STUDY OF INNOVATIVE TECHNOLOGIES FOR COMMUNICATING REAL-TIME INFORMATION TO PORT DRAYAGE DRIVERS
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Prepared by The Tioga Group, Inc. for Asia Pacific Gateway Skills Table, and the Montréal Port Authority
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EXECUTIVE SUMMARY

The Asia Pacific Gateway Skills Table (Skills Table) and the Montréal Port Authority (MPA), asked The Tioga Group (Tioga) to compile and evaluate information on systems used to communicate real-time traffic and terminal conditions to drayage companies and drivers. The purpose of this effort is to provide insights into whether such a system would be effective in the unique circumstances of Montréal and other Canadian ports and, if so, how best to proceed.

A cross-section of ten ports was selected, based on size and technology systems. These are listed in Figure 2. As the table shows, these ports vary widely in their size, container volumes, and complexity. While the largest and most complex ports tend to have more complete and ambitious systems, the relationship is not without exceptions—Long Beach, in spite of its size, has the most basic system of the ports examined.

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1 At multi-terminal ports, some terminals have on-dock rail.
2 Estimated average of 5 trucks per firm.
3 Estimates vary by coverage and year.
4 In PMV Licensing System.
Tioga identified five types of information that could be provided in port communications systems for motor carriers:

- Traffic conditions on port-area roads.
- Traffic conditions on local/regional routes to/from the port terminals.
- Traffic incident alerts on either port-area roads or approaches.
- Planned closures, repairs, or restrictions on either port-area roads or approaches.
- Port terminal conditions, incidents, or alerts.

For each port the choice of communications program scope likely reflects the nature of local traffic and terminal issues and the availability of other parallel information sources.

Port traffic communications systems are scalable and highly adaptable to circumstances. It is clearly feasible for a port authority to start a traffic alert or information system with readily available, internal information regarding planned operations and maintenance activities, or by relaying available real-time information from other organizations. Oakland proactively supplements typical information sources with daily staff observations and vessel data to produce a daily status report for motor carriers and real-time updates as required. Other ports vary in their ability and interest in capturing and communicating general traffic and incident information outside port boundaries. The need for traffic management in the multi-jurisdictional eastern United States has resulted in organized traffic and incident management information available to ports in that region. Other regions have traffic information available from metropolitan, regional, or state sources.

Most communication methods used in port traffic alert systems have low incremental cost. Tioga found systems using Twitter, SMS texting, email, and website postings. With the exception of website posts, these are all “push” options that do not require recipients to look for messages. The dynamic messages signs (DMS) used in Hamburg and Vancouver are more costly and ambitious, and have the advantage of communicating to all drivers passing the sign.

The systems discussed in this report are also highly adaptable, and some have been augmented and improved even since the study began. The low initial cost and inherent flexibility of the technologies used enable ports to respond to changing conditions and needs.

Systems exist that meet the very different needs of these diverse ports. The implementation path for a truck traffic information system should be port-specific and community-specific. The technology choices available provide a port with modest resources and minor truck congestion issues the option to meet its immediate needs with a small-scale system based on existing resources and available staff time. A larger port, one with more serious truck traffic issues or a sensitive community context, may require a more comprehensive, ambitious system. The use of existing resources and rented data collection or display equipment could also facilitate pilot or test implementation of system features as an intermediate stage, and allow the port to expand on successful features and avoid costly dead ends.

These systems serve the broader community of which each port is a vital part. The implicit “social license” by which a port continues to operate as a public entity increasingly requires the port to minimize and mitigate any adverse impacts on that community, and these systems serve that goal.
INTRODUCTION & OVERVIEW

2.1 PURPOSE

The Asia Pacific Gateway Skills Table (Skills Table) and the Montréal Port Authority (MPA), have asked The Tioga Group (Tioga) to compile and evaluate information on systems used to communicate real-time traffic and terminal conditions to drayage companies and drivers.

The purpose of this effort is to provide insights into whether such a system would be effective in the unique circumstances of Montréal and other Canadian ports and, if so, how best to proceed. To do so, Tioga:

- Identified ten port systems for brief case studies
- Compiled basic information about each system and port
- Contacted port staff to determine how each system operates
- Researched LYNX, eModal, and FRATIS systems that can be used at multiple ports.

2.2 BACKGROUND

Canadian and U.S. container ports are under pressure from growing trade, inter-port competition, and the escalating concerns of their host cities and communities. Ports are being asked to simultaneously improve capacity, and efficiency while reducing local and regional impact, and to do so with scarce resources.

Trucks move the majority of containers to and from marine terminals at almost all North American ports. Managing the flow of trucks to and from port terminals is a major challenge for all involved, including the cities and communities in which the ports operate. The drivers, the ports, the port customers, and the public would all benefit from greater truck efficiency and reduced truck impact.

Trucking companies and their drivers pursue efficiency but can be frustrated by congestion, delays, detours, and stoppages on port approach routes and port-area roads. Few ports enjoy an exclusive port road network; most share surface streets and highways with their host cities. When that city is New York or Los Angeles, the terms on which port drivers must share the network can be extremely stringent.

Reliable, timely information regarding current or expected traffic conditions can be a useful tool for drayage firms seeking efficiency and ports seeking to sustain their “social license” to operate in busy and sensitive communities. Such information will let trucking companies and their drivers make better decisions on:

- When to go to which port terminal, and for what purpose.
- What route to use in each direction.
- How to combine trip legs in the most efficient multi-stop trip.
- How much time to allow.

True optimization is an unrealistic goal. Companies that control their operations in detail, such as UPS and FedEx, may approach but still not attain optimization. For port trucking the more reasonable goals are operational improvement and reduction in avoidable inefficiencies. If an importer insists, a truck driver will endure delays, detours, and congestion to retrieve a high-priority container. Likewise, an exporter needing to make an outbound vessel cut-off time may send the trucker to the terminal even under adverse conditions. Even in those circumstances, however, the trucker can benefit by knowing how much time to allow or if the trip is even possible.

Information is also often viewed as a low-cost source of near-term improvements, especially in contrast to costly, long-term infrastructure projects. The availability of nearly ubiquitous communications options such as email, SMS texting, and Twitter tends to reinforce this view. Most systems reviewed for this scan entailed little if any capital investment and their operating costs consist almost exclusively of port staff time.

5 The known exceptions are Prince Rupert, BC and Seattle-Tacoma, WA where most containers move by rail.
2.3 SCOPE

The primary focus of this scan is systems that communicate real-time, port-area highway conditions to motor carrier dispatchers and professional drivers, enabling them to make well-informed decisions on what port transactions to schedule and what routes to use. Unfavourable conditions are typically the result of simple traffic congestion or adverse incident which impedes the free movement of port trucks. Difficult weather conditions, a primary concern at some ports, are treated as an element of incident reporting.

Truck dispatchers and drivers are also interested in conditions at and within the terminals themselves. There are some systems focused on these issues, notably terminal turn time postings and advice on marine terminal websites, eModal email broadcasts from terminals, and the Port of Metro Vancouver’s on-line turn time dashboard. These systems are mentioned peripherally, and described in the Appendix.

It was found, however, that most traffic-focused systems also issue related terminal-focused bulletins, and vice versa. The New York-New Jersey E-Alerts system, for example, is primarily a traffic advisory system, but it also reports terminal incidents that affect truckers. The Port of Virginia VA Trucker Alerts mostly concern terminal conditions, but also issue traffic alerts when needed. Tioga established that it is feasible to add traffic alerts to a terminal-focused system, and so this report covers examples of that approach.
## Port Systems

### Figure 2: Characteristics and Communications Technologies of Ports Examined in This Study

<table>
<thead>
<tr>
<th>Port</th>
<th>Container Terminals</th>
<th>2014 TEU</th>
<th>On-Dock Rail?</th>
<th>Drayage Firms</th>
<th>Truck Fleet</th>
<th>System Summary</th>
<th>Info Source</th>
<th>Real-time?</th>
<th>Level of Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltimore</td>
<td>1</td>
<td>770,139</td>
<td>Y</td>
<td>275</td>
<td>1,375</td>
<td>eModal Email announcements of road work, etc.</td>
<td>Internal</td>
<td>N</td>
<td>As needed</td>
</tr>
<tr>
<td>Hamburg</td>
<td>4</td>
<td>9,700,000</td>
<td>Y</td>
<td>2,400</td>
<td>12,000</td>
<td>DIVA Real-time data collection, messaging, and display system</td>
<td>Internal &amp; External</td>
<td>Y</td>
<td>Two full-time staff</td>
</tr>
<tr>
<td>Houston</td>
<td>2</td>
<td>1,951,088</td>
<td>N</td>
<td>600</td>
<td>3,000</td>
<td>LYNK Access to terminal info, alert capability</td>
<td>Internal</td>
<td>N</td>
<td>As needed</td>
</tr>
<tr>
<td>Long Beach</td>
<td>6</td>
<td>6,820,806</td>
<td>Y</td>
<td>2,500</td>
<td>10,000</td>
<td>eModal Email announcements of road work, etc.</td>
<td>Internal</td>
<td>N</td>
<td>As needed</td>
</tr>
<tr>
<td>Montréal</td>
<td>3</td>
<td>1,402,393</td>
<td>Y</td>
<td>200</td>
<td>4,000</td>
<td>In Progress Text, mobile app for terminal and access route times</td>
<td>TBA</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td>New York &amp; New Jersey</td>
<td>6</td>
<td>5,772,303</td>
<td>Y</td>
<td>4,000</td>
<td>16,000</td>
<td>Port Alerts Real-time text alerts on terminal and road conditions</td>
<td>Internal &amp; External</td>
<td>Y</td>
<td>Multiple part-time staff</td>
</tr>
<tr>
<td>Northwest Seaport Alliance</td>
<td>10</td>
<td>3,427,562</td>
<td>Y</td>
<td>1,100</td>
<td>6,000</td>
<td>Information for Truckers As-needed email alerts on terminal and road conditions</td>
<td>Internal</td>
<td>N</td>
<td>As needed</td>
</tr>
<tr>
<td>Oakland</td>
<td>5</td>
<td>2,394,069</td>
<td>N</td>
<td>400</td>
<td>4,000</td>
<td>Operations Update Daily trucker advisory with terminal and road conditions</td>
<td>Internal &amp; External</td>
<td>N</td>
<td>3-5 daily man-hours</td>
</tr>
<tr>
<td>Vancouver, BC</td>
<td>4</td>
<td>2,912,928</td>
<td>Y</td>
<td>125</td>
<td>3,000</td>
<td>Twitter Messages as needed, supplemented by Port Dashboard</td>
<td>Internal</td>
<td>Y</td>
<td>Multiple part-time staff</td>
</tr>
<tr>
<td>Virginia</td>
<td>3</td>
<td>2,393,038</td>
<td>Y</td>
<td>600</td>
<td>2,500</td>
<td>VA Trucker Alerts Real-time text alerts on terminal and road conditions</td>
<td>Internal &amp; External</td>
<td>Y</td>
<td>Multiple part-time staff</td>
</tr>
</tbody>
</table>

6 At multi-terminal ports, some terminals have on-dock rail.
7 Estimated average of 5 trucks per firm.
8 Estimates vary by coverage and year.
9 In PMV Licensing System.
APGST, MPA and Tioga jointly identified a number of major ports and port traffic communications systems to be described in this study. The list was refined as the study progressed and eventually included the ten ports listed in Figure 1 (pg. 6). As the table shows, these ports vary widely in their terminal counts and container volumes. While the largest and most complex ports tend to have more complete and ambitious systems, the relationship is not without exceptions—Long Beach has the most basic system of the ports examined. The number of trucking firms and trucks is not a reliable indicator either, because many of the statics are rough estimates.

The descriptions on the following pages suggest that each port has found its own solution based on the issues it faces, on the nature of its operations and operating environment, and on the internal and external resources available.
Chapter 3

3.2 PORT OF BALTIMORE

The major container terminal is Seagirt (Figure 3), and the nearby Dundalk Terminal handles a mix of cargo types. As with other legacy port complexes in major metropolitan areas, the Port of Baltimore is surrounded by freeways, industrial development, and residential communities.

The Maryland Port Administration uses eModal (see sidebar) to send notices to a wide range of trade participants: truckers, brokers, terminal operators, third-party logistics providers (3PLs), and others who have signed up to receive messages from the POB eBroadcast System. Users have the option to select the categories of messages they wish to receive. Baltimore concentrates on giving advance notice of planned restrictions rather than real-time updates on current conditions, and supports its motor carrier stakeholders by also regularly posting information on planned construction and other events that affect port motor carriers during days and times when the marine terminals are closed. Real time features of the system are used less frequently. The Port’s advisories can therefore best be viewed as planning tools rather than as day-to-day management assistance.

A notice posted July 16, 2015 provides an example (Figure 4). The Maryland Transportation Authority (MDTA) sent a cautionary notice regarding an upcoming sports event that was expected to cause traffic congestion on the main north/south highway in the region, I-95. The notice was relayed to port staff who judged the information important enough to retransmit to the port motor carrier community using the eModal system.
Chapter 3

eModal

eModal, an Advent service, handles the credentialing of port drayage drivers in several ports, including Baltimore, Philadelphia, Seattle, Oakland, Los Angeles, Long Beach, and San Diego. eModal thus maintains a large driver and motor carrier database which can be used to connect them to a Port’s alert system. Most eModal email messages are sent by terminals to notify drayage firms and other industry participants of changing conditions.
The Port of Houston consists of two physically separated container terminals, Bayport and Barbours Cut (Figure 5). The Port of Houston Authority (PHA) operates both terminals, although a portion of Barbours Cut is operated by APM Terminals.

PHA does not have a stand-alone traffic information system. PHA was a pioneer user of the LYNX Mobile system (see sidebar) to provide dispatchers and drivers with terminal and container-specific information. LYNX has the capability to include traffic-related information or incident alerts, although PHA has seldom used it for that purpose.

LYNX Mobile

LYNX Mobile, a Versiant product, is a smartphone app providing mobile access to Navis Express and Sparcs terminal operating systems. The primary propose of LYNX is providing container availability and terminal information, but LYNX also has provisions for terminal announcements. These announcements can include terminal-specific alerts such as changes to gate hours or chassis shortages, or traffic advisories. LYNX thus provides a different implementation and development option than the other traffic information systems.

The LYNX approach can combine transaction and terminals/traffic information system in a single platform, rather than having multiple single-purpose systems. LYNX is a "pull" application in that users can check terminal announcements at any time, but in its present form it does not issue traffic or incident alerts. LYNX Mobile has been used at the Port of Houston Barbours Cut and Bayport terminals for some time. It has been more recently adopted at Maher, Port Newark (PNCT), and Global Terminals at NYNJ, the Ports America Chesapeake terminal at Baltimore, and Yusen Terminal at Los Angeles. The smartphone implementation is customizable and appears slightly different at each location.
Chapter 3

The Hamburg Port Authority (HPA) developed the port road management initiative to cope with tight truck capacity on port roads, a lack of port-area parking for trucks, truck incursion in nearby residential areas, and the emissions and noise from truck activity.

HPA identified a series of current and expected issues that called for improved communications and information flow for truck transport to and from the port:

- The amount of transloading was predicted to double by 2025 to 25 million TEUs.
- An enormous increase in port traffic was expected: up to 40,000 trucks would be active at the port each day.
- Only 30% of forwarding agents have effective telematics systems.
- Low utilization of electronic scheduling systems for container pick-ups.
- Limited space makes it difficult to enhance infrastructure.

In response, HPA initiated the SmartPORT logistics program covering a number of transport issues. SmartPORT was developed by T-Systems, Deutsche Telekom Innovation Laboratories, SAP Research, and HPA.

The HPA communications system is called DIVA (Dynamic Information on traffic Volumes in the Area of the port). To create DIVA, HPA first defined a strategic port road network that includes the port terminal access roads, connectors to regional highways, and alternate routes (Figure 6), and then developed a data collection and monitoring system. The Port Road Management Centre (PRMC) collects data from an array of existing and newly installed induction loops, video detectors (webcams), weigh-in-motion units, and Bluetooth detectors to assess and monitor traffic conditions on these routes (Figure 7).

The Port of Hamburg has what appears to be the most ambitious traffic information system among container ports.

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**PORT OF HAMBURG SmartPORT DIVA System**

<table>
<thead>
<tr>
<th>MESSAGE TYPE</th>
<th>DMS/CMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORMATION TYPES</td>
<td>Traffic, Parking and Incident</td>
</tr>
<tr>
<td>MAIN TECHNOLOGY</td>
<td>LED Variable Message</td>
</tr>
<tr>
<td>MAIN INFORMATION SOURCE</td>
<td>Management Center, Automated Data Collection</td>
</tr>
</tbody>
</table>

> Planned multi-device system

Figure 6 HPA Strategic Road Network
Operators at the PRMC display conditions and messages on 17 strategically located LED display boards (similar to changeable message signs) on port roads. DIVA provides information on:
- Traffic conditions in the port area
- Traffic conditions on regional motorways
- Blocking times of movable bridges
- Construction sites
- Flood warnings
- Container terminal situations

The DIVA display locations correspond to points where drivers can choose alternate routes or choose to park and wait at a truck park or service area. HPA plans to add Floating Car Data (FCD) from Bluetooth detectors to provide online traffic conditions, travel times, and wait times.

HPA expects to develop an Intermodal Port Traffic Centre covering rail and water movements, as well as highway traffic, and DIVA would become a building block of that system. The system, like DIVA is intended to provide transport operators (and potentially their customers) real-time information to make routing decisions based on real-time traffic information. Data from multiple sources would be merged into a single system that could be used to predict short-term traffic conditions.

An example from an HPA presentation illustrates the intended exchange of information:
- Truck drivers registered and active in the system receive relevant traffic and infrastructure information when approaching their Port destination, or information about the number of available parking spaces when approaching a truck park.
- The HPA PRMC agent receives information about registered vehicles approaching certain areas, and can predict traffic situation development. This statistical analysis of port truck movements helps to improve traffic control.

There are SmartPort Logistics web and mobile apps to supplement the DMS displays (Figure 8).

The system would eventually encompass:
- Incident management
- Car park management
- Real-time traffic information
- Traffic management on approach roads

HPA also intends to provide this information via mobile devices and apps to supplement the LED display boards. As a next step in SmartPORT development HPA has equipped a section of “SmartROAD” to test data collection systems.

Truck parking is a particular concern for HPA, and a major focus of DIVA and the SmartPORT initiative. Starting in October 2015, the system will begin providing information on parking slot availability via smartphone and DMS (Figure 8).
The Port of Long Beach is a landlord port with six marine container terminals adjacent to the Port of Los Angeles, with seven more terminals.

The two ports share approaches and traffic problems. As Figure 9 shows, the multiple terminals and approaches to the Port of Long Beach define an extensive road network. Tioga estimates that roughly 4 million port container truck movements take place over these roads annually—about 16,000 every weekday—in addition to trips made by personal vehicles.

The Port of Long Beach uses eModal (described earlier) to send notices to a wide range of trade participants: truckers, brokers, terminal operators, 3PLs, and others who have signed up to receive eModal messages for Southern California. The major information sources are the Port’s own Traffic and Construction Management Departments which in turn coordinate with the City of Long Beach.
FRATIS

The Freight Advanced Traveler Information System (FRATIS) is a pilot program sponsored by the U.S. Department of Transportation Research and Innovative Technology Administration (RITA). FRATIS is being tested in Southern California in a cooperative effort between RITA, the Port Logistics Group (a drayage operator), and Yusen Terminals (a marine container terminal operator).

The test involves three specific FRATIS components:

1 — **Drayage-Marine Terminal Operator Information Exchange**, providing two-way messaging between the MTO and the drayage firm with estimated time of arrival.

2 — **Freight Traveler Information**, a dashboard of routing aids with order entry, driver routing, in-cab messaging, and marine terminal queuing information.

3 — **Drayage Optimization**, which attempts to optimize driver schedules based on expected travel and stop times.

The Southern California FRATIS implementation began in March 2014 and is expected to continue through early 2015. Initial results are reportedly positive.

eModal messages (Figure 10) are prepared by a Port staff member. The primary focus is on lane closures, road closures, detours, or other restrictions that would affect the route and timing choices made by truckers or their customers, or the need to plan for extra time on a given trip. In parallel, marine terminal operators send out regular terminal condition bulletins via eModal, so the Port of Long Beach messages become part of that stream. Truckers and other parties also have access to terminal webcams to observe gate queues, and traffic webcams to observe current road conditions. The Port’s advisories can therefore best be viewed as planning tools rather than as real time management assistance.

Yusen Terminals at the neighbouring Port of Los Angeles is the test site for FRATIS, a U.S. Department of Transportation initiative that includes traffic information as one of its functions (see sidebar).
The Port of Montréal is in the process of implementing truck traffic information features as part of its broader Greenhouse Gas (GHG) reduction initiative. Montréal has three container terminals, Racine, Maisonneuve, and Cast, and a fourth, Viau, in the planning stage.

Figure 11 shows the existing container terminals. As with several other major ports, the Montréal terminals are located between the waterway and developed commercial, industrial, and residential areas. The key roadway dividing these areas is the Notre Dame East (Figure 11). This route is subject to congestion and delay, and one objective of the GHG program is to reduce congestion and idling on that route.

The Port is expanding a network of RFID readers and RAPI license plate reader, combining two technologies to measure and report truck travel and processing times. This strategy will enable the Port to generate and communicate current travel and wait times, and to generate performance indicators for management and planning use. The Port divides the truck approach and exit process into four segments:
- Pre-port admission at an OCR/RFID gate.
- Truck entry point for RFID and identity validation.
- Terminal entry.
- Terminal exit.

The information can be “pushed” in real time to the motor carrier industry. Plans call for communicating current wait and route segment times to truckers via SMS text or a mobile app as appropriate. The Port is exploring a further expansion of the data collection network via strategically placed Bluetooth sensors in the surrounding road network.

The Port of Montréal also has a webcam system in place (Figure 12). The system will be utilized and augmented as necessary to aid port staff and trucking dispatchers in validating RFID data.
Chapter 3

3.7 PORT OF NEW YORK & NEW JERSEY

PORT OF NYNJ
E-Alert System

MESSAGE TYPE
Email, Text, Twitter

INFORMATION TYPES
Traffic and Incident

MAIN TECHNOLOGY
Multiple

MAIN INFORMATION SOURCE
RFID, Bluetooth, Webcam

The Port Authority of New York and New Jersey (PANYNJ) is a landlord port with six container terminals: four in the Newark, New Jersey area, one on Staten Island, and one in Brooklyn (Figure 14).

Densified operations have led to the establishment of nearby off-terminal empty container and chassis depots. This split of operations has led to additional truck trips in the area. The terminals are in a very congested urban area, connected by freeways, bridges, and tunnels (Figure 14). Port trucks share access routes with commuters and airport patrons as well as with routine passenger and truck traffic. To plan their operations, dispatchers and drivers need information about both regional routes and port-area surface roads.

PANYNJ’s E-Alert system posts traffic and related messages by email and text. PANYNJ also has a Twitter feed and blog where these messages are posted. Truckers and others can sign up to receive E-Alerts on the PANYNJ website (btt.paalerts.com/usersubscribe.aspx). Figure 15 provides example of recent email messages. Topics include changes to gate procedures, gate congestion, and traffic incidents. As of mid-2015, many messages refer to management of traffic during Bayonne Bridge reconstruction.
The E-Alert system received positive feedback in the Port’s most recent customer satisfaction survey. The E-Alert system was greatly expanded from 2,000 to 12,000 contacts in advance of Hurricane Sandy. The PANYNJ included their entire contact list in the system and the vast majority of contacts have chosen not to be removed after the storm.

An incident that occurred on July 14, 2015 illustrates the system in action. A water main break at the APM terminal flooded a significant portion of the container yard. The Twitter feed for the incident is in Figure 16. The PANYNJ pointed out that a key feature in the message was the free time statement by the terminal. That was a warning to the motor carriers and drivers to check the location of the box they were seeking to pick up before they initiated a trip. A dispatch to pick up a box in an impacted area resulted in a useless trip. The PANYNJ reported that there was an immediate, noticeable decrease in gate volume at the impacted terminal and increase in volume at other facilities, which was taken as an indication of success for the E-Alert system.

### TRANSCOM

On the U.S. East Coast traffic and incident information is collected and disseminated by the TRANSCOM communication system, focused on the New York Metropolitan Area and the surrounding states. TRANSCOM was established by the I-95 Corridor coalition, an alliance of transportation agencies, toll authorities, and related organizations with affiliate members in Canada. These agencies gather and disseminate traffic and incident information of interest to the motoring public. While there is no specific TRANSCOM focus on port trucking, many ports receive and screen the information for relevance to port stakeholders. The Port Authority of New York & New Jersey was the lead agency for the development of the system, which has since been privatized. The information is retransmitted using the port’s E-Alert system.

### 511NJ System

Canada and the United States have designated 511 as the travel information telephone number. Provinces and states have been working to increase the utility of the system for all motorists, private and commercial. The Port of New York & New Jersey wants to increase the use of the 511 system by port drivers. In New Jersey, 511NJ (www.511nj.org) provides drivers information about accidents, incidents, and unusual delays on New Jersey interstate and state highways, the New Jersey Turnpike, the Garden State Parkway, the Atlantic City Expressway as well as all bridge and tunnel crossings. A key feature of 511 in New Jersey (511NJ) is the availability of email notifications or RSS Feeds. Port Authority views this feature of the 511 system as under-utilized since many port motor carrier movements are repetitious and extend beyond the New York Metro region, and would extend traffic/incident coverage to capture more complete information.

### Information Sources

The primary information sources for the E-Alert system are sources within the PANYNJ organization, the Marine Terminal Operators (MTOs), and the regional TRANSCOM system (see sidebar). Within the PANYNJ Commerce Department full-time staff members review the information provided by these systems and transmit it to port stakeholders. This is the human intervention stage, where a judgment is made about which information is important to which subset of the port’s contact list. Training of E-Alerts staff is considered critical.

PANYNJ is a large organization with internal sources for the status of bridges and tunnels important to port truckers, as well as a broad range of other conditions and events that could affect port-area truck traffic. It also has a substantial Police Department of its own (PAPD) which deals with traffic congestion at the port. The Port Authority divisions that manage bridges and tunnels reported that they have found the most effective way to communicate tunnel and bridge delays to truck drivers from outside the region was by making periodic CB broadcasts.

MTOs are primarily sources for “inside the fence” terminal operations or incident issues rather than for traffic information.

### Other Sources and Systems

There are other parallel and overlapping traffic information sources and systems serving the Port area. The Association of Bi-State Motor Carriers maintains an office in the port area. An employee of the Association regularly drives the port roads, posts information to member firm dispatchers, and also relays information from the E-Alert System.

A major current goal of the Port Authority is to increase the use of the “511NJ” system (see sidebar) by all truck drivers, notably those who are making longer interstate moves.
The Northwest Seaport Alliance (NWSA) was recently formed by merging functions of the Ports of Seattle and Tacoma. The Port of Tacoma had taken the lead in traffic information communications.

The Port of Tacoma includes several major marine container terminals and substantial on-dock rail capacity (Figure 17), reducing reliance on trucks. The majority of Port of Tacoma communications relate to the roadways within the port complex. The MTOs handle specific communications regarding traffic levels and incidents on their facilities. Other port communications cover changes in port schedules and occasionally highway incident or accident information outside the port complex. The NWSA communications initiative was motivated by confusion and congestion that resulted when changes in the terminal operations brought a large number of new, unfamiliar drivers into the port.

Of particular and regular concern are occasions when railway operations block port roads, sometimes for extended periods. An immediate goal of NWSA is to gain and communicate advance notice of upcoming rail crossing conflicts. They would also like to be able to create a variable message sign system that would communicate these matters as well as current queue times at marine terminals.
The NWSA messages are tweeted, emailed, and texted to a list of 1200 subscribers. An example is provided in Figure 18. More than 13% of the emails are opened within the first two hours, which is regarded as a high percentage for that kind of communication. The port does not have the ability to know who is reading the tweets and texts. The ports use GovDelivery (www.govdelivery.com), a communications platform designed for public agencies.

The NWSA website also provides terminal information, updated twice weekly, at www.nwseaportalliance.com/operations/terminal-updates

Operations staff monitor the traffic advisories of the Washington Department of Transportation and repeat those postings as warranted (sample in Figure 19). Determining the frequency and content of driver communications is one of several job duties assigned to a particular individual in the port operations department.
The Port of Oakland (Figure 20) has five active marine container terminals with four different operators. There are BNSF and UP near-dock rail terminals in the center of the port complex.

As Figure 21 shows, the Port is west of metropolitan Oakland and separated from commercial and residential areas by freeways and rail lines. Truck traffic, however, seriously affects adjacent neighbourhoods and there has been a long history of concern over congestion, noise, parking, and emissions. The rail terminals are near-dock, and require short but frequent truck moves to and from the terminals. Oakland also has a broad mix of local moves within the San Francisco Bay Area and longer moves to and from California’s Central Valley. The longer moves are especially affected by U.S. Hours of Service (HOS) regulations that restrict daily driving hours. A long wait in port congestion or queues may mean that a driver serving Central Valley points can only make one round trip per day rather than two.

The Port of Oakland sends out Operations Updates via email each weekday at about 9 AM and occasional real-time updates during the day for special circumstances. The daily messages were started in early 2015 to assist truckers and other stakeholders in coping with the severe port congestion that affected the U.S. West Coast at the time.
Chapter 3

The daily report is put together by members of the Port’s Wharfinger Department who drive the Port roads, enter terminals, and share their observations of traffic and terminal conditions at a morning meeting. Current level of effort averages 3–5 total man-hours daily.

Traffic Information

The traffic-focussed portion of the message includes traffic conditions and terminal operations information for each port terminal. A sample for the Oakland International Container Terminal is shown in Fig. 22. The morning email thus gives a “snapshot” of conditions each day. The message is updated in real time if specific new information is available, such as gate closure due to system failure or other critical incident.

Vessel Information

As of mid-2015 the daily message also includes vessel information (Figure 24).

→ A graph indicating the number of vessels at berth and waiting.

→ A table of vessels at each terminal berth, vessels anchored or moored, and vessels known to be in route to Oakland.

These features were added in 2015 when vessels were being forced to wait due to labor shortages.

The Wharfinger Department uses daily reports from the San Francisco Bay Marine Exchange that list vessels in port, vessels due to depart, and vessels due to arrive. Wharfingers also use the live vessel position maps on marinetrack.com to verify vessel information and identify inbound vessels farther out (e.g. departing Los Angeles or Long Beach), and to determine which vessels are moored or anchored in San Francisco Bay (Figure 25). Finally, the Wharfinger Department receives regular reports from the marine terminal operators (MTOs), and contacts the terminals to verify and update information as needed.
**PORT METRO VANCOUVER**

**Port Metro Vancouver (PMV) is a landlord port with four marine container terminals (Figure 26):** DPW Vancouver (Centerm), Global Container Terminals Vanterm, Global Container Terminals Deltaport, and Fraser Surrey Docks.

Centerm and Vanterm are located adjacent to downtown Vancouver and have two access points. Deltaport is located to the southwest, and is accessed from the regional highways. Fraser Surrey Docks is located on the south bank of the Fraser River, and is accessed over surface routes.

Figure 27 shows access to the DPW Vancouver and GPT Vanterm terminals, via one PMV-controlled entrance gate, and two exits. Congestion can be a recurrent problem on this route, and is exacerbated by rail switching movements that block the roadway.

PMV has three traffic-related communications channels:

**GPS Dashboard**—PMV’s preferred channel for communicating traffic and terminal condition information to truckers is the on-line GPS Dashboard. The GPS Dashboard displays current and recent turn times (covered in the Appendix, Figure 37), but also has a comments section. PMV uses this channel to communicate terminal-specific information such as lane closures or service interruptions.
Operations Twitter Account—PMV maintains two Twitter accounts, one for general port announcements and one for operations-related messages (twitter.com/pmvops, Figure 30). The operations Twitter account is most frequently used to inform truckers and other port stakeholders of access road blockages for railway switching movements, and less often for vehicular traffic issues.

The main access route to the DP Vancouver (Centerm) and Global (Vanterm) terminals is crossed by railway tracks in multiple locations. There are typically multiple switching movements across the road each day that can block truck movements for a few minutes at a minimum and sometimes for extended periods. PMV’s Operations Centre receives notification of planned switching movements from railway personnel, and uses this guidance and monitors PMV webcams to determine when and where the switching movements begin and end. The information is provided on the PMV website and via Twitter (Figure 28). With this information on rail access road blockages, drivers and dispatchers can choose the alternate access route, allow extra time to comply with an appointment window, or allow extra time to return from the terminal to a customer, for example.

PMV is very careful about the use and content of tweets. Re-tweeting can spread messages far beyond the intended audience. In extreme cases, tweets relayed to foreign vessel operators can be mistranslated, misinterpreted, or taken out of context. The 104-character tweets are suitable for short, concise messages readily understood by a regular audience of followers.

PMV might, for instance, use Twitter to inform truckers of an incident-related road closure, but not to inform the public of a labor disruption.

Changeable Message Signs—PMV’s third communication channel is changeable message signs (CMS). By agreement with the regional transportation authority, TransLink, PMV can post messages at TransLink-controlled CMS locations leading to the Port. Relevant messages might include road closures, unusual delays, or detours. PMV also has two CMS installations of its own within 1 km of the port entry points (Figure 29). These CMSs are ordinarily blank, but can be used for port-specific messages as required. By reciprocal agreement, TransLink can post messages on the PMV CMSs.

As with most ports, PMV also has webcams available on its website. These webcams cover terminal gates, approaches, and waiting areas. The webcams can be useful to drayage dispatchers concerned about current conditions.
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3.11 PORT OF VIRGINIA

The Port of Virginia operates three major container terminals (Figure 30): Virginia International Gateway (VIG), Norfolk International, and Portsmouth Marine Terminal. The Portsmouth terminal had been inactive, but was reactivated in early 2015 to cope with rapid volume growth and port congestion.

The Port of Virginia mostly posts real-time information on conditions at the Port’s marine terminals. The Port posts real time incident and planned traffic disruption information as required.

The port communications staff participates in operations meetings and advises terminal operators on the timing and content of communications. Many communications are planned in advance.

Virginia uses the following communications methods:

- General posting of information to the Port Website (Fig. 31).
- Email to motor carrier firms for data appropriate for dispatchers.
- Text and Facebook messages are used when the message is meant for drivers.

The Port chose these methods because they are both effective and inexpensive. A Port representative indicated that one weakness of the system is that they do not know who has received the messages. The Port would like to communicate earlier about planned events to give the motor carriers more lead time for planning.
3.12 TRUCKING COMMUNITY RESPONSES

Motor carriers often have no choice about making a trip to a given terminal for a given transaction. Once a driver has picked up a loaded or empty container on a chassis, the driver must either complete the required transaction at the specified facility or incur the cost and risk of parking the container on chassis at a secure location, seeking another assignment, and returning to the original container at a later time. If a terminal appointment has been made there may be penalties for non-compliance, or no alternative appointments available. Import containers begin incurring storage and demurrage charges if not picked up and returned by the last “free day”. Export containers have a cut-off time for delivery at the terminal before the outbound voyage. All of these circumstances can lead a dispatcher or driver to make a terminal trip despite warnings of congestion or delay.

The response of the trucking community will therefore depend on the nature of the communication or alert and the options available. An announcement of road or terminal closure will, of course, result in trip cancellations. An announcement of congestion, delay, or detour will result in a mix of cancellations, postponements, and drivers proceeding with their original plans. Even in those cases, however, there is potential value in the knowledge that the transaction or trip will take longer than planned.

Trioga surveyed port drayage firms (motor carriers that routinely move containers to and from marine terminals) to understand dispatcher and driver experiences with the systems described on the previous pages.

Their responses were variable and pragmatic:

- Drivers consistently find traffic and terminal systems valuable, with the value depending on the system, the situation, and the driver.
- There was general agreement on the value of incident alerts (e.g. accidents, weather emergencies, etc.)
- Some drivers faulted alert systems for inconsistency in announcing the end of an incident or closure.
- Most drivers and dispatchers find routine port traffic assessments to be too optimistic, possibly reflecting the reluctance of port authorities to broadcast bad news about port traffic conditions in general.
- More experienced and better-organized drivers and dispatchers are more likely to be using other information sources for traffic information, including highway and port webcams, regional authority websites, and reports from other drivers.
- Experienced drayage drivers and dispatchers know when and where to expect congestion and delay; the greatest value may be to firms and drivers that are less familiar with typical port conditions.
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PORT OPTIONS
Port authority options for traffic and incident advisories range from very simple to very ambitious. It appears that a port with modest needs could provide adequate coverage at a relatively low investment threshold.
Chapter 4

4.1 OVERVIEW

Port authority options for traffic and incident advisories range from very simple to very ambitious. It appears that a port with modest needs could provide adequate coverage at a relatively low investment threshold. Mid-level systems may require investment in webcams, if not provided for other purposes, and other real-time monitoring equipment. Only the most elaborate systems, such as DIVA at the Port of Hamburg, appear to require large-scale financial commitments.

All of the traffic information systems analyzed for this scan have a few basic features in common:

- **Scope**—The traffic port and terminal issues covered.
- **Information types**—The types of information to be provided to various recipients.
- **Information gathering**. Each system identifies a few regular sources of information on port-related truck traffic and related issues.
- **Analysis and message composition**—None of the systems are automatic; all involve human intervention to analyze incoming information, evaluate its significance, and choose or compose a suitable message.
- **Communication method**—Ports use different combinations of email, SMS texting, Twitter, and website posts. Some systems use all these methods simultaneously. The Ports of Hamburg and Vancouver also use changeable message signs.
- **Recipient list**—Most recipients are self-selected, typically by signing up on port websites or via text, or by following a Twitter feed.

4.2 SCOPE

For each port the choice of scope likely reflects the nature of local traffic and terminal issues and the availability of other parallel information sources. The relative severity of local traffic conditions is an obvious factor driving the need for traffic and incident information systems.

- Landlord ports typically rely on their tenants for operational alerts and typically focus on relevant highway and railway traffic and incident information.
- Operating ports may focus on marine terminal operating information including real-time and planned “inside the gate” conditions affecting motor carriers, as well as relevant highway and railway traffic and incident information.

4.3 INFORMATION TYPES

Tioga identified five types of information that could be provided in port communications systems for motor carriers:

1. Traffic conditions on port-area roads.
2. Traffic conditions on local/regional routes to/from the port terminals.
3. Traffic incident alerts on either port-area roads or approaches.
4. Planned or scheduled closures, repairs, or restrictions on either port-area roads or approaches.
5. Port terminal conditions, incidents, or alerts.
Study of Innovative Technologies for Communicating Real-time Information to Port Drayage Drivers

Chapter 4

Adding terminal condition messages to a port traffic communications system could create significant value.

Truck turn time information is a special category of terminal messaging, and is discussed in the Appendix. Current turn times can be presented in a “dashboard” format while turn times for prior time periods are more often provided in “report card” style.

In planning a port traffic communications system, how recipients use the information matters. Information on lane closures due to accidents may lead truckers to delay trips or take alternate routes, or allow more time until the lanes are reopened. Information on a month-long port-area road construction project, in contrast, may lead truckers to change operating plans for the duration. The matrix in Figure 32 (page 34) attempts to relate decision types to information types.

As could be expected, all information types are potentially relevant to many truck operator decisions, and drivers and dispatchers will ultimately benefit from having that information available. Some factors are essentially fixed in each planned trip: once a trucker has committed to a specific transaction at a specific time (especially through an appointment system), the driver and dispatcher must either cancel, reschedule, or find a way to meet the commitment. Traffic conditions anywhere might lead a trucker to allow more time to reach the port for that appointment, but unless the appointment is changed terminal and traffic conditions are not relevant to that decision.

Terminal conditions might affect the time allowed to complete the transaction and thus the ability to meet a customer appointment. Systems that attempt to mitigate port-area congestion might thus focus on port-area traffic information, while systems that attempt to reduce unproductive trips might focus on terminal information.

Port-area roads, whether public or port-controlled, are not likely to receive sufficient attention from traffic monitoring agencies or news services, so port systems that provide this information are a valuable supplement to information available to the general public.

Like commuters, however, port drayage drivers cover the same port-area roads every weekday, and quickly become familiar with typical traffic conditions. Under those circumstances port information systems may be most valuable when they alert drivers and dispatchers to unexpected traffic conditions.

Metropolitan areas commonly have multiple sources for information on regional traffic conditions. Radio and on-line reports are often tailored to the needs of commuters, as opposed to the needs of port truckers. Some port services gather local and regional traffic information from multiple sources, identify relevant information, and relay that information to port truckers. Such systems provide value by condensing multiple sources into a single information stream and by drawing attention to items of significance that truckers might have missed.

Alerts of current congestion, accidents, closures, weather impacts, or other unexpected changes to expected traffic conditions may be widely available. Port systems, however, can insures that relevant messages reach affected stakeholders. Localized weather impacts such as flooding on terminal access roads or lanes blocked by snow are important to port truckers but are often ignored by public media.

Announcements or reminders of planned restrictions on local and regional highways may also be available from other sources, but port-area projects are less likely to receive attention. This distinction is particularly important where terminals are served by single-purpose, port-controlled roads on which non-port vehicles seldom travel.

The value of terminal condition messages within port traffic information systems depends on the alternatives. Many port terminals will post information such as holiday hours, gate restrictions, incidents, etc. on their websites, although that does not guarantee that a truck driver or dispatcher will see it in time to react. Using websites for announcements from several terminals can be unmanageable, and robust systems for terminal messaging like Southern California’s eModal system, make port systems redundant. Where such a system is missing or incomplete,
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4.4 INFORMATION GATHERING

Input to traffic alert systems can come from a variety of sources:

- Port departments. This may include operations, construction, traffic etc. (All ports)
- Marine terminal operators (Virginia, NYNJ, Oakland)
- Staff observations (Oakland)
- Port-installed or terminal webcams (Oakland, Hamburg, Vancouver)
- Local and regional highway and transportation agencies (NYNJ, Baltimore, Tacoma)
- Sensor arrays and Bluetooth detectors (Hamburg, Montréal – planned)
- Truck GPS transponders (Vancouver)

Ports face choices regarding information collection and message frequency:

- A system that advises of planned restrictions needs updates only when projects are announced, begun, or ended. Such a system does not need webcams, sensors, or other real-time inputs (Long Beach).
- A daily bulletin system needs information to update traffic status daily (e.g. early morning), but may not need real-time updates (Oakland). Once a webcam system is in place, however, it can provide both daily and real-time information.
- A real-time alert or status system will likely need multiple inputs, including information from other organizations (NYNJ, Baltimore, NWSA), webcams (NYNJ, Oakland, Hamburg), and sensor, Bluetooth, or GPS data (Hamburg, Vancouver).

Port-specific traffic advisories need port-specific inputs. Regional and local sources, such as those used at New York-New Jersey and Baltimore are most effective at communicating conditions on port approach and exit routes that are shared with other traffic (particularly routes shared with commuters). The field visits made at Oakland and the webcams used at Oakland and elsewhere allow Port staff to monitor port-specific conditions and focus on “hot spots” such as critical intersections and terminal gates.

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**Figure 32: Traffic Information and Truck Operator Decisions**

<table>
<thead>
<tr>
<th>Truck Operator Decision</th>
<th>Port-area Traffic Conditions</th>
<th>Local/Regional Traffic Conditions</th>
<th>Traffic Incident Alerts</th>
<th>Scheduled Closures, etc.</th>
<th>Terminal Conditions or Alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule a Trip</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reschedule a Trip</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Inform Customer of Expected Delay</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reschedule Customer Appointment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reassign a Driver or Tractor</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change a Terminal Appointment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Allow More Time to Reach Port</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reroute a Trip</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cancel a Trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td>Choose a Different Transaction at the Same Terminal</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td>Choose a Transaction at a Different Terminal</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td>Allow More Time to Complete Transaction</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>X</td>
</tr>
</tbody>
</table>
Chapter 4

4.5 ANALYSIS AND MESSAGE COMPOSITION

In each port system someone must choose whether or not to issue a message or alert and what message to send. Discussion with PANYNJ revealed the complexity of this issue and the range of choices involved.

The simplest option is to relay messages received from other sources, as with the event advisories sent out by Long Beach and NWSA. In both cases one or more port staff members receive notices of planned construction, lane closures, etc., and reformat the information as a port message with weblinks as appropriate.

Systems such as those in NYNJ, Baltimore, and Virginia that pass on versions of public agency traffic alerts function similarly. Such regional messages are usually not port-specific and do not involve port policy or legal considerations.

Oakland and Virginia take publicly available terminal information (e.g. from websites – “pull”-mode) and rebroadcast it to their users (“push”-mode).

The choices around sending messages become more complex as the judgment of port staff and the image of the port became involved. Ports are understandably reluctant to announce congested conditions, long lines, detours, or other adverse conditions that would reflect poorly on the port. In addition, port authorities do not want to become involved in legal actions between terminals, carriers, or truckers as a result of their traffic alerts. The 2014–2015 U.S. West Coast port congestion, for example, left a morass of disputed container demurrage and per diem claims. The central issue in most of those disputes is whether or not it was feasible for truckers to pick up loads or return empty containers at terminals within the free time allowance.

One specific issue raised in Tioga’s industry contacts was the consistency of port messages regarding the end of incidents and the resumption of normal operations. If the port relies on other agencies to cancel alerts or report incident resolution, there may indeed be such lapses. Port staff may need to make specific inquiries to determine when and if incidents have been resolved.

4.6 COMMUNICATION METHOD

Most communication methods used in port traffic alert systems have little or no incremental cost. With the exception of website posts, these are all “push” options that do not require recipients to look for messages:

- **Twitter** (NYNJ, NWSA, Vancouver) is free and accessible to anyone with a smartphone, but is limited in message length and complexity.

- **SMS Texting** (NYNJ, Virginia, NWSA) is free, and can accommodate complex messages, links, and graphics, and is accessible to anyone with a smartphone.

- **E-Mail** (NYNJ, Oakland, NWSA, Virginia, Baltimore) is free and can be received via smartphone, tablet, or computer. Email can accommodate the most complex messages, including pre-formatted reports (Oakland).

- **Website postings** (NWSA) are low cost, but may require involvement of staff with technical knowledge and system access. Website postings, however, are not a “push” option. They may be linked to “push” alerts as a source of more information.

- **eModal** provides a third-party portal for email messages, relieving the sender of the need to manage email lists. eModal requires both the sender and receiver to sign up (for free).

- **Display** on changeable, port-specific message signs (Hamburg, Vancouver) is a far more costly and ambitious option, but has the advantage of communicating to all drivers passing the sign.
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4.7 RECIPIENT LIST

The effectiveness of Twitter, SMS texting, and email depends on how well the message is crafted and on how completely the system covers the stakeholder audience. SMS texting and emails both require the recipient to provide contact information but that process can be easily managed on-line, via text, or via email. Tioga found it very easy to sign up for these services.

eModal’s primary lines of business at present include maintaining port and terminal truck registries, which makes using eModal as a portal for traffic alert emails a sensible option for ports where this feature is incremental.

4.8 IMPLEMENTATION PATH

The questions facing a port authority contemplating a traffic information system parallel the system elements discussed above:

→ **Scope**—Should the system focus on traffic conditions, terminal conditions, or both? Should it be as needed, daily, or real-time?

→ **Information Types**—What types of traffic or terminal information should be provided? What choices will truckers be able to make with that information?

→ **Information sources**—What suitable information sources are available for current regional and port-area traffic conditions? It would be possible to start with existing sources and expand as new sources become available or the system scope expands.

→ **Communications method**—Email, SMS texts, Twitter, or website posting

→ **Recipient list**—Often the most difficult start-up task: eModal has a built-in list but it may not be sufficiently comprehensive for every port, and ports’ own email lists may not suffice for traffic alerts. Publicizing the system encourages users to sign up.

The wide range of systems in place and the commonality of their basic elements suggests that port authorities could easily start with modest, low-cost systems and expand as dictated by needs and resources.

On a small scale, an individual port staff member could compile and relay available relevant traffic information to a target audience. A Twitter-based or SMS text system could be started by any port staff member with a smartphone and access to existing traffic information sources. Blogs and Yahoo! groups are also used to exchange traffic and terminal observations between drivers. It is relatively easy to send message versions simultaneously via email, SMS text, and Twitter. There is virtually no incremental cost beyond staff time. eModal offers easy access to email accounts of interested stakeholders. In ports such as Los Angeles and Long Beach where eModal is a heavily used conduit for terminal status messages, truck registration, fee payment, etc., virtually every significant truck or terminal operator will receive the messages.

On a large scale there is no upper limit, with technology options for data collection (F RFID, RAPI, Bluetooth, detection loops), automation, and information display (DMS/CMS installation) potentially adding the most costs. These systems generate and disseminate new information.

These systems serve the broader community of which the port is a vital part. The implicit “social license” by which the port continues to operate as a public entity increasingly require the port to minimize and mitigate any adverse impacts on that community. The extensive DIVA system being implemented by the Port of Hamburg extends beyond the port boundaries to reduce congestion on approach roads and assist with parking and rest issues for long-haul truckers. The FRATIS demonstration project in Southern California likewise attempts to improve the efficiency and reduce the impact of port trucking throughout the port region.

These observations suggest that the appropriate implementation path for a truck traffic information system should be port-specific and community-specific. The use of existing resources and rented data collection or display equipment can facilitate pilot or test implementation of system features as an intermediate stage, and allow the port to expand on successful features and avoid costly dead ends.

4.9 COST FACTORS

The port truck traffic communications systems described in this report range from simple information relays at virtually zero cost to ambitious semi-automated systems with multi-million dollar investments. There are a few basic cost factors that determine this wide range:

→ **Use of existing resources**
→ **Port staff time**
→ **Information collection systems**
→ **System development**
→ **Information communications systems**
### Information Collection Systems

The widest range of direct costs is likely to be in information collection. At the lowest end of the scale are systems that use existing resources as discussed earlier.

Figure 33 displays illustrative cost ranges for data collection and display technologies. As a rule, the cost of installation substantially exceeds the cost of the data collection device itself. Installation costs are much higher when new structures need to be built and new power supply and data connections must be provided.

All of the devices listed above can be rented for pilot projects or tests. As of November 2015 the Port of Oakland has a test Bluetooth detection system in place collecting truck turn time data, and the Port of Tacoma has plans to follow. This effort is being watched by other ports trying to identify the best means of long-term turn time monitoring.

Existing structures and power supplies may not be configured to match vehicle paths with data collection. The mismatch can be most significant with RFID, which requires close vehicle proximity, and with Bluetooth detection, which may detect extraneous or misleading signals.

### System Development

System development costs would be incurred by complex data collection systems, automated communications systems, or data displays on Changeable Message Signs (CMS, also called Dynamic Message Signs or DMS). The only existing system located with those features is the Port of Hamburg's DIVA. The overall cost of DIVA has been estimated at 6 million CAD.

New, complex, and innovative systems cost more, though development costs usually decline as systems become more common.

### Information Communications Costs

The costs of communicating via Twitter, SMS text, email, or posting messages on a port website are essentially zero. The use of port-specific CMS/DMS display units, as in the Hamburg and Vancouver systems, could entail higher installation costs where legacy structures are unlikely to accommodate CMS. CMS displays have one concrete advantage that could justify their expense: they are a visible reminder to the community that the port is taking action to improve trucking efficiency and reduce congestion.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Unit Cost Range</th>
<th>Installed Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID Reader</td>
<td>$200 – 750</td>
<td>$2,000 – 20,000</td>
</tr>
<tr>
<td>Bluetooth Detector</td>
<td>$200 – 500</td>
<td>$2,000 – 8,000</td>
</tr>
<tr>
<td>Webcam</td>
<td>$200 – 500</td>
<td>$2,000 – 20,000</td>
</tr>
<tr>
<td>Induction Loop</td>
<td>$100</td>
<td>$700 – 1,400</td>
</tr>
<tr>
<td>CMS/DMS Unit</td>
<td>$500 – 2,000</td>
<td>$47,000 – 150,000</td>
</tr>
</tbody>
</table>

Sources: US DOT RITA Cost Database, various
APPENDIX
5.1 OVERVIEW

“Turn time” refers to the time required for a truck driver to complete a planned transaction at a marine container terminal. The complete cycle may have many variations but includes a few basic elements:

1. Queuing or waiting time between joining the queue of trucks (if any) outside the entrance gate and arrival at the initial terminal contact point, typically a communications pedestal or the entrance gate itself.

2. Entrance gate processing time.

3. Terminal transaction time. This step includes actual interchange of loaded or empty containers and chassis.

4. Exit gate processing time.

Elements 2–4, the “gate-to-gate” or “pedestal-to-pedestal” turn time, are captured in the Terminal Operating System (TOS). Element 1, the queuing time, requires a separate data collection mechanism, possibly using RFID, GPS, or Bluetooth technologies. These technologies can also capture data on elements 2–4 with appropriate detector placement or geofences.

Most port or terminal websites report on recent turn time performance, using terminal TOS data for gate-to-gate times. Reports are provided for weekly results, weekly averages, or the previous day. These “report card” approaches reveal averages and trends rather than current conditions and are more useful for planning rather than daily dispatching decisions. At present in North America, only Port Metro Vancouver provides real-time data that could be used by drivers and dispatchers to either choose when to visit the terminal or anticipate how long the visit will require.

The “report card” turn time data would likely be of greatest use in planning for future trips, specifically in anticipating how long a given trip is likely to take. This value should not be underestimated since dispatchers need to know expected trip times to plan the drivers’ itinerary, and expected trip time is a factor in pricing the trip.

Publishing turn times also have a broader purpose in responding to public and private criticism of terminal productivity. Long lines of trucks at port terminals can be a public nuisance and an embarrassment to port authorities. Port authorities may publish turn times to counteract anecdotal information, and to show that the Port is responding to the issue. The underlying turn time data collection also supports cause-and-effect analysis and the search for solutions, as in APGST’s previous research (e.g. Drayage Excellence Metrics in Metro Vancouver, 2013, and Vancouver Drayage Truck Turn-Time Analysis, 2013).
5.2 PORT OF METRO VANCOUVER TURN TIME DASHBOARD

The Port of Metro Vancouver (PMV) has experienced drayage congestion and delays periodically over the last decade. Partly in response to those issues PMV has developed an industry-leading system to track and display turn times at its four container terminals.

The system began as a pilot program using data from GPS on 300 drayage tractors. The Port of Metro Vancouver defined a series of geofences at and around the terminals (Figure 34) and collected GPS data on entry and exit from each geofence.
The GPS-equipped fleet was part of the fleet licensed under the Ports Truck Licensing System initialized in 2005. Under this pilot program PMV reported summary wait time data as shown in Figure 35. Similar summaries are still provided on the PMV website at: www.portmetrovancouver.com/port-dashboard/supply-chain-performance/.

Summary data (Figure 36) are also provided in a separate on-line location.

Based on the successful pilot program, PMV expanded GPS coverage to the complete TLS fleet and began displaying an online “dashboard” with current (Figure 37) and hourly turn time data at www1.portmetrovancouver.com/COGS_Chart/GPSTruck/pmvindex.

Current turn times are split into Terminal Pregate (staging, queuing or waiting time) and Terminal (entry to exit turn time) segments. The dashboard also has provisions for posting rail crossing status. Recent completion of the South Short corridor Project has greatly reduced the impact of rail crossing on the South Shore terminal access routes.

Contacts with Vancouver truckers suggest that the PMV dashboard is used, but has limited value for dispatchers because the terminal appointment system obligates drivers to make planned trips regardless of current turn times. This observation suggests that the dashboard is most useful in anticipating the time required for an appointment rather than choosing whether or when to make a trip.

Figure 35
Sample PMV GPS Turn Time Data

Figure 36
Summary PMV Truck Turn Time Data
Figure 37 Sample PMV GPS Dashboard

Estimated truck waiting and flow times at Port Metro Vancouver terminals

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Current total average wait time</th>
<th>Total average wait time</th>
<th>Terminal Pre Gate</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centerm</td>
<td>31m</td>
<td>29 minutes</td>
<td>≤ 5 minutes</td>
<td>27 minutes</td>
</tr>
<tr>
<td>DeltaPort</td>
<td>53m</td>
<td>34 minutes</td>
<td>10 minutes</td>
<td>44 minutes</td>
</tr>
<tr>
<td>FSD</td>
<td>23m</td>
<td>15 minutes</td>
<td>≤ 5 minutes</td>
<td>14 minutes</td>
</tr>
<tr>
<td>Vanterm</td>
<td>1h 0m</td>
<td>33 minutes</td>
<td>≤ 5 minutes</td>
<td>29 minutes</td>
</tr>
</tbody>
</table>

This chart shows the estimated wait times for terminal pre-gates and within terminal yards.

- Current average wait times are updated once per minute and reflect the average waiting time of transactions which have completed their trips in the last thirty minutes.
- Total average wait times are updated once per minute and reflect the total average waiting times of transactions which have completed their trips today.

Port’s rail crossings status:

No record.
5.3 PORT OF VIRGINIA WEEKLY TURN TIME METRICS

The Port of Virginia publishes weekly port KPIs on its website. The KPIs cover the major container terminals, Norfolk International Terminals (NIT), Virginia International Gateway (VIG), and Portsmouth Marine Terminal (PMT).

The KPIs previously included:
- Gate Transactions
- Vessel Calls
- Rail Containers
- Rail Container Dwell Time
- Gate (Truck) Container Dwell Time

In March 2015, POV began listing the past week’s turn times for VIG and NIT at (Figure 38) www.portofvirginia.com/pdfs/Weekly%20Metrics.pdf:
- “Traditional” on-terminal (gate-to-gate) turn times, based on terminal transaction data.
- “Extended” turn times that include gate times from RFID data.

Since these data cover past performance they are “report cards” rather than real-time information for dispatching. The creation of these reports is facilitated by the close relationship between POV and Virginia International Terminals, the closely held subsidiary that operates the terminals. The RFID system was implemented when VIG was built by APM Terminals as their Portsmouth terminal, giving POV another building block for the information system.
5.4 DP WORLD SOUTHAMPTON DASHBOARD

The DP World Southampton, UK terminal provides a multi-function dashboard on its website (Figure 39) at: www.dpworldsouthampton.com/port-status/#truck-report.

The Southampton dashboard has some of the same vessel information as the Oakland operations report, and also uses green/yellow/red codes for queuing conditions at terminals. The dashboard also shows average terminal (gate-to-gate) truck turn times for the previous 60 minutes, and a summary for the previous day. Finally, the dashboard shows the volume of containers in the terminal. This dashboard thus provides a mix of “actionable” information on current conditions similar to Vancouver and Oakland, and “report card” information similar to Virginia. The dashboard appears to be generated from data in the DP World TOS.

![DP World Southampton Dashboard](image-url)
5.5 TERMINAL WEBSITE
TURN TIME DATA

Some marine terminals also report gate-to-gate turn times on their websites. One example is the Ben E. Nutter terminal at Oakland, operated by Ports America. As shown in Figure 40, the website shows average turn times for the previous day. Here, too, the data functions as a report of recent performance rather than as a real-time dispatching tool.

<table>
<thead>
<tr>
<th>Average Turn Times — 08/28/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis In</td>
</tr>
<tr>
<td>Chassis Out</td>
</tr>
<tr>
<td>Empty In – Decked</td>
</tr>
<tr>
<td>Empty In – Wheeled</td>
</tr>
<tr>
<td>Empty Out – Decked</td>
</tr>
<tr>
<td>Empty Out – Wheeled</td>
</tr>
<tr>
<td>Full In – Decked</td>
</tr>
<tr>
<td>Full In – Wheeled</td>
</tr>
<tr>
<td>Full Out – Decked</td>
</tr>
<tr>
<td>Full Out – Wheeled</td>
</tr>
<tr>
<td>Total Average for All</td>
</tr>
</tbody>
</table>

Figure 40
Sample Port of Oakland Ben E. Nutter Terminal Turn Times
Study of Innovative Technologies for Communicating Real-time Information to Port Drayage Drivers

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