RUC West
Technologies for RUC Communications

Final Presentation

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NEW PATHS TO ROAD FUNDING

Introduction

- September 2017 to March 2018:
  - Inventory and review of technologies to collect and report RUC in future pilots
- Key deliverables produced:
  - Initial list of technologies
  - White paper on technologies **currently being used** for RUC
  - White paper on technologies that **could be repurposed** for RUC
  - White paper on **emerging and custom** technologies for RUC
  - Final Report
- Purpose of final presentation:
  - Summarize findings on RUC technologies
  - Highlight key takeaways for future RUC pilots

Contents

- Project Goals and Deliverables
- Approach and Methodology
- Summary of Technologies Reviewed
- Findings and Recommendations

Project Goals and Deliverables

- Inventory and evaluate **viable mileage recording and reporting technologies**
- **Identify firms** that could provide existing or emerging technologies, or develop custom technologies
- Provide **indicative timelines** for emerging technologies and custom technologies

Approach and Methodology

- Review of technologies implemented on or being developed for:
  - RUC pilots or live programs in the US and internationally
  - Tolling, congestion charging schemes, and fleet operations in the US and internationally
  - Other relevant RUC applications
- Analysis of technologies under several dimensions including:
  - **Latest developments** with existing technologies that could impact RUC implementations
  - **Specific features** of technologies that could be relevant or customized for RUC
  - **Maturity** of emerging technologies and estimation of a **notional timeline**
  - **Benefits, drawbacks, opportunities, and challenges** of each technology
- Methodology:
  - Use data collected through and lessons learned on pilots
  - Conduct research and surveys on these technologies
  - Consider RUC policy guidelines and interest for the private sector

Summary of Technologies Reviewed

Technologies Implemented on RUC pilots and programs

Technologies that could be Repurposed

Emerging and Custom Technologies

Basic components

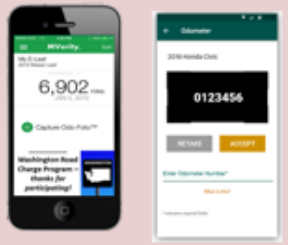
Convergence

Stakeholders

Technologies Implemented on RUC pilots and programs

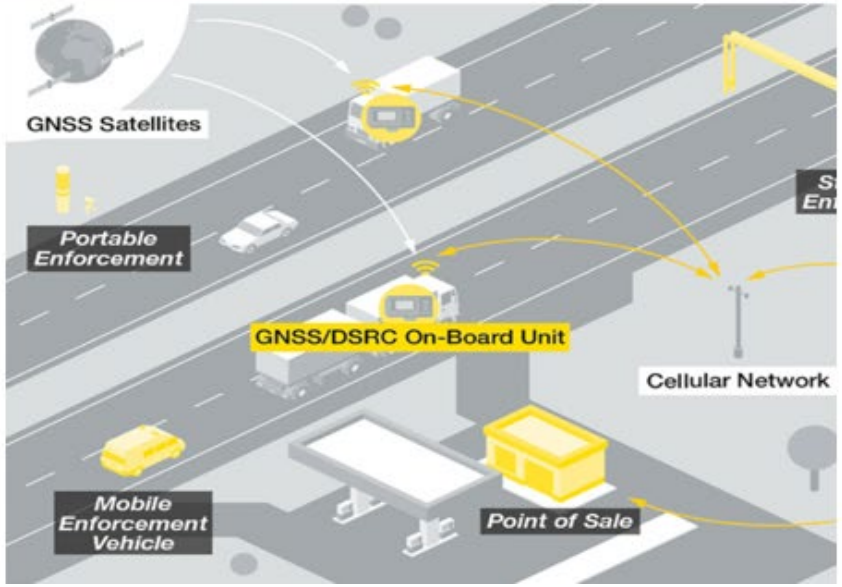
Mileage Recording & Reporting Technology	Main applications	Main differentiators	Key limitations
OBDII (with location and without location) 	• Usage-Based Insurance • RUCPP (OR) • RCPP (CA) • WA RUC	• Most reliable and mature technology	• Intrusive
Smartphone with Location 	• Usage-Based Insurance • RCPP • WA RUC • I95 CC	• Convenience • Vehicle identification (through proprietary technology and odometer images)	• Reported battery drainage on some implementations • Requires Active compliance to be reliable • Reported mileage (not measured)
Smartphone coupled with OBDII	• Customized for the Oregon pilot (RUCPP)	• Flexibility to choose between accuracy/transparency or privacy	• Unstable (and thus unreliable)

Technologies Implemented on RUC pilots and programs

Mileage Recording & Reporting Technology	Main applications	Main differentiators	Key limitations
Image processing via smartphone 	• Usage-Based Insurance • RCPP • WARUC	• Privacy • Enforcement	• Requires Active compliance to be reliable
Commercial Vehicle Mileage Meter 	• IFTA, ELD, and Fleet Operations	• Reliability • Accuracy • Compliance	• HVs only (technical and financial)
Native-vehicle telematics (via a third-party App)	• Vehicle telematics • RCPP	• Simplicity • Accuracy	• Limited support of vehicle makes and models (improving)

Technologies Implemented on RUC pilots and programs

Mileage Recording & Reporting Technology	Main applications	Main differentiators	Key limitations
GNSS-based RUC systems	• Heavy RUC in Europe	• Reliability • Accuracy	• HVs only



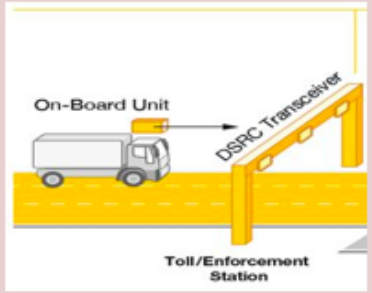
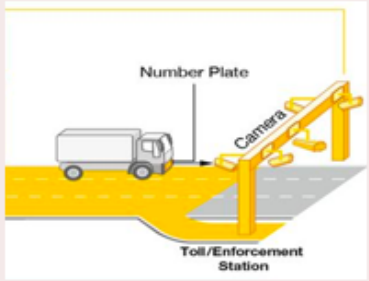
Summary of Technologies Reviewed

Technologies Implemented on RUC pilots and programs

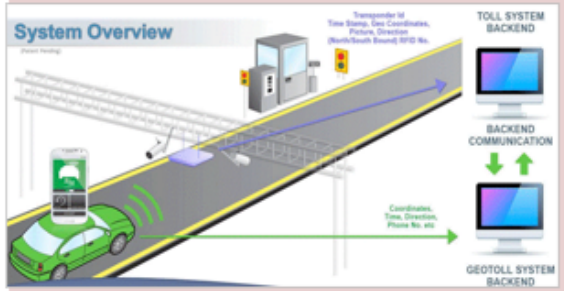
Technologies that could be Repurposed

Emerging and Custom Technologies

Technologies that Could be Repurposed for RUC

Mileage Recording & Reporting Technology	Main Applications	Relevance for RUC	Potential Roadblocks
DSRC and RFID On-board Units 	• Electronic tolling	• Enforcement • Identification of out-of-state driving • Interoperability	• Widespread deployment costly (and perceived to be intrusive)
ALPR 	• Electronic tolling	• Enforcement • Identification of out-of-state driving • Interoperability	• Widespread deployment costly (and perceived to be intrusive)

Technologies that Could be Repurposed for RUC

Mileage Recording & Reporting Technology	Main Applications	Relevance for RUC	Potential Roadblocks
Smartphone as a Transponder 	• Electronic tolling (proposed by Geotoll)	• Multi-modal support (RUC and tolling) • Enforcement	• Requires high capital expenditure • Limitations with battery life
CAN BUS Clip Connector 	• Mostly Heavy Vehicle Fleet Management	• Not yet used in the U.S • May not be needed with ELD mandate	• N/A (No location)
Electronic Logging Devices (ELD)	• Mostly Heavy Vehicle Fleet Management and Compliance	• Accurate mileage and fuel collection, Fraud resistant	• HVs only

Summary of Technologies Reviewed

Technologies Implemented on RUC pilots and programs

Technologies that could be Repurposed

Emerging and Custom Technologies

Emerging and Custom Technologies

Mileage Recording & Reporting Technology	Relevance for RUC	Potential for Customization for RUC	Potential Roadblocks	Deployment Timelines (forecast)
Smartphone with Location	• Would offer reliable pairing between phone and vehicle	• Multimodal mileage collection device that would require app.	• Technology readiness and reliability	• Recently tested on I-95
Pay-at-the-Pump	• Pay for RUC while buying gas (no account required)	• Designed to collect RUC	• Requires wide network of outfitted gas stations	• Operational solutions

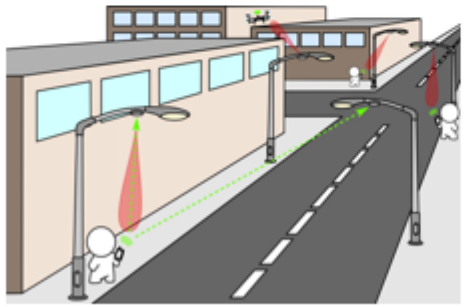
Emerging and Custom Technologies

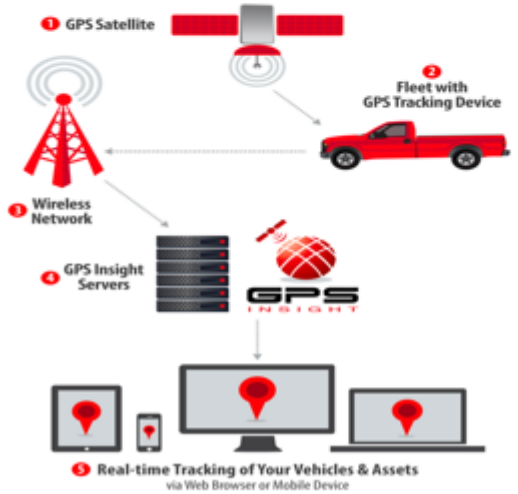
Mileage Recording & Reporting Technology	Relevance for RUC	Potential for Customization for RUC	Potential Roadblocks	Deployment Timelines (forecast)
Digital License Plates 	• RUC collection through smart license plate	• Already has embedded technology to capture mileage information (GPS)	• Cost (about $600 to acquire plates)	• Operational solutions in CA
Native Automaker Telematics 	• Direct support of RUC	• Direct support of RUC	• Automakers willingness to develop RUC applications	• Post 2020
U.S DOT Connected Vehicle Program	• V2V and V2I communications for RUC collections	• Communications to RUC system	• Uncertain timelines (and outcomes)	• Unclear

Emerging and Custom Technologies

Mileage Recording & Reporting Technology	Relevance for RUC	Potential for Customization for RUC	Potential Roadblocks	Deployment Timelines (forecast)
5G Mobile Communications	• Enable quick data collection and transfer	• None required	• Urban areas only at the beginning	• 2020
Fleet Vehicle Technology	• Direct support of RUC for HVs	• RUC use cases	• Truckers willingness to support RUC applications	• Operational systems

5G

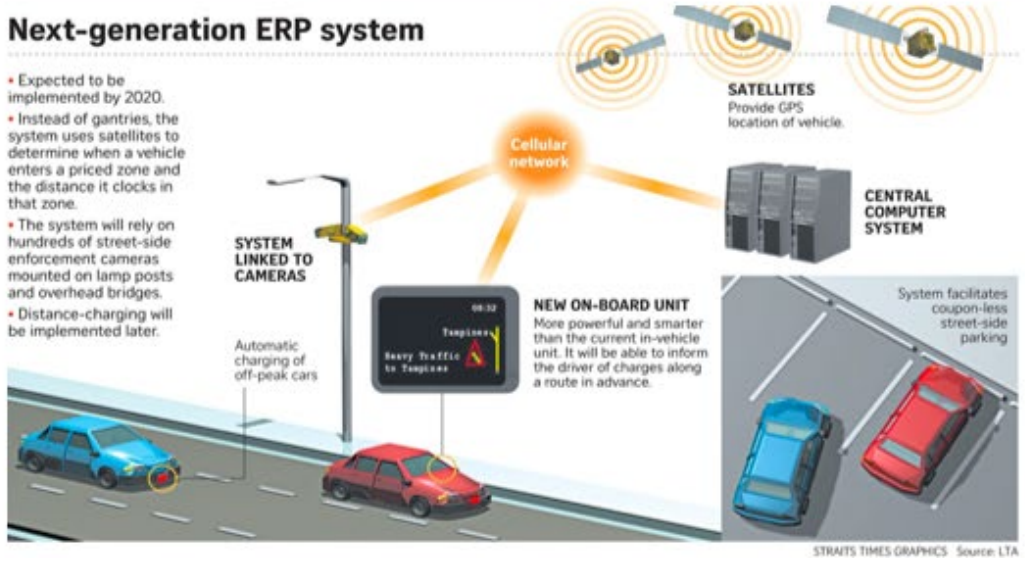




Fleet Vehicle Technology

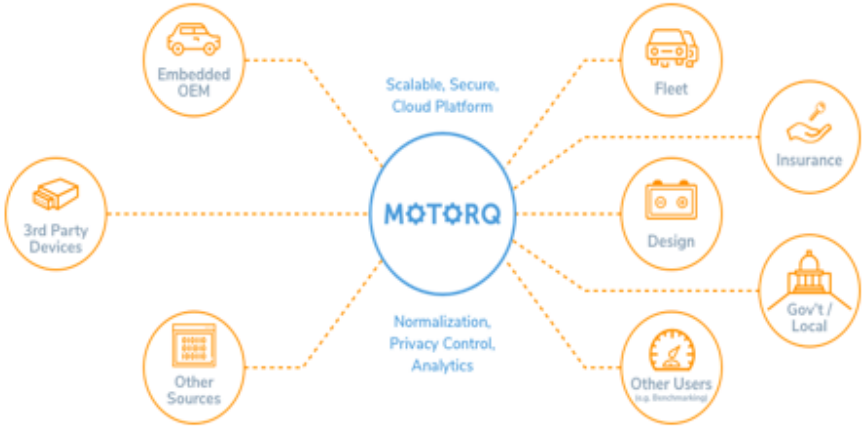
Emerging and Custom Technologies

Mileage Recording & Reporting Technology	Relevance for RUC	Potential for Customization for RUC	Potential Roadblocks	Deployment Timelines (forecast)
Next Generation ERP System	• Assesses RUC by distance, location, time, and vehicle type	• Direct support of RUC in real-time	• Requires GPS and mandatory OBU	• 2020 (Singapore)



Emerging and Custom Technologies

Mileage Recording & Reporting Technology	Relevance for RUC	Potential for Customization for RUC	Potential Roadblocks	Deployment Timelines (forecast)
Telematics Data Aggregators	• Direct support of RUC for enrolled vehicles	• Develop use case or specific application for RUC	• Automakers reluctance to support RUC application	• Operational solutions



Emerging and Custom Technologies

Mileage Recording & Reporting Technology	Relevance for RUC	Potential for Customization for RUC	Potential Roadblocks	Deployment Timelines (forecast)
Blockchain	• Payments	• Only for payments — not a mileage recording and reporting technology	• Maturity of technology and existence of an industry standard	• 2025

Findings and Recommendations

Key Takeaways

- **Technology**
  - Technologies consist of three basic elements – Communications, GPS, Database
  - No revolution in mileage collection, but gradual progress over the past 20 years
  - Few mature technologies guarantee accuracy and simplicity of use for RUC collection
  - Significant progress with Native Automaker Telematics and 5G expected in coming years

- **RUC Market**
  - RUC market not yet sizeable
  - No technology has been specifically developed for RUC yet
  - Initially, primarily UBI firms active in the RUC space
  - Other telematics companies showing interest as pilots advance
  - Largest companies interested in RUC come from tolling industry

Recommendations

- Determine policy goals first and then choose technologies most suited to support these goals

- Technology key determinant of public acceptance
  - Ensure that it does not contradict the policies it supports
  - Acknowledge limitations of value-added services

- Elicit interest of private sector early on (especially until a significant RUC market emerges)