ALL-IP MIGRATION CENTRAL PART OF DEUTSCHE TELEKOM'S SUPERIOR PRODUCTION MODEL

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LIFE IS FOR SHARING.

OUR STRATEGY: TECHNOLOGY LEADERSHIP IS KEY FOR OUR MISSION TO BECOME THE LEADING EUROPEAN TELCO

LEADING EUROPEAN TELCO

TECHNOLOGY LEADERSHIP

INTEGRATED IP NETWORKS

BEST CUSTOMER EXPERIENCE

WIN WITH PARTNERS

LEAD IN BUSINESS

TRANSFORM PORTFOLIO

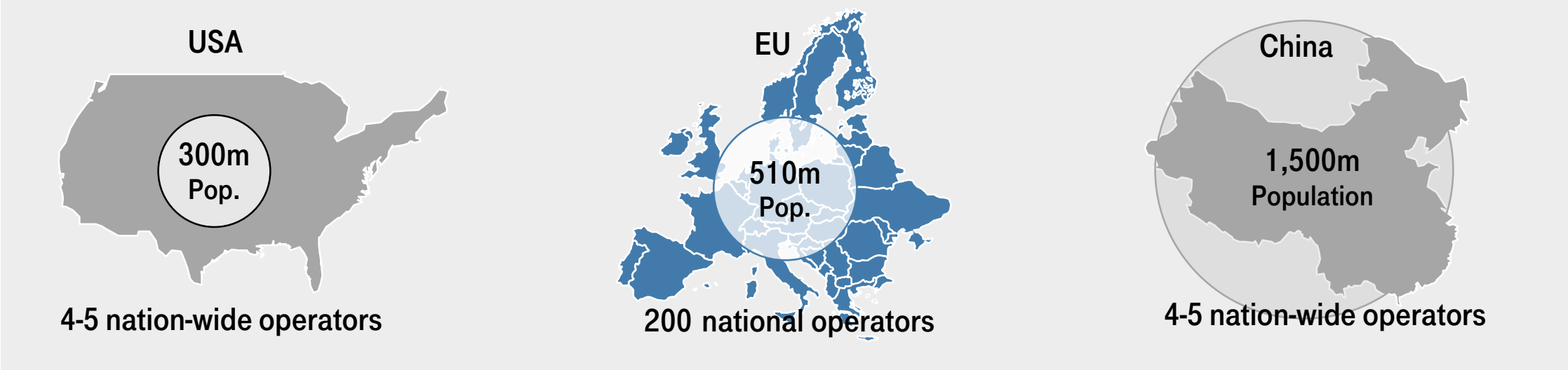EVOLVE FINANCIAL TARGETS & EFFICIENCY

ENCOURAGE LEADERSHIP & PERFORMANCE DEVELOPMENT

OUR CHALLENGES: EUROPEAN TELCO MARKET EXTREMELY FRAGMENTED COMPARED TO OTHER MARKETS

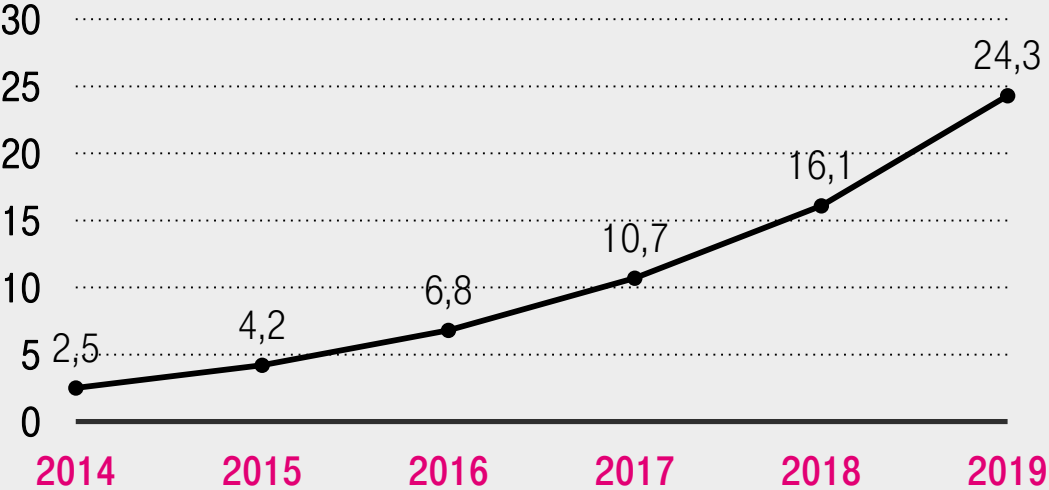## MARKET SIZES COMPARED TO NUMBER OF OPERATORS PER REGION

USA

300m Pop.

4-5 nation-wide operators

EU

510m Pop.

200 national operators

China

1,500m Population

4-5 nation-wide operators

Source: European Commission

OUR CHALLENGES: DATA CONSUMPTION IS SKYROCKETING

TRAFFIC IN EXABYTES PER MONTH

Year	Traffic
2014	2,5
2015	4,2
2016	6,8
2017	10,7
2018	16,1
2019	24,3

Source: Cisco Systems; ID 271405

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OUR ANSWER: WE RADICALLY CHANGE TELCO PRODUCTION

DT'S SUPERIOR PRODUCTION MODEL: A VISIONARY APPROACH

T··

WHAT DIFFERENTIATES US:
WE THINK 'TRANSFORMATION' BEYOND TECHNOLOGY

WAIT AND SEE - DO WHAT IS NECESSARY, REACTIVE

Stick to **currently installed technology for as long as possible** and wait for vendors to offer key-turn-projects

Stay **away of anything that affects the customer relationship** (risk of loosing customers by shutting down old platforms)

Technology function fully responsible for the whole "All IP Transformation"

Use Governance & regulations as excuses for limited cross-country synergies

Develop **only own products**

VS.

THINK BIG - GO FOR POTENTIAL, PROACTIVE

Drive industry & vendors (e.g. TeraStream, 5G)

Use all migration paths, **convince customers of advantages** of new platforms and go for **upselling potential**

**Cross-company approach & cross-functional** for transformation project

Go for cross-country synergies beyond procurement: **Work with all stakeholders**, vendors, investors, governments

Go for **partnering**

WE START WITH WHAT WE HAVE AND WORK TOWARDS OUR TARGET PICTURE

Cloudification / IT centralizaiton

STEP-BY-STEP TRANSFORMATION

TARGET PICTURE

| PAST | PSTN -TRANSFORMATION | BNG | TERASTREAM |

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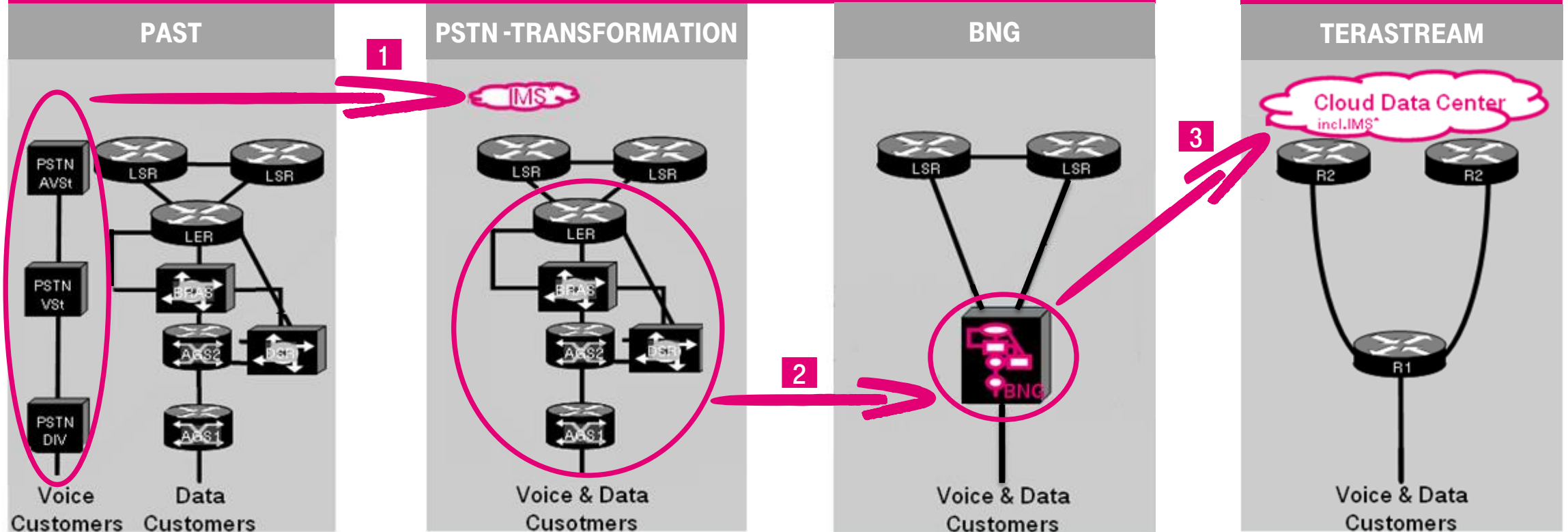
DT'S SUPERIOR PRODUCTION MODEL BUNDLES THE STRENGTHS TO REACH TECHNOLOGY LEADERSHIP & BEST CUSTOMER EXPERIENCE

DIGITAL TRANSFORMATION OF CUSTOMER FACING PROCESSES
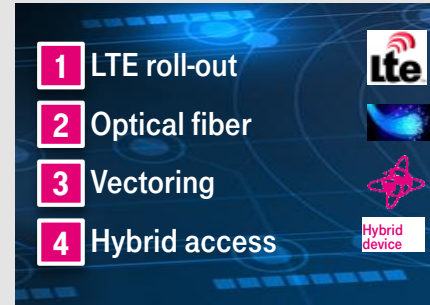
COST EFFICIENCY & SIMPLICITY

Annual run rate adj. Opex savings:

≈ €-1.2 bn[1]

ALL-IP TRANSFORMATION	PAN-EUROPEAN NETWORK	INTEGRATED NETWORK STRATEGY
PSTN migration in all NatCos	Centralized, virtualized architecture and production platforms	1 LTE roll-out 2 Optical fiber 3 Vectoring 4 Hybrid access
PLUG & PLAY	**TIME TO MARKET**	**BEST CONNECTIVITY**

[1] Gross Opex savings D/EU before any counter effects (e.g. personnel cost increases)

ALL IP TRANSFORMATION:
BASIS FOR PLUG AND PLAY EXPERIENCE

DIGITAL TRANSFORMATION OF CUSTOMER FACING PROCESSES

COST EFFICIENCY & SIMPLICITY

ALL-IP TRANSFORMATION

PSTN migration in all NatCos

PLUG & PLAY

PAN-EUROPEAN NETWORK

PAN NET

Centralized, virtualized architecture and production platforms

TIME TO MARKET

INTEGRATED NETWORK STRATEGY

1 LTE roll-out
2 Optical fiber
3 Vectoring
4 Hybrid access

BEST CONNECTIVITY

ALL IP TRANSFORMATION: THE CREATION OF A SIMPLIFIED AND STANDARDIZED NETWORK

FROM THE "OLD PSTN WORLD"...

Mobile · Fixed · Carrier

PSTN

Mobile Consumer · Fixed Consumer · Carrier

...TO THE "NEW IP ERA"

Service

Virtualized Service Platforms

Core

Infrastructure Cloud

NG IP Network (BNG/TeraStream)

Transport

Access

Mobile Access | Hybrid | Fixed Access

SIM | CPE

Mobile Consumer · Fixed Consumer · Carrier
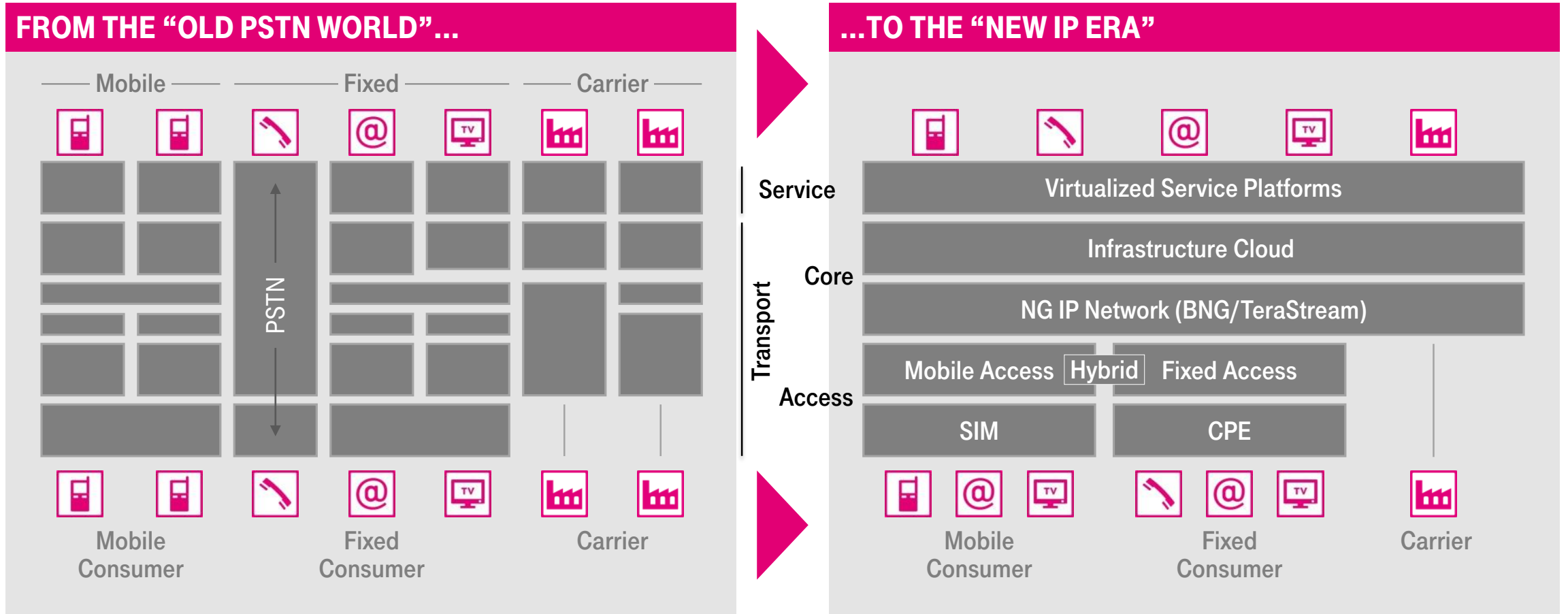
PSTN MIGRATION: IT IS TIME FOR REVOLUTION INSTEAD OF EVOLUTION

FROM THE "OLD PSTN WORLD"...

Mobile   Fixed   Carrier

PSTN

Mobile Consumer   Fixed Consumer   Carrier
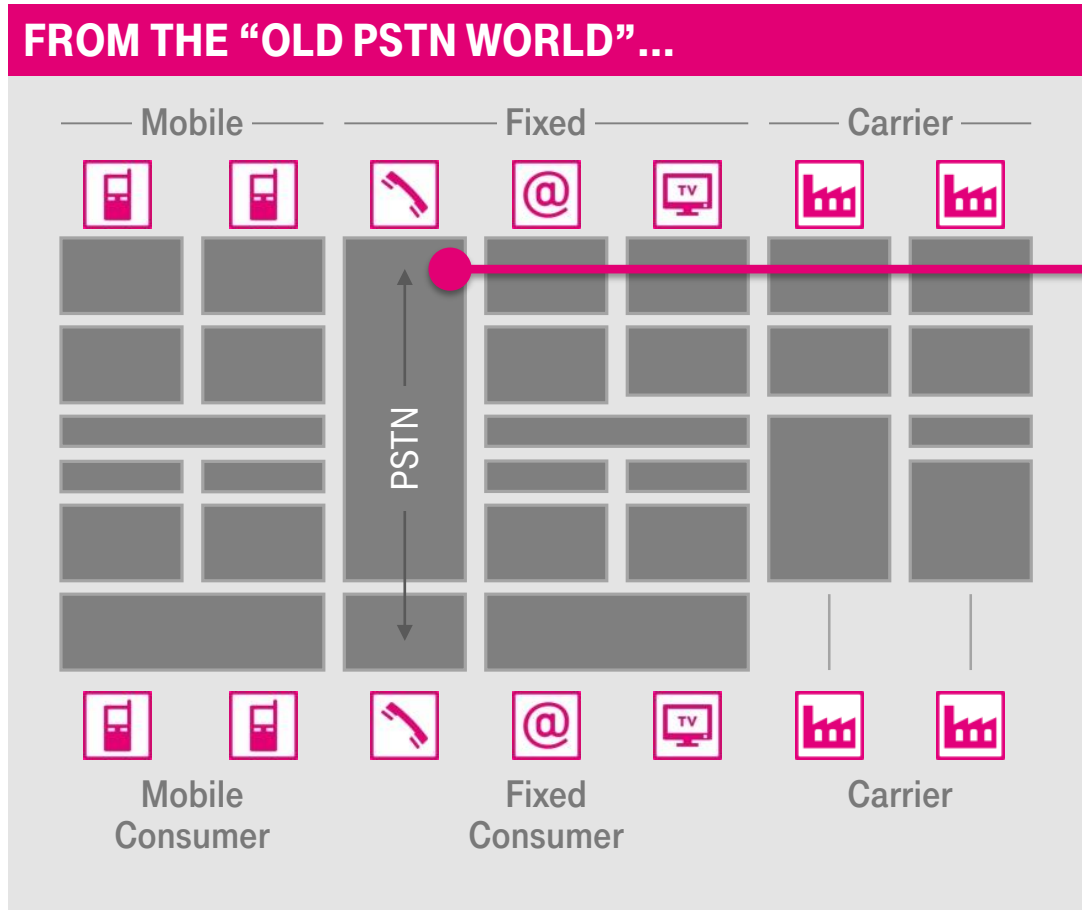
EVOLUTION OF VOICE PRODUCTION PLATFORM

Manual switching   Strowger switch   ISDN   Softswitch

Softswitch would keep us in technology silo instead of paving the way for a layered structure

PSTN MIGRATION IS THE FIRST STEP ON THE WAY TO SEPARATE SERVICES FROM TRANSPORT LAYERS

IMS in central data center

MSAN in outdoor cabinet or CO

Router (no splitter)

THE NEW IP ERA

Service

Virtualized Service Platforms

Core

Infrastructure Cloud

NG IP Network (BNG/TeraStream)

Access

Fixed Access   Hybrid   Mobile Access

CPE   SIM

Fixed Consumer   Mobile Consumer   Carrier
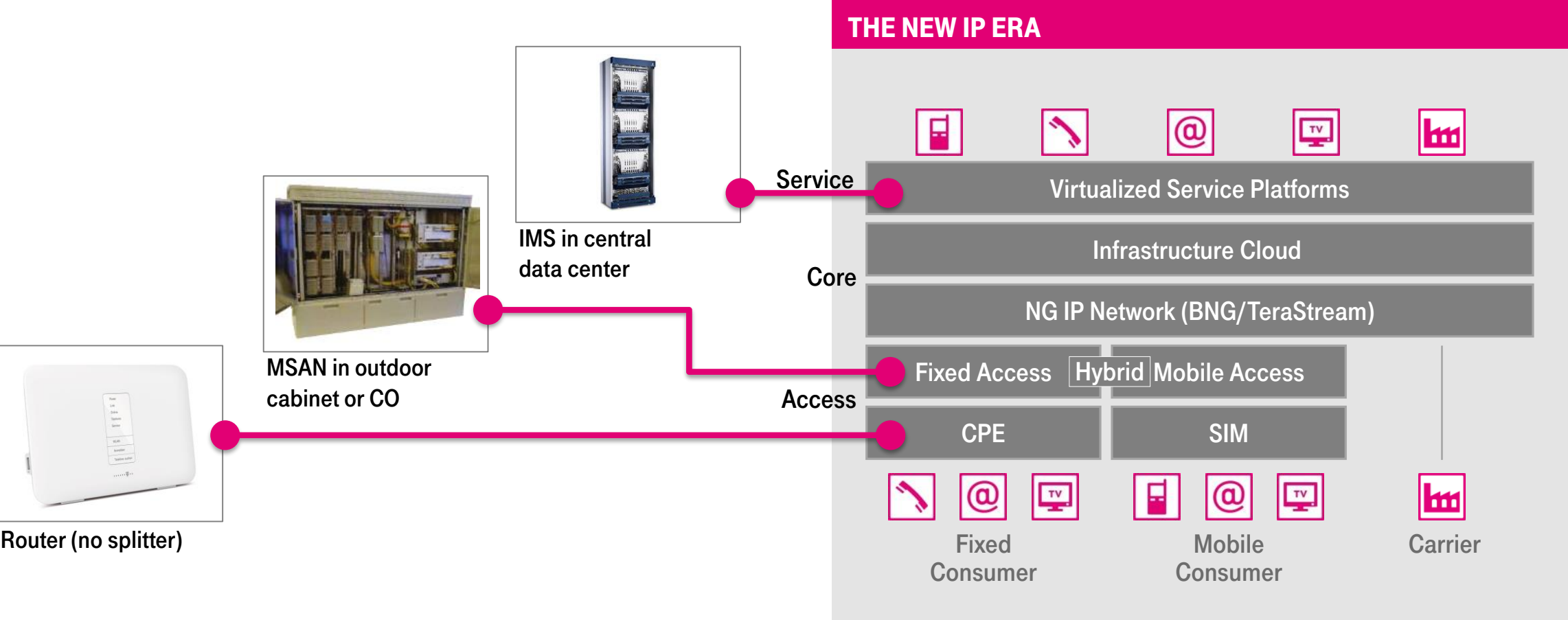
DEUTSCHE TELEKOM PURSUES DIFFERENT PSTN MIGRATION STRATEGIES IN EUROPE

Mass market scenarios only

PSTN replacement only

- Using MSAN card solutions for all customers (Single (SP), Double (DP) and Triple Play (TP) customers)
+ silent migration
+ low risk of churn
+ cheaper and faster
− additional operating costs (2 ports per customer and higher configuration cost)
− no All-IP opportunities

Reduced VoBB scenario

- all Single Play customers
- actively migrated Double Play customers

VoBB for
- rest of Double Play customers
- all Triple Play customers

All DP/TP on VoBB

MSAN cards for
- all Single Play customers

VoBB for
- all Double Play customers
- all Triple Play customers

Extended VoBB scenario

- most of the Single Play customers

VoBB for
- Single Play customers with high up-sell potential
- all Double and Triple Play customers

Full All-IP

- Using VoBB for all customers
+ all-IP opportunities
+ up-sell potential
+ future ready
− higher costs
− higher risk of churn and revenue loss

Business Perspective

ALL-IP Strategy Perspective

VoBB = Voice over Broadband   MSAN = multi-serviceaccess node

PSTN MIGRATION IS PRIMARILY ABOUT COST AVOIDANCE & ENABLING OF IP SERVICES/PROCESSES

€

Cash in

Cash out

About 30-60 Euros per migration[1]

Risks from do nothing
- Does not fulfill future customer demand
- Does not support future cost model

New IP serv./ products

Value for Customer

Savings of about 10 € per customer/year[2]

Improved processes

Mid term perspective

Long-term perspective

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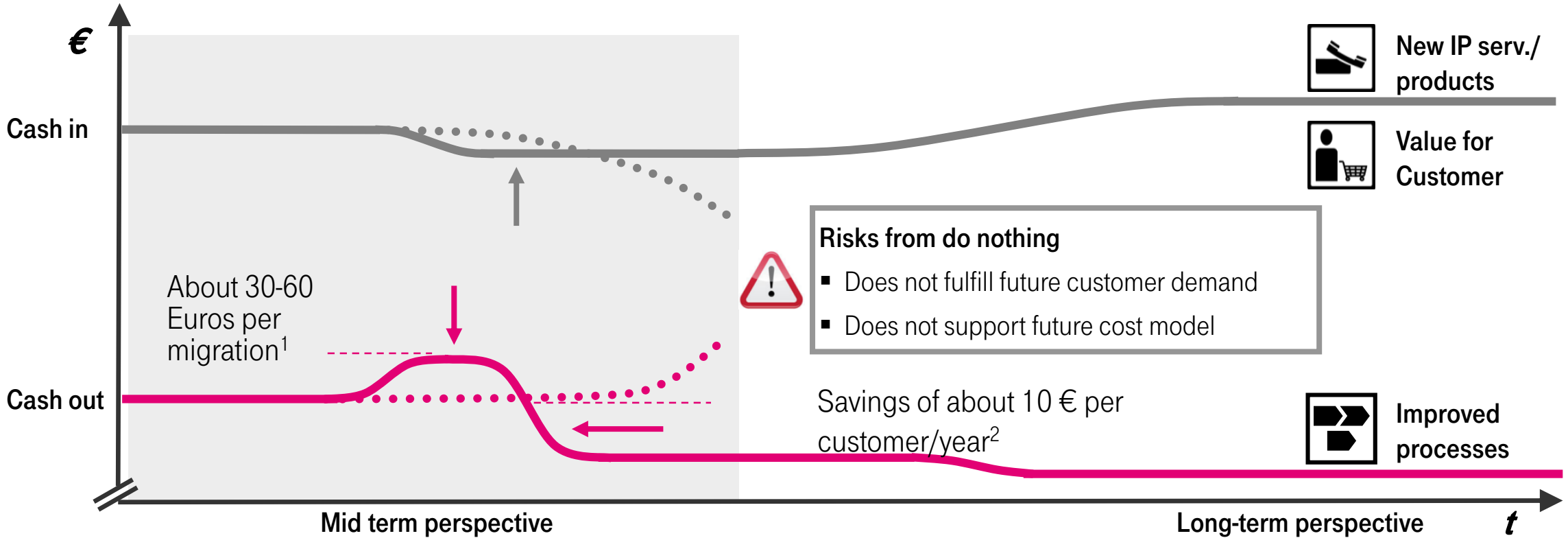
1 Depending on migration strategy; 2 After complete PSTN switch-off

— Migration

····· Do nothing case

⇒ Influencing

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WE NEED TO MIGRATE 100% OF OUR CUSTOMERS AND IT GETS MORE EXPENSIVE IN THE END

MIGRATION COSTS IN DIFFERENT PHASES

x 2

x 6

NATURAL MIGRATION

ACTIVE MIGRATION
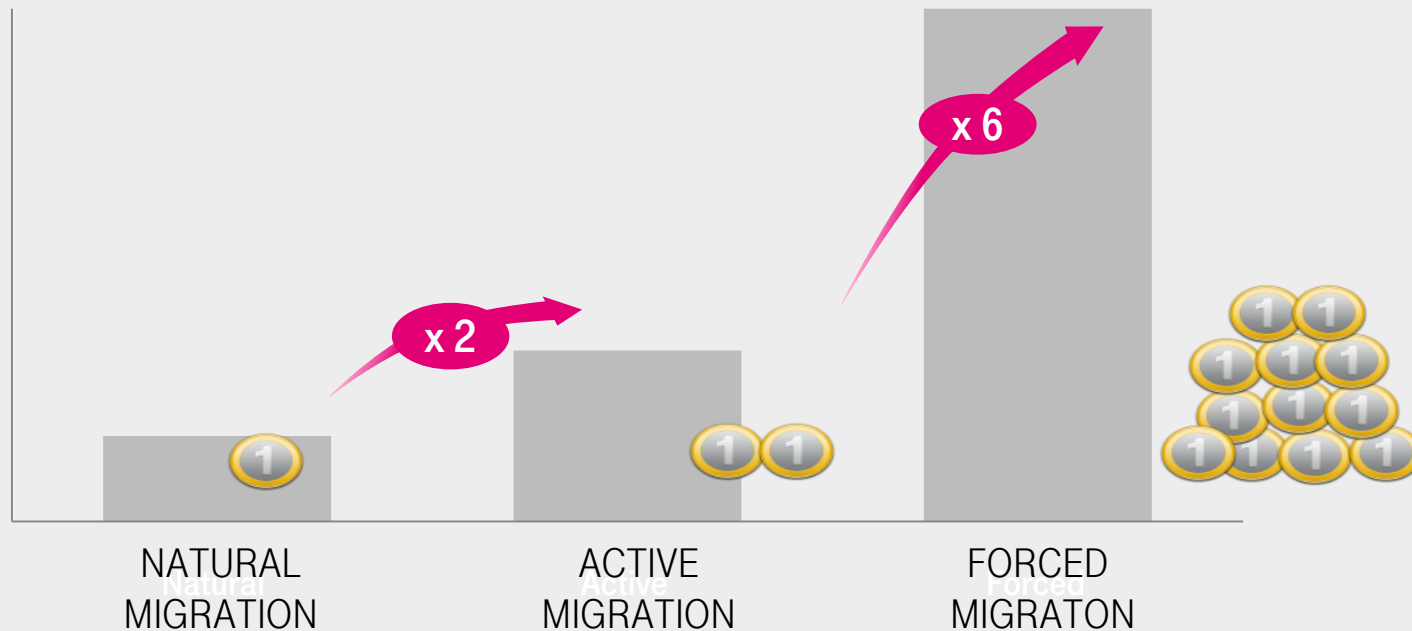
FORCED MIGRATON

Push customer driven NATURAL migration, than start the ACTIVE opportunity driven approach
to avoid the costs of the FORCED migration.

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IT'S NECESSARY TO DIFFERENTIATE BETWEEN CUSTOMER SEGMENTS WHEN STARTING MIGRATION

CUSTOMER SEGMENT AS A PRIORITIZATION CRITERIA

TECHNICAL SOLUTION COMPLEXITY

high (customized solutions/ special cases)

low (standard products, existing substitutes)

MIGRATION PROCESS COMPLEXITY

low

high (need of customized solutions, multi-area presence, regulator interaction wholesale negotiations)

low priority – high priority

WS Wholesale partner products
RC Residential customers products
BC Business customers products

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17

ALL IP TRANSFORMATION IS NOT A PURE TECHNOLOGICAL APPROACH BUT IT IS ABOUT A CROSS-FUNCTIONAL ENABLING

INTRODUCTION OF NEW FEATURES GOES DOWN TO ONLY ONE SOFTWARE UPGRADE

Example: „HD Voice"

OLD WORLD

12x

700x

8,300x
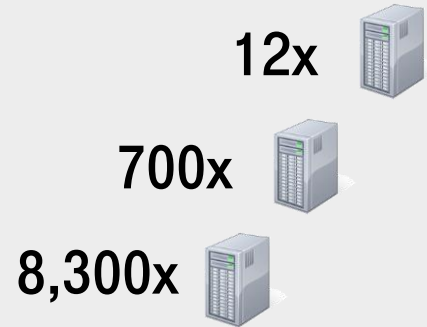
KNOWN FOR MORE THAN 14 YEARS

NEW WORLD

1x

**IMPLEMENTED FROM DAY 1
UPGRADES EASY**

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SERVICE PROVISIONING: INSTANT DELIVERY FOR THE CUSTOMER WITH „ZERO TOUCH" PROVISIONING FOR OPERATOR

Example: „Broadband on Demand"

	OLD WORLD	NEW WORLD
Duration	**Days or Weeks**	**Seconds**
Customer Experience	5 steps interaction	3 Clicks
Production	5 steps, semi manual	Fully automated
	EXPENSIVE, SLOW	ENABLING IMPULSE PURCHASES

TANGIBLE RESULTS: HIGHER PRODUCTIVITY & QUALITY

CRITERIA	FIGURES
Personnel intensity ↘	**FTE in Customer Services** — **-26%** — 2013 / 2014
Maintenance intensity ↘	**Customer announced Faults** — **-14%** — 2013 / 2014
Reliability ↗	**Mean Time Between Failures** — **+19%** — 2013 / 2014
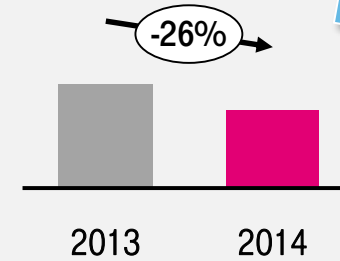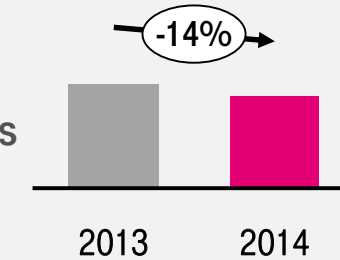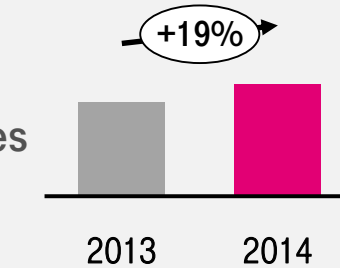
BENEFITS OF PSTN MIGRATION RESULT IN 10€ COST REDUCTION FOR VOICE PRODUCTION PER ACCESS LINE

POWER

Reduced energy consumption of 348 GWh[1] yearly equals a 8 km long train with 500 cisterns with fuel oil

MAINTENANCE

Line-up of dismantled legacy equipment within DT group would be longer than the entire M25 (>180KM)

SERVICE

Massive Simplification

1 Number refer to the sum of HU, GR, RO, MK, HR, SK, ME

ALL-IP TRANSFORMATION: WE ARE ON TRACK

ALL-IP TRANSFORMATION BY COUNTRY (NUMBERS IN THOUSANDS)

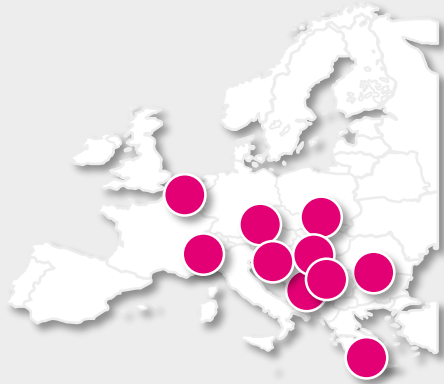|	Total Voice customers August 2015	IP access lines August 2015		Areas shut down August 2015	expected completion dates
Macedonia	230	230 (100%)	✓	22 of 22	Jan 15th, 2014
Slovakia	598	598 (100%)	✓	50 of 50	Dec 15th, 2015
Croatia	1.110	1.076 (97%)		46 of 72	EoY 2015
Montenegro	144	130 (90%)		0 of 4	EoY 2015
Hungary	1.406	954 (68%)		25 of 67	EoY 2016
Romania	2.000	227 (11%)		0 of 96	EoY 2018
Greece	2.601	29 (1%)		0 of 190	EoY 2018
Europe	8.089	3.244 (40%)		143 of 501	EoY 2018

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PAN EUROPEAN NETWORK:
THE NEXT TELCO PRODUCTION.
MADE FOR EUROPE.

DIGITAL TRANSFORMATION OF CUSTOMER FACING PROCESSES

COST EFFICIENCY & SIMPLICITY

ALL-IP TRANSFORMATION

PSTN migration in all NatCos

PAN-EUROPEAN NETWORK

Centralized, virtualized architecture and production platforms

PAN NET

INTEGRATED NETWORK STRATEGY

1 LTE roll-out
2 Optical fiber
3 Vectoring
4 Hybrid access

PLUG & PLAY

TIME TO MARKET

BEST CONNECTIVITY

WE COMPETE AGAINST CENTRALIZED PLAYERS WITH OUR CURRENT LOCAL AND DETACHED PRODUCTION

DT EUROPE

GLOBAL PLAYERS

30 BILLION MESSAGES SENT PER DAY

Local Platform

- Limited investment capabilities to scale up and innovate
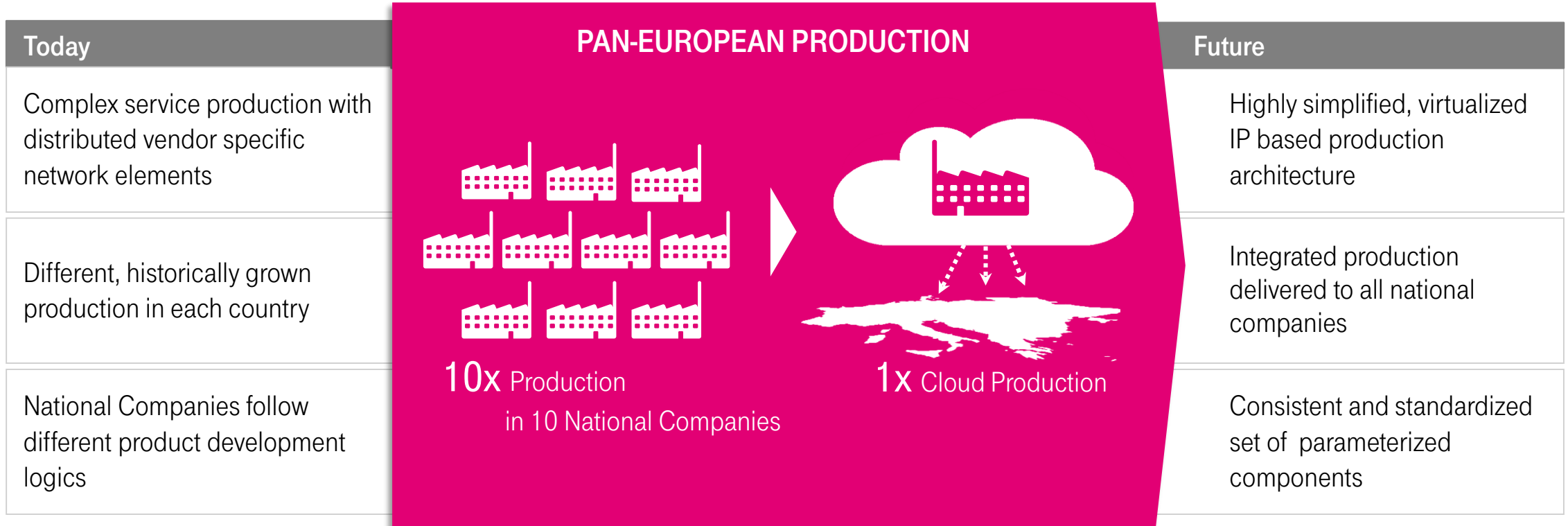- Challenge to keep services & quality up to date

Joint Platform

- Joint x-border global production with **significant economies of scale**
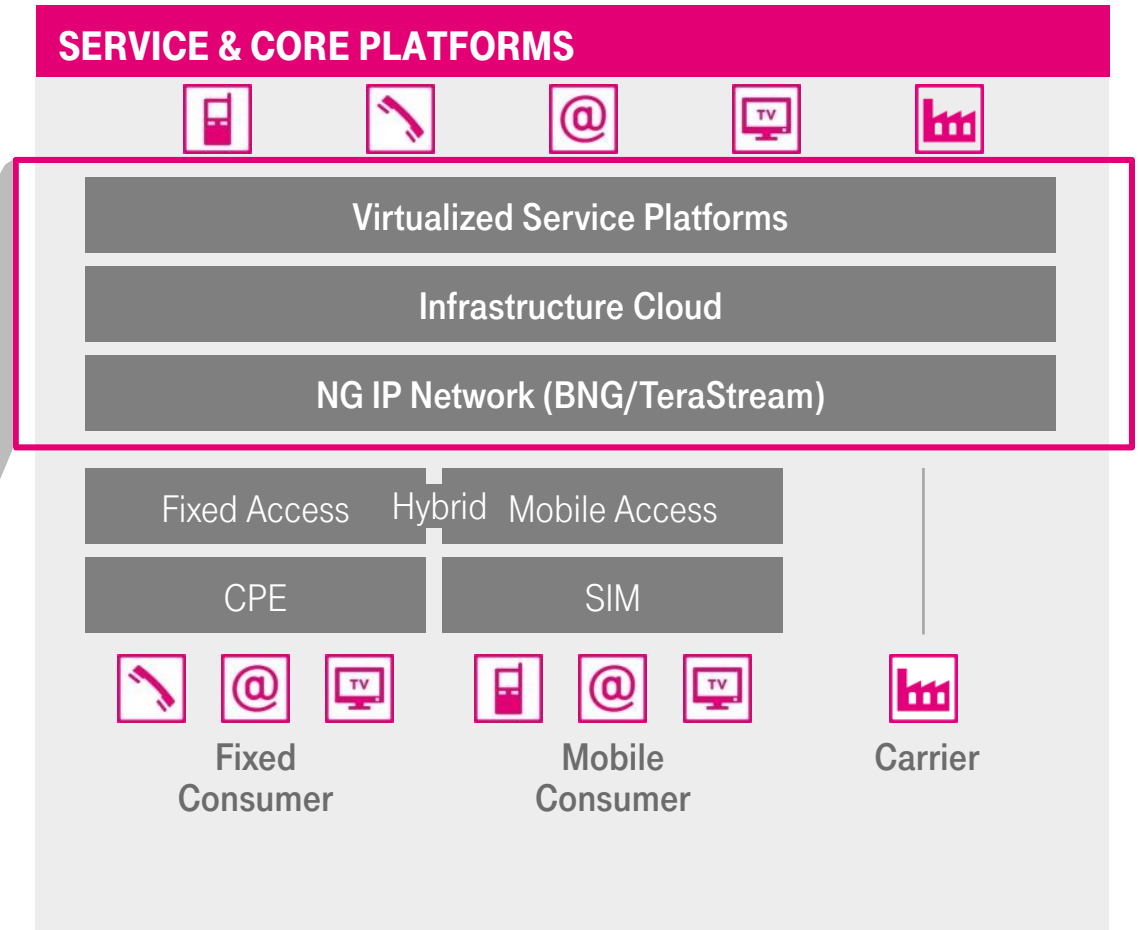- Fast **time-to market** for new services
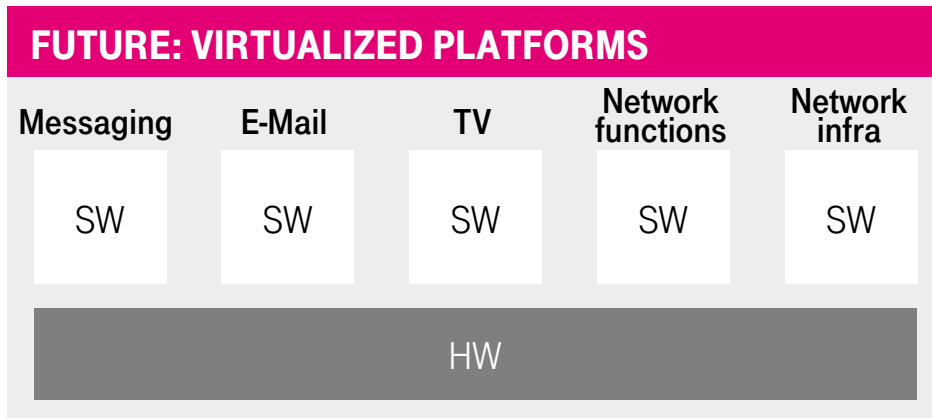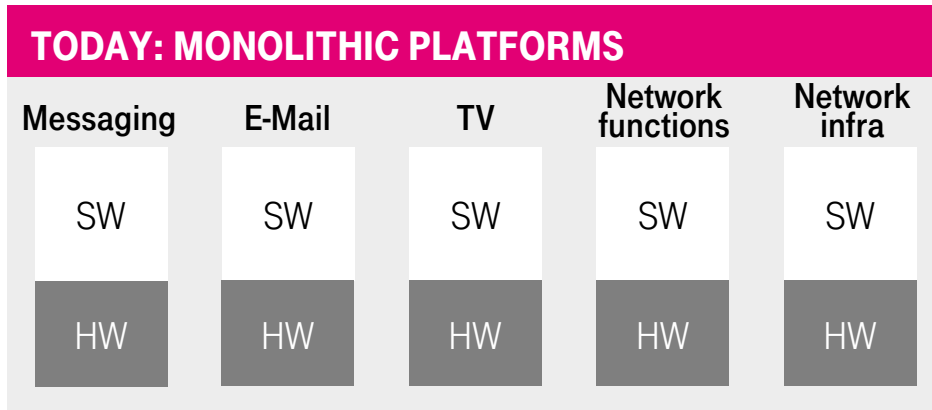- **Huge level of innovation** driving the digital world

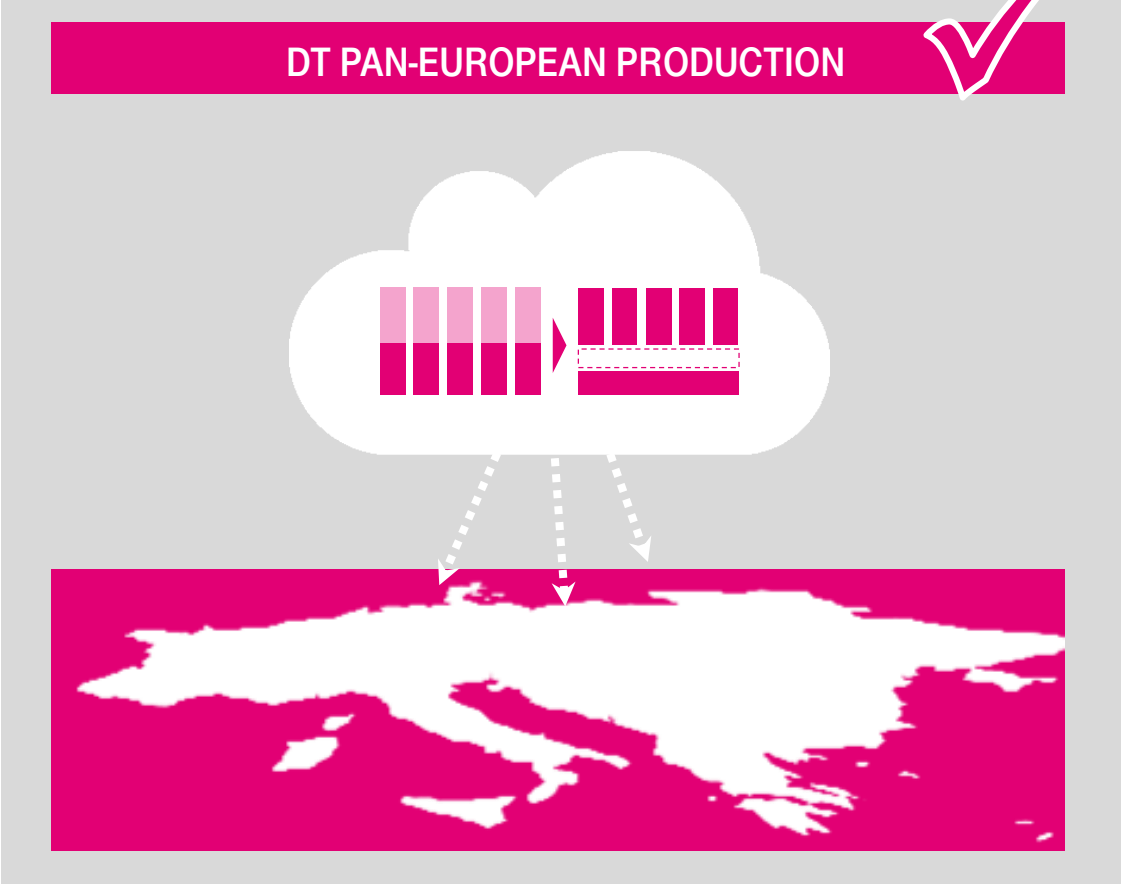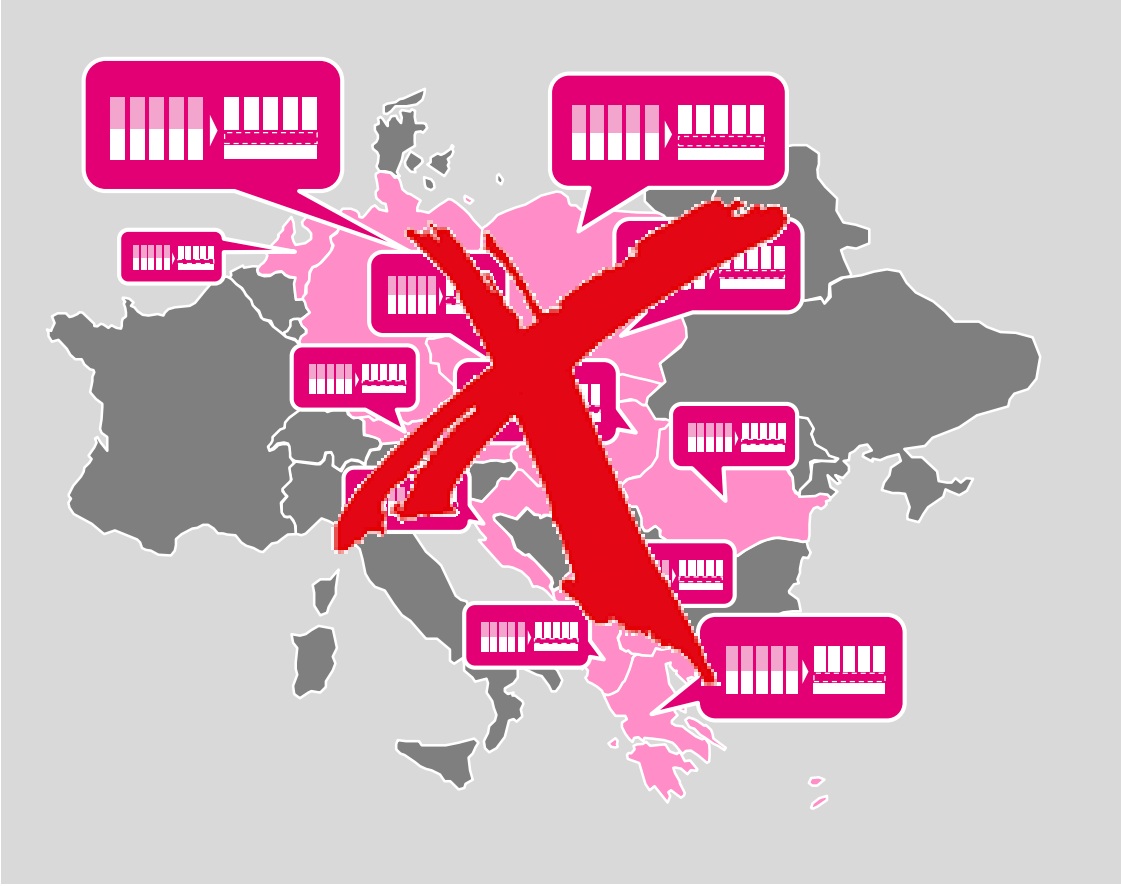# TO FACE THIS WE APPLY STANDARDS PROVEN IN OTHER INDUSTRIES FOR YEARS

COMMON COMPONENTS

FLEXIBILITY TO ADJUST FOR LOCAL NEEDS

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WE BUILD AN INTEGRATED EUROPEAN NETWORK WITH MAXIMUM TECHNOLOGY AND COMMERCIAL BENEFITS

| Today	PAN-EUROPEAN PRODUCTION	Future
Complex service production with distributed vendor specific network elements		Highly simplified, virtualized IP based production architecture
Different, historically grown production in each country	**10x** Production in 10 National Companies → **1x** Cloud Production	Integrated production delivered to all national companies
National Companies follow different product development logics		Consistent and standardized set of parameterized components

VIRTUALIZATION AND SEPARATION OF HARDWARE AND SOFTWARE ARE KEY PREREQUISITES TO BUILD AN INTEGRATED NETWORK

TODAY: MONOLITHIC PLATFORMS

Messaging	E-Mail	TV	Network functions	Network infra
SW	SW	SW	SW	SW
HW	HW	HW	HW	HW

FUTURE: VIRTUALIZED PLATFORMS

Messaging	E-Mail	TV	Network functions	Network infra
SW	SW	SW	SW	SW
HW				

SERVICE & CORE PLATFORMS

Virtualized Service Platforms

Infrastructure Cloud

NG IP Network (BNG/TeraStream)

Fixed Access	Hybrid	Mobile Access
CPE		SIM

Fixed Consumer

Mobile Consumer

Carrier

WE AIM AT BUILDING THIS ON A PAN-EUROPEAN LEVEL

DT PAN-EUROPEAN PRODUCTION

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DEUTSCHE TELEKOM CUTS THE NUMBER OF PLATFORMS BY 90% FROM 500 TO 50
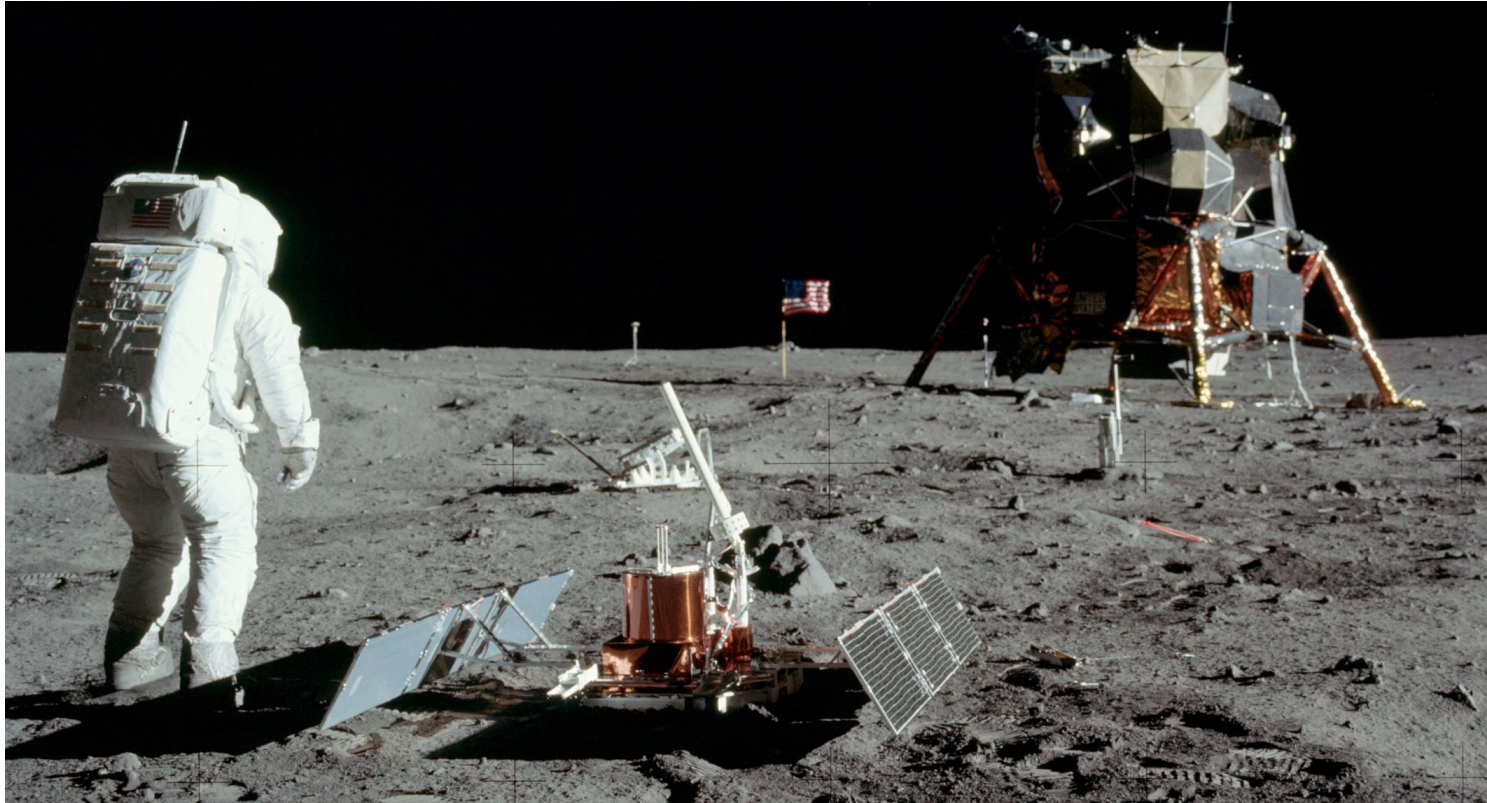
>50 PLATFORMS
WILL BE MIGRATED

ACROSS 10 NATCOS

RESULTING IN >500
MIGRATIONS TOWARDS
PAN-NET

Up to new frontiers:
With >500 migrations, Pan-Net goes were no other program has gone before.

ALL SERVICES WILL BE DELIVERED TO NATCOS BASED ON A GLOBALLY SCALABLE BUSINESS MODEL

What is our mission?
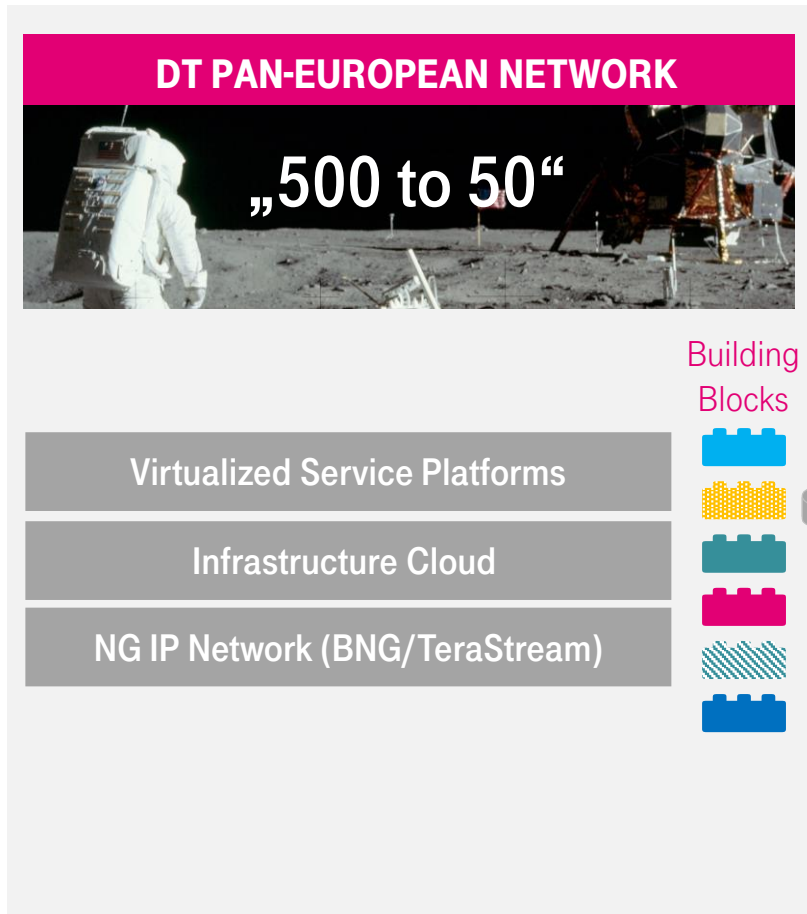
What does that imply for our national companies and our customers?

DT PAN-EUROPEAN NETWORK

„500 to 50"

Building Blocks

Virtualized Service Platforms

Infrastructure Cloud

NG IP Network (BNG/TeraStream)

DT NATIONAL COMPANIES

'4P'
Product, Price, Place & Promotion

Access

Business Support Systems

Customer care

DT CUSTOMERS
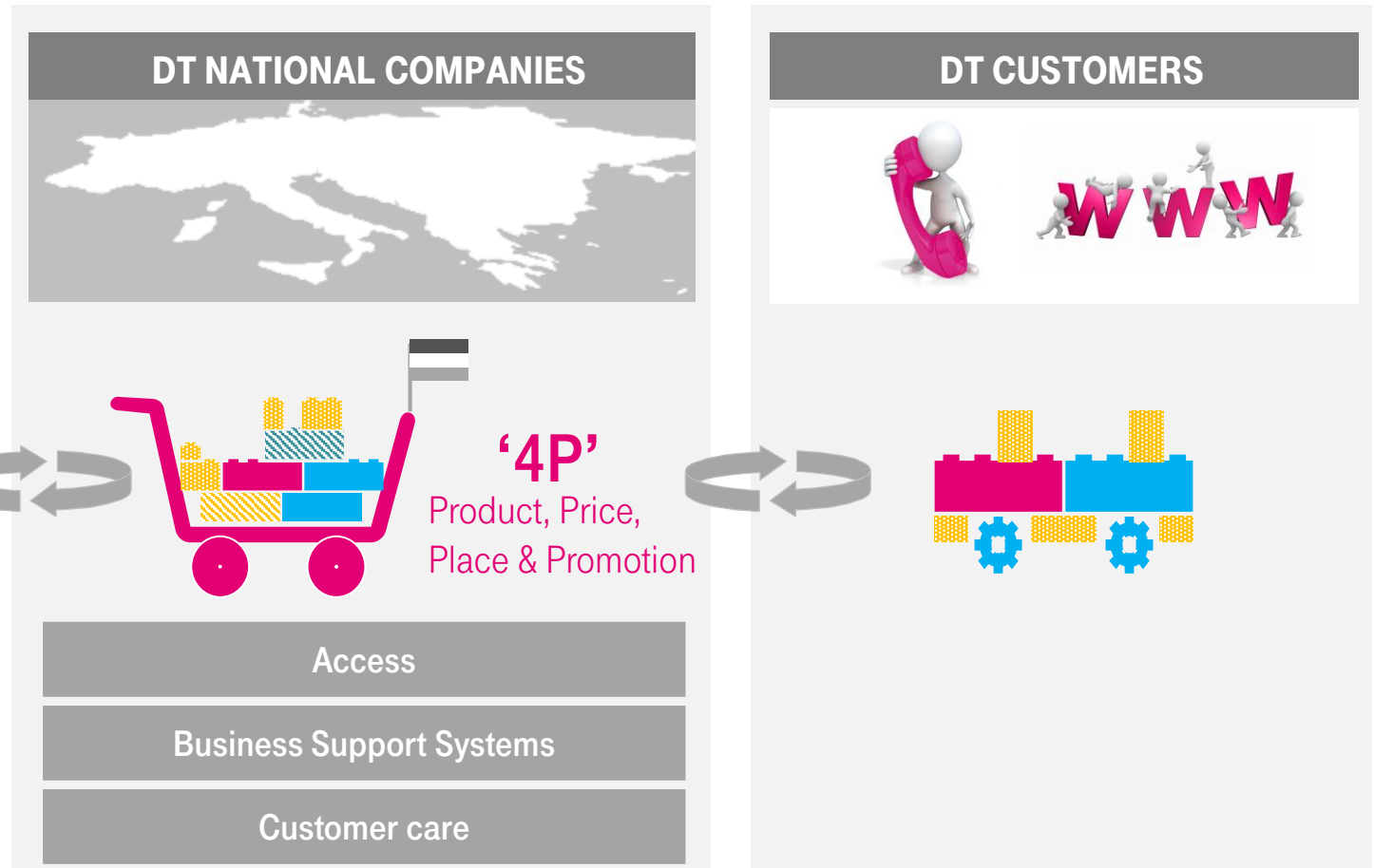
THE BUILDING BLOCKS OF THE PAN-EUROPEAN PRODUCTION COVER THE FULL TELCO PORTFOLIO

Voice & Real-time Communication
- Voice Services
- Message Services
- Fax & other Communication Services

Home
- TV
- Gaming
- Smart Home

Data & Business
- Privacy & Security Services
- Data & Connectivity Services
- Business Cloud Services
- Managed Services

Global Infrastructure & Wholesale
- International Voice Connectivity
- International Data Connectivity
- International Infrastructure

Service Enablers
- Payment Services
- Service Configuration Services
- E-Mail
- Location & Registration Services

Network Functions
- Basic Mobile Network Functions
- Basic Fixed Network Functions
- Identity, Profile & Authent. Functions
- Basic Voice Functions
- Data Service Connectivity Functions
- Policy & Control Functions

Pan IP Infrastructure
- IP Network Infrastructure
- Data Centre Infrastructure & Housing
- Virtualization & Orchestration Layer
- Basic IP Connect & Control Functions

TO MANAGE THE TRANSFORMATION WE ESTABLISHED A STRONG LEADERSHIP TEAM WITH END TO END RESPONSIBILITY

European Leadership Team

Managing Directors

CEOs of National Companies

Legal entity

Virtual cross-functional organization

Program Lead

Operations

...

		Operations
Voice & Real-time Comm.	Demand | Design | Plan | Build | Run	
Home	Demand | Design | Plan | Build | Run	
Data and Business	Demand | Design | Plan | Build | Run	
Global Infrastructure & Wholesale	Demand | Design | Plan | Build | Run	
Service Enablers	Demand | Design | Plan | Build | Run	
Network Functions	Demand | Design | Plan | Build | Run	
Pan IP Infrastructure	Demand | Design | Plan | Build | Run	

Transformation tasks

Deliver & Operate first Components from pan-European production

- Managing the Transformation with a **strong and transformation project** plus setting up **stable structures for the future in parallel**

- **Eight Cluster are end-to-end responsible** for the building blocks – from demand specification to operations

THE PRINCIPLES OF 'DUAL CITIZENSHIP' AND 'SHARED LEADERSHIP' TAKE OUR TRANSFORMATION PROGRAM TO THE NEXT LEVEL

E2E CLUSTER

Lead	Operational Lead	Demand	Design	Plan	Build	Run

CMO CTIO

Commercial Technology

ROLES

CxO
(dual citizenship)

Experts
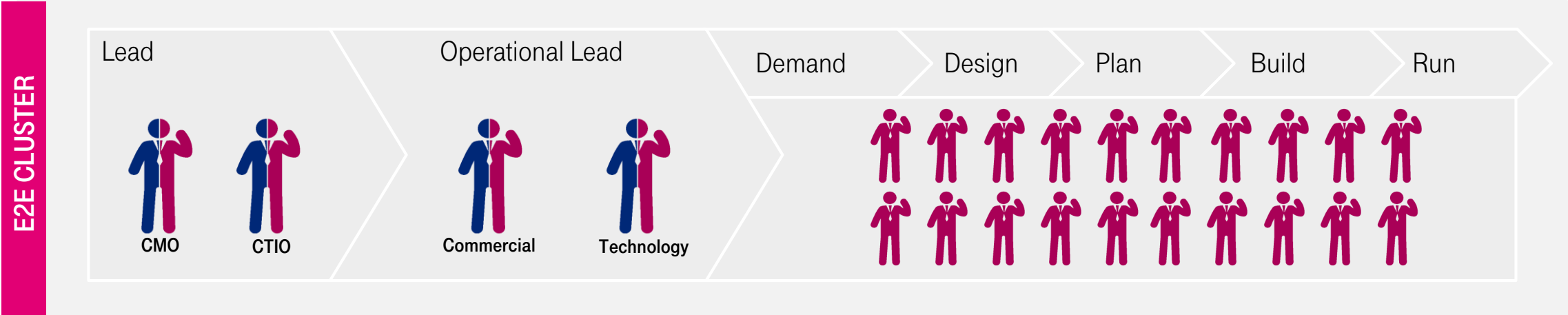
WE LIVE CROSS-NATIONAL AND CROSS-FUNCTIONAL COLLABORATION!

|		Lead	Co-Lead			Lead	Co-Lead
	Voice & Real-time Communication	CTIO (Czech Republic)	CMO (Croatia)		**Service Enablers**	CTIO (Montenegro)	CMO (Greece)
	Home	CTIO (Macedonia)	CMO (Hungary)		**Network Functions**	CTIO (Greece)	Engeneering HQ
	Data & Business	CTIO (Hungary)	CMO (Romania)		**Pan IP Infrastructure**	CTIO (Slovakia)	Architecture HQ
	Global Infrastructure & Wholesale	Global Network Factory HQ	BEX HQ		**Operations**	CTIO (Croatia)	

PHYSICAL INFRASTRUCTURE OF THE PAN-EUROPEAN NETWORK OWNED BY THE NEWLY CREATED PAN-NET COMPANY

## DT EU PORTFOLIO: BROAD & ADJACENT FOOTPRINT IN EUROPE

locations and number of backend data and network operations centers not decided yet
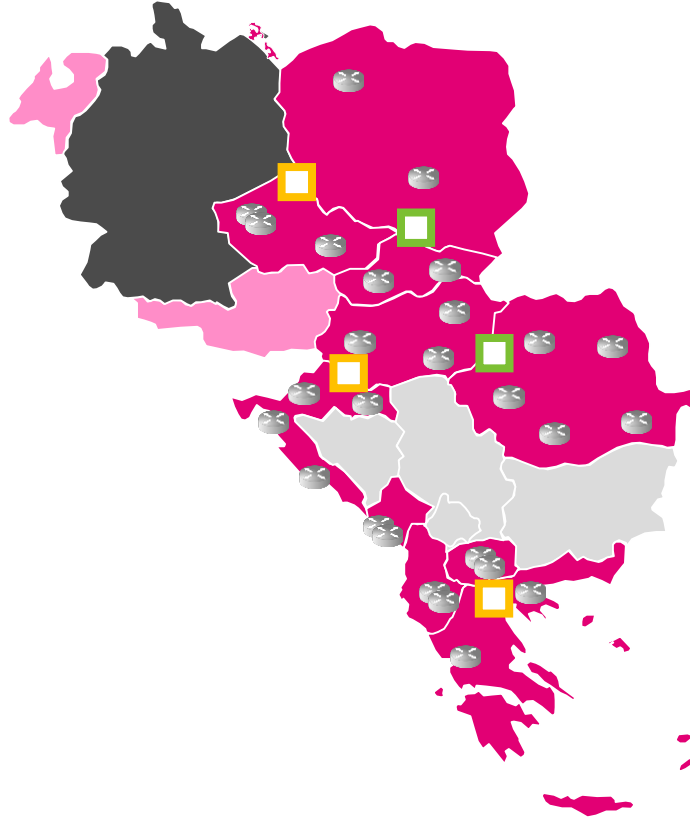
PAN-NET characteristics:

- 3 backend data centers (☐)

- 2 geo redundant network operations centers (☐)

- In each country minimum 2 data centers with routers at the edge of the network (⬡)

- 1 distribution network, fast and highly capable

FIRST PAN-EUROPEAN IMPLEMENTATIONS WERE LAUNCHED AT MWC 2015
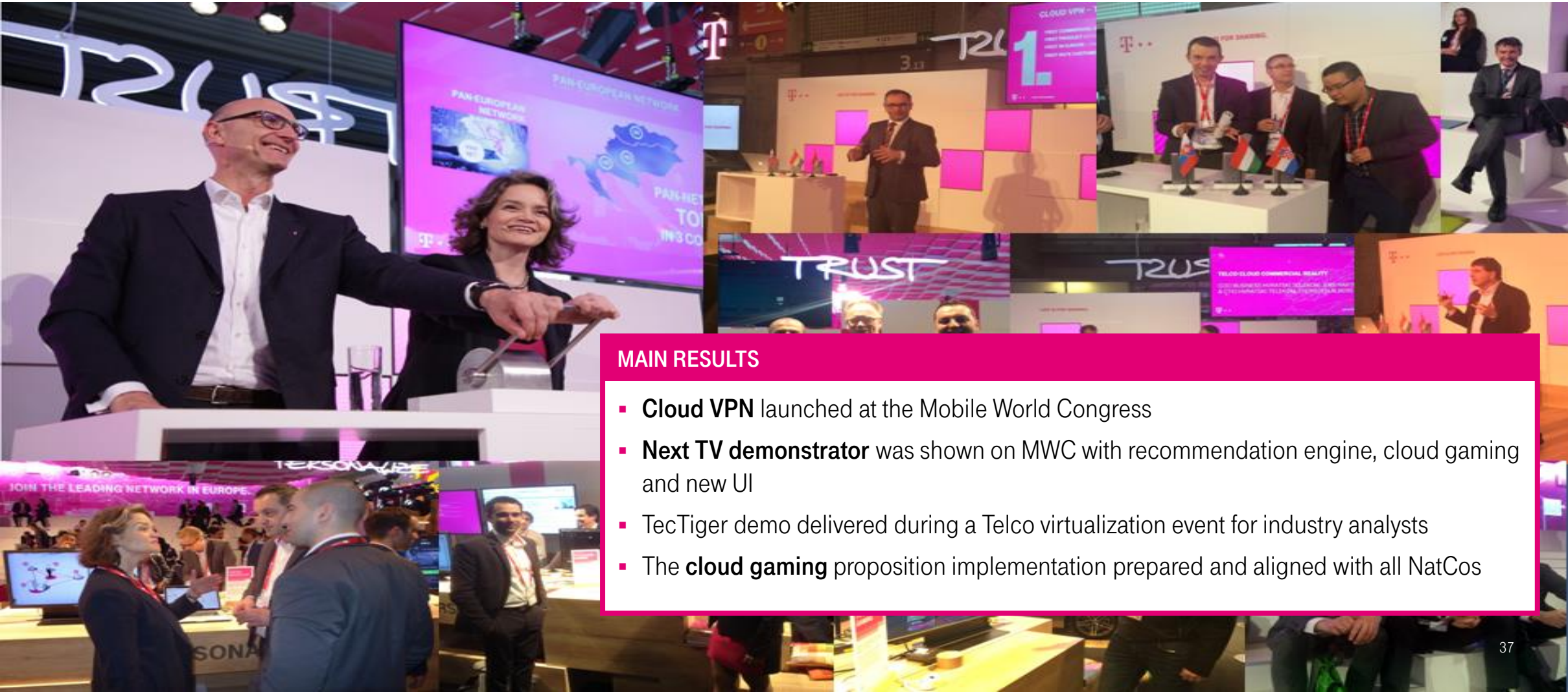
MAIN RESULTS

- **Cloud VPN** launched at the Mobile World Congress
- **Next TV demonstrator** was shown on MWC with recommendation engine, cloud gaming and new UI
- TecTiger demo delivered during a Telco virtualization event for industry analysts
- The **cloud gaming** proposition implementation prepared and aligned with all NatCos

KEY LEARNINGS FROM PSTN MIGRATION AND GUIDING PRINCIPLES FOR TRULY PAN-EUROPEAN ALL IP INTEGRATED PRODUCTION MODEL

PSTN MIGRATION LESSONS LEARNED

- Top Management drive and cross organizational alignment (technology , B2B, B2C) are crucial
- It is about 100% or nothing
- It is not about setting to ambitious targets but about hitting the target as planned
- It is not about additional revenues, but about cost avoidance and churn minimization

NOT JUST A PURE TECHNOLOGICAL APPROACH BUT CROSS-FUNCTIONAL ENABLING.

SUCCESS FACTORS PAN-EUROPEAN NETWORK

- Focus on areas that allow for standardization
- Deploy new technologies and services and re-define role of vendors
- Proactively approach all stakeholders
- Collaborate and jointly transform commercial and technology operating models
- Execute!

PAN-NET GOES WERE NO OTHER PROGRAM HAS GONE BEFORE.

Q&A

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