

WIRED

LA's Plan To Reboot Its Bus System—Using Cell Phone Data

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The Gray Buses that roll along Los Angeles' Orange Line don't look like other buses: They're 60 feet long, and their streamlined design means they don't just stop. With some pomp, they arrive. They dock. And today, on a drizzly Sunday, nearly every seat on the Orange Line is taken. The route connects the northwest corner of the San Fernando Valley to a Metro Rail station in North Hollywood, 18 miles and about an hour away. It's perhaps the country's best example of “bus rapid transit,” a grade of service that's supposed to combine the best features of a trolley line with the relative cheapness of a bus. People dig it. Today, the woman next to me is speaking quietly into her phone in Russian; next to her a guy is watching Instagram videos about elaborate bong hits. Two riders are talking about using analytics to provide better customer service, sitting across from a man in a red knit cap carrying his belongings in a black trash bag. Kids in Dr. Martens and torn black T-shirts jostle with people in boots muddied from work.

Part of what makes the Orange Line so fast and so popular is that it's protected from street traffic in a dedicated, manicured lane of its own. That lane cuts a demographic and geographical transect through typical Southern Californian sprawl. The sides of the busway are landscaped and a bike path runs parallel, but at crossings, when you can see up and down intersecting streets, the view is of strip malls, liquor stores, car dealerships, and boxy apartment buildings butting up against single-family homes. It's a road to Hollywood paved with irony: LA once had the most extensive rail transit system in America but tore it up for cars in the middle of the 20th century. This right-of-way used to be one of the rail lines.

The Orange Line carries more than 20,000 people every weekday. But setting this route aside, bus ridership has gone off a cliff, here and nationwide. Some 2,300 buses run around LA every day—165 routes covering almost 1,500 square miles, for a total of 73 million miles a year. Ridership is down 36 percent this decade, and most cities in the US have seen similar declines. Last year, the number of people using transit fell in most of the biggest metro systems—and that was an improvement over the year before.

No one's really sure why. Some researchers think people with enough money may have switched to services like Uber and Lyft, though it's likely those trips replaced private car travel, not transit. Another hypothesis is that after the 2008 recession, cars and car loans became very cheap. LA may not be as decentralized as cliché would have it, but it is multicentric and, well, eccentric when it comes to the places people live, work, and shop. The right-wing think tank Cato Institute says public transit makes sense only when one central area in a city has most of the jobs, and anywhere else it's too slow and too expensive. So why even bother? Cars are too damn great.

That certainly feels true when you look down on Los Angeles—a meshwork of highway laid over a fractally complex mesoscale of avenues and boulevards and a microscale filigree of

surface streets. Ubiquitous freeways, scenic coastal highways, long straightaways reaching from the mountains to the beach—it's a town made for driving.

Or it would be, but driving here still manages to be famously, crushingly awful. Stratospheric housing costs are forcing more people to live farther away from their jobs, making traffic ever worse.

Transportation, meanwhile, emits nearly a third of the nation's climate-change-causing greenhouse gases. Getting people out of cars and into buses and trains is key to knocking that number down. Trains are great, and Los Angeles' light rail network—84 miles spreading across the Southland—is the largest in the country. But trains are expensive, and they can't get everywhere. That's where buses can come in. Yet at the precise moment when it's most urgent that cities get people out of their cars, bus systems are struggling.

So LA is talking about scrapping the system and starting over, the first radical revamp since rail came back to town. To figure out how to do it right, all the city's transit planners need is location data from about 5 million cell phones.

Conan Cheung makes precise points and bolsters them with concrete examples, the signs of an ordered mind: matrices, grids, categories, and subcategories. There's a rigor here. So it's cool that Cheung, senior executive officer for service development, scheduling, and analysis at the Los Angeles County Metropolitan Transportation Authority—or Metro for short—is in charge of NextGen, a study to reimagine the city's bus system. “Every time we put out a new rail line, we make incremental changes to the bus network to feed into it,” he says. “But over the past 25 years, we've never looked at a systematic overhaul of the buses.”

For decades, buses were Angelenos' only transit choice. In the early part of the 20th century, the city had a 1,750-mile trolley network but shut down the last lines in service in 1963. Not everyone was happy about that. Kenneth Hahn had been a county supervisor for 11 years by then, and he pushed for rail's return to little effect until 1980, when he got clever. His Proposition A raised tax revenue to first reduce bus fares—a popular (and populist) sop to the users of an overburdened system—and then to fund rail construction. As a result, ridership grew from 397 million trips a year to 497 million trips by 1985. But after that tax money was redirected to rail, bus fares eventually went up and ridership declined.

A dozen years after Prop A passed, I was in college, a wannabe reporter writing a thesis on LA transit. I asked a longtime deputy of Hahn's why his boss had spent all that effort and political capital to build rail instead of increasing the frequency and reliability of the bus system.

“Have you ever ridden a goddamn bus?” he said. “They're awful.”

That was a common vibe in LA, as in most American cities: Buses were for people too poor to own cars. So politically they got screwed. The first of LA's Prop A-funded rail lines, the Blue Line, opened in 1990 at a cost of \$877 million. Four years later, a multicultural coalition of mostly low-income Angelenos calling itself the Bus Riders Union took the county transit agency to court for paying overweening attention to rail and to wealthier, whiter bus routes. The resulting court-ordered consent decree forced the agency to build higher-frequency, higher-capacity service across the entire network, instructions the agency fought for years. That battle lasted into the 2000s, just in time for the 2008 recession to crush LA bus ridership again, and it's been falling steadily ever since.

The agencies that run LA's buses and trains have mounted study after study of the problem, proposing answers that have never been implemented. As the great Los Angeles Times transportation writer Laura J. Nelson noted recently, just 7 percent of LA County residents account for 80 percent of all bus trips. So how do you get everyone else?

To answer that question, Cheung is doing all the usual stuff—a survey of 20,000 residents, community meetings, reviewing the price per rider per mile on individual routes. The answers have been, largely, what you'd expect: faster buses and more of them, plus better security at stops.

But come on, that seems so ... bussy. Maybe Metro could think bigger. And in fact, the agency has done something radical. It used location data from 5 million cell phones in Los Angeles County. It didn't matter who the phones belonged to, or if they were on buses. What mattered was how they moved around.

Is that a little creepy? Maybe. Cambridge Systematics, a transportation consultancy, acquired the kind of location information your phone continuously produces—from every app you didn't say “no” to. The data was “hashed” so that researchers could connect geolocations (at a resolution of about 300 meters) to a device but couldn't link the device to a phone number or a number to a person. Even with the resolution blurred this way, you can still discern a picture.

The first result was not surprising: Rush hour is real. “You see two peaks,” says Anurag Komanduri, principal at Cambridge Systematics. “A lot of travel happens in the 7 to 9 am, and then between 3 and 6 pm, when schools break and work breaks.” Normal normal.

Partially obscured by the evening commute, though, was a third peak. That was new. “What we know from traditional surveys is, people remember their biggest trips,” Komanduri says. “But what people forget is ‘I'm picking up the laundry,’ ‘I'm stopping to grab coffee.’ We see more of these data captured by cell phones.” Those trips, the futzing around of daily life, tend to happen in off-peak hours—from midday into the evening, 8 or 9 o'clock. “That's traditionally when agencies cut down their services.” The buses are slacking off when they could be serving a whole other population.

They're also in the wrong parts of town. The old rules for building a transit network concentrate service between the places where the most people live and the places with the most jobs. But that's actually a bad approximation of how a modern American city works. People move around for a lot of reasons besides commuting. “What we've learned is the areas that have the greatest population density and employment density aren't necessarily the areas where we have a lot of trip-making,” Cheung says.

In fact, Metro's whole approach turned out to be skewed to the wrong kinds of trips. “Traditionally we're trying to provide fast service for long-distance trips,” he says. That's something the Orange Line and trains are good at. But the cell phone data showed that only 16 percent of trips in LA County were longer than 10 miles. Two-thirds of all travel was less than five miles. Short hops, not long hauls, rule the roads.

The best way to get people onto buses for those late-day short trips seems likely to be speed. Cheung's team ran billions of cell phone-registered trips through the agency's regional planner to estimate how long they would take on the transit system. Then they ran the same trips through

Google Maps to see how long they'd take to drive. Some 85 percent of trips could be taken on mass transit, but fewer than half were as fast as driving.

Cheung also had fare card data—location- and time-stamped information about when people used their bus passes. (Riders swipe their passes when they get on the bus, but not when they get off—so it takes some fancy data science to figure out their destinations.) But laying the fare card data alongside the larger set of phone logs showed that even if a trip took about the same amount of time, just 13 percent of travel on that route was by transit. That percentage, what Cheung calls “transit mode share,” declined according to speed. Trips that took 2.5 times longer on a bus were the killer. “At that point, all we're carrying are people who have no choice but to ride transit,” he explains. “If we want to attract people who have a choice, we cannot be that slow.”

It's too early for Cheung to commit to any recommendations. What he'd like to know is, who are the people with that choice, those who could ride a bus but don't? “That's an area of opportunity,” he says. “There are a lot of people there. Propensities are high. How do we restructure the network to attract them?”

One of the core metaphors in policymaking—the carrot versus the stick—is about transportation. The carrot encourages the donkey to pull the cart; the stick spurs the donkey forward if it doesn't. When it comes to transit use, the carrots are nicer buses, increased frequency, better reliability—all the stuff in Cheung's matrix.

But the handful of American cities with thriving transit systems have undertaken more than carrot-flavored bus overhauls. Seattle has had the fastest increase in transit use in the US; the city increased bus frequency, sure, but also took space on streets away from cars and gave it to bikes and pedestrians, and added bus-only lanes. Seattle deployed the stick on drivers ... which, after all, was a carrot for everyone else.

Seattle also added denser, more walkable housing. LA hasn't. Housing in all of California's big cities is now prohibitively expensive. Between 2010 and 2017, the number of Los Angeles households with six-figure incomes rose by 22 percent, while the households earning less than \$35,000 dropped by 4.4 percent. “What you're really seeing, I think, is the dramatic effect of the housing crisis driving out low-income people,” says Denny Zane, executive director of Move LA, a transit advocacy group. “We don't know exactly where to. But they ain't riding the bus anymore.” Metro has lost a total of about 7 million bus riders since 2010.

Angelenos love to vote for more transit. They did it with Proposition A in 1980—and again in 1990, in 2008, and in 2016. Zane's group pushed for that last one, Measure M—a half-percent sales tax increase to give \$120 billion to transit over the next 40 years, an almost European-sized carrot. Nearly half of the people who supported Measure M thought reducing traffic congestion was LA County's most important priority, and indeed the campaign for it claimed it would do so. But as the satirical site the Onion put it nearly 20 years ago, 98 percent of Americans favor public transit for other people.

California has some sticks on the way too. New legislation and regulations out of Sacramento threaten to take away funding from cities that don't meet housing quotas and take control of zoning in localities that won't approve development. Transit agencies already have the right to build housing on land they own—on top of subway stations, for example, as the San Francisco

Bay Area Rapid Transit agency is considering. “In the long run, an affordable housing program may be as important to ridership as an operational change,” Zane says.

The shape of a city isn't some imperturbable cosmic background radiation. A city is just a collectively defined outcome made of concrete, glass, and steel. You think LA was built for the automobile? The main freeway was once El Camino Real, the royal road that Catholic missionaries walked. The city's wide boulevards were the fence lines between its original Mexican ranchos, with names familiar to anyone who's ever prayed to Waze to get them across town in less than an hour—San Vicente y Santa Monica, Rodeo de las Aguas, Cienega o'Paso de la Tijera. And the city's widest boulevards often had trains running down their middles. The city wasn't designed for cars; it was redesigned for them.

So maybe it's actually fine—good, even—that traffic has made driving in LA so unpleasant. In February, Metro voted to begin a study of congestion pricing, charging drivers (including Ubers and Lyfts) per mile driven or to enter some neighborhoods. This is the kind of fix that makes tweedy urban theorists puff their pipes contentedly while civilians claw at their own eyeballs, but it works. Congestion pricing has reduced the number of cars entering London's regulated zone by almost 30 percent. Even New York City is considering it.

This is the baller move: Stop making cars easy and everything else hard. Tear down some freeways. Make retail districts pedestrian-only. Strew commercial corridors with curbside parklets, protected bike lanes, scooter-share services, and apartment buildings with first-floor retail and no parking. Make it illegal to park on the street—on every street. Put buses and trains everywhere.

I had picked up the Orange Line about halfway along its route. It wasn't hard to imagine someone walking, biking, or driving to catch it every day, riding the bus to work or school. But the in-between stuff, the exploratory, browsing behavior of a city-dwelling human, seemed as walled off as the San Fernando Valley traffic. At the line's terminus, a U-shaped turnabout atop the North Hollywood subway station, I found a place to get a coffee and a decent sandwich. But after some hunting through the nearby parking lot—surrounded, I should say, by multistory residential developments but only scatterings of retail—I saw what I was really hoping for. Someone had set up a couple of folding tables, protected by a blue tarp clipped to poles, to sell the stuff newsstands used to sell back when the news still stood—soda pop, salty carbohydrates, umbrellas so cheap as to be essentially disposable.

For buses to be successful, cities need sticks and carrots—but also bad-for-you snacks sold by pop-up vendors. That informal street life, that mild chaos, is a city's true self, but it only flourishes where people are, not where they drive right by. Build housing and transit and jobs, parks and libraries and schools, and the streetside communities and economies will build themselves. Instead of predictable, traffic-inducing, planet-killing exurban sprawl, you get a real city—a living metropolis.