

Design Project FAQ

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Questions about failure recovery

Can we assume that there are a consistent 45 buses reserved for failure recovery?

It's fine to work with that assumption, yes. But remember: a good design can respond well to changing requirements. If your design relies on exactly 45 buses being available at all times — not, say, 44 — it's not going to respond well to changing requirements.

If a stop needs to be changed for some reason (e.g., police action), are all possible stops that this route could use already in the route schedule dataset?

No. However, we have updated the DP spec to include a separate dataset that gives the lat/lon of places that you might consider as alternative stops.

How should passengers be notified of failures? What resources are available for this?

That's largely up to you. Some students have asked about whether they can have MBTA employees go out to routes to, e.g., place signs. That's fine, and you can assume that the MBTA has employees that you could use (you wouldn't need to use the sys admins).

Regardless of what technique you use, you will need to justify it. For instance, in the above example, you'd have to deal with the fact that it takes an MBTA worker some amount of time to get out to the stop, among other things.

Questions about cameras or computer-vision algorithms

Can security cameras see the entire bus?

Yes. In terms of counting passengers, though, there will always be configurations that are hard to deal with (e.g., a short passenger surrounded by multiple hard cameras is difficult to see even if cameras capture multiple view angles).

The passenger-count data is 95-98% accurate? What does that mean? What other information do we have about the algorithms?

95-98% of the time, the passenger-count data is correct. You know nothing about what happens the remainder of the time, but it's reasonable to assume that it's not ridiculous (it won't report, e.g., 100 people on a bus with two passengers).

Can we re-run the computer-vision algorithms to get more accurate data?

Assume that those algorithms are as accurate as they can get at this point. Designing better computer-vision algorithms is a project for another class (and allocating more hardware resources to computer-vision algorithms is not something the MBTA can afford).

How many frames of data do we need for accurate reporting?

Given a single frame of video data, you can assume that the computer-vision algorithms can count the number of people in it with reasonable accuracy, and that only a few frames — let's say five — are needed to get the reported accuracy numbers (95-98%). But remember that a single frame (or a few frames) is just a snapshot: people will likely enter or leave the bus at every stop.

Questions about the bus routes

Can bus routes share a stop? How does that affect the route's frequency constraint?

Bus routes can share a stop (think, e.g., about multiple bus routes that pass through Kendall Square). If route *x* includes stop *y*, then route *x* must service stop *y* roughly every twenty minutes.

Is 446,700 daily bus passengers an average or a maximum?

Average.

Can we assume that the current system, without our design, has normal operation? For example, do the current bus schedules take rush hour into account? Can we assume that buses are already more frequent during rush hour, since it's not really unexpected?

That's fine to assume, yes.

In the real world, different routes have different frequency requirements at different times of the day (e.g., rush hour = higher frequency). We didn't account for that explicitly in this project, because it added too much complexity.

Questions about the payment interface

Are we expected to verify payments (e.g., reject passengers with empty Charlie Cards)?

No. You're not responsible for handling customer payments, though you may (or may not!) find that data useful.

When a Charlie Card is used, do we get information about whether or not it was a transfer from the payment interface?

Yes. We've updated the DP spec to include this.

Do passengers pay for their ride when getting on or off the bus?

Getting on the bus.

Miscellaneous

This is a section for questions that didn't fit into any particular category. As we get more questions, we'll likely end up with additional categories, so some of the questions below may get moved to other parts of this document.

In the MBTA warehouse, a single server handles receiving/transmitting data — Who specifies which server that is?

You do, as part of your design.

Do we have to worry about non-MBTA users impersonating buses (i.e., do we have to worry about authentication the bus connections with the MBTA warehouse)?

No. You can assume an authentication protocol is already in place.

Can we use real data from the MBTA schedules to estimate quantities like time between stops?

That data would be great for getting a reasonable estimate of such quantities (if you need them). You shouldn't rely on it too heavily, though; we've given you a modified MBTA system that wouldn't use exactly those schedules. In particular, the real MBTA does not serve every stop on a route every twenty minutes (some are more frequent, some are less frequent).

Do we specify the details of the bus-control?

You can specify the specs of the bus-control, but keep in mind that it's meant to be a fairly small device. For instance, a "reasonable" spec for storage would be 64-128MB, not terabytes of data.

For the standards of reliability and comfort, when you say 75% or 96% of the time, how long is this time defined? In a week, across a month or a few months or a year?

For the purposes of this project, over a couple of weeks. In the real world, these targets are annual. (If you're thinking "It seems really easy to hit targets if you average over the entire year!", you should know that the MBTA has *not* historically met every target.)

How long is the "night period" where all buses have returned back to the warehouse?

5-6 hours.

What is exactly the definition of total load? Is it the number of people who have used the bus system ever? Who use it regularly? Is it an average over a year? Per day? In general?

The MBTA would likely use this data to plan routes, etc. At a minimum, they'd want to know the total number of people who were on a bus for each of its rides (trips along a route), but it would also be useful for them to know how the load on a bus changed during its ride. (Were there 40 people on the bus before stop X, and then only 5 people on the bus after stop X? For example.)