



DRAFT WORKING PAPER:
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Transit Crowding Data:

The current state of real-time crowding data

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Realtime Crowding Data

Realtime crowding data are data provided by transit operators about the current level of crowding on individual transit vehicles, in real time. Most operators share this data using GTFS Realtime, an extension to the General Transit Feed Specification that already powers trip planning applications such as Transit App and Google Maps. GTFS Realtime is widely used to update riders on the precise location of the vehicle they intend to board, and when it will arrive at their stop. Crowding information is a more recent addition, with limited adoption and ongoing discussion regarding the most effective ways to generate and share it.

Methods for Generating and Sharing Realtime Crowding Data

Most transit agencies generate vehicle-level crowding data using existing Automated Passenger Counters, or APCs. Those count passengers boarding and alighting the vehicle using an optical beam. Although widespread, accuracy can be a concern with this technology. To share the data in real time, operators transmit APC data over cellular or other data networks, integrating it with their GTFS Realtime or other feed.

There are other potential ways to generate realtime crowding data. Operators could use image recognition, running an algorithm on still images captured from existing security camera footage to count the number of people in the image. This may be an attractive option for operators that already have the ability to transmit images from their vehicles and is likely more accurate than APCs. Vehicle weight sensors, possibly already installed for maintenance or other purposes, can also be used to generate a rough estimate. This technology is used by JR East on Tokyo's Yamanote Line, sharing the crowding status of each individual car on the train.

Challenges to Supplying Realtime Crowding Data

There are a variety of challenges that may discourage operators from providing realtime crowding data. APC technology is not always accurate, and may require accuracy checks, maintenance, and calibration to provide reasonably accurate realtime data. Vehicles may be equipped with APCs, but they may not have suitable communications hardware to transmit that data in real time. While APCs are common on buses, they are generally not installed on rail vehicles.

Historical Crowding Data

Other Ways to Generate Crowding Data

Agencies can also generate crowding data retrospectively. Although its railcars are not equipped with APCs or other ways to track crowding in real time, Bay Area Rapid Transit is able to

estimate past crowding levels using fare gate data: matching the time and location that a passenger entered and exited the system to the specific train(s) that served that trip.

APC data can also be used to generate historical crowding data, regardless of whether those data are able to be shared in real time. Finally, operator and rider reports are an anecdotal but useful source of crowding information. LA Metro is actively soliciting rider reports in their COVID-19 related [communications](#).

How Are Agencies Sharing Historical Data?

Dashboards and Aggregations on Agency Websites

Transit agencies are offering historical crowding data in various formats. BART publishes [schedules](#) overlaid with the average number of passengers per car at each station. The Chicago Transit Authority offers a [tool](#) that allows riders to look up a chart showing peak crowding levels on a particular bus route and direction by time of day. Nishitetsu in Fukuoka, Japan publishes a similar [chart](#) showing crowding levels during the morning peak on major bus routes to the city center. The San Francisco Municipal Transportation Agency offers a map-based [visualization](#) that shows the median passenger count for Muni buses at each bus stop.

Historical Data in Trip Planning Applications

It's also possible to embed historical crowding data in trip planners. Using this approach, transit riders would see how crowded a potential route usually is when using trip planners such as Transit App or Google Maps. This could be preferable to publishing historical crowding separately, since riders would automatically be presented with these data when planning their trip, avoiding the need to seek out the information elsewhere.

Crowding Data in a Pandemic

Informing Service Planning

Transit agencies can and do use crowding data to plan and adjust service. However, it is not always possible to quickly and dramatically respond to crowding in light of other challenging conditions for public transit. Responding to crowding generally involves increasing frequency (how often vehicles arrive on a particular route), but agencies also consider span (how many hours of the day the service is available) and coverage (how much of the region the service covers). Given the current financial crisis for transit, agencies face difficult decisions in balancing those priorities.

Helping Riders Feel More Comfortable

According to a June [survey](#) by Transit App in several North American cities, transit riders would like to have access to crowding data in order to plan trips and feel more comfortable riding

transit. Surveyed riders especially valued realtime data, with over 60% of respondents indicating that realtime crowding data would cause them to ride more often during COVID-19. About 30% of respondents indicated that historical crowding data would cause them to ride more often.

The survey also asked what riders would do when confronted with a vehicle that is too crowded. Less than 30% indicated that they would board anyway, even for urgent travel. About 30% indicated that they would wait for the next vehicle, while slightly more than 30% indicated they would choose another mode. A majority of non-urgent travellers indicated that they would wait for the next vehicle.

Although riders do value crowding data, it's important to note that the availability of crowding data alone does not ensure riders won't experience crowding. For example, ability to wait for the next vehicle depends on both frequency and the flexibility of the rider's schedule. An essential worker that has to be at work on-time may choose to board a crowded bus anyway if they lack easy access to other modes. Agencies such as the Massachusetts Bay Transportation Authority are aware of this, noting in a [presentation](#) that only some riders "have the privilege of flexibility in their travel time."

Facilitating (cross-agency) Analysis

Crowding data can be useful for various kinds of research into transit's role during the COVID-19 pandemic and beyond. Historical crowding data on agency websites is a good first step towards enabling research. Realtime crowding data can be archived into a large, detailed data set, however variation between technologies and operator policies makes comparative analysis challenging.

There may be a role for regional agencies such as Metropolitan Planning Organizations in collecting and standardizing crowding data from across the region. In addition to making the data easier to find, integrating crowding data for multiple operators could enable better integrated service planning— especially where multiple operators serve similar trips.