Metrobus Crowding Information

Briefing for TPB RPTS Committee

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DATE 01/26/2021

Agenda

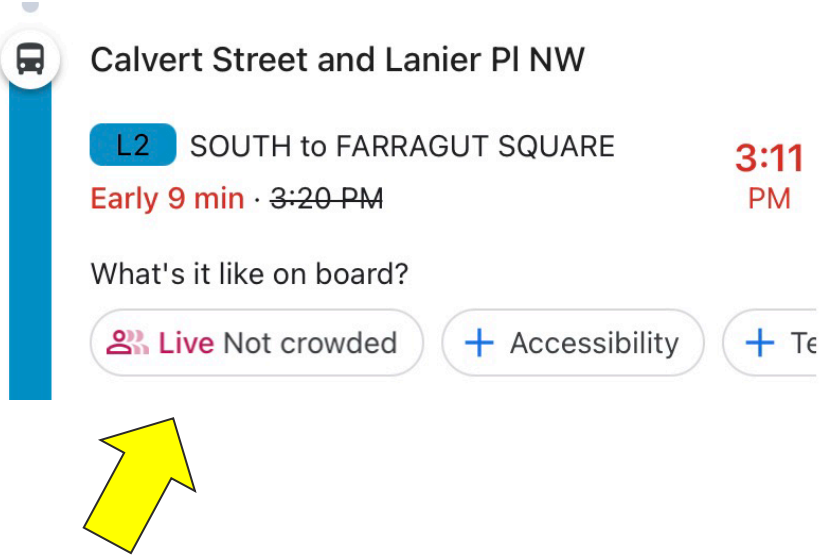
What?	Real-time occupancy predictions for buses
Where?	Apps customers use, including BusETA
Why?	Give customers info needed to feel comfortable riding Metrobus
How?	Leverage bus technology & software investments
When?	Mid-December launch
Who?	WMATA IT, Bus Technology and Planning staff + Cambridge Systematics / OneBusAway

Real-time occupancy predictions for buses

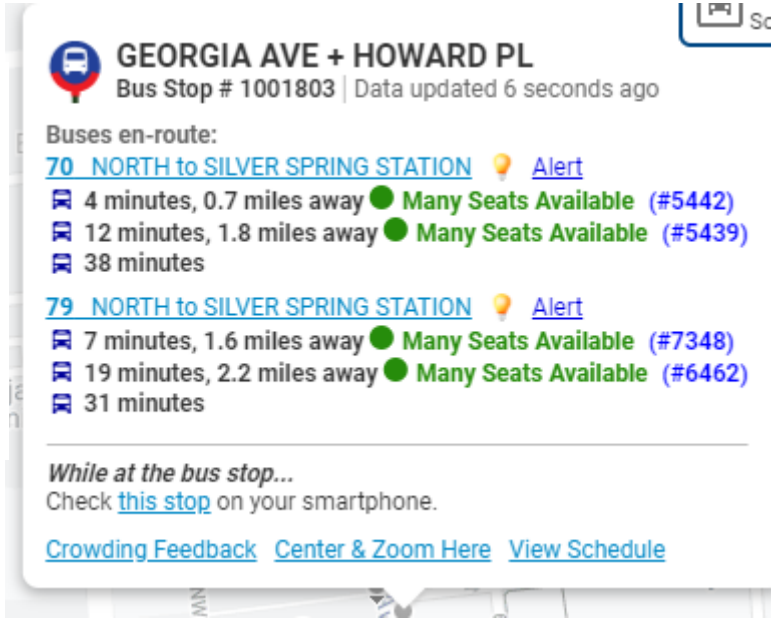
Available on major apps used by customers

Predictions fall in three categories:

- Many seats available
- Few seats available
- Full



View in Google Maps

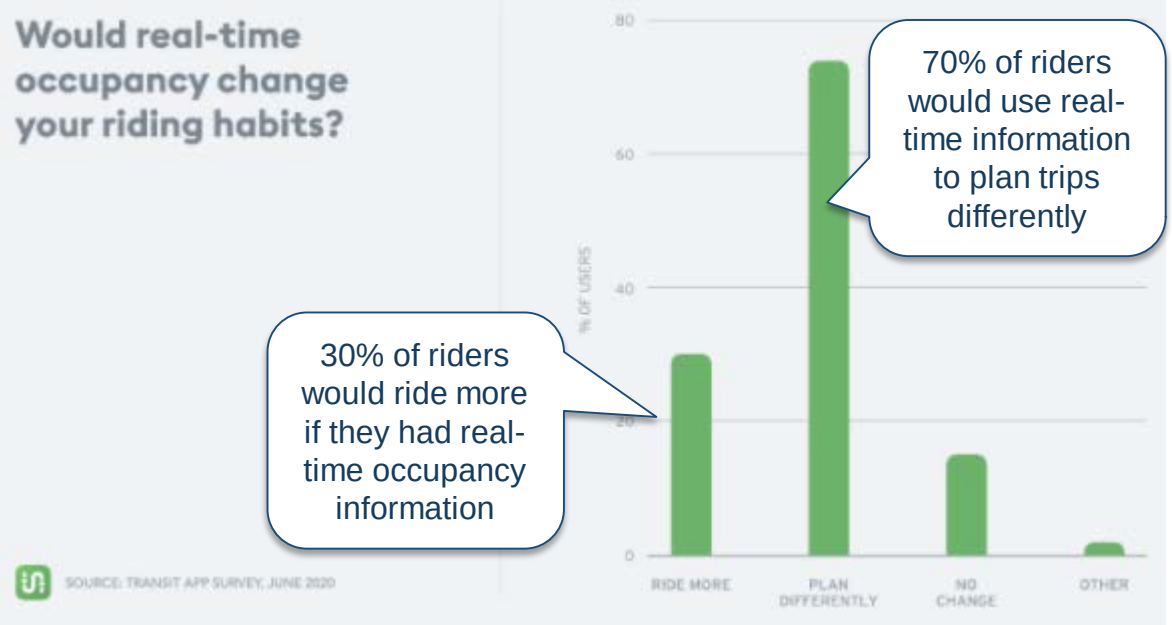


View in BusETA

With current service levels, we expect app to show “full” about 5% of time for bus, <1% of time for rail

Riders value real-time occupancy data

Occupancy information helps customers use our system confidently



Timeline and Steps: 4.5 months of weekly meetings!

Start project

- Started 8/4/20
- At kick-off meeting, scoped project:
- Use GTFS-RT spec
- Communicate three levels of crowding: many seats available, few seats available, full
- Data source: APCs on 100% of buses
- Dissemination: work with Cambridge Systematics to incorporate in GTFS-RT feed and BusETA

Define crowding

- Completed 9/21
- Service planners set standards based on bus type
- Reflect operational practices and planning standards

Develop methodology to clean & bucket raw APC

- Started in August, completed November
- Correct for known issues: reset counters at the beginning of each trip, remove duplicates
- Monitor accuracy by comparing to checker data
- Ensure algorithm runs quickly

Include APC in data stream provided to Cambridge

- Started in August, completed November
- Data flow: CAD real-time -> CAD database -> Oracle database
- WMATA added lookup and transformation tables to our Oracle DB – cleans raw APC + translates into three buckets
- WMATA pushed changes to the Advanced Queue (added three buckets) used to transmit data to Cambridge

Incorporate in BusETA, GTFS-RT

- Required Cambridge Systematics contract mod for $60K
- 6 weeks to incorporate in BusETA, GTFS-RT
- Started work 10/26

Launch in BusETA, GTFS-RT

- Launched 12/20/20
- Developed customer feedback form
- Monitoring accuracy and looking for opportunities to improve
- Will adjust crowding definitions as social distancing requirements change

Crowding definitions

- Align with results from rider surveys
  - 45% of riders surveyed by Transit say “sitting alone” is their threshold to ride
  - Remaining 55% would continue to ride even if more crowded
- Match current practice on bus for skipping stops, changing headsigns
- Can be easily adjusted as requirements change

Bus Type	Seat Count	Many	Few	Full
40 ft Coach	40	10 ≤	Between 11 & 20	> 20
60 ft Coach	60	17 ≤	Between 18 & 25	> 25
30 ft Coach	27	7 ≤	Between 8 & 15	> 15

Methodology to clean APC data

- Start an independent APC tally (we call it “Adjusted APC”)
- Log every bus record and compare to previous
- For each bus record, 2 possible adjustment actions:
  - **APC action**

    If the record is not a duplicate of the previous and

    New Passenger Count = Previous Passenger Count – New Offs + New Ons

    - Update the Adjusted APC
  - **New trip action**

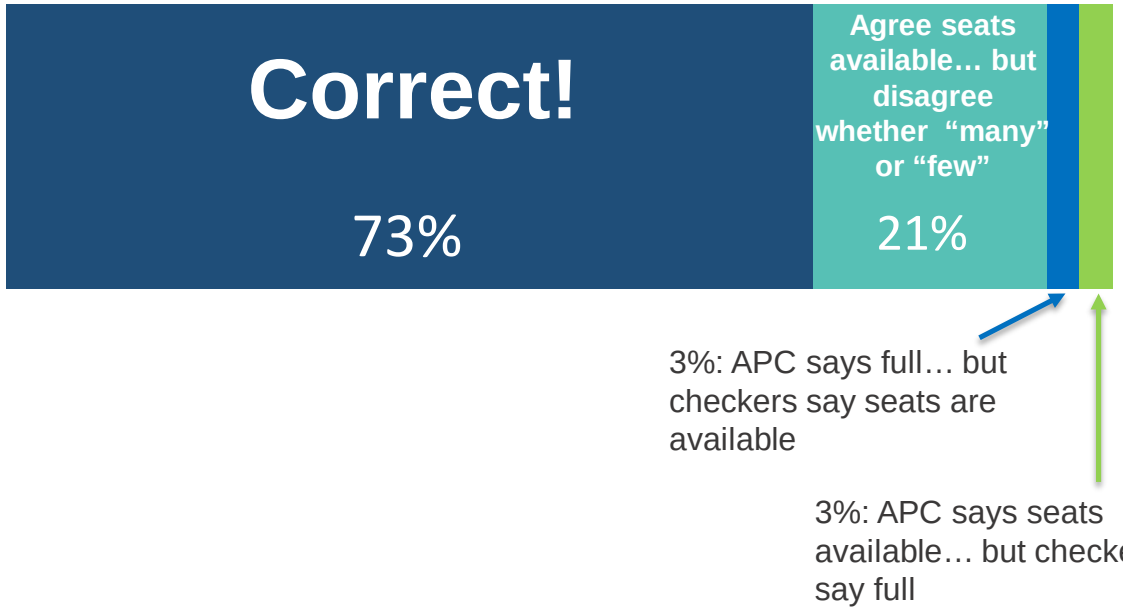
    — If the record new tripid is different from previous tripid

    - Update the Adjusted APC to 0

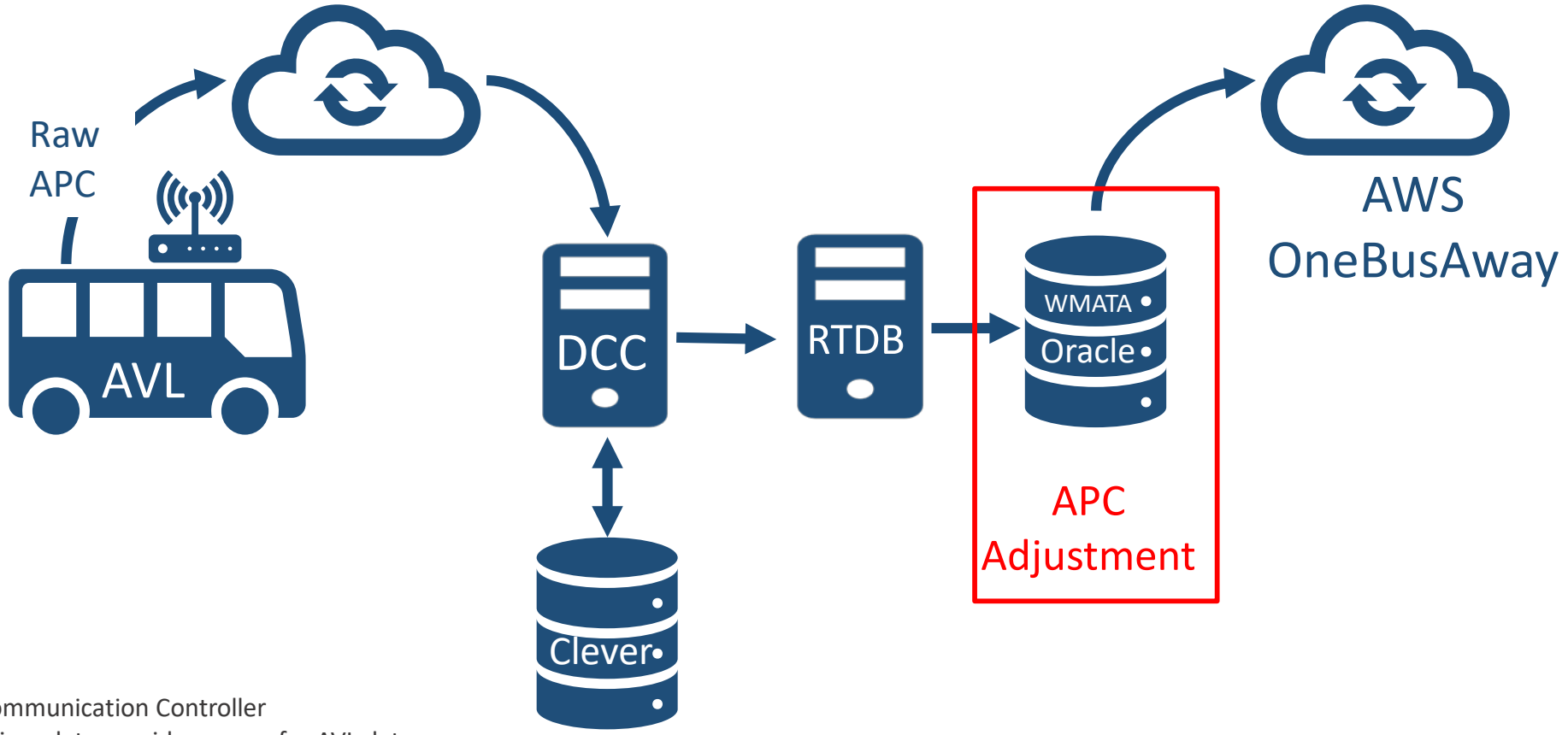
Accuracy – Bus Predictions

To check accuracy, we compare our predictions to observations from Metro checkers

- We only predict a bus has many seats available when checkers say it is full 1% of the time
- Our adjustments greatly improve accuracy
  - "Raw" APC data only match checker counts 53% of time
  - "Adjusted" APC data match checker counts 73% of time
- Video "Hella" APCs are more accurate
  - “Raw" Hella APCs match checker counts 77% of the time
  - “Raw" Clever APCs match checker counts 48% of the time



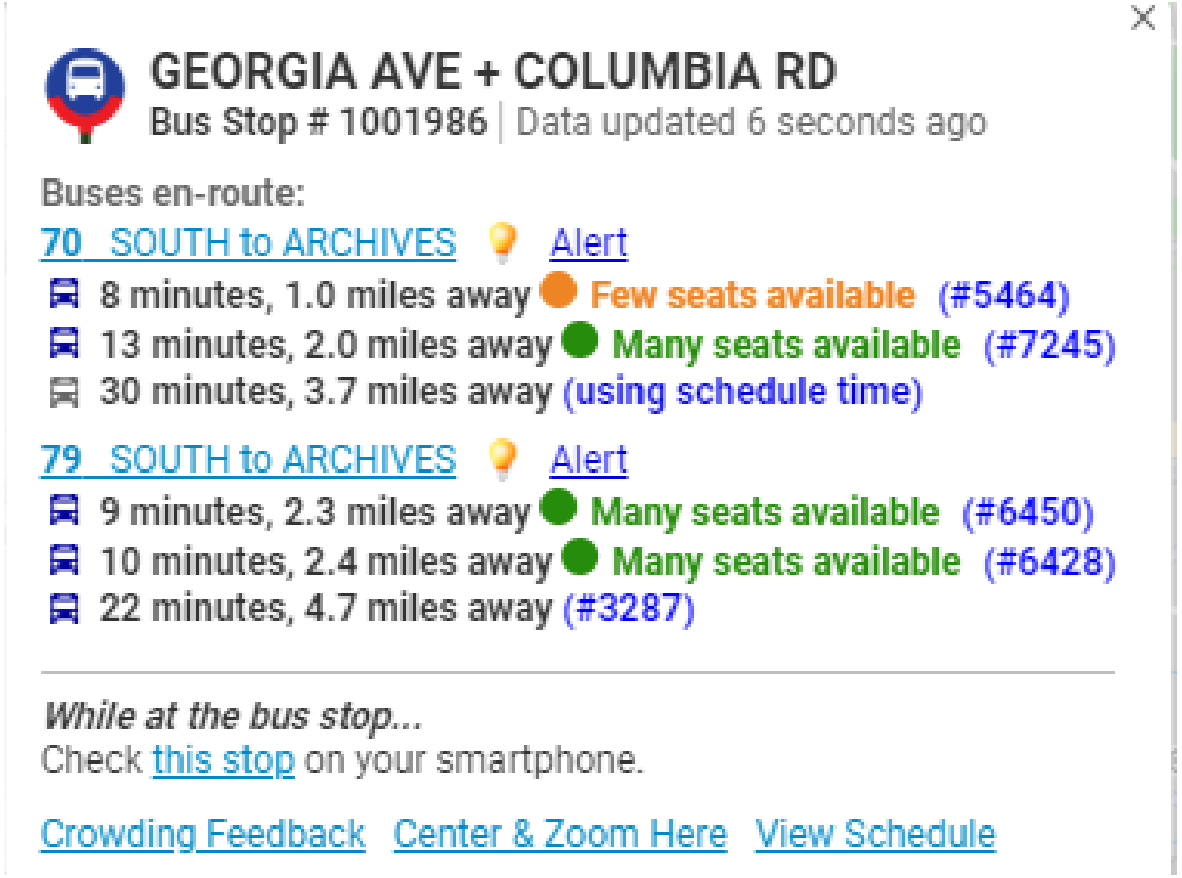
Data flow/architecture



DCC - Data Communication Controller
RTDB – Real-time data provider server for AVL data

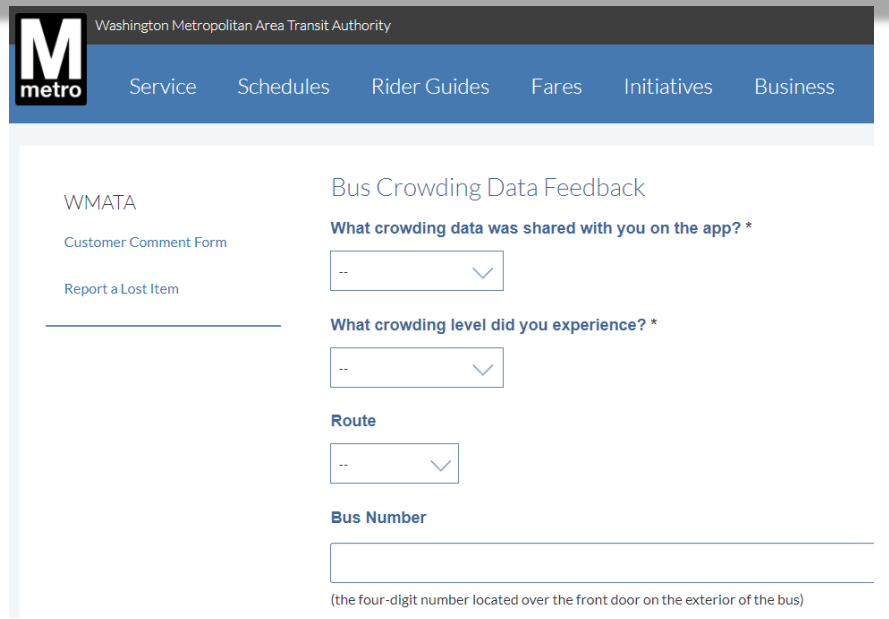
Incorporate into BusETA and GTFS-RT

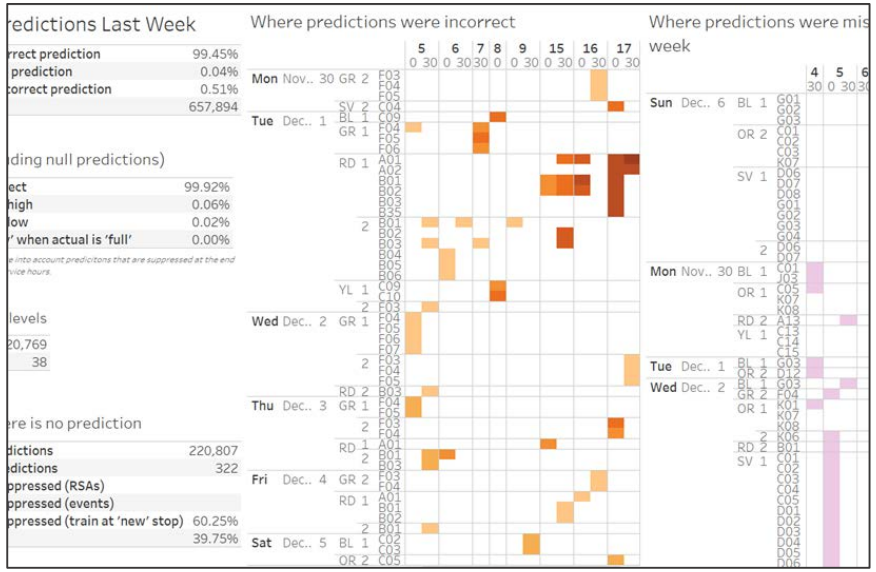
Item #	Task	Start Date	Duration	Projected Finish Date
	I - Project			
1	WMATA-Oracle Advanced Queuing Infrastructure Update	10/26/2020	5	10/30/2020
2	Cambridge- Procide Revised Data Forwarder	10/26/2020	5	10/30/2020
3	Cambridge - Update the data serialization between the Database and Amazon's SQS	10/26/2020	8	11/4/2020
4	Cambridge- Update the Prediction server to ingest the new data from Amazon	10/26/2020	8	11/4/2020
5	Cambridge - Update the prediction server internal data model to support OccupancyStatus	10/26/2020	8	11/4/2020
6	Cambridge- Update Prediction server internal APIs to support Occupancy status	10/26/2020	8	11/4/2020
7	Cambridge - Update Prediction server GTFS-RT bindings to suppor experimental OccupancyStatus	10/26/2020	8	11/4/2020
8	Cambridge - Update OneBusAway's GTFS-RT ingestion code to parse Occupancy Status	11/4/2020	6	11/11/2020
9	Cambridge - Add OccupancyStatus into OneBusAway's internal data model	11/4/2020	6	11/11/2020
10	Cambridge- Serve OccupancyStatus in OneBusAway APIs for mobile/native app development	11/4/2020	6	11/11/2020
11	Cambridge- Serve OccupancyStatus in SIRI for desktop web application consumption	11/11/2020	11	11/25/2020
12	Cambridge- Update mobile web display and icons to render OccupancyStatus	11/11/2020	11	11/25/2020
13	Cambridge- Update desktop web display and icons to render OccupancyStatus	11/11/2020	11	11/25/2020
14	Cambridge- Deploy to QA; Test database data model upgrade process	11/11/2020	11	11/25/2020
15	Cambridge - Testing - OneBusAway portion	11/11/2020	11	11/25/2020
16	WMATA - Testing	11/25/2020	15	12/9/2020



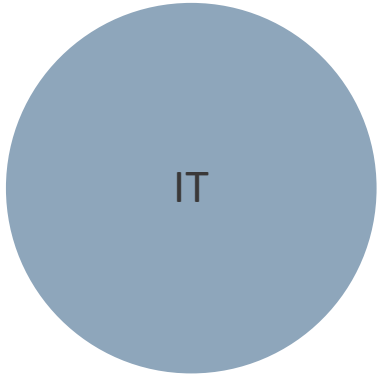
Launch & Monitoring

- Data live on 12/20
- 12/23 press release
- Continued verification and refinement
  - Customer feedback via Metro comment form
  - Customer research
  - Dashboards to verify accuracy by comparing to checker data, actuals





Team effort from staff across WMATA



- IT Apps
- IT Business Intelligence

- Capital and Systems Intelligence

- Performance
- Bus Tech Support Services
- Intermodal Planning

- Innovation and Digital Communications
- Customer Service