DIGITAL SMARTER
Containerizing Middleware

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Principal Engineer, Software, T Mobile

Sudeep Hebbar
Sr. Solution Architect, HCL America Inc.
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HCL IS BUILT TO DELIVER INDUSTRY, TECHNOLOGY AND GEOGRAPHY FOCUSED SOLUTIONS

$7.2BN IN REVENUE
32 COUNTRIES
118,000 IDEAPRENEURS

- Application Services
- Infrastructure Services
- Engineering & RnD Services
- Business Process Services
- Manufacturing
- Financial Services
- Life Sciences & Healthcare
- Public Services
- Retail & CPG
- Telecom, Media, Publishing & Entertainment
- Others

*As of March 31st, 2017

APPs 37.1%
BPS 3.9%
ERS 19.7%
RCPG 9.6%
FS 24.4%
LSH 12.0%
INFRA 39.4%
MFG 33.9%
OTH 0.3%
TMPE 8.6%
PS 11.2%

TIBCO NOW 2017

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RECOGNIZED BY ANALYSTS

Rated Leaders across Mode 1 and Mode 2 offerings

IoT
Digital
Analytics
Cloud
Mobility
Apps
Infra
ERS

1 of only 2 tech services firms globally to be rated ‘Leader’ in IoT by 4 Analysts

1 of only 2 tech services firms globally to be rated ‘Leader’ for all 4

Only IOP to be rated ‘Leader’ in App Modernization for SAP & Oracle

Only IOP to be rated ‘Leader’ for all 3

Worldwide IoT Consulting & System Integration Services, 2016
Internet of Things, 2016
Internet of Things, 2016
Internet of Things, 2016

Application Modernization Services for Digital Transformation, 2015
Worldwide Big Data Consulting and Systems Integration Services, 2016
Cloud Professional Services, 2016

Software Product Engineering Services, 2015
Worldwide Microsoft Enterprise Applications Implementation, 2015
Worldwide Application Modernization Services for SAP Upgrades, 2016
Worldwide App Modernization Services for Oracle Upgrades, 2016

Data Center Transformation Consulting and Implementation Services, 2016
Data Center Outsourcing & Infrastructure Utility Services, North America, 2016
Data Center Outsourcing & Infrastructure Utility Services, Europe, 2016
Managed Workplace Services, Europe and North America, 2017

IDC
IDC
IDC
IDC

HFS
IDC
IDC
IDC

Gartner
Gartner
Gartner

Everest
Zinnov
HFS

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About T-Mobile

- As America’s Un-carrier, T-Mobile US, Inc. is redefining the way consumers and businesses buy wireless services through leading product and service innovation.
- NASDAQ traded public company – TMUS
- Operating two flagship brands: T-Mobile and MetroPCS
- Based in Bellevue, Washington

Q3 2017 Highlights:
- 1.3 million net adds – 18th consecutive quarter of adding more than 1 million
- 70.7 million total customers
- 316 million Americans covered today and targeting 321 million by the end of 2017
- 15 quarters in a row with the fastest download and upload speeds
# T-Mobile USA – Current Architecture

<table>
<thead>
<tr>
<th>Channel</th>
<th>CARE</th>
<th>IVR</th>
<th>RETAIL</th>
<th>TELESales</th>
<th>B2B</th>
<th>COMMISSION</th>
<th>WEB</th>
</tr>
</thead>
</table>

## Hardware & Devices

<table>
<thead>
<tr>
<th>Application</th>
<th>Hardware &amp; Devices</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care Desktop</td>
<td>Care Desktop</td>
<td></td>
</tr>
<tr>
<td>Motorola Scanner</td>
<td>Motorola Scanner</td>
<td></td>
</tr>
<tr>
<td>Ingenico iSC480</td>
<td>Ingenico iSC480</td>
<td></td>
</tr>
<tr>
<td>REMO</td>
<td>REMO</td>
<td></td>
</tr>
<tr>
<td>iPad 4, mini 2, Air V1 for Kiosk</td>
<td>iPad 4, mini 2, Air V1 for Kiosk</td>
<td></td>
</tr>
<tr>
<td>Infinea Tab M MSR</td>
<td>Infinea Tab M MSR</td>
<td></td>
</tr>
<tr>
<td>iPhone 5S</td>
<td>iPhone 5S</td>
<td></td>
</tr>
<tr>
<td>iPad 4, mini 2, Air V1 for Kiosk</td>
<td>iPad 4, mini 2, Air V1 for Kiosk</td>
<td></td>
</tr>
<tr>
<td>REMO</td>
<td>REMO</td>
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</tbody>
</table>

## Middleware

<table>
<thead>
<tr>
<th>Application</th>
<th>Middleware</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP Adapter</td>
<td>SAP Adapter</td>
<td>TIBCO BusinessWorks</td>
</tr>
<tr>
<td>ADB Adapter</td>
<td>ADB Adapter</td>
<td></td>
</tr>
<tr>
<td>Siebel Adapter</td>
<td>Siebel Adapter</td>
<td></td>
</tr>
<tr>
<td>Smart Mapper</td>
<td>Smart Mapper</td>
<td>EMS/TIBCO Rendezvous®, TIBCO ActiveSpaces®</td>
</tr>
<tr>
<td>EJB Plugin</td>
<td>EJB Plugin</td>
<td></td>
</tr>
<tr>
<td>Teradata Adapter</td>
<td>Teradata Adapter</td>
<td>TIBCO BusinessEvents®</td>
</tr>
<tr>
<td>REST Plugin</td>
<td>REST Plugin</td>
<td></td>
</tr>
</tbody>
</table>

## SOR

<table>
<thead>
<tr>
<th>Application</th>
<th>SOR</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postpaid Billing</td>
<td>Postpaid Billing</td>
<td></td>
</tr>
<tr>
<td>PREPAID Billing</td>
<td>PREPAID Billing</td>
<td></td>
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<tr>
<td>ENGINEERING</td>
<td>ENGINEERING</td>
<td></td>
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<tr>
<td>CRM</td>
<td>CRM</td>
<td></td>
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<tr>
<td>Orders</td>
<td>Orders</td>
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<tr>
<td>SUPPLY CHAIN</td>
<td>SUPPLY CHAIN</td>
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<tr>
<td>CREDIT CHECK</td>
<td>CREDIT CHECK</td>
<td></td>
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<tr>
<td>PAYMENT</td>
<td>PAYMENT</td>
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<tr>
<td>Reporting</td>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td>Ext. Sources</td>
<td>Ext. Sources</td>
<td></td>
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</tbody>
</table>

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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

NEW RULES
JANUARY 2017

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
TECHNOLOGY – HARDWARE

- Two data centers
  - Primary
  - Disaster recovery
- Primary data center
  - Set A – 48 blades
  - Set B – 48 blades
- Disaster recovery center
  - Set C – 48 blades

Hardware currently sized for peak load
PROBLEM STATEMENT

1. Infrastructure Costs
   - Multiple silos
   - Hardware – storage disks, SAN/FC switches
   - Network hardware – LAN switches, load balancer costs

2. Time-To-Market
   - Separate Dev and Ops Teams
   - Waterfall Model

3. The Monolith
   - Code Maintenance
   - Startup Time
   - Need for frequent restarts
   - Testing Challenges

- Software - OS, maintenance costs
- Storage admin costs
- Network admin costs
- Server admin costs

- Cost of Spinning a new Prod/non-Prod Environment
- Monthly Releases

- Security, Availability, Scalability, Reliability, Elasticity, Performance, Governance

Overhead cost
- Space
- Power
- Cooling
- Patching

Overhead cost
- Installation
- Scaling
- Telemetry

Overhead cost
- Downtime
- Prod Issues
- Bug Lifecycle
SOLUTION

Evolving TMUS TIBCO infrastructure and business services to the cloud.

Step 1  Refactor and Co-Exist

Cloud Native Application DevOps

Apps Manager

Ops Manager

TIBCO CE on Pivotal Cloud Foundry

Cell

Cell

Cell

TIBCO DevOps

BW Studio
(Design Time)

BW Admin
(Run Time)

Business Works Cluster

BW Engine

Tuxedo
Adapters

Other TIBCO Adapters

JMS Services

Break existing SOA services into MicroServices. Services on Cloud leverage existing TIBCO BW backend integration layers and adapters.
SOLUTION

Step 2   Lift and Shift

Cloud Native Application DevOps

Apps Manager  
Ops Manager

TIBCO Developers

BW Studio Container Edition

Pivotal Cloud Foundry

Cell

Cell

Cell

Cell

Cell

Cell

Cell

Cell

Cell

Migrate complete business services into TIBCO Container Edition
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### T-Mobile USA – Future Architecture

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<td>REMO iPad 4, mini 2, Air V1 for Kiosk</td>
<td>Infinea Tab M MSR</td>
<td>EMV Scanner</td>
<td>Infinea mPOS</td>
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<tr>
<td>USB Cash Drawer</td>
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</tr>
<tr>
<td></td>
<td>Inventory Scanner</td>
<td>iPhone 5S</td>
<td>Infinea mPOS</td>
<td>Network Cash Drawer</td>
<td>Grand Central Hub</td>
<td>Cellebrite Touch</td>
<td>Content Transfer</td>
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<td>T-Mobile Proprietary Applications</td>
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<td>API/Micro Svcs</td>
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<td></td>
<td>API Security Gateway</td>
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<td></td>
<td>Cassandra Plugin</td>
<td>Rabbit MQ Plugin</td>
<td>TIBCO BusinessWorks Container Edition</td>
<td>Pivotal Cloud Foundry</td>
<td>Circuit Breaker</td>
<td>Tuxedo Plugin</td>
<td>CI/CD Pipeline</td>
</tr>
<tr>
<td>SOR</td>
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<tr>
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<td>SAMSON</td>
<td>PREPAID RPX</td>
<td>ENGINEERING</td>
<td>CHUB</td>
<td>OMNI</td>
<td>SUPPLY CHAIN</td>
<td>CREDIT CHECK</td>
</tr>
</tbody>
</table>
MIGRATION STRATEGY

T-Mobile Experience
- Leverage SMEs in respective areas
- Cloud/Microservices Architecture Team Inputs
- New Technology Integration: Splunk, AppD, Grafana, Cassandra
- Reuse CI/CD/CT Pipeline Practices
- Version Controlling via GIT
- Agile Practices and Rally

HCL IP’s & Accelerators
- Vendor SME Expertise
- HCL Migration Utility
- HCL CodeGen Tool
- Leverage existing Automation and Virtualization for Testing
- Leverage CoE Expertise in Cloud Technologies, TIBCO BW 6.x
- Analysis and Research Results of Cloud Technologies in T-Mobile
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MIGRATION FLOW

- Translate BW 5.11 project (TIBCO CE compliant)
- Selective and Automated Export of Services
- TIBCO GV optimization
- Export translated & optimized project
- TIBCO CE Migration
- Refactor, Fix issues, Configure

TIBCO BW 5.11

HCL Migration Suite

Export

XSLT

GV Optimizer

TIBCO CE

TIBCO CE Migration
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MIGRATION STEPS

**Project Analysis**
- Review App Architecture
- Review supported/unsupported activities
- Go/No Go for Migration

**Pre-Migration Work**
- Clean Global Variables
- Refactor Activities (AE to JMS, RV to JMS, etc)
- Clean folder structure
- Collect dependent assets (JARs, DTLs, etc)
- Migrate projlibs (first time OR enhance)

**Migrate to BWCE**
- Migrate application
- Clean workspace after migration

**Post Migration Work**
- Post-migration enhancements (ex: convert GUID() function to uuid())
- Resolve Quick fix errors (ex: XSLT out-of-sync)
- Resolve binding issues
- Refactor error handling and logging
- Resolve XSLT 1.0 vs. 2.0 related issues
- Tokenize Module Properties for SCC

**Review App Architecture**

**MIGRATION STEPS**
<table>
<thead>
<tr>
<th>Core Software</th>
<th>Supporting Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIBCO Businessworks Container Edition 2.3.1</td>
<td>Pivotal Cloud Foundry</td>
</tr>
<tr>
<td>TIBCO Businessworks Maven Plugin 1.2.2</td>
<td>Netflix Hystrix</td>
</tr>
<tr>
<td>TIBCO Businessworks Buildpack for Pivotal Cloud Foundry</td>
<td>Spring Cloud Config Server</td>
</tr>
<tr>
<td>TIBCO Businessworks Container Edition Tuxedo Plugin 7.0</td>
<td>Netflix Eureka</td>
</tr>
<tr>
<td>TIBCO ACTIVEMATRIX BUSINESSWORKS™ PLUG-IN FOR APACHE CASSANDRA</td>
<td>Apache Casandra</td>
</tr>
<tr>
<td>TIBCO ACTIVEMATRIX BUSINESSWORKS™ PLUG-IN FOR AMQ</td>
<td>RabbitMQ</td>
</tr>
<tr>
<td>TIBCO EMS 8.1</td>
<td>Bitbucket, SourceTree</td>
</tr>
<tr>
<td></td>
<td>Jenkins</td>
</tr>
<tr>
<td></td>
<td>Maven</td>
</tr>
<tr>
<td></td>
<td>HAPProxy</td>
</tr>
<tr>
<td></td>
<td>Grafana</td>
</tr>
<tr>
<td></td>
<td>Splunk</td>
</tr>
<tr>
<td></td>
<td>AppDynamics</td>
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# MIGRATION MANAGEMENT

<table>
<thead>
<tr>
<th>Project Execution</th>
<th>No# of Sprint teams</th>
<th>No# Sprints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agile Scrum Methodology</td>
<td>4 (Onsite + Offshore)</td>
<td>10</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Average Velocity/Sprint</th>
<th>Total No. of Operations:</th>
<th>Total CE transactions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>515</td>
<td>1105 (54% completed so far)</td>
<td>76 M per day</td>
</tr>
</tbody>
</table>
### CHALLENGES/LEARNINGS

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences between XSLT 1.0 and 2.0 behavior</td>
<td>Come up with Best Practices Knowledge Base based on the situation SRs and active session with TIBCO support</td>
</tr>
<tr>
<td>TIBCO ActiveMatrix Tuxedo Adapter Performance issue with JMS transport</td>
<td>Selectively move to TIBCO Container Edition Tuxedo Plugin</td>
</tr>
<tr>
<td>Memory, Latency and CPU Issues</td>
<td>Addition of JVM parameters based on TIBCO’s suggestion</td>
</tr>
<tr>
<td>Studio Performance issues</td>
<td>Selectively disable Hystrix</td>
</tr>
<tr>
<td>Builds across GIT Repos</td>
<td>Work with TIBCO Maven Plugin Team (in progress)</td>
</tr>
<tr>
<td>Troubleshooting on PCF</td>
<td>TIBCO Came up with BWCEMon (enhancements in progress)</td>
</tr>
<tr>
<td>126 Total SRs filed on Migrator and CE</td>
<td>24x7 support from TIBCO including Support, Engineering and PSG teams. 90%+ Resolved or worked around till date</td>
</tr>
<tr>
<td>Legacy codebase Overhead: Non-standard coding practices, dead code,</td>
<td>Code Cleanup, GV cleanup, re-analysis case-to-case basis</td>
</tr>
</tbody>
</table>

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