Key Trends in Network Technology

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Rethink Possible®

Agenda: Key Themes

1 High Performance Networking

2 Virtualization

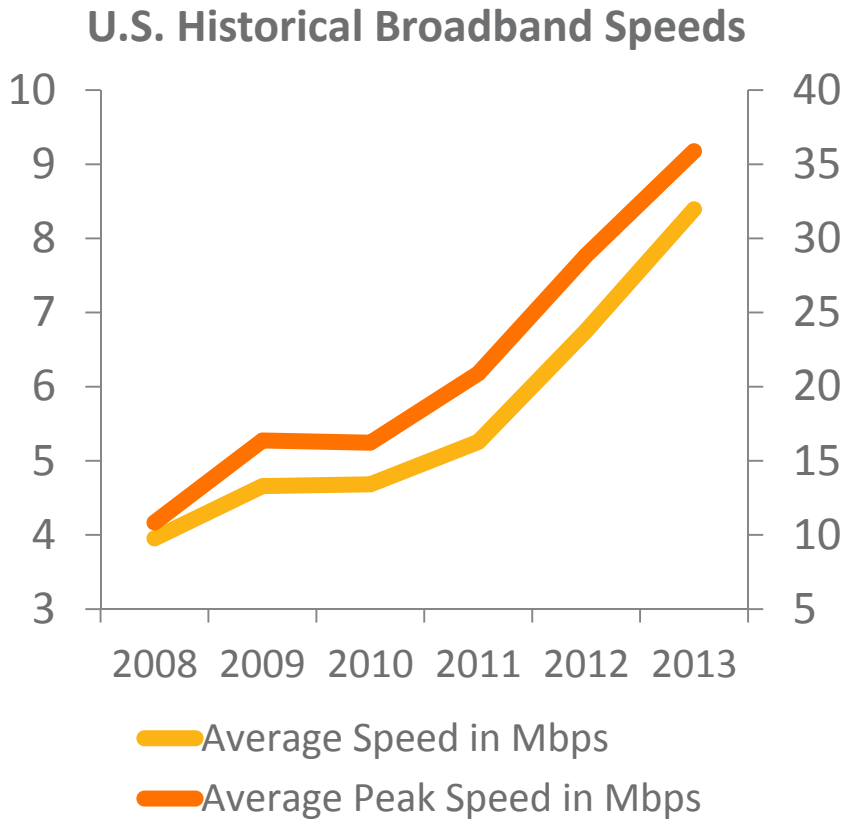
3 Mobilization

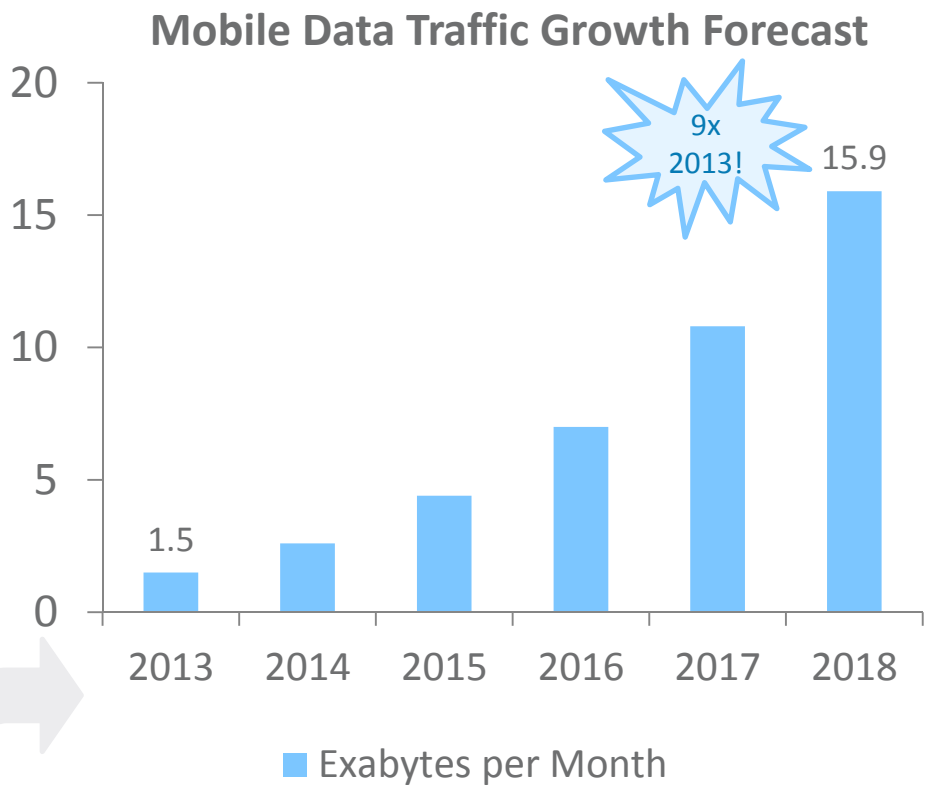
4 Security Trends

Key Trend #1: High Performance Networking

- Insatiable Demand for Data
- TDM to IP Transformation

Insatiable Demand for Data





One exabyte can hold 3,000 times content of the Library of Congress

Sources: Akamai State of the Internet Report, 3Q2013
Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2013–2018.

How the TDM to IP Transformation Can Help

1. Increases Flexibility
2. Enables Network Infrastructure Convergence
3. Increases Capacity
4. Decreases Costs
5. Allows for Easier Integration of Apps

How to Start your Transformation

- **Consider your current network**, budget, needs, and what technology changes are taking place in the industry.
- **Pick your protocol & platform**, think of your core network as the foundation of the rest of your communications.
- Focus on where you can **make the most impact** and how that can be an investment and not just a change.
- **Develop a step by step upgrade plan** – start with easy value-added services, such as IP Toll Free Voice, or add VPN to your data network and allow business to take place anywhere you want.
- Every time you touch your network, it should be to **improve it and not just maintain it**.

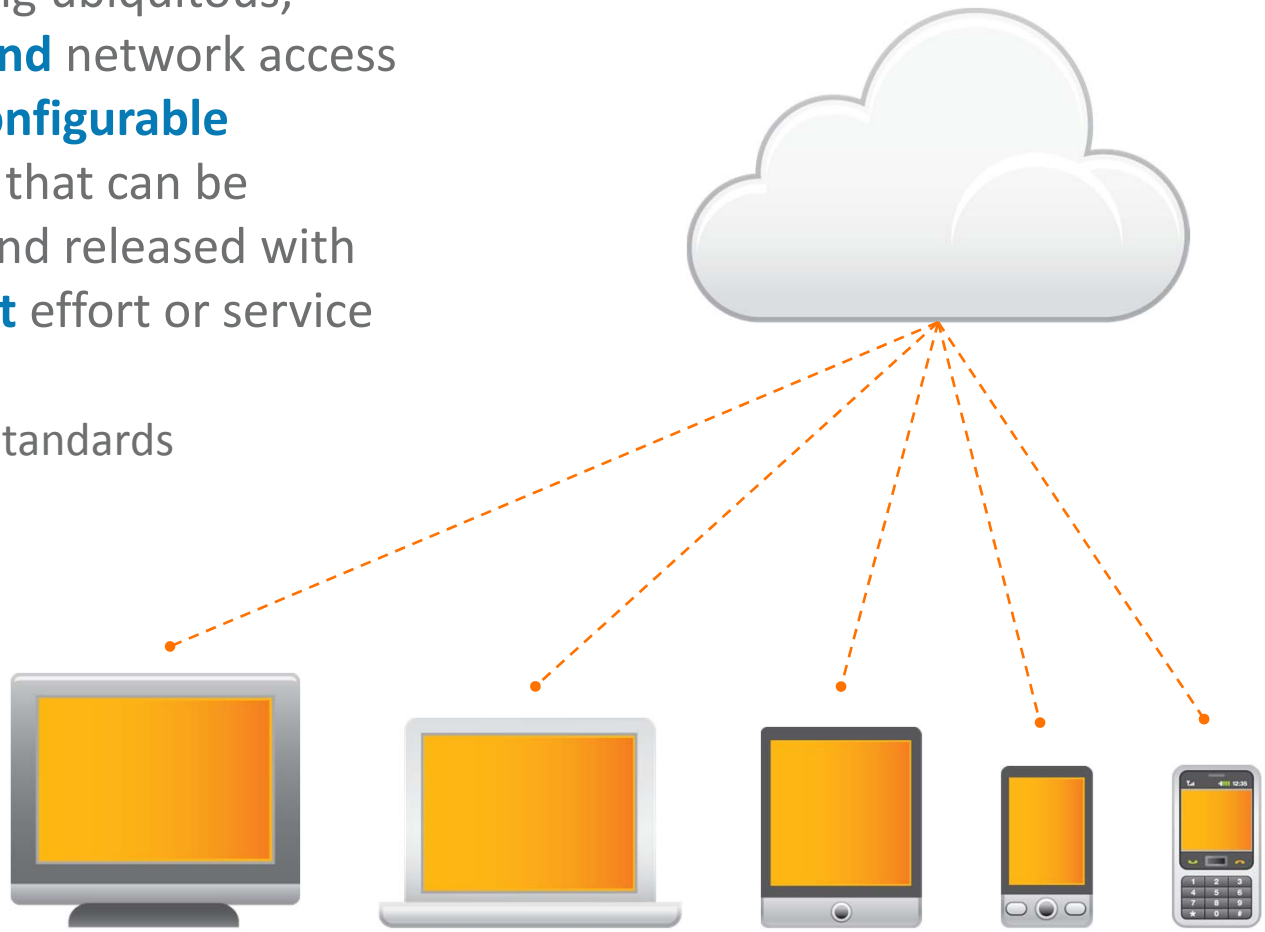
Key Trend #2: Virtualization

- Cloud
- Network 2020
  - Network Function Virtualization
  - Software Defined Networks
  - L0-L3 Convergence

What is “Cloud Computing”?

“…a model for enabling ubiquitous, convenient, **on-demand** network access to a **shared** pool of **configurable computing resources** that can be **rapidly provisioned** and released with **minimal management** effort or service provider interaction.”

- National Institutes of Standards and Technology



The Benefits of Cloud

Improves Productivity

- Real time collaboration across employees, partners, customers
- Requirements for applications to work across devices

Reduces Cost

- Low storage and server utilization in non-peak periods
- Desire to pivot from capex to opex

Removes Complexity

- Simplification due to limited IT staff down market
- End-to-end ownership vs. multi-vendor service integrations

Demand to mobilize and virtualize assets, applications and activities

- Off-premise
- On-demand
- Easy to Use
- Web-enabled
- Device Agnostic
- Tiered Support

Types of Cloud Deployments

Software as a Service

- Storage and Computing resources delivered via the network.
- Provision easily and immediately via a portal.
- Turn on and turn off resources as-needed.
- Pay for only what you use.

Benefits:

- Lower total cost of ownership for applications
- Easy access for distributed workforces
- Reduce time to deployment

Platform as a Service

- Complete, ready-made technology stack.
- Standardized infrastructure on which you can deploy applications.
- Scale up as you draw more users.
- Pay per user, per month.

Benefits:

- Quickly launch applications
- Automate business processes
- Meet needs of users

Infrastructure as a Service

- Full software functionality
- One software instance delivered to multiple customers over the Internet
- At term end, customer has no access to application.
- Pay per user, per month.

Benefits:

- Storage and Computing resources delivered via the network.
- Provision easily and immediately via a portal.
- Turn on and turn off resources as-needed.
- Pay for only what you use.

Cloud Infrastructure as a Service Use Case: Help Schools Eliminate Underutilized Data Equipment

Challenge

Schools are faced with **rising costs** and capital investment to maintain enough computing capacity for peak processing times.

Applications like payroll, quarterly financial close outs, registration, testing, grading, etc. **only required computing capacity during certain parts of the day, week, month, or school year**.

Excess operating costs during non-peak hours in the form of real estate, maintenance, security, etc. are required to maintain equipment that is underutilized.

Solution: Cloud Compute as a Service

- Eliminates the need for over building and the associated costs
- Offers scalability to meet fluctuating demands
- Minimizes cost of ownership & capital investment in IT equipment
- Retain control of capacity, OS and software

Cloud Infrastructure as a Service Use Case: Help Municipalities with Data Archiving

Challenge

Most municipalities are **required to oversee mountains of data**, everything from municipal records to data storage.

In house data solutions can be costly as they may **require additional hardware or physical real estate** space necessary to maintain archived records.

IT resources are needed to monitor and maintain equipment, thus taking time away from more strategic projects and initiatives.

Solution: Cloud Storage as a Service

- Able to retain and archive data housed in a data center that can be accessed at any time
- Improves total cost of ownership by not having to pay capital costs for hardware, upgrades, real estate expansion and IT resources
- Flexible and scalable solution allowing agencies to scale up or down, depending on data size
- Pay-as-you-go service providing data storage “in the cloud” that allows agencies to have control over how and when they use it

Network 2020

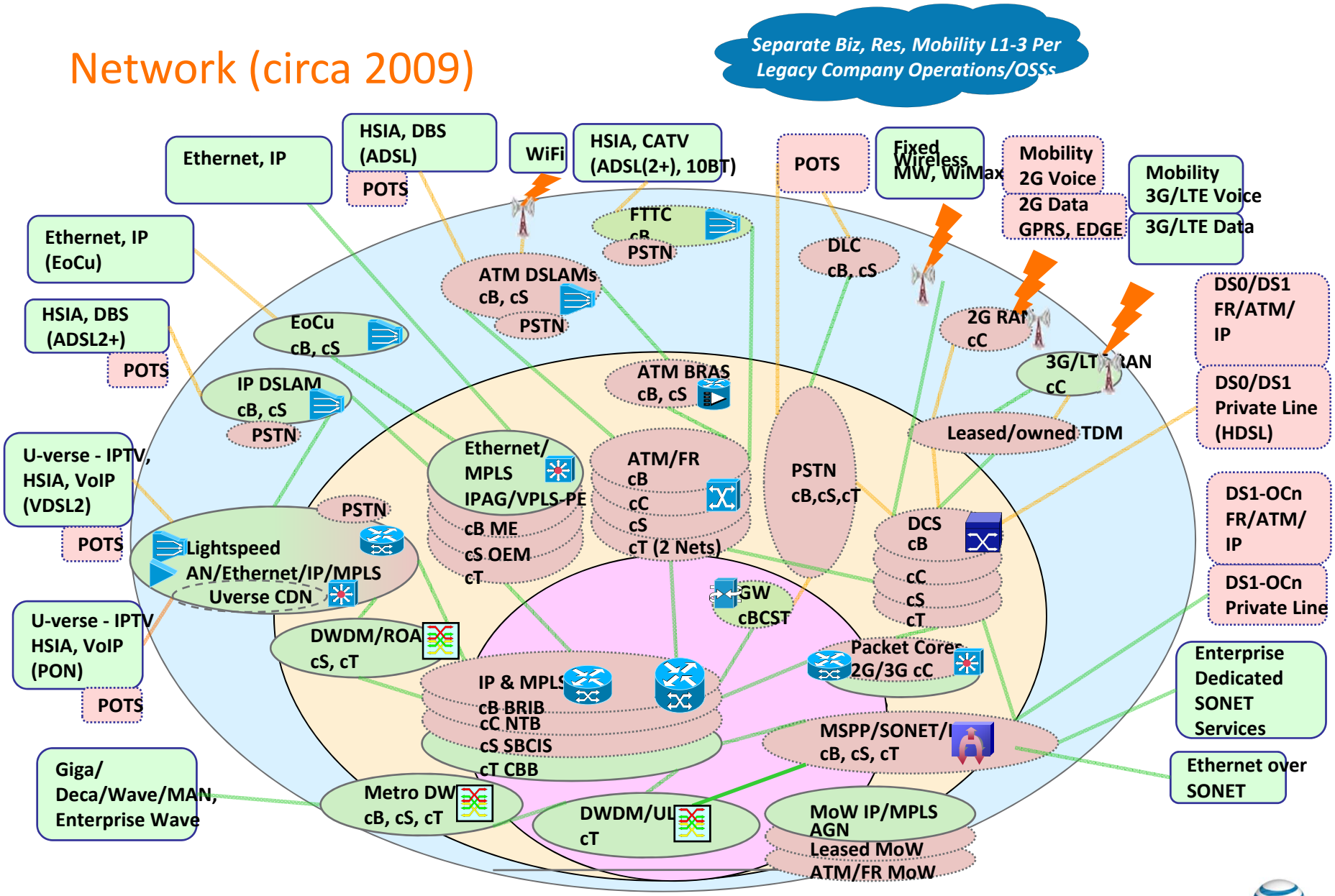
Software Defined Network (SDN)

Network Function Virtualization (NFV)

L0-L3 Convergence

Three New Paradigms for Network Design

Network (circa 2009)



Network 2020 – Key Drivers for Change

Nature of Traffic continues to change

- Cost challenges as traffic growth continues with video, M2M and Web RTC

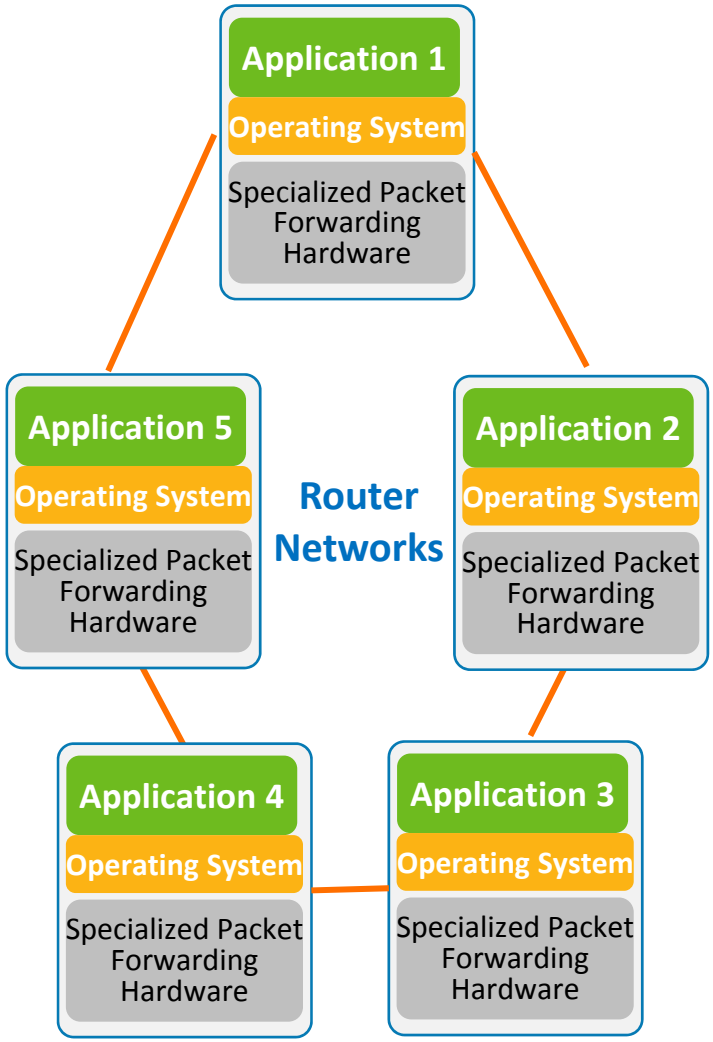
Services need to decouple from Infrastructure

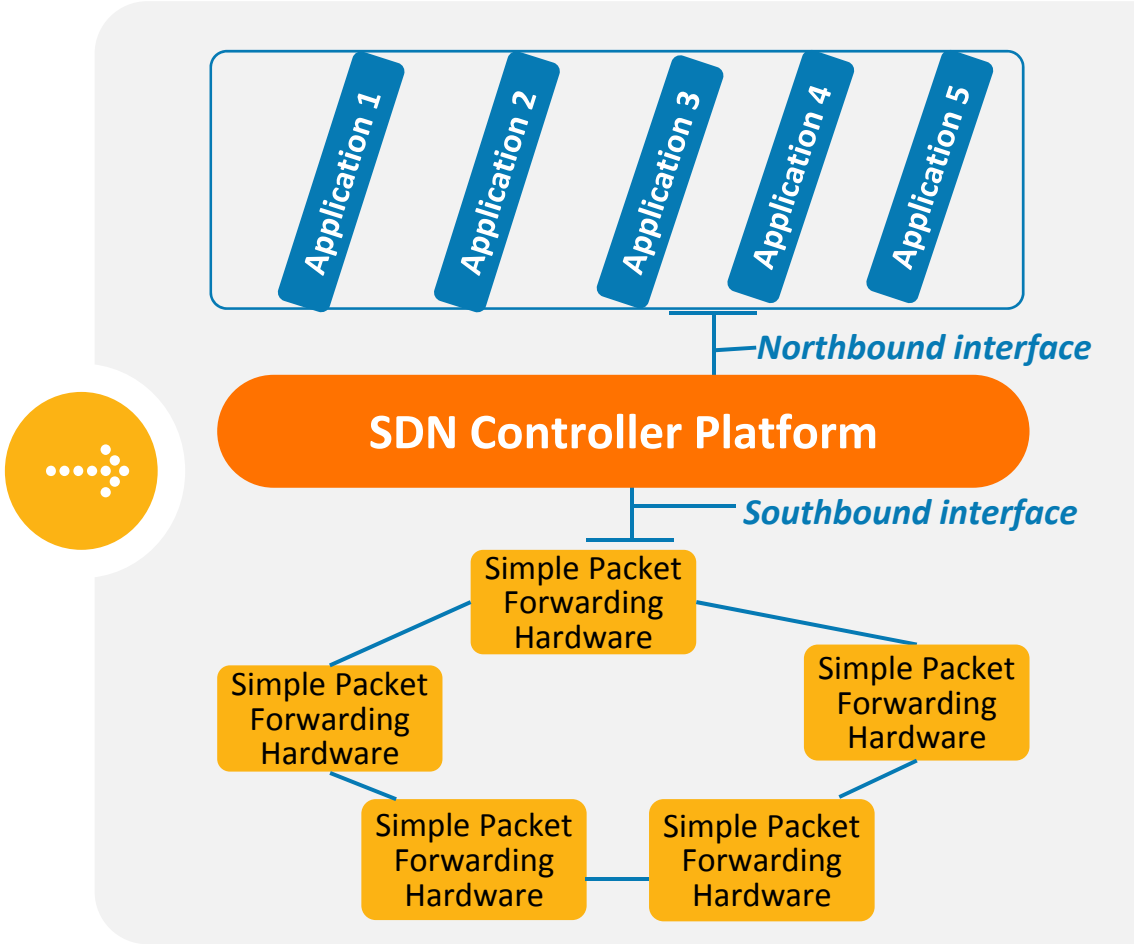
- With Network as a Service (NaaS) and rapid service creation, we can get more efficient monetization through network "programmability"

Big Data and Analytics become increasingly valuable for us and our customers

Security, Identity and Authentication paradigms emerge that are more robust and intelligent

Software Defined Networks (SDN)





Network Function Virtualization (NFV)

Domain 1.0

Message Router | CDN | Session Border Controller

DPI | Firewall | Carrier Grade NAT

SGSN/GGSN | PE Router | BRAS

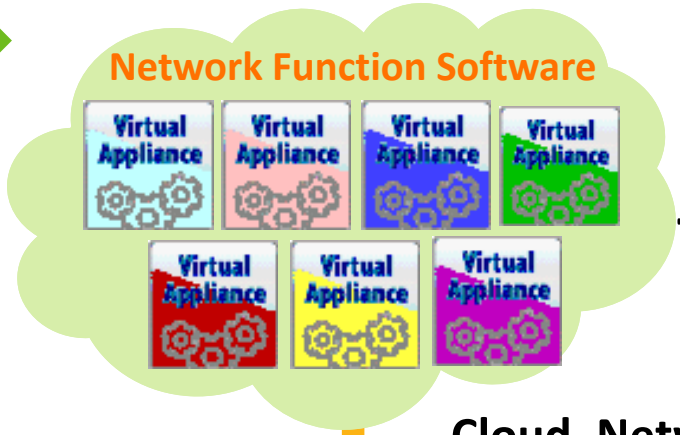
Software

Processors

Storage

Each Appliance has a common structure

User Defined Network Cloud (UDNC)

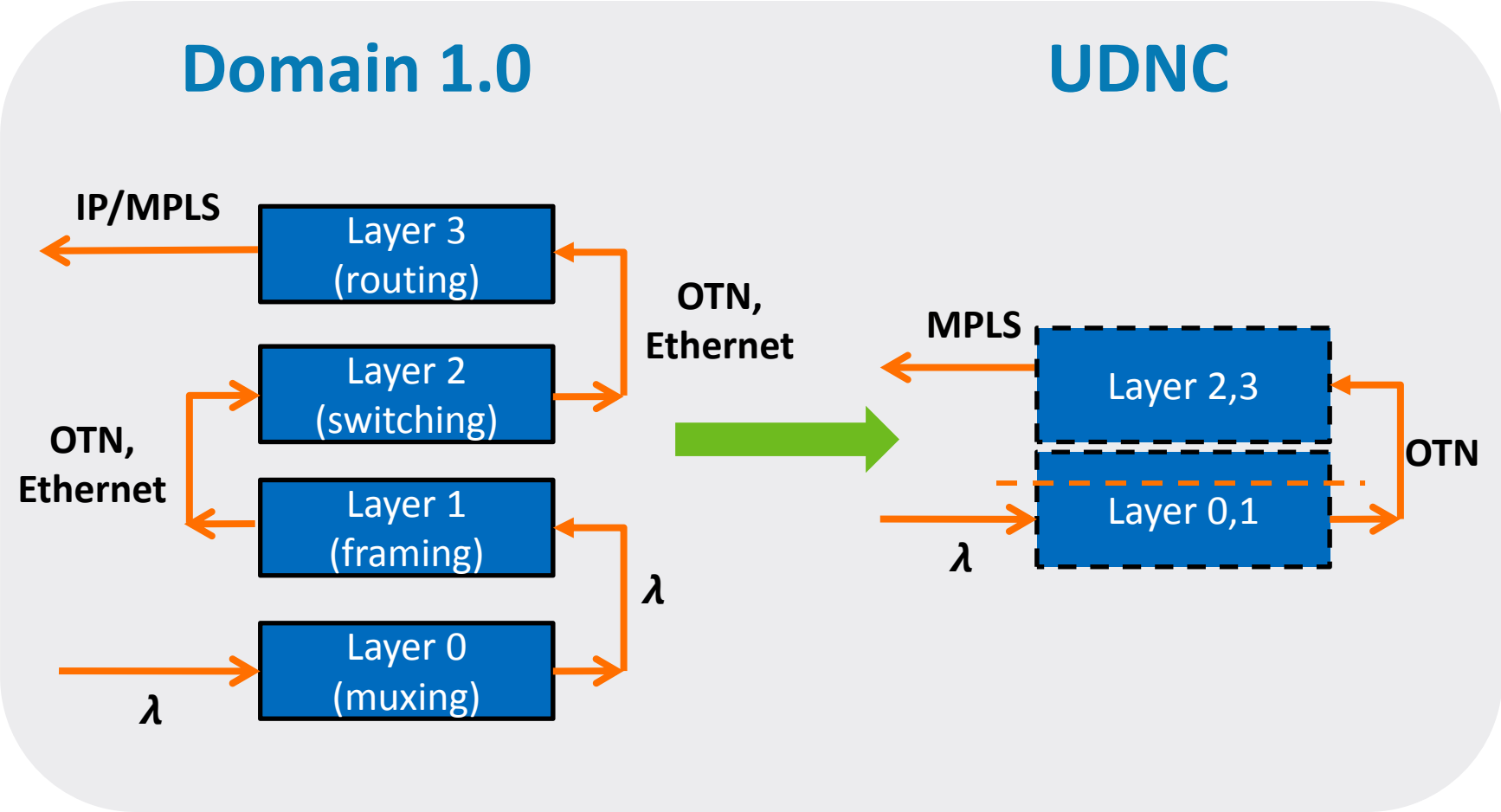


Software – Sourced or Developed

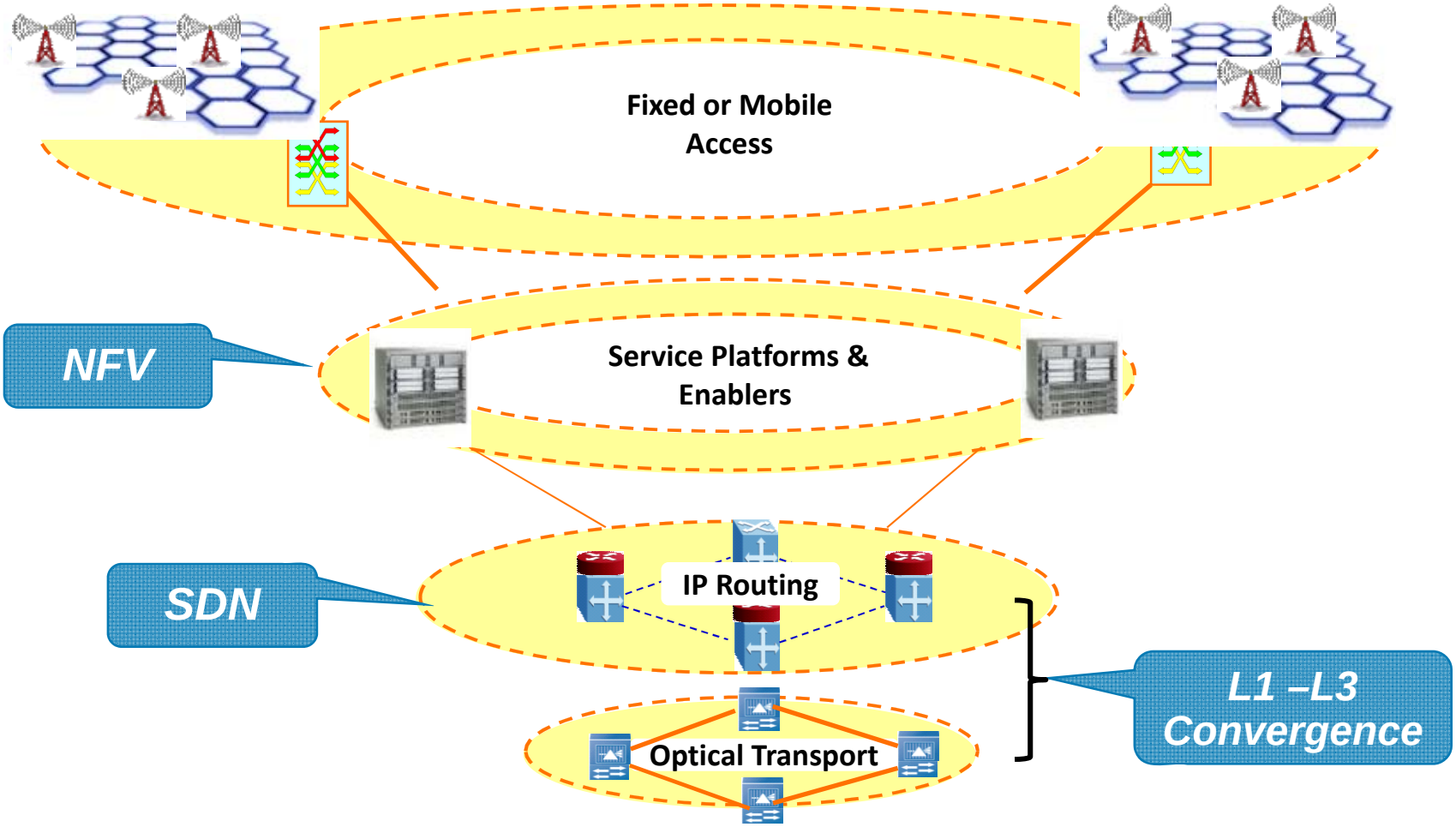
Cloud, Network & Service Orchestration

Real Time Cloud

L0-L3 Convergence



The VIP Network mapped into UDNC



Benefits of Network 2020

- Decouples services & infrastructure
- Reduces capex, opex, space and power consumption
- Decreases hardware costs through usage of commercial off-the-shelf products
- Enables agile, elastic, dynamic and on-demand network services at scale
- Facilitates new growth services and apps
- Manages the variability of traffic & creates more endpoints, which supports mobilization
- Enhances ability to maintain network security

Key Trend #3: Mobilization

- App Solutions

What are the Benefits from Applications?

Operational Improvements

- Increases Efficiency & Productivity
- Provides Real-time Inventory Management
- Improves Customer Satisfaction
- Generates Automatic Alerts
- Enhanced Security
- Advances Speed & Quality of Reporting

Workplace Improvements

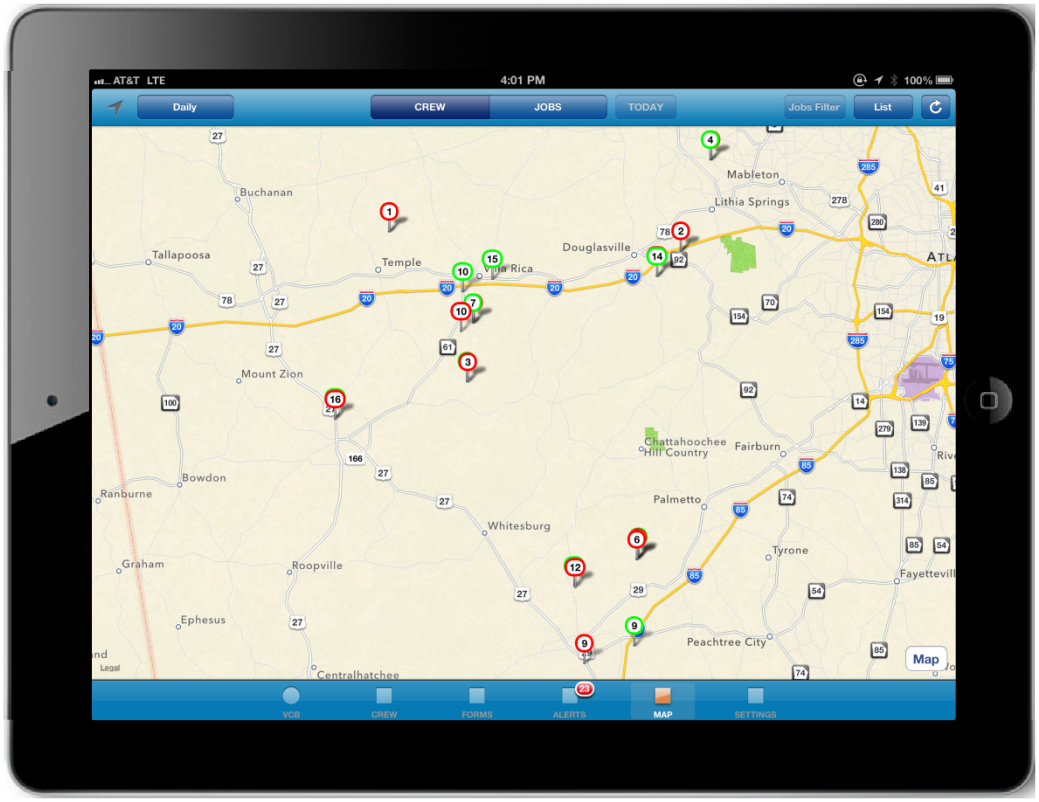
- Flexible workspace
- Increases collaboration
- Improved employee satisfaction

Cost Improvements

- Decreases spend on equipment
- Reduces spend on administrative expenses
- Improves scalability & upgrade costs

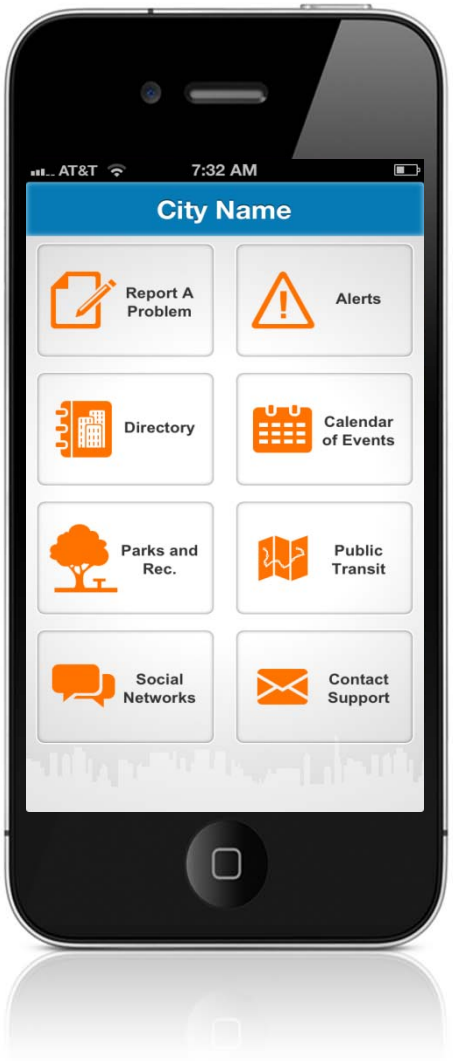
Spotlight: Mobile Manager Applications

- Assigns job/ticket based on employee skillsets, location proximity, etc.
- Allows for real time data entry
- Creates automatic alerts including when exceeding time allotted for a job
- Provides instant access to results & trends
- Presents force utilization information, such as ticket vs. vehicle location and ticket load vs. employees available



Spotlight: Government Applications

- Provides self-service access to basic government services
- Allows real-time, two way government-citizen interaction
- Enhance customer service and government prestige simultaneously
- Brings all pertinent city/county news, updates & alerts to citizens in real-time
- Enables cities to get information they didn't have before (exact location via GPS, detailed issue information, pictures) for prompt resolution
- Enables government agencies to become more efficient while providing convenient mobile access to non-emergency information



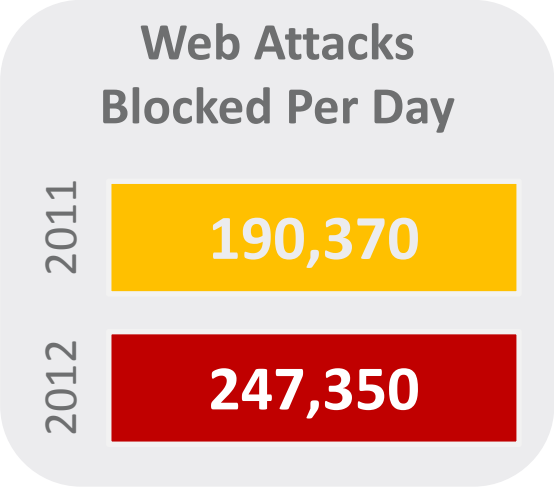
Spotlight: Bring your own Device

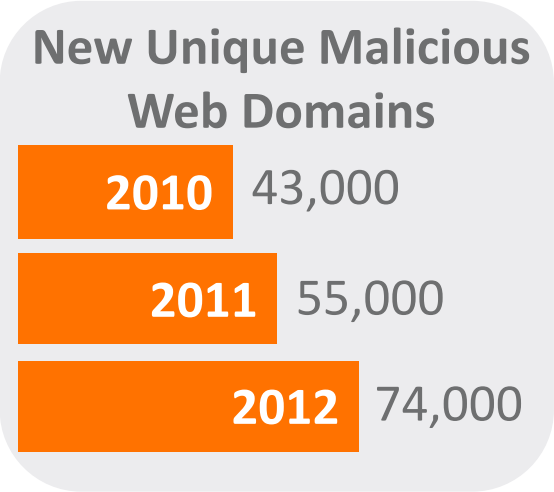
- Allows secure email access anywhere
- Decreases device & voice/data plan expenses
- Increases efficiency & responsiveness
- Decreases device complexity & redundancy
- Improves employee morale

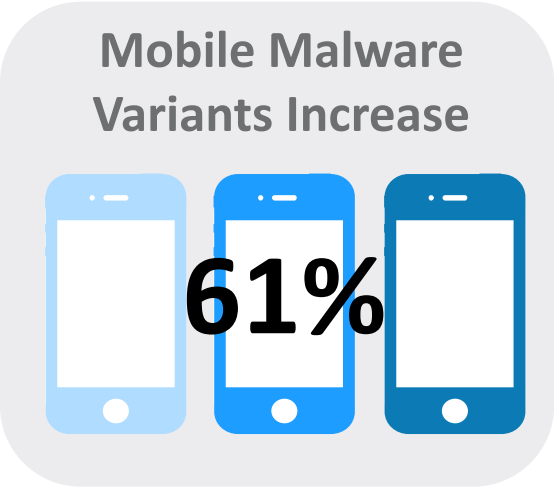
Key Trend #4: Security Trends

- Threats
- Solutions

Current State of Threats: Causes & Results







Increased **mobilization**, **content** created at the edge, and **virtualization** all lead to an increased importance on **security**, **identify & authentication**.

Source: Symantec Internet Security Threat Report, Vol. 18

Risk & Protection

What's at Risk

- Data Loss
- Legal & Regulatory Compliance
- Privacy Concerns

Need to Protect *Everything*

- Mobile & Connected Devices
- Data Centers/Servers
- Data & Services on the Cloud

Take a Tiered Approach to Security

- **Enact device level security**
- **Create centralized policy based controls for accessibility enforcement and management**
- **Acquire infrastructure security software**
- **Ensure adequate support including maintenance oversight and 24/7 monitoring**

So What is the Impact on AT&T and What is our Plan?

What will our industry look like in 2020?

Effortless

- An effortless customer experience is table stakes for great companies

Virtual

- Cloud – how content is stored and processed
- Software Defined Networks – how content is delivered

Ultra-Fast

- Fiber-optic world

Mobile

- All solutions must be mobile
- Customers won't know or care whether fixed or wireless

Global

- Communications and entertainment will be global
- Customers, content owners and app developers will need partners with global scale

What is AT&T's path to 2020?

Project VIP

- LTE, IP broadband and fiber network
- 21st century public policy for 21st century networks

Project Agile

- Simplify processes
- Standardize platforms
- Effortless customer interaction
- Product portfolio aligned with all IP, mobile, cloud

User Defined Network Cloud

- Virtualize the network
- Software-centric infrastructure, services, solutions
- Improved cost structure, faster time to market

Project Stream

- Networks architected for video first

Workforce 2020

- More employees with software skills
- Recruiting, training (T-University, MOOCs)
- Competitive compensation, benefits
- Workplace 2020, Work Smart apps and tools

The National Transfer Plan

Q&A