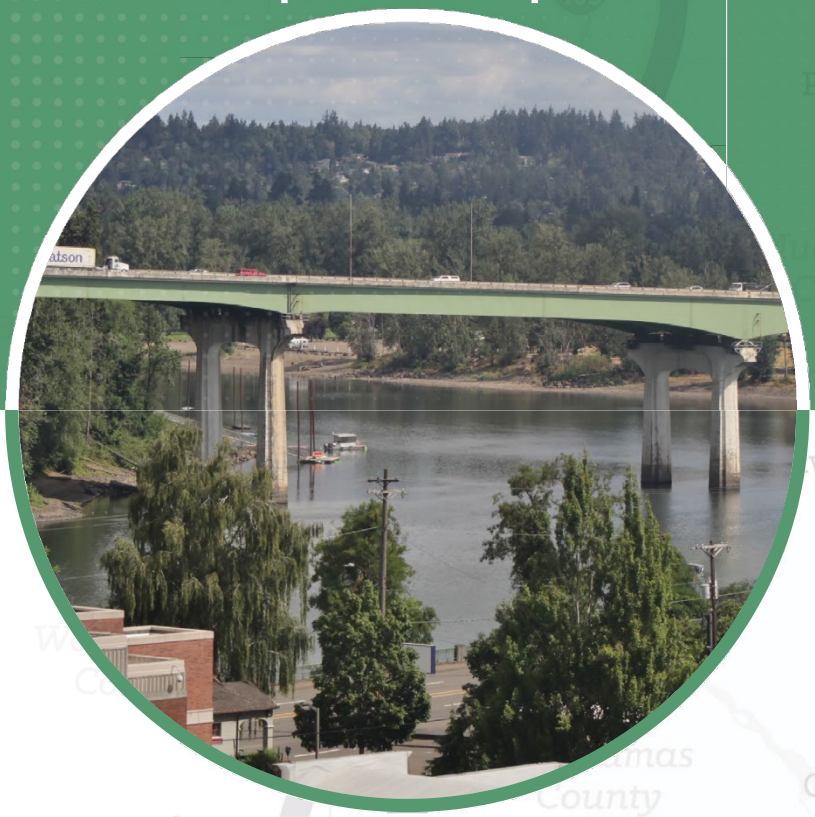
FINAL REPORT

Oregon Toll Program Concept of Operations



Oregon Department of Transportation

Concept of Operations

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List Of Revisions

Revision Date	Reason for the Change and Short Summary of the Revisions Made	Version Number
6/03/2020	Interim draft submission	1.0
7/02/2020	Revised draft submission after initial ODOT review	1.1
8/03/2020	Final client review comments incorporated	1.2
8/24/2020	Final internal review for consistency with OTC Presentation and Business Rules	1.3
10/08/2020	After the document was submitted to address the I-205 Toll Project, this revision is prepared to encompass the entire I-5/I-205 Portland Metro region.	1.4
5/22/2022	CDM Smith team modification	2.0
6/2/2022	ODOT Toll Program Director review with comments	2.1
6/27/2022	CDM Smith team update re: ODOT comments	2.2
8/12/2022	ODOT updated	2.3
10/4/2022	CDM Smith Team Update	2.4
10/10/2022	ODOT Review	2.5
11/7/2022	CDM Smith Team Update based on ODOT feedback	2.6
11/14/2022	Final technical editor review	3.0

1.1 TERMS USED IN THIS DOCUMENT

Term	Definition
Account	The record of toll transactions by a specific vehicle or group of vehicles. Accounts are pre-established with owner identification and means of account payment. Most toll accounts are prepaid accounts, typically associated with a pre-authorized credit or debit card or an associated connected bank account checking or savings. Most toll accounts have a transponder mounted on the vehicle to associate it with the account. In addition, "Pay-by-Plate" account options will be available for drivers not using transponders. Accounts that are not valid are those created by vehicles without any prior arrangement for payment. These invalid toll account holders are invoiced; if the invoice is not paid, additional fees and penalties and other escalation remedies such as vehicle registration holds and collection actions may apply.
All Electronic Tolls	The system of toll zones and systems that only collect tolls by detection of electronic toll collection (ETC) toll transponders or vehicle license plate images. All Electronic Toll systems do not accept cash payments in the lane, so there are no tollbooths.
Automated Clearing House (ACH)	A network to coordinate electronic payments and money transfers without paper checks or cash, and outside the credit card network, thus avoiding credit card clearinghouse fees.
Automatic License Plate Recognition (ALPR)	The automated reading of license plates to determine jurisdiction and license plate number, based on character recognition and plate image recognition.
Auto-Replenishment	The pre-authorization of a credit card or other source of funds to replenish a prepaid toll account, which is used when the toll account balance drops below a defined minimum balance threshold.
Back-Office	The business part or "back half" of the Oregon Toll System. It includes the Back-Office System (BOS), which incorporates customer relationship management (CRM) software with other applications, data repositories, and IT infrastructure, as well as interfaces with other toll agencies, service providers, financial entities, and other governmental entities. The Back-Office also includes the operating Customer Service Center and other portals through which toll customer services and account management support is provided. The Back-Office is sometimes referred to as the "Commercial Back-Office" (CBOS), to distinguish it from the Operational Back Office (OBO), which is an element of the Roadside Toll System.

Term	Definition
Business Rules	Rules governing the use and operation of the toll system, particularly with respect to toll account structure and operations, as well as other aspects of toll system operations.
ConOps	The Concept of Operations (ConOps) describes the proposed function and operations of toll in the Oregon Toll Program. The ConOps describes how the Oregon Toll System would operate, from the perspective of the users, owner/operator, and other involved stakeholders. ConOps documents are most often used in development as the first design step in a systems-engineering process.
Customer	Any vehicle operator driving on a toll facility.
Customer Relationship Management (CRM)	The systems and services in the Back-Office's Customer Service Center that enables customer service via any channel or method as desired by the owner. The term CRM often implies the wide range of commercial software packages that provide customer service and customer account management functions, such as those provided by Microsoft, Salesforce, SAP, and many other firms. CRM software may also be custom software as part of a toll system package.
Customer Service Center (CSC)	Part of the Back-Office. The systems and services to support one or all the following: customer relationship management software, call center, storefront, website, phone application, and mail house and to provide account management, transponder fulfillment, image review in some cases, and other operations services. Some elements or functions of the CSC may be provided by various companies or service providers.
Electronic Toll Collection (ETC)	The collection of tolls based on the automatic identification of vehicles, currently achieved with the use of Radio Frequency Identification (RFID) electronic systems.
Enrolled vehicles	Vehicles that have enrolled in other programs such as the OReGO or motor carrier weight/mile program. In the case of OReGO, registered owners may want to have tolls paid from their OReGO accounts. For the weight/mile program, the owner or operator may want to pay tolls when filing and paying the weight/mile tax. While this functionality is not contemplated to be a "go live" consideration, it is a desirable end state for Oregon.
Gantry	The physical structure in the toll zone on which overhead electronic toll equipment is mounted.
Go-Live Day	The first day of regular revenue collection operations. This is a critical project milestone.

Term	Definition
Home Agency and Away Agency	The home agency is the agency that establishes and/or maintains the customer's account and issues the transponders. The away agency is all other agencies.
I-205 Toll Project	The project to design, develop, furnish, install, test, and operate a fully functioning system that will collect tolls on I-205 between Stafford Road and Oregon Route 213.
Interoperability	A cooperative arrangement between toll operators enabling toll transponders and toll accounts from one agency to be used on another agency's toll facilities. Another extension of interoperability enables toll operators to extend use of their toll accounts and transponders for payment to other public and/or commercial entities such as transit and parking lot operators or roadside food and vehicle servicing vendors. This may also include other account managers such as OReGO Road Usage Charge (RUC) program, Oregon Commerce Compliance Division (CCD) for weight/mile tax, and third parties.
Manual Replenishment	Manual replenishments of accounts may be initiated by the customer in person, by phone, through mail, via the web, through a retailer location, or by mobile application if available.
Multiprotocol Electronic Toll Collection	The use of electronic toll transponders or in-lane readers that can use more than one radio frequency technology protocol. There are three primary protocols in use in the United States today. Multiprotocol transponders can be issued by one agency but used across many agencies with any of the protocols supported by the transponder. Multiprotocol readers can read transponders issued by their own agency as well as those issued in other parts of the country.
Operational Back-Office	The system host and center of the Roadside Toll System, which manages the toll zones and performs other transaction pre-processing such as image review and verification, electronic toll and license plate validation, and transaction processing. The hardware and software operated here is referred to as "OBO," or simply "Toll Host."
OmniAir	An independent industry association promoting interoperability and providing certification services for connected vehicles, Intelligent Transportation System (ITS), and transportation payment systems, including electronic toll equipment.
Oregon Toll Program	The new Oregon state tolling policy and implementation, which is operated through by the Oregon Toll System described in this document, and encompasses the policy, operations, and administration

Term	Definition
	of tolling in Oregon. The Oregon Toll Program is initially intended to cover I-5 and I-205 but may in the future be extended to include other facilities. The Oregon Toll Program does not include the existing tolling programs on the White Salmon-Hood River Bridge and the Bridge of the Gods, but it will be interoperable with those programs.
Oregon Toll System	The entirety of the Roadside Toll System and the Back-Office, incorporating all the primary systems and services required to provide toll collection for the State of Oregon.
Roadside Toll System	The "front half" of the Oregon Toll System, which includes the Toll Zones (including all roadside toll system hardware) and the Operational Back-Office.
Systems Integrator	A toll industry prime contractor or vendor responsible to design, develop, install, test, maintain, and operate part or all of toll system. For the Oregon Toll Program, one Systems Integrator contract will provide the Roadside Toll System and another will provide the Commercial Back-Office System, including the customer service center. These vendors will be references as such: • Roadside Toll Systems Integrator (RTSI) • Commercial Back-Office System Toll System Integrator (CBOS TSI)
Toll Host	The center of the Roadside Toll System that controls the toll zones, receives toll transaction messages, and processes transactions.
Toll Zone	The part of the Roadside Toll System deployed in the field. The location on the tolled highway where the toll gantry and field electronic toll collection equipment is located.
Transaction	The data set provided in an electronic message that describes the vehicle, the toll to be charged to the account, the date-time-location of the toll event, and other information as necessary for proper system function. A point transaction identifies the vehicle and toll from a single toll zone. A trip transaction is derived from the association of many point transactions to describe an end-to-end trip on a roadway and set a single toll for the entire trip. All transactions will have the same uniform data format, but content can vary. An ETC transaction will include a valid transponder number. All transactions will have license plate information. A transaction without a transponder will be referred to as a license plate (LP) transaction.

Term	Definition
Transponder	The in-vehicle electronic toll device that employs RFID technology to enable roadside toll system equipment to identify a vehicle by its transponder. Also, often referred to as a "tag," "ETC tag," "toll tag," or sometimes a "pass."
V2X	Vehicle-to-everything communications allows connectivity in vehicles to report location data at a level that enables its travel through toll zones to be priced and added to the toll account for that vehicle or to other accounts, such as its RUC account. This functionality is being developed, and as Oregon looks to future-proof its system, an adaptable system is desirable. The specific protocol expected to implement V2X is C-V2X, cellular V2X communications.
Vehicle Classification	The method to rank or describe the vehicle size, such that larger or heavier vehicles may be charged a higher toll than smaller or lighter vehicles.

1.2 ACRONYMS AND ABBREVIATIONS

ACH	Automated Clearing House
ALPR	Automatic License Plate Recognition
AM	Account Manager
API	Application Programming Interface
BOS	Back-Office System
CBOS	Commercial Back-Office System
CBOS TSI	CBOS Toll System Integrator
CCTV	Closed-Circuit Television
COAT	Concept for Open Architecture Tolling
CCD	Commerce and Compliance Division of ODOT
ConOps	Concept of Operations
CRM	Customer Relationship Management
CSC	Customer Service Center
CSR	Customer Service Representative
CTOC	California Toll Operators Committee
DMV	(Oregon) Driver and Motor Vehicle Services
DOL	(Washington State) Department of Licensing
ETC	Electronic Toll Collection
FHWA	Federal Highway Administration
HB 2017	House Bill 2017
I-205	Interstate 205
I-5	Interstate 5
IBR	Interstate Bridge Replacement
IVR	Interactive Voice Response
IT	Information Technology
ITS	Intelligent Transportation System
LIDAR	Light Detection and Ranging
MOU	Memorandum of Understanding
MP	Mile Post
NEPA	National Environmental Policy Act
NOCP	Notice of Civil Penalty
OBO	Operational Back-Office
ODOT	Oregon Department of Transportation

OR 213	Oregon Route 213
OReGO	Branded Name of the State of Oregon Road Use Charge Program
OTC	Oregon Transportation Commission
PCI	Payment Card Industry
PEL	Planning and Environmental Linkages
PII	Personally Identifiable Information
RFID	Radio Frequency Identification
RMPP	Regional Mobility Pricing Project
RTSI	Roadside Toll System Integrator
RTS	Roadside Toll System
RUC	Road Usage Charge
UPS	Uninterruptible Power Supply
V2X	Vehicle to Anything
VPPP	Value Pricing Pilot Program
WRTOs	Western Region Toll Operators
WSDOT	Washington State Department of Transportation

2 EXECUTIVE SUMMARY

2.1 THE OREGON TOLL PROGRAM IMPLEMENTATION

The Oregon Toll Program will incorporate multiple toll implementation projects throughout the state. The Oregon Toll Program will be implemented through the Oregon Toll System (OTS), which is described in this Concept of Operations (ConOps) document. This concept of operations focuses on the tolled facilities within Oregon for the first three project phases, although it is possible that in the future, the OTS could be expanded to include other projects. Note that the Oregon Toll Program does not include the existing tolling programs on the White Salmon-Hood River Bridge and the Bridge of the Gods, but it will be interoperable with those programs.

The first phase will include the initial group of projects shown on the map in **Figure 1**. These will be located on I-205 near the Abernethy and Tualatin River Bridges and will include two toll zones with additional ramp toll zones.

The second phase will be referred to as the Regional Mobility Pricing Project (RMPP). This phase will include Interstate 5 (I-5) and the remaining portion of I-205 within Oregon and the Portland area. It is estimated to include an additional 30+ toll zones.

The third phase will be referred to as the Interstate Bridge Replacement (IBR), which will replace the lift span bridge carrying I-5 over the Columbia River to Washington. Where the concepts contained in this document are not applicable to the IBR project, that is noted.

Figure 1 Oregon Toll Program Area of Operation

The concept develops the Oregon Toll System in two basic parts: (1) the Roadside Toll System (RTS), which would include all the toll technology in the field and (2) the Commercial Back-Office System (CBOS), which would include a customer service center to perform all toll account management

functions. The I-205 Toll Project, as the first major toll project in Oregon, will establish policies and prerequisites for future tolls in the state and will develop a system that could be easily expanded to support tolls on other Oregon Department of Transportation (ODOT) roadways with little new centralized infrastructure. ODOT is interested in future-proofing its toll system so it can use other toll zone reporting options in the future, such as electronic logging devices used by commercial vehicles, embedded telematics native to newer vehicles, on-board diagnostic devices, digital license plates, and other technologies. This will not be a requirement when the toll system goes live, but will follow other ODOT transportation program paradigms, such as the OReGO Program, and will mature and adapt to new technologies in the same way.

Initially, the Oregon Toll System will rely solely on electronic toll collection (ETC) transponders and license plates to identify vehicles. Vehicles will have a toll account linked to the transponder and/or license plate of the vehicle. If a detected vehicle does not have a toll account, that vehicle's registered owner-of-record will be billed for the toll. The Oregon Toll System will support many toll payment and customer service channels to ensure equity for all communities. Integration with already established toll authorities for payments, such as the Port of Hood River, the Bridge of the Gods, the Oregon Road User Charge (RUC) system, and out-of-state toll account programs such as Washington's *Good To Go!* or the California FasTrak toll systems, is planned for future development. The initial implemented toll transponder technology will be the standard used by all the western U.S. region toll operators.

2.2 AUTHORITY

ODOT has statutory authority to implement toll projects under Oregon Revised Statute 383. The Oregon Constitution (Article IX, Section 3a) specifies that revenues collected from the use or operation of motor vehicles is spent on roadway projects, which could include construction or reconstruction of travel lanes, as well as bicycle and pedestrian facilities or transit improvements in or along the roadway. The following list provides an overview of the structure through which a toll program is being developed:

- Federal Highway Administration (FHWA), United States Department of Transportation, the Value Pricing Pilot Program, and other federal regulations, policies, or executive orders (Executive Order 13985 of January 20, 2021, "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government")
- Oregon's Constitution (e.g., Article IX 3a); Governor Executive Orders (e.g., Order 20-04 Reduce Greenhouse Gas Emissions); legislative actions (e.g., House Bill 2017 [HB 2017]) and oversight (e.g., Joint Committee on Transportation); and state policies, plans, and regulations (e.g., Oregon Revised Statute Chapter 367 and 383, Statewide Transportation Strategy: A 2050 Vision for Greenhouse Gas Reduction)
- Oregon Transportation Commission (OTC) and ODOT regulations, plans, and policies (e.g., Strategic Action Plan, Oregon Transportation Plan, Oregon Highway Plan, Tolling and Congestion Pricing Research and Policy Support: Congestion Pricing White Paper, Blueprint

for Urban Design, mobility measures, design standards, and modal plans for bicycles, pedestrians, freight, public transportation, transportation options, and safety)

- ODOT's Urban Mobility Office and the Oregon Toll Program project administration (e.g., Comprehensive Congestion Management and Mobility Plan and National Environmental Policy Act (NEPA) documentation of toll projects (e.g., I-205 Toll Project, I-5/205 Regional Toll Project, Equity Framework, and Equity and Mobility Strategies)
- Regional transportation plans, policies, and regulations (e.g., Metropolitan Transportation Improvement Program, Regional Transportation Plan, Southwest Washington Regional Transportation Council's Regional Transportation Plan)
- City and County-level (e.g., Portland Bureau of Transportation, Clackamas County [transit], Washington County [transit], Multnomah County, and Clark County), transit or transportation option providers (e.g., C-TRAN 2030, TriMet Unified Service Enhancement Plan, SMART Transit Master Plan, and Ride Connection), and mobility service provider transportation plans, policies, and regulations

With this structure in place, this ConOps describes the proposed function and operations of the I-205 Toll Project (Tualatin and Abernethy Bridges). It also applies to the overall Oregon Toll Program in the Portland metropolitan area, and other areas in the state where tolling may occur. As a result, the system described in this ConOps is termed the "Oregon Toll System."

The ConOps describes how the Oregon Toll System will operate, from the perspective of the users, owner/operator, and other involved stakeholders. The operational description leads to concept-level guidelines and recommendations for toll system design, including hardware and software design, data architecture, as well as identification of services required to maintain and operate the system and to provide customer service. This document also provides an initial look at potential business rules and minimum business rules requirements. The ConOps identifies potential strategies for the toll system to support environmental justice measures such as targeted discounts or favorable toll account terms and conditions, all of which would be designed to aid low-income individuals, and customers who prefer using cash.

The ConOps represents the first step in the systems engineering process, whereby the design of complex systems follows the operational requirements. Subsequent engineering and contract documents will build on the concepts presented herein as the requisite systems and services are procured, developed, and placed into operations. The ConOps tracks closely with the rapidly changing information technology (IT) and toll technology marketplace, which evolve primarily based on market demand and customer service requirements.

ODOT has been a leader in development of transportation funding with the development of OReGO, Oregon's RUC program. This program has tested technical and regulatory structures that could enable the state to move away from reliance on fuel taxes. This is similar to its existing weight-mile tax program that applies to commercial vehicles that weigh in excess of 26,000 pounds. Now, ODOT and OTC have begun to develop the Oregon Toll Program focused on funding infrastructure improvements as well as managing congestion. This ConOps describes the OTS, the system that

implements the Oregon Toll program, and helps identify administrative functions needed to manage the toll systems and services.

2.3 INTENDED AUDIENCE

This ConOps is primarily intended for stakeholders who may potentially provide services or own and operate systems and equipment that will implement the proposed toll system concept. This audience includes:

a. ODOT, particularly the following:
    i. Director's Office
    ii. Driver and Motor Vehicle Services Division
    iii. Commerce and Compliance Division
    iv. Office of Innovative Funding
    v. Headquarters and Office of Maintenance and Operations
    vi. Region 1 – Portland metropolitan area
    vii. Procurement Office
    viii. Urban Mobility Office
    ix. Data Solutions Office
    x. Oversight and steering committees within ODOT
b. Industry consultants
c. Academic institutions
d. Engineering firms and consultants
e. BreezeBy Toll Program
f. Law enforcement
g. Metropolitan planning organizations
h. Other jurisdictions, including other state departments of transportation
i. Out-of-state toll operators, such as:
    i. Washington State DOT
    ii. California Toll Operators Committee (CTOC)
j. Policymakers including state and regional elected officials
k. Professional organizations
l. Toll systems integrators and service providers (back-office and/or roadside)
m. Other government entities
    i. OTC
    ii. Oregon Department of Justice
    iii. Oregon Department of Administrative Services
    iv. FHWA

Although not a direct audience, the needs of potential toll facility users and interested parties should also be considered and reflected in this document. This audience includes:

a. Car rental agencies
b. Commercial vehicle operators and associations
c. Consumer organizations, such as the American Automobile Association (AAA)
d. Media
e. Private companies and business owners
f. The public

2.4 RELATED PROJECTS, PROGRAMS, AND FACILITIES

2.4.1 Future Project Supported by Tolling

ODOT and the OTC have identified several initial highway improvement projects to be funded by tolls, the first of which is planned to be the I-205 Improvements Project. This would add a third lane in both directions on part of I-205 and include seismic upgrades to several I-205 bridges.

Tolls may also be considered for the remainder of I-205, from its southern terminus with I-5, through the I-205 study area, and up to the Columbia River area to the north. In addition, tolls are also under consideration for I-5 for from Multnomah Boulevard to North Going Street and may include other portions of I-5 between the Boone Bridge over the Willamette River at Mile Post (MP) 282 to the south and the I- 5 Interstate Bridge Crossing project between Oregon and Washington to the north. The IBR project may use the same back-office system for toll collection, subject to negotiations with the State of Washington.

2.4.2 Existing Oregon Tolls

There are two existing toll facilities in Oregon: the White Salmon-Hood River Bridge and the Bridge of the Gods, both over the Columbia River. These are operated by the BreezeBy program, are funded independently of ODOT, and will be treated as partner toll agencies.

2.4.3 Road Usage Charge Program

ODOT has also been administering a RUC program called OReGO, which charges vehicle owners based on number of miles traveled in Oregon. Motor fuel taxes have become less sustainable over time as vehicle fuel efficiency improves and as vehicles being sold increasingly become electric-powered, with little or no gas consumption at all. A RUC is the funding solution that addressed the dwindling fuel tax revenue. This new funding model decreases fossil fuel use with a modern, technology-based solution that combats climate change while assessing drivers fairly for their road use.

The ODOT Office of Innovative Funding has been a leader in development and implementation of the OReGO program. The OReGO program allows for technology and service innovations and

flexibility in service provider options. The Oregon Toll System will work with the OReGO program and its account managers as an interoperable partner agency. This is because there are similarities between the OReGO program and tolling: data collection, transaction processing, and account management that includes setting up accounts for enrolled vehicles, performing order fulfillment, and billing.

2.4.4 Open Architecture for Transportation Services

ODOT had launched an initiative to complement OReGO and other existing and future transportation services using an open architecture for transportation services. Open architecture enhances interoperability opportunities with other jurisdictions and the private sector. It should provide a platform for a variety of technological solutions and payment options for transportation system users. The aim is to provide each traveler a range of choices to seamlessly pay all charges related to road usage, tolling, or other transportation-related expenses (i.e., transit fares), creating a market environment that encourages competition and build systems that can adapt as technology advances.

This allows for flexibility in technological approach and business rules. Adherence to the open architecture concept positions the agency to anticipate future needs and market developments. This ConOps applies those principles with a presentation of a state-of-the-practice toll system that will have flexibility to replace technologies, vendors, and services as agency needs and technology innovations continue to evolve. **Figure 2** shows the system architecture for a range of transportation programs and services including tolls, RUC, transit, and parking. The open architecture model supports each service involved in providing and collecting for transportation services, including:

a. Data collection
b. Transaction processing
c. Account management
d. Sending data and funds to the administration or the governing agency

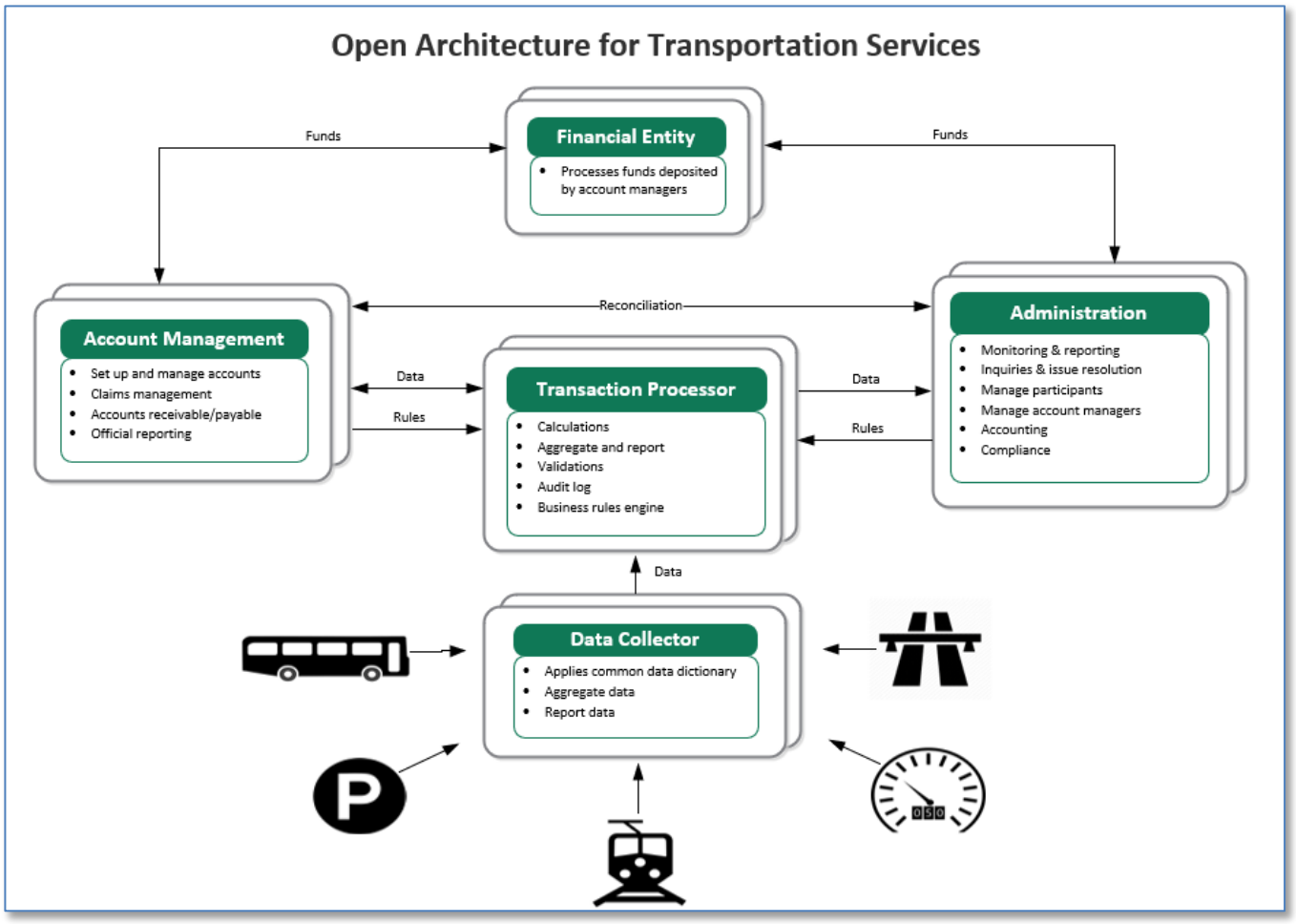

Figure 2 System Architecture

Open architecture objectives:

a. Enable transportation system users to manage multiple transportation services and payments for those services through a single account.
b. Deploy systems that support and emphasize user choice.
c. Enable private sector vendors to provide their own value-added services and manage the customer experience for their users.
d. Deploy systems where each component can be independently operated and vendors for those components can be individually managed, thus reducing reliance on a single vendor.
e. Deploy systems that allow multiple vendors to provide services for a single system component.
f. Provide and support a streamlined process for vendors to enter and exit the mobility market.
g. Develop a system with independent components, as determined by their business functions and requirements, that communicate through defined interfaces using common standards.
h. Provide a system where any given component can be independently replaced without affecting other components.
i. Deploy a system that supports jurisdiction-specific requirements on any given component.

3 PROJECT DESCRIPTION AND TOLL NEED

3.1 OREGON TOLL PROGRAM BACKGROUND

In response to increasing traffic congestion and the needs of aging infrastructure, the Oregon legislature passed HB 2017, directing the OTC to establish a Traffic Congestion Relief Program. This program uses variable toll pricing based on time of day along with targeted infrastructure improvements to manage freeway demand and to provide funding for these improvements on I-5 and I-205 in the Portland metropolitan area. HB 2017 also established a Congestion Relief Fund as the repository for all toll revenues to ensure that highway toll revenues remain dedicated to fund congestion relief projects.

3.2 IMPLEMENTATION PHASES

As previously indicated, ODOT is currently developing three toll project phases: 1) the I-205 Toll Project, 2) the RMPP, and 3) the IBR project, in partnership with the Washington State Department of Transportation (WSDOT) to replace and improve the I-5 bridge over the Columbia River.

Both the I-205 Toll Project and the IBR are currently in the NEPA process; the RMPP will begin the NEPA process later in 2022. All three toll projects (**Figure 3**) will apply variable rate tolls based on time of day for congestion management.

Figure 3 Oregon Toll Program Area of Operation

3.2.1 I-205 Toll Project

The I-205 Toll Project will be the first of the Oregon Toll Program projects to go into operation and will include the development of the Oregon Toll System. The Oregon Toll System as delivered for the I-205 Toll Project will form the foundation for the entire statewide system.

The I-205 Toll Project will toll all vehicles in all lanes of I-205, in five toll zones, at three primary locations between MP 4 and MP 9. Tolls will be used to pay for improvements and manage congestion pricing by incorporating variable time-of-day pricing. Tolls will be higher during peak periods than during off-peak periods and would be the

lowest, or possibly free, during overnight periods. Larger vehicles may have the same or higher toll rates than smaller vehicles because of the increased road attrition. All vehicle owners or operators will be required to pay tolls, except exempt public transit vehicles or others as determined by the OTC. The OTC will also have the authority to approve discounts for certain demographics or other attributes in the future.

Currently, as planned the I-205 Toll Project will toll the reconstructed Abernethy and Tualatin River Bridges. The NEPA analysis considers two alternatives: the Build Alternative (tolling) and the No Build Alternative. The environmental assessment information was made available for public review and comment in summer 2022.

3.2.2 Regional Mobility Pricing Project

The RMPP plan is to toll all lanes on 55 route miles of interstate highways, from the I-5 Boone Bridge in Wilsonville north to the Columbia River on both I-5 and I-205. Toll rates will vary based on time of day, vehicle class, trip length, and method of payment. All segments of the two routes will be tolled with no free movements but with possible accommodations to address equity, tolling impact concerns, and other issues identified and approved by the OTC.

The RMPP is presently in a pre-NEPA U.S. Department of Transportation Planning and Environmental Linkages (PEL)[11] phase through fall 2022. When the NEPA process begins, ODOT will apply for tolling authority under the Value Pricing Pilot Program or under the recently created Congestion Relief Program.

3.2.3 Interstate Bridge Replacement Program

The interstate bridge is a critical connection on I-5 over the Columbia River between Oregon and Washington. Replacement of the aging twin through-truss lift-span bridges with a modern, seismically resilient structure is a high priority for Oregon and Washington. The IBR Program is currently in the planning and development phase and anticipates implementing tolls on the bridge to help pay for the replacement.

3.3 PROGRAM GOALS AND OBJECTIVES

3.3.1 System Functionality

The Oregon Toll System business rules and requirements will govern the use and operation of the system and are based upon the operational concepts described in this ConOps. Business rules are used to inform the development of the requirements for the toll system and the standard operating procedures for toll operators. The business rules and requirements developed for the Oregon Toll System will be organized in sections reflecting operating and functional needs for the Systems

[1] PEL represents a collaborative and integrated approach to transportation decision-making that 1) considers environmental, community, and economic goals early in the transportation planning process and 2) uses the information, analysis, and products developed during planning to inform the environmental review process.

Integrators (e.g., RTS versus CBOS). Business rules and requirements will include configurable settings in the systems to the greatest extent practical. The baseline business rules and requirements to be in effect on Go-Live Day will be defined by ODOT and may be refined during design meetings with ODOT and the system integration teams.

Business rules and requirements will reflect toll policy decisions adopted by ODOT and are subject to revision throughout the life of the toll program. The Oregon Toll System will need to be flexible in the application of business rules, such that those rules can be changed when needed to meet new policy decisions, new technologies, or market demands.

3.3.2 Customer Considerations

The three toll projects add tolls to previously untolled roadways, so the Oregon Toll System will be designed to offer clear and simple options to help drivers who are now "customers" to comply with toll payment requirements. These systems and services will be designed for drivers that regularly use the toll route, as well as for infrequent drivers unfamiliar with the roadway or the new requirement to pay tolls. ODOT will provide clear signage and identification of where tolls are active, how much the tolls are, and how to pay them.

The Oregon Toll System and services will offer a range of payment options to accommodate a wide range of user groups. The system will provide multiple venues for customers to manage accounts and pay tolls, such as via the web, over the phone, on phone applications, and in person. It is anticipated that most account holders will live or work in the greater Portland metropolitan area, including southwest Washington, or elsewhere in Oregon. Infrequent customers can be expected from any of the western states, and it would not be unusual for the toll system on I-5 or I-205 to occasionally experience license plates from almost any jurisdiction in North America, particularly on commercial vehicles.

3.3.3 Interoperability with Other Transportation System Providers

ODOT's goal is that the Oregon Toll System is interoperable with other agencies across the United States such that if a driver has a toll account with any jurisdiction, that account can be used to pay for tolls incurred on the Oregon Toll System. Similarly, a driver with an Oregon Toll System account will be able to travel on toll facilities in other states and use their Oregon toll accounts to pay for those tolls as described.

For the Oregon Toll System to be interoperable with tolling jurisdictions across the country:

a. Toll technology must be able to support transponder protocols used by other systems.
b. Toll technology must be able to read license plates from different jurisdictions.
c. Toll operators need business arrangements and memoranda of understanding (MOU).
d. Computer interfaces must exchange toll information.

Currently, there are many transponder protocols in use across the nation. Toll system technology can support all these protocols; however, only two or three protocols should be enabled at any time to achieve needed accuracy and efficiency. The optical recognition systems used to decipher license

plates are capable of reading plates from all jurisdictions but can be optimized to read plates from a few select areas. Given these constraints, the Oregon Toll System will be designed to support interoperability with jurisdictions that are close to the state.

3.3.4 Interoperability with Other Transportation System Providers within Oregon

The toll system ETC technology will be interoperable with the BreezeBy system used by existing toll operators in Oregon including the Port of Hood River and Port of Cascade Locks. This will enable Oregon Toll System operators to enter into reciprocal interoperability agreements with these operators and accept BreezeBy toll accounts for payment of tolls on I-5 or I-205, or through an interoperability hub as described for the out-of-state agencies in subsection 3.3.5 below.

The Oregon Toll System will be designed to accept OReGO account managers as interoperable partners such that OReGO RUC customers can use their OReGO accounts to pay tolls. This may be accomplished in a variety of ways, including simply reading RUC-registered license plates on the Oregon Toll System and sending fully formed toll transactions to RUC account managers.

3.3.5 Interoperability with Tolling Agencies Beyond Oregon

The Oregon Toll System will also be designed to be interoperable beyond Oregon with the following:

- The Western Region Toll Operators (WRTOs), which include WSDOT's *Good To Go!,* BreezeBy, and the CTOC FasTrak toll account programs
- California hub, consisting of all CTOC agencies
- National hub (under design), which will include all tolling agencies across the United States

Because all states are not ready for national interoperability, and the WRTOs and California hub are not currently deployed, Oregon Toll System will support interoperability with WSDOT's *Good To Go!* system, in addition to BreezeBy in the state of Oregon in the initial deployment.

3.3.6 Interoperability with Third-Party Account Managers

Finally, the Oregon Toll System will be interoperable with third-party account managers that offer customers options for opening accounts and may provide added services. These account managers may include commercial toll account managers that support truck traffic throughout the United States.

Figure 4 describes the integration between the Oregon Toll System and these interoperable partners.

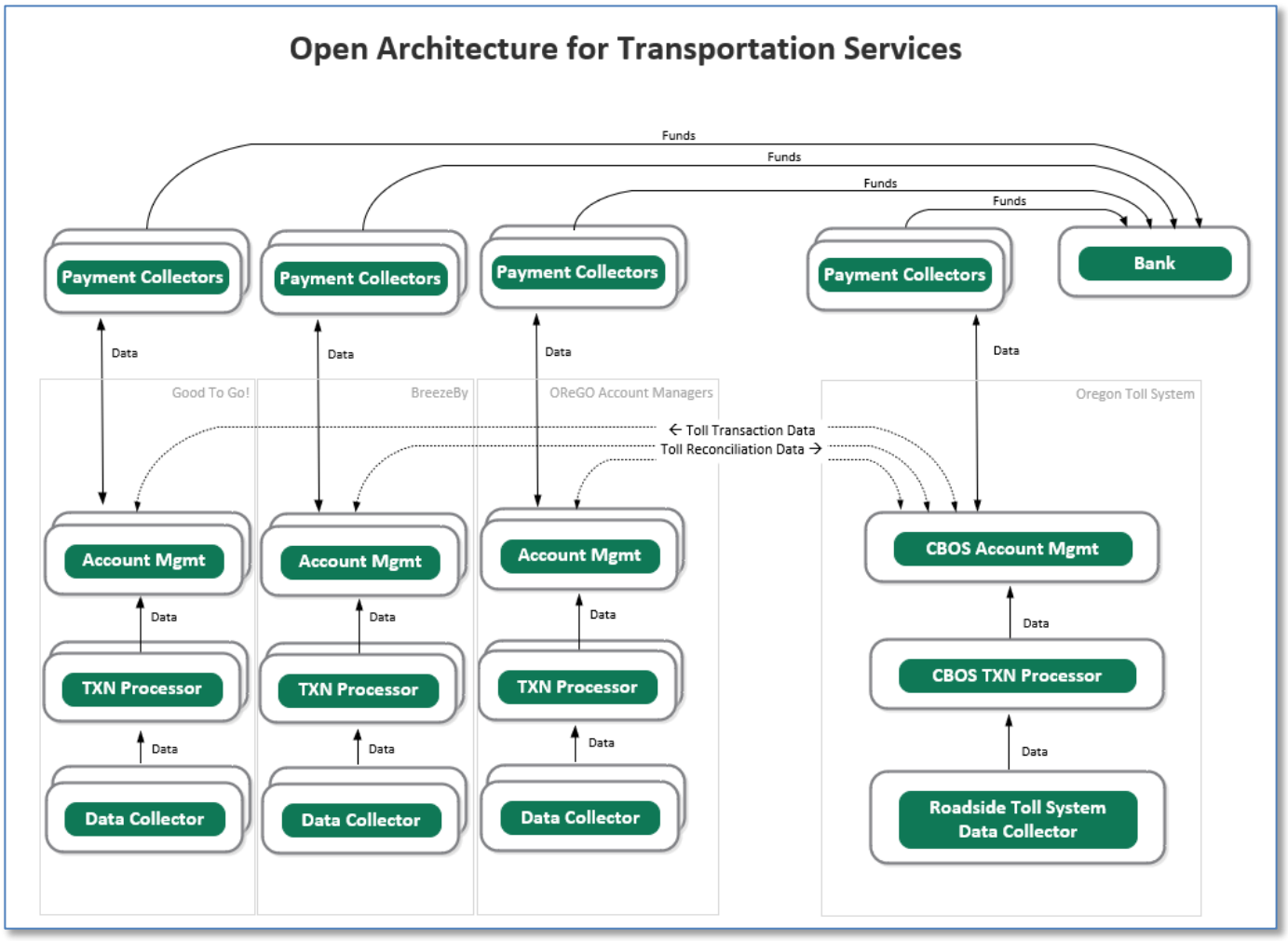

Figure 4 System Interoperability Architecture

3.3.7 Future Mobility Interoperability Beyond Tolls

The Oregon Toll System will support future mobility options in addition to toll payments. To accomplish this the Oregon Toll System will use standardized application programming interfaces (APIs) such that any vendor or business partner will be able to interface with the toll system for payment of tolls or using toll accounts to support payment of additional transportation needs.

The Oregon Toll System technology will support broad interoperability with other transportation providers. However, the ultimate commercial offering of interoperable arrangements with other transportation providers will depend on mutually agreed-upon conceptual terms and conditions that are acceptable to all parties.

3.3.7.1 Parking

As price points for transponders and in-lane hardware have decreased, the use of ETC for parking at major locations such as airports, central urban locations, or sports venues has become increasingly popular. The Oregon Toll System may support the use of its transponders for parking with major parking providers in the future, such that as Oregon Toll System transponders are detected at entry

and exit of parking garages, the parking charges could be assigned directly to the Oregon Toll System account.

The Oregon Toll System may limit the use of ETC transponders for parking to certain account types with business rules determined by the OTC. This is because parking charges can far exceed typical toll charges in a short period of time. As an example, parking in downtown Portland or at Portland International Airport can be as much as $30 daily.

3.3.7.2 Transit

The Portland regional transit system, TriMet, already has a mobile wallet payment option. ODOT may work with TriMet to explore ways for the toll system to also be used for TriMet payments. One possibility to explore would be to use the Oregon Toll System account as another link in Apple Pay, Google Pay, or Samsung Pay, which would provide an automatic linking of the two systems.

3.4 PROCUREMENT APPROACH

ODOT will procure services to design, develop, implement, operate, and maintain the Oregon Toll System. This includes contracting services for the RTS, CBOS, and Customer Service Operations. The contracts will be structured to minimize involvement from ODOT. The procurement approach will be designed to secure these systems and services considering limited availability of ODOT staff and targets for specific milestones, such as the Go Live date.

3.4.1 Roadside Toll System

The RTS is an integrated systems and services project. The contract requirements will be developed as functional systems requirements with details that govern how the Roadside Toll Systems Integrator (RTSI) will conduct the design, development, delivery and installation, testing, and then maintenance and operations of the RTS. Technical requirements will control selection of design features, such as the interfaces with the CBOS and the associated data requirements.

The RTSI's scope will include all elements of the RTS work required to provide a fully functioning system meeting all contract requirements.

3.4.2 Commercial Back-Office System

The CBOS is an integrated systems and services project. The contract requirements will be developed as functional systems requirements with details that govern how the CBOS TSI will conduct the design, development, delivery and installation, testing, and then maintenance and operations of the CBOS.

Toll Back-Offices are composed of many parts provided by many types of systems and service providers. As ODOT moves towards procurement, some of the individual systems and services may be provided directly by ODOT or existing statewide contractors.

3.4.3 Customer Service Operations

The customer service operators will conduct customer interactions and services representing themselves as agents of ODOT, not as employees of their company. The customer service operators will be responsible for provision of all Oregon Toll System customer services—except for any portions taken over directly by ODOT.

3.4.4 Maintenance and Operations

The contracts are likely to include details for maintenance services. For example, ODOT prefers for the RTSI to provide maintenance for all the roadside toll system equipment. ODOT is considering options to minimize state staff involvement to support equipment and systems. Additional information for maintenance roles and responsibilities will be provided in the request for proposals.

4 STAKEHOLDER ROLES

This section describes the following primary roles of the stakeholders in the setup and operation of the Oregon Toll System.

4.1 OREGON TRANSPORTATION COMMISSION

The OTC is the Oregon toll authority and is responsible for setting toll rates and exemptions as well as approving toll program business rules.

4.2 OREGON DEPARTMENT OF TRANSPORTATION

ODOT is the responsible owner and operator of highway facilities and rights of way within Oregon, and owns and maintains all systems for traffic control, traffic data collection, and toll collection. Thus, ODOT will be responsible for managing all improvements associated with toll infrastructure, from environmental approval, right-of-way acquisition (if needed), preliminary and final design, through the construction phase and to acceptance.

During operations, ODOT will remain responsible for traffic control, including lane closures to support toll system maintenance and incident management. As discussed below in its own subsection, the Roadside Toll Systems Integrator (RTSI) will be responsible for maintenance of physical tolling equipment and will coordinate with ODOT on all needed lane closures and other ODOT activities needed for tolling equipment maintenance. ODOT will remain responsible for highway maintenance, including maintenance of the toll zone civil works, and will coordinate with the RTSI for such maintenance. ODOT will also remain responsible for maintaining its overall fiber communications network except for new network technology provided by the RTSI. Where fiber is owned by another entity with whom ODOT has a Service Level Agreement (SLA), ODOT will be responsible for updating SLAs to support tolling or providing alternative fiber.

4.2.1 Oregon Toll Program Administration

The Oregon Toll Program administration, led by the Oregon Toll Program director, is and will remain responsible for executing all duties with respect to management and governance over operations of the Oregon Toll System and services.

The administration will be responsible for design and development of the toll program, including procurement of engineering and construction of toll gantries, systems both for the roadside and the CBOS, and all ongoing services, maintenance, and operations.

Duties of the administration will include, but are not limited to:

a. Toll system development
b. Development of requirements for the RTS and the CBOS
c. Development of a procurement and selection process
d. Development with policies and procedures
e. Management of the selection process
f. Negotiations on behalf of ODOT with the highest-ranked systems integrators (back-office and roadside)
g. Management of the systems design, development, and testing process
h. Selection and oversight of support services from toll, IT consulting, marketing and public relations firms, and other firms and services providers as needed
i. Operations
j. RTS operations and maintenance contract oversight
k. CBOS operations and maintenance contracts oversight
l. Traffic operations
m. Customer service operations oversight
n. Marketing and public relations
o. Vendor support operations oversight
p. Technology support (communications, web services, utilities, etc.)
q. Liaison with interoperable toll agencies
r. Operations audit of RTS
s. Finance
t. Controller
u. Data interoperability, integration, and MOUs
v. Accounts management
w. Financial audit

4.2.2 Road Usage Charge Program

The ODOT Office of Innovative Funding established and currently manages OReGO, Oregon's RUC program, which has engaged several third-party account managers to operate RUC accounts as substitutes for the requirement to pay fuel taxes. The Oregon Toll System administration will work with the OReGO administrators and the RUC third-party account managers to develop operating agreements that would allow some RUC account managers to collect for tolls as interoperable partners in the future.

4.2.3 Oregon Driver and Motor Vehicle Services

Oregon Driver and Motor Vehicle Services (DMV) will support the Oregon Toll System operations at launch in two ways:

a. Perform passenger license plate lookups for registered owner information.
b. Enforce tolls with holds on passenger registration renewals.

If the Oregon state legislature authorizes reciprocal toll enforcement, the Oregon DMV will also provide registration holds and releases on behalf of participating reciprocal toll operators.

In the future, functionality will be added for additional interoperability between DMV and Oregon Toll System. DMV could take payments for toll invoices from customers at the time of registration renewal for the vehicle. The DMV may also be able to provide space at its in-person customer service centers throughout the Portland metropolitan area for customers to pay their toll invoices on demand. To improve machine legibility, the Oregon Toll System administration will be able to assist Oregon DMV with updates and reviews of license plate designs.

4.2.4 Oregon Commerce Compliance Division

In Oregon, the Commerce Compliance Division (CCD) is responsible for registering commercial motor vehicles. In addition to vehicle registration, CCD also enrolls out-of-state motor carriers into the weight mile tax system. Oregon CCD will be able to support the Oregon Toll System operations in two ways:

a. Perform commercial license plate lookups for registered owner information.
b. Enforce tolls with holds on commercial registration renewals.

In the future, functionality will be added for CCD to act as a third-party account manager and allow their account holders to pay for their tolls using CCD accounts.

4.3 OREGON STATEWIDE ENTERPRISE SERVICES

There will be integrations with Oregon state enterprise services. To the extent required by law, services provided by Oregon state agencies will be used for things like lock box and collection services. For example, ODOT has an internal collections unit. ODOT will cultivate those relationships for integrated services.

4.4 FEDERAL HIGHWAY ADMINISTRATION

FHWA provides regulatory oversight through the environmental process with respect to the introduction of tolls on interstate highways. FHWA will provide approval to undertake tolling and ensure that the implementation of tolls meets the requirements.

4.5 CUSTOMERS

All users of the Oregon Toll System will be considered ODOT customers. Customers will choose their account type and payment method with the Oregon Toll System and will need to keep this information up to date. Payment schedules will be communicated once their account type is chosen. Customers with transponders on accounts will be required to place and maintain their transponder as well.

4.6 ROADSIDE TOLL SYSTEMS INTEGRATOR

The RTSI is the prime contractor responsible for designing, developing, installing, testing, maintaining, and operating the toll zones and the Operational Back-Office (OBO). The RTS is responsible for detecting every vehicle on the roadway, for building accurate toll transactions, and then pushing the trip transactions to the CBOS.

The RTSI outfits the toll zones with the toll technology and will operate an OBO from which it can supervise the field system operations and maintenance, manage image review, and perform other tasks as needed. It is anticipated this would be located in commercial leased space close to the project area with a disaster recovery site located elsewhere. The RTSI will coordinate installation and testing periods with ODOT and specifically with the toll zone civil engineers and contractors and will provide site design details for the civil infrastructure.

During operations, the RTSI will be responsible for maintaining 1) system uptime and accuracy to contract requirements and 2) adequate spares and resources (i.e., bucket trucks and consumable supplies either with staff or an electrical subcontractor) to meet performance requirements. The RTSI will also be responsible for delivering, servicing, and deploying portable generators as needed during operations. The RTSI will coordinate these activities with ODOT.

The RTSI generally maintains no personalized customer information or account information—it maintains information on roadside transactions. It receives validation lists of transponders and license plates from the OBO, but these are not associated with any other identification information. The RTSI will normally have no contact with Oregon Toll System customers.

4.7 COMMERCIAL BACK-OFFICE TOLL SYSTEMS INTEGRATOR

The CBOS TSI is responsible for customer relationship management (CRM) software. This contractor, like the RTSI, will be responsible for designing, developing, installing, testing, and maintaining its system. The CBOS may be locally hosted at a CBOS TSI's physical location or hosted in the cloud via web services.

The CBOS will be the center of the Oregon Toll System, interfacing with many customer support systems and services software. These interfaces are described further in Section 6.0 Interoperability. The CBOS functionality will support customer account management, including posting tolls to customer accounts and invoicing.

4.8 CUSTOMER SERVICE CENTER CONTRACTOR

The customer service center (CSC) contractor is responsible for providing staff to operate the CSC and in-person centers. The CSC contractor staff uses the CBOS to provide customer service. This CSC staff will be on the front line for ODOT in all matters with the public related to the collection of tolls. ODOT may procure CSC staffing services as part of CBOS TSI procurement.

The CSC contractor uses a combination of staff who work at a CSC facility or remotely from their homes. ODOT will also require the CSC contractor to operate in-person centers from locations suitable and accessible to customers in the toll highway service areas. ODOT may ask the CSC contractor to lease these facilities or would provide them space in existing ODOT facilities, such as DMV offices. In the case of IBR, the CSC contractor will work with the State of Washington to determine where to locate an in-person CSC, along with other details, to make it operational.

4.9 BANKS AND FINANCIAL INSTITUTIONS

A credit card clearinghouse interface(s) will be necessary to support credit card operations, authorizations, and payments. The CBOS will also require access to a custodian account to make payments to various accounts according to a chart of accounts developed with Oregon Toll System administration and finance departments. These institutions will all require financial accounting to track settlements and movements of funds across accounts.

The Oregon State Treasury is the banking and cash management officer for the state and provides banking services to state agencies. This includes providing electronic payment products and services like wire transfers, ACH transactions, merchant card acceptance, and lockbox services. ODOT's Financial Services Branch is the point of contact for accessing these services. They also maintain a list of acceptable banking institutions for any third-party vendors that collect fees on behalf of the state. Any third-party collector should use an acceptable banking institution or obtain an exception to statute/rule.

4.10 OTHER TOLL AGENCIES

The Oregon Toll System will be interoperable with toll operators in Oregon, including Port of Hood River and Port of Cascade Locks, and WSDOT to support interoperability as described in Sections 3.3.3 and 3.3.5. This will require the Oregon Toll System to develop interoperability agreements and interface control documents, which are described in more detail in Section 6. The Oregon Toll System may also support reciprocal enforcement with other jurisdictions (other toll agencies) as described in Section 6.4.

5 USER-ORIENTED OPERATIONAL DESCRIPTION

The RTS will identify each vehicle as it passes through gantries located on the roadways equipped with automatic license plate recognition (ALPR) cameras and Automatic Vehicle Identification (AVI) readers/antennas. The RTS will determine whether the toll is a single-point toll or multipoint trip toll and will build the trip accordingly. This trip information will be sent to the Oregon tolling CBOS, where the system will apply applicable toll rates and eligible discounts for the trip to determine the total toll amount. Toll drivers will have the ability to link vehicle license plates and/or transponders to a personalized account for a streamlined user experience to complete toll payments. If there is no corresponding toll account, the registered owner of the vehicle will be invoiced for the toll charges.

5.1 ROADSIDE TOLL SYSTEM/VEHICLE DETECTION

Overhead toll system equipment on the roadside detects all vehicles. The system equipment identifies passing vehicles by ETC transponder(s), by license plate, and perhaps by other technologies, and uses all of that information to build a toll transaction data record. The system forwards that transaction record, overview images, and license plate images to the tolling CBOS for data processing and revenue collection. The RTS will also include signs to inform customers about toll rates. No driver interaction or special navigation is required.

5.1.1 Vehicle Classification

As a vehicle passes through a toll gantry, a vehicle size classification will be determined using camera images. A preliminary vehicle size classification schedule is shown in **Table 1**; however, dimensions and classifications are subject to change during the design phase once the RTSI is on board. Current ODOT toll strategies will have smaller and lighter vehicles charged less than larger and heavier vehicles, in accordance with current road cost responsibility.

Example Classification Table		
Tier	Length (feet)	Height (feet)
1	0–20	4–7.5
1	20–35	<7.5
2	20–35	>7.5
2	35+	<7.5
3	35+	>7.5

Table 1 Example Vehicle Classification Schedule

5.1.2 No High-Occupancy Vehicle Toll Rate Category

The OTC has determined toll rate discounts or exemptions based on the number of occupants in a private passenger vehicle will not be implemented during Phase 1 Go-Live efforts. Therefore, RTS cameras will not capture images of vehicle occupancy. The system will be developed to support occupancy-based discounts or exemptions for possible future phases, or as a new design feature following project implementation.

5.2 COMMERCIAL BACK-OFFICE SYSTEM

The CBOS receives transactions from the RTS with transponder and license plate information. These transactions are categorized as ETC-based, meaning a transponder was detected, or license-based transactions, where images are used to read the license plate of the vehicle.

ETC-based transactions get posted to the toll account associated with the transponder. For license-based transactions, the system checks if the plate is valid on an account and if so, posts the transaction to the account. Otherwise, the transaction is processed as an invoiced transaction. The processing cost for image-based transactions is higher than ETC-based transactions as these transactions may require image review. The OTC may decide to charge different rates for ETC-based transactions and license plate-based transactions.

5.2.1 Toll Rates

The OTC will set toll rates. The toll rates will vary by time of day and will be periodically evaluated. With variable toll rates, vehicles would pay more during peak periods than during off-peak periods. The Oregon Toll System will always be in operation, even during overnight operations.

The OTC may choose to set dynamic toll rates based on various data points. These may include:

a. Time of day
b. ETC versus license plate-based transactions
c. Vehicle classification (small, medium, and large)
d. Payment method
e. Other criteria as identified by the OTC

Current rates will be displayed on variable message signs so that drivers are aware of the rate they will be charged for entering the tolling area. Rate tables will also be displayed on the Oregon Toll System website and mobile applications for all rate variations. A variable toll rate structure is key to manage the traffic and equity impacts of tolls and to generate sustainable revenue. The rate structure will be simple to understand and configure.

5.2.2 Account Management Fees

The Oregon Toll System may require customers to pay certain fees for certain account functions, for example, a fee for returned checks or a fee for mailing statements. This is to control operations cost

and incentivize certain behaviors for efficiency. Some agencies also charge an account fee and or a transponder fee. At this time, the OTC is not planning to assess these fees.

5.2.3 Discounts

The OTC will determine any available discounts for customers and/or vehicles. Any applicable discounts will be applied to the eligible customer account.

5.2.4 Exemptions

The OTC may determine toll exemptions based on variables that are undetermined, at the time of this writing. Any person or vehicle eligible for an exemption would need a toll account so that trips may still be posted for reporting purposes.

5.3 CUSTOMER ACCOUNTS

The customers using the Oregon toll roads have several account options to provide maximum flexibility and meet customer needs, including the agency they create their account with. Accounts can be created with the Oregon Toll System or with an interoperable partner.

5.3.1 With the Oregon Toll Program

Oregon Toll Program accounts can be created by either calling into CSC, going into an in-person CSC, or using the website or mobile application. The customer can then add vehicles to their account and/or request transponders. The customers will also be able to add a transponder purchased through an ODOT-approved retail outlet. The customers may also add a payment instrument to their account and select a payment method.

5.3.2 With an Interoperable Partner

Interoperable accounts will use third-party account managers to collect for tolls incurred on ODOT toll roads. The intent is to allow customers to manage all their transportation services through as few accounts as possible. Section 6 contains more details on interoperability.

5.3.3 Vehicles without Accounts

Some drivers will not choose to create an account with the ODOT Toll System or an interoperable partner. When those vehicles are detected by the RTS, the following occurs:

a. The RTS builds a toll trip transaction with date, time, and location information as well as the vehicle classification and license plate image(s) and sends all the data to the CBOS.
b. The CBOS then performs a registered owner vehicle lookup using one of the registered owner vehicle lookup databases. This may include Oregon DMV, Oregon CCD, Washington Department of Licensing (DOL) or third-party providers of registered owner information.
c. The CBOS generates an invoice to send to the customer based on Oregon business rules.

5.4 PAYMENTS

The Oregon Toll System will offer a variety of options to customers for payment methods, payment instruments, and payment channels. The intent is to provide flexibility to best fit a variety of customer preferences and lifestyles. While there is a minimum set of methods and channels that will be provided as part of Phase 1, options may be offered or limited as necessary as the project matures.

5.4.1 Payment Methods

5.4.1.1 Prepaid

Accounts with a prepaid payment method require an upfront balance to open and maintain an active account status. This type of payment method is often referred to as "e-wallet" or "digital gift card." Prepaid methods allow customers to pay an amount beforehand and simply not worry about individual charges. Customers can configure a replenishment method for their prepaid balance.

a. Automatic: Requires a payment instrument on file, and the customer is required to maintain a prepaid balance on the account according to the business rules. The account is replenished automatically when the prepaid balance on the account falls below a configurable threshold.
b. Manual: Does not require a payment instrument on file and the customer is required to maintain a prepaid balance on the account according to the business rules. The system will alert the customer when the prepaid balance falls below a configurable threshold.

5.4.1.2 Postpaid

This payment method offers the customer an option to pay after they travel. No upfront amount is necessary.

a. Auto-Pay: The Oregon Toll System will allow customers to store a payment instrument on their account. When charges are posted to their account, they are automatically paid using that payment instrument. The system charges the credit card at a regular frequency or when the balance reaches a certain threshold according to the business rules. This will require customers to open an account.
b. Pay as you go: The Oregon Toll System will allow customers who do not have toll accounts to pay their tolls within a few days (number of days to be determined) of using the toll road before invoices are sent out. Customers will be able to use a website/mobile application to find their transaction by providing their license plate information and the day/time of the trip to confirm and pay their toll balance.
c. Invoice: The invoice payment method allows customers to pay their toll balance without opening a toll account. Customer payments of invoice/notices will follow the "first in first out" rule where the oldest invoices will be paid first, and tolls will be credited first, followed by fees and penalties.

5.4.2 Invoice Escalation Process

The Oregon Toll System will be designed to encourage all customers to use toll accounts and maintain them in good standing. Toll enforcement is needed nonetheless to reinforce the need to pay tolls. Toll enforcement business rules have changed dramatically across the United States over the past 10 years and may continue to change in the future, underlining the need for an enforcement system to be nonpunitive and have configuration flexibility built into the design. Agencies are shifting from issuing violations to invoicing the customers for transactions not associated with a valid account. The Oregon business rules will detail the escalation process.

An example of how rules for potential invoicing escalation process could be structured is shown in **Table 2**.

Rule Category	Notice and Escalation Rules
First Invoice	The trigger for the invoice will be X (system-configurable) days after the first transaction on an invalid account and a $X (system-configurable) negative amount on a valid account. Information will include: a. Registered owner's name and address b. Listing of the license plate tolls due (date, time, location, value) c. Invoice fee (to be determined) d. An image of the captured license plate e. A unique invoice number for payment cross-reference f. Due date g. Information on where and how to pay h. Information on how to open an account i. Notification of the escalation process and potential penalties for nonpayment j. A 6C transponder may also be included for the first-time users of the system
Reminder Letter	X days after invoice is mailed, customers will be sent a reminder letter for toll amounts due. This may be combined with first invoice for subsequent toll charges, if any.
Collections	X days after the due date of the reminder invoice notice, unpaid tolls will be sent to a collections unit.
Notice of Civil Penalty (NOCP)	X calendar days after the invoice is sent to collections. This will include the unpaid tolls, fees, and a NOCP per transaction as determined by the OTC. The NOCP will also include outstanding amounts from previous invoices for the account. Information will include: a. Outstanding tolls, fees, and penalties b. An image of the captured license plate c. A unique invoice number for payment cross-reference d. Due date (XX days after issuance) e. Information on where and how to pay f. Notification of the escalation process and potential penalties for nonpayment g. Other outstanding invoices and amounts due
Vehicle Registration Hold/Release	If tolls, fees, and penalties remain unpaid after X days of NOCP, the Oregon Toll System would request eligible plates registered with the Oregon DMV and Oregon CCD to hold vehicle registration renewal for the vehicle with unpaid tolls, fees, and penalties. Upon payment of all outstanding tolls, fees, and penalties, the Oregon Toll System would request removal of the vehicle registration hold.

Table 2 Example Escalation Process

6 INTEROPERABILITY

This section describes the Oregon Toll System's approach to interoperability with other transportation revenue systems. ODOT's goal is that the Oregon Toll System is interoperable with other toll agencies across the region and United States. The Oregon Toll System will also support future mobility options in addition to toll payments by supporting an open system architecture.

6.1 INTEROPERABLE ACCOUNTS

Interoperability with the Oregon Toll System is envisioned with three types of accounts:

a. Other tolling agencies' accounts
b. Other Oregon state programs
c. Third-party account managers

6.1.1 Accounts with Other Tolling Agencies

Interoperability within the Oregon Toll System means that owners of vehicles with accounts with other tolling agencies or services could use those accounts to pay for travel on Oregon toll roadways, and owners of vehicles with Oregon tolling accounts could use those accounts to pay for tolls while traveling on the other interoperable agency's roadways. To accomplish this, all equipment and systems will need to accommodate various technologies.

6.1.1.1 Transponder Technology

ODOT will be issuing transponders that use the 18000-6C (hereafter simply "6C") communications protocol for use on the Oregon Toll System. *Good To Go! system* (the toll system used by Washington) and BreezeBy system (used by existing toll operators in Oregon including the Port of Hood River and Port of Cascade Locks) use the 6C protocol, which can be completely interoperable with the Oregon Toll System. These systems also use SeGo protocol, a semi-proprietary toll transponder protocol developed by TransCore, a tolling system equipment provider and integrator.

The Oregon Toll System will apply technology in the toll zones to be able to read multiple transponder protocols (e.g., 6C, SeGo, Title 21, and E-ZPass). However, a toll lane system can only achieve desired performance when it reads two or three protocols. Thus, at Go-Live, the Oregon Toll System will support only the 6C protocol and SeGo, with the potential for adding other transponder protocols to support interoperability in the future.

6.1.1.2 Interoperability with other Agencies in Oregon

The Oregon Toll System will be interoperable with Oregon's current private toll operator BreezeBy via a reciprocal interoperability agreement.

6.1.1.3 Interoperability with the Western Hub

The Oregon Toll System will also be designed to be interoperable beyond Oregon and Washington with the WRTOs, which includes WSDOT's *Good To Go!* system and the CTOC FasTrak toll account programs. Together with Oregon's BreezeBy system, these groups are developing a western hub to

facilitate interoperability among themselves. When the western hub becomes operational and the Oregon Toll System is connected to it, the Oregon Toll System will no longer require separate connections to *Good To Go!* and BreezeBy systems.

6.1.1.4 Interoperability with the National Hub

The Oregon Toll System will also be designed to be interoperable with the national hub when it becomes operational.

6.1.2 Oregon State Account Managers Collecting Other Transportation Revenue

The State of Oregon currently has operational programs other than tolling that are collecting transportation revenue from their account holders. To provide a seamless experience to customers of these systems, the Oregon Toll System will support these account managers to allow their customers to pay their tolls using their existing program accounts. This includes OReGO and CCD programs.

6.1.2.1 OReGO Program

The Oregon Toll System will be designed to accept OReGO account managers as interoperable partners such that OReGO customers can use their OReGO accounts to pay for their tolls. RUC account managers may have the option to issue transponders to their customers, or simply use the license plate to identify the vehicle. Interoperability with OReGO is a future functionality and will not be available at Go Live.

6.1.2.2 Oregon Commerce Compliance Division

The Oregon Toll System will also be designed to interface with CCD such that CCD customers can use their CCD accounts to pay for their tolls. The CCD currently issues transponders to their customers but those transponders will not be suitable to be used for tolling applications at Go Live. CCD may have the option to issue OTS tolling transponders to their customers or use the license plate to identify the vehicle, or technology may adapt such that current transponders will eventually work together. Interoperability with CDD is a future functionality and will not be available at Go-Live.

6.1.3 Third-Party Account Managers

As used here, third parties are nonaffiliated companies that offer toll account management services with phone applications or separate platforms. These firms serve specific users who may not be interested in typical regional toll accounts with transponders or license plates. Some of these companies offer services that consolidate toll charges across the nation so that customers do not need individual accounts with different toll agencies. Some firms target support for commercial vehicles that travel nationwide. Other offerings target infrequent toll payers, and yet others are marrying smartphone Bluetooth and GPS technologies to geo-locate vehicles and thus identify tolls due.

The Oregon Toll System is intended to support as many of these services as reasonably possible as long as agreements with these entities serve the Oregon traveling public and/or make business sense for the State of Oregon. Customers of third parties will have accounts with an account

manager and will use those accounts to pay for tolls incurred on ODOT toll roads. ODOT will enter into an agreement with each third-party account manager to be supported, to allow that account manager to operate in the state and enroll customers. These companies do not charge ODOT for these services, but a specific agreement with each participating third-party account manager is necessary.

The Oregon Toll System would offer both transponder and license plate accounts to third-party account managers. The toll charged for transactions associated to these accounts will be the same as the Oregon Toll System would charge to customers with accounts directly with the Oregon Toll System. The third-party may charge varying fees based on their business paradigm and services offered, but the account manager must guarantee the payment of the toll to Oregon.

6.1.3.1 Possible Third Parties for Parking

As the cost of toll transponder readers comes down and the wide distribution of inexpensive transponders increases, it may become possible for parking garage operators to offer acceptance of Oregon Toll System transponders to pay for parking. Several airports in the United States provide this service today. One operational challenge is that parking rates at airports and major sporting venues or urban centers routinely can exceed $30 for a single day and can approach $100 if parked for several days. Business rules at the Oregon Toll System may need to be customized for these cases if interest in this service grows in the Portland area—for example, to limit use in parking garages to interoperable accounts with preauthorized credit cards.

6.1.3.2 Possible Third Parties for Mobile Payment

The mobile application for TriMet has a payment function for its passes that uses a secure mobile payment application. This is becoming increasingly common to access sources of funds approved for use in payment apps on mobile devices. If there were an interest or need for Oregon Toll System customers to use their account for mobile payments on their smartphone, then TriMet customers, gas customers, or fast-food customers could conceivably use their Oregon Toll System account to pay for any of those things. The technical and financial capability to cross-support these travel industries exist today and would be supported with the Oregon Toll System.

As with the use of Oregon Toll System transponders for parking payments, these services must be accompanied by business arrangements that protect the State of Oregon by covering costs and reasonably anticipated risks before valid transponder lists would be widely distributed across the Portland metropolitan region.

6.2 ACCOUNT PROCESSING ORDER OF PRECEDENCE

Vehicles may have multiple transponders and/or have an account with multiple services that are interoperable with the Oregon Toll System. To prevent a vehicle being charged multiple times for a given transaction, an order of precedence for toll transactions will need to be defined so that transactions from vehicles are only processed once, regardless of how many interoperable accounts the customer may have. One possible order of precedence might look like the following:

1. Valid account with Oregon transponder
2. Valid account with interoperable agency transponder
3. Valid account with interoperable third-party transponder
4. Valid account with Oregon license plate
5. Valid account with OReGO
6. Valid account with CCD license plate
7. Valid account with other interoperable agency license plate
8. Valid account with other interoperable third-party license plate
9. Valid license plate–based account in invoice status (in other words, the account has plate-based tolls on it that have not yet been paid. This is still a receivable.)
10. No valid account for license plate (has never been seen before by Oregon Toll System)

This is only an example, and there will likely be additional categories. Further, the order of precedence and associated rules for accepting account payments may change over time. For this reason, prioritization sequence and types of account to be accepted need to be configurable in the new system.

6.3 INTEROPERABLE DATA EXCHANGE PROCESS

The CBOS is responsible for exchanges of various types of data and files to support interoperable operations. The basis of toll interoperability lies on the foundation of agreed terms and conditions to accept another toll account as valid for payment. The interoperability terms commonly used are the following:

a. The "home" agency (agency where the vehicle has a registered account and perhaps a transponder) owns the toll account
b. The "away" agency (agency where the vehicle is recorded as driving) owns the transaction

As an example, if an Oregon Toll System driver uses a BreezeBy facility, Oregon is the "home" agency, and BreezeBy is the "away" agency. The sequence of general interoperable activities in the data exchange process is as follows:

1. Each toll home agency, including the Oregon Toll System CBOS as well as any interoperable account manager, maintains and distributes lists of valid transponders and license plates, from which the account manager is willing to guarantee payments to away agencies.
2. The away agency attempts to match a given vehicle with the valid transponder and license plate lists.

3. The away agency builds the transaction with the valid transponder or license plate and sends this transaction to the home agency.
4. The home and away agencies exchange correction and acknowledgement files back and forth until there is an agreed listing of accepted away transactions by both parties.
5. The home agencies post the interoperable transactions to their home accounts.
6. The agencies generate, correct, and acknowledge reconciliation files that inform the away agency of the disposition of transaction processing.
7. The interoperable agencies make financial settlements on a mutually accepted basis, which may be daily or weekly exchanges of payments or funds transfers between custodial accounts or simply net payments on the agreed-to intervals.

Detailed data exchange business rules and technical specifications will be created and agreed upon as each interoperability agreement is issued for the OTS. Foreseen data exchange partners include *Good To Go!*, BreezeBy, western regional hub, national hub, and countless possible third parties, as well as other internal ODOT partners such as CCD and the OReGO Program.

6.3.1 Washington Department of Transportation's *Good To Go!* System

The Oregon CBOS will be able to accept *Good To Go!* system as an interoperable home agency with valid accounts. The Oregon CBOS and *Good To Go!* system will maintain and update valid transponder and license plate files, as in Step 1 above, and exchange them with each other. Either agency can fill the role of home or away agency in the interoperability Steps 2 through 7 listed above.

6.3.2 Hood River Bridge and Bridge of the Gods BreezeBy Program

The Oregon CBOS will also be able to accept BreezeBy as an interoperable home agency with valid accounts and will maintain valid transponder and license plate files and exchange them with each other, outlined in Step 1 of the exchange process. Either agency can then fill the role of home or away agency in Steps 2 through 7 of the process. An especially close working relationship between the Oregon CBOS and BreezeBy with immediate transaction and valid file transfers as well as cross-reference checks with potential invoiced transactions may be warranted. Because of the proximity of Hood River and Portland, the region will likely have customers of both toll agencies regularly driving on the other's facilities. Having especially close operational coordination will minimize incorrect license plate toll invoicing or enforcement measures, which should be avoided at all costs to uphold customer service and aid in public acceptance of tolls.

6.3.3 Western Regional Hub

The Oregon Commercial Back-Office will be designed to accept all regional hub agencies as interoperable home agencies with valid accounts once the western regional hub becomes operational. The WRTOs are developing the regional hub to improve and simplify interoperable operations with provision of one location to send and receive transactions and status files. In this case, any of the participating western toll operators can fill the role of home or away agency in the data exchange Steps 2 through 7 listed above, subject to any specific requirements that participation in the regional hub may require.

When the western regional hub becomes operational, the Oregon Toll System will not need to maintain separate interfaces with BreezeBy and *Good To Go! systems*.

6.3.4 National Hub and California Toll Operators Committee Hub

There is also work being done to create a CTOC hub to support interoperability with all agencies in California and a national hub for interoperability with other tolling agencies across the nation. Both these efforts are in the planning stage. The Oregon Toll System will work with these agencies in California and nationally when work begins on designing and implementing these hubs.

6.3.5 Third Parties

Third-party account managers, which are private firms offering toll accounts for specific customer groups, will be supported as their services become available. These entities serve as home agencies in the interoperable process. The Oregon Toll System CBOS will function as the away agency in the conduct of Steps 2 through 7 in the data exchange process above. The third-party account managers will maintain and update valid license plate and transponder files and provide them to the Oregon Toll System. Third-party account managers do not operate their own toll facilities and therefore would never have the role of an away agency—they are only the home agency for their customers.

6.3.6 Commerce and Compliance Division

CCD plans to eventually allow their customers to use their weight/mile tax account to pay for tolls and will serve as home agency in the interoperable process. The Oregon Toll System CBOS will function as the away agency in the conduct of Steps 2 through 7 above. CCD will maintain and update valid license plate/transponder files and provide them to the Oregon Toll System. CCD does not operate its own toll facilities and so would never have the role of an away agency—it would only be the home agency for its customers.

6.3.7 OReGO Road Usage Charge

The CBOS will be able to accept the OReGO RUC account manager as an interoperable home agency with valid accounts as the Oregon Toll System matures. The OReGO account managers will maintain and update valid license plate/transponder files as in Step 1 of the data exchange process and

provide them to the Oregon Toll System once ready. The Oregon Toll System CBOS will then function as the away agency in the conduct of Steps 2 through 7.

The RUC account manager must guarantee toll payment to the Oregon Toll System if the RUC-validated license plate is seen in an Oregon toll transaction. This would be a condition of the interoperability agreement between the two parties.

In the future when full interoperability is achieved, RUC Account Managers that provide GPS–enabled devices can geo-fence toll zones and charge for tolls based on the same rate tables the Oregon Toll System uses. RUC account managers that have enrolled vehicles without GPS-enabled devices will still need to get transactional data from the Oregon Toll System as mentioned above, in an away agency capacity. When connected vehicles are on the road and the infrastructure is in place to support reporting, there will be no need for external devices.

6.4 INTEROPERABLE AGREEMENTS

To achieve interoperability, it is necessary for the Oregon Toll System to enter into agreements with the operators of the interoperable agencies or the hubs that support them. Those interoperable agreements will include terms and conditions to minimally cover transaction eligibility, account eligibility, and payment guarantees.

6.4.1 Transaction Eligibility

The interoperability agreement will need to specify whether compatibility with a given agency is achieved through transponder transactions, license plate transactions, or both, as ODOT may choose to enter with some partners with only certain transaction types. In certain cases, such as CCD and OReGO, account managers may not want to distribute transponders to their customers, so only license plate transactions may be supported. With private third parties, ODOT will need to decide whether they allow third parties to distribute their own transponders or get transponders from the Oregon Toll System.

6.4.2 Account Eligibility

Support of interoperability may also vary by account type. Specifically, some interoperability agreements may be supported only for prepaid accounts. All partners offer different types of accounts to their customers. Many U.S. toll agencies only offer prepaid (electronic wallet) accounts and thus may only be willing to interoperate with other prepaid accounts. For State of Oregon agencies (OReGO and CCD), ODOT may want to support interoperability with postpaid accounts, as OReGO and CCD offer postpaid accounts to their existing customers. For private third parties, this is not an issue, as they will be required to open an account with ODOT, which will be a prepaid account.

6.4.3 Payment Guarantees

Interoperability generally requires a payment guarantee from the home agency to the away agency. With interoperable toll agencies, this would be a reciprocal arrangement with a State of Oregon agency—Oregon will agree to pay them, and they will agree to pay Oregon. In the case of OReGO, ODOT will need to review existing contracts with account managers.

6.5 RECIPROCAL TOLL ENFORCEMENT

For vehicles with valid accounts in Oregon, the Oregon Toll System can and will assess fines and, in major cases when fines go unpaid, implement consequences such as vehicle registration holds. For vehicles registered outside of Oregon, the Oregon Toll System will send penalty notices to the registered vehicle owners, but Oregon has no authority to implement consequences (e.g., a registration hold) if the penalty notice goes unpaid unless there is an agreement with the given agency or state. Allowing any consequences, in particular registration holds, will require interagency agreements and, in most cases, rulemaking by legislatures. Because of proximity with Washington and tolling on IBR, Oregon is exploring implementing reciprocal toll enforcement with the State of Washington.

The Oregon Toll System will work with WSDOT to create a reciprocal toll enforcement agreement. Each state must be legislatively permitted and willing to enforce tolls on behalf of a neighboring state with reciprocal obligations. A conceptual reciprocal enforcement process would enforce tolls in the same manner as in-state tolls but with specific restrictions. The restrictions below are for informational purposes and will be refined in conjunction with Washington once the legislation is in place.

a. Toll operators will only work with the DMV (or equivalent) in their own state, with the interoperable toll operator in the other state, and with the violator residing in the other state. Toll operators will not engage directly with out-of-state DMVs.
b. Toll operators' business rules regarding enforcement will need to be identical for all customers regardless of the state of vehicle registration.
c. Each DMV will only engage with the toll operator in its own state and with vehicle owners within its own state. Each DMV's registration laws, statutes, or rules are identical for all its registered vehicles, regardless of where tolls were unpaid.
d. Toll legislation in each participating state will allow DMVs to hold vehicle registrations on behalf of other state's toll operators, in exchange for the same reciprocal service.
e. The two DMVs and the two toll agencies will execute an agreement.

The general steps in the process are depicted in **Figure 5** with the example of a vehicle with Washington license plates, using Oregon toll facilities but not paying tolls. The reciprocal process would work similarly for an Oregon-licensed vehicle violating in Washington.

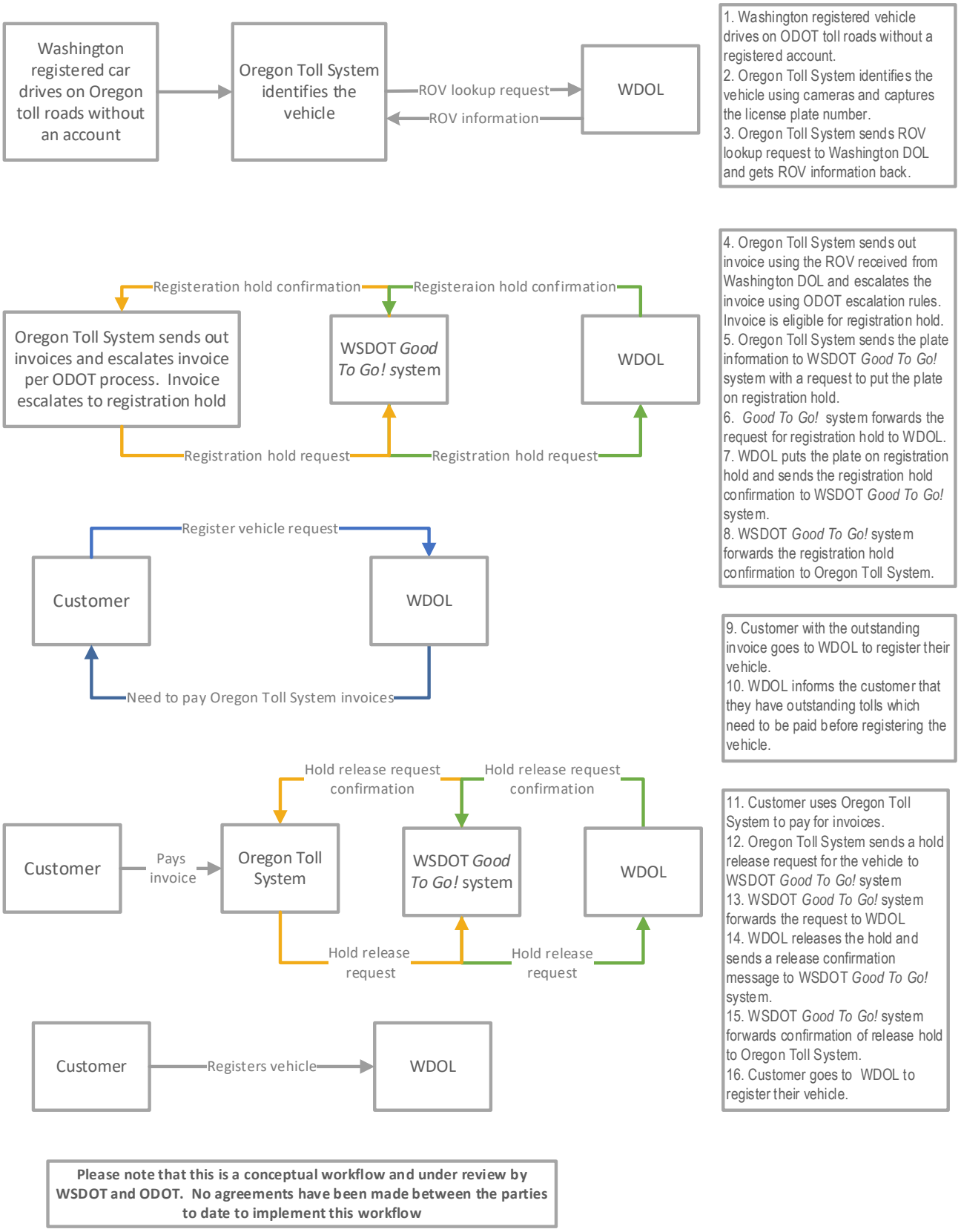

Figure 5 Example Reciprocal Toll Enforcement Process

7 PROPOSED SYSTEM ARCHITECTURE

The operational goal is to provide reasonably easy and cost-effective means for nearly 100 percent of drivers on the tolled interstate sections to pay a toll, including for those drivers who may be unfamiliar with the route and unaware in advance that tolls will be required.

All Oregon Toll System customers, except those that are exempt, will be required to pay a toll if they drive through a toll zone. There will be toll signs to display toll rates.

The Oregon Toll System will use an open architecture to support tolling and interfaces to other functions/systems. The architecture will define the system functionality and subsystems without specific hardware or software solutions, to account for the evolution of technology over time. This will allow for support of 1) multiple data collection devices such as roadside lane systems, 2) mileage reporting devices such as onboard devices and GPS, and 3) multiple account managers.

Figure 6 identifies the relationship of functional building blocks and interfaces with interoperable toll entities and with service providers.

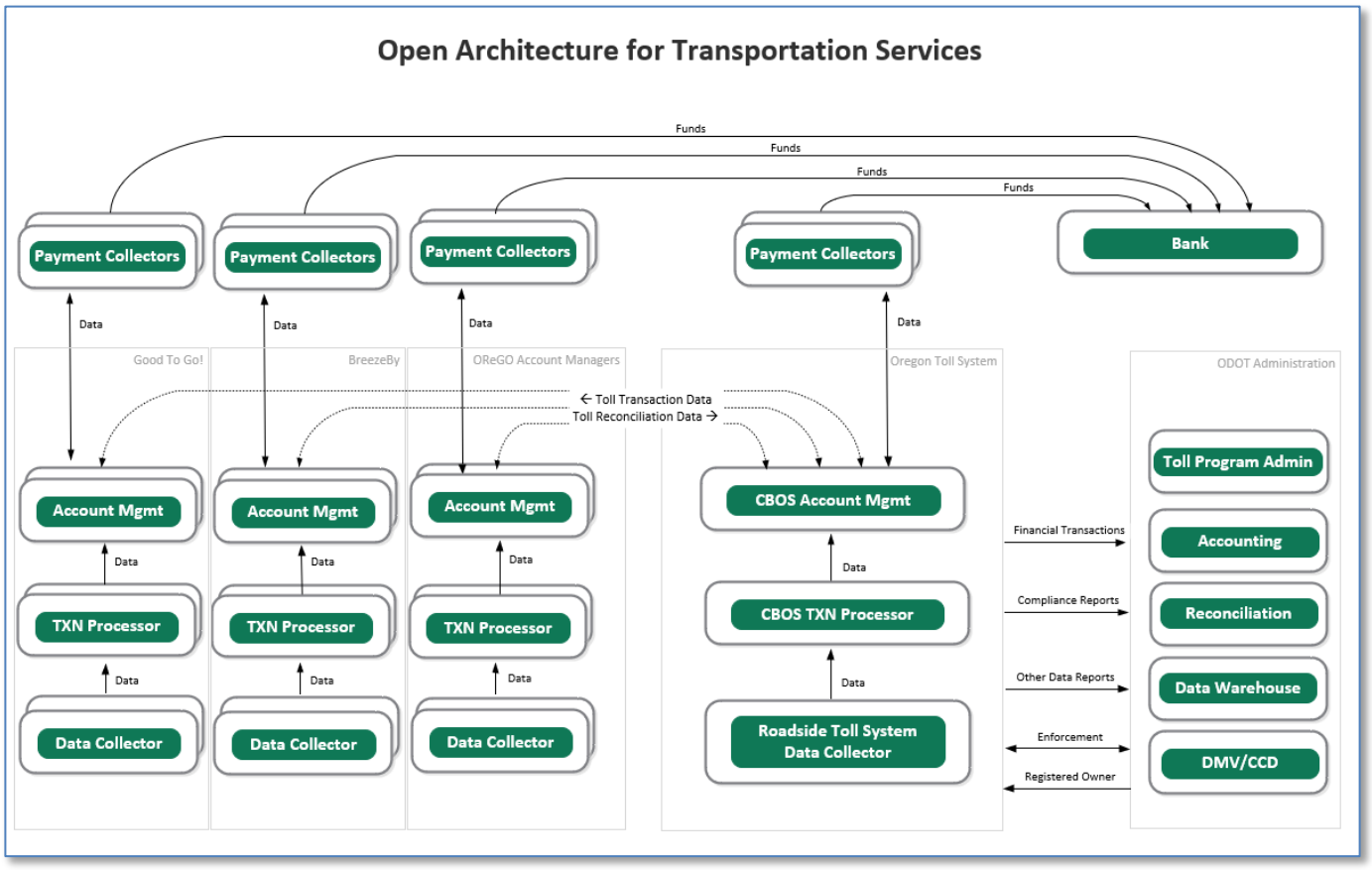

Figure 6 System Interoperability Architecture

7.1 ROADSIDE TOLL SYSTEM

The RTS is broken down into two main parts: vehicle detection and OBO. For this ConOps, vehicle detection is further broken down into two categories: technology on the vehicle and technology on the roadside. The RTS is also responsible for managing the physical equipment necessary to maintain the Oregon Toll System, including gantry facilities.

7.1.1 Vehicle Detection System – Vehicle

The Oregon Toll System will identify vehicles using two methods upon Go Live. These will include ETC toll transponders and license plate reads. The Oregon Toll System will have the ability to incorporate other technologies in the future.

7.1.1.1 Electronic Toll Collection Transponders

The ETC transponders are currently the most cost-effective and customer-friendly device for nonstop vehicle identification. The RTS will read transponders from most major toll operators in the United States but will issue transponders using the same standard as all WRTOs: the 6C protocol. This transponder is designed to be mounted directly to the windshield to use the glass of the windshield for signal amplification. Purchase costs are so low (under $1 each) that toll operators can provide transponders for free or minimal cost, and inventory and handling costs are very low because of minimal storage requirements and ease of mailing—even to infrequent customers detected by license plate.

Figure 7 shows an example of a sticker transponder from North Carolina.

Figure 7 Sticker-Mounted Transponder

Exterior 6C transponders, typically mounted above the front license plate, are available for vehicles with interfering windshields such as metallized windshields that do not provide a cutout for transponder placement. Tag technology also includes exterior-mounted sticker tags that can be mounted on headlights or other discrete locations.

The "6C coalition" of toll operators using this transponder technology has already developed many of the configurable data standards needed for interoperability. In addition to North Carolina and many other Eastern/Midwest agencies, WRTOs using the 6C standard include:

a. WSDOT
b. Port of Hood River
c. California Toll Operators:
d. Bay Area Toll Authority (BATA)
e. Transportation Corridor Agencies
f. California Department of Transportation (Caltrans)
g. Golden Gate Bridge, Highway and Transportation District
h. Los Angeles County Metropolitan Transportation Authority (Metro)

i. Orange County Transportation Authority
j. Riverside County Transportation Commission (RCTC)
k. San Diego Association of Governments (SANDAG)
l. Santa Clara Valley Transportation Authority (VTA)
m. South Bay Expressway, LLC (SBX)
n. Sunol SMART Carpool Lanes Joint Powers Authority (Sunol JPA)
o. San Francisco County Transportation Authority (SFCTA)
p. San Bernardino Associated Governments (SANBAG)
q. Los Angeles World Airports
r. Colorado E-470
s. Utah Department of Transportation (UDOT)

The 6C ETC transponder standard is also available in a hard case, which is a little smaller than a deck of cards. Hard-case transponder inventory and handling is much more expensive than that for sticker transponders, so they have not been as commonly used.

7.1.1.2 License Plates

The license plate remains the only involuntary means of vehicle identification as of the writing of this ConOps. Rapid advances in camera and image interpretation technology have made the use of license plate images a viable backup source of vehicle identification.

The large number of license plate backgrounds and color combinations challenge camera technology to read characters with great accuracy. **Figure 8** shows the variety of Oregon standard license plates. An even wider range of colors and patterns may be seen with license plates from other states. Therefore, license plate review and verification steps are necessary as part of the OBO

Figure 8 Oregon License Plates

7.1.1.3 Other Electronic Devices

Embedded Vehicle to Anything ("V2X") technologies or Bluetooth phone-based technologies are in its infancy phase and not deployed on an adequate scale to be considered a primary source of identification data for Go Live on the Oregon Toll System. V2X, using either cell phone radio technology or the 5.9 gigahertz C-V2X standard, may become widely available and accessible to use as an identification link for toll accounts in the future. Likewise, the Oregon Toll System will not initially be able to read the current RUC on-board telematics devices, but future use may be similar

to that of V2X. These technologies may also be used as a secondary source of identification to aid the integrator in building specific vehicle profiles. The Oregon Toll System will be designed with flexibility to add data from these sources in the future in the transaction message and transaction processing architecture.

7.1.2 Vehicle Detection System – Roadside

The roadside technology includes all the sensors, cameras, controllers, and servers required to detect, classify, and report on the vehicle; to capture license plate images and process them; to read transponders; and to correlate all the collected data to build a toll transaction data message. The RTS performs ongoing checks of captured data and internal operations to look for data duplications or omissions and to verify the proper function of all the supporting subsystems. Every toll zone will have identical hardware and software, configured with identical connectivity and settings to ensure redundancy to the greatest extent possible.

The ODOT system will use overhead sensors such as lasers, light detection and ranging (LiDAR), and optical and video processors to analyze the vehicle and perform volumetric calculations such as length, width, and height. In conjunction with being used for the classification of vehicles, these devices can and frequently perform a dual role and serve as a trigger mechanism for imaging systems, such as plate detection region of interest and optical character recognition (OCR) systems.

7.1.2.1 Overhead Sensors

The vehicle detection system detects a vehicle's presence and vehicle classification with a range of possible devices. Many system designs include overhead sensors as called out in **Figure 9**. Sensors that use LiDAR or other infrared sensors detect the beginning, height, and end of vehicles. The devices are also used to trigger license plate cameras, detailing the precise beginning and end of a time interval when a vehicle is in the toll zone. Overhead sensors may also provide other classification data such as the detection of commercial trailers.

The vehicle detection system for Oregon Toll System will be configured to classify vehicles (including trailers, towed objects, etc.) into three size categories: small, medium, and large. The OTC will set the classification and toll rate structure for the different sizes. The vehicle detection system will be required to classify vehicle size in a consistent manner for both in-state and out-of-state vehicles.

7.1.2.2 License Plate Cameras and Systems

The Oregon Toll System will use license plate image capture as an integral part of the toll system. High-speed cameras, shown in **Figure 10**, will capture images of front and rear license plates of all vehicles passing through toll zones. Photos provided are only for example purposes and do not constitute recommendations of any vendor selection or mounting design.

License plate images are needed when one of the following is true:

a. The vehicle is on a toll account, but the transponder is not read because of technical or user error.
b. The vehicle is on a toll account, but according to account holder preference, the account holder does not use a transponder.
c. The vehicle is not on a toll account.

The system will capture front and rear license plate images of each vehicle. Capturing both front and rear images typically provides a higher likelihood of capturing a "billable" license plate.

The terms optical character recognition , automated numeric plate recognition, and automatic license plate recognition (ALPR) are all somewhat interchangeable and refer to machine-reading of license plates. This ConOps uses the term ALPR. ALPR can be performed by the camera, at the roadside zone controller, at the roadside host, or a combination of the above.

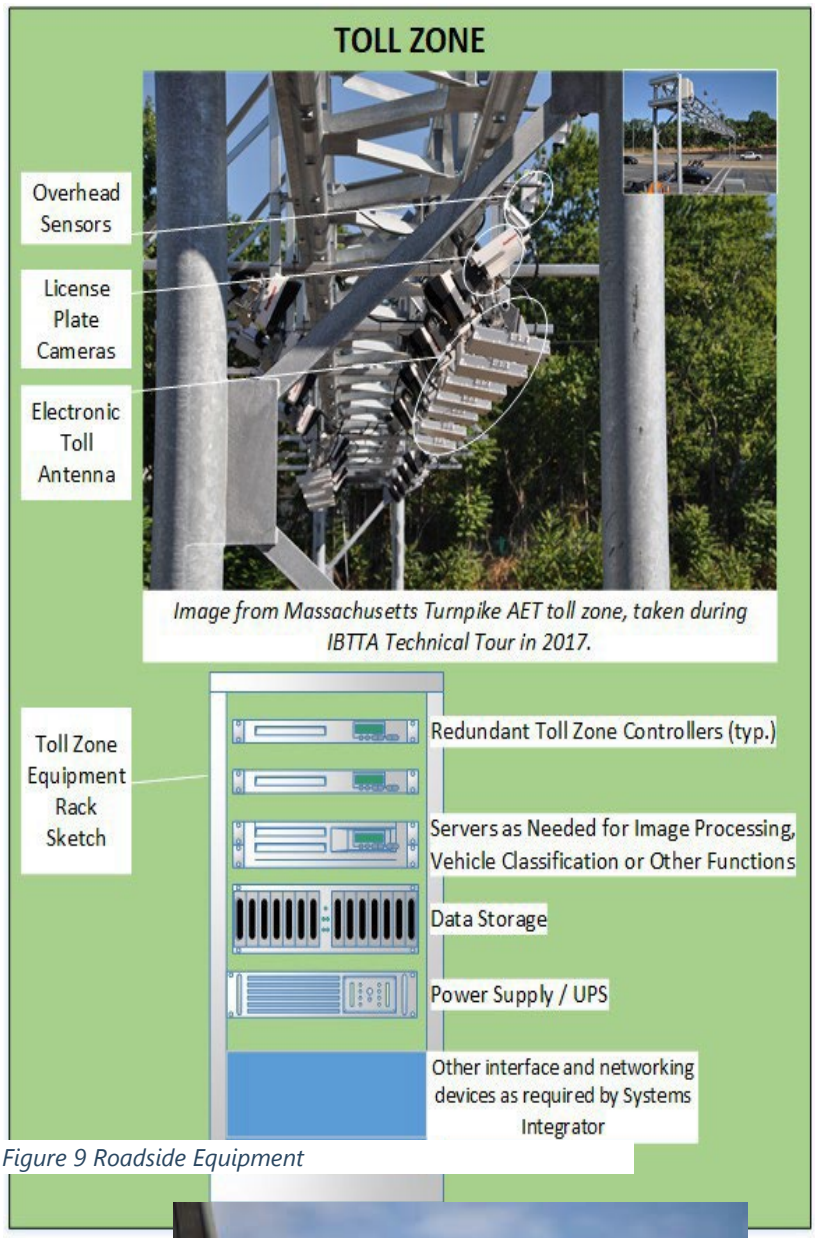

Figure 9 Roadside Equipment

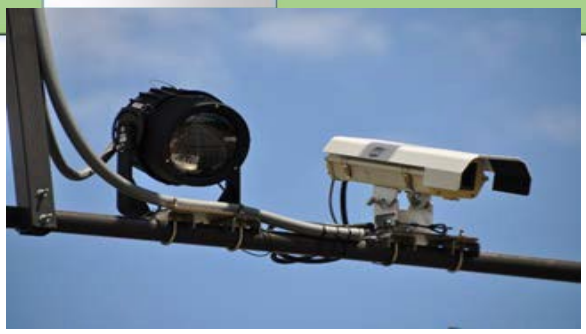

Figure 10 High-Speed Cameras

Vehicle detection systems provide metadata on the performance of these analyses with "confidence levels" typically on scales from 1 to 100 or 1 to 1,000. These are indicators of the system's ability to verify the accuracy of the license plate output data. After extensive initial testing and calibration of the system with the majority of license plate types normally seen in the region, the system operators can select configurable confidence level settings above which human review is not needed to meet accuracy and performance requirements. The system in the toll zone will provide an initial confidence level with the ALPR data.

The camera and ALPR system will generate the license plate data to be inserted in every toll zone transaction message. The system will transmit the images to the Operational Back-Office System (OBOS) for retrieval if human review is needed. The CBOS will also have access to the license plate images to aid with customer inquiries and dispute claims. Images may be stored separately from the transaction message and file but must be mapped to the transaction message.

Figure 11 TITAN-brand Toll Reader from STAR Systems

7.1.2.3 Digital Video Auditing System

The digital video auditing system located on all toll gantries will employ closed-circuit television (CCTV) cameras to monitor traffic and provide a backup tool to audit and confirm data. CCTV cameras will be installed with a field of view at an angle to be able to observe traffic across the roadway both upstream and downstream. These cameras may also be used to capture overview images to verify vehicle classification and will be included in the transaction message.

A camera will also be located to observe the toll zone cabinets and/or technical shelter, for security and anti-vandalism purposes. CCTV recordings are only held temporarily for audit purposes and are not retained for permanent records. However, overview images will be retained for the same duration as the transaction.

7.1.2.4 Electronic Toll Collection Readers and Antennae

The reader is an electronic device that generates and accepts data signals from the antenna over the roadway. The antenna is tuned to the frequency range of the transponders to be read and calibrated to the proper signal strength and direction, such that only vehicles in the toll zone are detected and only toll transponder signal data is used. The reader shown in **Figure 11** is an example of one reader on the market today but is not an endorsement or recommendation.

The readers and transponders in use in the United States today operate in the 915-megahertz band range at a very low power level—adequate to detect a transponder roughly 15 to 20 feet away. Technology vendors must conduct site surveys for ambient radio frequency signals before they finalize design of their lane installations to ensure reliable function at low power levels. This technology has been tested and used across the U.S. in one of several protocols and forms since

1989. When installed, configured, and tested properly, the technology operates with high reliability with vehicle speeds over 100 miles per hour even though at that speed, the vehicle is only in the read zone for approximately 100 to 150 milliseconds.

The Oregon Toll System will use one of the available triple-protocol readers. The Oregon Toll System will be optimized to read 6C transponders primarily but will be capable of reading and reporting up to three protocols. ODOT is interested in evolving its system to use the V2X-based fee collection system based on the Society of Automotive Engineers' Standard J3217, which was adopted in 2022. The J3217 documentation includes the concept of operations, reference system architecture, user needs, AND system functional and performance requirements, among other things for the standard. It was designed to enable V2X-based tolling and other financial transactions. ODOT will continue to monitor the market for adoption of the Society of Automotive Engineers' Standard J2317 and plan for possibly adoption in the future.

7.1.2.5 Zone Controllers

The toll zone controller(s) are the intelligent units that correlate all the data from all lane devices and sensor sources to the correct vehicle. The lane controller will assemble all the data into a single data file (with a reference to image files). This data file is the transaction message.

Current typical configurations provided by most vendors include a primary and backup server to perform this task. Zone controllers are typically commercially available ruggedized servers. The designers place emphasis on reliability and uptime to minimize loss of data, so the hardware is designed for harsh field conditions. The operating systems and applications are designed to be very resilient, capable of operating many devices simultaneously and quickly.

Zone controllers also monitor diagnostic data from all the devices in the lanes and may also monitor toll zone equipment such as the back-up generator and uninterruptible power supply (UPS) status. Depending on vendor design, the system will provide ongoing diagnostic data to be monitored by toll operations staff as well as the RTSI.

7.1.3 Operational Back-Office System

The OBOS will be physically located at a site mutually agreed upon by the RTSI and ODOT. It is anticipated this will be co-located either with the RTSI's maintenance facility or other leased office space near the I-205 Toll Project, which will be the first section of highway to be tolled. The OBOS maintenance facility will be the on-site center for system maintenance management and asset management.

Building leases for the OBOS will be negotiated by the RTSI, acting as agents on behalf of ODOT, with leases signed and approved by ODOT. The OBOS will function as the system maintenance center, where spares and tools would be kept in inventory. Any RTSI vehicles such as service vans would be stored at this location.

The OBOS applications described below may be hosted on site with a RTSI-provided system, or may be supported remotely, but the system will maintain ongoing records and updates to all transactions and reports on an on-site server. OBOS functionality is provided in terms of the data inputs,

processes, data outputs and reports. These are only high-level descriptions of the functions required and will be developed in more detail during the procurement and design process. Also, depending on procurement design and the RTSI's solution, the order and breakdown of OBOS functions may vary; for example, transponder validation against Oregon and interoperable toll accounts will probably be performed before human image reviews are conducted.

7.1.3.1 Image Review and Verification

The OBOS receives the following data to verify the accuracy of the license plate read in the toll zone:

a. Images, data, and confidence level from the transaction message
b. Vehicle transaction information such as vehicle size classification
c. Other transaction data related to system operations
d. Synchronized overview video clip and images if needed to verify classification

Based on RTS design, preset and configurable confidence levels, and business rules for acceptance of images, the system may send the images to a queue for human review. For example, if a transaction does not contain a valid transponder number, the image will have to be used for billing; if the license plate number is previously unseen, the confidence level is inadequate for billing purposes, or if the additional image-based transaction would trigger a serious penalty, a human review may be required for confirmation. If the system cannot report a license plate number because it was missing or obscured, this would be reviewed also. The associated confidence levels and disposition will be included in the transaction information provided to the OBOS vendor.

If the transaction's license plate number must be changed, the human operator will amend the original transaction with the new license plate number. The system will record a reason code provided by the human operator if the license plate image must be modified or discarded, such as for a missing license plate, a plate blocked by dirt, a trailer hitch, open pickup tailgate, or other reasons.

In addition to the amended transactions, the system will provide aggregate image transaction disposition reports for each selected time period (such as every 24 hours), the total number of license plate transactions processed, the counts of confidence levels in several ranges above and below the acceptable threshold, and count and locations of discarded transactions and reason codes. To enable troubleshooting, the system will enable searches of this data by location and lane as well as by time.

The OBOS will also review vehicle classification for edge case vehicles or vehicle classification conflicts as defined during the design process. These vehicles will be identified during the design phase, during soft opening, and during operations. Confidence levels will also be assigned to classification where any vehicle classification that does not reach a defined threshold, a previous transaction profile, or where incomplete data is received from the lane system will be flagged for manual review. The RTSI team may use overview images provided as part of the transaction to verify and update classification.

The RTSI and OBO systems will provide fully formed transactions including reviewed images (as required) to the CBOS system.

7.1.3.2 Trip Building

The first I-205 Toll Project, including the Abernethy and Tualatin River Bridges, will use "point transactions" where each transaction for a toll zone is considered an individual transaction. Future toll projects, including RMPP, will have more than one toll zone. The system will be configured to consolidate multiple point transactions into a trip transaction. Trip transactions may be used to simply bundle several low-value point transactions into a manageable trip value. Some interoperable partners charge a fee based on the number of transactions or use trip-building for special toll pricing business rules.

The processes for building trips out of point transactions require planning and business rules for implementation, such as maximum time allowed between transaction points, directional limitations, or other restrictions. There will also be processing rules; for example, if a transponder read is missing from a toll zone between two other ones where it was read, the middle read may or may not be presumed to have just been missed. In some cases, transaction matching will also be performed by license plate, which is why all transactions contain license plate data, even if the transponder number is validated.

The trip transaction will contain point transaction data or links to all the point transactions including plate and overview images. Customer service representatives in the CSC call center or in-person center need to be able to see how trip transactions are compiled so they can field questions from drivers. This occurs most often with customers without valid accounts, and so the license plate images and overview images from the point transactions will have to be accessible, also at both the OBO and CBOS.

7.1.3.3 Trip Message

The zone controller will store input data, transactions as completed, and diagnostic data to allow adequate time for the RTS operator to restore operations and recover all data stored in the field in the event of an outage. This duration is typically 30 to 90 days.

The RTS vendor will specify the exact format of the transaction message and provide its detailed specifications during the design process. Minimum required transaction data from the toll zone will include the information shown in **Figure 12**.

Neither the RTS nor the CBOS ever delete existing toll transaction data as the transaction messages work their way through the system. The data fields will be amended or supplemented, but original data from the lane controller will always be maintained. The zone controller will assign file names or other markers to the image files related to each toll transaction. The Vehicle Detection System will transmit all transactions and diagnostic messages to the OBO.

For each point toll:

a. Unique point-of-transaction number
b. Date of transaction creation
c. Time of transaction creation
d. Location of transaction creation (toll zone identifier, direction, and lane)
e. Vehicle classification
f. Vehicle front license plate alphanumeric string
g. Vehicle front license plate read confidence level
h. Vehicle rear license plate alphanumeric string
i. Vehicle rear license plate read confidence level
j. Vehicle transponder data, if detected (which should include type of transponder, issuer, number, and may include vehicle class as assigned to the transponder as well as other data)
k. Second vehicle transponder data, if detected at the same time in same vehicle as first transponder (which may include type of transponder, issuer, number, and other data)
l. System health indicators

Figure 12 Potential Transaction Message Data

7.1.3.4 Operations Performance Management

The RTSI will also be tasked with designing and developing a Maintenance and Operation Management System as part of the OBO that will be used to:

a. Track toll system inventory and assets
b. Provide a ticketing system for incidents as well as predictive and preventative maintenance schedulers
c. Provide dashboards and reports for performance reporting, both historical and near real time reporting
d. Include the ability to view and review transactions and messages as well as diagnostic messages for both historical and near real-time monitoring, including plate and overview images
e. Provide reporting tools that can be used to evaluate system performance, operational performance, and data exchanges

7.2 COMMERCIAL BACK-OFFICE SYSTEM

Whereas the RTS's toll-zone detection systems and the OBO are somewhat self-contained entities that work primarily with each other and with the CBOS only, the CBOS interfaces with many interoperable partners (**Figure 13**) to exchange transactions and files.

The CBOS will maintain many external interfaces with other agencies and service providers to support customer service. Service providers and vendors will be added over time, so the CBOS will apply standard APIs in interface control documents to manage toll system interfaces and provide the capability to add new functions and service providers.

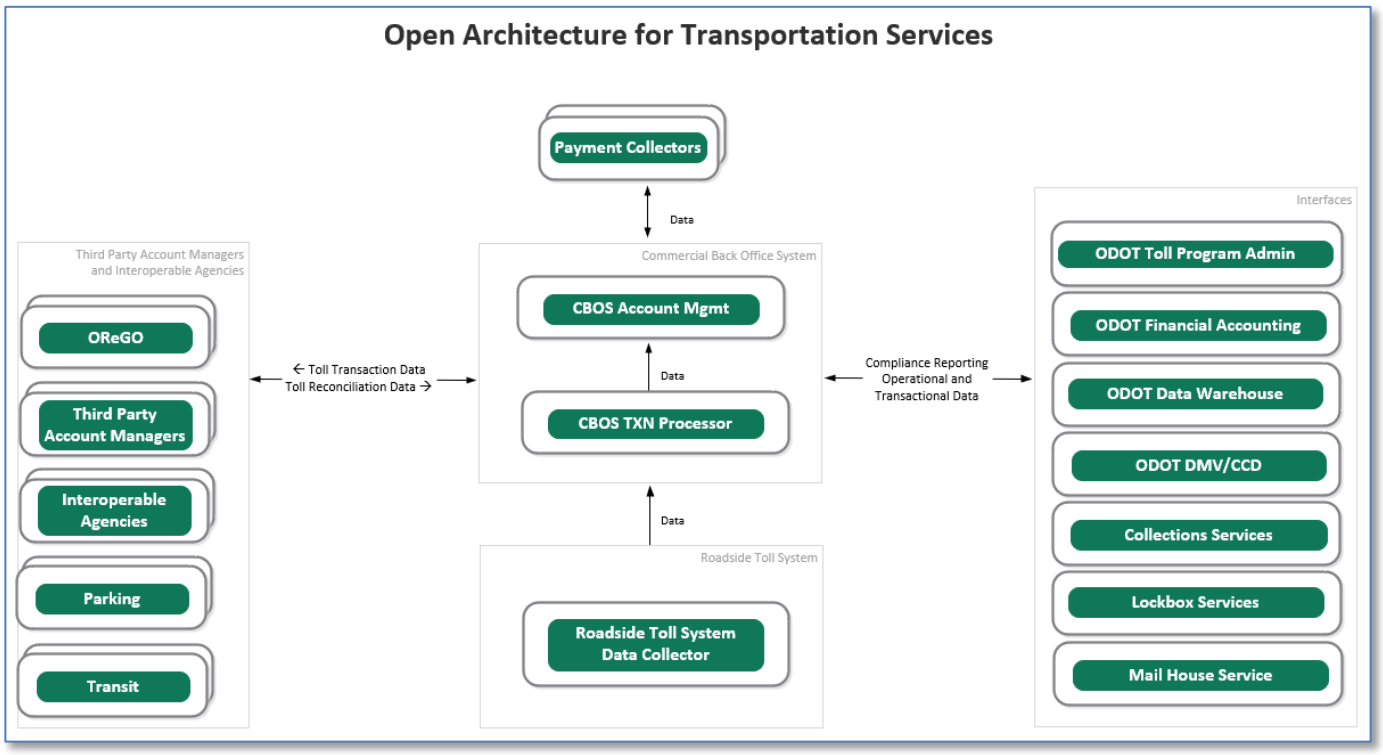

Figure 13 Commercial Back-Office System Overview

CBOS software may be hosted on-site by the CBOS TSI or may be hosted in the cloud on web services platforms. Cloud-based services are becoming increasingly popular to eliminate development and maintenance of large IT systems, provide increased personally identifiable information (PII) resiliency, and meet payment card industry (PCI) requirements to mask payment card information.

7.2.1 Transaction Processing System

The Transaction Processing System within the CBOS receives data from all data collectors and interfaces with all interoperable account managers. It is assumed that all third-party interoperable

agencies and private entities will guarantee payments for trips/transactions assigned to them. The data processing within the CBOS is responsible for:

a. Sending Oregon toll account information to interoperable agencies
b. Receiving account information from all partners (internal and external)
c. Receiving data from all sources (data collectors) and interfacing with all account managers (internal and external) to assign trips/transactions
d. Receiving trips from interoperable agencies and posting them to Oregon toll accounts precedence of transactions
e. Invoicing trips as needed

7.2.1.1 Receive Trip Message and Calculate Charges

The Transaction Processing System receives the raw data from the data collectors in the form of a trip message. This data is validated and stored within the CBOS. The data in the trip message includes information about the vehicle passing through the toll zone such as the date, time, and location, the vehicle classification, plate numbers and transponder data (if detected). This information is used to calculate the charges owed for the toll. The Transaction Processing System posts these charges to the appropriate account or sends the transactions along to a third-party partner or account manager for collection.

7.2.1.2 Oregon Toll Account Information to Interoperable Partners

An expectation of any interoperable partner with the Oregon Toll System is to manage and distribute lists of valid transponders and license plates from all active accounts the system maintains. This aids ODOT in identifying the toll customer responsible for the toll. Oregon must also provide this information to partner toll agencies for their processing needs of Oregon Toll System active accounts. Creation, maintenance, and distribution of Oregon's lists is a responsibility of the Transaction Processing System.

7.2.1.3 Trip Information Exchange

Once a toll agency identifies the correct account the toll gets assigned to, a process of data communication exchange begins using API interfaces shown in the system architecture. These interfaces send many data points necessary for agencies to post tolls for payment, including vehicle IDs, transponder information, transaction point data, license plate information and images, read confidence levels, and total toll calculations. Detailed requirements and technical specifications of API interfaces will be developed later in the project. Further details regarding the data exchange process and the expected interoperable partners involved can be found in Sections 6.3 Interoperable Data Exchange Process and 7.2.2 Interfaces.

7.2.1.4 Reconciliation

The interoperable agencies make financial settlements on a mutually accepted basis, which may be either daily or weekly exchanges of payments or funds transfers between custodial accounts or simply net payments on the agreed-to intervals.

7.2.2 Interfaces

The following identify some macrolevel service interfaces required to support the Oregon Toll System. Additional interfaces are expected and will continue to be added or deleted based on the evolution of the Oregon Toll System.

Detailed requirements and technical specifications of API interfaces will be developed later in the project. Further details regarding the data exchange process and the expected interoperable partners involved can be found in Section 6.3 Interoperable Data Exchange.

7.2.2.1 Oregon DMV and CCD

The CBOS will regularly send requests to the Oregon DMV and CCD for license plate lookups. CBOS will also use this interface to identify vehicles with unpaid tolls that exceed a configurable age or amount to enable DMV and/or CCD to place a hold on the vehicle's registration until the toll is paid. If the Oregon state legislature authorizes reciprocal toll enforcement, the Oregon DMV will also provide registration holds and releases on behalf of participating reciprocal toll operators.

7.2.2.2 ODOT Data Warehouse

The CBOS will make records of all non-PII and non-PCI information available for ingestion into an ODOT cloud-based data lake for system archival purposes. It will also provide data lakehouse functionality to enhance ODOT's traffic analytics and be the core component of the data fabric that will support analysis related to travel patterns, changes in behavior, and vehicle usage. Design collaboration and data integration coordination with respect to the data architecture of ODOT's cloud-based enterprise data fabric will be needed to ensure proactive and scalable data security and privacy protections while enabling automated data flows between systems. The CBOS will be configured to ensure that PII and PCI-sensitive information will not be improperly stored or shared.

7.2.2.3 Payment Processors

The payment processors clearinghouse provides payment validation services to the CBOS. This may include credit cards, ACH payment, and cash payment networks. This is the financial portal to funds from the credit cards/ACH provided by customers. ODOT will select one or more cash payment network operators in conjunction with the CBOS TSI. Automatic replenishments with credit cards and ACH are replenished when balances drop below the minimum balance threshold.

7.2.2.4 Custodial Accountholders and the Oregon State Treasury

Ultimately, all revenues collected by the Oregon Toll System will be deposited to the Toll Program Fund. Common practice for toll operations is for the system to employ a custodian account for day-to-day deposits and settlements with interoperable agencies and other parties. This will need to be coordinated through the Financial Services Branch of ODOT.

7.3 CUSTOMER SERVICE CENTER (CSC)

7.3.1 Customer Relationship Management Software

Customer relationship management (CRM) is the main hub of the system. CRM software, either commercially available packages or custom-developed software on commercial databases, manages the toll accounts and includes basic functions such as:

a. Account creation with name and demographics, license plate number, and vehicle description
b. Account addition and issuance of transponders
c. Account modifications and/or additions to names, license plates and vehicles (including temporary license plates for rental vehicles or loaners)
d. Account payment setup and modifications (replenishment sources)
e. Account payment terms (selection of auto-replenish, prepaid minimum balances and replenishment thresholds)
f. Account status changes – primarily, when vehicle without a valid account or invoice-status accounts are paid up and the account holder wants to convert the account to a standard Oregon Toll System account or some other valid account choice
g. Account inquiries – most often for customers without valid accounts making their initial response to invoices received in the mail, but also for other perceived errors in tolls or fees, or simply for detailed statements or clarifications
h. Account closing

The CRM software will support access to these services and more, including self-service options where possible. Customer Service Representatives (CSRs) for the Oregon Toll System will access the CRM software daily and use its functionality to perform customer support duties.

Account business rules and changes to those rules impact CRM more than any other subsystem, thus requiring the software to be highly configurable. CRM software or associated routines will manage applications of account features such as toll rates and discounts as may be directed by OTC, how fees and fines are determined, and where account status and the transponder and license plate validation files are built for Oregon Toll System customers. All account records and histories will be maintained by the CRM software and the commercial database and will be configured to maintain PCI security standards with tokenized card numbers and restrictions to data access.

7.3.1.1 Web Host

The CRM software will provide account data via a web portal provided by the CBOS TSI. Oregon Toll System account holders will be able to apply for accounts, maintain their accounts, retrieve statements, see account histories, and request account closures on the web portal. CSRs will also log in to the web portal to perform service duties.

7.3.1.2 Reporting

CBOS will provide a robust data reporting solution for a multitude of purposes. One purpose is to provide CRM activity reporting to measure volumes of calls, volumes of posted transactions, and volumes of interoperable transactions successfully posted. Another is transaction disposition reports that track billable transactions as they are received from the RTS, or from interoperable partners, and through to final disposition. Volumes of other activities, such as numbers of accounts of every type created, closed, or converted, transponders issued, transponders sold by third parties, pieces of mail sent out, and credit card successes and declines, all are reported on a regular basis.

Financial reports will also be provided by the CBOS using either commercial financial software or financial modules of larger packages. These will be developed with an account and subaccount structure yet to be determined in conjunction with ODOT's chart of accounts. Reports will include information on recognized revenues by account type and special categorization of revenue recognition for license plate tolls on accounts that are not valid. There will be reports on accounts and values of receivables which are 30, 60, or 90 days out. Finally, financial reports will document all settlements and movements of funds between the Oregon Toll System custodial accounts, interoperable parties, and the Oregon State Treasury.

The CBOS TSI scope of services also includes full support for the State of Oregon to independently conduct system and organization control Type 2 process audits and thus will provide any and all reports necessary for these audits. Process audits will include oversight over uses of funds and compliance with regulatory and statutory requirements, as well as ODOT rules and procedures. Process audits will also ensure compliance with measures needed to protect PII. The Oregon Toll System will also be completely open for financial audits of all expenditures and the recording and accounting of those expenditures, as well as for movements of funds between accounts within Oregon and in the reconciliation and settlement process.

7.3.1.3 Customer-Facing Website

In addition, the overall Oregon Toll System web presence will include information about the corridors with tolls on them, what toll rates and usage instructions are, and how to pay tolls if the driver was an unintending customer without a valid account. This mobile-friendly website will allow toll customers to manage their accounts and view statements. They can also replenish their accounts and make payments.

7.3.1.4 Mobile Application

In the future, it would be desirable to have one mobile application for all transportation-related services with customers having a choice about who provides that application. For example, if someone rarely drives in a toll zone but has an OReGO account, then having the OreGO account manager application providing toll information would be preferable.

7.3.2 Customer Service Operations

7.3.2.1 Call Center

The CSC will provide a call center with CSRs to assist with account set-ups and other typical issues. The call center will be established with an interactive voice response (IVR) system to triage calls and route them either to automated systems for typical requests or to CSRs when requested.

The call center and its CSRs will represent the Oregon Toll System, and by extension, ODOT, to the motoring public using Oregon toll facilities. CSRs will be trained for this project and their performance will be closely monitored for key performance indicators. The call center system will be driven by the CRM application software with access to account information as needed by the CSR. Requirements with respect to the physical location of the call center will be determined during the system procurement process, as will limitations or possibilities of work-from-home routines during emergency conditions, such as were experienced during the coronavirus pandemic in 2020.

7.3.2.2 In-Person Center and Third-Party Payment Channels

The CSC may include an in-person center or storefront at a location to be determined in the general vicinity of the projects with easy access by car or in person. In-person centers are most useful for account initiations and when customers become confused or challenged by account operations and need assistance. In-person center(s) will not accept cash for payment but will accept payments by debit cards and phone applications, such as Cash App, as well as by credit card. The in-person centers will also accept payments by ACH and by check.

To provide even more retail access in more places, particularly for customers who will regularly need to pay tolls in cash, cash apps and arrangements will be explored with cash payment venues such as Western Union or CheckFreePay. These cash payment venues have convenient locations in groceries and other retail outlets. Provision of multiple payment channels, including kiosks, online, mobile, as well as other more traditional channels, will be important.

7.3.2.3 Transponder Retailers

The CBOS TSI will also seek arrangements with distribution of transponder sales packets to local retail outlets, convenience stores, gas stations, or even pharmacies. This approach is widely used in states that offer sticker transponders, as the sales packets are not much larger than prepaid store cards hanging on displays. This is where the size and convenience of the sticker transponders are very advantageous.

The Oregon Toll System will promote advance retail transponder distribution and advertise to encourage customers to open their own accounts over the phone or on the web. It is anticipated that a robust, but customer friendly, mobile application will aid in managing the surge in customer activity in the 2 to 3 months preceding the Go Live date of tolls and the immediate weeks and months after Go Live.

The system could support the sale of transponders for cash customers that are not tied to a normal personal account and may be maintained by cash payments.

7.3.2.4 Transponder Vendors

The Oregon Toll System will provide transponders from one or more sources, including the ETC technology provider used in the RTSI contract, or other vendors. The Oregon Toll System will be able to bid out for periodic restocking of transponders from several vendors, through the CBOS TSI, or separately if needed.

7.3.2.5 Other Future Vendors and Third-Party Account Managers

The CBOS will periodically engage various vendors or resources for specific services and contract periods that will regularly expire and then require renewal or replacement. These can be for any range of specific services needed to support CBOS operations, for example to retain a retail packaging firm to stuff sticker transponders in mailers with instruction packets.

7.4 TECHNICAL CONSIDERATIONS

7.4.1 Data Storage

The toll zone stores all the data on-site for a configurable period of time, usually 30 to 90 days, to be determined by ODOT and as approved through the system design process.

The purpose of the data storage is redundancy. If a communications outage were to happen (for example, if the roadside fiber communications lines were cut during an excavation accident) transaction data could be retrieved by service technicians using approved media, whether a laptop or a portable drive. Ideally, the system will consistently check for connectivity and upload untransmitted data once a valid connection to the OBO is detected. This will be particularly valuable if there are periodic/intermittent down times for connectivity and will reduce the amount of manual intervention for short communications outages.

Also, typical design calls for images to be stored in the toll zone if they are needed, but once a transaction has been validated at the OBO and the images will no longer be needed, the toll zone image data can be overwritten.

7.4.2 Network

The data network over the ODOT fiber optic system will connect the toll zones to the OBO. ODOT and the RTSI will collectively design a fiber inter-connect from the selected OBO site into the data network. The RTS design will develop a separate dedicated network on the fiber system, such that only authorized parts of the toll system will be able to communicate with each other.

Additionally, should the fiber network and backbone be deemed inadequate or unreliable, a secondary means of communications such as wireless (cellular or point-to-point) may be considered.

8 STRUCTURAL AND CIVIL WORKS

ODOT is the owner and responsible party for all physical capital assets within the highway right-of-way, including the toll zones themselves. **Table** 3 summarizes the distinction between the structural and civil works versus the RTSI responsibilities:

Toll Zone Structural and Civil Works	Toll Zone RTSI Work
a. Site development including earthwork and drainage b. Service vehicle area pavement c. Toll gantry(s) d. Technical shelters e. Concrete pads for other technology cabinets as needed f. Provision of utility power g. In-ground junction boxes and underground conduit as needed h. Safety appurtenances such as guardrail protecting vehicles from vertical toll gantry supports in the clear zone i. Supplemental lighting	a. Furnish and install toll technology equipment (electronic toll readers and antennae, cameras and supporting equipment, and vehicle sensors) b. Overhead equipment mounting to include any needed hangers/arms/cantilevers that attach to the gantry and allow equipment to achieve needed heights and positions to properly function and meet performance requirements c. Toll-zone control system and equipment d. All cables, connectors, and terminations from fiber patch panel and from power drop e. Equipment calibration and testing f. System burn-in and testing through site acceptance testing g. All other work required for the system to function properly

Table 3 Toll Zone Separation of Responsibilities

8.1 TOLL-ZONE SITE

The ODOT Toll System administration and support technical staff (including the RTSI) will provide input for design features such as in-ground conduit placement and relative locations of pads for buildings and cabinets.

Likewise, ODOT will control construction of the toll zone. ODOT could elect to begin toll operations before construction of the I-205 Improvements Project is complete. In this case, ODOT would build the toll zones to span the new final roadway cross section, which will be wider than the existing cross section. If temporary toll zones were to be required, staging and temporary construction would be provided by the highway contractor(s), and the temporary and permanent toll equipment installations would be performed by the RTSI.

8.1.1 Power Supply/Uninterruptible Power S

Normally, emergency power generators and fuel tanks are provided by DOT contractors; however, ODOT has elected to have the RTSI provide portable generators, subject to ODOT design approval. ODOT will manage the design of the toll zones. The toll zones will have UPS batteries on each site, such that if there is a power interruption between fractions of a second and several minutes, the UPS power will remain constant. The UPSs also serve to provide clean power, which improves system performance and longevity. It is anticipated that 4 hours of runtime will be required for the UPS.

Each toll zone will also have provisions for a portable backup generator, generator connection, transfer switch, and portable fuel supply for cases of extended power outages. The design of backup power will be developed during the design process of system requirements; however, it is anticipated that each site will not have a permanent generator, but mobile units will be provided by the RTSI. A generator (sometimes called "gen set") is typically sized with enough power to support the computer system and some minimal highway lighting at the toll zone. Diesel or natural gas are typical fuel choices. If possible, solar or other renewable fuels should be considered.

8.1.2 Toll Signing and Traffic Control

ODOT will be responsible for all signage supporting the Oregon Toll System. Supporting signage includes project signing and pavement markings at toll sites for protection of traffic during construction as well as for the ultimate traffic control plan. Toll-rate message signage is also needed and will be integrated into the entire signing plan within the corridor limits of work. The signing plan will also include additional signing that will be needed on the intersecting routes.

The design for the signs with variable toll rates will call for static signs with variable blocks for toll rates. ODOT will provide the static signs as well as provide data and power to them. The RTSI will provide the roadside enclosure and variable message blocks for the variable message displays. The RTSI furnish and install required cabling from the roadside enclosure to the signs and will have system control over posted toll rates.

8.1.3 Civil Works

The toll zones will have supporting civil works such as structural members, cabinets, junction boxes, and conduits as well as a pad for an emergency generator and all-weather parking.

Each toll zone will have one or more overhead sign trusses or other structural members with supporting vertical members, often termed "toll gantries." The gantry(s) supports the toll system technology mounted overhead. **Figure 14** shows a Massachusetts Department of Transportation toll zone in the suburban Boston area.

Figure 14 Massachusetts Turnpike All-Electronic Toll Zone and Gantry

The toll-zone site will include accommodations for toll system service vehicles to safely park along the roadside, either alongside or behind the site equipment and generator pad. Typical safety design provides space for vehicles to pull off to the right and then once off the mainline and shoulder to back into the service area parking slot, as shown in **Figure 15.** Maintenance parking access could also be provided from nearby roadways that are relatively close to the toll zone equipment—for example, from crossroad underpasses or overpasses, depending on toll-zone site conditions.

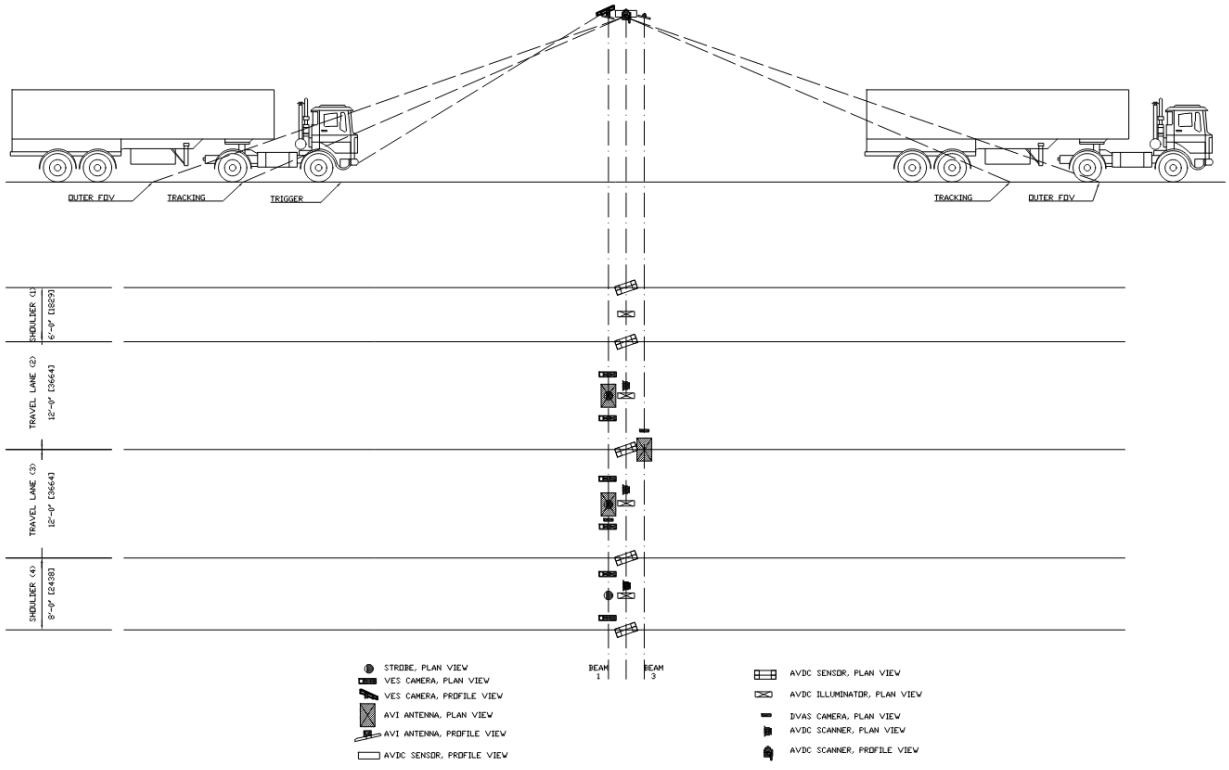

Figure 15 Example Toll-Zone Plan View

The gantry verticals, cabinets, building, generator pads, and parking area are protected by a guardrail or safety barrier between them and the mainline roadway and shoulders where required. In some areas, video surveillance, perimeter fencing, or other methods may be needed to reduce incidents of vandalism.

The toll-zone roadside civil works may support one direction, or both directions of traffic in one location, if the toll zone gantries spanning both directions of traffic are close to the same highway location. This could minimize roadside construction requirements and environmental impacts.

8.2 NETWORKING AND COMMUNICATIONS

The RTSI will make the fiber terminations to the fiber patch panel. The RTSI will design the roadside toll data network and design, furnish, and install the switches and routers required to operate this system between the Vehicle Detection System and the OBOS.

As the topic is further explored and additional information is gathered, ODOT will share with the RTSI.

8.2.1 Intelligent Transportation System Technologies

ODOT will provide Intelligent Transportation System (ITS) systems and devices on the tolled highway sections and will integrate these ITS devices into the rest of the regional ITS architecture.

The RTSI will be responsible for maintenance and repair services of toll equipment within their service area. The RTSI may be required to maintain tolling specific devices for an extended warranty period.

As the above topics related to networking, communications, and ITS technologies are further explored, ODOT will share additional information.

9 REFERENCED DOCUMENTS

The following documents are referenced in this ConOps. These resources provided some of the background information applied here.

i. *Oregon Department of Transportation Open architecture in support of transportation services – Vision, Mission, and Objectives*, July 24, 2017

j. *Oregon Open Architecture Tolling System Report of Standards Research Results*, June 26, 2018

k. *Oregon Open Architecture Tolling Program Business Requirements*, June 3, 2019

l. *Oregon Open Architecture Tolling Concept of Operations,* April 9, 2019

m. International Bridge Tunnel and Turnpike Association terms and definitions: https://www.ibtta.org/sites/default/files/documents/IBTTA%20Glossary.pdf

n. OReGO project website: https://www.oregon.gov/odot/programs/pages/orego.aspx