



**Massachusetts Bay
Transportation Authority**

Bus Transformation Update

Fiscal and Management Control Board

January 25, 2021

Kat Benesh

Agenda

- Vision for Bus Transformation
- Achievements to Date
- Key Projects: Fleet & Facilities, Bus Network Redesign, Bus Priority
- Bus Transformation Governance
- Next Steps



Bus: the MBTA's on-street workhorse



Pre-pandemic, the MBTA Bus Service network served nearly **450,000 trips** on a single weekday **across more than 50 cities and towns**, and provided **more than a third of all MBTA trips**.

Riders of the MBTA bus service **are more likely to be low-income or people of color** than any other fixed route mode.

And during the COVID-19 pandemic, bus ridership was **more durable than any other mode, retaining up to 4x more of its riders than Commuter Rail or Ferry**.

All of these things call for a bus system that meets the needs of the region.

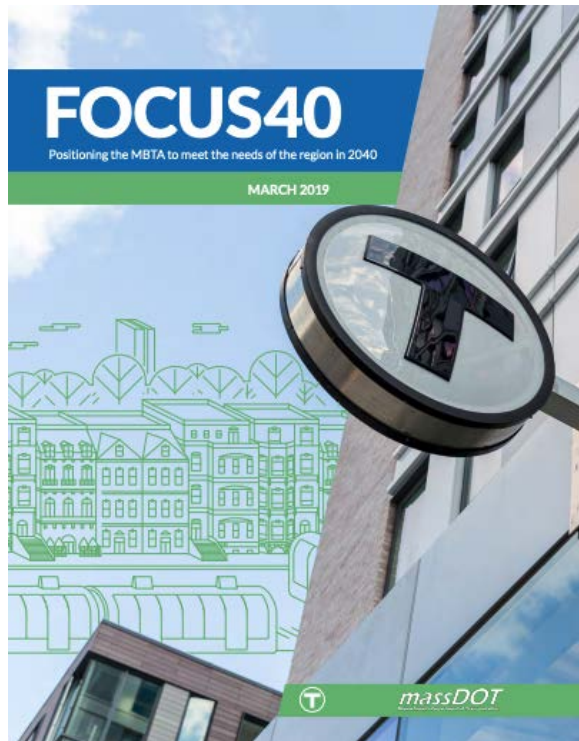
Additional Bus Statistics

~8,000 Bus stops

~1,100 Buses

9 Facilities

Bus Transformation Vision



Achieve a better, faster, lower emissions service, supported by all-door boarding and exclusive busways, that is more aligned with where riders live, work, and travel (Focus40)

Focus40 and the MBTA strategic plan highlight equity, sustainability, livability, competitiveness, and safety, all of which will guide the bus transformation work.



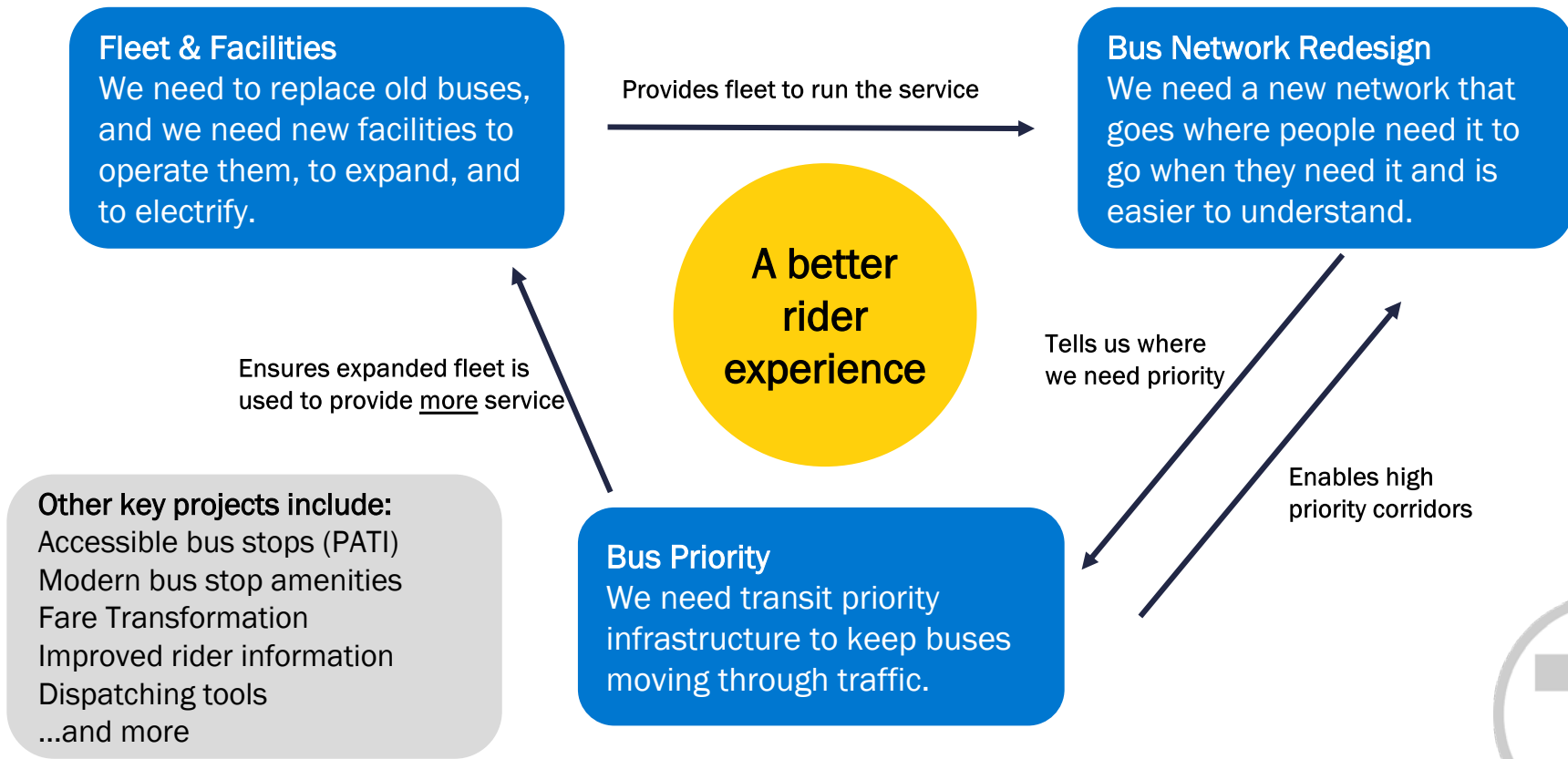
Bus Transformation Program Goals

Program Goals	Progress to Date	Timeline Horizon*
<p>A route network that goes where people need to go when they need it and is simple to use</p>	<ul style="list-style-type: none"> • Better Bus Project 2019 changes incl. addition of off-peak service • Bus Network Redesign planning underway • SL3 opened, SLX concept planning underway 	<p>Start phased implementation of Bus Network Redesign in FY22, expected to take 3-5 years</p>
<p>A core network of high priority corridors with all day frequent service, supported by transit priority facilities and infrastructure</p>	<ul style="list-style-type: none"> • Approximately 20 lane miles implemented since 2002 • 41% of weekday passenger miles system-wide benefit • 28 TSP intersections 	<p>Targeting ~75-100 lane miles within next 5 years</p>
<p>A fast, reliable, and competitive bus experience that includes all-door boarding, and safe, accessible, and comfortable bus stops and busways</p>	<ul style="list-style-type: none"> • Planning all door boarding through Fare Transformation • 218 bus stops made accessible or eliminated through PATI process 	<p>Ongoing</p>
<p>Reliable and easy to understand passenger information online, at the stop, and on the bus</p>	<ul style="list-style-type: none"> • Pilot E-ink signs • Bus real-time crowding information • Improved bus arrival time predictions 	<p>Ongoing</p> <p><small>*All timelines contingent on securing future funding</small></p>

Bus Transformation Program Goals (continued)

Program Goals	Progress to Date	Timeline Horizon*
<p>Modern work environments & vehicles to improve conditions for employees and riders</p>	<ul style="list-style-type: none"> • \$50m in investments in existing bus facilities • Average age of bus fleet decreased from 9.7 years (2016) to 6.6 years 	<p>Ongoing</p>
<p>A zero-emissions fleet of battery-electric buses to reduce emissions</p>	<ul style="list-style-type: none"> • Five bus BEB pilot on Silver Line • New Quincy BMF designed to accommodate BEBs at opening 	<p>2023/2024 for North Cambridge/Quincy BEB capability; dependent on pace of additional facility modernizations beyond 2024</p>
<p>More service, enabled by a larger fleet in new facilities</p>	<ul style="list-style-type: none"> • 60 additional 40' buses and procurement of larger Silver Line replacement fleet (13 bus increase) • New Quincy BMF designed for 40% increase in fleet size • North Cambridge modifications to accommodate 25% increase 	<p>2023/2024 for North Cambridge/Quincy capacity increases; dependent on pace of additional facility modernizations beyond 2024</p> <p>*All timelines contingent on securing future funding</p>

Three key projects we are focusing on today



Vision to modernize fleet and facilities

Fleet & Facilities vision will support **bus electrification** and improved **reliability** and **working conditions**:

- ***Modernized Facilities:*** Approx. \$4.5B to support design, real estate acquisition, and construction of new bus maintenance facilities.
- ***Rolling Fleet Procurements:*** \$100 - 130M annually to purchase 80 to 100 buses to replace buses at end of service life, technology (BEB or hybrid) pending facility capacity.
- ***Distributed Charging Network:*** Investment in any additional systemwide charging infrastructure to support BEB operations.
- ***Operational Transition:*** Investment in hiring, training, deadhead mileage, and other operational impacts; \$15M to support software upgrades for scheduling BEBs.



Fleet and facilities top priority: Quincy

- New **120 bus facility** will usher in the modern era for the MBTA
 - First all indoor facility to support **fully zero emissions fleet**
 - Built with **room to grow** to meet future demand
- However, investment is essential to **maintaining service beyond 2024**
 - Existing facility only accommodates **oldest diesel buses** (currently already 12 - 15 years old)
 - **Poor conditions** hinder workforce ability to work effectively
- **Funding needed to keep Quincy project on schedule to complete in 2024**
 - **Programmed:** \$65M for real estate and final design
 - **Unprogrammed:** \$305M for construction (demo in Fall 2021; construction Summer 2022, facility opening in December 2024)



Quincy: Before and After



Fleet and Facilities: Beyond Quincy

Accomplishing **systemwide electrification** will require the last procurement of hybrid buses to occur at least **14 years prior** (given FTA mandated minimum service life).

To achieve this within the Focus40 planning horizon, new facilities need to come online **every 2-3 years** (Quincy 2024, next facility 2027).

- Funding/schedule expectations based on Quincy experience (120 bus facility)
 - Preliminary design (0-15%) - **6 months, programmed through PM contract**
 - Final design (30-100%) - **2 years, \$70M (includes real estate)**
 - Construction - **2.5 years, \$300M**
- Major cost variables
 - **Size:** Charlestown garage (the MBTA's largest) houses 242 buses
 - **Real estate:** Boston industrial market remains extremely competitive
 - **Operations:** Temporary relocations when rebuilding in place (anticipated for Cabot, Charlestown, Southampton)

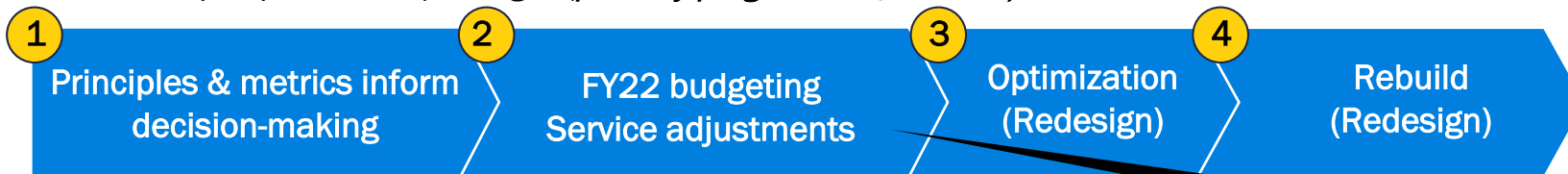


Vision to bring back service in the future

The Bus Network Redesign is a complete re-imagining of the MBTA's bus network to reflect the travel needs of the region and create a more competitive bus service for current and future bus riders.

The Bus Network Redesign will serve as a blueprint for how to rebuild the longer-term network in the future and requires:

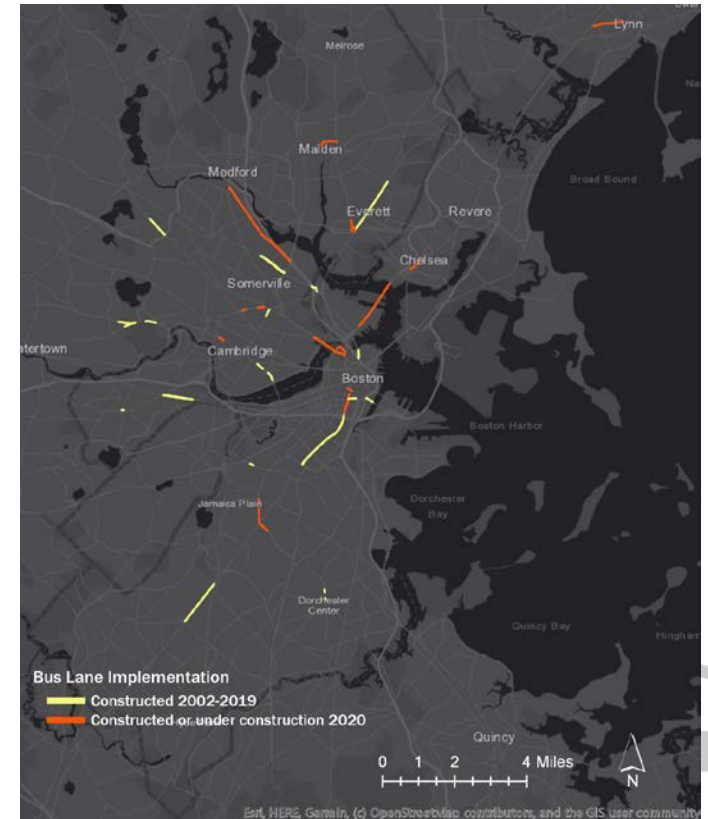
- Planning (*underway*)
- New service (*can be cost neutral*) & demonstration projects (*unprogrammed, \$3-5M*)
- Project management (*programmed*)
- Service planning and scheduling capacity (*unprogrammed, \$1-4M*)
- Public outreach and marketing (*unprogrammed, \$2-4M*)
- Infrastructure: signage, transit priority (see slide 14 for costs), bus stop improvements/changes (*partially programmed, \$2-10M*)



New tools will help us evaluate and adjust.

Vision to improve speed and reliability

- Continue to build out **Bus Priority network** with municipal and other agency partners, focusing on:
 - High Priority Corridors for Network Redesign
 - Additional corridors with (a) durable ridership, (b) chronic delay, and (c) high social impact / essential riders
 - Targeting 10-20 lane miles per year (\$200-\$350M unprogrammed over the next 5 years)
- **Pilot advanced TSP** to improve TSP benefits, reliability, and measurements
- **Develop and publish public-facing and municipality-facing tools** to help evaluate where bus lanes are needed most, and to evaluate effectiveness of completed transit priority projects
- **Develop and publish Speed and Reliability Toolkit** - standard set of guidelines for municipalities, engineers and planners to help ensure adherence to national and local best practices and requirements



Other key projects to achieve the vision

Investment Type	Project	FY 2021	2022	2023	2024	2025	2026
Rider Facing Information	Rider Digital Screens	Roll out of more E-ink signs Additional screens at bus stops	Pilot of on-vehicle digital screen - unprogrammed \$2M				
	Other Customer Tools	Real-time crowding info on 95% of bus routes Digital flag stop pilot	Rider alert improvements				
Connections & Hubs	Plan for Accessible Infrastructure (PATI)	258 additional bus stops to be upgraded	Complete the remaining 489 bus stops identified - unprogrammed \$26M				
	Street Furniture	Pilot new form factors (i.e. information kiosks, small shelters, etc.)	Street Furniture Rollout - partially programmed \$35M				
People & Processes	Skate and Dispatch Tools	Begin development of Operations Control Center features	Operations Control Center features to be completed	"Digital Bus Platform" dispatch pilots - unprogrammed \$4M			
Foundational Enablers	Service Delivery Policy (SDP)	Development of network quality measures and evaluation tools to track progress	Periodic updates to the SDP to reflect better data sources and methodologies				

Bus transformation pillars: many parts of the organization working together to accomplish Bus Transformation goals

Fleet & Facilities and other major infrastructure



Service & Street Design



Connections & Hubs



Rider Facing Information

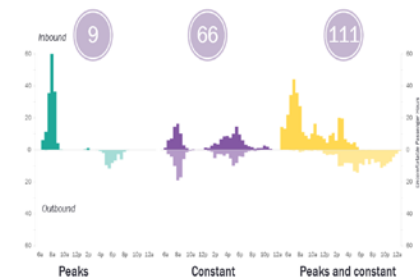


Process & People



Foundational Enablers
(Planning & Policy)

Patterns of bus crowding



Bus Transformation Governance Structure

	Main Accountable department (Accountable)	Supporting departments (Responsible or Consulted)	
Fleet & Facilities and other major Infrastructure	Office of Chief Engineer (OCE)	<ul style="list-style-type: none"> •Vehicle Engineering •Vehicle Maintenance •Bus Operations •E&M 	<ul style="list-style-type: none"> •Capital Delivery •Environmental •Real Estate •OPSS
Service & Street Design	Operations Planning, Scheduling & Strategy (OPSS)	<ul style="list-style-type: none"> •Office of Transportation Planning (OTP) 	<ul style="list-style-type: none"> •Bus Ops •Capital Delivery •OPMI
Connections & Hubs (incl. Bus Stops)	Dept. varies on specific issue	<ul style="list-style-type: none"> •SWA •Revenue •Real Estate / TOD 	<ul style="list-style-type: none"> •OPSS •Bus Ops •E&M
Rider Facing Information	Customer Experience (CX) and Customer Technology (CTD)	<ul style="list-style-type: none"> •OCC •OPMI 	<ul style="list-style-type: none"> •OPSS •Capital Delivery
Process & People	Bus Operations	<ul style="list-style-type: none"> •OPSS •CTD •Workforce Planning 	<ul style="list-style-type: none"> •Safety •Training •OCC
Foundational Enablers (Planning & Policy)	Policy	<ul style="list-style-type: none"> •OPMI •Legislative Affairs 	<ul style="list-style-type: none"> •Fare Transformation •Other Transformation Offices

- Bus Transformation is an already **organizational-wide** focus
- Governance is a **matrix-approach**, with clear owners for most major “pillars”
- **Cross-functional decision-making** driven via coordinating mechanisms (examples below):
 - Bus Facility Modernization Task Force
 - Design Project Development Group meetings
 - Electrification Team Meetings
 - Bus Network Redesign Internal Task Force
 - Quarterly Service Planning Meetings
- Goal for FY22 is to hire a **Bus Transformation Lead** to help drive coordination and planning



Next Steps

Fleet & Facilities

- Complete property acquisition for the new Quincy Bus Maintenance Facility (**Spring 2021, programmed**)
- Award contract for 160 hybrid bus procurement (**Summer 2021, programmed**)
- Finalize design for North Cambridge BEB conversion (**Winter 2022, unprogrammed**)
- Initiate procurement process for North Cambridge and Quincy BEB fleets (**Winter 2022, partially programmed**)
- Complete final design and begin construction on Quincy BMF (**Spring 2022, \$23M programmed for design, \$305M for construction unprogrammed**)
- Begin design for second modernized facility (**Winter 2022**)

Bus Network Redesign

- **Planning process to continue** with final recommendation on new bus network structure and phased implementation plan (**Spring 2022, programmed**)
- **Phased implementation to begin Summer 2022** (**\$3.2M programmed, \$20M unprogrammed over 3-5 years**)

Transit Priority

- Finalize CY21 & CY22 priorities with municipal and agency partners (**Spring 2021, unprogrammed**)
- Design & build with partners CY21 bus priority (**throughout 2021, partially programmed**)



Appendix



Bus Transformation: Achievements to Date (Detailed)

Bus Transformation: Program Achievements									
Investment Type	Project	2016	2017	2018	2019	2020	2021	Spend to Date (November 2020)	
Fleet & Facilities and other major investments	Bus Procurement	Bus Deliveries: 156 40' Hybrid buses 175 40' CNG buses 44 60' Hybrid Buses		1 - 60' Enhanced Electric Hybrid (test bus)	5 - 60' Battery Electric Buses (BEB) 254 40' Hybrid buses (194 option and 60 VA option) delivered across 3 years.			\$530.2M	
	Major Capital projects (ROW + Facilities)			SL3 open				\$49.1M	
	Facilities						Albany Door Retrofit (to enable use of newer buses)		\$1.5M
							Quincy Facility Concept Design		\$5M
								North Cambridge Design	\$0.5M
						Program Management Contract Awarded		\$46M	
Service and Street Design	Transit Priority		1.1 miles, incl. Broadway (Everett)	1.1 lane miles, incl. Roslindale (Boston)	1.7 lane miles	4.4 lane miles	~9 lane miles built, piloting or under construction	>\$25M	
	Service Design				Better Bus Project 2019 Route Changes Implemented	Bus Network Redesign Planning		\$4.5M	

Bus Transformation: Achievements to Date (Detailed)

Bus Transformation: Program Achievements								
Investment Type	Project	2016	2017	2018	2019	2020	2021	Spend to Date (November 2020)
Rider Facing Information	Bus Tracking Technology				Improved bus arrival predictions contract	High-Frequency GPS on all buses	"Digital Bus Platform" grant submitted	\$1.6M
	Rider Digital Screens					18 pilot bus E-ink signs installed	Up to 20 more E Ink signs; signs on Columbus Ave	\$1.1M
	Real-time Crowding Info					Real-time crowding info on 9 pilot routes	Real-time crowding info on 95% of bus routes	\$0.3M
People & Process	Skate: dispatch app for bus officials				Deployed to all bus officials	Added features for field officials	Field features complete	\$0.9M
	HASTUS Daily, Bid & BidWeb			Bid deployed to all Bus	Daily deployed to Bus	BidWeb piloted	BidWeb in all bus garages (target)	TBD
Connections & Hubs	Plan for Accessible Infrastructure (PATI)			Phase 1 Construction Contract awarded	PATI phase 1 – 218 stops completed or eliminated (158 critical stops; 4 high priority; 56 medium/low priority) PATI Phase 2 – 258 stops to be upgraded; 8 completed in 2020; 115 anticipated completion 2021			\$8M
Foundational Enablers	Service Delivery Policy (SDP)	Major overhaul of Service Delivery Policy with focus on passenger-weighted metrics. Adopted in 2017				Development of network quality measures to expand SDP	Implementation of network quality measures and development of evaluation tools	N/A

Bus Transformation: Look Ahead (Detailed)

Investment Type	Project	2021	2022	2023	2024	2025	2026	
Fleet & Facilities and other major investments	Fleet		Retire 32 DMA Silver Line bus fleet , replace with 45 60-ft EEHs \$89.9M (act.)					
				310 Diesel buses retire (Includes 86 buses at Quincy - require new facility) Replace with 160 EEHs- \$168M est., Programmed				
				ETB Trolleybuses retire Replace with 35 BEBs for N. Cambridge and 45 for Quincy - \$101M est., \$52.9 programmed				
				Exercise option to purchase BEBs or EEHs, dependent on facilities \$287M - \$356M est., Unprogrammed				
	Facilities		Quincy Real Estate (FY21); Quincy Final Design (FY22)	Quincy Construction - \$305M , Unprogrammed			Quincy Opens	
			North Cambridge Final Design - \$2M, Unprogrammed	North Cambridge Construction - \$21M, Unprogrammed	North Cambridge Opens			
				Concept Design Facility #2 (Jacobs Contract)	Final Design Facility #2 - \$25-35M, Unprogrammed		Construction Facility #2 - Approx. \$400M, Unprogrammed	
				Concept Design Facility # (Jacobs Contract)-	Final Design Facility #3 - \$25-35M, Unprogrammed		Construction Facility #3 - Approx. \$400M Unprogrammed	
Service and Street Design	Transit Priority	Targeting 10-20 lane miles per year (\$200-\$350M unprogrammed over the next 5 years)						
	Bus Network Redesign	Phased Implementation of Bus Network Redesign - Partially Programmed						

Bus Transformation: Look Ahead (Detailed)

Investment Type	Project	2021	2022	2023	2024	2025	2026
Rider Facing Information	Rider Digital Screens	Additional screens at bus stops	Pilot of on-vehicle digital screen - unprogrammed				
	Other Customer Tools	Digital flag stop pilot - unprogrammed	Rider alert improvements - unprogrammed				
Connections & Hubs	Plan for Accessible Infrastructure (PATI)	115 anticipated bus stops completed	PATI Phase 3 to complete the remaining 489 bus stops - unprogrammed				
	Street Furniture	Plan deployment and pilot new form factors (i.e. information kiosks, small shelters, etc).	Street Furniture Rollout - Partially Programmed				
People & Processes	Skate and Dispatch Tools	Begin development of OCC features	OCC features complete	"Digital Bus Platform" dispatch pilots - unprogrammed			
Foundational Enablers	Service Delivery Policy (SDP)	Periodic updates to the SDP to reflect better data sources and methodologies					



Fleet & Facilities: Program Updates

- **Fleet Procurement:** Technical BEB specification under development, anticipated release Spring 2021
 - Release RFP for 160 EEH's - replace 2006 diesel fleet – Now
 - Release RFP for BEB's - North Cambridge / Quincy - Summer 2021
- **Bus Facility Design:**
 - Quincy Final Design awarded December 2020; anticipated opening Fall 2024 with partial fleet of BEBs
 - North Cambridge preliminary design commenced November 2020, anticipated opening Fall 2023 with full BEB fleet
- **Bus Facility Strategy:** Conducting planning work to scope and prioritize remaining facilities
- **Electrification Strategy:** Conducting analysis to identify most feasible/cost effective approach to implementation at Quincy and North Cambridge, scope of additional investment, backup power and resiliency



Current Bus Network Redesign project timeline

FALL 2020	WINTER 2021	SPRING 2021	SUMMER 2021	FALL 2021	WINTER 2022	SPRING 2022	SUMMER 2022
Identify High Priority Corridors	Finalize High Priority Corridors	Develop network alternatives to discuss policy trade-offs	Outreach on network alts	Develop draft network structure and phased implementation plan	Outreach on draft network structure and phased implementation plan	Outreach continues Develop final network structure and phased implementation plan (including Title VI Analysis)	Implementation will be phased over 3-5 years but could start Summer 2022
			FMCB decision on preferred alternative		MBTA Board input on draft rec. before public input & after	MBTA Board vote to adopt new bus network structure to be implemented over time	

This decision will guide us on how to allocate resources to the network.

This will adopt a network structure; exact frequencies and spans of service, as well as phasing, will be determined based on resources.

Bus Network Redesign Goals

1. Create a **more equitable network** that connects people, in particular low income people, people of color, and people with disabilities, to where they need and want to go with a high quality transit option
2. Design a **more logical system** that is more adaptable to change
3. Create a **framework for a future bus network that can be implemented over time.**
4. Identify **High Priority Corridors** that merit high frequency service and guide future investments
5. Identify **new or underserved destinations** to better serve with transit
6. Create **metrics that are flexible, data-driven, and assess service quality** so that as the region evolves, so will the bus network



Approach to designing a new network: corridors to routes

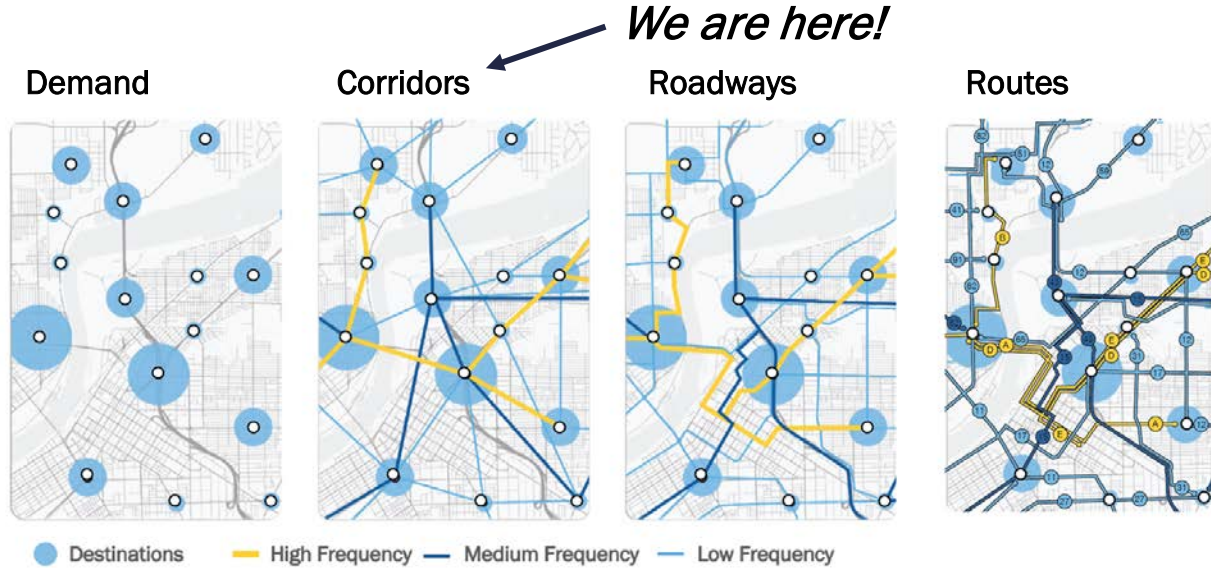
Travel demand data (location based services data) is being used to assess travel in the region.

Corridors connect areas of demand.

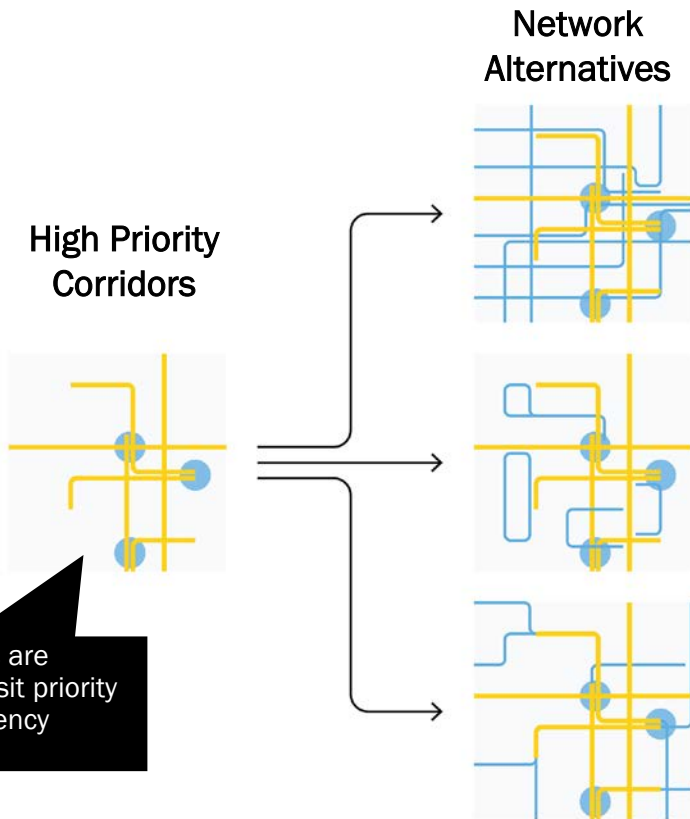
Corridors with high travel demand made by transit critical populations are identified as **High Priority Corridors** that warrant high frequency service.

Corridors are applied to **roadways** to identify where to prioritize investments in bus infrastructure.

Routes are the service that run in corridors. Corridors with bus infrastructure can be shared by multiple routes in order to optimize investments and improve connections.



High Priority Corridors are the first step in redesigning the entire network



High Priority Corridors are coordinated with transit priority to achieve high frequency service

High Priority Corridors cover 79% of essential trips*

As we continue with Bus Network Redesign, we will examine what the best structure for neighborhood service is in order to integrate other essential trips into the network

Core network of High Priority Corridors exist under any future Network Redesign

*Essential Trips are defined as part of Forging Ahead:
<https://www.mbta.com/forging-ahead>



