TO: BOARD OF DIRECTORS
THROUGH: PHILLIP A. WASHINGTON, CHIEF EXECUTIVE OFFICER
FROM: DAVID C. EDWARDS, CIO
JAMES GALLAGHER, COO
SUBJECT: NEXTRIP REAL-TIME BUS AND RAIL ARRIVAL INFORMATION

ISSUE
This board box provides an explanation for Nextrip bus and rail real-time prediction reliability and the steps being taken to improve system accuracy. Specifically, this is in response to Director Fasana's inquiry regarding how quickly information can be updated and what are the inconsistencies.

BACKGROUND
The Nextrip program provides a means to disseminate real-time bus/rail arrival information to the general public. The program was established in 2011 and is used over 8 million times per month. The majority of Nextrip users are bus riders using mobile phones to obtain arrival information. See below for a general program trend on usage, mode and delivery device over the past 5 years in the graphs below.

![Graph showing Nextrip Access, Oct. 2011 - Apr. 2016](image)

![Graph showing Nextrip Access, Apr. 2016](image)
DISCUSSION

Real-time bus and rail arrival information (Nextrip) used to calculate prediction is dependent on the rate at which the information is obtained from the fleet or field infrastructure.

BUS

For bus, the poll rate is 3 minutes. This poll rate is dependent on the data communication infrastructure implemented in 2001 as part of the ATMS bus fleet system implementation. If a communication update is missed at the 3 minute poll (poor coverage area, high channel demand, etc.), then the next opportunity for a location update would be after 6 minutes which is a significant time period for a prediction update which increases potential inaccuracies in the arrival time calculations. The ATMS system is now over 15 years old and is in need of an update/replacement so that the 3 minute poll rate is more in line with the data/information needs of today (i.e. 10-30 second poll rate). Because of the limited availability of frequency channels in LA County, the 3 minute poll rate is the best that can be achieved within the current Metro owned/maintained infrastructure. The next-gen data system will need to use a 3rd party service provider (Verizon, Sprint, etc.) to be able to meet the necessary data rates and have a noticeable impact on prediction information as well as meet similar demands for live video streaming and near instantaneous farebox information.

In addition to poll rates affecting predictions, bus arrival information is also affected by real world operational realities. Dynamic schedule changes caused by detours, construction, law enforcement events or temporary schedule changes (pink letters) affect the predictions as these unplanned real-time events cannot be readily accommodated in the prediction engine. Additionally, vehicles that may have equipment or communication maintenance related issues may prevent vehicle location
data from being available which then affects the prediction accuracy and/or availability of data for a vehicle in service. Because the various operational, maintenance, network, prediction accuracy, schedule, communication coverage and other related issues affect real-time prediction information, the end result to achieve accurate and timely arrival information is fairly complicated and dependent on many factors.

RAIL

For rail, the data rate depends on track circuit information. As vehicles pass static track circuits, the time and position information is used to provide rail arrival predictions. If/when rail vehicles are held or stalled on the line for any reason, the vehicles fail to trigger a track circuit update and the predictions become more of an estimate than a calculation because the update frequency diminishes. Since rail does not have automated vehicle location (AVL) hardware on-board, the prediction engine does not have the ability to assess the location of the rail vehicles for improved predictions especially when rail vehicles are being prepped for service but not actually on the main line. Obtaining location information while the rail cars are off line would improve prediction accuracy. Similar to bus, and often more critical, whenever there is an event on a rail line that requires Rail Operations intervention, the associated rail predictions are invalid until they return to a scheduled and predictive state. During these unplanned events, Rail Ops is tasked with removing the prediction information displayed on platforms and replacing them with real-time customer information that is specific to each event. Because every event is different, the prediction engine cannot accommodate the expected response without external intervention.

The rail platform predictions, referred as Transit Passenger Information Systems (TPIS displays), use the common bus/rail prediction engine but pass through another service provider that manages the TPIS display information. TPIS displays have another layer of service level because prediction information must be operational nearly 24/7/365. The TPIS signs are currently under a replacement program that has significantly reduced the failure rate and are now operating on a more stable TPIS network.

Vehicle location information for both bus and rail is pushed through Metro’s prediction engine algorithm contracted through NextBus Inc. The prediction information is then presented as arrival information by route/stop (bus) location or line/station (rail) and disseminated via web, SMS text, mobile, 511 and 3rd party contractors like Google transit and other service providers. As real-time information continues to evolve and become an increasingly important data point, we are seeing a higher caliber of contractors entering into this service area that are developing social media tools (twitter, WAZE, etc.) to refine alert information and make data collection a multi-sourced function for improved accuracy and more timely dissemination of information.
NEXT STEPS

Short Term

1. Work to enhance the current prediction engine to automate some of the planned schedule changes that affect prediction accuracy. *(0-6 months)*

2. Evaluate 3rd party providers to assess if there are other prediction engines that may provide increased accuracy by pulling external crowd sourcing datasets similar to Waze for traffic information. *(0-6 months)*

3. Develop internal operational policies and procedures that will disseminate customer information in a timelier manner whenever there are unplanned events that prompt customer anxiety and affect arrival predictions. *(Implemented)*

Long Term

1. Metro is completing its Bus and Rail Fleet Systems Strategic Plan. This plan will establish a blueprint of what is recommended to upgrade the fleet to meet the challenges of the next-gen technologies including expanded and enhanced customer information. *(0-3 months)*

2. Evaluate the Bus and Rail Fleet Systems Strategic Plan and determine whether to seek capital funding to implement the vision recommended by the Plan. *(FY17-18)*

3. If funding is sought and approved, implement the various upgrades required to improve prediction information, expand passenger information and meet the technology demand of the current and future data and information systems. *(1-3 years).*

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