



T-Mobile®

Cloud Adoption and Migration Six Lessons Learned

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About T-Mobile

The Un-carrier:

- Netflix on Us
- Real humans for Customer Service
- Taxes included in bill
- Unlimited Voice, Data and Text
- T-Mobile Tuesdays

81.3 million customers

Flagship brands:

**T-Mobile and Metro by T-Mobile,
TVision**

50,000+ employees



UN-CARRIER MOVES



**SIMPLE CHOICE &
MOBILE WITHOUT BORDERS**
MARCH 2013



**SIMPLE
GLOBAL**
OCTOBER 2013



**LIFETIME
COVERAGE
GUARANTEE**
JUNE 2014



**Wi-Fi
UNLEASHED**
SEPTEMBER 2014



**UN-CARRIER
FOR BUSINESS**
MARCH 2015



#GETTHANKED
JUNE 2016



**TAXES & FEES
INCLUDED**
JANUARY 2017



**TEAM OF
EXPERTS**
AUGUST 2018



**JUMP! &
JUMP!™ ON
DEMAND**
JULY 2013



**CARRIER
FREEDOM**
JANUARY 2014



**MUSIC
FREEDOM**
JUNE 2014



**DATA
STASH**
DECEMBER 2014



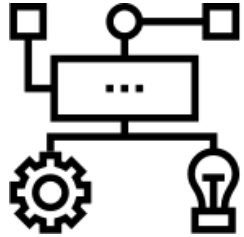
BINGE ON™
NOVEMBER 2015



T-MOBILE ONE
AUGUST 2016



NETFLIX ON US
SEPTEMBER 2017



Scale

Customer Experience

14,000+ APIs across 100s of applications
Massive adoption of cloud native technologies
in data center and public cloud over last 3
years

Public Cloud

7 years, 75+ Applications, AWS, Azure with
data center network integration
50+ container-based applications

Cloud applications

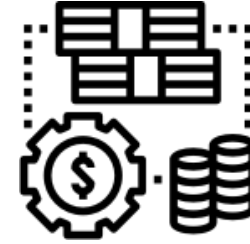
T-Mobile.com, Metro, Netflix integration, Retail
agent application, T-Mobile for Business,
Commerce, Biometric login, Team of Experts,
On Device upgrade, Coverage Maps, Social
messaging, TVision, Data Analytics



Network



Security



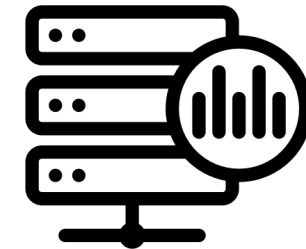
Cost



Self Service



Multi-Cloud



Platforms



Network

Lesson: Links go down!

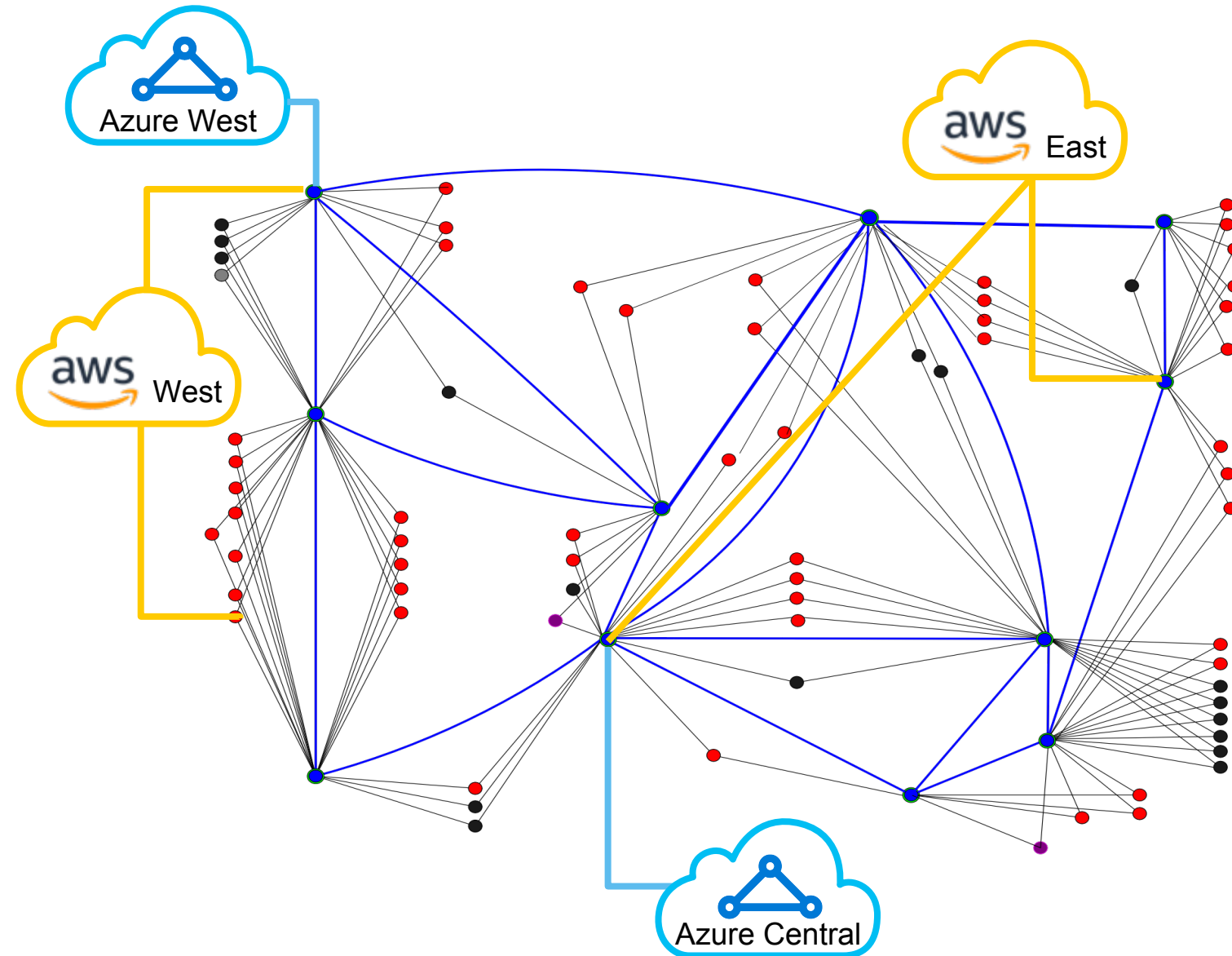
- Redundant connections
- Planning ahead
- Monthly failover exercise
- Multi Region – Deployment

A backhoe will take down part of your network

Winter weather in Utah could disrupt your applications

A routing configuration will get corrupted or go stale and DNS will happen

Network – Connectivity with T-Mobile Data Centers



Physical Circuit redundancy
—Two to Four 10G circuits on each cloud

Geo Redundancy
—West, Central, East Coast

Port redundancy
— Two physical ports

Segregation
— Segregation based on Inf. Security

Monitoring
— Circuit Level, VPC/Vnet etc



Security

Lesson: All hands on board!

- Security team involved on Day 1
- Consistent AMI
- Automated compliance tools
- Never stop!

Scale and sophistication of attacks increasing

Every surface is an attack point and success comes from all teams working together



PacBot

T-Mobile's open source security compliance tool



Cost

Lesson: Cloud costs can be tamed!

- Accountable budgeting
- Showback and Chargeback
- Normalizing consumption
- Pricing, utilization

Demand for agility will drive large scale use

Technology meets finance:

Some services are great for small use cases, but drive significant cost at scale
Dedicated IOPS, Elastic File Store, Instance sizes

Cloud creates data about your infrastructure, use it!:

Containerization drives savings
Memory utilization drives costs



Cloud Insights

Data lake to drive cost information and analysis to create cost-aware culture



Self Service

Lesson: Distributed responsibilities

- Reduce friction
- Reduce size of central teams
- Automated tooling
- Ensure common practices

Starting point: Own all aspects of cloud
Network, Identity Management, Cloud provider account management, Security, Common Platforms and tools

Move Functions to app teams and service groups

Application development, DevOps for all cloud infrastructure, CI/CD, Global Traffic management and web firewall

Cloud enabled company wide

Adoption of container platforms and mature cloud managed services drives common approach through the company



Multi-Cloud

Lesson: Leverage all services

- Be intentional about choosing providers
- Large organizations need to be flexible
- Acquisitions
- 3rd Party dependencies

Cloud Providers

Chose best in class products/services
Enabled by network integration
Consume managed services where it fits

T-Mobile approach

We do not run similar workloads in both clouds
We do not run same application across cloud
Limited Hybrid apps today

People

Take advantage of skill sets within your organization
Leverage existing technologies on-prem as they move to cloud



- Kubernetes
- Serverless
- AWS Reserve Instance improvement
- Integrated platforms

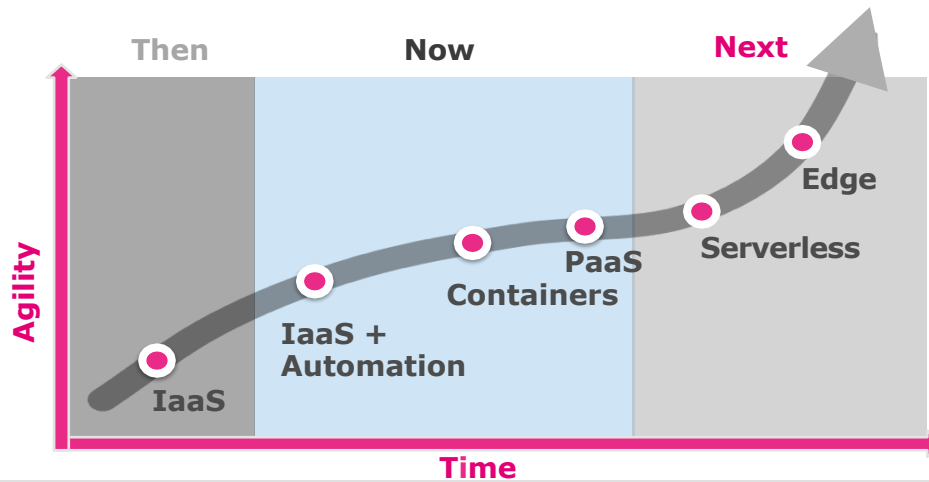
Telemetry across all aspects of infrastructure,
Kubernetes and applications
52 Billion data ingestion requests per day



T-Mobile®

T-Mobile Public Cloud Model for Customers

THE ROAD AHEAD – AT A GLANCE



STRATEGIC GOALS AND OBJECTIVES

Rapidly deliver new capabilities	Build modern platform for cloud app development	Simplify provisioning, deployment & management
Reduce time to market	Scale to meet business demand	Standardize & automate Dev & Ops procedures
Increase speed of innovation	Increase operational efficiency	Reduce cloud costs and risks

KEY FOCUS AREAS

Multi-Cloud

- Execute Multi-Cloud Strategy
- Azure Operationalization
- Google

IaaS

- Moving away from direct mgmt. of servers
- Moving toward consuming cloud capabilities at a higher level (PaaS and SaaS)
- Ultimately, the goal is Serverless

Dramatic reductions in management & operations overhead can be achieved by “moving up the stack”

Containers

- Evaluating container platforms & runtimes
- Containerizing existing apps to improve efficiency, consistency, portability & scale
- Planning for container networking & storage
- Architecting monitoring, security, auditing, etc.
- Engineering delivery pipeline & release process

Requires functionality to enable management of containers at scale

PaaS & Microservices

- Evaluating microservices platforms and tools
- Building new apps on microservices architectures
- Architecting monitoring, security, and release processes
- Engineering delivery pipelines & release processes

Have to be careful to isolate applications from vendor-specific features to ensure portability & avoid lock-in

Serverless

- Evaluating Serverless architectures and tools
- No infra to manage, developers bring their own code
- Apps need to bring “visibility” features as well

Visibility can be brought as a service (API management, subscription management)

Edge

- Data Processing at Edge
- Big Data Applications

T-Mobile Public Cloud Model for Customers

