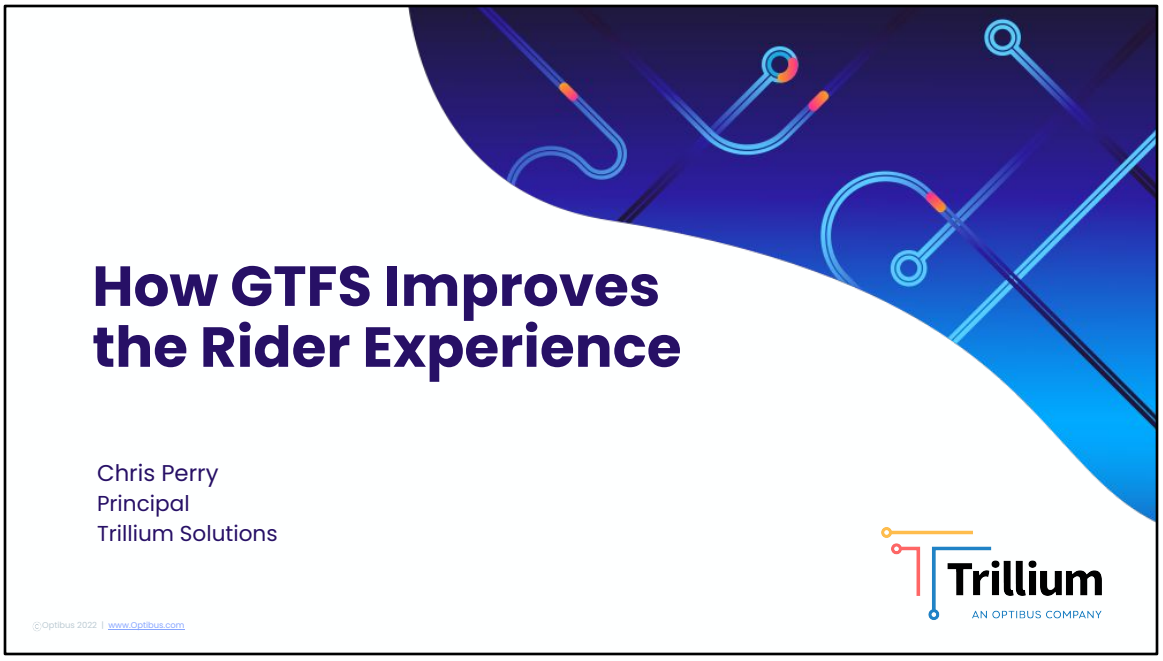
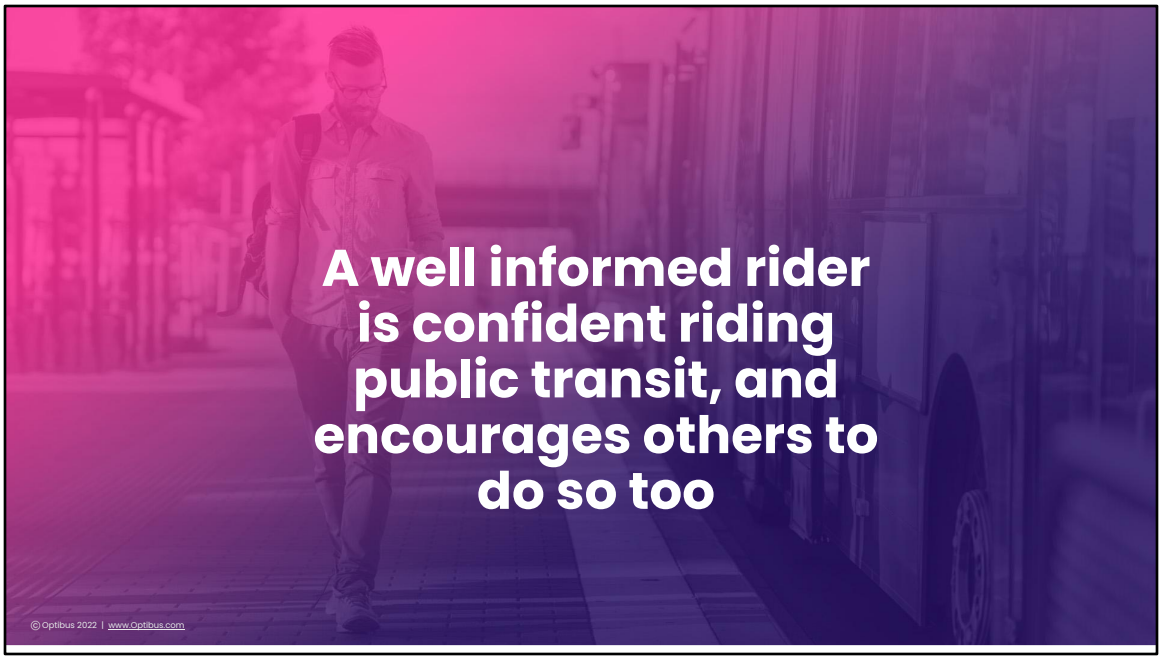
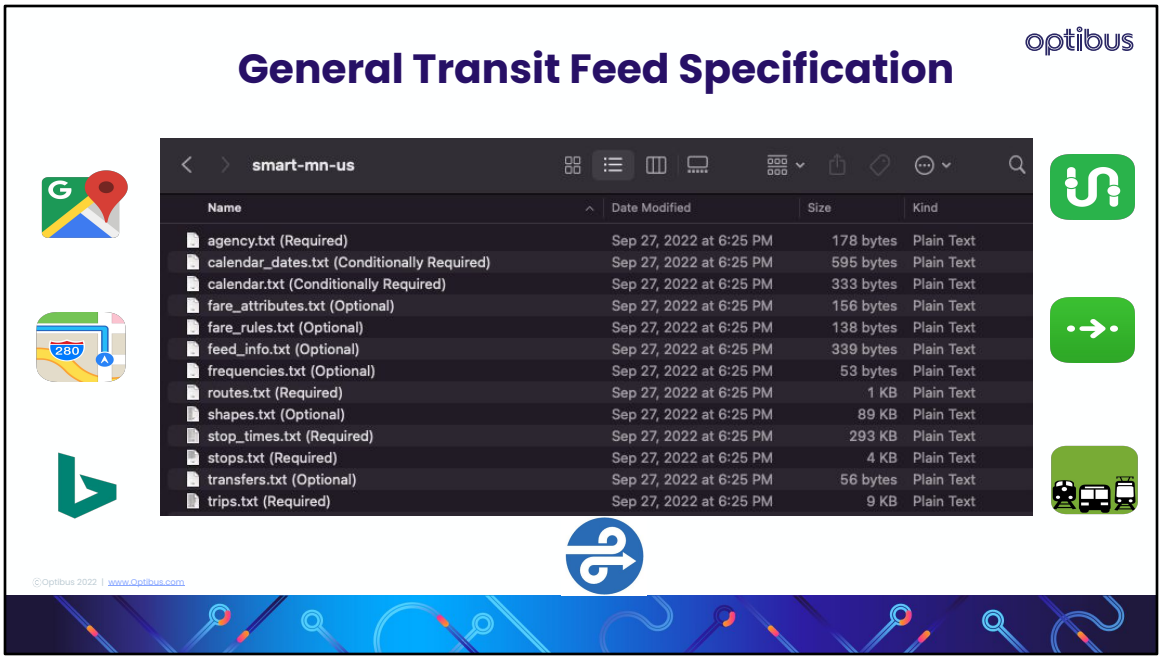


1. Thanks to MnDOT and Elliott (McFadden) for inviting me to speak to you all today.
2. Elliot gave a high level description of the project that Trillium is working on to serve riders here in Minnesota
    a. I'll cover a few other topics
        i. My own experience and thoughts on transit information and how it relates to rider confidence
        ii. Standards, generally and in transit
        iii. And how standardized data can power tools, lead to data-informed decision-making by agencies and DOTs, and improve the rider experience

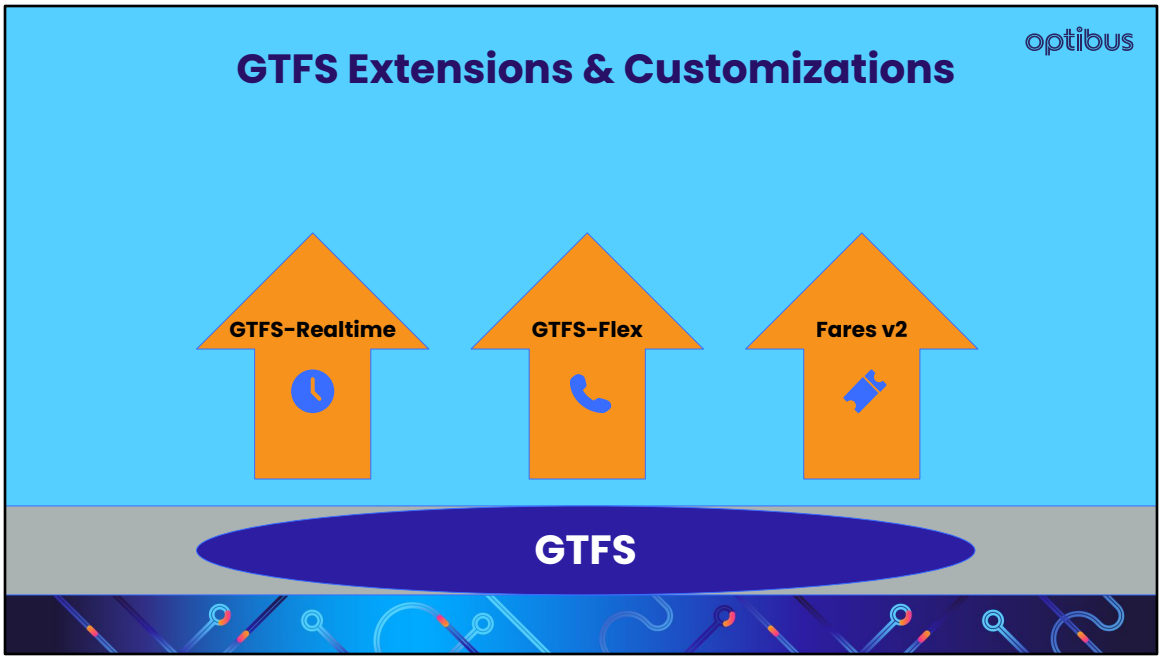


1. Was not too familiar with riding transit.
    a. Am I going to the right stop, did I remember the departure time, do I have the right fare…and what if I miss the bus?
2. Passenger expectations are at an all time high, but the basics are still crowd pleasers. Riders expect that if:
        i. They arrive to the correct stop on time with the proper fare
        ii. The bus will arrive at the correct stop on time, within reason
        iii. and drop them off at the correct destination stop on time, within reason,
        iv. and if something goes wrong, they are notified
        v. They expect that they can rely on transit information to make decisions that affect their lives.
    b. Something as simple as trust can translate to continued and reliable ridership. Reliable information makes me confident that I can trust public transit, and if I can trust public transit, I'm much more likely to utilize it, and tell others that they should too.
3. **Quality, well utilized GTFS is how we build rider confidence. It is the language of public transit. It is how we communicate with riders, how we can learn from our past, and how we can help plan for the future.**

1. Most of you are familiar with the general transit feed specification or GTFS, but here's a quick refresher.
    a. GTFS is a standard, like any other
        i. Financial system>Credit Card companies comply with the
            1. Payment Card Industry Security Standards for securing and storing, and transmitting data
        ii. E.g. hardware (nuts, bolts, screws), Measurements (baking)
        iii. Screw, nut, bolt hardware sizes

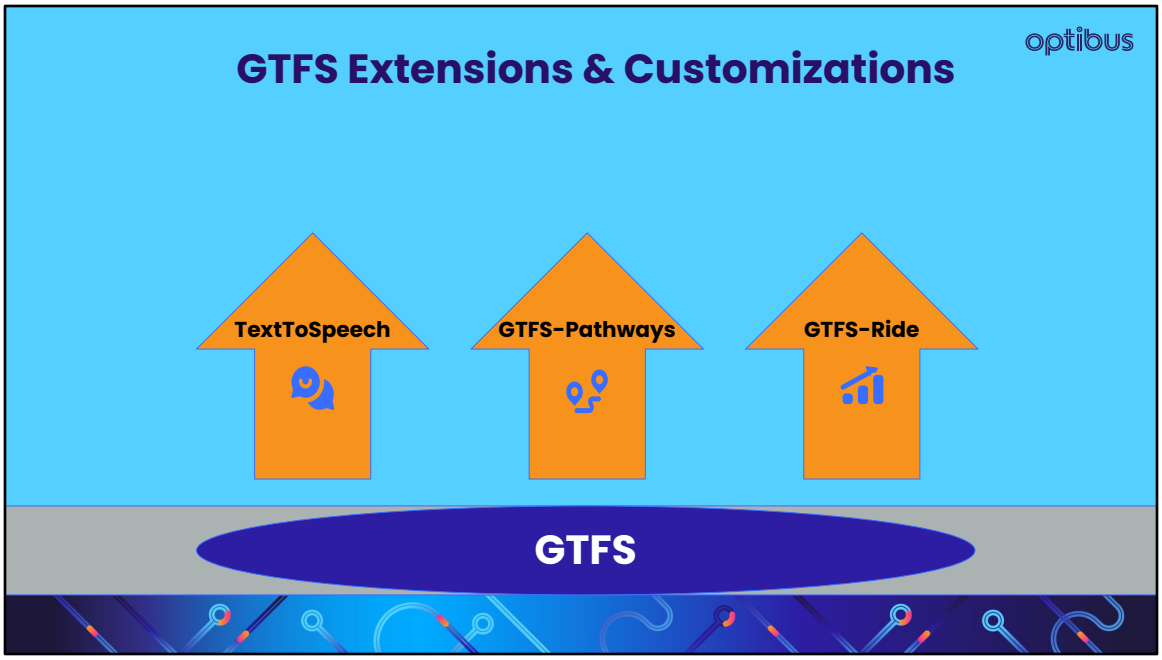


1. GTFS, a set of core and optional text files
    a. A trips.txt file from Metro Bus in St. Cloud includes the same core elements as one from SMART in Albert Lee, as does one from Trimet in Portland.
    b. Building out optional files and fields, like:
        i. shapes.txt
        ii. transfers.txt
        iii. fare_attributes.txt
        iv. Vehicle blocks in trips.txt
    c. turn basic GTFS into high-quality rider-facing GTFS ideal for trip planning or for other tools and applications.
    d. This standardization allows interoperability. Any trip planner can take and use this data, meaning your riders don't need to use one proprietary app, they can use whichever one they prefer, that suits their needs the most.



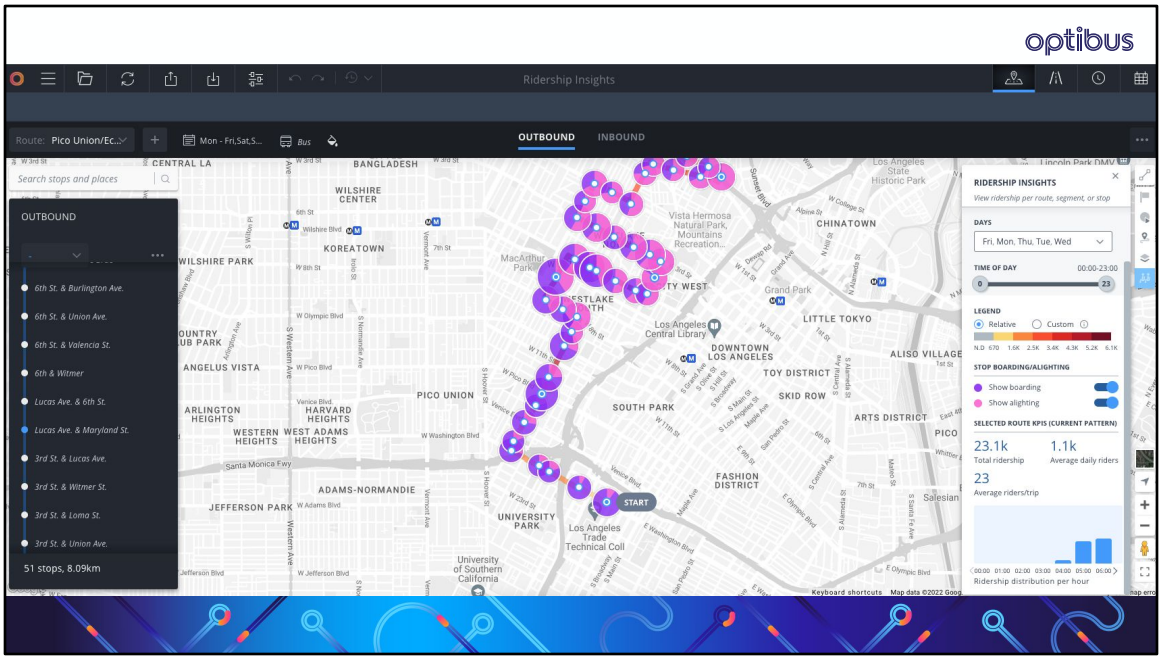
1. With the mighty GTFS as a launchpad, we are now able to expand both the wealth of information we can provide to riders, as well as the supplemental data we can collect to improve the rider experience
    a. Notable additions and extensions include:
        i. GTFS-Realtime, a set of three files that provide riders with up to the minute updates
            1. Solid GTFS static data is the backbone of a quality GTFS-Realtime feed.
            2. Shapes, blocks, and stop times, in particular, are key reference points
        ii. GTFS-Flex
            1. GTFS-Flex allows for the modeling and discovery of demand response and other flexible services in trip planners and other applications.
                a. I'll speak more on this later in my presentation
        iii. Fares v2- which is now partially adopted
            1. Better fare prediction
            2. By allowing modeling of distance or time-based fares, different rider/fare categories, fare media, fare capping, and

1. improved transfer rules among other features.
2. Some fare structures are complex, or involve transfers with special rules. A trip may be cheaper, or more expensive, than a rider may realize. In either case, they should not have to be surprised about their fare.
3. Faresv2 seeks to demystify fares for riders

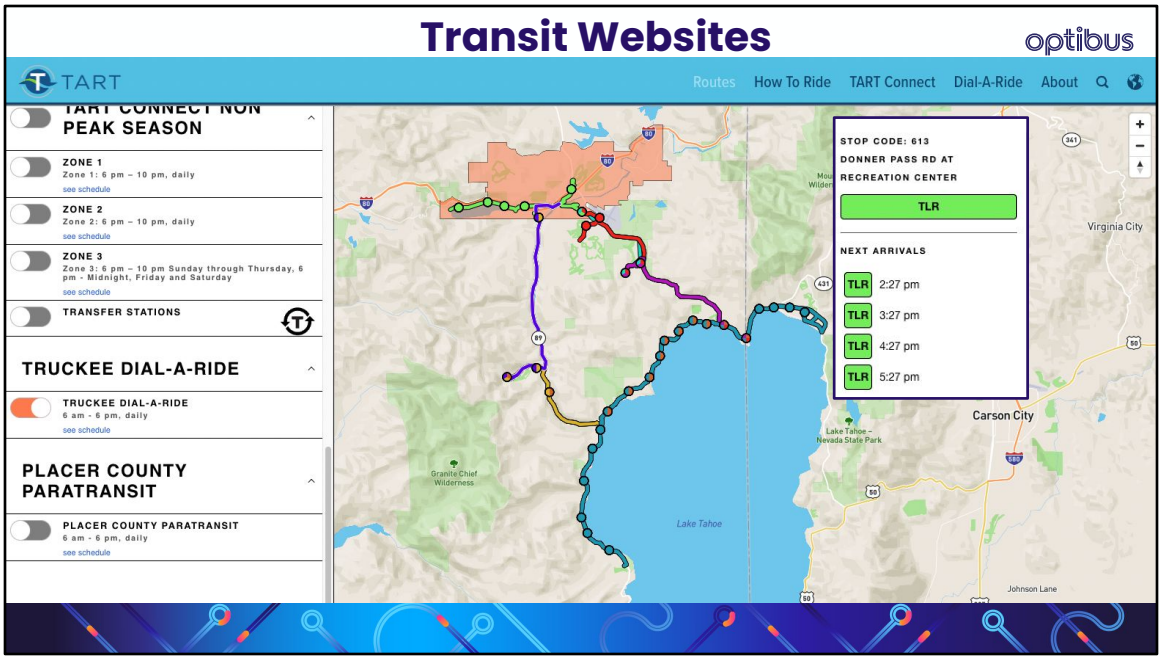


1. TextToSpeech
    a. Adds fields to GTFS to allow annunciators to read all formal and vernacular names and abbreviations correctly
2. GTFS-Pathways
    a. Station accessibility information about entrances, exits, turnstiles, and stairs, as well as elevators and escalators, and their status, to aid those who need help navigating a station for any reason, the blind, those using canes, walkers, or other mobility devices, travelers with luggage or parents with strollers.
3. GTFS-Ride
    a. GTFS-Ride is a proposed extension being developed by a partnership between Oregon State University and the Oregon Department of Transportation
    b. Using APC or hand passenger counts as inputs, it provides transit agencies a standardized way to collect, store, share, report, and analyze their ridership data. Transit agencies can use GTFS-ride to share their ridership data with other agencies and organizations interested in collecting and analyzing ridership data.
    c. A standard for ridership would provide agencies and DOTs with a common

a. format to track ridership between service changes that affect connectivity and allow us to see what a convenient transfer does (or does not) do for ridership.
b. Good ridership data can also help to fulfill equity goals. Where are riders going most/least, which neighborhoods are being undeserved?
c. Check out gtfsride.org to learn more and get access to tools to create, validate, and visualize your ridership data.

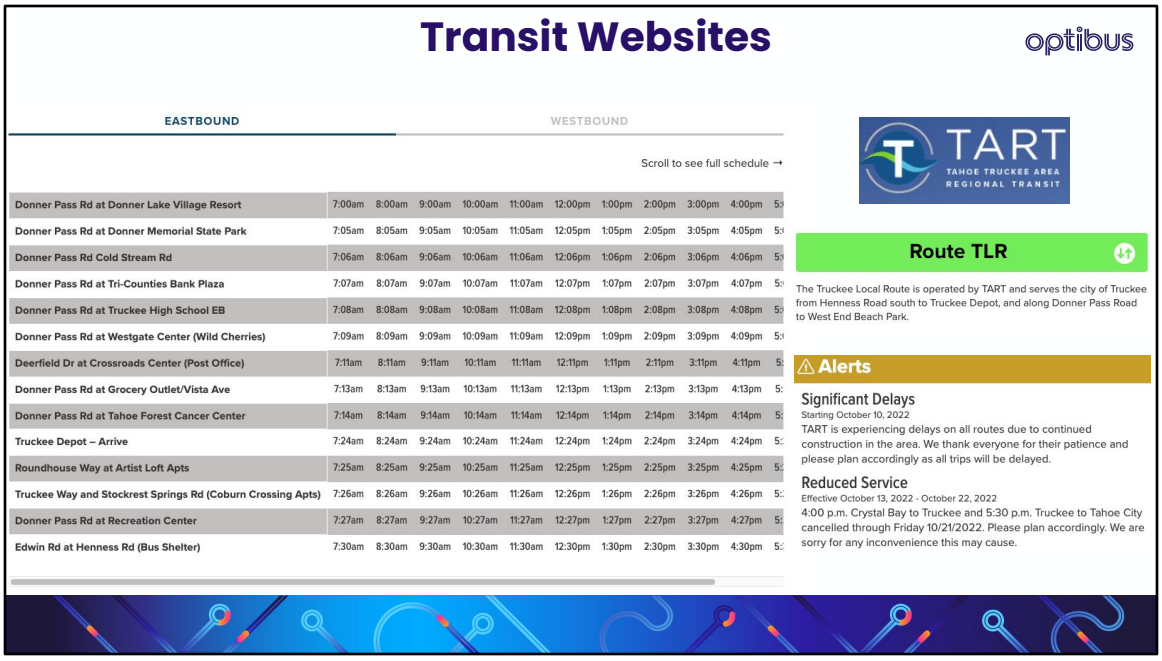


1. GMV, Optibus, and Swiftly are all working to pilot GTFS-Ride in their respective softwares
    a. Here we see image from Optibus' ridership insights of a day's worth of data from a single route
        i. Boardings in purple
        ii. Alights in pink
2. We're working with them to streamline the process from operational planning and scheduling, to quality rider-facing information, demonstrating how incorporating data standards throughout the process eases the burden on agencies, and provides better information to riders more quickly.

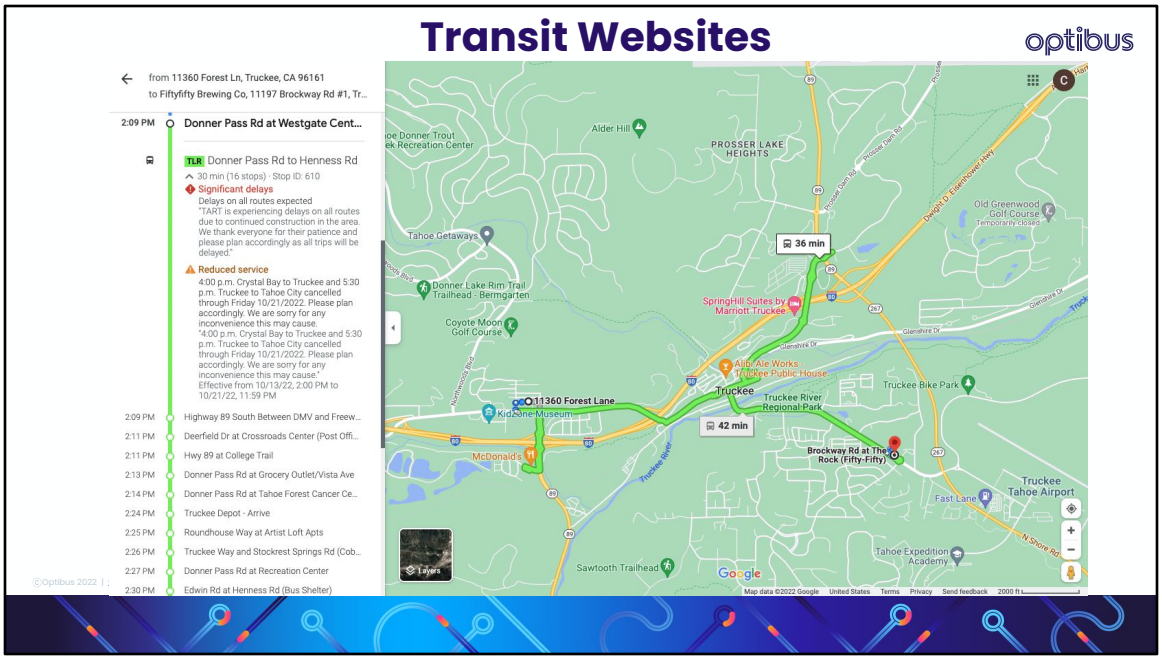


1. **Next, I want to highlight some example projects that have used GTFS in meaningful ways to improve the passenger experience**
    a. Websites
        i. GTFS can power your website
            1. Here, we see an interactive map on Tahoe Area Regional Transportation' site, created by Trillium
                a. The map shows both fixed routes and demand response areas
                b. Stops list upcoming arrival times

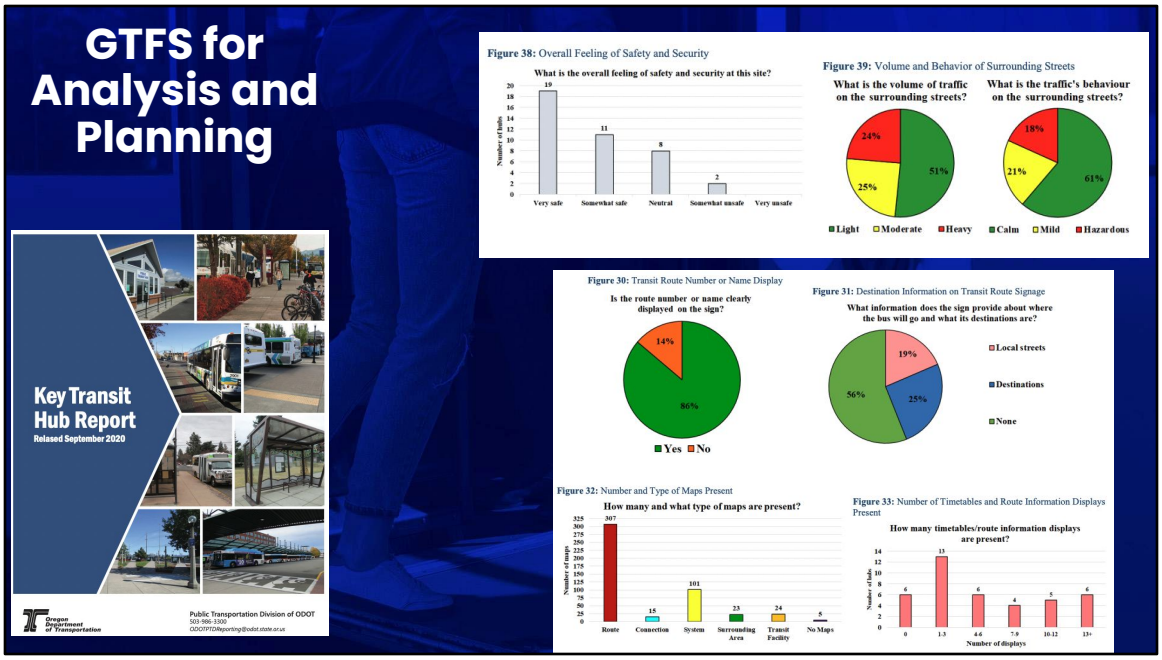
Transit Websites



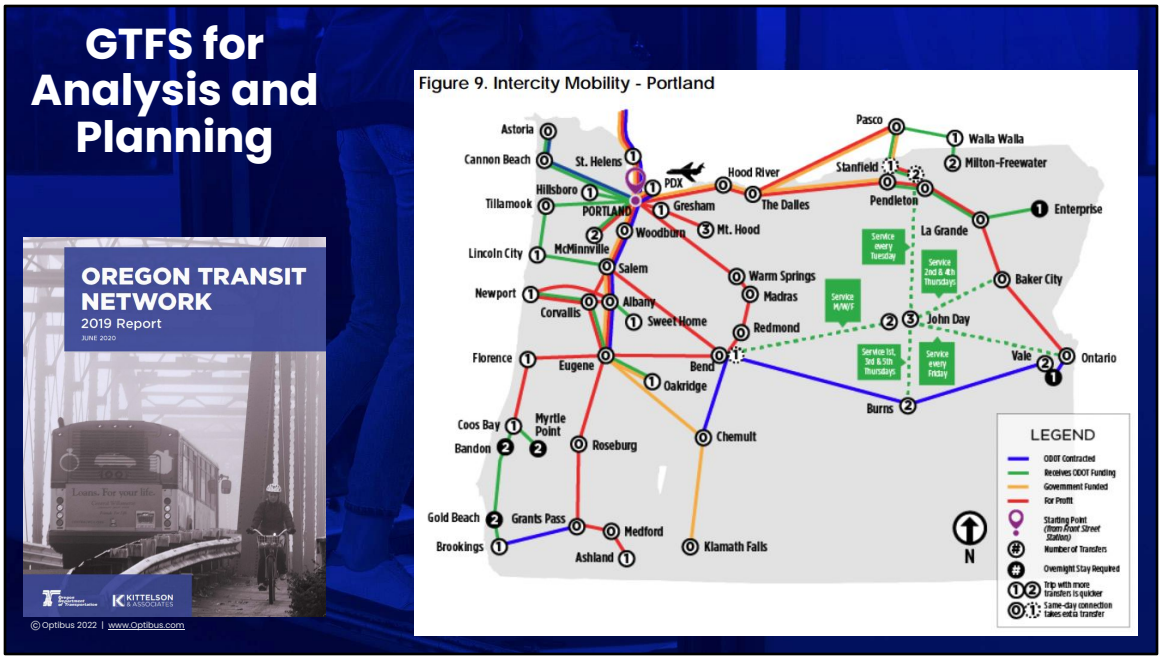
1. Timetables draw from the GTFS so updates only need to be done once
2. The resulting schedules are screen-reader accessible
3. Trillium's Transit Alerts, shown in the bottom right, provide Realtime service updates that are sent to the website……



1. …… and trip planning apps
    a. Here you can see the same alerts shown when a rider plans a trip that includes an affected route
    b. Rider should see alerts wherever they look, whether that's the agency website or any trip planning app

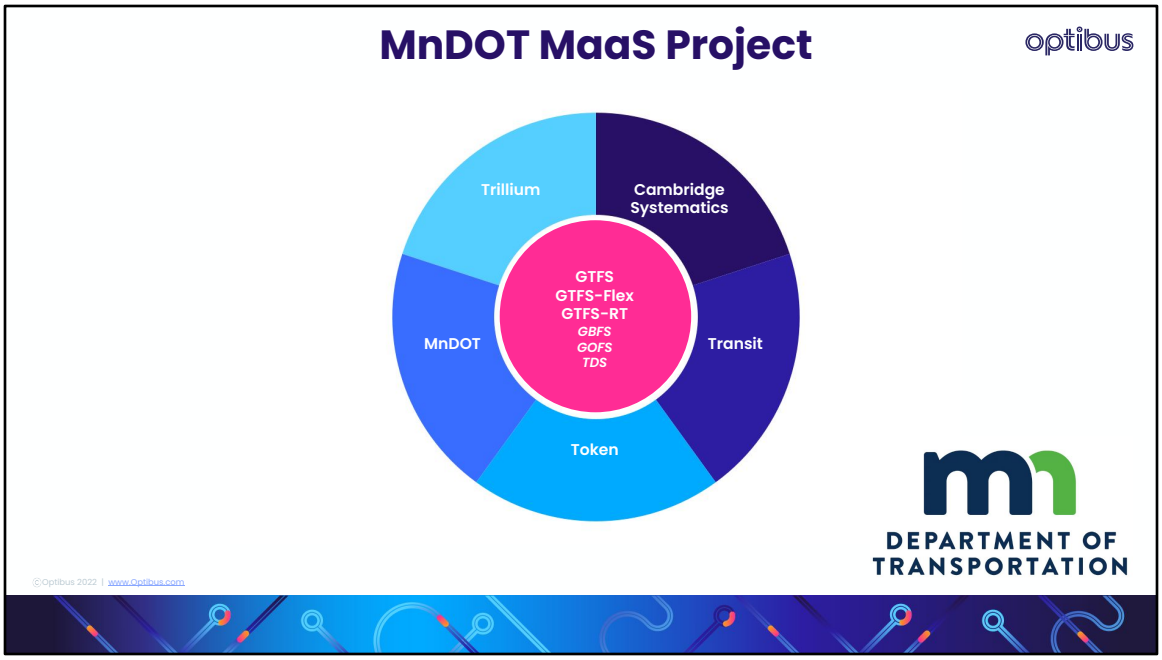


1. **GTFS can also play an integral role in decision making**
    a. For over ten years, ODOT has invested in providing Oregon transit agencies with full service GTFS creation and maintenance through Trillium. As a result, they have a wealth of reliable, historical, and uniform GTFS data for analysis.
    b. By taking quarterly “snapshots in time” of the entire state’s GTFS data (increased to monthly, during COVID), they are able see changes in transit coverage across the state and compare that to other inputs such as ridership and population served.
    c. Two notable publications demonstrate the fruits of this investment:
        i. Key Transit Hub Report (ODOT)
            1. Which used GTFS data to identify “Key Transit Hubs” a transit stop or cluster of stops served by 3 or more fixed routes, where a rider has the potential to travel more broadly than from other stop locations — to the next city, across the state, or even to adjacent states. The more key transit hubs lead to greater connectivity and more attractive travel. Equally important is the layout, signage, accessibility, and safety of the facility.

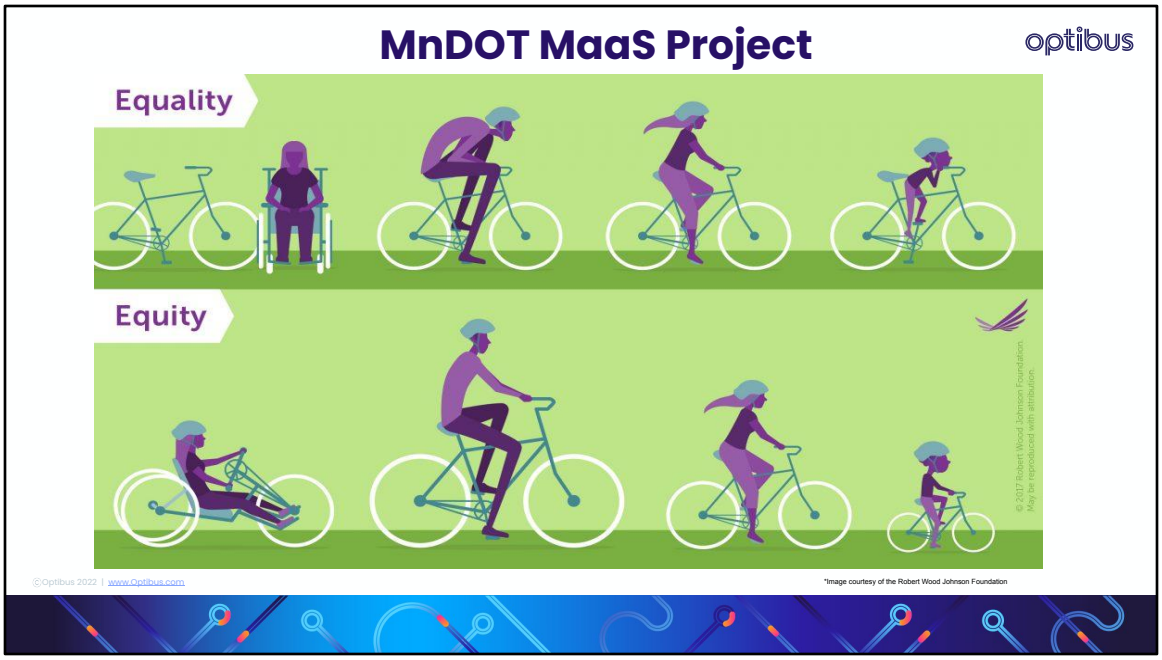


1. And the [Oregon Transit Network Report] (ODOT, OR agency advisors, Kittleson, Jacobs, Trillium)
    a. Which used GTFS and Census data to identify transit providers in Oregon, how they are funded, services provided, and how they all connect across Oregon, both temporally and spatially. If you don't have proper temporal or spatial connections you know that no one is going to transfer. A missed connection because of improper passenger information can alienate riders and erode confidence.
2. [Check out my interview with Matthew Barnes and Sarah Hackett from 2021 to hear more.]

1. In Massachusetts, Trillium has worked with MassDOT to maintain comprehensive GTFS data for transit and ferry agencies since 2015. This data is proving useful as they seek to electrify their fleet responsibly.
    a. Using GTFS from pre and post pandemic, along with additional inputs like ridership data, topography, weather, and deadhead trips, MassDOT and WSP are evaluating the ability for BEBs to satisfy the needs of each RTA's routes and schedules; And where additional infrastructure is needed.
    b. As electric buses begin to enter fleets in greater numbers, it's important that they reach the barn before the battery is drained, and riders are delayed and transferred to another vehicle.



1. Last but not least, how is the GTFS improving the experience of riders in Minnesota? The potential scale of MnDOT's MaaS project touches on much of what I've discussed already, but I'm going to focus on two fundamental aspects.
2. First being simple communication, teamwork, and collaboration on a large-scale project
    a. The work is centered around GTFS. We are all speaking a common language. The language of public transit.
    b. Collaboration would be immensely difficult without it.
        i. Proprietary Trillium data would be different from proprietary Transit data which would be different from CS data. We would be spending all our time trying to convert each others' data. Workflows are quicker when we're all operating under a common framework.
        ii. Example story
            1. New GTFS-Flex spec changes recently passed. This was communicated and acknowledged by all parties, and we moved forward on the same data page. Future changes to the spec, which result in better rider information, will be handled in the same manner.



1. How is the MaaS app improving the rider experience?
    a. As I mentioned earlier, GTFS-Flex allows for the modeling and discovery of demand response and other flexible services in trip planners and other applications.
        i. It puts information about vital ADA paratransit and demand response services on more equal footing with fixed route trip planning, allowing for improved discovery for those who haven't had this level of information, to date, as well as their loved ones, caregivers, and even transit agency staff
        ii. It also serves to identify where connections can be made between fixed and flex services, and helps plan first/last mile travel.
        iii. The inclusion of GBFS data will incorporate bike and scooter share visibility.
        iv. By showing multiple options in one place, the MaaS app meets Minnesotans and visitors where they are, allowing them to customize their travel according to their needs and wants.
2.

1. **Quality, well utilized GTFS can be the rock on which we build rider confidence. It is the language of public transit, with different dialects for different uses. It is how we communicate with riders, during normal operations and when service is affected. Using it, we can inform and empower. We can study our past to plan for our future.**

2. **Thank you for your time!!!**