Transit Choices Report
APRIL 2020
Executive Summary
What is the New Bus Network?

The DARTzoom New Bus Network project will update and redesign the DART bus network in all 13 of the DART cities. This bus network redesign is a collaborative planning effort to decide where bus lines should go, when they should run, and how frequent the service should be, starting from a clean slate.

At the end of this process, DART will have a New Bus Network Plan which includes two networks:

- A network that could be implemented without any additional funding for bus service, as early as 2022.
- A higher-funding network that could be implemented in the future if additional funding became available for bus service.

The members of the DART Board of Directors will direct DART staff in how to balance competing goals in a redesigned network. Input gathered from the groups of people described above will inform their decision about this difficult trade-off.

Why is DART doing a bus network redesign?

Bus service is much less expensive to operate than rail, bus vehicles are easier to purchase and maintain than rail vehicles, and bus service does not require lengthy and costly construction projects. Nearly every city with a high-ridership rail network has a high-ridership bus network.

People who use DART are more likely to use a bus as part of their trip than light rail. As of 2014, 71% of transit trips included at least one bus ride.

An outdated system

Some DART bus routes have been running the same paths since World War II, and most of the network was designed in the 1980s. Since then, the urban area has grown enormously and the places people go for work, recreation, socializing and other purposes have changed. The rail and bus network was originally designed to focus on downtown Dallas, but more of the region’s activity happens far outside of that center today than in the past.

Decline in transit ridership

In the past twenty years, DART’s transit ridership grew and then declined. Most U.S. transit agencies have seen declining transit ridership over the past decade. The exceptions are those cities where transit service has been increased or redesigned.

One of the biggest drivers of ridership gains or losses is how much service is provided: when more buses and trains are provided, more people tend to ride. When service is cut and fewer buses and trains are running, fewer people tend to ride.

Looking at total ridership over the years (in the graph at right) shows ups and downs that are mostly related to how much service DART was able to fund in those years. Yet when we hold the amount of service constant, as in the graph at right below, we see that ridership relative to service (productivity) has slowly declined for buses since 1994, and for light rail productivity since 2009.

Declining productivity means that DART has been attracting fewer riders for every unit of service that it provides. For various reasons, DART service is less useful to people today than it used to be, compared to peoples’ other transportation options.

Transit values and goals

High ridership is just one value that a transit network can serve, and increasing ridership is one potential goal for this network redesign. However, transit serves other values besides high ridership which can lead to economic, environmental, social, health and personal liberty goals.

A complete, blank-slate redesign allows DART to ask the public: How can the transit network best serve peoples’ values today?

Much of the current network is designed to get a little bit of service close to people in many places, even where there are not many people. Is that still the right design?

Starting from a blank slate

Redesigning the DART bus network does not mean every route or stop would change. It does mean, however, that everyone involved in this plan can think beyond the existing network. If there are routes or schedules that are meeting the region’s goals today, they are likely to be retained in the New Bus Network. If there are routes or schedules that are artifacts of history and no longer make sense, they can be revised.
**Useful terms**

**Frequency**
For the DART network, we describe service coming every 20 minutes or better as “frequent.” Frequency has a big impact on peoples’ travel time. Speed matters too, especially in DART’s large service area, where so many trips are many miles long. But frequency is invisible, and hard to imagine for those of us who mostly drive, cycle or walk. More frequent service means people are able to travel when they want to, without arriving at their destination earlier than they wanted to. High frequency also makes transfers quick and reliable. Higher frequency service tends to attract higher ridership, even relative to its costs.

**Hours of service, or span**
The span of a transit service is the number of hours it operates during the day, e.g. a service that runs from 6:00 am to 11:30 pm would have a 17.5 hour span. For riders who depend on transit service for all aspects of their life, it is important that the span is long enough for their weekday and weekend trips, whether it is an early morning work shift or a late night out with friends.

**Ridership and coverage goals**
Ridership and coverage goals, both laudable, compete with one another. An agency seeking to maximize ridership would focus service where there are large numbers of people, where walking to transit stops is easy, and where the linear routes feel direct and fast to customers. Because service would be concentrated onto fewer routes, frequency would be high and a bus would always be coming soon. Transit trips would be easy and quick, and as a result many people would choose to rely on transit. An agency seeking to maximize coverage would spread out services so that every street had a bus route. As a result, all routes would be infrequent, even those on the main roads where lots of people need to travel. Transit travel would require a lot of time, mostly time spent waiting somewhere, and as a result few people would choose transit.

On a fixed budget, designing transit for both ridership and coverage is a zero-sum game. Concentrating more of the budget into frequent routes means less of the budget is available to spread service out to get close to many places.

**Productivity**
Ridership responds to the amount of service provided on a route. To control for this, a route’s productivity can be measured—the total ridership divided by the quantity of service provided. Routes with low levels of service but high productivity probably have potential to attract more ridership, if their service levels are increased. Routes with high levels of service but middling or low productivity probably just don’t have enough people nearby to make them efficient, even with all the service invested in them.

**Rush hours, middays, nights and weekends**
Many transit systems, like DART, focus service during rush hours when automobile travel peaks. Providing high frequencies during these times makes transit an attractive option for commuters. However, this often results in poor frequencies at other times when many people still need to get around.

For example, many people travel at midday during the week for non-office commutes as well as for shopping, medical and school trips. Similarly, weekend transit service is essential for the retail and service workers who are required to take at least one weekend shift per week. Nightly transit service typically doesn’t attract as many riders as daytime service, but it allows people to rely on transit: it helps the service worker travel home from work, lets people socialize, and provides a “just-in-case” option for 8-to-5 commuters.

Providing an all-day all-week service is part of a high ridership strategy. Cities that have increased or maintained their transit ridership in the past decade are cities that invested in all-day, all-week services.

**Rush hour peaking**
DART runs some special routes only during rush hours. Many DART routes also have increased frequencies during rush hours. This additional rush hour service comes with some hidden costs. For example, extra buses have to be purchased, maintained and stored just for rush hours, and then sit idle the rest of the day and week. In the DART network, 46% of the fleet is used only during rush hours.

**Deadhead and one-way services**
Deadhead is the time a bus and driver spend traveling between a route and the bus garage, or returning to the start for a “one-way” route. Extra deadheading is one of the hidden costs of rush-hour only services, because buses have to come into and out of service from the garage twice per day. One-way routes have even more deadhead because the bus has to travel back to the starting point without passengers for each trip.

**Flexible transit**
Flexible transit is any transit service in which the route varies depending on who requests it. In contrast, fixed routes serve fixed stops, in a certain sequence, at scheduled times. Flexible service is appealing because it responds to people’s desire to travel when they want (rather than only when service is scheduled) and to avoid walking to and waiting at bus stops. In very low-density, flexible service can serve demand at a lower cost than fixed routes, which can be particularly valuable for people with severe needs. DART’s general public flexible service is called GoLink, and the flexible service for seniors and people with disabilities is called DART Rides.

**Transit networks**
Individual routes should connect to create a larger network, allowing people to get to many places by transferring between lines. Well-designed transit networks are broadly useful to people making many different trips.

In a network, transferring is a crucial part of creating efficient trips for residents to access many different opportunities. However, if riders have to wait a long time to make a transfer, it greatly increases their total travel time. Transfers between frequent routes allow for reliably short waits. In places where infrequent routes converge, a timed connection can create the same short transfer time. However, if a rider happens to miss the timed connection, they have a much longer wait until the next bus or train arrives.

In these ways, well-connected networks can be built out of either frequent or infrequent lines. The existing DART network is a well-connected but infrequent network.

For more detailed descriptions of these and other transit related terms, see Chapter 3.
Existing Network

DART is somewhat unusual among large U.S. transit agencies for having:

- A very large service area, with continuous low-density development throughout the service area (rather than large rural gaps)
- A large service area population
- A large light rail network but without much all day high-frequency light rail service

Productive, high-ridership routes: DART’s more frequent, all-day routes are, on average, more productive than the less frequent routes. Additionally, rush hours are not actually the most productive time – buses are most full on weekdays at midday.

Prioritizing rush-hours over other times: The DART network is designed around rush hour commutes, with 46% of the bus fleet used only during rush hours. But work trips make up a small fraction of peoples’ total travel; 1/3 of work commutes don’t even happen at rush hour.

Timed connections reduce transfer wait times: Most bus routes are infrequent, but the poor frequency is mitigated somewhat by reliable timed connections that some routes make with light rail.

High speeds for long trips: Dallas area trips are longer than in most other cities. The high speeds that DART offers on light rail and express buses help people make long trips at a decent speed.

Speed: Most bus routes run on surface roads where buses can stop and large numbers of people can access stops. But buses in mixed traffic are terribly slowed by congestion. Without protection from congestion, the DART bus network will not deliver the high speeds that make long-distance regional transit travel compelling and competitive.

Reliability: The reliability and speed of a route are related to one another. The reliability of DART’s existing services is quite good, in part due to staff’s work over the past five years to rewrite schedules and add time on the most problematic routes. However, this improved reliability has come at the cost of reduced speeds. The average weekday speed has declined by about 7% at rush hours and 5% at midday over the past seven years.

For more detailed analysis of the existing network, see Chapter 5.
Market and need assessments

When designing a transit network, a planner will ask:

- **Where are the strongest markets for transit, with potential for high ridership and low operating costs?** This is the transit “market.”
- **Where are there moderate or severe needs for transit, where coverage services may be important even if they do not attract high ridership?** These are transit “needs.”

A strong transit market is mostly defined by where people are, and how many of them are there. Peoples’ incomes can also affect ridership potential. Residential and job density, the density of lower-income residents, and walkability can all be mapped to help planners visualize high transit ridership potential.

We learn about transit needs by examining who people are and what life situation they are in. When planning to meet needs, we consider the locations of lower-income residents; lower-wage jobs; schools; medical centers; and places where seniors, youth or people with disabilities live. Designing a transit network to focus on these places is not generally the highest-ridership strategy, because there are often too few people in all of these places to fill buses. But such a network serves other values for transit, such as being there for people with severe needs for transportation.

Another important factor is where minority residents live. A person’s race or ethnicity does not tell us if they need transit, or if they have a propensity to use transit. However, we know that race and ethnicity are correlated with income.

In addition, providing equitable and supportive levels of service to minority people, even in areas that are costly to serve or that do not generate much transit ridership, can be an important element of a coverage goal. Transit agency policies that protect minority people from negative impacts are one type of coverage goal, because they pursue an outcome that is highly valuable regardless of ridership.

This page summarizes how each of these factors affect the DART service area. For further information and detailed maps, see Chapter 4.

Residential and job density

- In the Existing Network, at least some transit service is provided close to the areas with the most density of housing and jobs, but local street patterns and other physical barriers may create long walks to homes and workplaces.
- People travel in both directions on transit corridors with a mix of residential, commercial and other uses, so buses are full in both directions. In contrast, routes that serve purely residential areas tend to be used in only one direction each morning and evening rush hour.

Walkability

- Walkability is of existential importance to transit ridership: Only 5% of transit trips on DART bus or rail start with the parking of a car. The vast majority of trips (83%) involve walking at both ends of the trip.
- A connected street network is essential to easy walking. The most widespread and continuous areas of well-connected streets are those that developed before World War II, when nearly all transportation was done on foot, by bicycle or by transit. These areas are mostly in Dallas. Smaller contiguous areas of high connectivity also exist in Plano, Garland, Richardson and Farmer’s Branch.
- Many parts of the DART area are very difficult to walk in, due to a lack of street connections; developments that use cul-de-sacs or walled subdivisions; freeways that divide neighborhoods; rail lines; and a lack of sidewalks, safe crossings or lighting.

Poverty density

- Dense areas of low-income residents are spread out around the DART service area, in nearly every city.
- In some areas, such as southern and eastern Dallas, lower-income residents live at low densities, far from one another and far from dense job and commercial centers. This makes it more costly for DART to reach these residents with service, because buses have to traverse long distances. This is why the “suburbanization of poverty” is an enormous challenge for transit agencies – the farther away low-income people must live, the more it costs to connect them to opportunities.

Minority residential density

- The DART service area is very diverse, with large populations from many different racial and ethnic groups. However, it is more segregated by neighborhood than most U.S. cities. This means that when DART makes decisions about where to provide service, down which streets and in which neighborhoods, those choices have a racial impact, and changes in transit access by people of different races will need to be measured and considered.
Challenges

Not much service
DART has a modest supply of bus service with which it covers a huge area. All of the trade-offs presented in this report become more agonizing when the budget is small, especially in a big city with many urban centers, high standards and global aspirations.

Travel distances are long
The average commute distance in the DFW area has been longer than most peer cities. Transit can be effective over long distances and over a large area using three different strategies, ideally in combination: 1) Bus Rapid Transit or Light Rail Transit in exclusive right-of-way, 2) intercity or express buses on freeways, and 3) creating a frequent grid network. To date, DART has pursued light rail and express buses. The costs of operating a frequent grid far exceed what the existing bus budget could handle.

But shorter trips demand higher frequencies
The shorter someone’s trip, the more sensitive they are to time spent waiting. The DART network is currently designed for long trips, and in particular for long trips on light rail due to its high speed and its protection from congestion. This makes it harder for DART to provide high-frequency, local bus routes that make it easy to take short transit trips within your community.

Crosstown trips are hard
DART’s light rail network design makes trips to and from downtown fast. However, in a larger urban area with multiple centers, having to transfer at the center for “crosstown” trips can make them very long. The Silver Line is being built in part to address this crosstown problem. However, it can only be in a fraction of places and the train will only come once per hour all week (and every 30 minutes during rush hours). Crosstown travel on the north side will still be the bus network’s job.

Freeway-oriented development
Some of the densest development in the DART service area is oriented to freeways. For transit, freeways are barriers, not corridors. This results in two major consequences: 1) people have to walk in unsafe and unpleasant conditions to access transit service near freeway exits and entrances and 2) DART sometimes has to run two routes instead of one to make sure that neighborhoods on both sides of the freeway have access to transit.

The cost of using buses to fix walkability problems near light rail stations
Some light rail stations lack sidewalks and crossings that would make it easy to walk to nearby jobs and housing. To make up for this, DART runs bus routes for very short trips to these stations. Along with the operating expense, this means the bus might need to deviate from an otherwise direct path, making the route more time-consuming for anyone who is riding through to other places. Rather than making the one-time capital investments in sidewalks, crossings and street connections at existing rail stations to address this issue, DART shoulders the perpetual operating costs for these circuitous routes.

Wide light rail station spacing requires a bus supplement
To make the light rail system fast, there are long distances between stations. This is not bad, but it has consequences for the bus network: if someone is located halfway between two stations, the distance is probably too far for them to walk. As a result, light rail lines have not relieved DART of running parallel local bus routes on the same corridors.

No “inefficiency” in the network today
One of the biggest challenges for this network redesign is that the existing DART network is fairly well-designed. Every route has a purpose, though reasonable people can disagree about the relative importance of different purposes. Making service better in a certain place, or at a certain time, would require making service worse somewhere else for someone else.

Opportunities

All-day all-week service
If DART wants to increase ridership on its bus network, providing more consistent seven-day-a-week service on the highest ridership routes has proven to be a good strategy by peer cities and by DART’s own experience with the addition of weekend service in the past few years. On average, DART bus routes are less productive at rush hours than at midday, which means that some rush hour service could be shifted to other times (like weekends) in pursuit of higher ridership.

Creating a few frequent crosstown connections
Although a complete frequent grid network for the entire DART service area is currently unaffordable, some frequent crosstown connections may be possible. However, even that would require a major shift in investment away from low-ridership coverage services.

Close route-spacing
There are some parts of DART’s service area in which the transit network currently offers short walks to multiple parallel routes. This is an opportunity to ask bus riders and the public whether short walks are more important than short waits. Consolidating parallel service into fewer routes is a way that DART could improve frequencies within its existing budget.

For more details about these challenges and opportunities in redesigning the network, see Chapter 6.
Key choices

1. Longer walks for shorter waits?
   In places with many parallel routes, consolidating service onto fewer streets can allow an agency to offer riders higher frequencies. This could make peoples’ trips faster, but it would mean a longer walk to service.

2. How important are rush-hours relative to all-day, all-week frequency?
   DART transit ridership is somewhat higher during weekday rush hours than at middays, nights or on weekends. However, providing extra service during rush hours comes with extra costs. What is more important: fully-serving rush hour demands, and avoiding crowding on rush-hour buses, or providing more useful frequencies all day, everyday?

3. Are declining speeds tolerable?
   DART’s service has been slowing down in the past decade, with average bus speeds dropping by 5-7% during weekdays since 2012. The slower DART’s buses run, the less frequency DART can provide within the same budget, and the less useful transit is to people in a hurry.
   DART has no control over the operation of the roads, and therefore has no control over how congestion affects bus speeds. Municipalities raise sales tax revenue for DART bus service, and they have the power to protect their investment by changing the way streets are managed for transit. Some of DART’s cities are testing transit priority measures that speed up buses, but more work will need to be done if declining speeds (and the increase in costs they cause) are not tolerable.

4. How should ridership and coverage goals be balanced?
   In every transit system’s limited budget, a basic trade-off is made between:
   • Services and decisions that increase ridership relative to cost (such as concentrating service into more frequent routes where the greatest number of people are), and
   • Services and decisions that cover important places but do not yield high ridership relative to their costs.
   About 55% of the existing DART bus budget is spent pursuing high ridership, and 45% is spent covering important places where ridership is low.
   How should DART balance ridership and coverage goals in a redesigned network? Is the appropriate balance-point the same if, in the future, additional funding is available for more bus service, or does it change?

For further discussion of these choices, see Chapter 8.

Future Network Concepts illustrating choices

Some of the key choices described at left are illustrated in a pair of Concepts. These Concepts were designed collaboratively by DART staff, the consultant team and staff from each of the 13 DART cities. The two Concepts are intentionally very different from one another and are meant to help people develop their preferences and priorities for the New Bus Network plan:

• The High Coverage Concept spreads service widely across the DART service area. A few areas that are not covered today would become covered, while some areas would get worse frequencies than they do now. Short walks are maintained in many places, even though it means frequencies can’t be improved.
• The High Ridership Concept concentrates frequent service in areas with the largest number of people and jobs. Most existing transit riders would see improvements in their service, and the network would become more useful to large numbers of people, but some people in low-density areas would lose all access to service.

Neither of these concepts is a proposal. Rather, they illustrate how much the network could change, and how different the network could be, depending on whether DART shifts away from providing coverage and towards higher ridership potential.

These Concepts mark the ends of a spectrum between high coverage and high ridership potential. DART can decide to pick a balance point somewhere on that spectrum.

Design Principles and Assumptions

• Same budget: Both Concepts are limited by the same budget.
• Same resources in each city: Both Concepts were designed to avoid shifting much bus service among the 13 DART cities.
• Same speeds: Both Concepts assume that buses travel at the same average speeds as in the existing network.
• More consistent service all week: Both Concepts would shift some service away from rush hours, to midday, night and weekends. However, the High Ridership Concept would make a greater shift in this way.
• Blank slate: Both Concepts were designed from a “blank slate.”
• The Silver Line: Since this study is rethinking the network for 2022, the Concepts assume that the Silver Line has begun operating, with service every 60 minutes at midday and 30 minutes at rush hour.

The following two pages provide a brief summary of each of the Concepts, but for full details and analysis, see Chapter 7.
High Coverage Concept

Design
Maintain some transit service close to nearly every existing rider, and cover a few new places if possible.

- 60% of the budget would be spent toward Ridership goals and 40% toward Coverage goals.
- Small increases to daytime and weekend coverage of residents and jobs would be paid for by reducing some rush hour and nighttime service, and by replacing some extremely low-ridership daytime routes with GoLink.

Outcomes
Coverage: Existing riders would continue to have access to service, and more people would be within walking distance of service at night and on weekends.

- Nearly every existing rider would continue to have access to service.
- There would be service within a ½ mile walk of 99.8% of all existing boardings (on fixed routes, light rail and GoLink). Only a few bus stops with less than 1 daily average boarding would lose coverage.
- Modest increase in the number of residents (including low-income residents and residents of color) and jobs near any service during weekday rush hours and middays, as well as on weekends.
- Fewer residents and jobs would have service nearby late on weekday nights.

Total Travel Time: On average, most travel times on transit would not improve.

- Of 66 example trips between high-demand locations, 50% of the trips could be made faster, 40% would remain the same, and 10% would take longer.

Frequency: During daytimes frequencies would be similar to the Existing Network, but at night and on weekends better frequencies would be offered than in the Existing Network.

GoLink: The general public flexible transit service would continue to be offered, on weekdays.

Proximity to service:
- Increases in number of jobs and residents near some type of service during rush hours, middays, and weekends
- Number of jobs and residents near frequencies of 15 mins. or better more than doubles at rush hours

For detailed interactive maps go to dart-concepts-viewer.s3.amazonaws.com/index.html
High Ridership Concept

Design
Concentrate frequent service in areas with the largest number of people and jobs. Some low-density areas would have no transit service.

- 85% of the budget would be spent toward Ridership goals and 15% toward Coverage goals.
- Routes would offer good frequencies later into the evenings and on weekends; this would be paid for by reducing some rush-hour frequencies.
- In denser and more walkable neighborhoods, even higher frequencies would be provided by consolidating nearby parallel routes into fewer, more frequent routes.

Outcomes

Coverage: Some existing DART riders would lose all transit access. (However, flexible service for seniors and people with disabilities would still be available.) Transit would be provided within a ½ mile walk of 91.7% of all existing boardings.

Ridership: Offers higher ridership potential than the Existing Network or the High Coverage Concept.

- Would dramatically increase the average resident’s access to many more useful destinations in a given amount of time.
  - It would particularly increase access for lower-income and minority residents, and access to lower-wage jobs and activity centers outside of downtown.
- The number of jobs and residents within a ½ mile walk of frequent service would greatly increase.
  - However, the number of jobs and residents within a ½ mile walk of any service would decrease.
- The number of jobs and residents near service at night would increase, because all routes in this Concept offer such long schedules all-day and all-week.

Total Travel Time: Most existing riders would spend less time waiting for a bus, giving them access to more opportunities within a reasonable travel time.

- Of 66 example trips between high-demand locations, 78% could be made faster, thanks to shorter wait times and less circuitous routes.

Frequency:
- Frequent service near more people (especially lower-income and minority residents), all day long, every day.
  - Rush hours: 30-minute frequency or better on all routes
  - Midday and weekends: 30-minute frequency or better on nearly all routes
- In denser and more walkable neighborhoods, even higher frequencies would be provided by consolidating nearby parallel routes into fewer, more frequent routes.

For detailed interactive maps go to dart-concepts-viewer.s3.amazonaws.com/index.html
Next steps
By showing the public, stakeholders, and decision-makers the range of possibilities, DART is asking:

"Now that you see what it would be like to prioritize one goal over another, how do you want us to balance these goals? In other words, if you want better service, what is your definition of better?"

Outreach
The actual New Bus Network plan will depend on what we hear from the community. The community’s comments will guide the study team and decision-makers in developing the Draft Plan with the right balance between these competing goals. It may be similar to one of these Concepts, or somewhere in between.

The consultant team and DART will be conducting surveys and other outreach efforts from April through early June, and may continue longer depending on the length of the COVID-19 epidemic.

Designing a draft plan
Responses from the public and stakeholders will guide the DART Board in determining the balance of goals for the Draft New Bus Network Plan. With direction from the Board, the study team will design the Draft Plan in late 2020. The Draft Plan will be presented for public and stakeholder review in early 2021.

Who will be consulted?
Many different people will be involved in guiding this plan:

- Transit riders
- People living on low incomes
- People of color and non-English speakers
- Civic and neighborhood leaders
- Employers and businesses
- Municipal staff
- Local elected officials
- Members of the DART Board of Directors

How to get involved
For more information and to stay involved in the project, go to dartzoom.dart.org and:

Learn More
- View the network Concepts in an online, searchable map
- See scheduled events
- Sign up for project emails

Give Input
- Take the online survey
- Join an online webinar
- Call in to a telephone town hall

Share with Others
- Find videos, articles and reports to share
- Request a community presentation

Anyone who wants additional information, has questions or wishes to make a comment should contact the project team at serviceplanning@dart.org