Redesigning Transit for the New Mobility Future

Photo: Sean Marshall, Flickr

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Above: Conducted by the Kansas City Area Transportation Authority, RideKC buses are part of an initiative to better serve the metropolitan area. The Missouri transit agency will launch RideKC Next in 2022 with new mobility integration in mind, offering improved service and following its mission to connect people to jobs, education, health care, and housing.

Over the past decade, many transit agencies have undertaken comprehensive redesigns of their bus networks. These agencies realized that their legacy network—often still based, in part, on mid-20th century streetcar routes—were not serving the needs of communities today. There have been changes in demographics, land use, economics, technology, and—most recently—the emergence of new mobility options in major U.S. cities, all of which have spurred agencies to reexamine not only where bus service is provided, but the types and levels of service available, the multimodal connections needed, how to leverage new capital infrastructure, and identifying additional capital investments that need to be made.

At the same time, the availability and prevalence of new mobility options—such as microtransit,[1] transportation network companies (TNCs), carsharing, and micromobility[2]—has greatly expanded. Transit agencies across the United States are exploring ways to integrate new mobility options with their existing and redesigned bus service. The availability of enhanced data to aid service planning and the recognition that the bus can play a big role in improving mobility also have contributed to the rise in bus network redesigns.

This article highlights the findings of *Transit Cooperative Research Program (TCRP) Research Report 221: Redesigning Transit Networks for the New Mobility Future*, which was undertaken to provide a better understanding of existing work on the topic of bus network redesigns and how transit agencies are integrating emerging mobility options within system redesigns. Within *TCRP Research Report 221* are three toolkits designed to aid transit agencies in implementing the findings

[1] Microtransit is a technology-enabled passenger service that uses dynamically generated routes, usually between designated stop locations rather than door to door. It provides transit-like service but on a smaller, more flexible scale.

[2] Micromobility describes bikeshare and related modes, such as shared scooters and electric-assist bicycles.

of the research: one on conducting a bus network redesign, one on leveraging intra-agency and interagency partners for a better bus system, and one on partnering with the private sector.

Since the work for this study began in January 2019 and was finalized in July 2020, it did not incorporate the impacts of the COVID-19 pandemic other than to allude in the introduction that COVID-19 has impacted ridership and travel patterns and that the report contents pre-date the pandemic. Anecdotally, bus network redesigns—which largely dropped off during 2020—have made a resurgence in 2021 and are more likely to include new mobility elements than those conducted before the pandemic.

Research Methodology

A robust research agenda was used to develop a broad sense of what was then the current state of the practice for bus network redesigns, as well as goals and challenges transit agencies were facing related to their bus networks. This work included a detailed literature review, a review of relevant surveys conducted for previous TCRP syntheses and reports, interviews with transit agencies and other relevant organizations, and a focus group with transit industry researchers and private-sector companies.

A diverse set of 15 transit agencies were selected for inclusion in the research based on size (annual bus revenue hours), geographic diversity, and whether they operated fixed guideway services. The goal of the interviews was to understand how transit agencies and jurisdictions were reevaluating and redesigning their bus networks to address changes to demand, customer expectations, and the new mobility option landscape. The interviews were conducted in 2019 and included discussions about partnerships, introduction of new service types, and other tools and approaches to meeting the customer needs of today and the coming years.

Key Findings

PATHWAY TO IMPROVEMENTS

Transit agencies see bus network redesigns as a way to implement better bus service, address recent changes in their service or

Photo: LA Metro

With colleague Stephen Tu at the monitor in the background, LA Metro's Scott Greene (*right*) and Arrellano Associates's Melissa Holguin (*center*) share NEXTGen bus line plans with Los Angeles County residents at a community outreach event. The initiative includes a high-frequency network that will double the number of Metro bus lines and provide more than 80 percent of current riders with 10 minutes or better frequency.

their region, and pass through a variety of improvements under one umbrella.

Even in regions with extensive rail (or other types of fixed guideway) networks, buses carry a significant percentage of transit trips, and changing the bus network has major impacts. As a result, bus network redesigns are seen as a way to make wholesale changes to the transit agency's services, and the desire to improve the quality of bus service is typically a fundamental motivator for transit agencies undertaking a bus network redesign.

For example, Capitol Metro's Cap Remap bus network redesign in Austin, Texas, implemented in 2018, was undertaken with the intent to remove duplication and increase service frequency. In metropolitan Kansas City, Missouri, RideKC's bus network redesign addressed shifts in regional employment and residential growth patterns, with the aim of better serving their customers' travel needs and reversing ridership declines.

Transit agencies also integrated a variety of improvements under the umbrella of a bus network redesign, such as the introduction of high-frequency corridors with bus-priority treatments, bus stop optimization, new and expanded transit

centers, and even new branding and online and print materials. This was the case for IndyGo, an Indianapolis, Indiana, effort that incorporated a transition from a hub-and-spoke service model to a frequent grid, as well as the introduction of three new bus rapid transit lines.

STRONG GUIDANCE NEEDED

Bus network redesigns should be framed by strong decision-making processes and leadership guidance. Most successfully planned bus network redesigns have strong support and leadership from someone in a senior position, such as the transit agency chief executive officer or an influential board member. Having a transit agency leader who champions the redesign is key to generating buy-in for the endeavor with the public, internal stakeholders, local jurisdictions, and other key partners. Gwinnett County Transit Division in Gwinnett County, Georgia, attributes its successful bus network redesign to internal persistence, with internal champions consistently pushing the same agendas. In Houston, Texas, a strong board champion and a supportive mayor were key to the successful implementation of Houston Metro's new bus network.
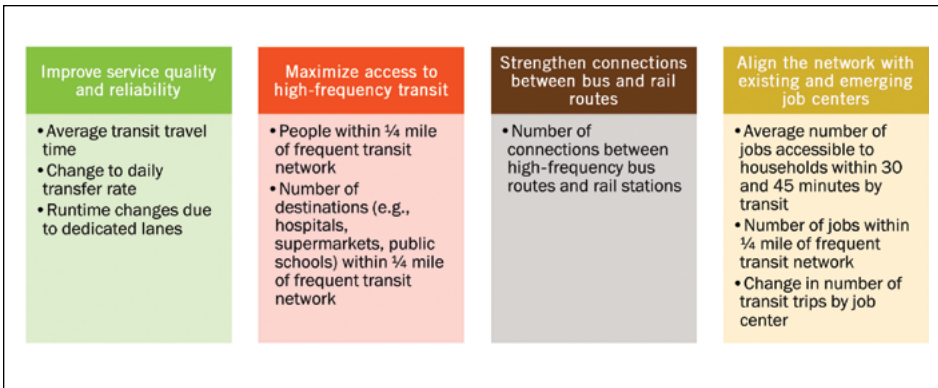
Improve service quality and reliability	Maximize access to high-frequency transit	Strengthen connections between bus and rail routes	Align the network with existing and emerging job centers
• Average transit travel time • Change to daily transfer rate • Runtime changes due to dedicated lanes	• People within ¼ mile of frequent transit network • Number of destinations (e.g., hospitals, supermarkets, public schools) within ¼ mile of frequent transit network	• Number of connections between high-frequency bus routes and rail stations	• Average number of jobs accessible to households within 30 and 45 minutes by transit • Number of jobs within ¼ mile of frequent transit network • Change in number of transit trips by job center

FIGURE 1 Maryland Transit Administration's BaltimoreLink goals and objectives.

ESTABLISH GOALS EARLY

Transit agencies should establish bus network redesign parameters and goals early to set expectations for stakeholders, the board, and the public. Without clearly stated goals for a bus network redesign, the focus can vary even across an organization, with some departments aiming to maximize operational efficiency, some to maximize accessibility, and some to facilitate revenue generation. It is important to have well-articulated and coordinated goals so that everyone is working toward the same goals for the bus network redesign. In instances where a transit agency is pursuing a cost-neutral plan (i.e., no net change in the amount of service provided), goals and objectives also encourage the discussion of trade-offs and reveal the must-haves for service in a community. For example, the Maryland Transit Administration developed a set of four goals with associated measurable objectives to guide their BaltimoreLink bus network redesign (Figure 1).

COMING TO CONSENSUS

Bus network redesigns should be built on agreed-upon design principles, service types, and design guidelines. Given the breadth of changes that will be recommended through a bus network redesign, transit agencies use the occasion to review and update some of their key service planning guidance documents, including service design and service performance guidelines (i.e., documents that guide the types, levels, and expected performance for their bus service). This not only provides transit planners with a structure under which to conduct the planning but also provides the transit agency with documented reasoning that can be used in discussions with the public and stakeholders.

For Hampton Roads Transit in Virginia, the Transit Transformation and Transit Strategic Plan projects jointly updated the transit agency's service standards and design guidelines, while also redesigning the entire bus network to fit within the newly updated service parameters. The service plan includes the creation of 13 high-frequency bus routes to be implemented over the next three years and a timeline that will guide Hampton Roads Transit toward meeting each of the standards by service type by FY 2031.

IMPORTANCE OF OUTREACH

The importance of frequent and meaningful engagement with stakeholders and the public cannot be overstated; there is no such thing as too much outreach, engagement, and communication when planning and implementing a bus network redesign. Outreach is a key element of all phases of the bus network redesign process. Even with significant amounts of engagement, transit agencies still encounter challenges come implementation time.

Bus network redesigns often involve at least two rounds of public engagement, in addition to ongoing maintenance of communications through website updates and other means. At the beginning, the public is offered an opportunity to identify issues and priorities and, later, to provide feedback on possible service alternatives. Transit agencies use a wide variety of strategies to engage the public, from workshops to pop-up surveys at transit centers to social media. Incorporating inclusive engagement strategies that provide meaningful

Photo: LA Metro

An exchange between **LA Metro's Wayne Wassell** and local residents at a public meeting focuses on the needs of people with disabilities and reflects the transit agency's commitment to engage local communities in its **NEXTGen** bus line redesign plan.

involvement opportunities for under-resourced and diverse populations is especially important in bus network redesigns, as bus riders typically comprise a higher proportion of minority and low-income persons than the community at large.

IndyGo cited robust public engagement as a critical factor in ensuring support of their IndyGo NEXT bus network redesign. IndyGo's outreach for their redesign included more than 500 engagements and directly reached more than 30,000 individuals. They conducted events such as public meetings, stakeholder group presentations, and pop-up meetings at festivals and fairs. This was in addition to the public engagement and advertising that was undertaken by partner community groups. One partner group, IndyCan, made more than 150,000 phone calls to residents and conducted outreach at meetings and through speaking with riders at bus stops. The transit agency also had robust website-based engagement and education, with more than 300,000 webpage views.

PILOT STAGE

When *TCRP Research Report 221* was developed, transit agencies were predominately in the stage of piloting and experimenting with the integration of new mobility in their services. Planning for new mobility has not been widely integrated into bus network redesigns. Microtransit, TNC partnerships, micromobility, and the development of mobility hubs were typically considered in parallel or as pilot efforts loosely associated with the bus network redesign.

Most transit agencies interviewed were in the process of implementing pilots or limited deployments of partnerships with a variety of new mobility options. The report identified four common use cases for the integration of new mobility with fixed-route bus networks:

- Microtransit to enhance service coverage and quality;

- TNC, micromobility, and carsharing to enhance system access;

- New mobility as an alternative service model to reduce costs; and

- New mobility to increase transportation equity.

Photo: BikeWalkKC

Orange bikes are ready for riders at a RideKC Bike hub in Kansas City's Meadowbrook Park. Such micromobility hubs enhance access to established and redesigned bus network systems.

Photo: Utah Transit Authority

Utah Transit Authority's UTA On Demand app is an innovative microtransit service that matches multiple riders heading in the same general direction and transports them in a single vehicle. The result is a quick and efficient shared trip, minus reliance on fixed-route schedules.

The most common of these was the use of microtransit to enhance service coverage and quality. For example, the Utah Transit Authority (UTA) began a microtransit pilot in November 2019 to explore how microtransit could serve part

of their service area that has relatively low ridership on their route deviation services. Within the first three months of UTA's microtransit pilot, ridership expectations were met—even though the existing route deviation transit service in the pilot's service area remained unchanged. UTA staff believe that the microtransit pilot's strong performance indicates previously unmet transit demand in the pilot's service area, and they have since incorporated microtransit into their service choices bus network redesign planning process.

EQUITY CONSIDERATIONS ARE INTEGRAL

At most transit agencies, buses serve a higher proportion of low-income, minority, limited-English-proficient, and other historically underresourced populations than other transit modes. The impact of changes to the bus network on these populations must be closely considered.

TCRP Research Report 221 explored the integration of equity primarily through the lens of compliance with Title VI of the Civil Rights Act of 1964 and the Americans with Disabilities Act (ADA). However, several transit agencies noted that their bus network redesign's analyses of equity went
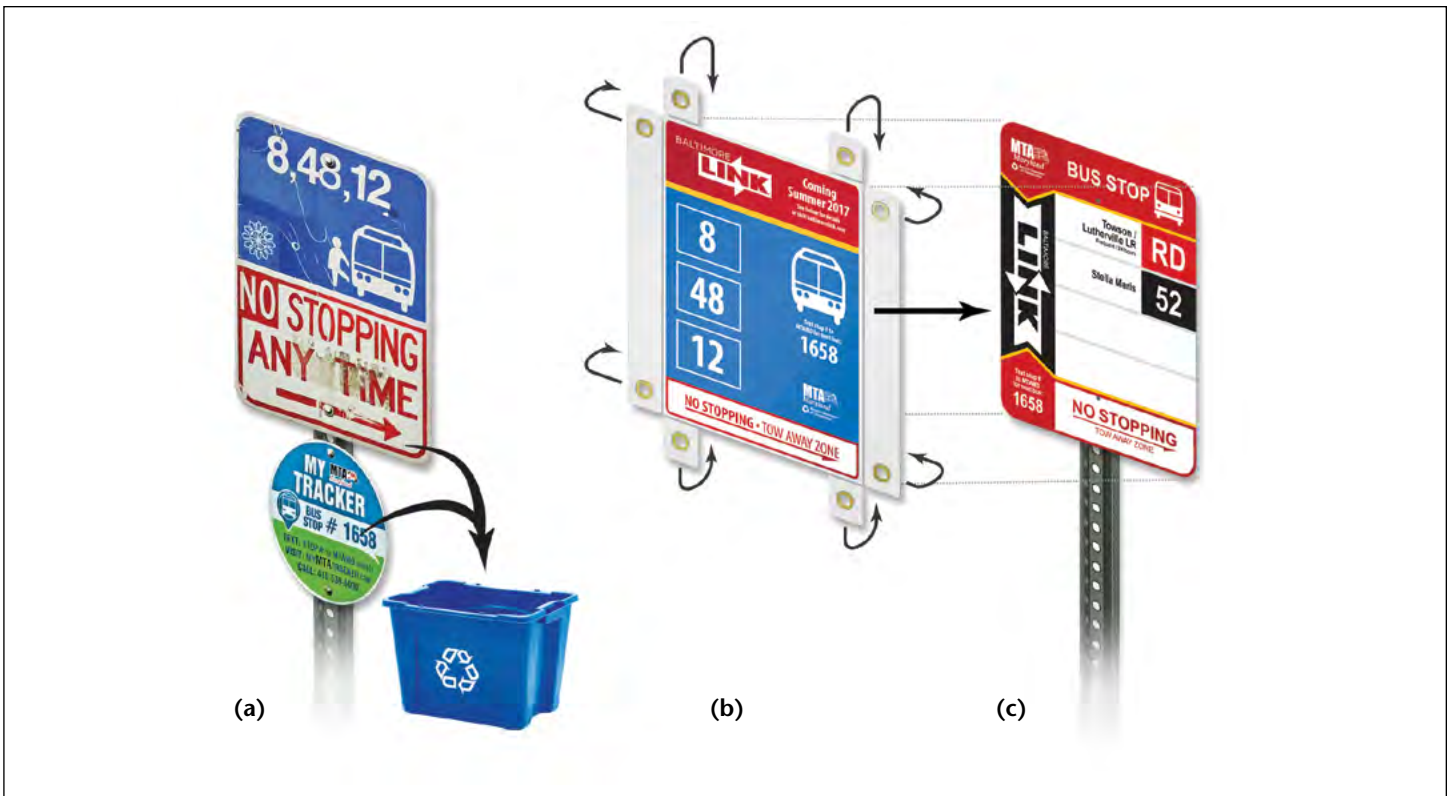
FIGURE 2 Baltimore transit system's redesigned bus stop signage included (*a*) removing old signs, (*b*) placing temporary signs with current routes and announcements of upcoming changes, and (*c*) removing temporary signs to reveal new routes on implementation day.

beyond these requirements. The Maryland Transit Administration, IndyGo, and Capital Metro undertook analyses of how the planned bus network changes would impact the share of the minority and low-income populations who have access to transit to ensure that they were increasing access to transit in general—and to high-frequency transit, specifically—with the planned changes.

Bus network redesigns also must consider the needs of seniors and people with disabilities when evaluating service alternatives, particularly those that may require longer walks to fixed-route transit and that would impact the availability of the complementary paratransit service that ADA requires. ADA complementary paratransit service must be provided within 3/4 of a mile on either side of each fixed route, as well as a 3/4-mile radius at the end of each fixed route. Within the transit agency's core service area, small areas that are surrounded by the fixed-route corridors also must be served by paratransit.

Some transit agencies that have implemented or are planning to implement bus network redesigns have grandfathered in either specific users or geographic areas to ensure continuity of paratransit service. This was the case with Capital Metro's Cap Remap bus network redesign that resulted in a simpler system and a smaller paratransit service area.

PARTICIPATION BY ALL

Implementation of bus network redesigns—on the operating side and with supporting capital elements—is incredibly involved and requires participation from all parts of the transit agency, local jurisdictions, and other key stakeholders.

At its simplest, a bus network redesign can be implemented with limited capital investments, such as new bus stop signs, new or expanded layover facilities, and additional space for transfers at existing facilities. More capital-intensive bus network redesigns require transit agencies to work closely with

their local jurisdictions to invest in bus priority treatments, new and expanded passenger stops and transfer facilities, and first- and last-mile improvements.

Transit agencies vary in how they deploy bus network redesigns in terms of an all-at-once change or implementing the plans over time. Deploying over time can occur for a variety of reasons, including availability of funds or resources (e.g., buses, operators, and facilities), or both. However it is done, a proper launch ensures that the changes to the system are understood by the public to make certain that the system will continue to attract and retain riders (Figure 2). This requires extensive public education, as well as educating and empowering front-line employees as ambassadors for the changes.

Prior to launch, every stop in the Central Ohio Transit Authority's system got a temporary sign explaining what would happen at that stop, and additional staff were assigned to the Customer Service

Center before and after implementation to handle rider questions. The transit agency also hired temporary workers—many of whom were transit users—as brand ambassadors to conduct direct outreach in the community.

Conclusion

The key findings represent common themes, challenges, and considerations observed across the research for *TCRP Research Report 221*. However, bus network redesigns are an evolving topic, with numerous redesigns being planned and undertaken across the United States. Transit agencies currently undertaking bus network redesigns must consider the long-term travel behavior impacts of the COVID-19 pandemic, as well as the evolving role of new mobility in their communities and how these new modes can complement the agency's services. The growing recognition of the impor-

tance of equity and delivering bus and new mobility services in an equitable fashion also is shaping those bus network redesigns. Transit agencies across the country will continue to learn from one another's experiences in planning

and delivering bus network redesigns, advancing the state of the practice to deliver higher-quality transit services that are responsive to the travel needs of today's public.

VOLUNTEER VOICES

"The key words that describe the strength of TRB are "convening" and "participation." TRB convenes professionals from around the world to participate in the Annual Meeting, as well as on committees and in research programs. There is something for everyone, based on their professional field, interests, and willingness to get involved. Viewing the Annual Meeting program and the detailed structure of TRB's committees and programs is somewhat amazing. The complex structure of TRB and its diverse components and activities work because of dedicated staff and volunteers at all levels. I got involved in TRB's programs in the early 1990s and have always viewed them as my most rewarding extracurricular activity.

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