IoT enabled Smart Mobility: Hype or Reality?
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Introduction

• Bambucluster is primarily focused on bringing technology solutions to mid-market businesses
  ➢ Primarily through our frameworks and our public and private ecosystems

• We are in the midst of expanding our focus to the public sector – primarily small and midsized towns and cities
  ➢ Our focus is on building ecosystems and public-private partnerships to enable Smart city efforts around mobility

• We are at the cusp of a mobility revolution

• We are here both as technology practitioners and global citizens
• What is Smart Mobility and why do we need it?
• Business, Social & Technology challenges around Smart Mobility
• Enablers of Smart Mobility - IoT devices, technologies, platforms, solutions and services
• An Integrated Approach to IoT enabled Smart Mobility
• An Architectural Framework for IoT enabled Smart Mobility
• A Use case around Smart Mobility
Roadmap

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The nature of urban mobility is undergoing tremendous change.

Traditionally, urban mobility has been about moving people from one location to another location within or between urban areas.

“Yesterday”

◆ Getting from A to B

“Tomorrow”

◆ Safe, sustainable and accessible solutions
Increasing Urbanization Is Only Going To Add To Urban Traffic Woes, Loss of Productivity & Lower Quality of Life

Global Urbanization Trends: Percent of Population Living In Urban Areas

1970: 30%
2014: 54%
2050: 66%

As gridlock plagues a growing number of cities around the world, transportation planners are embracing new ways of tackling the age old problem of congestion.
Lost Productivity, Lower Quality of Life

- Traffic congestion cost American drivers nearly $300 billion in 2016.
- Drivers spend an average of 32 hours a year stuck in jams during peak periods in the UK, with the direct and indirect costs reaching £31 billion last year.

“If we’re to avoid traffic congestion becoming a further drain on our economy, we must invest in intelligent transportation systems to tackle our mobility challenges.”

-- Trevor Reed, transportation analyst at INRIX

City and traffic management authorities have implemented numerous projects like road widening, rapid transit systems, monorails and metros to improve traffic congestion and quality of life for citizens. However, these measures have seen varied levels of success.
Singapore has made substantial investments in nationwide sensor platform, road sensors, phased traffic lights, implemented congestion charging and smart parking.

Barcelona has made extensive use of asphalt sensors to better manage parking. City planners are extensively leveraging technology to remodel the flow of vehicles to reduce congestion.

London has made big investments in smart traffic technology. Traffic lights in London respond in favor of buses to smooth the progression of public transport.

City is leveraging sensors to monitor parking spaces. San Francisco city officials use the data for dynamic parking system that adjusts the cost of parking based on whether spots are occupied or are vacant.

Oslo has started rolling out smart LED lighting and has launched a broad sensing network for monitoring traffic levels and parking spaces.
In December 2015, the US Department of Transportation (DoT) launched the Smart City Challenge

The DoT asked mid-sized cities across the U.S. to develop ideas for an integrated, first-of-its-kind smart transportation system that would use data, applications, and technology to help people and goods move more quickly, cheaply, and efficiently.

The DoT received 78 responses from cities across the U.S. and shortlisted 7 finalists: Austin, Columbus, Denver, Kansas City, Pittsburgh, Portland, San Francisco.

In early 2017, Columbus, Ohio was chosen the winner.

What is Smart Mobility and why do we need it?
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Mobility 1.0 has been transformative – but not always in a good way...

“Uber has enabled people to enjoy mobility without owning a private vehicle”

“Zipcar has been able to significantly reduce motorized trips. Each Zipcar replaces 15 private cars on the road, and every Zipcar driver drives 80 percent less than if they used their own cars”

“Citibike opened in New York City in May 2013, has 12,000 bicycles by 2017 and over 750 docking stations across NYC boroughs and has become one of the largest bike sharing programs today”

“A University of Chicago study estimates Uber and Lyft have increased traffic deaths by 2-3 percent nationally. That’s as many as 1,100 additional deaths a year — a small, but significant contribution to the increase in traffic deaths in the U.S. since 2011”

“According to CitiBike’s own data, at any given point - it has only about 70% of stated fleet of 12,000 bikes available. Annual membership has risen to $163 from $100 in 2013. And every time the company wants to put a dock somewhere, the somewhere pushes back”
Investing In Smart Mobility Has Become An Imperative To Improve Transportation Safety And Efficiency

Global IoT market in intelligent transportation systems is expected to reach $223 billion by 2026 at an estimated CAGR of +20% from 2015 to 2026.

Key Features of Intelligent Transportation Systems

- Greater visibility into traffic flows to minimize traffic congestion at signal controlled junctions
- Better understand passenger demand patterns to deliver transport capacity to handle peaks in demand
- Ensure excess capacity isn’t provisioned and therefore save money
- Reduce inefficiency in parking systems and payment systems
- Coordinate data collection and analysis across transportation systems to enable seamless multi-modal transportation

• Save costs through optimal resource allocation
• Achieve environmental targets by reducing emission
• Reduce transit time for citizens

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However, IoT enabled Smart Mobility faces a host of Business, Social And Technology Challenges

**Business and Social Challenges**

“ How do Smart Mobility solutions align with the changing demographics of a city/town/village?

“ How do Smart Mobility solutions compete with other land use – housing, economic infrastructure, recreation, etc.?

“ How to make Smart Mobility solutions accessible to the traveler population?

“ How do we deal with data privacy & security challenges in a data rich environment?

“ How do we ensure that the Smart mobility solutions are sustainable & environment friendly?

**Technology Challenges**

“ Lack of standardization to build, deploy & manage IoT applications

“ Need high-speed data capture, management, storage and analysis capabilities

“ Intelligent end-point devices that embody sufficient computing horsepower for activations

“ No consistency in managing end-to-end privacy & security of data in the system

“ Remote device update and management capabilities to reduce field service cost

“ No integration platform to plug IoT data into existing IT systems, applications & processes efficiently
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Today, a highly fragmented ecosystem of IoT devices, technologies, platforms, solutions & services enables Smart Mobility

- The Internet of Things (IoT) remain fragmented with no dominant ecosystem, providers or technical models to set industry standards
- Transportation Departments will need to find ways to make use of IoT devices, technologies, platforms, solutions and services from multiple providers and sources that are future proof
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An Integrated Approach for IoT enabled Smart Mobility

This fragmented ecosystem has made necessary an integrated approach & a well architected framework for IoT Enabled Smart Mobility solutions

People centered land transport system that meets diverse needs of an inclusive society and provides for a livable and vibrant global city

WHY SMART MOBILITY?

HOW TO ACHIEVE

Integrated Approach For Safe, Smart & Sustainable Transportation

WHAT TO MEASURE

- Service effectiveness
- Transportation asset & infrastructure efficiency
- Traveler experience

HOW TO DIFFERENTIATE

- To provide world class personalized multi-modal transport experience
- Increased Public Transport Modal Share
- Optimized Asset Usage & Increased Operational Efficiency
- Enhanced Customer Travel Experience

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IoT Presents a Key Enabler To Create Efficient Transport Models, Improve Asset Utilization & Improve Traveler Experience

- Devices & Sensors
- Transportation Assets
- Travelers

Transportation Intelligence & Analytics

- Traveler Support
- Transit Management
- Traffic Management
- Emissions Management
- Predictive Maintenance
- Emergency Management
- Toll Administration
- Commercial Vehicle Administration
- Fleet & Freight Management

A Cloud based transportation-centric IoT platform

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An Architectural Framework for Smart Mobility

The Architectural framework underpinning the cloud based transportation centric IoT Platform

- **Wide Area Wireless Communications**
  - Vehicles
  - Emergency Vehicles
  - Transit Vehicles
  - Maintenance & Construction Vehicles

- **Road Side Units**
  - Roadway Safety
  - Toll Collection
  - Parking Management
  - Commercial Vehicle Inspection

- **Dedicated Short Range Communications**
  - Road Side

- **Road Traffic Management**
  - Traffic Management

- **Emergency Management**
  - Emergency Management

- **Toll Administration**
  - Toll Administration

- **Remote Traveler Support**
  - Remote Traveler Support

- **Transit Management**
  - Traffic Management

- **Commercial Vehicle Administration**
  - Commercial Vehicle Administration

- **Fleet & Freight Management**
  - Maintenance & Construction Management

- **Supervisory control and data acquisition (SCADA)**

- **Event Processing**
  - Event Processing

- **Integration**
  - Integration

- **Security**
  - Security

- **Identity Management**
  - Identity Management

- **Use Interface**
  - Use Interface

- **Big Data & Analytics**
  - Big Data & Analytics

- **3rd Party APIs**
  - 3rd Party APIs

- **Service Provider APIs**
  - Service Provider APIs

- **Developer Portal**
  - Developer Portal

- **Developer API Management**
  - Developer API Management

- **IoT Developer Services**
  - IoT Developer Services

- **IoT Applications**
  - IoT Applications

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Transit Information

- Transit information would include updates on bus timetables, service advisories, traffic reports, scheduled construction, city events, weather conditions, and other factors which might impact a commute.

Commute Recommendation & Options

- A Personal travel Planner would provide a set of options that are tailored to the specific circumstances of the bus commuter.

Boarding Coordination

- Once the bus commuter selects a commute route and confirms her reservation, the system uses GPS on the bus and the user's mobile phone to coordinate boarding.

- Based on the location of the bus commuter and the bus, the system designates an ad-hoc pickup point where the bus and user arrive simultaneously.

Ticketing

- Once on-board, the bus commuter uses her mobile phone to pay for the ticket of her commute.

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**Personalized Journey Information With Various Access Channels (Web/PC, Mobile Device, Smart Screens)**

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