Western Road Usage Charge Consortium

Certification Project Phase 1

Key Elements for a Road Usage Charge Certification Program available to Multiple States

Final Report

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Preface

The Western Road Usage Charge Consortium comprises participating states interested in and concerned with the long-term viability, interoperability and cost effectiveness of road usage charging. Developing a multi-jurisdictional certification program is an essential component to achieving desired system attributes like low service and administrative costs, interoperability, security, and citizen and stakeholder confidence. However, participation in this study does not demonstrate commitment to participating in or implementing with other states a multi-state road usage charging certification program.

This phase 1 report provides research on a certification program for a road usage charge system available for use by multiple states, including a description of the role and importance of certification.

Executive Summary

As a public program and an alternative to the gas tax, road usage charging (RUC) warrants heightened care and scrutiny of design, development and delivery for adherence to relevant laws and regulations, public sensitivities and to principles of tax collection. These include fairness in administration, ease of and low cost of collection, ease of and low cost of compliance and transparency. As stewards of public funds and public trust, states considering RUC as a fuel tax replacement must meet these expectations by building systems that reliably do what laws require, states need, and citizens expect. Certification is a tool that independently validates and provides evidence to the public that states are meeting requirements which are an exhaustive documentation of what a system must do.

> As stewards of public funds and public trust, states must develop systems that reliably do what laws require, states need and citizens expect. Certification can provide independent validation of meeting these stewardship expectations.

The WRUCC vision is to develop RUC systems that foster market competition through open design; allow for motorist choice in how the charge is assessed and paid; and, are compatible with readily-available and affordable consumer products. Certification is a tool that can enforce and deliver on this vision.

Benefits of RUC certification

Requirements and certification provide specific advantages to RUC, including:

- Assurance that any products, services or systems developed or procured function properly; for a RUC system of sufficient size, this assurance can be achieved at a low-cost.
- Clear and transparent demonstration that the system fulfills public stewardship obligations thereby building:
    - Public acceptance – The public expects accountable and visible public programs, especially tax collection.
    - RUC payer acceptance – Participants require assurance that the system is accurately and properly calculating their bills and supporting their compliance (if RUC is mandated); and,
    - Prospective private partner acceptance – Private entities need clear, stable, predictable regulations and processes to understand their potential business case and risks of partnership.
- Opportunities for lower costs – comprehensive requirements support effective comparison (i.e. apples to apples) of alternatives (e.g. in-house, contracted or public private partnerships).
- Reducing concerns and risk around private entity participation – certification of requirements demonstrates and assures that private companies are compliant, especially given public stewardship standards.

Benefits of RUC certification within an open commercial market

Certification is invaluable when private partners and an open market are used to deliver RUC, as in Oregon. A state partnering with private companies ensures citizens have choices and minimizes costs by leveraging private expertise in account management, customer service, and mileage reporting technology, including the ability to keep pace with automotive, data, and communications industry innovations. Certification enables competition among private entities because they can offer choices to consumers; choices which all satisfy state requirements and pass certification. Oregon's requirements and certification are designed and structured

to drive down costs by enabling innovation and substitution which foster the best opportunities for economies of scale.

Benefits of RUC certification for use by multiple states

The importance and advantages of certification are amplified in a multi-state environment, with or without private partners. Multi-state certification represents a special opportunity for achieving core WRUCC objectives and providing benefits to payers, public sector and private entities (if engaged) by:

- Creating trust and confidence in products and services
- Expanding the market which brings down costs and increases competition
- Enabling interoperability of systems and services which expands revenue opportunities and maintains ease of use
- Encouraging innovation
- Avoiding or minimizing duplication of efforts
- Supporting greater confidence in procurement
- Increasing the ability to substitute system component suppliers

There are challenges to certification involving multiple states. States must agree on core requirements and certification processes that are, or will be, shared across all parties. This agreement will not come easily. Common elements must be robust enough to constitute a certification program and to reduce overall compliance efforts for potential private partners while allowing for each state to address their own unique, binding statutory or policy requirements. For RUC certification used by multiple states to produce the benefits described, it is critical that states work together to define the essential elements of certification.

Developing requirements and developing and performing certification are acts of policy making, policy interpretation and policy implementation. For interested states, this effort will be aided by identifying and committing resources early and sustaining them over time. These resources can provide engaged participation and oversight of: requirements and certification detail and development; the relationship of this work to state specific legal, regulatory and policy context; and, potential market effects if partnerships are anticipated.

Developing RUC requirements and developing and performing RUC certification are acts of policy making, policy interpretation, and policy implementation.

This document provides an overview of what certification is, what value it brings to RUC especially in a multi-state environment, and next steps for designing and implementing a multi-state approach to developing a RUC certification program available to multiple states. The content of this report is detailed and technical, covering the full range of certification elements and processes that should be considered. Emerging through this report is the clear notion that certification is an advantageous activity for any state pursuing RUC and that the value of certification is amplified when multiple states work together to define essential elements and share resources and expertise in their development.

This report should be used by participating states, as the starting point for common understanding of what certification is, what elements it features, what it accomplishes, and why it is important. Starting from this common understanding, states can begin working together to jointly define shared requirements and elements of certification.

1. Introduction

1.1. Purpose

A multi-jurisdictional certification program is central to achieving desired road usage charge (RUC) system attributes like low administrative costs for agencies, interoperability of technology for customers, interoperability of accounts across state borders for customers, data and system security, and citizen and stakeholder confidence. The purpose of this report is to identify and analyze the key elements of a multi-state RUC certification program for a road usage charge (RUC) system across multiple states. As a first step toward formulating a multi-state RUC certification program concept, this report provides an overview of the following four topics:

- Introduction to the concept and key elements of certification,
- Description of the value and key elements of RUC certification,
- Unique aspects of multi-jurisdictional RUC certification, and
- Next steps for building a multi-state RUC certification program.

This is a pool-funded research study by the Western Road Usage Charge Consortium (WRUCC). Participation by a state in this research project does not demonstrate a commitment to participating in or implementing with other states a multi-state certification program for RUC. This report is the first step toward presenting and understanding the idea of a certification program for road usage charging available to multiple states.

1.2. Assumptions

One way to attract and maintain commercial partners in the provision of low-cost, user-friendly RUC services is to employ common requirements and standards for RUC across multiple states to the maximum extent possible. Examples of requirements and standards include a mileage message, multi-jurisdictional reporting format and content requirements, and issue resolution procedures. It is unlikely that a completely common set of requirements and standards is fully achievable due to variations in state laws, policies and regulations. Therefore, this report assumes that states would likely use a combination of common requirements and standards as well as unique requirements and standards particular to each state.

This report introduces the concept and value of certification generally and as applied to road usage charging. To develop a RUC certification program available to multiple states, interested WRUCC states would have to work together to determine common elements that would be the foundation of such a program. This report assumes agreement on those common elements is a prerequisite for further development.

1.3. WRUCC Context

The Western Road Usage Charge Consortium is a voluntary coalition of Departments of Transportation. Members are collaborating on research and development for RUC systems. Of the 14 current member states, six are participating in this study of multi-state certification: Oregon (lead state), California, Colorado, Nevada, Utah and Washington. An overview of the WRUCC, its purpose and goals is provided in Appendix 1.

WRUCC's vision is to develop RUC systems that:

- Are open systems to foster competition in the market for providing RUC services;
- Allow for motorist choice in how a RUC would be assessed and paid;
- Are compatible with readily-available and affordable consumer products and technologies (such as smartphones, in-vehicle navigation systems, and other data-dependent vehicle technologies); and
- Are designed to achieve the primary purpose of collecting road use taxes to fund roadway maintenance and improvements.

Despite the Consortium's vision to develop common components of a RUC system, members are free to determine how they wish to implement RUC systems – they are not required to adopt the system(s) used by other members. However, the Consortium's vision for RUC systems informs the content and approach of this report.

Several WRUCC goals are relevant to this certification study:

- Explore technical and operational feasibility of a multi-jurisdictional RUC system;
- Develop standards and protocols for how RUC could best be collected and remitted among various jurisdictions;
- Develop preliminary operational concepts for how a multi-jurisdictional RUC system would be administered; and
- Develop a model for regional cooperation and interoperability of RUC systems that can be used in the Western region and potentially across North America.

2. Overview, Value, and Elements of Certification

2.1. Overview

The International Organization for Standardization (ISO) defines certification as the "provision by an independent body of written assurance (a certificate) that the product, service or system in question meets specific requirements."[1] Certification describes a designation earned by a product, process, service or person. In the context of RUC, this paper will focus on certification specific to products and services. Certification is both a journey and a destination: the process of becoming certified and an end state that conveys expectations of that product or service to a group of specific stakeholders. A Certification System is the structure that oversees and manages the requirements and operations of the certification program.

A certification program is normally developed to establish the Certification Entity, a neutral and authoritative entity for certifying service providers and testing products or services. The certification program may be operated by either a government or an outsourced entity. The Certification Entity may or may not conduct testing itself. Once products or services are certified, the Certification Entity provides authoritative information regarding certified products and service providers and their processes.

Certification terms

Certification. Applicable to products and services. The certification of products and services indicates their reputed [tested, documented] suitability for a specified purpose.

Certification Entity (CE) offers and conducts certification as a neutral and authoritative entity. Typically a business organization. Stakeholders or members typically play key roles in developing and maintaining the Certification Program that the CE operates. The CE typically determines how to operate the Certification Program.

Certification Program. The set of procedures, methods and tests to be followed and successfully 'passed' in order grant a certification. A Certification Program is part of a certification system.

Certification Mark. Products and services are advertised as certified by appending to the product or service packaging a *certification mark & number.*

Certification System. The overall structure of entities and activities that develop, manage, change, operate and quality assure certification for a specific product or service.

See Appendix 3 for a complete list of definitions for key certification terms.

The length of time a certification is valid varies. Some certifications may be permanent, although this is rare. Other certifications may need to be renewed periodically and may only involve certain subsets of the features required of the certified product or service. Re-certification may be required when a product is changed in a way that impacts performance and/or functionality or when the official period of certification for products or services is close to expiration. What must be re-certified and when is determined by the Certification Entity, in coordination with Certification System stakeholders and in consideration of overall Certification goals and objectives.

2.2. Value of Certification

Certification of products and services confirms adherence to technical, business and electronic communication standards, processes and requirements. In general, certification aims to facilitate the adoption of appropriate standards and certification processes in a given market, in order to ensure that "certified" products in that market are secure, protect consumer privacy and are interoperable, i.e., the ability of different information technology systems and software applications to communicate, exchange data, and use the exchanged information (see Appendix 4 for a more detailed definition of interoperability).

[1] http://www.iso.org/iso/home/standards/certification.htm. Website accessed on July 28, 2015.

Certification of products and services is a key element that supports the development, implementation and sustainability of interoperable products and services in an emerging technical market such as the one that will be created by RUC programs. Industry experts recognize that a well-developed certification program helps reduce the cost of implementation to private and public stakeholders, and stimulates demand in the fledgling market. That is because, within an open system model, the existence of a certification program ensures interoperability thereby enabling direct competition among multiple vendors.

In addition to these aspects, the value of having certified products and services include but are not limited to the following:

- End users (the public) can use certified products and services knowing that they have been rigorously tested, conform to specifications, and interoperate with each other:
- Equipment vendors are able to differentiate their certified equipment from their competitors whose equipment is not certified; and
- Public agencies and private vendors have confidence that equipment and services conform to agreed standards and requirements, which allows for an open, dynamic, and competitive market.

2.3. Elements of Certification

Certification consists of the following elements:

- Requirements development;
- Testing – Plans, Procedures and Tools;
- Role of Test Lab/Organization;
- Certification System Structure and Key Roles; and
- Certification Process.

Each element is typically created and exists independent of each other, but for the purposes of a particular Certification Program, they are mutually supportive.

2.3.1. Requirements Development

Certification of products and services validates that the products or services meet certain technical and business requirements. Requirements are captured in one or more requirements documents. These documents contain all the demands on that product or service, or in other words, what stakeholders want that product or service to do. Because of the variety of parties involved, these requirements should contain sufficient specificity and detail to ensure that necessary functionality is clear and achieved by meeting the requirements. These requirements may include technical specifications, business operating requirements (also often referred to as business rules), performance criteria, communication specifications and protocols, and more.

Business operating requirements specify how a product or service operates. Examples include, (1) how often data must be transmitted, (2) in the event of an error, what actions must be taken and when, and (3) what happens if the vendor's service application has a computer bug/virus that disrupts service functionalities. These rules may be documented in a business operating requirements document or an agreement between the Certification Entity and the vendor (see Appendix 4 for an explanation of these two terms). Market and business rules must also be established that lay out performance criteria, and if those criteria at some point

cease to be adequately met, certification should be withdrawn, if the vendor is unable (e.g. vendor goes bankrupt), or unwilling (e.g., vendor decides to pull out) to undertake required activities to rectify the situation. The agreement between a Certification Entity and a vendor could include a Service Level Agreement (SLA) calling out specific performance criteria.

2.3.2. Testing – Plans, Procedures and Tools

A rigorous testing and validation process for products and services must be completed in order to achieve certification. Products and services become certified through testing and validation that occurs via a Test Lab for products or Test Organization for services (see Appendix 4 for an explanation of these two terms).

Certification programs often have multiple levels of testing. At each level, the product or service is tested against a particular set of requirements. In general, the product or service must be tested and certified in some ascending order, i.e., a product cannot be tested for some 'level 2' certification until it has passed 'level 1' testing/certification.

> The least visible elements of a Certification Program are its test plans, procedures and tools employed by a Test Lab/Organization to conduct tests. Related terms include test condition, test scenario, test procedure, test suite, or test case – all of which are essentially 'how' the Test Lab/Organization tests a product or service as being in compliance with the requirements established by Certification System stakeholders and subsequently overseen and implemented by the corresponding Certification Entity. Developing tests requires having or establishing the following: clear measurable requirement; acceptance criteria (may reflect testing cost and availability considerations); specific test procedures; specific expectations for documentation of test procedures conducted and results.

The methods for certifying products and services are determined considering the array of possible testing methods for a specific requirement and the level of certainty or assuredness needed. Methods may include but are not limited to the following:

- **Lab testing** is in a physical laboratory, typically for products only, i.e., not for services. Example: Confirming heat resistance.
- **Environmental testing** (also referred to as applied testing) means how the total solution performs in an environment similar to where the equipment and/or service will be deployed. Example: Transmission of mileage data from a vehicle operating on roads in normal conditions.
- **Verification testing** means checking the validity of the existence and satisfactory status of existing certifications granted by other entities. Examples: Confirming valid and current certification mark for PCI (Payment Card Industry) compliance; confirming valid and current certification of processes and procedures, such as under ISO 9001.
- **Review of policies and procedures** means reviewing a vendor's internal policies and procedures, and other vendor information necessary to verify that a vendor's business and services provided are conducted in compliance with Certification System stakeholder's expectations and specific business rules. Example: Internal procedures for management of specific activities (e.g. staffing, ramp-up of services).
- **End-to-end testing** validates that the system, in its entirety, works as intended and provides the essential functions and qualities required. Example: Specific to RUC, using real data in real-time to

demonstrate mileage is collected, converted to road charges and road charges are billed and collected.

Test plans, procedures and tools may be developed and defined solely by the Certification Entity (if they have the appropriate expertise) or jointly by a Test Lab/Organization (if utilized) and the Certification Entity. The Certification Entity and Test Lab/Organization take requirements and assign or design proper tools to test them. Another common role for a Certification Entity is to be the sole interpreter and owner of the program's Test Plans, Procedures and Tools. The rationale for this arrangement is that one provider of a standard set of tools has the effect of ensuring reliable and repeatable results.

2.3.3. Role of Test Lab/Organization

A Test Lab/Organization is the entity that conducts and completes the testing and comprises a visible part of a certification program, particularly to applicants, because the Certification Entity requires them to submit their product or service to a Certification Entity-accredited Test Lab/Organization. Further, it is often the goal of a Certification Entity to have several choices of Test Labs/Organizations to consider because it enables a more open and competitive testing ecosystem. A Test Lab/Organization can be a part of a Certification Entity, though that is unusual, such may be the case for a new Certification Program with too few customers to warrant the existence of separate Test Lab/Organization.

Testing Labs/Organizations will use various test methods dependent on what is being tested. Testing Labs/Organizations, alone or in coordination with Certification Entities, will determine appropriate test methods.

To perform their role, a Test Lab/Organization must pass an accreditation process, which is a third-party evaluation by an accreditor that verifies that Test Lab/Organization has the means and expertise to test products and services to ensure they meet requirements as established by a Certification System's stakeholders (see Appendix 4 for definition of accreditation). Accreditation is essentially a "test the tester" approach typical of most all Certification Systems and varies based on the tests a Test Lab/Organization conducts. Third-party accreditation ensures a uniform process across accredited test labs/organizations, and reliable and repeatable results. Accreditation helps standardize and make known what it takes (costs) to be an accredited Test Organization. Third-party accreditation also allows for competition within the testing process based on price and quality of service, which tends to engender innovations in testing – innovations that usually result in lower costs for the Test Lab/Organization and thus lower fees for the applicant/vendor.

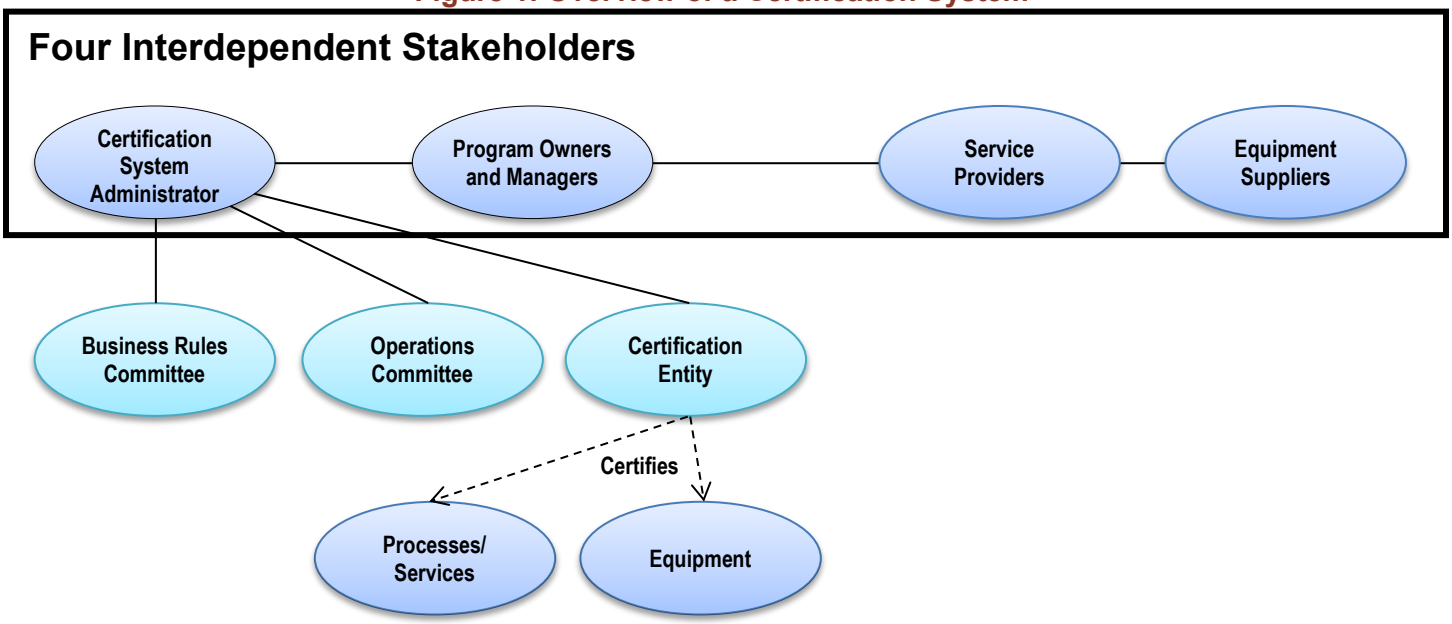
2.3.4. Certification System Structure and Key Roles

Discussion in the preceding sections described the core components of a Certification Program. A Certification System is the overarching structure that establishes the program in coordination with a variety of higher-level and interdependent stakeholders as follows:

- Certification System Administrator, which may host the following administrative functions and certain key groups:
  - Business Rules Committee,
  - Operations Committee, and
  - Certification Entity.
- Program Owners and Managers.
- Service Providers and Equipment Suppliers.

The following figure provides a generic overview of a Certification System in which there are both service providers and product suppliers.

Figure 1: Overview of a Certification System



Key roles in this Certification System Structure are explained below.

2.3.4.1. Program Owners and Managers

Program Owners and Managers are organizations that enable or authorize service providers and product suppliers to operate in the given market. Program Owners and Managers would choose only certified service providers to operate in the market to ensure that said services are provided in a uniform manner. These requirements – and others – are part of the Certification Program managed by the Certification Entity. Moreover, Program Owners and Managers, like any stakeholder, have their own vested interests in how specific certification is undertaken. In addition, the Certification System Administrator is the place where vested interests are advocated and specific certification programs are established.

For RUC, this group is likely to consist of one or more organization(s)—stakeholders—that authorize RUC in their jurisdiction(s).

2.3.4.2. Services Providers and Equipment Suppliers

Service providers and equipment suppliers[2]—jointly referred to as Vendors—are also key stakeholders. They are interested in creating value for their company, and thus seek to balance meeting program requirements while achieving their financial goals. Service providers, in particular, but also equipment suppliers heavily define user experience. Vendors hold valuable information and expertise on their work, potential efficiencies

[2] Service Provider is any company that provides a service to customers, from a financial service to a cleaning service. Equipment or technology supplier is a company that provides a technology product to customers.

and user experience. As noted above, the Certification System Administrator is the forum where those vested interests are aired, debated and reconciled. Vendors provide valuable technical and business expertise to the Certification System Administrator during the requirements definition process with the objective that the certification program serves the needs of both 'sides' of the table—namely, Program Owners and Managers, and service providers and equipment suppliers.

Certification elements for service providers may include more than adherence to technical specifications related to IT systems supporting account management and the movement of money. They may also include adherence to Service Level Agreement performance criteria such as call-center response and resolution times or the speed at which a customer receives a product after ordering it. When added to the technical, administrative and logistical processes that support financial components, certification of services is more complex and costly. Finally, service providers may periodically be recertified or perhaps subject to de-certification if they do not maintain their credentials such as Payment Card Industry Data Security Standard (PCI-DSS). In the end, a recurring, robust and transparent evaluation process enables service providers and equipment suppliers to optimize operations.

2.3.4.3. Certification System Administrator

The Certification System Administrator manages and/or oversees the Certification System (see figure 1). A key charge of the Certification System Administrator is to balance the robust requirements that advance particular objectives of Program Owners and Managers—such as technology reliability and ensuring an open system (i.e. interoperability of equipment)—with business realities borne by providers of equipment and services. The CSA provides the forum where these vested interests of stakeholders are aired, debated and reconciled through committees focused on specific subjects like business rules and operations.

A Certification System Administrator can be formal, like the OmniAir Consortium—a 501(c) (6) non-profit corporation of member companies organized to advance interoperable wireless vehicle communication systems, including toll systems. OmniAir Consortium oversees 'OmniAir Certification Services,' which is the Certification Entity. Or, it can be less formal and quasi-governmental, like the E-ZPass Group, which is not a corporation but more of a cooperative agreement among 'E-ZPass' branded toll operators, and which has a certification program to certify suppliers' compliance to its Electronic Toll Collection system specification. In some circumstances, particularly in new certification systems, or in the case of very small markets, the Certification System Administrator encompasses the responsibilities of and often serves as the Certification Entity. Whether part of or separate from the administrator, the Certification System Administrator still oversees and sets guidelines for the Certification Entity through an Operations Committee that may establish and manage day-to-day details like policies, bylaws and management procedures.

However it is organized or chartered, the Certification System Administrator is an association of like-minded stakeholders whose function is to manage or advance a specific industry. The Certification System Administrator can perform 'soft' activities like public relations, education, and publishing, or 'hard' activities like setting specific policies, developing standards, or adjudicating disputes, but its focus is collaboration between stakeholders. The Certification System Administrator might offer other services, such as producing conferences or offering classes or educational materials. The Certification System Administrator is typically a non-profit organization governed by bylaws and directed by officers who are also members.

The Certification System Administrator is the foundation through which stakeholders learn about and from each other. It is where trust is built - trust that a Certification System balances the needs of all program stakeholders. For Program Owners, it instills confidence that certified products can and will work in an interoperable environment. This is often built or bolstered through a Business Rules Committee which is responsible for establishing and refining requirements. For service providers and equipment suppliers, the Certification System Administrator creates a certification ecosystem that not only allows Vendors to complete a single test process (sometimes in one place), but also to apply their solution anywhere, as opposed to them staging discrete and expensive technology tests tailored to the idiosyncrasies of individual program owners.

Furthermore, the certainty and singularity of a Certification System's process reduces the risks and costs to service providers and equipment suppliers of bringing goods and services to a given and sometimes new market. Having a Certification System Administrator overseeing the process can create a certification ecosystem that is more likely to offer a more competitive certification ecosystem. In such an ecosystem, certified equipment suppliers and service providers gain a competitive advantage over providers of uncertified services and equipment. Finally, recognition and promotion of certification by the Certification System Administrator will help fully deliver the benefits of a Certification Program and its contribution to the success of program goals.

2.3.4.4. Certification Entity

The most visible part of a Certification Program is the Certification Entity because it is the face of the Certification Program and the entity that all stakeholders interact with, including the public.

The Certification Entity has another major role: it establishes—either on its own or in cooperation with other Certification System stakeholders—the General Policies, Procedures and Processes of the Certification Program. At a minimum these policies, procedures and processes include the following:

- Requirements regarding how a party – the Applicant – applies to the Certification Entity to have their product or process/service tested and certified.
- Structure, layout, content and other elements of the Certification Entity's Certification Reports – those documents provided to the Applicant upon completion of a test program.
- Handling of disputes in case an Applicant disagrees with the result of a certification test, process and/or procedure – and the resolution of said dispute.
- Procedures of the general test plan, i.e. the testing of the equipment or process/service for compliance to all requirements that, if met, result in a certification award.
- Procedures for performing Regression Testing, which means testing of just a part of the product or process submitted to the Certification Entity. This is a common practice when the equipment or

process itself consists of several parts and just some, or one, of those parts changed and must be re-tested. This feature reduces the cost of certification.

- How the certification mark database is managed.
- How certification data is kept private and secure and under what conditions said data is shared.

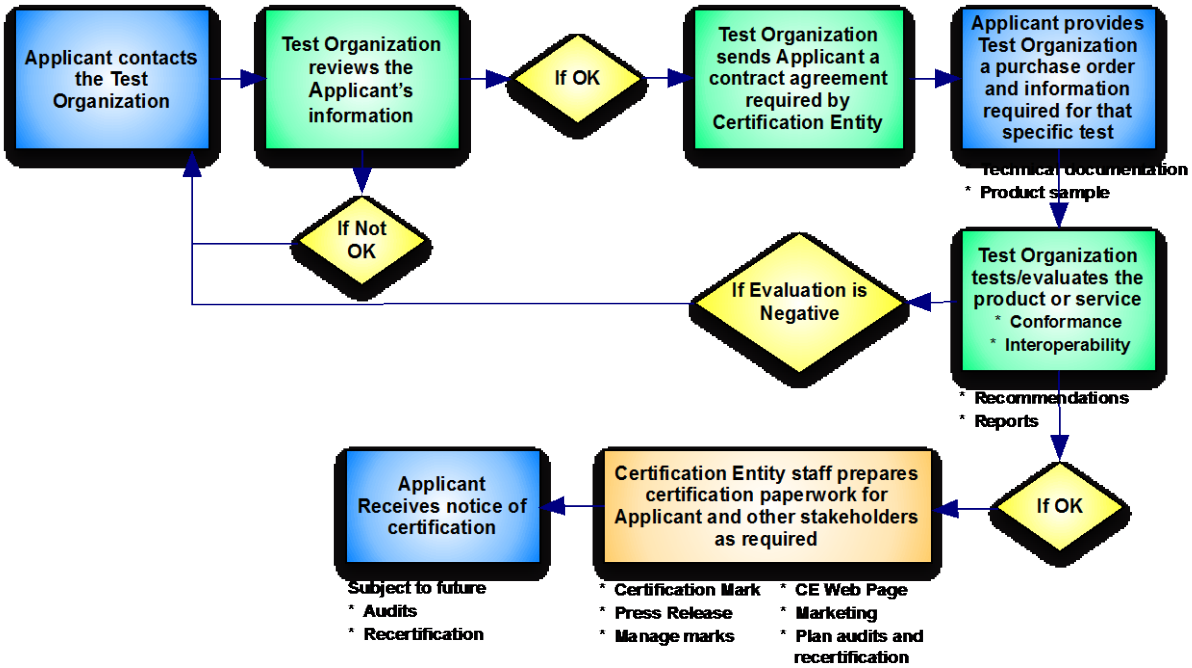
Upon completion of testing an Applicant's equipment or service(s), the Certification Entity determines whether it passes. The Certification Entity issues the mark, maintains the database of certified equipment (equipment suppliers) and service providers, and makes that database available for inspection by others. The Certification Entity also receives, addresses and adjudicates any protests made by equipment suppliers or service providers with respect to the Certification Program and/or the issuance or denial of a certification award.

2.3.5. Certification Process

Test Labs/Organizations follow a certification process typically defined by the Certification Entity and other stakeholders of the Certification System. The following is a typical process, which is also depicted in figure 2 below:

- Applicant contacts the Test Lab/Organization requesting information for certification services.
- Test Lab/Organization reviews the applicant's information to confirm it can perform the certification and provides the Applicant a quote for certification services.
- Test Lab/Organization sends the Applicant a contract agreement to sign that is specific to the Certification Entity's certification scheme.
- Applicant provides the Test Lab/Organization a purchase order, its technical documentation, an equipment sample, and/or other information required by the specific Certification Entity for that specific test of equipment or services.
- Test Lab/Organization begins testing the equipment or service.
- Test Lab/Organization finishes its evaluation of the equipment or service, and upon resolution of findings, if any, the application and equipment information is presented to the Certification Entity.
- Following – and conditional on approval – by the Certification Entity, the Certification Entity staff prepares certification paperwork and makes available any certificates or other data to the Applicant and other stakeholders as required, including listing the award on their website or other means that allow verification by others, including the public.
- Certification Entity may also begin observing the equipment or system to ensure continued compliance. This may take the form of inspections or random testing and audits – and depends on the certification program requirements.

Figure 2: Typical Certification Process



The certification process does not stop when equipment or services are certified. As part of the certification process, the Certification Entity also tracks reported problems and issues with certified products and services. For example, in the case of RUC, this could entail the monitoring of emergent problems with mileage reporting solutions[3] and determining if a there is a flaw that needs to be corrected. Corrective action could include a software or other fix to bring mileage reporting into compliance or could result in decertification and replacement with another certified solution. When flaws are discovered, certification tests may need to be modified to prevent future issues from passing certification. Changes to product designs, subsequent to their certification, should require them to be re-certified by the Certification Entity to ensure a robust change management and control process (although provisions may exist for exceptionally minor changes not to require recertification).

[3] Mileage reporting functionality or solution is a device and/or software (i.e., telematics) in the vehicle capable of measuring vehicle mileage traveled and collecting other related data from the vehicle, processing and storing the information, and communicating the usage to the account manager. Mileage reporting functionality may be factory installed or installed after market. Mileage reporting solutions may or may not have location-based technology.

3. Overview, Value, and Elements of RUC Certification

3.1. Overview

Certification of any equipment or service is tailored to that equipment or service. RUC Certification is the validation of service providers and equipment suppliers meeting RUC specific requirements, standards and interface specifications. These standards may include specifications for mileage reporting and data collection, transaction processing, account management, billing, payment processing and customer service. The purpose of RUC certification is to demonstrate and document adherence to requirements and overall system functionality. RUC requirements and certification are an agency's tools to ensure the system does what the law requires, what states need and what citizens expect. As such, these tools can demonstrate effective and appropriate stewardship by an agency and help ensure the viability and success of a RUC program.

Currently, there are only two established RUC certification programs in the world. These are located in Oregon and New Zealand. Little is known by these authors about the New Zealand program beyond the fact that it is outsourced to an independent entity. This section focuses on critical features of Oregon's Certification Program.

A key focus of Oregon's RUC Certification is the need for strict adherence to requirements related to the exchange of funds; state laws or treasuries often specify in detail what is required to handle public funds. Since the central purpose for RUC is to accurately calculate, collect and remit revenue, Account Managers could be subject to recertification or potential de-certification if certain fund-exchange credentials, like PCI compliance, lapse.

3.2. Overview of the Oregon RUC System and Functions

To understand the certification program specific to road usage charging in Oregon, a basic understanding of the operational system is needed. Figure 3 illustrates the basics of the Oregon RUC system currently in operation. It is important to understand that the Account Manager shown below is a private entity that conforms to standards and requirements set by the state. The reliance on private entities to deliver RUC services increases the importance of and attention needed for the development of requirements and certification processes.

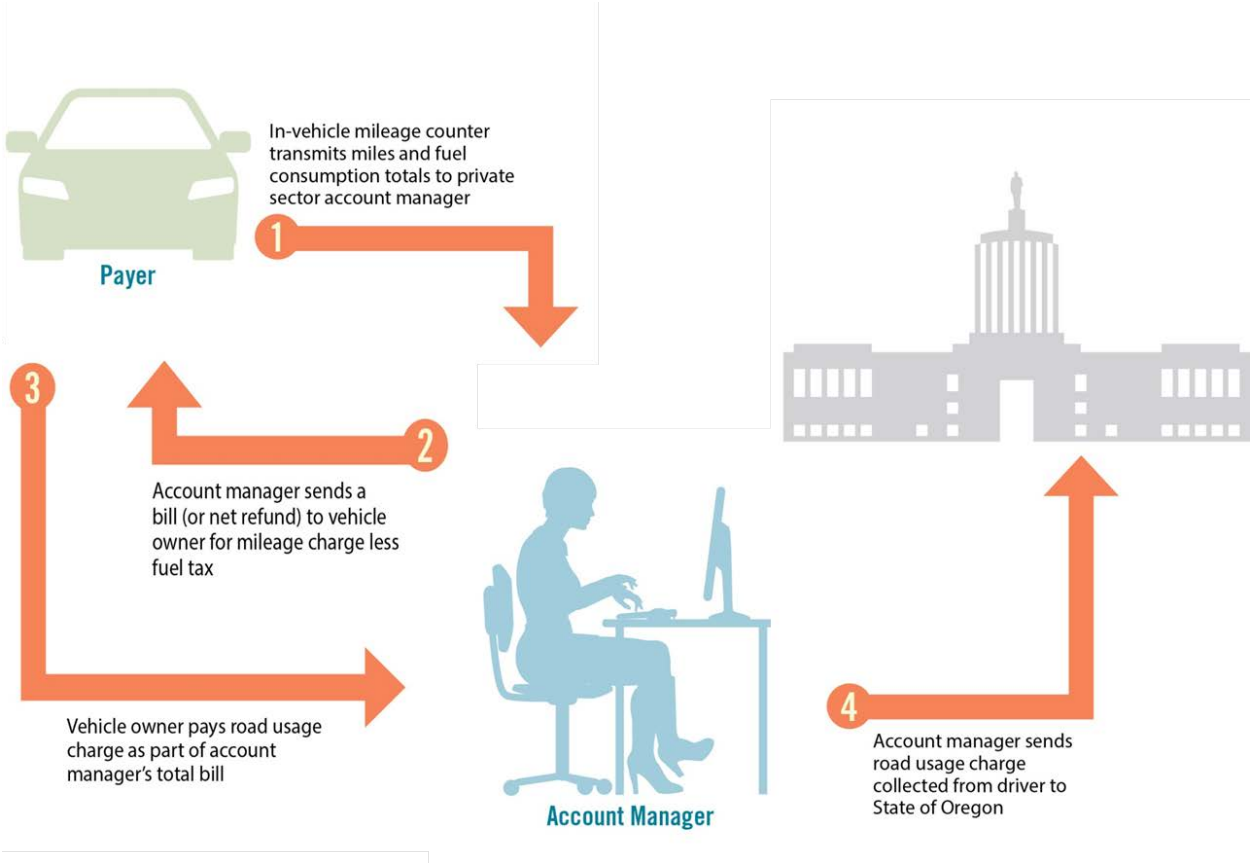


Figure 3 – Illustration of Oregon's RUC System

The Account Manager provides a variety of functions:

- **Mileage Reporting and Data Collection:** A device and / or software in the vehicle measures and reports the miles traveled and fuel used each day. Reported data is stored and transmitted in a common format that conforms to open system protocols. Data is transmitted to an account management system via wireless communications.

- **Transaction Processing:** Functions which transform the vehicle data transmitted into a road use charge through calculating and applying the appropriate use fee (e.g. fee per mile) and any applicable credits (e.g. fuel tax credits).

- **Account Management:** A variety of activities, including setting up accounts for RUC payers and their vehicles, issuing invoices and statements, receiving payments, managing accounts receivables, transmitting collected monies to the state treasury, providing customer service, and supporting audit activities.

The government, as system owner, receives certain data[4] from all account managers on all RUC payers in one central database and performs accounting for the program, including confirming participation eligibility of vehicles at enrollment and ensuring that RUC payments are ultimately provided to the state treasury. Data transmitted to the government is in a common format that conforms to open system protocols. The government also supports enforcement activities, measures and evaluates RUC system performance, liaisons with other agencies (e.g., DMV) as needed and provides program-wide customer service and public information.

3.3. Value of RUC Certification

Road usage charging, as a public tax program, requires effective and appropriate public stewardship. The benefits of certification (quality goods and services, interoperability, reduced implementation costs, stimulated demand and competition) take on new meaning and importance in this context. These benefits provide value and certainty for public stakeholders in verifying the system works as it should, providing improved opportunity for lowering operating costs and fulfilling expectations of transparency and consistency for the general public, for RUC payers and, if utilized, private partners.

The value and benefits to Oregon of having a RUC Certification Program include but are not limited to:

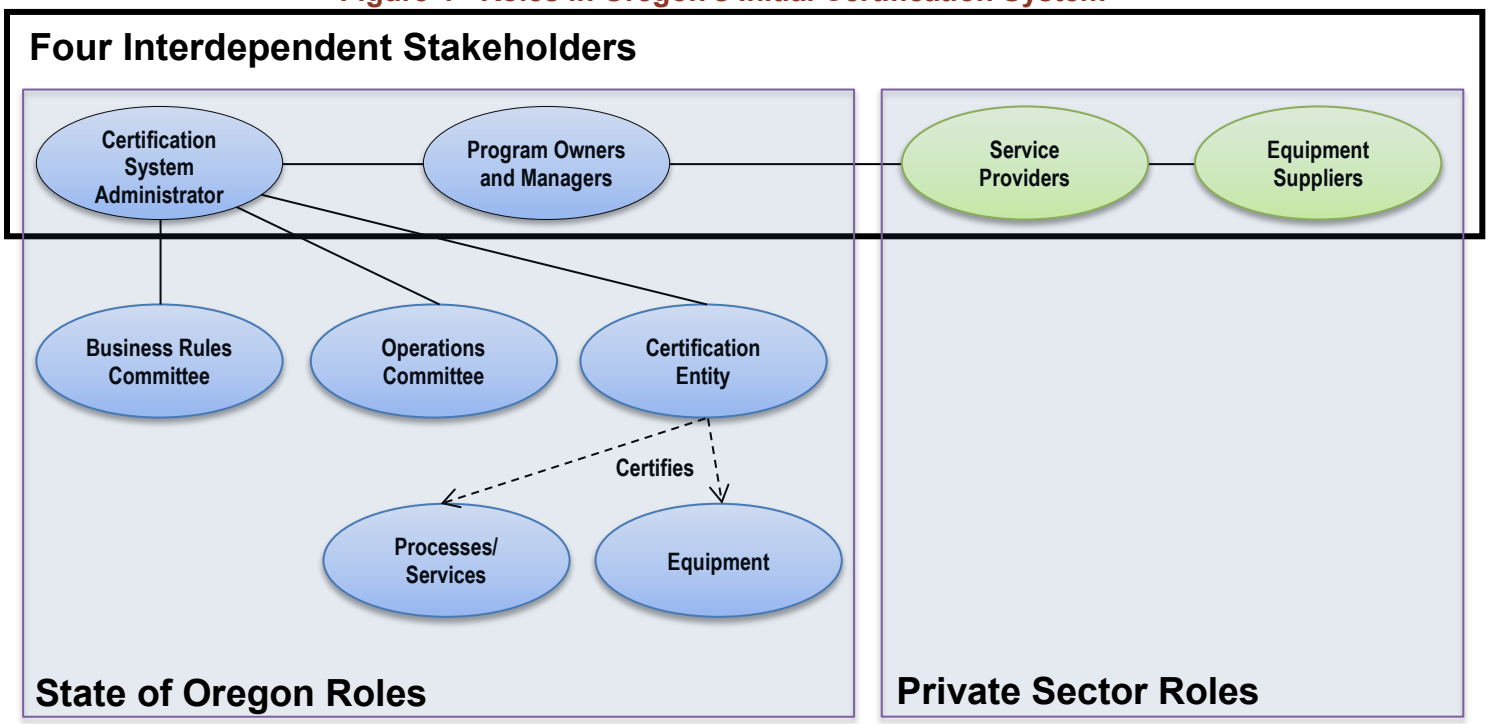
- RUC payers will have confidence to sign up with Account Managers and use certified equipment or non-equipment based mileage reporting solutions and services knowing that they have been rigorously tested, conform to specifications, and interoperate with each other;
- Equipment suppliers will be able to offer their RUC-certified mileage reporting solutions where competitors without certification cannot;
- Account Managers will benefit by being able to participate in a growing RUC market enabled through certification; and
- Government authorities and stakeholders will have confidence that Account Managers and certified mileage reporting solutions conform with agreed upon standards and requirements, which allows for an open, dynamic, and competitive market.

3.4. Unique Attributes of RUC Certification in Oregon

Account managers must be certified by ODOT to provide services to RUC payers; the certification process in Oregon is a refinement of typical certification structures and processes. RUC is a fledgling industry supported through ODOT's pioneering launch of a volunteer RUC system. Due to the program's newness and size, ODOT is currently performing almost all certification roles as shown in Figure 4.

[4] Oregon Revised Statutes and Administrative Rules contain specific provisions related to data collection, access and retention. Under Oregon's program, the state never receives location or daily metered use (i.e. trip by trip mileage or fuel usage) data. The state and RUC account managers must destroy location and daily metered use data not later than 30 days after completion of payment processing, dispute resolution for a single reporting period or a noncompliance investigation, whichever is latest.

Figure 4 - Roles in Oregon's Initial Certification System



Major objectives for Oregon's RUC program include choice, competition and innovation. These objectives can only be achieved by obtaining services and equipment from an open market.

The opportunity for an open market is made possible by RUC's open system design: publicly available requirements and common communication standards between components. Compliance with these common communications standards is verified through certification.

An open system[5] for road usage charging is a fundamental policy choice with far reaching effects on system cost, adaptability, customer experience, state agency procurement flexibility, and resources devoted to developing standardized interfaces. Key aspects of open systems are as follows:

- Open systems tend to be more customer-oriented and adaptable to latest technologies;
- Open systems tend to be lower cost because they restrict the use of proprietary equipment and services which enhances competition among providers and enables the substitution and addition of equipment and services; and,
- Open systems require common standards and interfaces between the interchangeable pieces of the system.

[5] An open system uses standard functional requirements and interfaces that are fully accessible to the marketplace, allowing different members of private industry to participate in the parts of the program that they are best suited to support. An open system allows system components and processes performing the same function to be readily substituted or provided by multiple providers.

Oregon's competitive market for account managers is defined by a *market contract*: a common set of requirements and contract terms for *all firms* in the open market. Contract terms and system requirements for the commercial open market are structured to ensure essential program characteristics (e.g. auditable tax collection, privacy protection and security) while providing flexibility for competition among firms. For example, the tax collection function can be provided alongside other goods and services like pay as you drive insurance, driving scores, vehicle and battery health. Firms are able to adjust services or equipment, as long as they meet certification requirements, to better meet customer needs or preferences and to enable them to meet their bottom line.

3.5. Elements of Oregon's RUC Certification

Similar to the generic elements of certification presented in Chapter 2, elements of RUC Certification as developed by ODOT for the Road Usage Charge Program (RUCP) comprise the following distinct yet interrelated elements:

- RUC Requirements development;
- RUC Testing – Plans, Procedures and Tools;
- Role of RUC Test Lab/Organization;
- RUC Certification System Structure and Key roles; and
- Certification process.

Appendix 3 presents two examples of translating a policy intention into a specific, testable requirement that can be certified and monitored over time.

3.5.1. RUC Requirements Development

ODOT developed requirements for third party vendors.

Requirements address all aspects of third party products and services essential for a functioning RUC program. These aspects include the following key functions:

- Mileage reporting and data collection;
- Transaction processing—validate and store data, manage errors, calculate usage charges and fuel tax credits;
- Account management—provide access and manage payer accounts, control data retention, report to Agency, control hub for full system;
- Billing—generate invoices/statements, manage accounts in arrears, post payments/refunds to payer accounts);
- Payment processing—payments or refunds for payers, payments to Agency—typically subcontracted based on payment security expectations; and
- Customer service—customer support, tracking and reporting on customer support.

The requirements documents are:

- Interface Control Document—specifies data transmission messages and associated security and protocols—started in 2012.

- System Requirements Specifications—technical specifications for vendor provided functions and systems—started in 2012.
- Business Requirements Document—business rules and specifications for vendor provided functions and systems—started in 2014.
- Service Level Agreement—performance measure specifications for vendor provided operational service, performance reporting, and quality standards with punitive effects for poor performance—started in 2014.

3.5.2. RUC Testing – Plans, Procedures and Tools

The RUC Certification process developed by ODOT has several facets to ensure complete validation of a vendor's ability to administer the road usage charge. Both business and technical documentation is reviewed and evaluated for compliance with OReGO Program requirements and completeness, to ensure continuity of operations and compliance with contractual obligations. After full validation of all business and technical documentation, ODOT conducts real-life testing to ensure end-to-end performance of the vendor offerings and verification of contractual compliance.

Evaluation efforts for general and end-to-end testing fell into four categories:

- **Vendor Documents**—RUCP evaluation of vendor-submitted documentation supporting Account Manager processes, procedures, designs and product specifications;
- **Vendor Test Results**—RUCP evaluation of vendor-submitted test results supporting Account Manager testing of systems and processes;
- **Integration Testing**—RUCP and Account Manager collaborative testing of Account Manager capabilities to send accurate and standardized reports to ODOT; and
- **Acceptance Testing**—RUCP end-to-end testing of Account Manager systems and processes from start to finish.

Examples of business processes and procedures evaluated include, but are not limited to:

- Processing a refund for overpayment of an invoice;
- Collecting and remitting RUC tax due;
- How and when to notify volunteers when an error has occurred with their mileage reporting solution; and
- Managing volunteer requests to update account information.

Technical documentation and systems evaluated include, but are not limited to:

- Physical security and stability of the mileage reporting solution;
- Security of the payment processor accessed via the vendor website to pay invoices; and
- Storage and transmission of accumulated data to calculate the road usage charge.

One unique attribute of ODOT's testing structure was a data validation tool which was built by ODOT specifically to test the interfaces – the data formats and transmission protocols – between the mileage reporting function and the account management system as well as between the account management system and ODOT's administrative databases. These interfaces are the hallmark of RUC's open system design in Oregon.

3.5.3. Role of RUC Test Lab/Organization and Staff

The certification process for the July 1, 2015 RUC system launch was conducted almost exclusively by ODOT staff—without the use of a Test Lab or Organization. Implementation team staff worked with the certification coordinator to develop tests, acceptance criteria and tester protocols. Staff from the RUC implementation team, with assistance from Agency specialists in information security and geographic information systems, evaluated Account Manager processes, procedures and systems to ensure Account Managers compliance with RUCP requirements.

Staff participating in certification evaluations underwent RUC Program and Certification training to ensure readiness for vendor certification evaluations. Staff participating in the certification process also participated in the Operational Trial, a several week real world simulation of operations (extended end-to-end test) to test operations and any outstanding certification items. Furthermore, project staff was cross-trained to increase capacity across the project to meet project timelines.

3.5.4. RUC Certification System Structure and Key roles

Because there was no pre-existing RUC industry and no other states were operating RUC systems, ODOT had to get creative about certification. System accuracy and accountability are critical to ODOT therefore testing was essential.

Due to the developmental nature of RUC and ODOT's public stewardship responsibilities, there was great value in growing in-house understanding and expertise in RUC certification. To do this, ODOT devoted internal resources to oversee, develop and conduct certification including efforts to balance state needs, public expectations and industry interests.

3.5.4.1. Program Owners and Managers

As program owner, ODOT represents important system stakeholders including the state of Oregon, elected officials and Oregon citizens. Ownership activities included the development of requirements and the development of a certification program. Broad objectives of both were established by state and agency leadership through legislation or policy directives. These objectives were implemented by ODOT staff responsible for program development and project implementation.

The agency identified a certification coordinator to develop and manage certification. This work included relationships with ODOT subject matter experts for conducting certification, ODOT leadership to confirm the process of certification and ODOT volunteer program implementation management for confirming adherence to the process and requirements. This involved regular meetings and, when needed, issue escalation to the executive leadership team.

The certification coordinator developed a certification plan incorporating step-by-step procedures for the certification process including engagement of management to oversee and provide approval for key steps in the process. The certification coordinator also developed certification guides for each step in the process that identified for each requirement the evaluation method, staff role evaluating (e.g. volunteer coordinator, compliance specialist, information security specialist) and time estimate.

During the certification process, the certification coordinator and a vendor liaison worked together to track progress, ensure clarity of expectations for vendors, and act as the hub for all certification activities.

3.5.4.2. Services Providers and Equipment Suppliers

As a new application of existing products and services, RUC vendors (services providers and equipment suppliers) have diverse business models and solutions. Information to industry about the RUC program and solicitation of industry feedback about the program occurred early and often. Vendor participation was defined by requirements and contract terms. These requirements and contract terms were communicated to the market in advance of advertising the opportunity to seek feedback and develop offerings that were best suited to market.

RUC vendors were contracted to provide all services from mileage reporting to account management and payment processing to customer service. RUC vendors were not individually engaged to provide one aspect of service. The current RUC vendors are subcontracting certain functions but ultimately remain the primary responsible party to ODOT for full system functionality.

During the certification process, communication to and from vendors regarding certification ran through an authorized RUC representative. Communication activities included tracking of certification progress, remediation of processes, standard operating procedures, and/or test results required. As issues emerged during certification, vendors and ODOT worked together to identify solutions that addressed industry barriers while maintaining core program objectives.

3.5.4.3. Certification System Administrator

ODOT requirements were developed over several years and have been refined through learning over that time. ODOT certification work common to activities typically performed by a Certification System Administrator was conducted primarily by the certification coordinator. The coordinator drew on expertise from across the agency, developed a certification plan and oversaw the effort on behalf of and in coordination with Agency stakeholders described above.

3.5.4.4. Certification Entity

ODOT certification work common to activities typically performed by a Certification Entity was coordinated by the certification coordinator and conducted by Agency staff with subject matter expertise in accordance with the approved certification plan. Specific communication roles and responsibilities were identified to ensure that all parties stayed on the same page during the several month process of certification.

3.5.5. RUC Certification Process in Oregon

Initial certification of account managers required five steps. Two steps were conducted prior to contract and were associated with proposal review. Three steps were conducted post-contract. Steps are described below and illustrated in Figure 5. ODOT also conducted an operational trial – an extended end-to-end test, which simulated operational conditions and functions to test state and vendor operations together and concurrently as the full system. This several week effort had state employees (familiar with how the system should operate) act as volunteers to test all stages of participation (enrollment, mileage reporting, invoicing, bill payment, un-enrollment and account closeout) and key system functionality (e.g. mileage reporting accuracy, accuracy of delineating mileage by zone for services with location capabilities). State employees that developed the system

and would be operating it monitored this test and tested the ability of the state administrative system to receive data and internal procedures related to tax administration.[6] Ongoing certification activities will occur to ensure that requirements are being met over the duration of contracts with the state.

Step 1: Meet basic business requirements (pre-contract).

Step 2: Demonstrate existing systems and functions (pre-contract).

Step 3: Self-certification verifying each requirement individually through documentation of performance tests and results, policy and/or procedure documents and other evidence (post-contract).

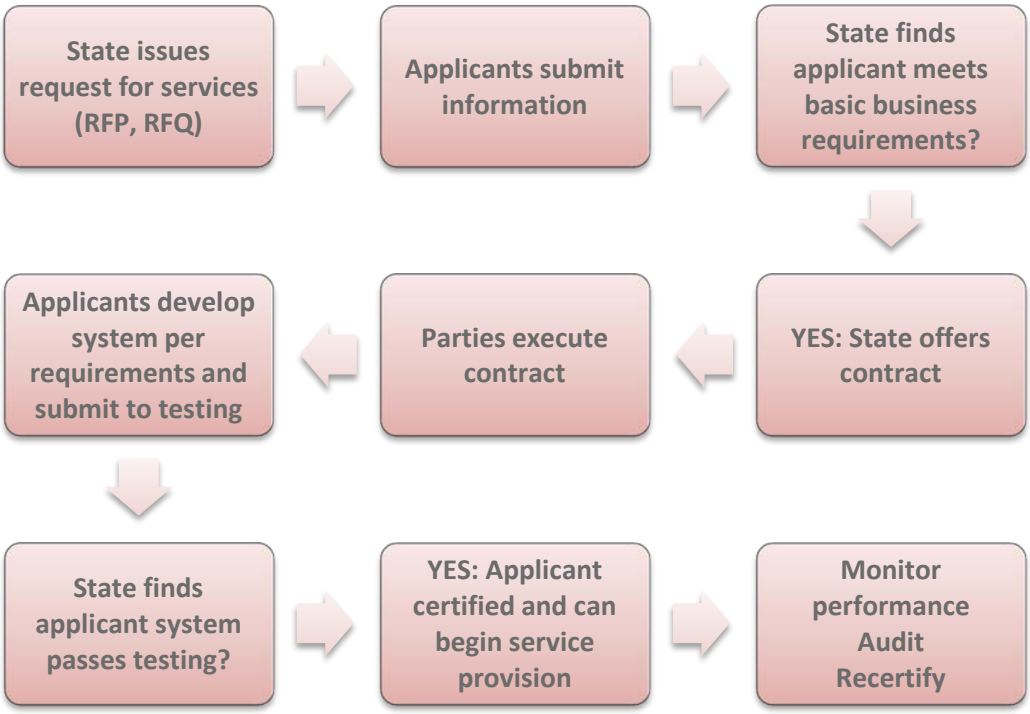
Step 4: Verify data transmissions and formatting between system components: mileage reporting functionality to account management system; account management system to ODOT program management system; and, account management system to ODOT tax reporting system (post-contract).

Step 5: End-to-end test verifying full system functionality through tests like enrolling and setting up an account, reporting miles and generating an accurate associated billing (post-contract).

Ongoing: Composite system of scheduled and unscheduled re-certification activities. Activity in this area may address re-testing when changes are made in account manager systems as well as testing related to emergent issues observed or identified through regular monitoring or audit activities.

[6] Parties interested in additional operational trial information can request it from ODOT directly.

Figure 5 – Summary of Oregon's Initial Certification Process



4. Special Considerations for Multi-Jurisdiction RUC Certification

A multi-jurisdiction certification process is beneficial when significantly common requirements and system design is used by each participating jurisdiction; significantly common requirements and system design are an underlying assumption in this discussion. If multiple states use a common certification process, a management structure will be necessary. The Certification System Administrator could be formed as the top-level entity overseeing the activities of the Certification Entity (see a conceptual representation of potential responsibility in Figure 6). Participating as a stakeholder in the Certification System Administrator and use of the Certification Entity could be open to various states with RUC systems. The Certification Entity would set the rules, requirements, and business model. The Certifications System Administrator would, at a minimum, have the three main entities/committees reporting, namely, Business Rules Committee, Operations Committee and Certification Entity.

For RUC Certification, the requirement of offering RUC services *in multiple jurisdictions* impacts many aspects of certification including:

- Requirements development;
- Requirements ownership;
- Certification program development, structure and management;
- Cross jurisdiction legal items; and,
- Resource requirements.

4.1. Benefits of a Certification System available to Multiple States

A common Certification System across multiple jurisdictions is beneficial to existing and prospective service providers and equipment suppliers because it increases the number of RUC participants, enabling greater opportunities for economies of scale, and it reduces the cost and volume of testing. Benefits accrue to the jurisdictions by enabling the pooling of resources for certification and reducing RUC system operations costs, paid either by the jurisdiction or by RUC payers of a participating RUC system. A common Certification System based on the RUC open system platform sets the stage for advanced interoperability opportunities like sharing data across multiple jurisdictions for the purpose of creating an integrated and interoperable road usage charging system. This level of interoperability could allow motorists to pay RUC in multiple states using one mileage reporting solution and one account and could require additional administrative and/or financial processes to be developed among participating states and/or between participating states and RUC account managers.

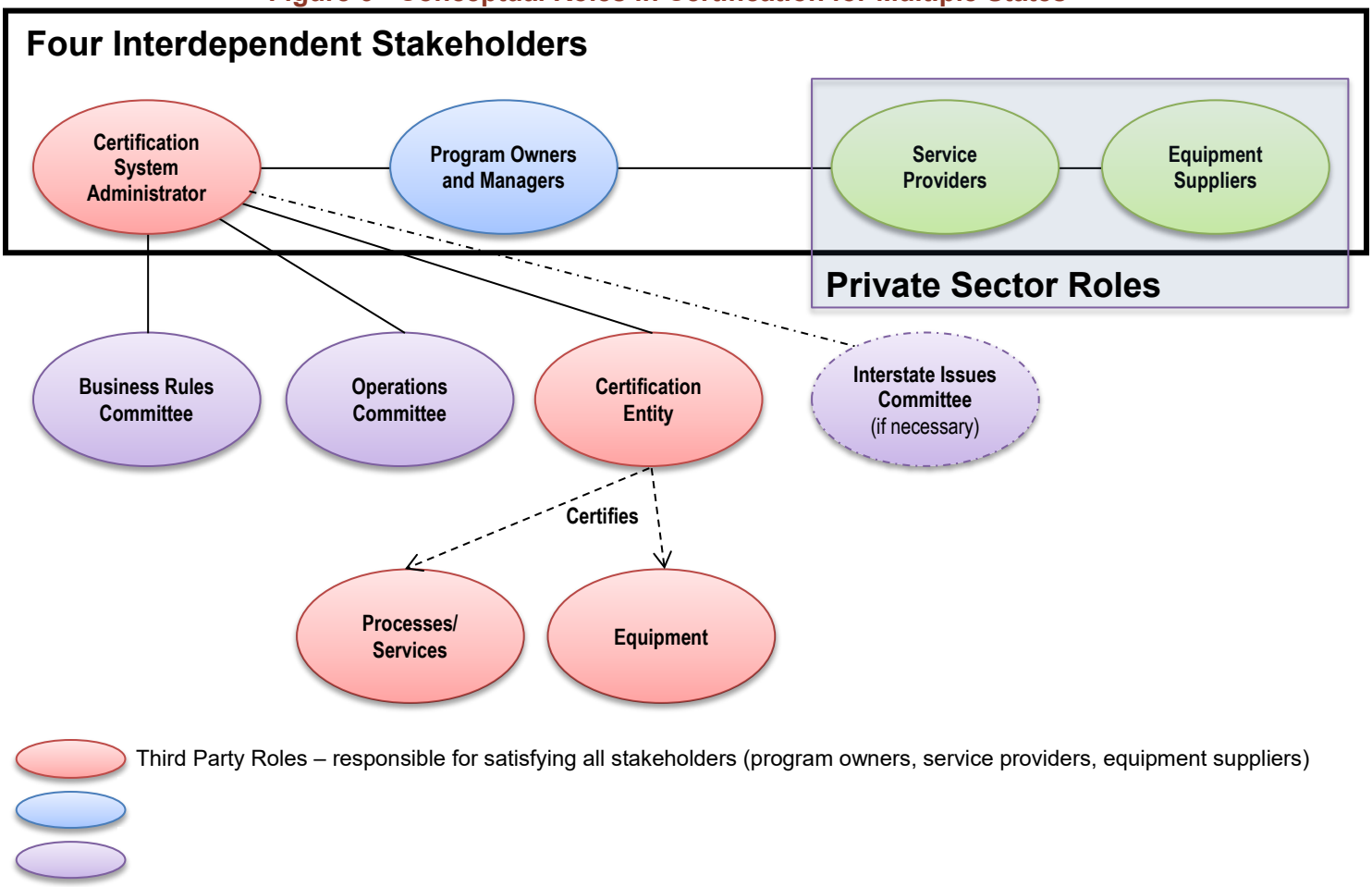
4.2. Conceptual Structure for Certification System available to Multiple States

Figure 6 shows a conceptual structure for a multiple state certification structure. The combining of multiple state interests and expectations into one system requires strong coordination and a way to find common ground amid these various interests, laws, rules and policies. An independent Certification System Administrator may be advisable to navigate between various state interests as well as industry perspectives. Subgroups of the CSA would necessarily include state representatives and likely also industry representatives.

Within this structure, the common requirements as well as testing and acceptance criteria could be developed or confirmed. Ultimately, testing would be managed and overseen by the CSA in conformity with expectations

resulting from the processes and groups they run with stakeholders to determine details. Some examples of requirements and activities to test and confirm performance are described in Appendix 3.

Figure 6 - Conceptual Roles in Certification for Multiple States



4.3. Requirements Development

In a multi-state RUC situation, requirements development is critical to each participating state. Development and maintenance of requirements would have to be conducted by a multi-state body, could be an activity of the Certification System Administrator or another structured entity, with each participating state represented. There will be the need to strike a balance between the volume of common standards and details with state-specific needs. To do this, an organizational structure would be necessary to discuss and decide upon requirements for the RUC market. This system will also need to support the coordination between common and individual requirements to ensure a seamless open system regardless of these unique features. This would include the involvement of communications, technical, business and financial partners to identify, coordinate and manage these requirements and could be managed through the Certification System Administrator or another structured forum.

The degree of common requirements would be arbitrated through the development process—it is easier for states and vendors if all requirements are the same. Potential building blocks for a common system may be

found in the charter for WRUCC which presents a shared vision for RUC systems including: open systems to foster competition, motorist choice in how charges are assessed and paid, compatibility with available and affordable consumer products and technologies and designed to collect taxes to fund roadway maintenance and improvements. Commonalities may also be found in existing best practices (e.g. technology security) and industry standards (e.g. financial management and processing standards, like PCI compliance). Important variables to discuss include expectations for system structure and implementation, e.g. which system functions are expected to be provided by the private sector or what level of interoperability, if any, between states is desired.

While it is reasonable to expect that many requirements can be common among the states, certain state-specific laws or policies will need to be addressed individually introducing some variation. For example, in Oregon there are specific rules set by state agencies other than the DOT for the handling, storage and processing of state funds (e.g. RUC remitted to the state by the vendor). It is likely other states have specific requirements in these and other areas that are not the same as Oregon's. It is also likely that these requirements are non-negotiable, e.g., part of state statutes.

It may be appropriate or necessary in each state implementing a road usage charge to document in statute specific state agency authority to provide or procure services for a particular approach to delivering services: by the government, through public private partnerships or both. Then the agency may, through rulemaking and operational documents, set standards for these services and determine and implement methods themselves or through public or private partners to validate meeting these standards.

4.4. Requirements Ownership

The distinguishing attribute of RUC Certification and Requirements Ownership in a multi-jurisdiction context is that if we assume the Certification System Administrator owns the requirements – and the Certification System Administrator itself is 'owned' by its stakeholders – those owners will increase in number as RUC programs expand regionally and nationally. In this ever complicated evolution, state stakeholders will need to spend time developing how requirement ownership works, how new requirements are approved, how changing requirements are updated and distributed, etc. To meet stewardship expectations of their citizens, each participating state will want to consider carefully the resources and expertise they choose to engage in these efforts. An example of the 'group' ownership model is the 43-member Board of Directors of HELP Inc. (Heavy-vehicle Electronic License Plate), a Commercial Vehicle Operations (CVO) inspection bypass service. The board grows as additional states adopt the service. In the case of HELP Inc., its board may be similar to the RUC Certification System Administrator's board in that it will have public sector representation.

4.5. RUC Certification Program Development and Management Structure

What may distinguish a RUC Certification Program's Management Structure in the context of multi-jurisdiction RUC services is not necessarily the composition of the management. Due to the opportunity afforded by a common system, i.e. potential administrative interoperability or reciprocity agreements, the management structure – depending on the level of interoperability desired – may feature a component, division or department whose task is to manage interstate issues. The International Registration Plan (IRP), Inc., is an example.

4.6. Cross-Jurisdiction Legal Items

One rationale for having RUC programs deployed widely – meaning across jurisdictional boundaries – is to improve the capacity and efficiency of RUC services. This includes RUC certification, because such a certification program can clearly – in a technical sense – be 'shared' and thus used by other states and jurisdictions that wish to offer their citizens RUC.

Cross-jurisdictional sharing of RUC certification is different from most commercial certification programs because it implicates numerous federal and state institutions, laws and regulations, including federal and state privacy laws, laboratory certifications, packaging and shipping requirements, as well as state laws regarding handling and remittance of money, fees and revenue. While federal laws generally do not present impossible barriers to sharing certification services, state laws vary greatly – sometimes even within the same region of the country. The authors are not aware of the potentially relevant federal and state legal issues related to cross-jurisdiction RUC certification programs, but it is important that the Certification System Administrator coordinate early with jurisdictions interested in sharing certification services, and ask them to consider all relevant laws, potential conflicts of law, as well as inconsistencies with interstate agreements already in place among program owners/administrators (DOTs, DMVs, DORs). Even if there are not barriers to sharing certification services, these types of conflicts may exist and should be considered in relation to simply having a common RUC system among multiple states.

4.7. Resource Requirements

While resource requirements are generally the same for a single or multi-state RUC certification system, how they are satisfied is different. In a multi-state RUC certification system, each state will likely want to have a handful of experts participating in system ownership and oversight by working with and participating in groups guiding the Certification System Administrator. Strong state ownership will be important for each state and can occur through this identification and commitment of expertise to work with the Certification System Administrator.

Costs for the Certification System Administrator, Certification Entity and Test Organizations/Labs as well as other certification costs would be shared in a multi-state context. Depending on the market's maturity and volume of RUC payers needing services, some or all of these certification costs could become the responsibility of vendors and not participating states.

In summary, resource requirements for a RUC certification system are basically the same: it is just that who pays them is different. Due to the lack of a viable market, Program Owners and Managers (states) may have to fund and subsidize the operations of the RUC Certification Program initially. As such, this is the key attribute that distinguishes RUC Certification from its commercial brethren.

5. Next Steps for Multi-State RUC Certification

This section provides an overview of next steps for development of the certification program in Oregon and highlights unique organizational and institutional context for RUC certification that is important to consider in any future work.

To advance towards a RUC certification system available to multiple jurisdictions, interested states will need to work together to identify and document:

- Requirements - A common RUC system or common components of RUC systems that will be the subject of a process for certification (a conceptual system structure is described in Appendix 2);
- Certification
  - Approaches to RUC Certification *testing*
  - Approaches to *structure* of a RUC Certification System
  - Approaches for RUC Certification System *governance*

5.1. Next Steps for Development in Oregon

The RUC Certification program conducted for Oregon's launch of their voluntary RUC program in July 2015 was an effective initial effort that has been and continues to be a learning opportunity. Based on the nature of the program and market, the certification effort employed initially has growth opportunities to better support core program objectives. Additionally, ODOT sees opportunities to improve the program and increase efficiency.

ODOT plans to update, refine and transform the existing certification program to better support the achievement of core program objectives. This will engage expertise from across the Agency, existing vendor market and, as there is interest, interested states.

This effort anticipates revising the existing certification process by separating requirements and certification into functional areas, e.g. mileage reporting, to improve access for specialized firms and thereby foster innovation and encourage competition. Additionally, ODOT will explore available third party certifications that may satisfy certain RUC requirements and, if available, identify and map these to existing requirements as acceptable proxies.

Cost and resource efficiency is an ongoing concern for ODOT. The potential for RUC certification to be conducted in part or in full by third parties will be considered on an ongoing basis as ODOT continues to develop and refine the certification process.

5.2. Unique Context

There are several unique issues to RUC that must be addressed in a future RUC Certification System. First, a RUC Certification System must be able to manage and verify compliance with various state-specific performance requirements and objectives of public entities (agencies). A key objective of RUC Certification is to help build and maintain acceptance by key stakeholders of what is being certified. In this context, RUC Certification should ensure that certification verifies adherence to state laws and requirements and compliance with RUC-specific business rules which represent stakeholder interests.

Second, a RUC Certification System must be supported by agencies it functions on behalf of. Agencies and participating states will need to dedicate resources to RUC Certification, and they will need to actively participate in and steward the work of the RUC Certification System. Because of this particular objective and the public agency context of RUC, RUC Certification differs from commercially oriented certification programs like the Wi-Fi Alliance – a certifier of wireless device interoperability. Given that RUC is a small and new program, RUC Certification would be undertaken by self-selected states on behalf of themselves and their citizens – not, as is often the case, on behalf of an industry group. Because state agencies are sponsoring RUC, 'institutional' acceptance of RUC Certification is partly embedded in the approach described here. It is nonetheless critical to ensure sufficient resources are committed RUC Certification, and that those who control the resources and work assignments understand the importance of certification and its relationship to public stewardship.

5.3. Identifying and Documenting Common Systems or Components

Much of the detail of certification is guided by the structure, design and requirements of what is being certified. Currently, there is insufficient information or consistency among states interested in RUC to immediately identify, define and document what might be addressed by a certification system available to multiple states. Multi-state work on RUC to date has primarily focused on the analysis and theoretical consideration of potential approaches to policy making and conceptual structures for road usage charging. Delving into the content of what might be covered by a certification system available to multiple states represents a new level of engagement.

Due to this different level of engagement, it will be important to layout the work at hand, level of effort and expectations for participation. A work plan and decision path could provide structure to the effort of identifying, defining and documenting a RUC system (common structure, requirements and certification) available to multiple states. This structure would define and document agreement among the interested states about the following:

- What decisions need to be made
- What information (individually and collectively) is needed
- What staff support/level of effort (individually and collectively) is needed
- How to document decisions for implementation use
- How to engage in, manage and govern this collective work
- What order and process to follow to conduct this work

With this plan, interested states can then begin the work together to identify, define and document the common aspects of RUC that will form the basis of a certification system available to multiple states. As noted under the unique attributes, it will be important for any common system to accommodate state-specific laws or requirements. Additionally, states participating in this effort should identify and commit sufficient resources to this work to ensure sustained participation and oversight. These resources would engage in requirements and certification development, consider this work in context of their own state's legal and regulatory context as well as RUC policy direction and watch for potential market effects if commercial entities are expected to provide RUC services in their state.

5.4. RUC Certification: Testing, Structure and Governance

Once the common requirements have been developed, details of a certification program available to multiple states can be developed. The three aspects of certification to be determined among the participating entities are:

- How to set-up and conduct testing. This can only be done once the RUC Certification System as a whole has been defined and establish.
- How to structure and manage certification operations
- How to govern the certification program.

There is no one recipe to address these factors. How one is defined will influence the other. There are several approaches to certification testing, program structure and governance that can result in different schemes interested states can choose to adopt. Each approach has implications. The remainder of this chapter provides a brief explanation of approaches to RUC certification testing, structure and governance. If and when efforts progress on developing common requirements and certification, these can be explored in greater detail specific to per-mile charging.

5.4.1. Testing

Certification approaches vary in design and in the bearing and impact the certification has on an industry. The question that most pointedly influences the design of a certification program is, “what are the implications of the product or service failing to work or interoperate?” The greater the consequence, the more robust the program should be. Another matter to resolve is where the responsibility falls in the event of a product or service failure. Some examples of these implication considerations are:

- Balancing robustness with risk—includes public stewardship or public funds stewardship considerations;
- Balancing robustness with market acceptance; and,
- Balancing robustness with cost considerations regardless of who bears that cost, owners or vendors.

Certification programs vary in another important way in how they are structured. Structural considerations include the following:

- In-house or out-sourced or a combination—in house could mean internal to the Certification System Administrator/Certification Entity or even Agency-conducted;
- Certifying by system component or by complete system or both—balance of good access for entry (and thereby competition) with considerations of overall certification effort, i.e., weight of the effort aggregated versus segmented;

As these examples show, Certification programs can vary in terms of test approach and overall program structure.

A Certification Entity will typically employ a combination of methods in their approval process and what they choose will depend on the needs of Program Owners, suppliers and even the end-user. The chosen methods

greatly affect the cost of the program, but also the level of confidence in it. And cost can either advance or hamper certification and ultimately, deployment.

Testing methods should build in collaboration with vendors to improve confidence in results. Vendors may have insight into testing certain attributes or functionalities which can be identified and benefited from through this collaboration. If the Certification Entity establishes testing methods that are not appropriate or sufficient, this will delay the certification process and require additional resources to ensure a workable solution.

5.4.2. Structure

Certification programs all have some common elements. Certification guides typically define what the requirements are, how certification is structured and what the certification process is. Information will often be provided with important context about the industry, the certification entity as well as how the testing was developed and is conducted.

The most relevant differentiator of how industries structure their certification program is not elements of the program itself, but the structure of the program, i.e., where the elements of the program are developed and held. Essentially, there are three baseline options as briefly described below:

- **One stop shop**—One entity acts as Certification System Administrator, Certification Entity and Test Labs/Organizations to develop, maintain and operate the Certification Program.
- **Disaggregated**—Separate entities act as Certification System Administrator, Certification Entity and Test Labs/Organizations to develop, maintain and operate the Certification Program.
- **Hybrid**—Some combination of separate and combined entities acts as Certification System Administrator, Certification Entity and Test Labs/Organizations to develop, maintain and operate the Certification Program.

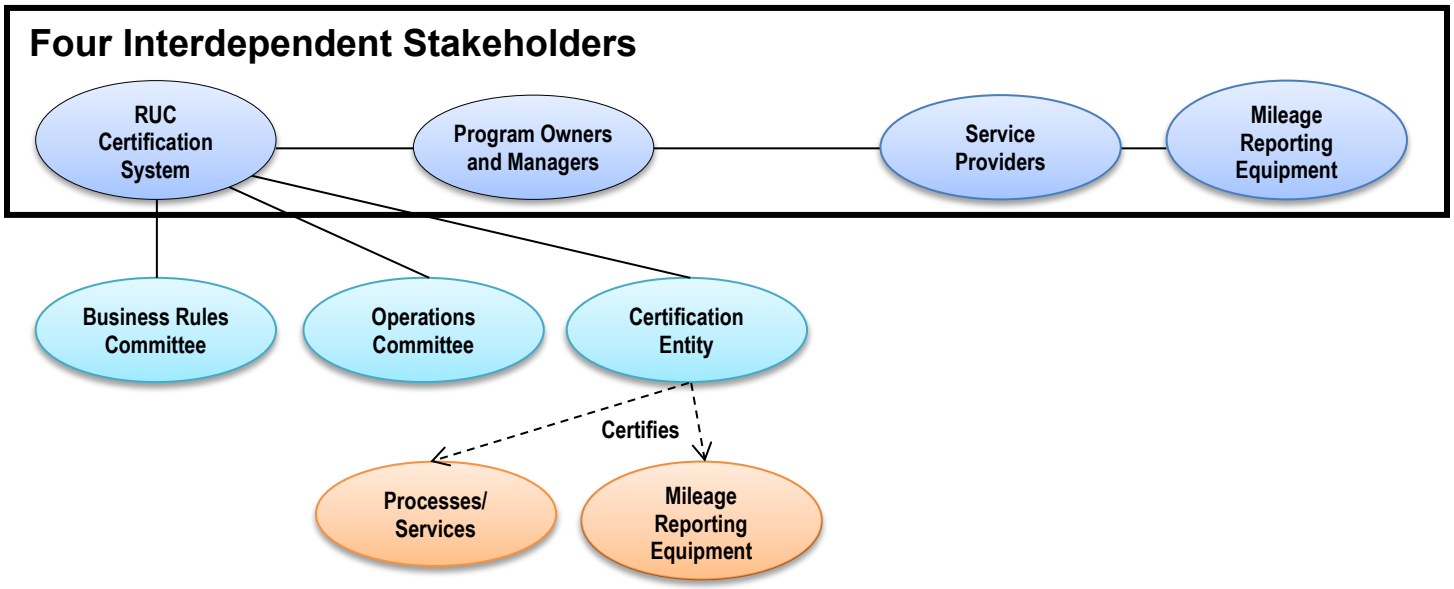
These choices will be influenced by the unique nature of RUC in its current developmental state as well as its possible final state. These unique characteristics include issues to be addressed collectively and individually by states interested in a common certification system. These include but are not limited to determining what the common RUC system is, whether or not both open and partially open markets need to be accommodated and what the goals are for interoperability: open system design only (i.e. mileage reporting solutions choices can be separated from account manager choices) or fuller administrative and service interoperability (i.e. seamless tax remittance for payers to multiple jurisdictions through one account).

5.4.3. Governance

Unique to certification programs for public programs like RUC is the expectation and need for participating states to ensure that their requirements and commitments are satisfied by certification. These include citizen expectations, state needs and legal requirements, both state and federal.

The following figure depicts a potential baseline RUC Certification System.

Figure 7: Potential RUC Certification System



State governance of the system relates to who serves as the Certification System Administrator and how they are engaged in this work – procured and paid for. Ultimately, the CSA must operate somewhat independently of the states because they have an important function to be the convening point for all participating states and all interested vendors and to find a satisfactory path through competing interests among these parties. The CSA is essentially the steering committee for a certification system.

State governance of the system also comes through state participation as a stakeholder in CSA committees like the business rules committee and the operations committee.

- Business Rules Committee would likely be responsible for establishing and refining common RUC program requirements. Deals with external interfaces with the program owners (states) and vendors (service providers and mileage reporting solution suppliers). Likely the primary coordination point for a seamless system despite the reliance on both common and individual requirements.
- Operations Committee deals with internal aspects including day-to-day operations of the Certification Entity; and specific aspects such as membership, policies, bylaws and management procedures.

Additional committees specific to this endeavor as a certification for a public program may be identified if work progresses.

5.5. Conclusion

The work to develop a RUC certification system available to multiple states will be complex and challenging but offers benefits and opportunities that would be unavailable to states working on their own. Beyond this, consistency among RUC systems seems appropriate given the interstate nature of the transportation system. For interested parties, the critical next steps are to agree on a work plan, develop a common system, develop certification to verify this common system and develop a governance and working structure for operating and maintaining these common systems over time.

Appendix 1: Overview of WRUCC

The Western Road Usage Charge Consortium (WRUCC) was founded in 2013 – the inaugural Meeting of the Steering Committee took place on November 13, 2013 in Portland Oregon. The Consortium is a voluntary coalition of state Departments of Transportation and provincial Ministries of Transport that are committed to collaborative research and development of a potential new transportation funding method that would collect a road usage charge (RUC) from drivers based on actual road usage. There are currently 14 member states of the WRUCC:

- Arizona
- California
- Colorado
- Hawaii
- Idaho
- Montana
- Nevada
- New Mexico
- North Dakota
- Oregon
- Oklahoma
- Texas
- Utah
- Washington

The Consortium's vision is to develop Road Usage Charge systems that:

- Are open systems to foster competition in the market for providing RUC services;
- Allow for motorist choice in how a road usage charge would be assessed and paid;
- Are compatible with readily-available and affordable consumer products and technologies (such as smartphones, in-vehicle navigation systems, and other data-dependent vehicle technologies); and,
- Are designed to achieve the primary purpose of collecting taxes to fund roadway maintenance and improvements.

Members are free to determine how they wish to implement road usage charging systems – they are not required to adopt the system(s) used by other Members.

The WRUCC was created by adoption of an organizational Charter that further details the Vision; Goals; Guiding Principles; Organizational Structure (including membership and minimum funding requirements); Governance; and Administrative Duties (see WRUCC 2013 for more details).

In addition to the vision noted above, the Consortium Members share the following goals:

- Explore the technical and operational feasibility of a multi-jurisdictional road usage charge system.
- Investigate public and key decision maker criteria for acceptance and share experience and lessons learned to foster positive outcomes.
- Develop standards and protocols for how road use charges could best be collected and remitted among the various jurisdictions.
- Develop preliminary operational concepts for how a multi-jurisdictional road usage charge system would be administered.
- Develop a model for regional cooperation and interoperability that can be used in the Western region and potentially across North America.
- Engage the automotive manufacturing and technology sector to encourage the ability for mileage reporting to occur in conjunction with other products and services the sector provides in the marketplace.
- Share knowledge to maximize the preparedness for and efficiency of policy and program development for road usage charging among the members.

Appendix 2: Key Elements of Conceptual Open System for Multi-State RUC Program

Key elements of certification in the context of an open system model for a multi-state RUC program are shown in the following figure.

Figure 8: Conceptual Open System Model for a Multi-State RUC Program

Deciding whether the road charge system will be open or closed may sound like a technical detail, but it is a fundamental policy choice with far reaching impacts on system cost, adaptability, customer friendliness, state agency procurement flexibility, and resources devoted to developing standardized interfaces (see Appendix 3 for definitions of open and closed systems). Key aspects of open and closed systems are as follows:

- Open systems require common standards. Examples include Unix computer operating system, and mobile telephone networks (i.e., roaming).
- Open systems tend to be more customer-friendly, lower cost, and adaptable to latest technologies.
- Open systems require the state agency to develop common standards and interfaces between the interchangeable pieces of the system, whereas closed systems require the agency to specify the entire system.
- Closed systems are based on proprietary standards, e.g. road tolling systems in the U.S.

Appendix 3: Examples of Requirements and Testing

A certification program provides assurance that requirements are met. Requirements are a comprehensive, exhaustive definition of who, what, where, when and how for a system or functionality. Expert, leadership and business perspectives are needed to develop requirements, identify appropriate evaluation methods and set acceptance criteria. The following chart provides two examples of translating a policy expectation into a requirement that can be tested, approved and assured over time.

Expectation (basis for requirement)	Define Requirement	Criteria	Evaluation Options*	Approve	Certify	Monitor Options*
Mileage reporting with location information (location-based mileage reporting) charges only taxable miles (dependent on location)	Location feature shall determine which zone vehicle is in at least 99% of the time within a half-mile of tax zone borders.	Commercially available map standard (1:24,000 scale – about 40 ft. horizontal accuracy) *Exceeds ½ mile tolerance*	• Check metadata of application used • Drive test(s) across one or more borders • Extended drive test (simulated operational performance)	• Document test, review and conformity with applicable standard and evaluation options • Obtain review and approval on finding as required	• Granted upon successful completion and approval of all certification steps for an entire system or functionality.	• Vendor system changes reported and may require retesting • Analyze performance reporting by vendors • Auditing • Regular recertification requirements • Ad hoc issue identification
Customer service must know, understand and accurately convey program information	Customer service materials (internal and external) shall be accurate and clear Customer service representatives shall be accurate and clear	Staff and public facing materials contain specific program information that is accurate, complete and aligns with approved info.	• Review staff handbooks and public facing material against required and approved program information • Systematic tests of customer service • Operational tests of customer service			

*The appropriate option(s) can be determined in consideration of the cost to evaluate or monitor, importance of the requirement, level of assurance desired regarding performance certainty and other factors. Importance of requirement and level of assurance may be informed by state law, rule, policy or public expectations based on comparable state service levels.

Appendix 4: Definitions & Abbreviations

Term/ Abbreviation	Definition/Description	Remarks
Accreditation	Accreditation is the formal recognition by an independent body, generally known as an accreditation body, that a Certification Entity is capable of carrying out the specific certification program it employs to test and certify something. Accreditation need not be obligatory but it adds another level of confidence, as 'accredited' means the Certification Entity has been independently checked to make sure it operates according to international standards and specific requirements as established by the stakeholders in that specific Certification Program.	Refer to ISO generic definition: http://www.iso.org/iso/home/standards/certification.htm
Accreditation process	A third-party evaluation by an accreditor that verifies that the Test Lab/Organization has the means and expertise to test devices and services to ensure they meet requirements as established by a Certification System's stakeholders.	
AICP	American Institute of Certified Planners	
Account Manager	Account Manager is an entity that manages customer accounts in Oregon's RUC program. Account managers capture mileage data, calculate net RUC owed, send invoices to customers, receive payments from customers, and remit funds, and report road usage charge data to the state.	A conceptual RUC open system model for multiple states would allow independent account managers to provide RUC services to motorists (customers) across multiple jurisdictions.
Assurance	Promise or pledge; guarantee.	
Audit	Systematic, independent, and documented process for obtaining evidence and evaluating it objectively to determine the extent to which defined, documented criteria (audit criteria, which are external standards or agreed-upon benchmarks) are fulfilled. Fulfillment can either be binary pass/fail or by degree. • Internal audit: Audit conducted by or on behalf of the organization being audited. • Third-party audit: Audit conducted by or on behalf of an outside party for purposes of certification/registration of conformity	
Authentication	Provision of assurance that a claimed characteristic of an entity is correct.	
Certification	Provision of written assurance (a certificate) that the product, service, or system in question conforms to specific requirements. Provision of such written assurance follows determination that the product, service, or system in question is in compliance with a specified set of requirements, criteria, and standards. All certification methods and processes as well as requirements, criteria, and standards must be known, transparent, and documented prior to the start of certification. Perfect conformity with all requirements, criteria, and standards is not necessarily needed for certification, but all deviations from the requirements, criteria and standards should be documented and a reason recorded explaining why the deviation is sufficiently minor that certification is still possible. • Self-certification: Certification based on the assurance of the	ISO definition can be found at http://www.iso.org/iso/home/standards/certification.htm

Term/ Abbreviation	Definition/Description	Remarks
	organization being certified. • Third-party certification: Certification based on the assurance of an independent third party.	
Certification Entity	Certification Entity–also called Certification Body–offers certification and is typically a business organization. Also referred to as: • An independent body that provides certificates of conformity to standards as the result of a certification process, or • A neutral and authoritative entity for certifying service providers and testing products or services. Sometimes the Certification Entity is directly related to the certification, like a software firm that certifies individuals as competent to use its products (Microsoft), or a trade association that certifies its members to provide a compliant product that they promote (Wi-Fi Alliance). In other cases, the organization exists wholly, or in large part, to offer a particular certification and has no commercial interests or ties to the developers, integrators or consumers of the product.	The Certification Entity's stakeholders or members typically play key roles in developing and maintaining the Certification Program.
Certification Mark	Products and services are advertised as certified by appending to the product or service packaging a certification mark & number. The Certification Mark is a type of trademark whereby the recipient uses it to indicate certain features and attributes about the product or services. Example: Vendors can become ISO 9000 compliant for the supply and operation of tolling systems. ISO provides the vendor a "Certification Mark" that is then used on the vendor's letterhead and referenced for business activities such as responding to toll system supply and operations contracts.	Individuals advertise their credentialed status by appending a certification abbreviation to their name (i.e. "John Smith, CE").
Certification Program	The Certification Program is the set of procedures, methods and tests to be followed and successfully 'passed' in order grant a certification.	
Certification System	The Certification System is the over-arching organizational structure that includes the higher-level and interdependent stakeholders as follows: Certification System Administrator, Program Owners, Equipment Suppliers, and Service Providers.	
Certification System Administrator	Certification System Administrator (CSA) is the entity that manages and/or oversees an industry's certification system.	Note: The CSA may host administrative functions and certain key groups such as a Business Rules Committee, or Operations Committee.
Compliance	The state or process of conforming to documented requirements.	
Closed system	An internally integrated system controlled by a single entity with essential components that cannot be substituted by other external components, which could perform the same functions.	
Credentialing	Generic, umbrella term applied more to people, and includes the notions of accreditation, licensure, qualification, registration and professional certification.	Nearly every profession uses credentialing to establish criteria for quality, competence and verification of the person's expertise in various practices, technologies or skills. Here, certification leaves one credentialed,

Term/ Abbreviation	Definition/Description	Remarks
		and indicates to the world that the individual has the specific knowledge and abilities in the view of the certifying body.
CSA	Certification System Administrator. This is the actual entity that runs the Certification System.	
CTIA	Cellular Telecommunications & Internet Association	
CVO	Commercial Vehicle Operations	
DMV	Driver & Motor Vehicle services	Common abbreviation for such entities in State DOTs.
DOL	Department of Licensing	Abbreviation for Washington State's equivalent of a DMV.
DOR	Department of Revenue	
DOT	Department of Transportation	
Equipment Supplier	Equipment or technology supplier is a company that provides a technology product to customers.	
EV	Electric Vehicles	While EV and PHEV have some important distinctions, these two classes of vehicles are often bundled together, particularly within the latest road charge legislation.
HELP	Heavy-vehicle Electronic License Plate	
IEEE	Institute of Electrical & Electronics Engineers	
Interoperability	The ability of different information technology systems and software applications to communicate, exchange data, and use that exchanged information. The basic level of interoperability for RUC is the open system design which is structured to allow any mileage reporting solution to serve any account management system. This sets the stage for competition, innovation and keeping pace with evolution of technology in mileage reporting. A RUC open system platform common to multiple states (i.e. a common set of requirements) sets the stage for advanced interoperability opportunities like sharing data, across multiple jurisdictions for the purpose of creating an integrated and interoperable road usage charging system. Characteristics of interoperability with other states may include: • Motorists could pay RUC in participating RUC states through one mileage reporting solution and one account. • Motorists receive and pay a single bill for travel in all states. • States could develop agreements to remit any funds collected in one state to the state where the mileage was driven. • Motorists from other states would be able to measure and report mileage driven out of their home state without the use of additional devices or short-term permits.	

Term/ Abbreviation	Definition/Description	Remarks
IRP	International Registration Plan Inc. manages cross-border tax remittances for Commercial Vehicle Operators who operate in multiple jurisdictions in the US, Canada and Mexico.	
ISO	International Organization for Standardization	http://www.iso.org
Mileage message	Between the subsystems to collect mileage and process the mileage charge, is a "mileage message" that is independent of communication channel, and specific hardware or software. Key attributes include: • The mileage message is a standardized message written a specific software protocol that specifies mileage traveled by a given vehicle. • Finally, the mileage message records information about whether the mileage reporting solution is working correctly.	
Mileage reporting functionality or solution	A device and/or software (i.e., telematics) in the vehicle capable of measuring vehicle mileage traveled and collecting other related data from the vehicle, processing and storing the information, and communicating the usage to the account manager. A mileage reporting solution may be factory installed or installed after market. Mileage reporting functionality may or may not have location-based technology.	Previous ODOT documentation uses the term Mileage Reporting Device (MRD). This is being moved away from to more clearly embrace the potential for reporting to be based on embedded technology (often factory installed) instead of after-market devices.
MPG or MPGe	Miles per gallon or miles per gallon equivalent	MPGe is used in lieu of MPG for vehicles that derive some or all motive power from a fuel source other than gasoline or diesel, such as electricity.
NACHA	National Automated Clearing House Association	
Non-compliance	Defined to mean failure to meet certification testing criteria, standards and market and business rules requirements.	
OCS	OmniAir Certification Services	
Open System	An integrated system based on common standards and an operating system accessible to the marketplace whereby components performing the same function can be readily substituted or provided by multiple providers.	
PCI-DSS	Payment Card Industry Data Security Standard provides an actionable framework for developing a robust payment card data security process, including prevention, detection and appropriate reaction to security incidents. PCI security for merchants and payment card processors is the vital result of applying the information security best practices in the Payment Card Industry Data Security Standard (PCI DSS). The standard includes 12 requirements for any business that stores, processes or transmits payment cardholder data. These requirements specify the framework for a secure payments environment; for purposes of PCI compliance, their essence is three steps: Assess, Remediate and Report.	For more information on PCI-DSS please refer to the website: www.pcisecuritystandards.org/security_standards/
Open system	An integrated system based on common standards and an operating system accessible to the marketplace whereby components performing the same function can be readily substituted or provided by multiple providers.	

Term/ Abbreviation	Definition/Description	Remarks
Qualification	Qualification has two relevant meanings: • The demonstration of the ability of a person, product, process, system, or entity to fulfill specified, documented requirements. Qualification may be a predecessor to certification, and be based on a looser set of criteria or standards that is more rapidly and economically checked than all system criteria or requirements. In such a case, the qualification process may be used to reduce the number of applicants for certification that must experience the full system verification. • A method of verification that involves examination of documentation that certain criteria or requirements have been verified in a separate process and thus do not need to be verified again.	
Regression Testing	This is the testing of just a part of the equipment or process submitted to the Certification Entity.	
RUC	Road Usage Charging is the name of the multi-state program to collect a tax on the miles traveled by a vehicle.	Also referred to as Road Charging.
RUC Certification	RUC Certification is the validation of service providers and equipment suppliers meeting RUC specific common standards and interfaces. RUC Certification covers a wide range of standards and processes to establish and maintain integrity, commitment and transparency in order to ensure the viability and success of this partnership.	
RUCP	Road Usage Charging Program	ODOT's RUC program also known as OReGO.
SAE	Society of Automotive Engineers	
SDO	Standards Development Organization	
Self-certify	An activity where compliance with a specified set of requirements is validated using internal (in this case vendor conducted) test procedures.	
Service Provider	Service Provider is any company that provides a service to customers, from a financial service to a cleaning service.	Potential functions of a RUC service provider may include: mileage reporting and data collection; transaction processing; account management; billing; payment processing; and, customer service.
SLA	Service Level Agreement	
Test	A method of verification that involves determination of one or more characteristics according to a procedure, measurement or criteria. Generally involves quantitative observation.	
Test Lab	A Test Lab is the physical facility that does testing for certification of products.	
Test Organization	A Test Organization is the entity that conducts and completes the testing. For equipment, in particular, it is also referred to as a Test Lab.	
Testing	Testing in a physical laboratory occurs typically for products only – and	RUC devices, for example a dongle

Term/ Abbreviation	Definition/Description	Remarks
	only when the equipment can be satisfactorily tested to meet requirements *inside a specific facility*.	that plugs into a car's OBD-II port, could be tested in a physical test lab to determine whether it functions satisfactorily (however the term is defined by the program).
Traceability	Ability to trace the history, application, or location of that which is under consideration over a specific time frame.	
Validation	Confirmation, through the provision of objective evidence, that the specified, documented requirements for a specific intended use or application have been fulfilled under conditions either real or simulated. • Note: the term "validated" should not be used to designate the corresponding status of a single requirement or criterion, as validation can only be applied to a system, service, or product, as a whole. • Validation is more specific than "verification," because validation focuses on confirmation of an intended use or application of the entire system or service, while verification is just checking of one or more requirements or design specifications without regard to use or application.	Validation contributes to an award of certification and does not comprise certification.
Vendor	Private company that offers something for sale. In RUC, a vendor refers to a company that provides mileage reporting functionality/solution, or account management services.	
Verification	Confirmation, through the provision of objective evidence, that specified, documented requirements have been fulfilled via, e.g., alternative calculations, comparing design specifications with similar proven specifications, undertaking tests and demonstrations, and reviewing documents. Note: the term "verified" may be used to designate the status of a single requirement or criterion.	Verification, like validation, contributes to an award of certification and does not comprise certification.
WRUCC	Western Road Usage Charge Consortium	
WFA	WiFi Alliance	

Appendix 5: Frequently Asked Questions

Q01: What is RUC?

A: Road Usage Charging is a transportation funding concept that would collect a road usage charge from drivers based on actual road usage, i.e. a per-mile charge. In the United States, this concept is also referred to as road charging, mileage based user fee and other names.

Q02: What is Certification?

A: Certification is the provision of written assurance (a certificate) that the product, service, or system in question conforms to specific requirements. Provision of such written assurance follows determination that the product, service, or system in question is in compliance with a specified set of requirements, criteria and standards.

Q03: What is RUC Certification?

A: RUC Certification is the validation of service providers and equipment suppliers meeting RUC specific common standards and interfaces. RUC Certification covers a wide range of standards and processes to establish and maintain integrity, accountability and transparency. A key difference between certification in general and RUC certification concerns the need for strict adherence to requirements related to the exchange of funds.

Q04: What is RUC interoperability?

A: At minimum, RUC interoperability is the open system design which is structured to allow any mileage reporting solution to serve any account management system. This sets the stage for competition, innovation and keeping pace with evolution of technology in mileage reporting. This interoperability allows for the choice aspects of RUC which are essential for public acceptance.

RUC interoperability beyond this minimum is an area for future development. A RUC open system platform common to multiple states (i.e. a common set of requirements) sets the stage for advanced interoperability opportunities like sharing data across multiple jurisdictions for the purpose of creating an integrated and interoperable road usage charging system. This level of interoperability could allow motorists to pay RUC in multiple states using one mileage reporting solution and one account. This could be achieved through the use of a clearinghouse or other intermediary, through administrative and/or financial processes among participating states, or through administrative and/or financial processes between participating states and RUC account managers.

Q05: Why are certification and interoperability important in RUC?

A: Certification and interoperability in the RUC market will help attract and maintain commercial partners in the provision of low-cost, user-friendly RUC services.

Q06: How can working together on Certification reduce the cost of running RUC systems?

A: Working together assumes a common approach to RUC Certification, which will enable participating states to avoid recreating the wheel each time for their certification process. Also, having open systems with multiple certified vendors will reduce the need for in-house staff and reduce governmental operations costs.

Q07: Who are the primary stakeholders in a RUC Certification Program?

A: Stakeholders of a RUC Certification Program would include program owners (i.e. responsible state agencies); program authorizers (e.g. state legislatures); vendors – service providers and equipment suppliers; and, program users (i.e. citizens of participating states).

Q08: Where do vendors fit in?

A: They are the face of RUC to drivers subject to the road usage charge. Vendors supply equipment and services in compliance with the Certification requirements established by Program Owners.

Q09: How does certification affect and improve the RUC marketplace and support innovation?

A: Certification levels the playing field for equipment suppliers and service providers, takes the guesswork out of contracting with vendors and facilitates competition andinnovation. Requiring certified equipment and service providers reduces barriers to entry because vendors will have to adhere to only one set of requirements and not have to deploy solutions that meet particular requirements from each jurisdiction. As such, they can distinguish and differentiate their commercial service offerings.

Q10: How could RUC certification work across states, especially related to procurements, state statutes and rules?

A: If RUC Certification is developed, supported and deployed by WRUCC, a range of components could be standardized across states. This could include a standardized procurement approach across states except the requirement for each to address statutes and rules that are particular to their state, e.g. financial accounting tent be very state-specific.

Appendix 6: References

EPC Global. (2004). “Hardware Certification: An Overview.”

EasyGo. (2012). “Concept for EETS Suitability for use tests within EasyGo.” February 2012.

International Organization for Standardization and International Electrotechnical Commission (ISO/IEC). *Guide 2*. 1996.

OmniAir Consortium. (2011). Task 1 – Mapping of the Connected Vehicle Landscape: Certification Program for Connected Vehicle.” June 2011.

OmniAir Consortium. (2011). “Overview of the Connected Vehicle Certification System, Task 2.” August 2011.

OmniAir Consortium. (2012). “Connected Vehicle Certification Program, Task 4 – Gap Analysis.” March 2012.

OmniAir Certification Services (2012). “ITS Texas Annual Meeting – Technology Certification & Interoperability (presentation).” October 2012.

Oregon DOT and D’Artagnan Consulting. (2011). “Strategic Program Plan (Final).” ODOT Flexible Services Agreement 29142 / WOC1: Task 3. November 2011.

Oregon DOT and D’Artagnan Consulting. (2012). “Technical Memorandum on Certification Entity, its role, and its responsibilities.” ODOT Flexible Services Agreement 29142 / WOC12: Task 12.2.3. July 2012.

Osinski. T. (2009). “How to Realize the Full Potential of EPCIS.” RFID Journal, http://www.rfidjournal.com/article/view/4627.

Proctor, A. and Catmur, R. (2007). “Certification Processes and Testing of a A-GPS Equipped Cellular Phones.” Inside GNSS (www.insidegnss.com), November/December 2007.

Richardson, J.R. (2008). “A Safety Application Certification Framework.” Abstract Paper submission to ITS American Annual Meeting. June 2009.

Swiss Government, Department LSVA. (2012). “EETS, Quality Monitoring and Assurance – EETS Specification Work Package D – A.10.1 & A.10.5.” January 2012.

TÜV Rheinland InterTraffic GmbH, *et al*. (2007). “Study on the Implementation of a European Network of Certification Centres (ENCC) for the purpose of the Single European Service of Electronic Fee Collection.” Final Report, Release 2007-10-16 (Reference: TREN/06/MD/S07.64747 ENCC) to the European Commission Directorate-General Energy and Transport, October 2007.

Wi-Fi Alliance. (2015). “Becoming a Member.” www.wi-fi-org/become-a-member.

Western Road Usage Charge Consortium. (2013). “Western Road Usage Charging Consortium – Organizational Charter.” File for the Charter is “March 25 2013 Western RUC Consortium Charter.pdf.”

Appendix 7: Key Issues by Participating State

Question	California (Brady Tacdol)	Colorado (Debra Perkins-Smith)	Nevada (Peter Aiyuk)	Oregon (Jim Whitty)	Utah (Cameron Kergaye)	Washington State (Tonia Buell)
Why is your state participating in this project?	• Pilot in CA will be based on open systems. • As part of the pilot, CA would like to test interoperability with other states.	• Do not want to re-invent the wheel. • Want to avoid interoperability issues, like experiences w/tolling. • Need for internal buy-in to show that Colorado is doing something about certification which lends legitimacy to the process and to RUC.	• This is a worthwhile activity that Nevada is keen to participate in. • Interested to learn about and avoid pitfalls.	• National highway system has no boundaries, which means RUC must be interoperable across jurisdictions. • Certification process needs to be consistent for commercial account managers so that RUC work across multiple states.	• To explore issues regarding interoperability and efficiency of RUC.	• Learn and be prepared for future WA and national RUC. • New gas tax in WA; no resources for RUC pilot at this time in WA.
What do you/your state hope to learn by participating?	• How to reduce procurement time. • How much can CA save using third party vendors. • How to make RUC simple for all stakeholders.	• How to do certification. • How working together reduces overhead costs. • *How to secure data in a world of evolving technologies.**	• Want to increase understanding especially related to costs, technologies involved and interoperability considerations	• Perspectives of other states	• How to be efficient and cost-effective regarding certification. • What it takes to conduct certification • What to anticipate in establishing or conducting certification	• Roles, capacity and best use of vendors • *Who is best for a vendor to work with at the State level, e.g., DOL, Department of Revenue, DOT.*
What concerns do you/your state have that you would like to see addressed?	• Understand how to reduce administrative costs. • Privacy and data security are key issues. • How certification fits into a marketplace structure that supports innovation.	• *Security requirements for data and how to prevent breaches.** • How this is administered eventually. In CO, RUC may be implemented by the CO Department of Revenue. • Reducing administrative overhead.	• How and when to get our IT staff involved in the process? • *Costs to conduct certification, e.g. average costs** • How to implement at state-specific level and with other states.	• How certification allows for evolution of technologies and business solutions for RUC	• How this might work across states, esp. related to procurements and state statutes and rules • List of roles that can be consolidated for efficiency in the certification process.	• Understand what OR did and did not include in their certification process and avoid pitfalls. • Since there is no uniform WRUCC program, we need to ensure that we know what we are certifying.

**These items (in italics) may not be fully addressed in Phase 1 due to the nature of Phase 1 work and its multi-state focus; topics will be addressed as appropriate in the context of this work and retained as critical issues in future certification and/or requirements work.*