(November 27, 2024 draft)

City-Wide On-Demand Transit – An Alternative to Project Connect Rail

by Larry Akers

Introduction

It is time to re-think how Austin approaches public transit, time to apply current and new technologies and forward thinking to solve a problem at the juncture of urban mobility, finance, equity, and sustainability.

This paper proposes a solution that is being successfully pioneered around the country, indeed even within our city, that is radically different from the primary thrust of our Project Connect path. This solution not only provides mobility but is also more broadly available, easier to use, cheaper, more scalable, less disruptive, faster to build, and more equitable than the Project Connect model. It would also actively accelerate our transition to a more sustainable and climate-sensitive world.

That solution is city-wide on-demand micro transit, a coordinated fleet of commuter vehicles available for door-to-door service anywhere within the city. Routes would be dynamically constructed on demand, serving multiple riders with separate or similar origin and destination points, and optimized for time to delivery. Such systems are already in place around the country, in some cases replacing entire local transit systems.

We will describe the system below, but first let's take a look at Project Connect.

Project Connect Rail

To address the mobility problem with a concession to equity, in 2020 Austin voters were presented with a transit system proposal heavily cost-weighted toward a backbone of urban rail. Well before ground has been broken, its projected cost has ballooned, its scope has been radically reduced, its timeline extended, and its fiscal future placed in question by a hostile state legislature, legal clouds over its financing mechanism, and a failure of public confidence due to broken promises. Furthermore, it is possible, even likely, that the antipathy towards mass transit that has been expressed by the incoming administration in Washington will reduce the likelihood of federal matching funding for the rail project.

The press is now covering the various difficulties that have turned the Project Connect vision sour, so we do not need to repeat that here. Suffice to say the project is in deep trouble fiscally, politically, and logistically, and from the correct public perception that it is falling far short of the promise that was sold to the public.

Even built out completely, the rail system would well serve only that sliver of the population with direct access, leaving the vast bulk of the city in the same mobility boat as before, but much, much poorer from the high property taxes devoted to the project. Proponents admit it is only a starter system, the implication being that those were just starter taxes, too. The eventual public cost of the Phase 1 rail alone, already many times the entire City of Austin annual General fund budget (which is around $1.4 billion) would grow further if its development continued. The response to the foreseeable cost explosion, even before any dirt has been turned, has resulted in a radical pull-back of its scope.

We are getting nothing like what we agreed to pay for.

The On-Demand Transit Alternative

What is on-demand micro transit?

On-demand micro transit (aka transit on demand) is typically a van-based ride-sharing service that is available for door-to-door transit. Rides are requested via an app or phone call. Pick-ups and routes are dynamically configured according to demand. A trip for a patron may involve stops to pick up and drop off other riders, but the routes are determined to minimize circuitous routes and delays. Think of it as an Uber-or-Lyft-like service using multi-passenger vehicles, agency-employed drivers, and lower cost to riders.

All the technology is available to implement such a service, and has been for some time. Amazon, UPS, and Fedex use dynamic, on-demand route determination to optimize the pick-up and delivery of packages. With on-demand transit, vehicle routes for people are constructed similarly.

https://blog.rideco.com/what-is-on-demand-transit-and-why-does-your-city-need-it-af058b3f3d1

Commercial vendors now offer this technology specifically tuned to public transit. For example, Via has a call-handling and dispatching system that could provide a caller with a choice of options, either with one-hop van transit or including connections to other transit system components like rapid bus, quoting an approximate time to destination for each. The route choices and time estimates take into account many factors, including current traffic conditions and the stops of other riders, much as Google maps can provide for auto or other modes of transit. The caller may then select the desired ride.

Ausin has a handful of high-density, high-demand transit corridors. A few of these corridors are already served by rapid bus lines. The Project Connect plan includes addition of a few others. This makes perfect sense. A hybrid on-demand/rapid bus system could be seamlesslyl integrated to provide a comprehensive public transit capability.

Is on-demand micro transit unprecedented?

No. Numerous companies are supplying the technology to over 100 public transit agencies, including in Austin, San Antonio, Round Rock, Seattle, Atlanta, Houston, Kansas City, Haifa, Salerno, a collective of cities in northwest Arkansas, and a region of northern Utah. Typically the service is used to reach areas not well served by fixed-route service, sometimes to provide connection to fixed-route stops and sometimes for full source-to-destination transit. Some services are activated at low-traffic-volume hours to replace buses for reduced cost and increased efficiency.

But some cities have successfully abandoned their bus service completely, replacing it with city-wide on-demand micro transit. One example is Arlington, Texas (population 400,000). Others include Valdosta, Georgia (population 150,000) and Wilson, North Carolina, where the service has become very popular and provides door-to-door rides anywhere in the city for a $1.50 fare, as documented on National Public Radio.

https://www.npr.org/2022/07/19/1111765630/on-demand-shuttles-have-replaced-buses-in-a-small-north-carolina-town

Eliminating multi-mode transit, as these cities have done, can fully exploit the advantages of transit-on-demand. Shreveport and Souix Falls, South Dakota have implemented city-wide on-demand and been able to eliminate a number of their bus lines while providing improved service. Valdosta, Georgia, with a 151,000 metro population, also uses it as their complete transit system. The Utah Transit Authority and the cities of Northwest Arkansas implemented regional on-demand micro transit to supplement the local bus services offered in their individual communities. Successful adoptions of city-wide and region-wide on-demand micro transit are on the rise.

But what about a large city like Austin?

Here is where a hybrid system can work. In high-density, high-demand corridors, rapid bus on a frequent schedule makes more sense than a swarm of mini-buses, but can be provided at comparable efficiency and much lower cost than rail. Where a faster trip would result, the on-demand dispatching system would offer options including a one-hop van ride or another for the rider to be delivered to a rapid bus stop, possibly with another van ride for the last leg of the trip. The rider could choose between options, depending on need. Thus a hybrid system including both city-wide on-demand micro transit and rapid bus could provide high capacity, door-to-door transit over the entire city. With the system in place, its performance might justify the elimination of all or part of the fixed route conventional bus service.

What are the advantages?

Comfort, safety, convenience, ease of use, and efficiency are the obvious ones, but they are not the only advantages. A huge one is cost. Others include expanded coverage of the city, scalability, equity, lack of disruption of the urban fabric, rapid implementation, fleet adaptability, and sustainability. We will examine each.

Comfort, safety, convenience, ease of use, and efficiency

A ride on our conventional transit system can be a trying experience. You have to mate your plans to the fixed schedules of one or more transit vehicles. Those schedules may not coordinate well for transfers, and in off-peak hours the buses may run infrequently. Planning alone is a burden.

Getting to that first transit stop and getting from the last stop to your destination can be trying, as can making time-consuming transfers, especially if you carry a burden or accompany children. Dealing with all that in our sometimes brutal heat and other inclimate weather can make it dangerous as well.

A city-wide, one-hop, source-to-destination ride eliminates all that.

Such a ride is generally much faster than a transit ride, too. Though the ride may be slightly indirect and involve picking up other passengers, it eliminates the time devoted to the first and last legs and time spent on transfers. One might expect an on-demand ride to take 25-100% longer than by personal car, but it would very likely be shorter than by the conventional transit system. Furthermore, as with any transit ride, riders need not bear the time and expense of finding parking at their destination and bearing the cost of vehicle operation.

Providers can currently offer a combination of an app-based ride-summoning tool and a sophisticated dispatching system that can identify optimal ride options for any source and destination. This will be

perfectly familiar for anyone who has used Uber or Lyft, and can be as easily adopted by new users. For those without a phone app, the same can be accomplished with a phone call. The system can provide options for multi-mode rides, for example by making a transfer to a rapid bus, as well as a one-hop shared van ride, and provide good estimated time of arrival for all options, so the user can make a choice.

Cost

Along with service, here is the big pay-off.

Considering a fleet of 1000 EV vans will help compare with the cost of Project Connect rail Phase One, which forecasts daily ridership of 28,500. (System-wide, Capital Metro currently carries around 72,000 passengers on a typical weekday.) Documented experience with micro transit in other cities indicates 2-10 boardings per vehicle per hour, with 4-5 boardings per hour being typical. Running 1000 vans for 10 hours a day, then, would likely bring 40,000-50,000 boardings per day, and since at least a portion of the fleet would extend the operating schedule, that number is very conservative.

The cost of a multi-passenger electric van is $100,000, which is on the high side but allows a margin for adding equipment for those with mobility disabilities. So a fleet of 1000 such vans would cost $100 million to purchase.

The vans will need charging stations. Suppose we wish to install enough of them to charge all the vans simultaneously, as we might overnight. A two-port Level 3 charging station runs around $50,000. (A Level 3 charger can charge a typical vehicle in around one hour. A van may take marginally longer.) The cost of 100 charging ports, then, would be around $2.5 million.

The chargers will need real estate. The City of Austin uses Travis Central Appraisal District averages for land costs in other permitting, and in 2024 TCAD states that urban land is $4.65 million per acre, and surburban land averages $1.36 million per acre. (https://www.austintexas.gov/news/updates-parkland-dedication-fee-schedule) Urban land typically consisits of medium density commercial and multi-family residential development like might be found along major arterial streets and highways and in mixed-density districts like West Campus. One would not expect charging stations to be located on such land, though a few might. Suburban land typically houses low-rise residential, commercial, or light industrial uses. So let us assume land costs of $1.5 million per acre. Around 100 average sized vehicles can be parked on an acre of land, inclusive of driveways and such. Adding a generous 50% of land requirement for the chargers and slightly larger than average vehicles, and 1.5 acres of land for a 100-vehicle charging station would be around $2.25 million. Ten such lots, then would cost $22.5 million.

There are significant installation costs. A generous estimate for paving each site would be $150,000. Also required are fencing, security equipment, installation trenching, permits, circuit upgrades to support 480 volt lines, parking blocks, signage, and the usual allowance for contingencies, all of which could add another $500,000 and bring the total cost of constructing a 100-vehicle charging station to around $2.9 million. Let's call it $3 million, bringing the total cost of a 100-port charging facility to around $5.5 million.

So we could expect 10 100-port Level 3 charging facilities scattered strategically around the city to have a capital cost on the order of $55 million.

Moreover, federal funding for EV charging stations is available. The extra availability of those charging ports would allow them to be made available to the public, a possible revenue source for Austin Energy CapMetro, depending on who owns the facilities.

By this estimate, the capital cost of a 1000-vehicle fleet with 100 ten-port charging stations would come to $155M.

Compare this with the capital cost of our current starter system rail option, preliminarily pegged at $7.1 billion. All prior experience suggests this will significantly rise.

What about operational costs? Let's compare with rail. Austin Transportation Partnership anticipates annual operation and maintenance cost for the Phase One rail to be $200 million when the system reaches the age of regular maintenance. For micro transit, pay for drivers and equipment maintenance dominate. Experience with larger-sized on-demand fleets elsewhere shows a typical O&M cost of around $45 per vehicle per hour of operation. At that rate our fleet, then, operating 12 (not just 10) hours/day on average would result in an annual operation and maintenance cost of $197 million, virtually the same as rail. Manning and maintaining the charging facilities would be an ongoing operational expense, as with any transit infrastructure facility, including those supporting other fueling regimens, so those costs would be comparable as well.

Morever, with micro transit, pay for drivers is the majority of this cost. Autonomous vehicle technology is arriving and at some point may be available for general use in some on-demand vans, which could result in a signficant reduction of O&M cost. That technology could be introduced into the system gradually, serving only streets that have been specifically approved for autonomous vehicles. Serving riders with special needs, though, almost certainly requires a human driver, so some will always be needed.

Providing ride service for people with disabilities is rightfully an obligation of our transit agencies. But providing dedicated ride service is so expensive that Capital Metro funds programs designed to steer those who might request it toward other ways of accessing the transit system. City-wide on-demand could nearly eliminate the need for dedicated service by providing a door-to-door option for people with disabilities that blends smoothly into the rest of the on-demand operation.

The Myth of Cost Per Rider

All public transit fares are heavily subsidized. In transit literature, this leads to an analytical focus on cost per rider. Some argue against on-demand due to its supposedly high cost per rider. Observed cost per rider for on-demand is usually in the neighborhood of $12-20/ride, whereas fixed route bus is more commonly in the $10-12 range. For Capital Metro's Red Line rail, the cost is $30-40.

But this analysis is limited to direct costs to the transit agency. Since public transit is a public service, however, its costs should include not only the transit agency's expense, but also the cost to the rider. This cost is ignored by on-demand's detractors.

Valued at a living wage, the time that metro riders spend planning, walking, waiting, and making transfers is easily worth $20. That’s why, irrespective of fares, those with cars find it cheaper to drive. Those without cars are impoverished by the time and health/safety costs imposed on them accessing the system in our often brutal weather.

City-wide on-demand transit would nearly eliminate this user-borne, balance-sheet-invisible, but very real expense. Considering user cost in the comparisons of on-demand with conventional bus and rail tips the cost scale very favorably in on-demand's favor.

Finance of On-Demand As It Relates to Project Connect

The displacement funding alone for Project Connect Phase One is pegged at $300M, and those funds, which will only cover a portion of the cost to those affected, will not provide a single ride. The physical displacement will be both temporarily and permanently disruptive. An entire on-demand micro transit fleet carrying as many or more riders than Phase One rail would cost far less than Phase One's displacement funding alone.

The Texas Attorney General and the Texas legislature are calling into question whether Austin Transit Partnership (ATP) can issue bonds to cover its capital costs.

ATP's projected 2025 operating budget is $193 million ($172 million from property taxes), and its capital spending $116 million. The entire on-demand transit fleet could be scaled up and easily financed within two years of ATP's capital budget and faster if the operating budget for on-demand were less than for rail's complex planning stages. No bonds would be required.

Absent the enormous cost of the rail projects, the burdensome ATP property tax could soon be eliminated or reduced to a sliver. Maintaining a portion of the revenue stream would allow expansion of the on-demand fleet as needed. A portion of the revenue stream could even be used to make on-demand transit rides completely free of charge.

Coverage and Equity

Areas further from the urban core are less likely are they to be well served by fixed route transit, if at all. Bus lines become sparse and those that exist run less frequently. Capital Metro acknowledges this problem in its increasing number of on-demand zones in generally outlying areas. But using an on-demand ride just to get to a far-flung bus stop only adds to the time expense and difficulty of getting across town via transit. Yes, there is service, but it comes as a high cost of use.

City-wide on-demand relieves this problem. You may have further to travel than someone who lives in the center of town, but you still get the one-hop, door-to-door service like everyone else. You do not have to live in a high-rise box to have access to transit. You can live in your neighborhood of choice and still have access to efficient, quality transit. That is the essence of equity.

Furthermore, there is nothing equitable about having taxpayers across the whole city pay a 20% increase in their City property taxes for a rail system that serves only a tiny handful of transit corridors that generally run through the highest priced, least affordable parts of town.

City-wide on-demand, by contrast, would serve every corner of the city, including the vast outlying (and even central city) areas that now have little or no transit, whether it be rail, rapid bus, or conventional bus. Many of these areas are where those with less financial advantage live.

Quite simply, in order for the system to be equitable, if everyone is paying for it, everyone should be served by it. City-wide on-demand accomplishes this.

Scalability

For comparison, we have discussed a fleet of 1000 micro transit vans. But this is neither a lower nor upper limit. The fleet and its driver and support workforce could be scaled up as demand supports and financing allows, and it could continue to grow well beyond that size without any fundamental change in approach. Unlike rail, there is no bottom level of anticipated/hoped for use required to support the huge expense of getting started. There are no enormous financial hurdles to putting the system into operation. An on-demand system can grow organically along with its public acceptance and use.

Preservation of the Urban Fabric and Lifestyle Choices

Our leaders have set a course of re-building the city to suit a mass transit model rather than seeking a mass transit model that fits the city we have.

The city of Austin was not built for transit. It is a widely distributed urban area with fewer of the business and residential corridors that built up organically around highways and railroads in many older cities. Despite much greater spending on transit, fewer people use it today than did in 1990. The fixed route mode simply is not working well here.

To justify the rail project, the City has upended its land development code, attempting to virtually re-make the city to support implementation of some transit corridors. Residential compatibility standards that preserve the quality of existing properties have been eviscerated. In the rush to relax the code and provide incentives to accommodate transit, consideration of the future need and expense of retrofitting various elements of our primary infrastructure – water, wastewater, drainage, electricity, streets – has been swept under the rug. Potential loss of existing affordable housing along those corridors is also not well acknowledged.

City-wide, on-demand transit eliminates all this. People can live where they wish and still have access to efficient public transit. Perfectly fine buildings and infrastructure need not be torn up to re-build transit corridors. Our existing streets can be used in the same proportion that they are now.

We do currently have some high-demand transit corridors, and several of them are already served by rapid bus. This collection of rapid bus corridors can and should be extended, as per some of the plans in Project Connect. There is no need to decommission the corridors we have to make way for rail.

To this point, it is worth observing that Phase One rail offers to deliver riders from its northern terminus at 38th Street to its southern terminus at Oltorf in 23 minutes. Our existing rapid bus along that same route can do so in 28-35 minutes depending on time of day. Most commuters would ride only from one end or the other to downtown or thereabouts, cutting all those times in half. So for our $7.1 billion investment, we are shaving from 2.5-6 minutes off that commute. Consider, then, if the commute extends further north or south. This requires making a transfer from rail to the existing rapid bus, which would negate any time savings. The same situation would hold true at any rail terminus. Rapid bus by itself would serve more or less as well as the rail at a fraction of the cost and with much less disruption of the corridor's development fabric.

A hybrid system of rapid bus and city-wide on-demand micro transit, then, would seem a highly efficient, vastly less expensive alternative to the Project Connect vision, and would likely enable

elimination of much of our fixed route conventional bus service in favor of better service at comparable or less overall cost. None of this would require disrupting our city or our lifestyles or emptying our highly stressed pockets.

Rapid Implementation

We need better public transit now, but Phase One rail will not come on line until 2033 at the soonest. In the mean time, rapid bus routes in the path of the rail lines will be disrupted by construction. No dates have been set for later phases.

City-wide on-demand micro transit would require mainly the acquisition of currently available vans and support technology and on-boarding of an operations staff. Publicity and user education could roll out in parallel. A full system exceeding the potential ridership of the rail could be operating in relatively short order. Likewise with future expansion of the system. Our rapid bus expansion could also proceed, while existing routes would continue to provide full service.

Adaptability

There scarely a way to know in what pattern our city might develop in the long run, which areas might be radically changed by gentrification or other turnovers of housing stock and style, what re-development and new institutions will introduce new concentrated nodes, or any of the significant events that can change the physical character of the city.

A commitment to rail is, in civic terms, forever. It forces the hand of development artificially and unnecessarily and permanently shapes the city in ways that might not be optimal in the long run.

City-wide on-demand transit, on the other hand, is completely adaptable. It will go wherever the need arises. It can grow if the city grows or reach an optimal level if it does not.

We could, if we see fit, re-purpose or adapt toll and HOV lanes on highways or create new ones to accommodate on-demand micro transit use. We could create on-demand lanes on city streets to provide favorable movement. If hydrogen engines become the next engineering miracle, they could be phased into an on-demand fleet much more easily than retrofitting behemoth vehicles and rails.

Here we have assumed service would be provided only within the City of Austin, since City of Austin taxpayers are funding Project Connect. But with regional participation, the system could be extended beyond our city limits and provide a region-wide transit solution.

In short, on-demand micro transit is adaptable to the future, while fixed route rail fixes us in what will soon be the past.

Sustainability

Electric vehicles (EVs) would be used for the on-demand fleet, reducing the number of fossil-fuel powered vehicles in operation. These are now available and will become more so as the nation transitions away from gasoline-powered vehicles.

The implementation of a large EV fleet could have remarkably positive side effects. The fleet would

require a network of charging stations. These could be reserved for the fleet overnight, and some of the ports for daytime charging if needed. But the stations could be made available to the public, which would have several beneficial effects. Their presence, perhaps near places of heavy employment or concentrated housing, would help overcome reluctance to purchase private EVs due to uncertain or inconvenient charging opportunities, thus accelerating the public's transition away from fossil-fueled vehicles. The stations could also become profit centers for Austin Energy (assuming they were utility-owned), relieving the revenue crunch that recently led them to dump higher rates on their least energy-consuming residential customers.

Public Acceptance

Uber and Lyft has demonstrated widespread acceptance of app-requested transportation. This is despite concerns about the vetting of drivers, which would not be the case with fleet drivers employed by the transportation authority.

Moreover, while there may still exist some public reticence about riding with strangers, this is the obvious circumstance with all bus and train transit.

As has been the case in other cities, the many advantages of city-wide on-demand micro transit would likely result in widespread public acceptance and increase public transit use even among the population with access to a personal vehicle.

Is this a Bait-and-Switch?

The public perceives the radical downscaling of Project Connect's rail plans as a bait-and-switch scheme. Whether this occurred by design, circumstance, or ineptitude in forecasting, the perception is well founded. Yet Austin Transit Partnership (ATP) and its director Greg Canally have stated that the ballot language the voters were given allows the broad flexibility of sweeping changes of plan. “On-demand” service is also named in the Project Connect enabling ordinance. If the ballot authorization is as broad as Canally maintains, it would also allow the flexibility to abandon the rail option and replace it with a hybrid system including city-wide on-demand micro transit and rapid bus.

Summary

So what would city-wide on-demand transit provide compared with Project Connect's starter rail:

- service provided city-wide, door-to-door rather than limited to corridors
- elimination of the multi-mode system, i.e. requiring a user to combine walking with bus and/or train rides to complete a trip – eliminates transfers
- eliminating laborious and possibly burdened and dangerous walks to/from a bus or transit stop
- not confined to fixed schedules
- reduced transit times and difficulty compared to using conventional public transit
- one-call service rather than complex route planning
- vastly less system and per-passenger cost
- capitalization and funding within the Project Connect revenue stream, which could be reduced or retired early
- scalable as the system grows

- no mass disruption from construction
- no mass displacement along transit routes
- no permanent disruption of current thoroughfare streets
- no warping of the real estate market to reward investment properties along the rail routes
- equity positive
- eliminates parking and reduces the number of vehicles on the streets
- proven concept, already partially implemented here and fully implemented elsewhere with demonstrated customer acceptance
- potential for zero fares
- a publicly available network of EV charging stations, a potential revenue source, that would stimulate public purchase/use of EVs and aid transition to a sustainable future
- escape from Project Connect's bait-and-switch public perception and legal clouds over finance
- the system could be extended beyond the City of Austin to provide a regional transit solution

City-wide, publicly funded on-demand micro transit in Austin could serve as a national/international model for modern, sustainable transit in a large metro area.

So why are we continuing to pursue an expensive, inconvenient, disruptive, 19th and 20th Century transit notion that ill fits the geography and population distribution of the Austin metro, when a forward-looking, technologically available, faster, more convenient, cheaper, more sustainable alternative is available? We have better tools now now, so we can plan better than we did in 2020.

Why force ourselves to re-build the city to fit an old-school mass transit model rather than adopting a modern transit model that fits the city?