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

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MANAGING DIRECTOR DEUTSCHE TELEKOM PAN-NET

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

Source: Cisco Systems; [ID 271405]
OUR ANSWER: WE RADICALLY CHANGE TELCO PRODUCTION
DT’S SUPERIOR PRODUCTION MODEL: A VISIONARY APPROACH
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

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

DIGITAL TRANSFORMATION OF CUSTOMER FACING PROCESSES

Cost Efficiency & Simplicity

ALL-IP TRANSFORMATION

PSTN migration in all NatCos

Plug & Play

PAN-EUROPEAN NETWORK

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

Annual run rate adj. Opex savings:

≈ €-1.2 bn

1 Gross Opex savings D/EU before any counter effects (e.g. personnel cost increases)
ALL IP TRANSFORMATION: BASIS FOR PLUG AND PLAY EXPERIENCE
ALL IP TRANSFORMATION: THE CREATION OF A SIMPLIFIED AND STANDARDIZED NETWORK

FROM THE “OLD PSTN WORLD”...

...TO THE “NEW IP ERA”

Virtualized Service Platforms

Infrastructure Cloud

NG IP Network (BNG/TeraStream)

Mobile Access  Hybrid  Fixed Access

SIM  CPE
PSTN MIGRATION: IT IS TIME FOR REVOLUTION INSTEAD OF EVOLUTION

FROM THE “OLD PSTN WORLD”…

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

Mass market scenarios only

<table>
<thead>
<tr>
<th>PSTN replacement only</th>
<th>Reduced VoBB scenario</th>
<th>All DP/TP on VoBB</th>
<th>Extended VoBB scenario</th>
<th>Full All-IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 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</td>
<td>• all Single Play customers • actively migrated Double Play customers VoBB for • rest of Double Play customers • all Triple Play customers</td>
<td>MSAN cards for • all Single Play customers • all Double Play customers • all Triple Play customers VoBB for • all Double Play customers • all Triple Play customers Extended VoBB scenario</td>
<td>• most of the Single Play customers VoBB for Single Play customers with high up-sell potential • all Double and Triple Play customers</td>
<td>• Using VoBB for all customers + all-IP opportunities + up-sell potential + future ready – higher costs – higher risk of churn and revenue loss</td>
</tr>
</tbody>
</table>

Business Perspective

VoBB = Voice over Broadband  MSAN = multi-service access node

ALL-IP Strategy Perspective
PSTN MIGRATION IS PRIMARILY ABOUT COST AVOIDANCE & ENABLING OF IP SERVICES/PROCESSES

- **Cash in**
  - About 30-60 Euros per migration\(^1\)

- **Cash out**
  - Savings of about 10 € per customer/year\(^2\)

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

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1 Depending on migration strategy; 2 After complete PSTN switch-off
WE NEED TO MIGRATE 100% OF OUR CUSTOMERS AND IT GETS MORE EXPENSIVE IN THE END

Push customer driven NATURAL migration, than start the ACTIVE opportunity driven approach to avoid the costs of the FORCED migration.
IT’S NECESSARY TO DIFFERENTIATE BETWEEN CUSTOMER SEGMENTS WHEN STARTING MIGRATION

CUSTOMER SEGMENT AS A PRIORITIZATION CRITERIA

- **BC**: Business customers products
- **WS**: Wholesale partner products
- **RC**: Residential customers products

<table>
<thead>
<tr>
<th>Technical Solution Complexity</th>
<th>Migration Process Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (standard products, existing substitutes)</td>
<td>Low (need of customized solutions, existing substitutes)</td>
</tr>
<tr>
<td>High (customized solutions, special cases)</td>
<td>High (need of customized solutions, multi-area presence, regulator interaction wholesale negotiations)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Priority – High Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS</td>
</tr>
<tr>
<td>BC</td>
</tr>
</tbody>
</table>

**BC**: Business customers products
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

OLD WORLD

12x
700x
8,300x

KNOWN FOR MORE THAN 14 YEARS

NEW WORLD

1x

IMPLEMENTED FROM DAY 1
UPGRADES EASY

Example: „HD Voice“
## SERVICE PROVISIONING: INSTANT DELIVERY FOR THE CUSTOMER WITH „ZERO TOUCH“ PROVISIONING FOR OPERATOR

<table>
<thead>
<tr>
<th></th>
<th>OLD WORLD</th>
<th>NEW WORLD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration</strong></td>
<td>Days or Weeks</td>
<td>Seconds</td>
</tr>
<tr>
<td><strong>Customer Experience</strong></td>
<td>5 steps interaction</td>
<td>3 Clicks</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>5 steps, semi manual</td>
<td>Fully automated</td>
</tr>
</tbody>
</table>

**EXPENSIVE, SLOW**

**ENABLING IMPULSE PURCHASES**
### TANGIBLE RESULTS: HIGHER PRODUCTIVITY & QUALITY

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>FIGURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel intensity</td>
<td>FTE in Customer Services</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Graph showing Personnel intensity decrease from 2013 to 2014 with a -26% change" /></td>
</tr>
<tr>
<td>Maintenance intensity</td>
<td>Customer announced Faults</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Graph showing Maintenance intensity decrease from 2013 to 2014 with a -14% change" /></td>
</tr>
<tr>
<td>Reliability</td>
<td>Mean Time Between Failures</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Graph showing Reliability increase from 2013 to 2014 with a +19% change" /></td>
</tr>
</tbody>
</table>
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

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**MAINTENANCE**

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

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**SERVICE**

Massive Simplification

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\(^1\) 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)

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Voice customers August 2015</th>
<th>IP access lines August 2015</th>
<th>Areas shut down August 2015</th>
<th>expected completion dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macedonia</td>
<td>230</td>
<td>230 (100%)</td>
<td>22 of 22</td>
<td>Jan 15th, 2014</td>
</tr>
<tr>
<td>Slovakia</td>
<td>598</td>
<td>598 (100%)</td>
<td>50 of 50</td>
<td>Dec 15th, 2015</td>
</tr>
<tr>
<td>Croatia</td>
<td>1,110</td>
<td>1,076 (97%)</td>
<td>46 of 72</td>
<td>EoY 2015</td>
</tr>
<tr>
<td>Montenegro</td>
<td>144</td>
<td>130 (90%)</td>
<td>0 of 4</td>
<td>EoY 2015</td>
</tr>
<tr>
<td>Hungary</td>
<td>1,406</td>
<td>954 (68%)</td>
<td>25 of 67</td>
<td>EoY 2016</td>
</tr>
<tr>
<td>Romania</td>
<td>2,000</td>
<td>227 (11%)</td>
<td>0 of 96</td>
<td>EoY 2018</td>
</tr>
<tr>
<td>Greece</td>
<td>2,601</td>
<td>29 (1%)</td>
<td>0 of 190</td>
<td>EoY 2018</td>
</tr>
<tr>
<td>Europe</td>
<td>8,089</td>
<td>3,244 (40%)</td>
<td>143 of 501</td>
<td>EoY 2018</td>
</tr>
</tbody>
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**All-IP Transformation: We are on track**

**Total Voice customers August 2015**
- Macedonia: 230
- Slovakia: 598
- Croatia: 1,110
- Montenegro: 144
- Hungary: 1,406
- Romania: 2,000
- Greece: 2,601
- Europe: 8,089

**IP access lines August 2015**
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**Expected completion dates**
- Macedonia: Jan 15th, 2014
- Slovakia: Dec 15th, 2015
- Croatia: EoY 2015
- Montenegro: EoY 2015
- Hungary: EoY 2016
- Romania: EoY 2018
- Greece: EoY 2018
- Europe: EoY 2018
PAN EUROPEAN NETWORK: THE NEXT TELCO PRODUCTION. MADE FOR EUROPE.
WE COMPETE AGAINST CENTRALIZED PLAYERS WITH OUR CURRENT LOCAL AND DETACHED PRODUCTION

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

**GLOBAL PLAYERS**
- 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
WE BUILD AN INTEGRATED EUROPEAN NETWORK WITH MAXIMUM TECHNOLOGY AND COMMERCIAL BENEFITS

<table>
<thead>
<tr>
<th>Today</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex service production with distributed vendor specific network elements</td>
<td>Highly simplified, virtualized IP based production architecture</td>
</tr>
<tr>
<td>Different, historically grown production in each country</td>
<td>Integrated production delivered to all national companies</td>
</tr>
<tr>
<td>National Companies follow different product development logics</td>
<td>Consistent and standardized set of parameterized components</td>
</tr>
</tbody>
</table>
VIRTUALIZATION AND SEPARATION OF HARDWARE AND SOFTWARE ARE KEY PREREQUISITES TO BUILD AN INTEGRATED NETWORK

<table>
<thead>
<tr>
<th>TODAY: MONOLITHIC PLATFORMS</th>
<th>SERVICE &amp; CORE PLATFORMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging</td>
<td>SW</td>
</tr>
<tr>
<td>HW</td>
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<tr>
<th>FUTURE: VIRTUALIZED PLATFORMS</th>
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**SERVICE & CORE PLATFORMS**
- Virtualized Service Platforms
- Infrastructure Cloud
- NG IP Network (BNG/TeraStream)
- Fixed Access
- Hybrid
- Mobile Access
- CPE
- SIM
- Carrier

**TODAY: MONOLITHIC PLATFORMS**
- Messaging
- E-Mail
- TV
- Network functions
- Network infra

**FUTURE: VIRTUALIZED PLATFORMS**
- Messaging
- E-Mail
- TV
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**SERVICE & CORE PLATFORMS**
- Virtualized Service Platforms
- Infrastructure Cloud
- NG IP Network (BNG/TeraStream)
- Fixed Access
- Hybrid
- Mobile Access
- CPE
- SIM
- Carrier
WE AIM AT BUILDING THIS ON A PAN-EUROPEAN LEVEL
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.
What does that imply for our national companies and our customers?
# The Building Blocks of the Pan-European Production Cover

## The Full Telco Portfolio

<table>
<thead>
<tr>
<th><strong>Voice &amp; Real-time Communication</strong></th>
<th><strong>Network Functions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice Services</td>
<td>Basic Mobile Network Functions</td>
</tr>
<tr>
<td>Message Services</td>
<td>Basic Fixed Network Functions</td>
</tr>
<tr>
<td>Fax &amp; other Communication Services</td>
<td>Identity, Profile &amp; Authent. Functions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Home</strong></th>
<th><strong>Data &amp; Business</strong></th>
<th><strong>Global Infrastructure &amp; Wholesale</strong></th>
<th><strong>Managed Services</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>Privacy &amp; Security Services</td>
<td>International Voice Connectivity</td>
<td>Managed Services</td>
</tr>
<tr>
<td>Gaming</td>
<td>Data &amp; Connectivity Services</td>
<td>International Data Connectivity</td>
<td></td>
</tr>
<tr>
<td>Smart Home</td>
<td>Business Cloud Services</td>
<td>International Infrastructure</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Service Enablers</strong></th>
<th><strong>Pan IP Infrastructure</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment Services</td>
<td>IP Network Infrastructure</td>
</tr>
<tr>
<td>Service Configuration Services</td>
<td>Data Centre Infrastructure &amp; Housing</td>
</tr>
<tr>
<td>E-Mail</td>
<td>Virtualization &amp; Orchestration Layer</td>
</tr>
<tr>
<td>Location &amp; Registration Services</td>
<td>Basic IP Connect &amp; Control Functions</td>
</tr>
</tbody>
</table>
TO MANAGE THE TRANSFORMATION WE ESTABLISHED A STRONG LEADERSHIP TEAM WITH END TO END RESPONSIBILITY

- 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

<table>
<thead>
<tr>
<th>E2E CLUSTER</th>
<th>ROLES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead</strong></td>
<td><strong>CxO</strong> (dual citizenship)</td>
</tr>
<tr>
<td><strong>Operational Lead</strong></td>
<td><strong>Experts</strong></td>
</tr>
<tr>
<td><strong>Demand</strong></td>
<td><strong>Design</strong></td>
</tr>
<tr>
<td><strong>Plan</strong></td>
<td><strong>Build</strong></td>
</tr>
<tr>
<td><strong>Run</strong></td>
<td></td>
</tr>
</tbody>
</table>
WE LIVE CROSS-NATIONAL AND CROSS-FUNCTIONAL COLLABORATION!
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

### 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!

### Not Just a Pure Technological Approach but Cross-Functional Enabling.

Pan-Net Goes Where No Other Program Has Gone Before.