Minutes for BRS-USSU-Transit online meeting
Monday, 8 February 2021 @ 2:00-3:15pm

Location: Online meeting using Zoom
Present: Cory Shrigley, Allison Gray from Saskatoon Transit; Jorgen Pedersen from Masabi; Christine Mongeau from Transit-App; Jamie Bell from University of Saskatchewan Student Union (USSU); Peter Gallén, Robert Clipperton, Lila Wagner, Curt McCoshen, Scott Colville, Doug Rudolph from Bus Riders of Saskatoon (BRS).

MEETING ADMINISTRATION

1) Allison was appointed Chair of this meeting, while Peter will provide the minutes.

USSU ITEMS

2) Nothing to report.

TRANSIT ITEMS

3) Nothing to report besides the items below.

BRS ITEMS

As a result of a previous request by BRS, Jorgen Pedersen, Masabi's Project Manager for the Saskatoon implementation, and Christine Mongeau, Transit-App's Partnership Relations Manager, were on hand to present and discuss Saskatoon Transit's New Fare Collection System.

4) New Fare Collection System for Saskatoon Transit
    a. Saskatoon Transit's implementation of a new Fare Collection System will include both the old and the new system until the old system is phased out. The old system will continue to use existing Bus Passes, while the new system will provide mobile ticketing:
        i. The new system will be tested in-situ and rolled-out this Spring and Summer.
        ii. Saskatoon Transit's new fare collection system consists of three distinct sub-systems: i) a 'back-office', which is a software platform, ii) the hardware, which consists of new on-board 'validators', and iii) the 'mobile apps', which provide the user interface to the mobile ticketing service. Each sub-system is described in more detail below.
    b. Description of the back-office software platform (Masabi *Justride*):
        i. Saskatoon Transit chose the ***Justride***-platform from a British company called Masabi as their mobile ticketing provider.
        ii. The Masabi *Justride* fare payment platform has so far been chosen by about 75 transit agencies world-wide:
            1. The cloud-based *Justride* software platform is the same for all transit agencies. This commonality allows every agency the option to sign up to any/all capabilities within *Justride* as they exist today and as they

continue to get developed and added to the multi-tenant Software-as-a-Service (SaaS)[1] *Justride* platform.

2. *Justride* operates on the principle of Fare Payments as a Service (FPaaS), which is a recent, sophisticated fare payment concept.

iii. From Saskatoon Transit's perspective as the transit agency that provides the service, the 'back-office' (i.e., Masabi *Justride* in Saskatoon's implementation) provides them with all the necessary system functionalities, such as a customized fare structure; sales & inspection of tickets; data collection & analysis; and overall system management. The back-office interacts with the ticket-validating hardware as well as the various front-end user interfaces. The back-office also houses the riders' Saskatoon Transit Customer Accounts, which will be required for any 'account-based ticketing' functions.

c. Description of the Hardware (validators):
   i. Saskatoon Transit selected one of Masabi *Justride's* standard-issue ticket-inspecting 'Validators' as the new on-board hardware in the buses:
      1. Saskatoon Transit's 'VAL 100'- validator is manufactured by AccessIS.
      2. A new Validator will be installed in each bus near the Operator as the self-serve ticket-inspecting hardware (see Fig. 1).
   ii. Existing tickets and bus passes (smartcards) continue to be validated on the old fare boxes in the buses, while activated mobile tickets (on cellphones and other mobile devices) will be validated on the new validators in the buses.
      1. Cash for a single-trip will continue to be accepted on the bus.
      2. Traditional Bus Passes[2] continue to be supported and accepted on the buses until new smartcards are introduced to replace the traditional bus passes.
d. User apps (*TGo* and *Transit-App*):
   i. From a Rider's perspective of the new fare collection system in Saskatoon, a branded and customized new mobile ticketing service will provide the following functions: i) it sells, delivers and stores (electronic) mobile tickets for the Rider, ii) it activates select tickets precisely when the Rider wants to use them, and iii) it securely processes all the required monetary and ticketing transactions with Saskatoon Transit's *Justride* back-office and the Rider's bank.

[1] Those who want to delve deeper into the concepts and terminology that are mentioned but not explained in these minutes are referred to the Technical Section at the end of this document.

[2] Traditional Bus Passes are Saskatoon Transit's legacy Go-Passes and newer t->Go-Passes (Adult, Youth, Child, Senior) as well as USSU's U-Pass for university students.

Fig. 1: Saskatoon Transit's 'VAL 100'-validator

ii. In practice the Rider will have the choice of two distinct front-end apps for mobile ticketing at Saskatoon Transit:
    1. The Rider can download a stand-alone user app called ***TGo***.
        a. This app is a specially configured and branded version of Masabi's standard, customizable front-end app that has been tailored for Saskatoon Transit's fare offerings.
    2. Users will also be able to purchase *TGo*-tickets using ***Transit-App***:
        a. This is accomplished by seamlessly integrating the mobile ticketing service into *Transit-App* (as described below).
        b. Since transit riders in Saskatoon are already familiar with *Transit-App* as their trip-planning and next-bus tool, it was natural to expand its usefulness by adding ticket purchases to it.
        c. By deliberately implementing *Transit-App* as a common front-end user interface to various mobility services in Saskatoon, Saskatoon Transit is already well on its way to integrate their traditional mass transit service with other mobility services and transportation providers. Current examples include Riide/Uber. The next step for Saskatoon Transit is to integrate their own soon-to-come on-demand transit service into the same trip-planning, ticketing and trip booking system with the ultimate

goal of providing fully integrated, end-to-end Mobility-as-a-Service (MaaS) in the future.

e. Mobile Ticketing and Account-Based Fare Payments in Saskatoon:
    i. The Masabi *Justride* back-office in conjunction with either one of the front-end apps will provide mobile ticketing and account-based fare payments for transit riders in Saskatoon. Definitions:
        1. Mobile Ticketing can be defined[3] as follows: "In a nutshell mobile ticketing involves turning your smartphone into both the ticket machine and ticket. This removes the need to waste time waiting in line or fumbling for the right change, allowing riders to buy their tickets anytime/any place, and then use their phone as the ticket."
        2. Account-Based Fare Payments (ABFP) or Account-Based Ticketing (ABT) is defined by ISO as: "ABT is a method of ticketing where the proof of entitlement to travel and any records of travel are in an ABT back office and not in the physical media held by the passenger. ABT is also known as server-based ticketing or security in system. ABT can operate in both an online and offline world using risk-managed revenue protection techniques as appropriate."
    ii. It may be noted that *Justride* is already operating in about 75 transit markets, while *Transit-App* is operating in some 200 locations world-wide. These include transit agencies, bikeshares, carshares, ride-hailing TNCs, and other Mobility-as-a-Service trip suppliers.
    iii. Saskatoon Transit's (Masabi-based) stand-alone *TGo*-app as the front-end:
        1. If Riders choose the stand-alone *TGo*-app, they will access Saskatoon Transit's ticketing system via the home-screen shown in Fig. 2.
        2. Installation of the *TGo*-app requires no registration with Masabi (except that the user's email address is required if a receipt is wanted).
    iv. *Transit-App* as the front-end:
        1. On the other hand, if Riders choose *TGo*-ticketing embedded within *Transit-App* as their front-end, they will access Saskatoon Transit's ticketing system via *Transit-App*'s familiar Home-screen, but:
            a. A new 'Ticket Bar' at the bottom of the Home-screen will provide access to any activated tickets (see Fig. 3; note that the 'Ticket Bar' in this figure is still a prototype and may change before the implementation goes live), while
            b. The familiar Gear-icon in the top-left corner of the Home-screen provides access to the 'Wallet' where the tickets are stored and (additional) ticket purchases take place.

[3] This definition of Mobile Ticketing was obtained from James Gooch's blog (28 Oct. 2019, p. 2): "Mobile Ticketing: Why Barcode?" on Masabi's website.

c. The use of *Transit-App* as the front-end for mobile ticketing at Saskatoon Transit requires the set-up of a specific Transit-App Account. This personal account can also be used to set up the Rider's interaction with other available (MaaS) trip providers; with the Rider's permission this account can be connected to any other service provider's ticketing system for which *Transit-App* already sells trips. This is a particularly handy way to purchase transit tickets while visiting another city.

v. One thing to note: tickets purchased on the *TGo*- app are not visible or available in *Transit-App* and vice-versa (because any purchased tickets are stored in separate Wallets within each app).

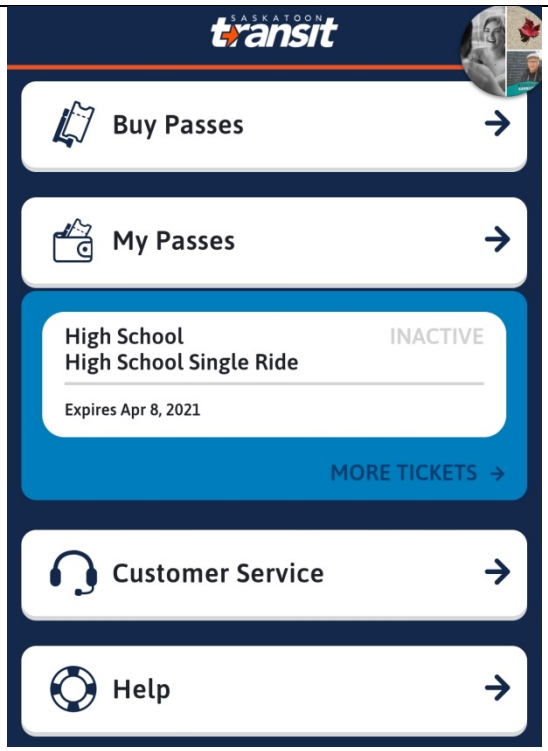
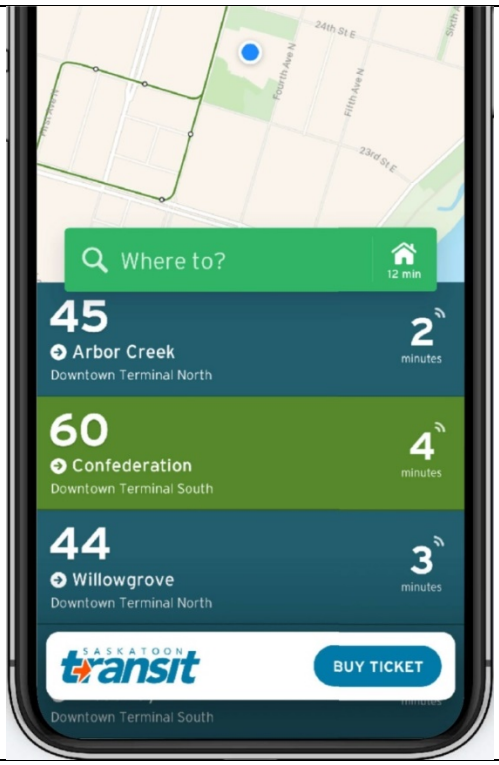


Fig. 2: Masabi's stand-alone *TGo*-app



Fid. 3: *Transit-App's* Ticket Bar (prototype)

vi. Mobile Ticketing (in Phase 1):

1. In both the *TGo*-app and *Transit-App* the Rider is asked (once) to provide a credit-card or debit-card number to which mobile ticket purchases will be charged.
    a. The app is then ready to sell, store, deliver and activate mobile tickets from Saskatoon Transit, which will be available in the 'Wallet' on the rider's mobile device.

2. In both apps the Rider may also be asked to create a (voluntary) Saskatoon Transit Customer Account. This Customer Account is not required for simple Mobile Ticketing, although it will be required for the more sophisticated Account-Based Fare Payments described next.

vii. Account-Based Fare Payments (in Phase 2):
   1. Account-Based Fare Payments (ABFP), which is not part of the initial implementation in Saskatoon but is expected in phase 2, is a more advanced form of mobile ticketing:
      a. In the future – when setting up *TGo*-app or *Transit-App* for ABFP – the Rider will be asked to set up a personal Saskatoon Transit Customer Account (which will reside in Saskatoon Transit's configuration space within *Justride*).
      b. This account will be required for ABFP if the Rider wants to take advantage of the more sophisticated, account-based fare payments services, such as 'fare-capping'.

viii. Stored ticked activation:
   1. Just before boarding, Riders access their pre-purchased tickets in their app-based Wallet and choose a particular ticket (or multiple tickets) to activate for that trip.
      a. It may be noted that Riders can store and activate any combination of available tickets in their Wallet. For example:
         i. A Senior rider can activate a trip from her Annual Seniors Pass, plus activate a single Adult Ticket for a fellow traveler and activate a grandchild's ticket off a Child's 10-pack Pass for all three to board the bus. The activated tickets then show up as ever-changing QR-codes on the Rider's mobile device.
         ii. After using the Rider's mobile device to inspect all three tickets on the Validator in the bus, the tickets remain activated for 90 minutes to allow the riders to transfer to other buses at no additional cost before the activated tickets expire and disappear automatically.

f. The roll-out in Saskatoon is expected to unfold as follows:
   i. In Phase 1 this Spring and Summer, new *VAL 100 Validators* will be installed in every bus.
      1. During this phase as well as later, Riders can continue to use existing Go-Passes and U-Passes or pay cash. When boarding, each of these old fare media will be validated on the old validators in the bus.
      2. Mobile Ticketing using the new *TGo*-app and updated version of *Transit-App* will also be introduced. Riders with mobile devices will be able to use this service to validate their tickets on the new validators.

   ii. In Phase 2, Account-Based Fare Payments (ABFP) will be implemented.
g. Cost of the new ticketing system:
   i. $2.2 million, which includes all aspects of the contract, system and hardware with an option for extension.
h. Privacy:
   i. Saskatoon Transit – not *Masabi* – owns and manages the data, including the Riders' Customer Accounts in *Justride*.
   ii. For example, *Justride* & *Transit-App* can only see a portion of credit-card numbers, so anonymity is ensured in accordance with the PCI[4]-standard.

5) Agenda items for upcoming, regular monthly meetings were determined:
   a. Meeting on 8 March 2021: Transit's Service Standards.
   b. Meeting in April: joint meeting with Jay Magus, Director of Transportation, and Walking Saskatoon.

NEXT MEETING: Monday, 8 March 2021, 2:30 – 3:30 pm on Zoom (date & time already confirmed).

[4] PCI Standard (this definition of the PCI Standard was obtained from Wikipedia): "The Payment Card Industry Data Security Standard is an information security standard for organizations that handle branded credit cards from the major card schemes. The PCI Standard is mandated by the card brands but administered by the Payment Card Industry Security Standards Council. The standard was created to increase controls around cardholder data to reduce credit card fraud."

Concepts, Terminology and Technical Description of Fare Payment Systems and the Masabi *Justride* platform

SOURCES (on Masabi's website)

- Gooch-blog (2019-09-24): "What is Fare Payments-as-a-Service" [https://blog.masabi.com/blog/what-is-fare-payments-as-a-service]
- Gooch-blog (2019-10-28): Mobile Ticketing: Why Barcode? [https://www.masabi.com/2019/10/28/mobile-ticketing-why-barcode/]
- Gooch-blog (2019-11-19): "The Future of Fare Payments: Account-Based Ticketing and MaaS." https://blog.masabi.com/blog/the-future-of-fare-payments-account-based-ticketing-and-maas
- Gooch-blog (2020-08-14): "Everything You Need to Know About Contactless Ticketing for Public Transit (cEMV)" [https://blog.masabi.com/blog/everything-you-need-to-know-about-contactless-ticketing-for-public-transport-cemv?utm_campaign=Remarketing&utm_source=facebook&utm_medium=paid&hsa_acc=1015199304553202 9&hsa_cam=6239102340493&hsa_grp=6239102342293&hsa_ad=6239102350093&hsa_src=fb&hsa_net=facebook&hsa_ver=3&fbclid=IwAR0io65hv02JNzB4wz_BLz35FQobnrk6jPFfmMtTYzIK-4rwlK06taFhohU]
- Kbidy-blog (2019-11-28): "Everything You Need to Know About Account-Based Ticketing." [https://blog.masabi.com/blog/everything-you-need-to-know-about-account-based-ticketing]
- Masabi-pamphlet: "A Guide to Fare Payments-as-a-Service for Public Transit: Why Agencies and Operators are Moving to Fare Payments Platforms." [https://info.masabi.com/a-guide-to-fare-payments-as-a-service-for-public-transit]
- Masabi-webinar with Ben Whitaker, co-founder of Masabi [embedded in the online Gooch-blog, 2019-09-24]: "The end of AFC [Automatic Fare Collection] as we know it?" [https://blog.masabi.com/blog/what-is-fare-payments-as-a-service]

FARE COLLECTION CONCEPTS & METHODOLOGIES

1) SaaS = *Software-as-a-Service*: "Around the globe multi-tenant *Software-as-a-Service* (SaaS) platforms have revolutionized industries, bringing leading solutions to companies of all sizes, quickly and cost-effectively. We now expect software to be available on a pay as you go (or subscription) basis, to update and improve all the time and to have the flexibility to switch providers if we are unsatisfied with the service we receive." [Gooch, 2019-09-24:p1]
2) DBOM & AFC = '*Design-Build-Operate-Maintain Model*' and '*Automated Fare Collection*', respectively: "Around the globe the *Software as a Service* (SaaS) delivery model has revolutionized industries, bringing leading solutions to companies of all sizes, quickly and cost-effectively. We expect software to be available on a pay-as-you-go (PAYG) basis, to update and improve all the time and to have the flexibility to change provider if we are unsatisfied with the service we receive. However, this trend has not taken hold in the Fare Collection industry

(mobile ticketing aside), which is still dominated by *Automated Fare Collection* (AFC) providers offering bespoke and customized solutions which agencies purchase and are stuck with for years (sometimes decades) using a *Design, Build, Operate, Maintain* (DBOM) model." [Masabi-pamphlet:p3]

3) FPaaS = *Fare Purchase-as-a-Service* (see Fig. 1): "FPaaS is a better way of delivering ticketing systems to transport agencies, operators and passengers. Instead of running a Design-Build-Operate-Maintain (DBOM) project and purchasing a bespoke Automatic Fare Collection (AFC) system, agencies can now sign up to a service delivered via a multi-tenant fare payments platform, removing the cost, risk and complexity of providing the latest fare payment innovations and allowing agencies and operators to concentrate on what they do best, operating safe, reliable and convenient transit services to riders. FPaaS systems delivery model enables the latest 'tap and ride' fare payment innovations for passengers extremely quickly and gives agencies the ability to grow capabilities as they get released onto the platform, removing the complexity of running ticketing services." [Gooch, 2019-09-24:p3]

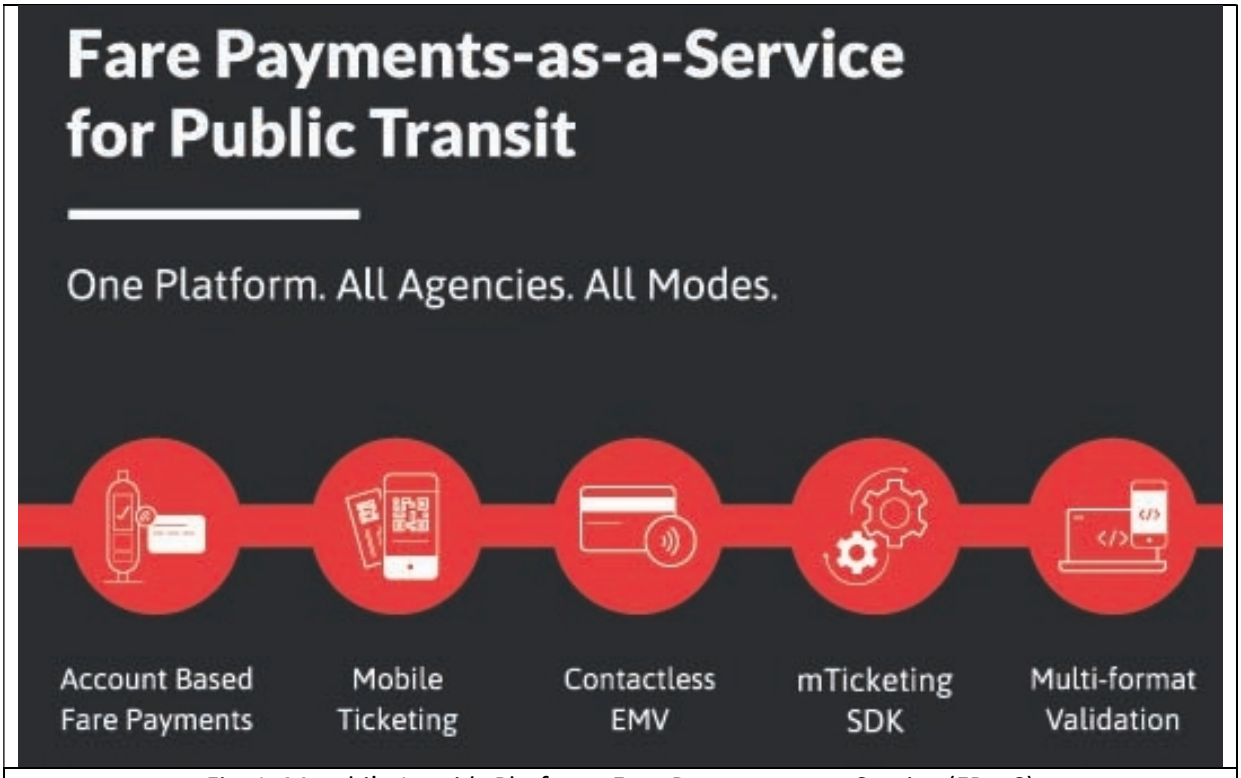


Fig. 1: Masabi's *Justride* Platform: Fare Payments-as-a-Service (FPaaS)

MOBILITY TICKETING TECHNOLOGIES

"The Ticketing or Fare Collection industry, has not dramatically changed in decades. Of course, new ticketing channels have come onto the market and had a significant impact; one of these, mobile

ticketing, Masabi pioneered (see Fig. 2). Now we are helping agencies enable Mobility-as-a-Service (MaaS) and moving them to Account-Based Fare Payments, so passengers no longer even need a ticket or to understand fares. Instead, they just tap and ride using a contactless bank card, mobile phone or smartcard." [Masabi-pamphlet]

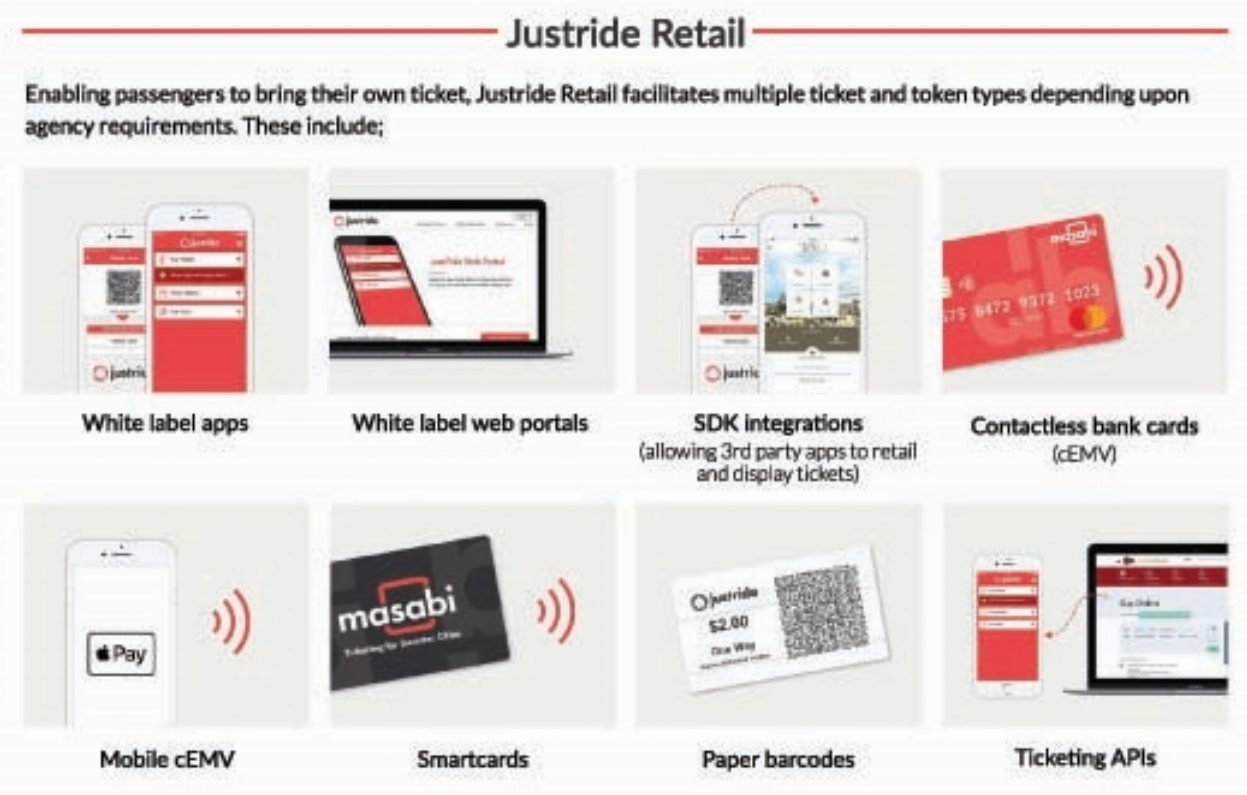


Fig. 2: *Justride* Fare Payment Technologies

1) *Traditional transit fares*, such as Token Coins and Mags (see Fig. 3) are not used in Saskatoon. Saskatoon Transit's current Cash-Tickets use barcodes, while the Transit Passes are proprietary smartcards and USSU-issued ID-cards (see Fig. 2 & 3).
2) *Mobile Ticketing* takes advantage of multi-media tokens[5] (see Fig. 2 & 3):
    a. Tickets: "At Masabi all of the mobile ticketing systems that we currently provide present tickets that can be checked and validated in two different ways – visually, like a traditional paper ticket and also with a barcode that can be scanned by a member of

[5] Note: there is a distinction between 'ticket', 'token' and 'fare':

- Ticket is the vernacular term for the physical or electronic trip-payment fare that gets consumed every time a rider commits to a trip. Masabi prefers to use the broader term token as 'the proof of the right to travel'. Accepting the ticket/token can take place through visual inspection by the Transit Operator, or by dropping a physical ticket/token into a receptacle, or by scanning a paper-ticket or electronic bus-pass, or by irreversibly activating a mobile token (which come in several physical forms on different media).
- In contrast, fare is the actual cost of that particular trip (ticket/token), which may have a fluctuating value depending on various circumstances (e.g., frequency of travel).

staff with a barcode scanning device, smartphone, on the bus/ferry, or at the transit gate." [Gooch-blog, 2019-10-28:1]

b. What is Mobile Ticketing?: "In a nutshell mobile ticketing involves turning your smartphone into both the ticket machine and ticket. This removes the need to waste time waiting in line or fumbling for the right change, allowing riders to buy their tickets anytime/any place, and then use their phone as the ticket." [Gooch-blog, 2019-10-28:3]

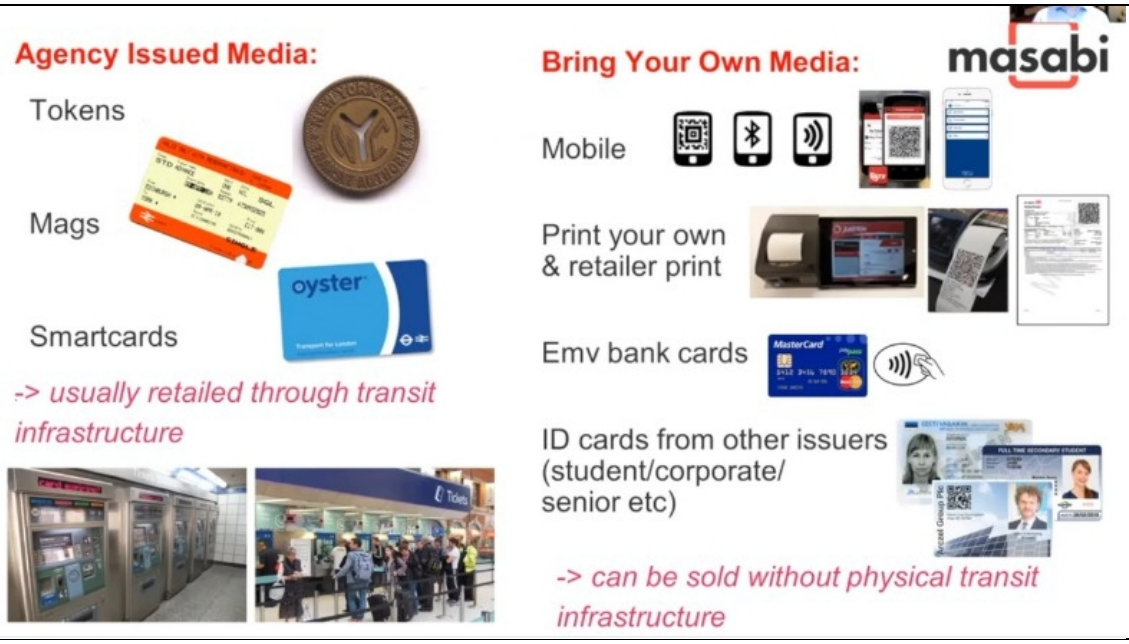


Fig. 3: Traditional, agency-issued fare media; and *Justride*-accepted 'bring your own media' (BYOM)

c. Electronic Fare Media:
    i. Stored Value Card and Smartcard (SVC[6] & NFC[7]),

[6] A **stored-value card** (SVC) is a payment card with a monetary value stored on the card itself, not in an external account maintained by a financial institution. This means no network access is required by the payment collection terminals as funds can be withdrawn and deposited straight from the card.

- Like cash, payment cards can be used anonymously as the person holding the card can use the funds. They are an electronic development of token coins and are typically used in low-value payment systems or where network access is difficult or expensive to implement, such as parking machines, public transport systems, closed payment systems in locations such as ships or within companies.

[7] **Near-Field Communication** (**NFC**) is not a payment technology; it is a set of standards that enables proximity-based communication (over a distance of 4 cm, $1\frac{1}{2}$ in, or less) between consumer electronic devices such as mobile phones, tablets, and personal computers. NFC supports an extremely simple man-machine interface by offering a low-speed connection with simple setup that can be used to bootstrap more-capable wireless connections.

- NFC can be used for sharing small files such as contacts, and bootstrapping fast connections to share larger media such as photos, videos, and other files.
- NFC technology is compatible with the current contactless payment acceptance infrastructure — an NFC-compliant mobile device can communicate with a point-of-sale (POS) system that currently accepts contactless payment cards.

ii. Contactless Bank Card (cEMV[8]), and
iii. Mobile Devices (NFC & cEMV), such as cellphones and tablets.

d. Activated Mobile Tickets (barcodes):
   i. When boarding the transit vehicle, the Rider needs to scan a pre-purchased, activated mobile ticket on the on-board validator.
   ii. Q: What's the difference between 'mobile barcode', 'QR code', 'Aztec barcode'?
      1. A: "All of these are mobile barcode types that display on screen as square, 2-dimensional barcodes (see Fig. 4). Aztec barcodes differ from QR in that they can hold more data at a given resolution and are slightly faster to scan in some scenarios, but otherwise they are broadly similar." [Gooch-blog, 2019-10-28:4]
   iii. Q: Why not use NFC rather than barcode?
      1. A: "For mobile ticketing to work, tickets need to be available across all mobile devices. This has been a serious issue for NFC-based mobile ticketing for the last decade. iPhones support NFC but they are not open to allowing a mobile phone to emulate a standard transit smartcard, and although most Android phones now have NFC capabilities, in practice it has been very difficult to get the phone to act as a transit smartcard without a new SIM card and commercial collaboration from the mobile phone carriers." [Gooch-blog, 2019-10-28:5]

- NFC is used in contactless payment systems that allow mobile payment replacing or supplementing systems such as credit cards and electronic ticket smart cards.

[8] **EMV** (acronym for 'Europay, MasterCard and Visa', who created it) is a global standard for secure debit or credit payments made using chip cards at a merchant who has an EMV chip-acceptance infrastructure (POS-terminal, Automated Teller Machine, transit fare Validator, etc.)

- NFC and EMV are companion technologies. NFC applies to how devices communicate; EMV applies to payments made with contact and contactless chip cards or with a mobile NFC device emulating a contactless chip card. Contactless payment transactions made using mobile NFC devices use the same infrastructure as contact and contactless EMV chip card transactions.
- EMV-compliant chip card payments protect against the use of counterfeit, lost, or stolen cards and skimming. Issuers, merchants, consumers, and acquirers/processors can all benefit from EMV.

Fig. 4: Activated Ticket: Mobile/QR/Aztec barcode

3) *Account-Based Fare Payments*: "Account-Based Ticketing (ABT) is a 'ticketless' way of allowing people to travel on public transport. ABT enables passengers to simply tap or scan a secure token (contactless bank card, phone or smartcard), linked to an account in the back-office to make a journey. Account-Based Ticketing means that riders no longer need to buy a ticket in advance or understand fares before traveling. The fare is automatically calculated based on a number of factors, such as location and amount of taps during a time window, and is then charged to the passenger post journey. Due to the way account-based fares are calculated post-journey, this also provides the transit agency or operator the option to implement 'fare capping'/ 'best fare finding' rules." [Kbidie, 2019-11-28:pp1-2]
    a. Stored Value Accounts come with some interesting advantages as "they allow transit agencies to easily implement and apply concessions (entitlements) which are very useful for user groups such as students, or alternatively issue mobility credit to an account. Account-Based Ticketing using stored value also benefits cash riders through cash digitisation, allowing riders to exchange cash for credit and enabling people without a bank account to tap and ride around a transport network." [Kbidie, 2019-11-28: p3]
4) Taking the ticketing system even further by going beyond mobile ticketing at a transit-service requires expanded capabilities, which *Justride* provides through 'capability modules':

a. Enable Mobility-as-a-Service (MaaS) for Public Transit
b. Mobility Ticketing
c. Ride-hailing TNCs,
d. Cash-based Payments and Account Loading
e. Multi-token Account Based Ticketing

5) *Mobility-as-a-Service* (MaaS) can be provided by one of *Justride*'s capability modules:
   a. "Mobility as a Service (MaaS) is the movement to full first/last mile journeys using private and public shared mobility services, allowing users to plan and pay seamlessly and will help move people away from private car usage, reducing congestion." [Gooch-blog, 2019-11-19]
   b. In Masabi's view [Gooch-blog, 2019-11-19], there are currently three approaches to enabling MaaS for public transport that are not mutually exclusive:
      i. "*Practical MaaS* delivers public transit ticketing within consumer-facing or white-label[9] MaaS apps, such as Uber, Transit, Moovit, Gertek and Kisio Digital. This connects public transit with private mobility services without the need for discounts on tickets or new business models (see Fig. 5).
      ii. *Account-Based MaaS* uses an Account-Based mobility card (Smartcard) or token (Mobile barcode, mobile payment or contactless bank card) to travel via tapping (or being) on public and private vehicles. Passes (like a monthly subscription) is earned based on usage over particular time periods, but does not exclude people unable, or not requiring, a subscription.
      iii. *Subscription-Based MaaS* connects public and private transit options through a time based subscription, be it a weekly or monthly time period, where users pay up front for a mobility package."

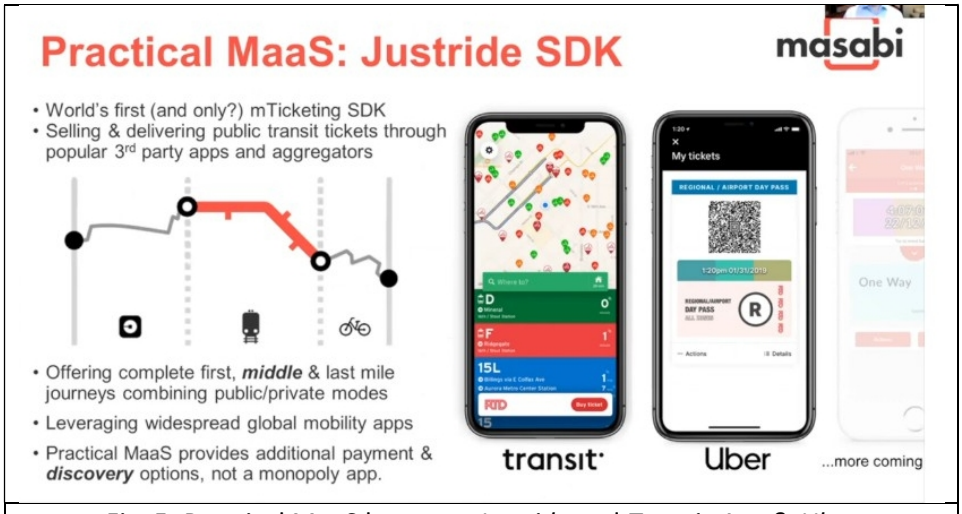


Fig. 5: Practical MaaS between *Justride* and *Transit-App* & *Uber*

[9] white label = 'agency/city'-branded as opposed to 'consumer'-branded. For example, *Transit-App* is a consumer-branded app, while Saskatoon Transit's *TGo*-version of Masabi's front-end is an agency-branded white-label app.

c. "Masabi has developed the world's first mobile ticketing SDK[10] for public transport, enabling 3rd party applications (like the ones provided by Transit, Uber, Jorudan, Moovit, Gertek and Kisio Digital) to integrate *Justride* into their existing applications. This means passengers can now use these services to buy tickets and ride on public transport alongside their existing mobility options and services. This is an important step in helping make access to public transport available within urban mobility and MaaS applications around the globe, helping to increase the accessibility and discoverability of public transit while enabling seamless multimodal journeys. " [Gooch-blog, 2019-11-07]
d. "Account-based MaaS puts the transit agency, and therefore the city at the centre of a MaaS ecosystem. In other words, the city retains the control needed to meet all the various players' - like private mobility companies and users - objectives and can use important MaaS levers for a city, like service provision, pricing and policy, to help solve issues like congestion caused by private vehicle usage." [Gooch-blog, 2019-11-07]
e. "The movement to enable Mobility as a Service is still in its infancy. We [Masabi] have highlighted three approaches to enable MaaS, but these options may not be mutually exclusive. In fact, some cities may well incorporate aspects of all three models. We can see a future where you use Account-Based MaaS and extend these services beyond a single app for the city in a practical way, while layering on subscription options for different user groups depending upon passengers needs." [Gooch-blog, 2019-11-07]
f. Independent mobility services that may be seamlessly integrated through MaaS:
    i. Conventional mass-transit provided by public and private transit agencies
    ii. On-demand transit provided by public and private transit agencies
    iii. Intercity bus, railway and air services; ferries
    iv. Transportation Network Companies (TNCs; such as Riide, Uber and Lyft)
    v. Car Shares
    vi. Bike Shares & eScooter Shares; etc.

MASABI *JUSTRIDE*

The Masabi *Justride* platform in a nutshell:

- Sell, store, deliver, activate and validate tickets plus calculate fares by managing all money transactions and ticketing functions at both the user and agency levels.
- Note that these functions are integrated through Masabi's proprietary APIs[11] (see Fig. 6) and programmed into third-party applications using Masabi's proprietary *Justride* SDK (see Fig. 7):

[10] SDK = *Software Development Kit*: As shown in Fig. 5, in order to integrate *Transit-App* and *Uber* with the *Justride* back-office, Masabi provided them with **Justride SDK**, which is Masabi's proprietary computer programming tool-kit for third-party software developers.
[11] API = *Application Programming Interface*: As shown in Fig. 6, the use of API's is a computer programming method that allows various devices and programs to interact in a compatible manner.

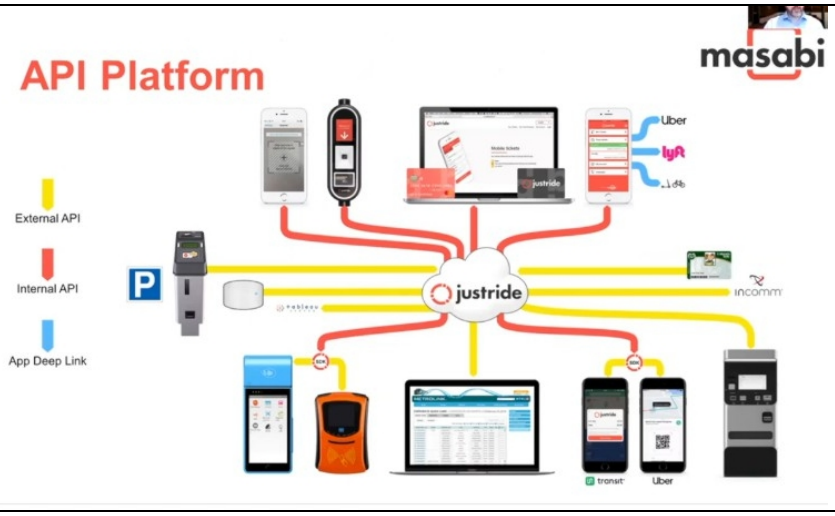


Fig. 6: *Justride*'s Application Programming Interface (API) platform

a. Sell fares:
    i. through Retail + *Justride* API/SDK.
        1. Traditionally this costly function, which includes both the ticket media (tokens) and the sales-channel (Customer Service Centre, vendors, vending machines), had to be provided by the transit agency.
        2. This function can still be handled through vendors, but the preferred method is to 'Bring Your Own Ticket' (BYOT). In BYOT, the Riders themselves purchase and access their tickets/fares using their own mobile devices.
b. Manage the entire fare collection system:
    i. through *Justride* Hub + API
c. Validate tickets:
    ii. through Inspect + *Justride* API/SDK.

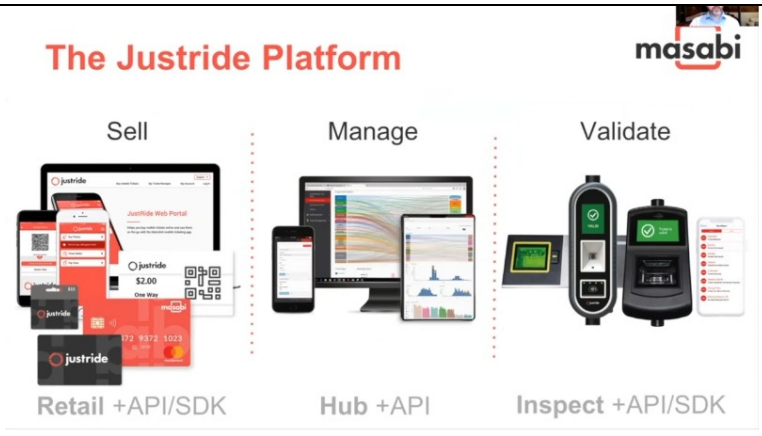


Fig. 7: The Masabi *Justride* platform