

A More Efficient Night Owl

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Summary: The interests of the MBTA (major cost reductions) and the interests of the MBTA's customers (basic late-night service) can both be satisfied by restructuring the Night Owl to greatly improve efficiency. The question before the Board should not be viewed as a black-and-white choice between the existing Night Owl and no late-night service. The existing Night Owl is inefficient because it provides service to all subway stations (irrespective of actual late-night demand) using a route network designed for commuter traffic (following subway lines into downtown). More efficient routes can be developed based on actual ridership patterns, and several possible Night Owl configurations are presented. With even a 75% cut in service, a well-designed Night Owl might be able to serve 2/3 of the existing passengers. With this type of option available, the Board should not eliminate service entirely. At a minimum, a core Night Owl service to regions with demonstrated high demand should be retained. I ask the Board to focus on saving money through a major restructuring of the Night Owl into a more efficient service.

Introduction

I appreciate the frank comments by Secretary Grabauskas and General Manager Mulhern at the February MBTA Rider Oversight Committee (ROC) meeting. From this presentation, I learned that the MBTA intends to terminate Night Owl service due to budgetary constraints. This will obviously be a controversial move, and I am sure that others will present the argument that Night Owl is a vital service and provides an important public service. I share this sentiment, but will approach the issue from a different angle. I understand that the service is not economically sustainable in the present form, so saving the Night Owl will require finding ways to drastically cut costs. Fortunately, I believe that this is possible.

I believe that both MBTA and ridership interests could be met by cutting the Night Owl to a very small core service, optimized to known ridership patterns. To help illustrate the viability of a core system, and the magnitude of the cost savings possible, I submit an analysis describing in detail one possible restructuring of the Night Owl, and showing several alternative concepts. My purpose is to show that a low-cost design is possible that meets known ridership demand. This is just one approach, and I encourage everyone to think about innovative concepts and possible new Night Owl configurations.

I ask the MBTA to consider cutting back the Night Owl, even drastically, while retaining some core service in the process. In addition, I ask the Rider Oversight Committee to become involved by providing advice and recommendations regarding the future of Night Owl service.

Existing Conditions

When the Night Owl service was introduced, the routes were designed to mirror each of the existing subway lines, with supplemental service on a handful of existing bus lines. This routing was easy to understand, and was a good way to run the "trial period" while ridership patterns were being determined. But the Night Owl in this form is burdened by several fundamental inefficiencies, and I believe that this is a significant factor contributing to its extraordinary cost per passenger. Some of the major Night Owl inefficiencies:

- 1) Providing service to all subway stations, irrespective of actual ridership demand. This is really a double hit, because most low-ridership stations are suburban, so buses spend a lot of time nearly empty while driving to/from these outlying stations.
- 2) Mirroring subway routes. While conceptually simple, this isn't necessary, and squanders the flexibility of a bus to shift routes based on actual demand patterns. This flexibility is often cited as an advantage for using buses on the Silver Line and Urban Ring.
- 3) Converging a hub-and-spoke route system at a "hub" miles away from the ridership's geographic center of gravity. Night Owl routes converge downtown because of the design

decision to mirror the subway route structure, and subway routes converge downtown. This, in turn, reflects downtown's role as a commuter destination and center of business activity. Using commute patterns as an effective constraint on Night Owl route design prevents optimization to ridership patterns during this service period.

4) Circuitous routing. The routes were selected to mirror subway lines, but the tracks that connect adjacent stations aren't being used, and navigating from station to station via surface streets can force circuitous routing.

A stripped-down Night Owl service, with routes optimized to actual ridership patterns, could probably serve most of the existing passengers at a fraction of the cost.

Night Owls and Early Birds

The Night Owl, in essence, runs "shuttle buses" on all the subway lines simultaneously. To some extent, the simplicity of that concept creates the impression that extended-hours service would necessarily look like the present Night Owl.

To broaden our perspectives, an interesting comparison can be made between the Night Owl and a little-known MBTA "Early Bird" bus operation that provides limited bus transport before the subway and bus networks begin regular service hours. Ridership patterns are very different during these two service periods, and the historical origins of the two operations are unrelated. But the services share an important feature, in that they both provide basic transportation options at a time when other MBTA operations (subway and bus) are closed for the night.

Early Bird service operates at least nine trips Monday through Saturday, and at least two trips on Sunday. (The 2004 service plan recommended adding an additional Sunday trip, but I haven't found it on the schedules.) The buses mostly (but not always) follow standard bus lines, the trips are listed on the ordinary bus schedules, and the fare is ordinary bus fare.

Five trips are inbound to downtown (Haymarket) originating at Watertown, Clarendon Hill, Wonderland, Mattapan and Cleary Square. Two trips are provided from Ashmont to Logan Airport, and three trips are provided on route #28 (including a timed transfer for trips to Logan). If my calculations are correct, the MBTA runs a total of 56 "Early Bird" trips per week.

The MBTA tries to make "Early Bird" service look like part of the ordinary bus network. For example, the trip from Clarendon Hill follows bus routes #89 and #93, and is listed in those schedules. But Early Bird service is really distinct from ordinary operation on these bus lines. A good example comes from the 2004 service plan, where additional service on "Route 191" is recommended. When Early Bird trips follow different paths from daytime bus service, the MBTA either "extends" a route (e.g. #57 schedule showing the trip from

Watertown with the note "To Downtown"), or simply lists the trip under a special "Early Bird" route number (e.g. Route 171 to Logan Airport on the CT3/171 schedule card).

Early Bird service demonstrates that limited MBTA bus service can be viable outside ordinary service hours. Indeed, since the 2004 service plan recommended expanding Early Bird service, I conclude that extended-hours service can successfully compete with standard-hours operations in the MBTA's service planning process. In this context, the possible demise of the Night Owl is quite striking. The Night Owl has a proven ridership demand. We have an example -- within the MBTA -- of viable extended-hours service on special routes outside ordinary operating hours. Based on these observations, it should be possible to restructure the Night Owl into a viable service.

Ridership Patterns

My information regarding Night Owl ridership patterns was obtained from the "Night Owl Pilot Program Status: September 2001 - April 2002" report provided to the MBTA Advisory Board on May 8, 2002. I may read too much into these provisional statistics, since line counts come from different weekends, and the figures are uncorrected for system-wide variations in ridership. But this is the only hard data in my possession, so I'll use this as a basis for analysis.

There were several striking features in the ridership patterns:

- | The Alewife and Boston College routes, which had the most passengers, combined for 1/3 of the total ridership. This was so heavy that the MBTA increased service.
 - | Over 50% of total ridership was concentrated on the western branches (Green Line and #57). These routes are nearly parallel and mostly serve a strip about 1 mile wide and 4 miles long.
 - | Over 2/3 of the total ridership was on these western branches or the Alewife line. This does not include riders on #1 and #66, which also operate in the same geographic region.
 - | Orange Line, Blue Line and southern Red Line service combined for less than 20% of this ridership. There are almost no inbound riders on these routes.
 - | Using "passengers per route minute" as a measure of the relative value of different routes, taking into account both the total ridership and the length of the route, there was a clear distinction between four strong routes (B, C, E/39, Alewife -- scores of 6-10) and everything else (only #1 and #57 even scored above 2.5).
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Principles for Restructuring

To restructure the Night Owl into a viable service, here are some general concepts:

- 1) **Limiting the service region.** The current Night Owl service attempts to serve all subway stations, irrespective of actual ridership demand. This is not an economically viable service objective. A restructured Night Owl should have a limited service region based on demonstrated ridership patterns.
- 2) **Route optimization.** Shadowing subway tracks with Night Owl service may be useful sometimes, especially since transit-oriented ridership is often clustered along subway lines. But this should only be done when appropriate, and the MBTA should diverge from subway paths when a more efficient routing is possible.
- 3) **Moving the "hub" of a hub-and-spoke network.** As noted below, most Night Owl ridership falls within a 2-mile radius circle centered on the BU Bridge. Therefore, if a restructured Night Owl has multiple routes, a transfer location near Hynes, Kenmore or Symphony would probably lead to more efficient service.
- 4) **Considering a single route.** To simplify operations, it may be possible to reduce Night Owl service to a single route. This would eliminate logistical and operational complexity associated with maintaining a timed transfer system, and eliminate the need for the massive support operation at Government Center.
- 5) **Keeping buses in service to the garage.** This would provide one trip to some destinations outside the limited service area, without requiring any additional service resources. Since almost all passenger trips to other regions are outbound, this could be quite useful. (The MBTA already does this on selected bus lines after midnight, e.g. #77A.)

In light of the geographic ridership distributions revealed by the ridership statistics, I believe that an efficient Night Owl system could be based on a limited service area roughly described by the four strongest routes: B, C, E/39 and Alewife. This area includes:

- | Commonwealth / Beacon corridor from Kenmore to the Reservoir;
- | Huntington Avenue;
- | Massachusetts Ave between North Cambridge and the Orange Line;
- | Back Bay / Downtown Boston.

To visualize this region, it's basically a circle centered on the BU Bridge with a radius of two miles. There are several ways to approach the problem of efficiently serving this area. For example:

A multi-line hub-and-spoke system could use fewer spokes and a more geographically central hub. For example, Hynes could be used as a hub location, with radial bus lines to Boston College, Cleveland Circle, Forest Hills via Huntington Ave, Downtown, and Alewife.

A two-line crossing pattern, again using Hynes as a transfer point, could be relatively simple. An east-west route would be based on the existing Boston College service, and a north-south route would operate via Massachusetts Avenue north to serve Red Line stops, and via Huntington Avenue south to serve E/39 stops.

A single route could be constructed by chaining together the two most popular routes, and operate between Boston College and Alewife via downtown.

Any of these options would be simpler than the current operation. Some possible configurations are illustrated with maps on the following pages.

When the MBTA introduced the Night Owl for a "trial period", it was expected that the service would continue if ridership demand was proven, albeit perhaps modified to improve service efficiency. Some minor changes were made, but the essence of the Night Owl system remains unchanged. It would be appropriate for the MBTA to make significant changes to the system to improve efficiency, and I hope that the MBTA finds a way to maintain a core system despite the severe financial conditions. Ridership demand is proven, and the key challenge is finding a more efficient way to meet that demand.

Since the Night Owl is being considered as a single budgetary line item, I am concerned that the fundamental inefficiencies in the original design will drag down the entire program. Night Owl service provides an important function in the community, and some sections of the service have demonstrated very high ridership. Early Bird service proves that limited bus service outside normal service hours can be successful. It should be possible to cut the Night Owl to a core service that serves the demonstrated ridership at a significantly reduced cost.

Single Route

If the Night Owl service is reduced to this limited region, I believe that it can be served by a single route.

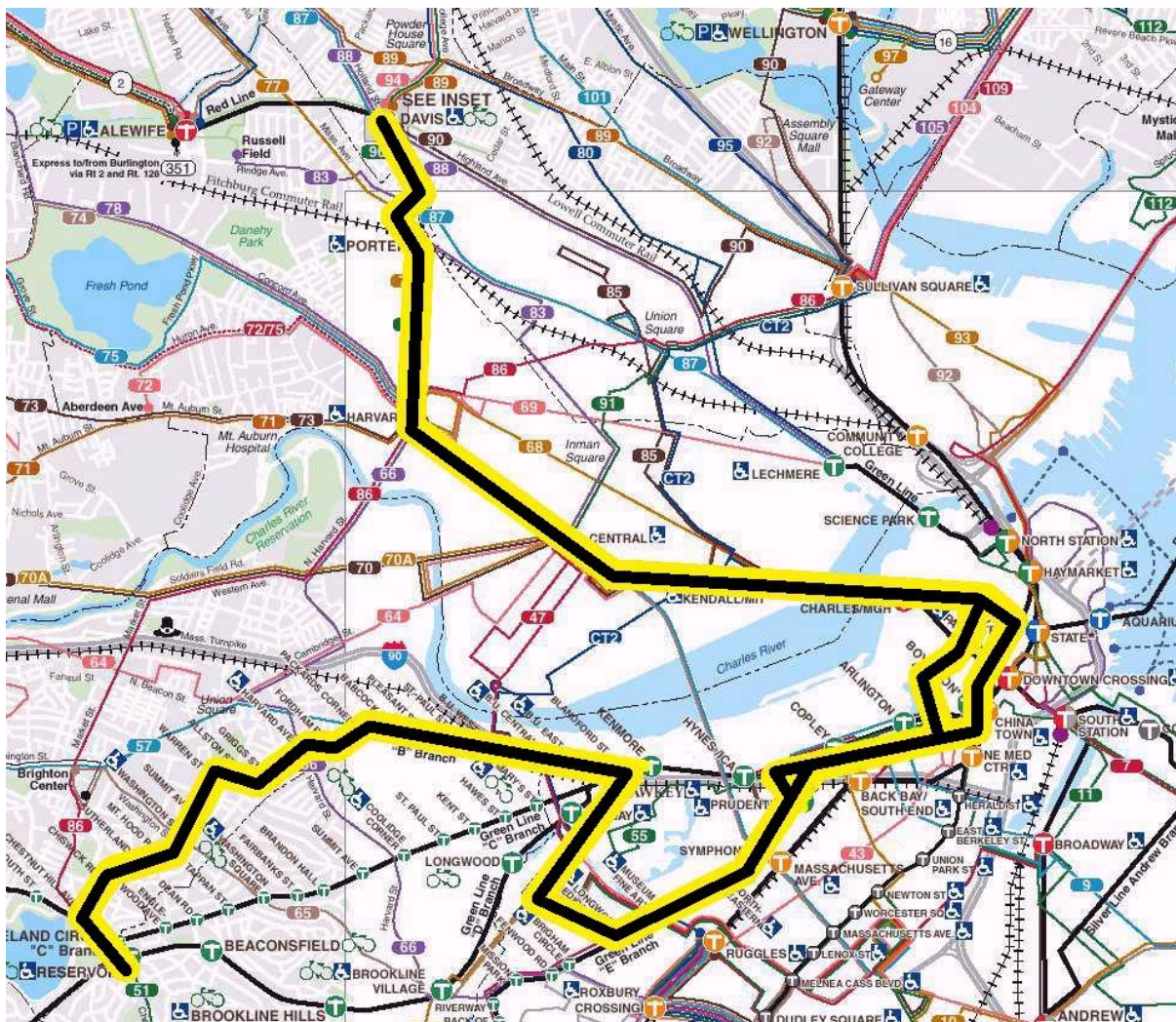
To illustrate the viability of this concept, I will propose a particular route that would serve 2/3 of the existing Night Owl ridership. Two buses could provide roughly hourly service, but due to high demand, perhaps six buses would be needed for the route. Other routings are obviously possible, and I encourage the exploration of alternatives.

To create a single route, the simplest approach would chain together the existing Boston College and Alewife routes into a single through line, in the manner of the MBTA's Early Bird chaining of bus lines to create through service. To capture much of the E/39 ridership, the route between Copley and Kenmore could be modified to run via Huntington Ave, Longwood Ave and Brookline Ave. Hynes would be bypassed, but it would be within walking distance of the route at Kenmore, Symphony and Copley.

To save time, the route could be clipped at Davis and Cleveland Circle. Travel to Alewife seems to add seven minutes (10% of the trip time), which doesn't seem efficient. Using the principle that 1/2 mile is "close enough" for Night Owl service, Boston College would be served by a stop at Chestnut Hill Ave, so trips can turn around at Cleveland Circle. In downtown, trips to Cambridge could take a more direct route, never going farther east than Bowdoin St, using the Route 43 stop near the State House as the main downtown stop.

This integrated route would provide service within about 1/2 mile (10 minute walk) of nearly all stops on the four major routes (B, C, E/39 and Alewife). Based on some measurements on a map, the only exceptions appear to be E/39 in Jamaica Plain, two stops on Beacon St (Summit Ave and Brandon Hall), and Alewife station. The line would also provide service within about 1/2 mile of all #1 stops between Harvard and Washington St; all #57 stops between Government Center and Brighton Center; all D stops except Brookline Hills and Newton stations; and significant portions of route #66.

This route is illustrated below:



Alternative 1: A single Night Owl route (Cambridge to Allston/Brighton via Downtown)

My best estimate is that over 2/3 of the existing Night Owl ridership would be served by this single route. Some people, of course, would not choose to walk the extra distance (especially from the Coolidge Corner region to Commonwealth Ave). But it isn't economically possible to serve everyone directly, and this seems like a good compromise. The route would directly serve the regions with the highest demonstrated ridership, and be close to other regions with significant ridership. In this way, a single-route Night Owl could provide a quality service, and keep important public transit options available after the end of standard operating hours.

Since there would be no transfers in this Night Owl operation, there would be no need for the massive operation at Government Center. Bus operations would be more relaxed since there would be no need to ensure timed connections. This would make the Night Owl easier and cheaper to operate. To estimate travel time, we can add the length of the existing Alewife and Boston College routes: 72 minutes. Cutting the lines short at Davis and Cleveland Circle would cut about 10 minutes from the trip, while the net effect of the Huntington Ave variation would add about 8 minutes. (These figures are guesses based on timetable interpolation and measuring distances on a map.) Thus, my best estimate is that a trip would take 70 minutes.

In principle, two buses could provide roughly hourly headways during the Night Owl service period (e.g. one bus leaving each terminus at 1:00 am and starting a return trip at about 2:15 am). But in practice, these buses would be filled to crush capacity, and the number of buses required would be determined by ridership demand. This isn't really a problem, because it shows the success of the Night Owl. Under ordinary conditions, the MBTA would never think of eliminating service at a time when a bus route had such heavy ridership. Service planning would call for the reduction of service elsewhere, if necessary, to preserve the route. The MBTA should keep that in mind when deciding between eliminating or restructuring the Night Owl service.

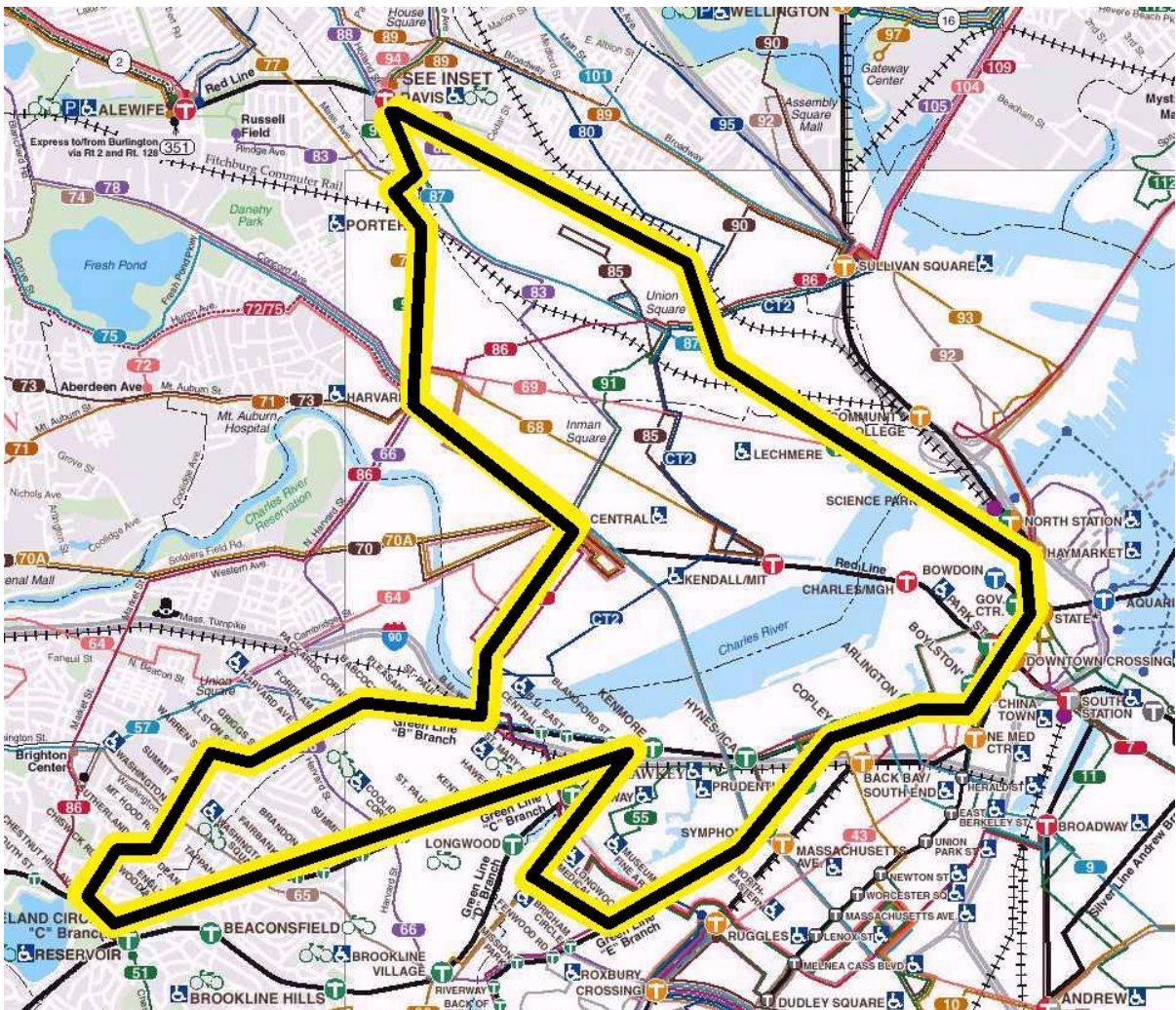
My impression is that five or six trips, in each direction, would be sufficient (although the buses would be packed). Headways would be 20-25 minutes. Assuming 70 minutes for one direction, and five round trips, an evening of the Night Owl would use under 12 hours of bus operations. The winter 2004 schedule shows that the existing system requires over 45 hours of bus operations. Thus, the proposed Night Owl could represent a 75% cut in the level of service, eliminate the operational complexity associated with timed transfers and multiple routes, and provide useful service to 2/3 of the ridership.

My hope is that this kind of Night Owl could be operated with almost no expenses beyond the operating costs for about six vehicles. To save the Night Owl, we need to cut back drastically on underutilized service, and eliminate the operational complexity inherent in the original system. Operating a single Night Owl route might fit the bill.

Some Alternatives

There are many alternatives for Night Owl route selection. I will illustrate a few additional concepts on the following pages.

In all scenarios, a single Night Owl outbound trip to other destinations (e.g. Malden, Revere, Ashmont) would be sensible, especially if the trip could be combined with taking a bus back to the garage. The ridership demand to these regions may not support a dedicated line (with both outbound and inbound service), but some effort for providing outbound service is clearly reasonable.

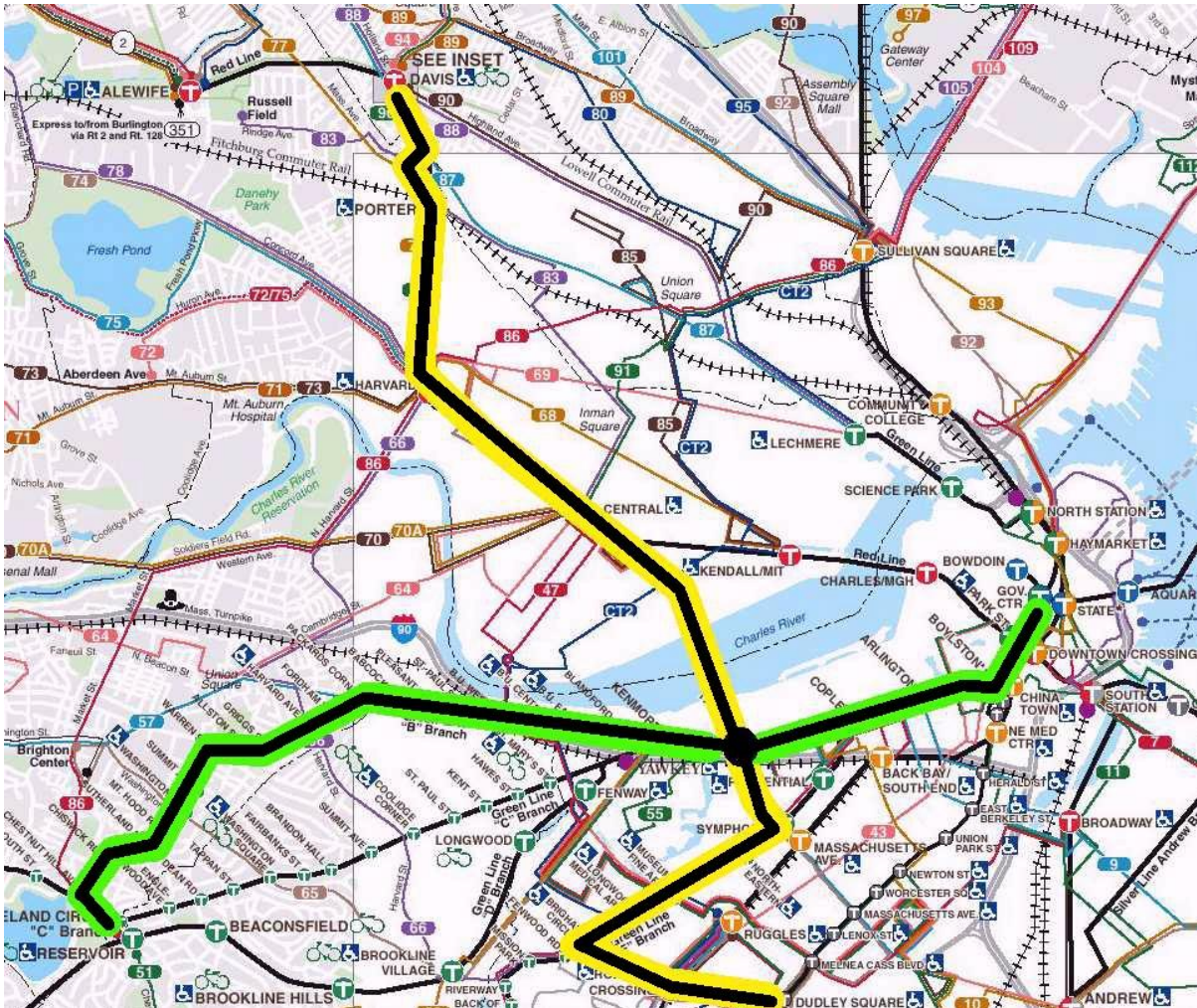


Alternative 2: A single Night Owl "circle route"

A "circle route", or continuous loop, can be relatively efficient. When ridership demand calls for multiple buses, the route would operate in both directions, offering relatively quick single-seat service between any locations on the loop. No transfers are required, and the operational complexity of a timed transfer is avoided.

At times of very low ridership, a "circle route" can be operated with a *single bus*, maximizing the effective service area of that lone bus. This would not be attractive for some passengers going a short distance, but it would provide a basic crosstown service at a minimal cost.

The proposed loop would take about 90 minutes for a full circuit.



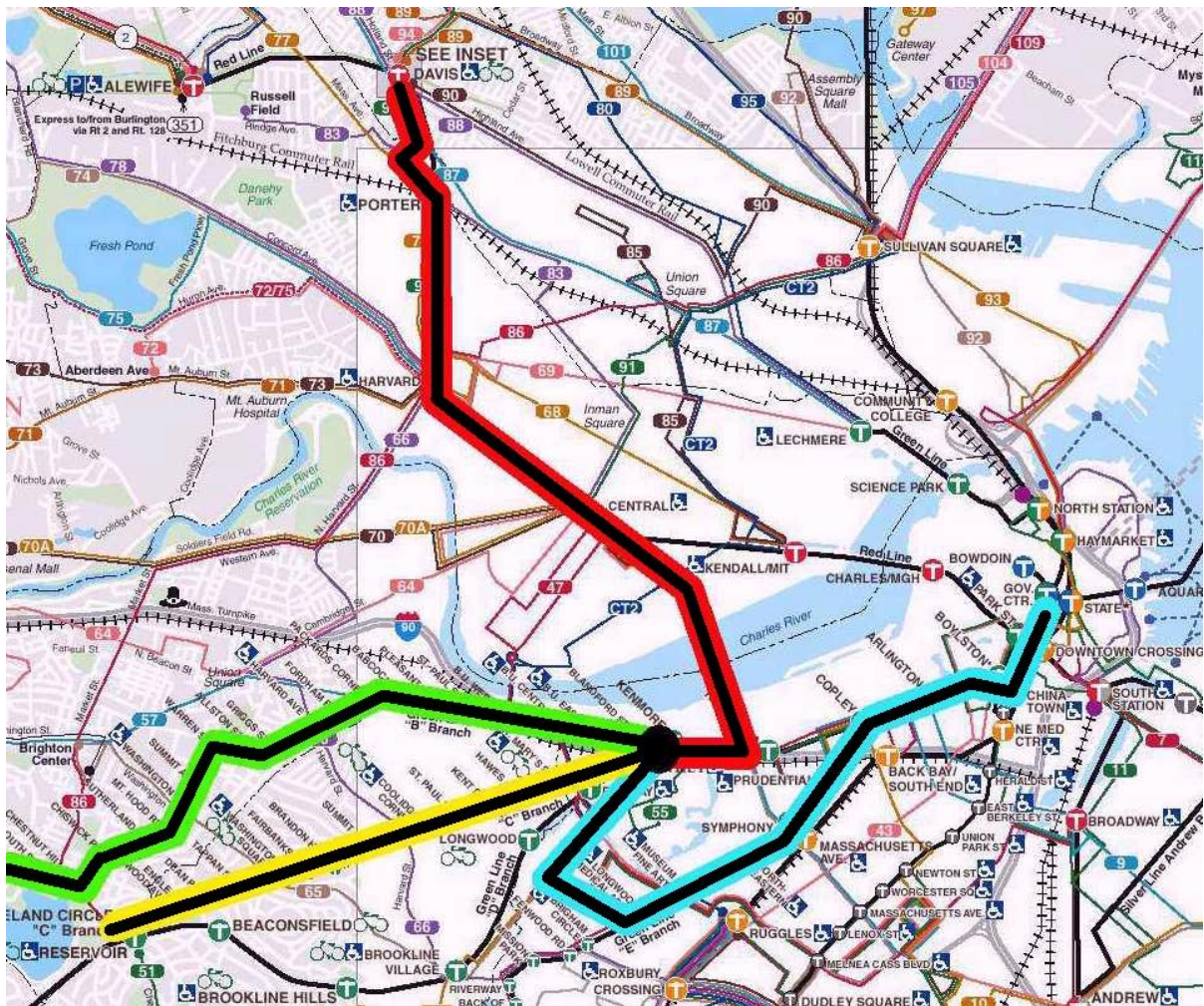
Alternative 3: Two Night Owl routes, crossing at Hynes

Two routes (one east-west, one north-south) could cover the primary service area, and Hynes would be a natural transfer point.

The east-west route is based on the Night Owl line with the highest ridership (Boston College). The line can also be considered a late-night variation on standard bus routes #57 and #55, since the routes could be virtually identical between downtown and Packards Corner.

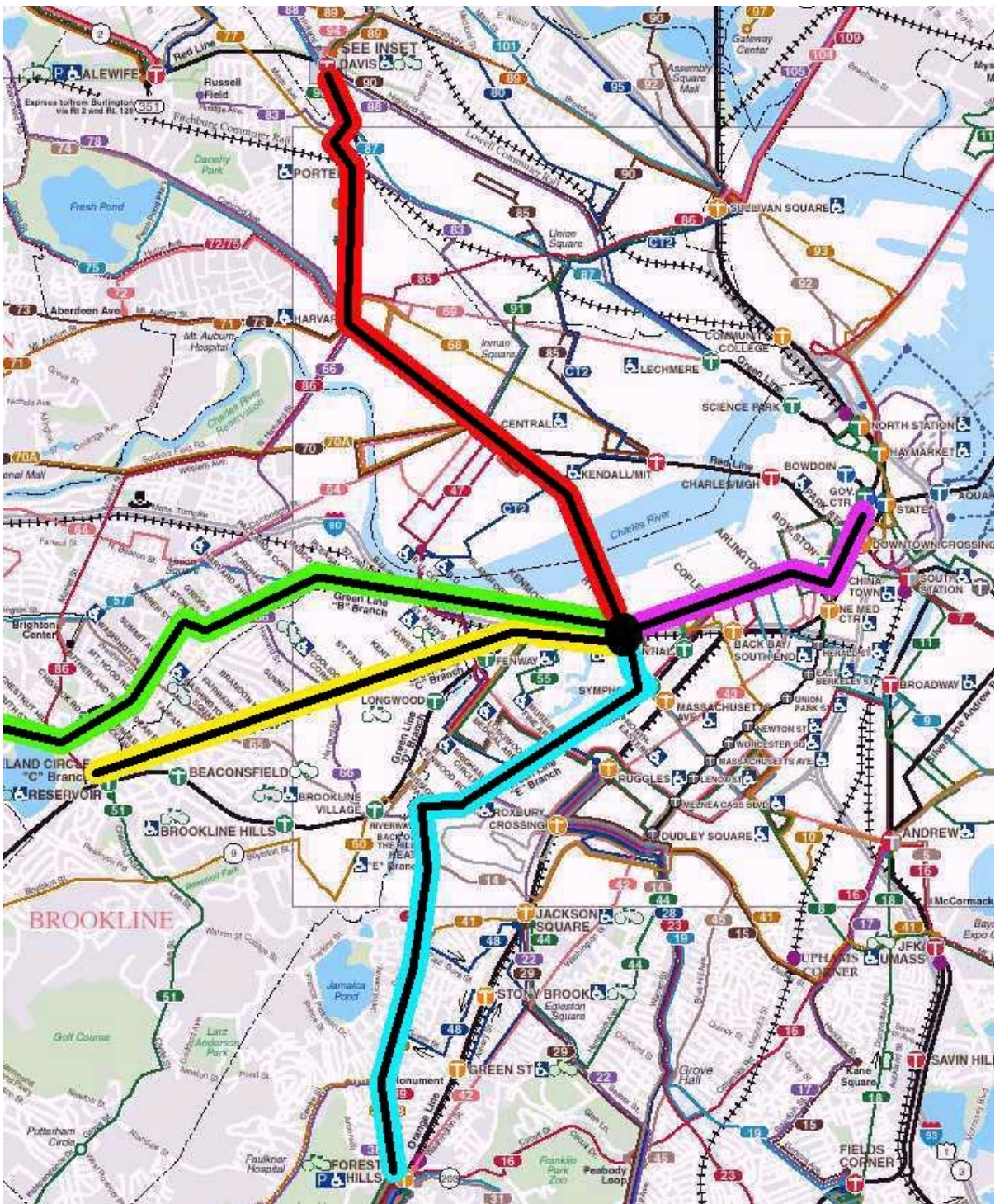
The north-south line serves most regions covered by the Night Owl lines with the second-highest ridership (Alewife) and the third-highest ridership (E/39). Using the Massachusetts Avenue bridge provides a more direct connection between Cambridge and Boston (no need

to travel east into downtown). This path also lets the route follow a major bus route (#1) for most of its length. At Symphony, the route turns west to cover much of the high-ridership E/39 Night Owl service area. The route could terminate at Brigham Circle, or continue to Dudley Square or Jamaica Plain.



Alternative 4: Four routes starting at Kenmore

Multiple Night Owl routes with similar lengths, all converging at Kenmore.



Alternative 5: Five routes starting at Hynes

Multiple Night Owl routes could converge and terminate at Hynes, a more centrally located transfer point than Government Center.