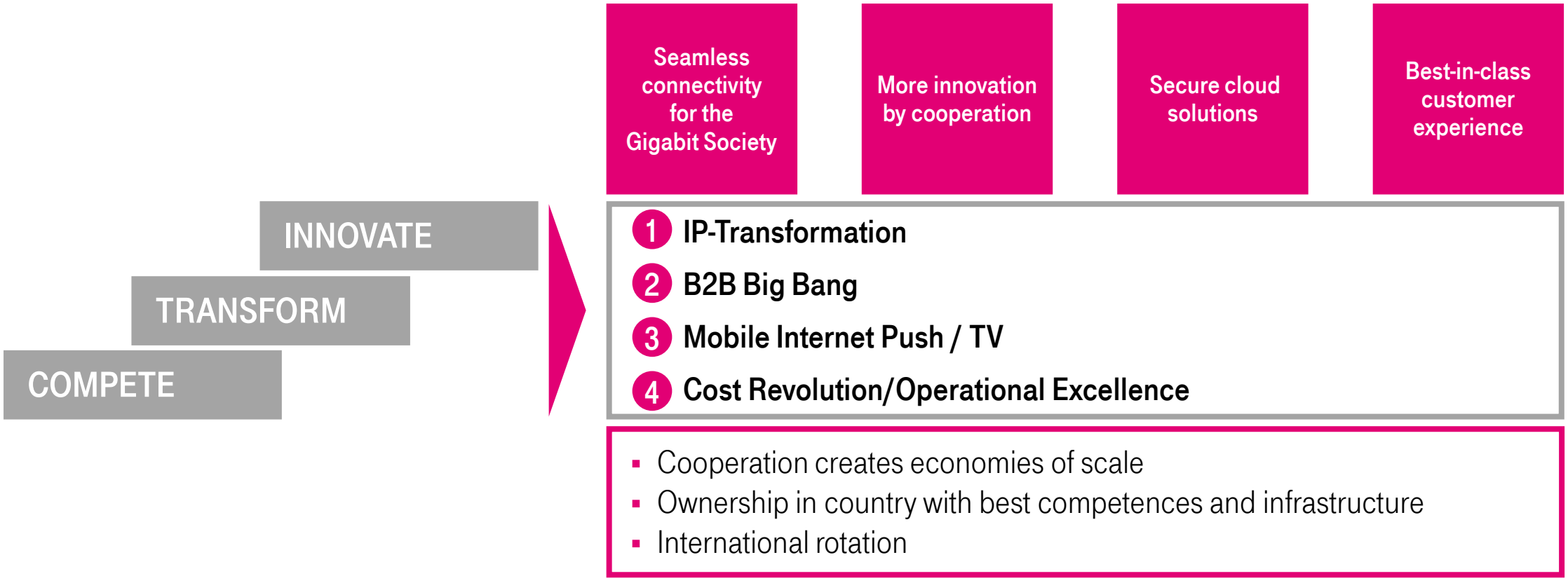
LIFE IS FOR SHARING.

AGENDA

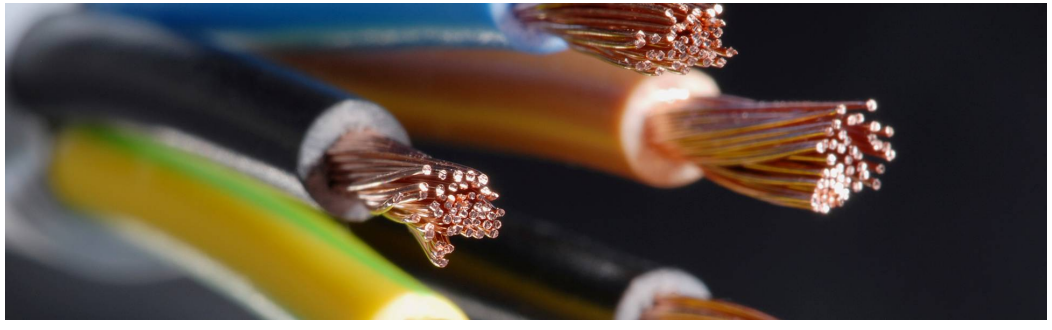
- **Europe strategy**
- **Transformation program for next decade**
- **All IP-Migration**
  - What is IP-Transformation
  - Why now
  - Advantages and challenges of migration
  - Commercial opportunities
  - When is the completion date
- **Target network infrastructure TeraStream**
  - Development from today to TeraStream
  - TeraStream in detail
  - Highlights and benefits
- **Final remarks**

IP-TRANSFORMATION IMPORTANT CORNERSTONE OF EU STRATEGY



OUR TRANSFORMATION PROGRAM FOR THE NEXT DECADE

PSTN migration is the first step

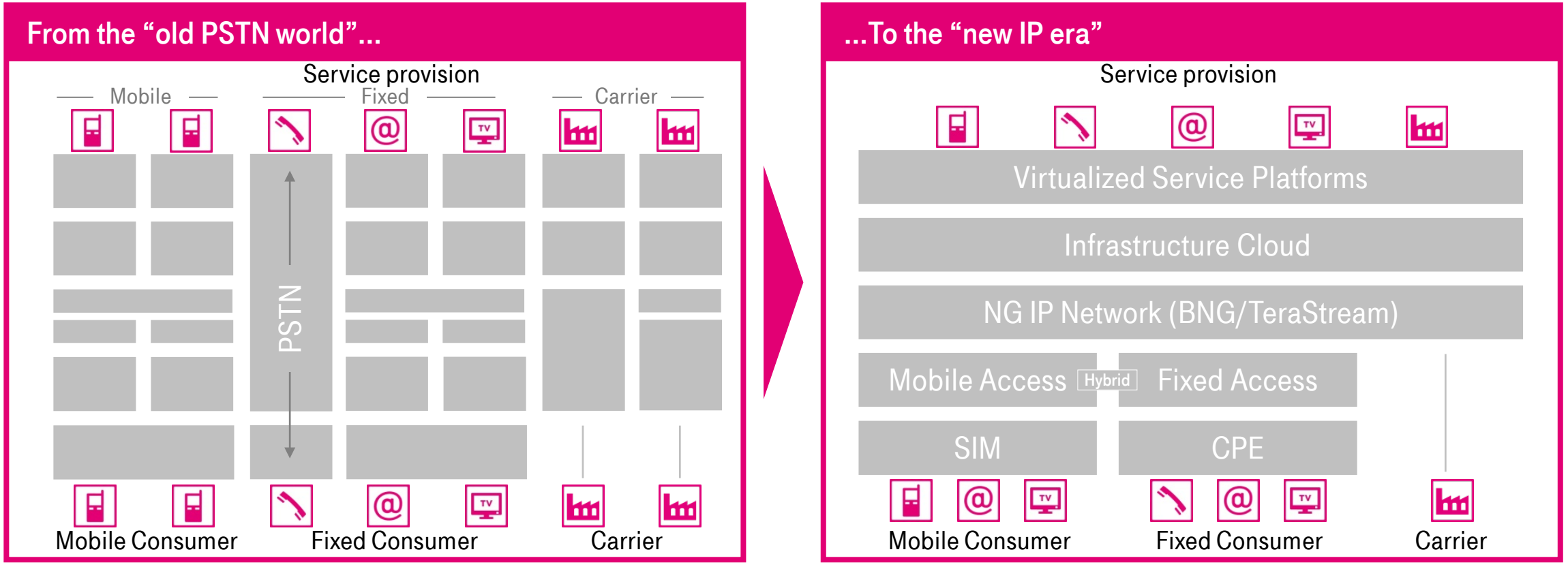


- Execute **switch-off PSTN/ISDN** products efficiently in each country
- The **PSTN migration has been accelerated in 2013** with specific migration plans for each country
- ➡ Focus on **additional customer services** (e.g. self-provisioning) for superior customer experience and **efficient cost savings**

Optimization of IP production

- Step 1 **Broadband Network Gateway (BNG):** consolidation of aggregation and relevant IT systems
- Step 2 **TeraStream:** applying cloud model to network infrastructure, network function virtualization, new real-time OSS
- BNG and TeraStream pilots started in Greece and Croatia respectively
- ➡ Focus on **capacity increase for traffic explosion and additional customer services** (e.g. plug-and-play, reduced latencies, 1 Gigabyte capacity) and **lower network production cost**

WHAT IS IP-TRANSFORMATION? – THE CREATION OF A SIMPLIFIED AND STANDARDIZED NETWORK



WHY IS NOW THE RIGHT TIMING FOR A STRONG FOCUS ON IP-TRANSFORMATION?

Customers need

- Demand for IP products and services
- Demand for fast & easy new solutions (instant activation)
- Demand for integrated personalized products & services
- Customer demand for bandwidth (+68% in mobile, +21% in fixed CAGR 2012 to 2017)

IP-Transformation

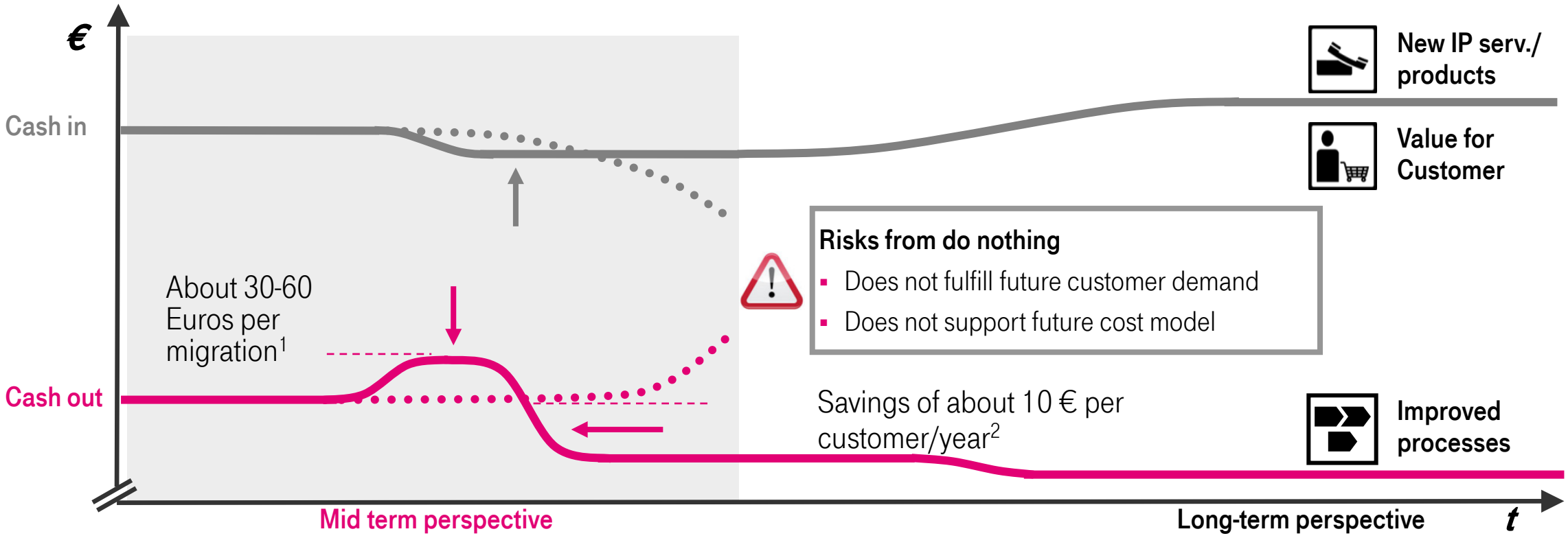
Technology

New technologies enable creation of new production model

- Software-Defined Networking (SDN)
- Content Delivery Network (CDN)
- Virtualization
- Optical IP

Source: Cisco Visual Networking Index: Forecast and Methodology, 2012–2017

ADVANTAGES AND CHALLENGES OF PSTN- MIGRATION



1 Depending on migration strategy; 2 After complete PSTN switch-off

Migration Do nothing case Influencing

COMMERCIAL OPPORTUNITIES IN B2B & B2C

Value for Customer

- Instant provisioning & faster customer service
- Network stability
- Clear voice quality
- ➡ Product examples:
  - Hybrid Access
  - HD Voice
  - Broadband on demand (e.g. Macedonia)
  - On-demand scalability (e.g. number of lines)

New IP services/products

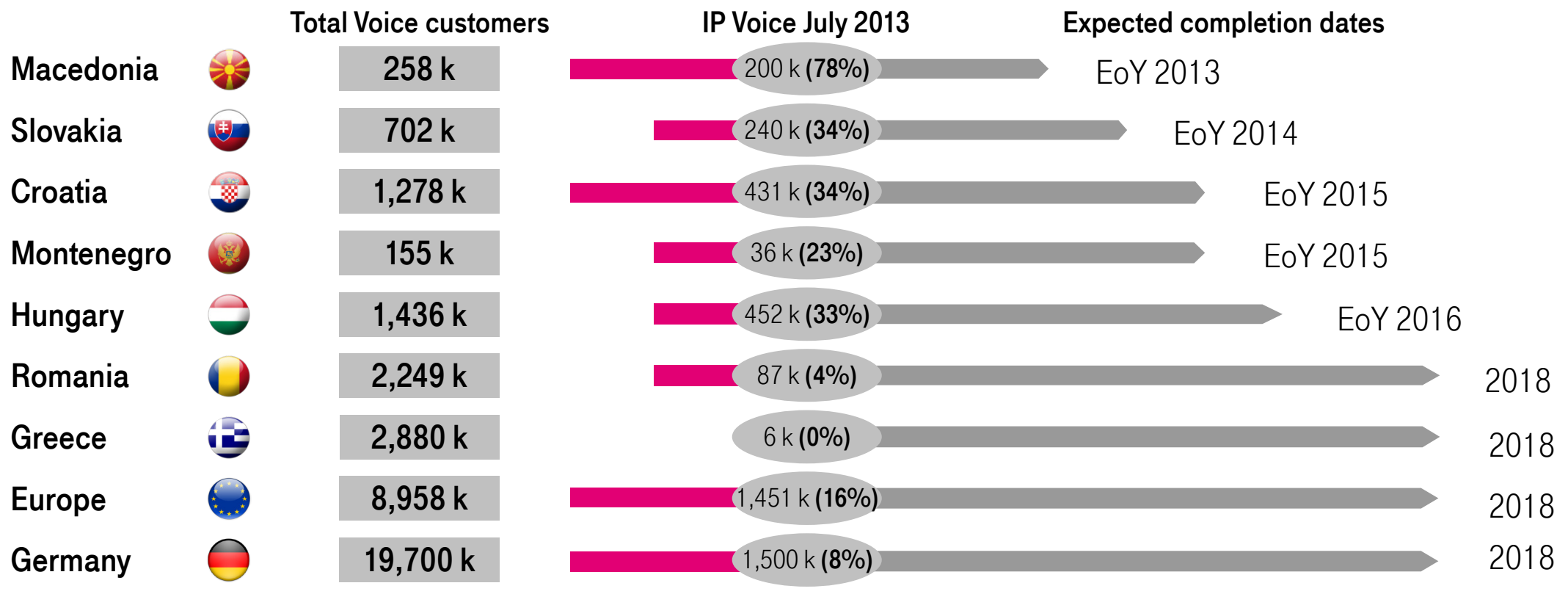
- Accelerated time-to-market
- Future proof product concept
- Enables convergent solutions
- ➡ Product examples:
  - IP Centrex/Hosted PBX
  - Unified Communication
  - IP Phone Portfolio

Improved processes

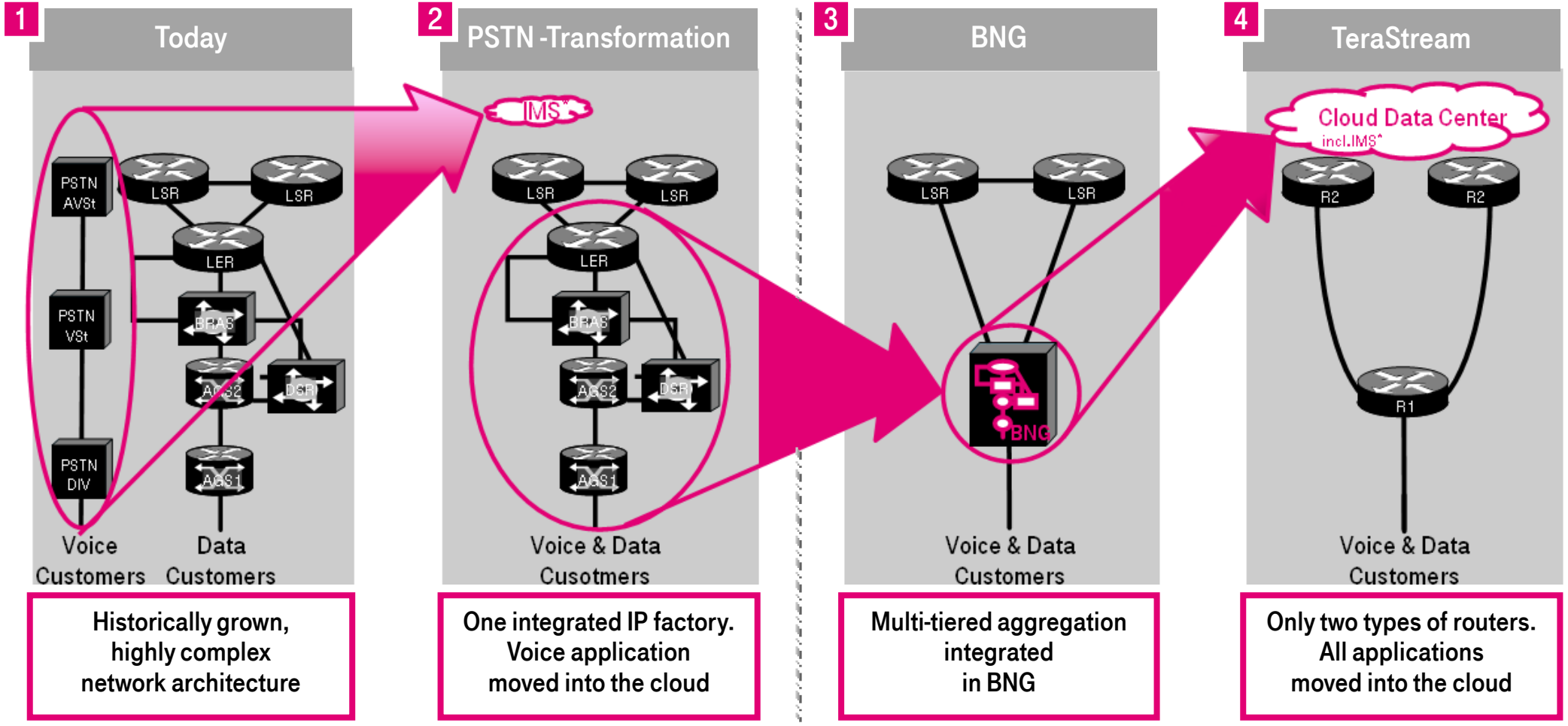
- Enables Zero Touch for provisioning and repair (plug & play without assignment of technicians)
- Increase self provisioning capabilities

TARGET SCHEDULE FOR PSTN MIGRATION BY COUNTRY

Subscriber base, actuals and target completion dates



TECHNOLOGY DEVELOPMENT:
PSTN (TODAY) – ALL IP /BNG – ALL IP/ TERASTREAM

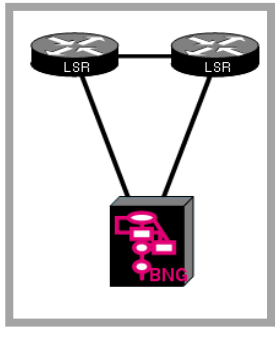


AGS1 - Aggregation Switch 1; AGS2 - Aggregation Switch 2; AVst – Automatical Switching Center; BRAS - Broadband Remote Access Server; DIV – Digital Switching Center (PSTN/ISDN); DSR - D-Server Router (Distribution of IP Multicast for IP/TV); IMS - IP Multimedia Subsystem; LER - Label Edge Router; LSR - Label Switch Router; R - Router; VSt – Switch Center

THE STEP FROM BNG TO TERASTREAM LEADS TO A REDUCTION OF PROTOCOLS

BNG – Protocols

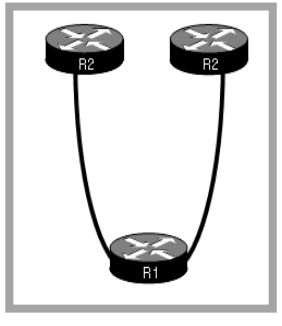
IPv6
MPLS
PPPoE
DHCP
IPv4
Tunnel
FRR
OTN
100 GE
ATM
SDH



TeraStream – Protocols

IPv6
DHCP
Tunnel
100 GE

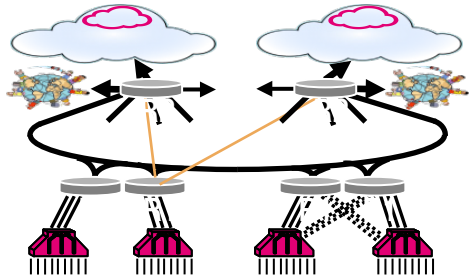
- Infrastructure Cloud model
- Drastic simplification of IP networks
- Reduction of layers to the minimum
- IP & Optical integration



TERASTREAM FEASIBILITY ALREADY REALIZED AS A PILOT IN CROATIA

TeraStream

- European first native IPv6 network
- Worldwide first integration of network and cloud technology for service production = Network function virtualization[1]
- Worldwide first 100 Gb/s network using IP and optical integration
- New real-time operations support system (OSS)
- Works with all access technologies (e.g. fiber, vectoring, DSL, LTE)



Benefits

Time to market:

- Software-based service production - Innovation cycle will be reduced dramatically from years to month

Customer Experience:

- Self service and plug & play will be common for all customers
- Realtime – minimal latency (from 10s of ms to ms)
- Highest upstream and downstream bandwidth
- It is the basis for simplicity and future customer experience

Cost Aspect:

- It will be operated at a fraction of today's cost capital, labor and energy cost

1 As a result, 40% of total traffic going forward will be delivered by data centers, tightly linked to the network; all more complex parts of production machine will be centralized

SUMMARY AND CLOSING REMARKS

IP-Transformation is a must do for the industry

- Enhanced customer experience → Superior products, better customer service and faster technology (e.g. higher speed and less latency)
- Efficient cost structure → Savings of about 10 € per customer/year[1] in Europe
- Lean production & virtualization →Easier maintenance and technology roll outs

DT aspirations

- First operator to finalize a PSTN-migration in a European country (Macedonia) by end of 2013
- Migration of all countries by end of 2018
- TeraStream pilot in Zagreb shows DTs superior future production model
- TeraStream principles as key element of the target production model identified and vital part of our vision for a pan-european integrated IP network for Europe

1 After complete PSTN switch-off

Q&A

GLOSSARY

AGS1	Aggregation Switch 1
AGS2	Aggregation Switch 2
ATM	Asynchronous Transfer Mode
AVst	Automatical Switch Center
BRAS	Broadband Remote Access Server
CDN	Content Delivery Network
DIV	Digital Switch Center (PSTN/ISDN)
DHCP	Dynamic Host Configuration Protocol
DSR	D-Server Router (Distribution of IP Multicast for IP/TV)
FRR	Fast Re-Route
GE	Gigabit Ethernet
IMS	IP Multimedia Subsystem
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
LER	Label Edge Router
LSR	Label Switch Router
MPLS	Multi Protocol Label Switching
NFV	Network Functions Virtualization
OTN	Optical transport network
R*	Router
PPPoE	PPP over Ethernet
PSTN	Public Switched Telephone Network
SDH	Synchronous Digital Hierarchy
SDN	Software-Defined Networking
VSt	Switch Center