

**Minutes for BRS-USSU-Transit online meeting
Monday, 27 April 2020 @ 2:30-3:30pm**

Location: Online meeting using Jitsi

Participants: Cory Shrigley, Allison Gray, Harold Matthies from Saskatoon Transit; Christine Mongeau, Sophie LeBlanc from the app called Transit; Peter Gallén, Robert Clipperton, Bob Eaton, Curt McCoshen, Melanie Hoffman, James Wood from BRS.

MEETING ADMINISTRATION

Allison was appointed Chair/Moderator of this meeting, while Peter will provide the minutes.

REGULAR ITEMS

1) Update on Covid issues

- a. Transit should only be used for essential trips.
- b. Regular boarding and disembarking takes place through rear-doors only.
- c. As a result, fares have been suspended.
- d. Physical distancing is enforced, and the maximum number of passengers on any bus is thus severely reduced.

2) Route changes

- a. On March 29 route 8+ (i.e., 8, 81, 82, 83 & 86) on the high-frequency corridor began using Broadway Bridge. At the same time routes 1 & 6 moved to Sid Buckwold Bridge. Despite widespread apprehension before the change, no major complaints have been heard after the change was implemented. BRS noted that at least a bench but a shelter as well would be appreciated at the bus stop in the corner of Broadway and 8th Street.
- b. No major changes are planned for June 1, when such changes are typically implemented
- c. The implementation of the proposed pilot route 111 has been postponed due to the pandemic.

SPECIAL ITEM

At the request of BRS, the main agenda item for this meeting was a high-level description of the creation and flow of transit data between Saskatoon Transit, the third-party app called Transit and the transit Riders' mobile devices. Harold Matthies, Transit's Technology Coordinator, provided an overview of the data produced by Saskatoon Transit, while Sophie LeBlanc, Business Development Manager with transit app, showed how the various data streams end up looking in their app (here called Transit-App). It should be noted that the description below is an amalgam of the various presentations plus additional information obtained after the meeting.

3) Summary of Saskatoon Transit's efforts to provide third-party access to their Open Data:

- a. In this section we will take a high-level look at the tasks and timelines required to make route changes to Saskatoon Transit's bus network. The description will provide a sense

of the formidable back-office effort that was required when 15 bus routes had to be reconfigured due to the sudden closure of Place Riel Terminal with only two days notice:

- i. Planning Supervisor:
 1. Saskatoon Transit's Planning Supervisor creates the bus routes and associated schedules in Transit's FX-software (part of the Trapeze-suite).
 2. The bus route may then be physically driven with a transit bus to validate the draft schedule; adjustments in either the route or schedule are made as required to comply with the physical realities of the route.
 3. The effort of the Planning Supervisor can take from 24 hours for a simple change to between 3 and 4 weeks for a complex sign-up revision.
 4. The integrity of the data changes must be validated prior to sending to the Programmer Analyst; subsequent follow-up is required as well.
- ii. Programmer Analyst:
 1. Saskatoon Transit's Programmer Analyst imports the FX-data into Transit Master (part of the Trapeze-suite), which is the software used in Saskatoon for the daily operation of the transit system. Collaboration with the Planning Supervisor is required to validate the data in FX as well as the City's Open Data set.
 2. The effort by the Programmer Analyst to merge and validate the data into Transit Master will take between ½ and 2 days depending on the complexities.
- iii. Transit Operational Support:
 1. Now that the new route has been imported into Transit Master, the details of the route (route pattern, driving directions, distances and bus stops) must be carefully validated.
 2. The text messages on the Head Signs and Internal LED-Sign plus the audio messages in the buses that run the route must also be confirmed.
 3. All the data must be validated for functional accuracy.
 4. Depending on the complexities of the changes being implemented, this effort could take from a low of ½ day up to 7 days.
- iv. Programmer Analyst and Corporate IT:
 1. The Programmer Analyst must then publish the data in accordance with GTFS-specifications for the City's Open Data set to be available for third-party consumption from the City's Corporate IT servers:
 - a. Preparing and publishing the mobile files can take up to 3 days, although most regular updates can be automatically processed overnight.
 - b. Preparing and validating complex GTFS-files can take up to 2 days to prepare and send to Google. Google advises that it can take up to 7 days for the submitted data to be approved and published, although Transit has seen it done in significantly less time.

- c. The approved GTFS-data must then be submitted to the City's Corporate IT.
 - v. Corporate IT:
 - 1. The City's Corporate IT publishes the files to Open Data.
 - 2. This can take 1-2 days to complete, after which the files can be freely accessed by third-parties, such as Google Transit and the Transit-App.
 - vi. Transit Riders
 - 1. The uptake of the publicly posted and frequently refreshed Open Data by the third-party developers returns 'immediate' and 'refreshed' results in the customer facing applications, such as Google Transit or Transit-App on the riders' mobile devices.
 - 2. As discussed later, these are relative terms, because there may be a number of delays across the live data flows from end-to-end.
 - vii. Co-ordination:
 - 1. Transit staff meets daily for an hour under the leadership of Transit's Technology Coordinator to plan the entire team effort.
- 4) Summary of the features in Transit-App:**
- a. Transit-App continuously picks up all the latest data from Saskatoon Transit's Open Data set and sends out precisely those data that each rider's mobile Transit-App requires to provide the desired information. Riders typically use Transit-App to i) plan their trip from A to B, ii) find out where the bus they want is currently located, and iii) find out how long it will take for their bus to arrive:
 - b. Next-Bus prediction:

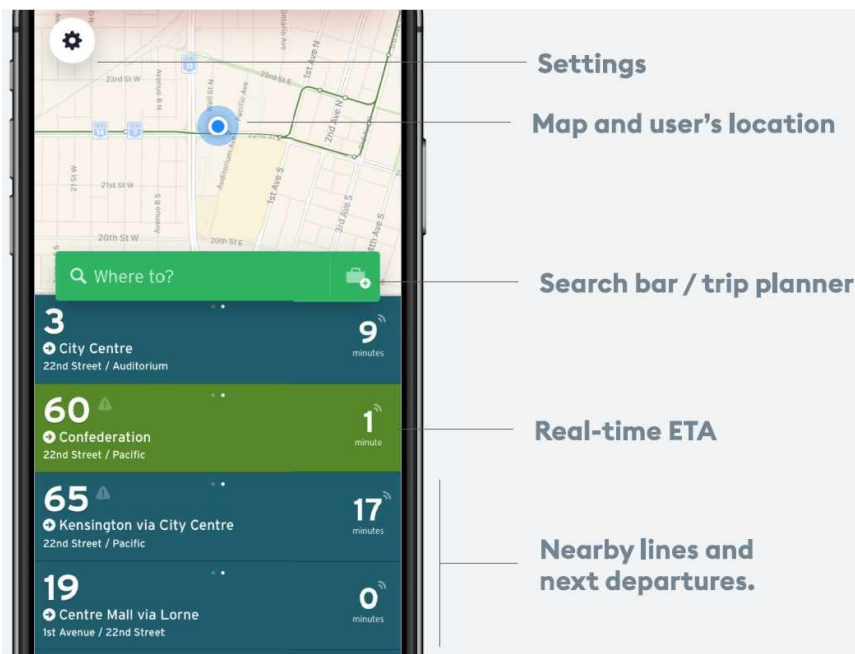


Fig 1: The estimated time for the arrival of the next bus on each nearby transit route to the rider's current location is shown. The 'wavy lines'-symbol beside the estimated time indicates that realtime bus locations are used.

c. Bus Location:

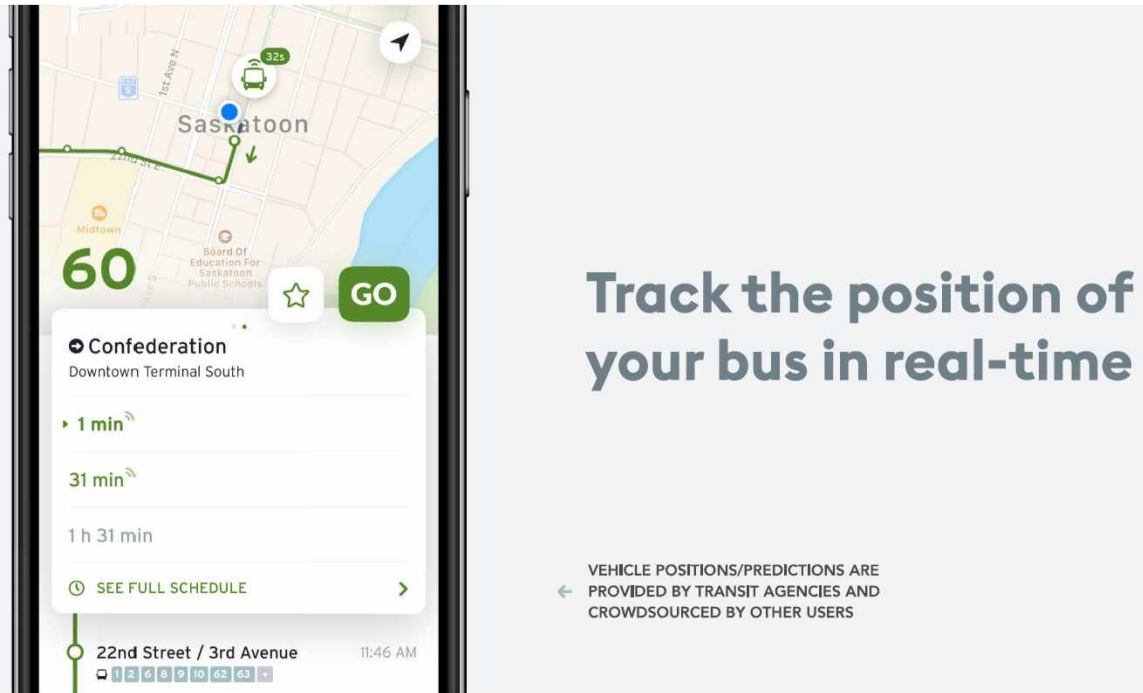


Fig 2: This screen clearly shows that the location of the bus was determined 32 seconds ago, which in practise means that the bus might already be a lot closer to the rider's bus stop.

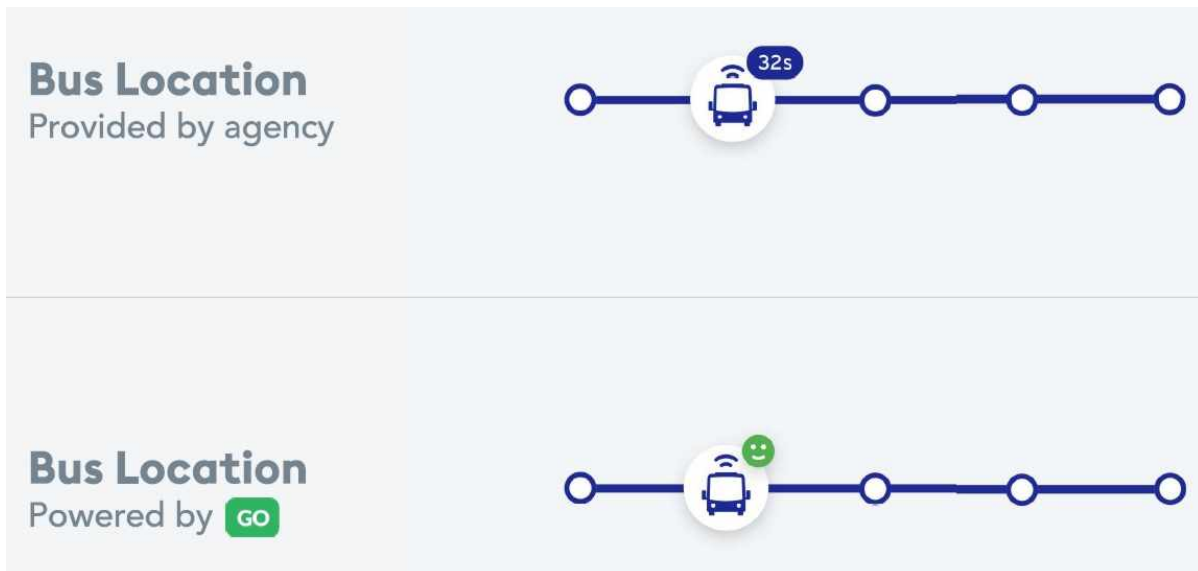


Fig 3: The upper line of this picture shows that the bus location, which was retrieved from Saskatoon Transit's Open Data, was determined 32 seconds ago by the GPS in the bus, while the lower line shows a more up-to-date bus location that was determined by the GPS in the mobile device of a Rider actually present on the bus and passed on to other riders by the GO-function in that rider's Transit-App (Note: active only when GO is turned on).

d. Trip Planning:

- i. Trip planning is the real 'gem' of Transit-App (and Google Transit and other such apps), because that function is *not* provided by Saskatoon Transit.
- ii. Transit-App determines the current location of the Rider using the GPS-function in the rider's mobile device and merges that information with all the transit routes and fixed schedules in the Open Data to plan the Rider's trip from A to B. The latest versions of Transit-App also include bike-shares (in some cities) and Transit Network Companies (TNCs) as potential means for (portions of) the trip (e.g., Riide and Uber in Saskatoon).

5) Open Data:

a. General

- i. The 'glue' in this complex system of trip takers (e.g., transit riders), trip providers (e.g., transit properties), and third-party service providers (e.g., app developers) is the proprietary data that is published for public consumption in particular data formats called Open Data:
 1. It may be noted that the City of Saskatoon provides third-party agencies with many kinds of Open Data, of which transit data is only one aspect (<http://opendata-saskatoon.cloudapp.net/>).
 2. All transit-specific data originates from the transit property (Saskatoon Transit in our case). In order for a fully independent, third-party software developer (such as 'Transit-App' in our case today, or 'Google Transit') to utilize that data for consumption by transit Riders, it must i) be freely shared by the transit agency, ii) be published in such a format that the app-developer can readily pick it up, and iii) be manipulated appropriately for display in the transit rider's mobile device.
 - a. Saskatoon Transit describes their Open Data as follows: "The Saskatoon Transit Real Time Data Feed enables developers to create applications for the desktop, web or mobile devices that include transit data. The information is available at no charge and can be implemented in both for-profit and non-profit applications. We only ask that developers adhere to the guidelines presented in the City of Saskatoon Open Data Terms of Use." (<https://transit.saskatoon.ca/about-us/open-data-saskatoon-transit>)

b. The GTFS-specifications for Open Data:

i. General:

1. There are many different Open Data specifications, but the two that concern transit data are called *GTFS* and *GTFS Realtime*: "GTFS is split into a *static* component that contains schedule, fare, and geographic transit information and a *real-time* component that contains arrival predictions, vehicle positions and service advisories" (www.gtfs.org).

- ii. GTFS:
 - 1. *GTFS*, originally called *Google Transit Feed Specification*, was later renamed *General Transit Feed Specification*.
 - 2. From www.gtfs.org: “The General Transit Feed Specification (GTFS) is a data specification that allows public transit agencies to publish their transit data in a format that can be consumed by a wide variety of software applications. Today, the GTFS data format is used by thousands of public transport providers.”
- iii. GTFS Realtime (<https://developers.google.com/transit/gtfs-realtime/>):
 - 1. “GTFS Realtime is a feed specification that allows public transportation agencies to provide real-time updates about their fleet to application developers. It is an extension to GTFS (General Transit Feed Specification)... GTFS Realtime was designed around ease of implementation, good GTFS interoperability and a focus on passenger information. The specification was designed through a partnership of the initial *Live Transit Updates* partner agencies, a number of transit developers and Google. The specification is published under the Apache 2.0 License.”
 - 2. Overview of GTFS Realtime feeds:
 - a. “The specification currently supports the following types of information:
 - i. Trip updates - delays, cancellations, changed routes.
 - ii. Service alerts - stop moved, unforeseen events affecting a station, route or the entire network.
 - iii. Vehicle positions - information about the vehicles including location and congestion level.
 - b. Because GTFS Realtime allows you to present the actual status of your fleet, the feed needs to be updated regularly – preferably whenever new data comes in from your Automatic Vehicle Location system.”
- c. Maps:
 - i. The maps on which the bus routes in Transit-App are displayed are provided by OpenStreetMap. From their website (<http://openstreetmap.org/copyright>):
 - 1. “OpenStreetMap® is open data, licensed under the Open Data Commons Open Database License (ODbL) by the OpenStreetMap Foundation (OSMF).”
 - 2. “The cartography in our map tiles, and our documentation, are licensed under the Creative Commons Attribution-ShareAlike 2.0 license (CC BY-SA).”

6) Flow of the GTFS Realtime data from Saskatoon Transit via Transit-App to the transit Riders:

- a. Bus Location Data Flows:
 - i. Each bus is equipped with a GPS-based Automatic Vehicle Locator (AVL) that frequently determines the bus location and sends it to Transit Master every 30 seconds over SaskTel's cell-phone network.
 1. A while back Saskatoon Transit experimented with 10 second updates of the vehicle locations, but the data transmission and recording system was so overwhelmed that the interval was reduced back to 30 seconds.
 - ii. Transit Master uses i) the static location of the bus stops, ii) the latest recorded location of the bus and iii) the predicted rate of progression of the bus along the route to estimate the arrival time of the bus at each stop along the route.
 - iii. The data in Transit Master is immediately sent to the GTFS Realtime Open Data set, where it can be picked up by the third-party apps.
 - iv. Transit-App accesses the Realtime data set every 10-15 seconds; it then takes another 10 seconds for the data to reach the mobile device for a total transfer time of about 30 seconds through Transit-App from the Open Data to the Rider.
- b. Bus Locations in Transit-App:
 - i. Although the total transaction time of the data through the system may indeed be up to 1 minute long (with 30 seconds being eaten up by data processing at Saskatoon Transit and another 30 seconds by data processing through Transit-App), the refresh rates in riders' Transit-Apps are not necessarily cumulative:
 1. The data in a rider's app is actually updated continuously every 10-15 seconds, as Transit-App keeps refreshing itself from the Open Data.
 2. Most importantly it needs to be recognized that the bus location shown in a Rider's app is truly the exact location of the bus at the time indicated (e.g. 32 seconds ago, as shown earlier in Fig 2).
 - a. This is achieved because the bus location determined by the AVL in the bus was accompanied by a time-stamp, which allowed the rider's Transit-App to calculate and display the exact time lags from the current time.
 3. Secondly, it needs to be recognized that the location of the bus will remain unchanged in the rider's Transit-App until an update from the bus is recorded in the Open Data; typically every 30 seconds, which is the current refresh rate between the AVLs and Transit Master.
- c. Next-Bus Time Predictions in Transit-App:
 - i. After retrieving the last known bus location from the Open Data (plus its time stamp and the estimated arrival time at the rider's bus stop), Transit-App calculates and displays the time remaining based on the current time.
- d. Service Alerts:
 - i. Time was not available at this meeting to discuss the production and distribution of Service Alerts, but they are entered into Transit Master by

COMM¹ and sent out through the *GTFS Realtime* data set to the Riders by Transit-App.

7) Troubleshooting and feed-back

- a. Both Saskatoon Transit and Transit-App are interested in feed-back from the users of the app in order to improve the performance and usefulness of the app.
- b. Existing channels of feedback are much preferred; Transit's regular webform for feedback is available at: <https://transit.saskatoon.ca/customer-services/customer-feedback>
- c. In addition, both parties can be sent feedback directly from the Transit-App:

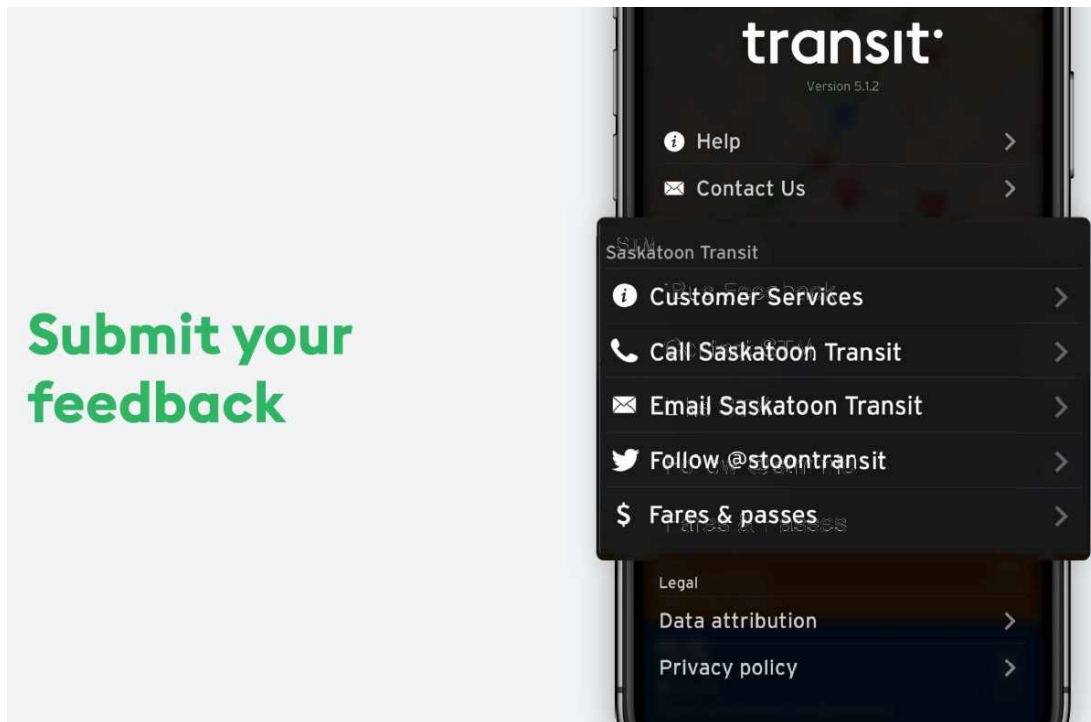


Fig. 4: Feed-back options available in Transit-App Settings (by clicking on the 'Transit-App'-button).

- d. Sources of errors in Transit-App:
 - i. As described earlier, almost all data displayed in Transit-App was produced by Saskatoon Transit and has been made available through Saskatoon Transit's Open Data set. As a result, most complaints about errors in the app should be sent to Saskatoon Transit. A few observations may be helpful.
 - ii. Transit Master and the Open Data:
 1. In general Transit-App has been pleased with the Open Data provided by Saskatoon Transit and with the close collaboration to remedy any deficiencies.

¹ COMM is the Supervisor-group at Saskatoon Transit that creates detours, issues service alerts and monitors Transit Master for issues that come up.

2. Having said that, there have been occasions when the Open Data was not updated properly, in which case the information displayed in the app was of course incorrect.
 3. It may also be noted that, Transit Master is pickier than Saskatoon Transit's previous Intelligent Transportation System (ITS) software, so creating accurate and consistent data has been a challenge. About 18 months ago Transit began the process of implementing Transit Master as its new ITS-software, so every bus route and bus stop, direction of travel and travel time prediction, as well as static schedules plus all text and audible announcements in the buses had to be recreated in Transit Master and carefully checked for consistency and data integrity both in Transit Master and in the Open Data. While Transit Master has been in daily use for quite some time already to manage the bus fleet on the road and the information going out to Riders and Operators, the data in Transit Master is still only about 90% complete to fully meet Transit's needs and expectations.
- iii. Next-Bus Prediction:
1. It may be noted that live location data is sometimes unavailable from a bus, in which case the next-bus-prediction is calculated from schedule data instead of the actual location of the bus. When this is the case, Transit-App fortunately shows that static schedule information was used for the prediction.

8) The company, Transit-App

- a. The Company:
 - i. The company that developed the app called Transit was founded in Montreal in 2012.
 - ii. Currently 60 people are employed of which all are active public transit users, avid walkers and cyclists.
 - iii. Transit-App is currently available in about 200 cities around the world.
 - iv. Additional features, such as the use of bike-shares and TNCs (Transportation Network Companies) were added to the app a few years ago.
 - v. The app in partnership with other companies can now handle fare payments for transit properties that have signed up for this integration.
- b. Privacy issues:
 - i. No data are sold to other agencies.
- c. Finances:
 - i. Transit properties, such as Saskatoon Transit, do not pay fees to Transit-App.
 - ii. Transit-App is free to the app users.
 - iii. Transit-App derives its income from other sources, such as commissions on fares.

NEXT MEETING: Monday, 25 May 2020, 2:30 – 3:30 pm by Jitsi.