Self-driving Car Proposal for Hayden Island

by Sam Churchill, Hayden Island resident

Executive Summary

This proposal envisions the first real-world test of self-driving cars in the United States. Reducing commuter congestion on the I-5 corridor is one goal.

A second goal is the establishment of a Portland-based incubator for autonomous vehicle expertise.

This proposal would tap the "smart city" expertise of Intel, Freightliner, Jaguar/LandRover, and software development professionals in the Portland region.

The basic idea is to move people from a Vancouver hub to the Yellow Max line by the Expo Center.

A much cheaper pedestrian/bike bridge over the Columbia River could carry battery-operated, rubber-tired, people-movers.

The advantage of autonomous, battery-powered, rubber-wheeled vehicles is that an

Figure 25: Reduction in average congested speeds between 2013 and 2020

expensive (light rail) bridge is not required. No overhead power lines. No tracks. No infrastructure.

This proposal would create a testbed for autonomous vehicles on Hayden Island.

Autonomous vehicles connect to public transit. Shoppers could easily move between Jantzen Beach stores. Commuters could connect directly to the Yellow Line using a much cheaper pedestrian bridge in phase two of this plan.

The ultimate goal is to reduce congestion on I-5. Portland's Light Rail is already built. A cheaper Personal Rapid Transit bridge lowers cost. It makes Light Rail convenient for Vancouverites.
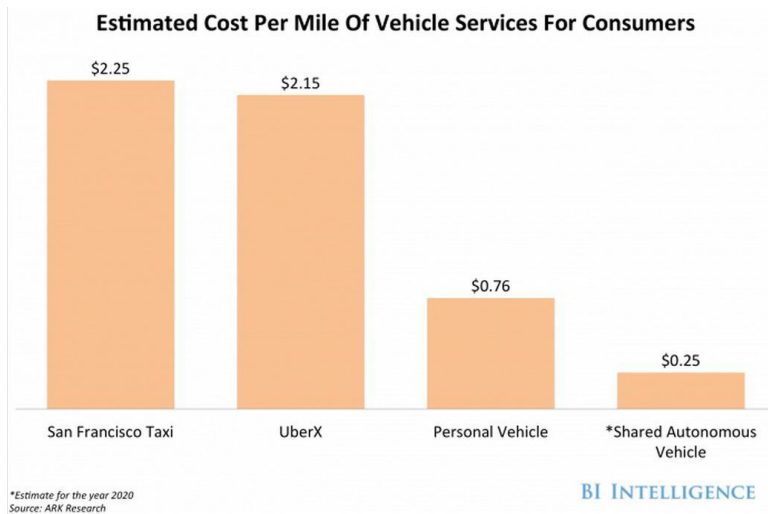
Economic Rationale:

The overall economic impact of congestion in the U.S is estimated at $2.8 trillion by 2030 – the same amount Americans collectively paid in U.S. taxes last year, according in Inrix.

Business Insider predicts about three percent of new cars will be self-driving by 2020, but an additional 65 percent will be linked to a wireless network.

A study from Berkeley Lab found that the per-mile greenhouse gas emissions of an electric autonomous taxi in 2030 would be

Estimated Cost Per Mile Of Vehicle Services For Consumers

San Francisco Taxi	UberX	Personal Vehicle	*Shared Autonomous Vehicle
$2.25	$2.15	$0.76	$0.25

*Estimate for the year 2020
Source: ARK Research

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90 percent lower than a 2014 gasoline-powered private vehicle.

A Rand report says public transit agencies currently spend 14 to 18 percent of their budgets to provide on-demand paratransit services. The per-trip costs are often three or more times those of fixed-route transit services. The average personal vehicle sits parked 95 percent of its life and only carries 1 person 75% of the time.

Driverless technology will take over taxi and car-sharing fleets in less than 15 years, according to some studies. Tesla's Elon Musk believes their fully autonomous cars will drive across the US unassisted within 2-3 years. Audi is less optimistic, predicting autonomous vehicles in 10 years or so.

But W-DOT and O-DOT did not considered the impact of autonomous vehicles in their Columbia River Crossing studies.

Autonomous transport may be the most cost/effective solution. Or maybe not. This proposal would investigate the most promising solutions. Personal rapid transit — without a driver — may provide the most cost/effective solution, connecting Vancouver and Jantzen Beach to Light Rail.

Smart City Challenge

This proposal dovetails with the DOT's Smart City Challenge,which will fund up to $40 million (+ $10M from Vulcan) for "bold, data-driven ideas to improve lives by making transportation safer, easier and more reliable." The five finalists will be announced at SXSW in Austin, TX, on March 12, 2016.
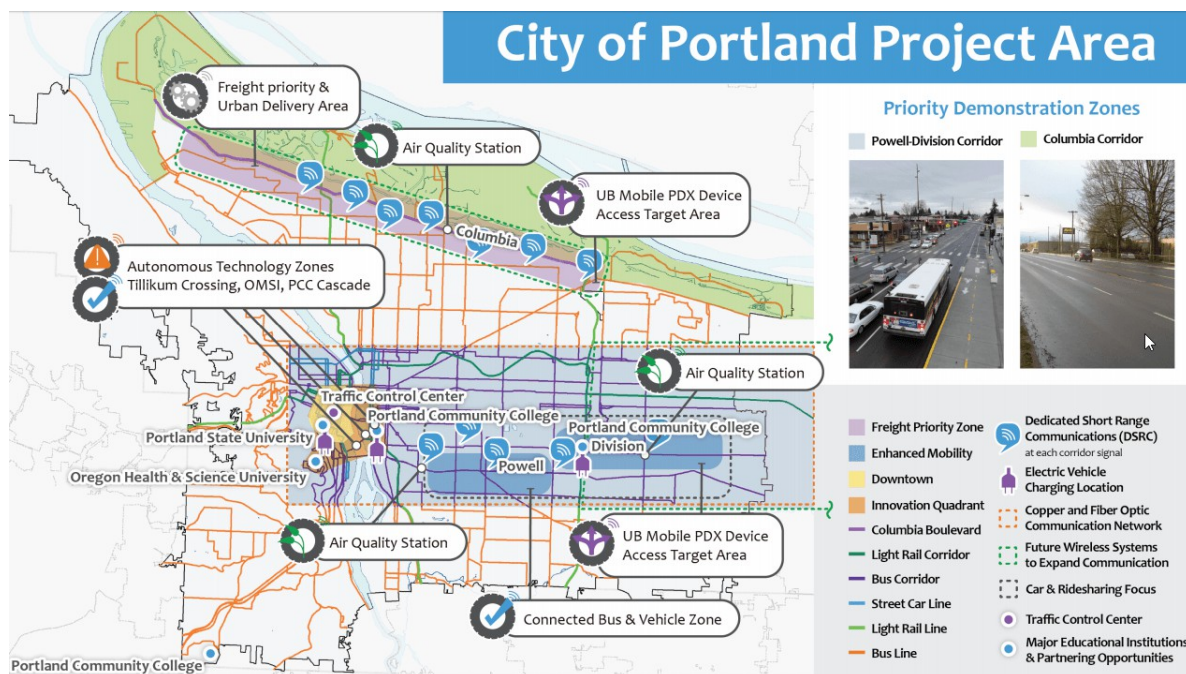
The DOT's Smart City Challenge is asking for data-driven ideas. The winning city is expected to incorporate the Intelligent Transportation Systems for connected vehicles.

Portland's bid proposes an Open Data Cloud, providing the analytics to enable Ubiquitous Mobility for Portland (UB Mobile PDX). By integrating APIs from public and private transportation into one smartphone app, Portland's plan enhances the appeal of alternatives to single occupant vehicles and improves mobility options like Lyft and autonomous transport.

After the DOT selects five finalists in March, it will offer each one $100,000 to refine and develop the ideas into more specific proposals. The winner will be announced in June.

- Austin is currently testing Google's autonomous cars and has Google Fiber. RideScout, which bought Portland's Globe Sherpa, is an Austin-based company.

- Raleigh's proposal is for self-driving pods as part of an electric, rapid transit system known as EcoPRT.

- Virginia Beach wants to create self-driving shuttles that connect to light-rail stations.

- Sacramento's proposal would create a smartphone app that will allow transit users to call for a self-driving car to take them from a station to their workplace

Portland's Strengths

Portland's Smart City proposal must compete with Austin, which has Google Fiber, Google's, Autonomous car-sharing system, and software developers like RideScout. RideScout acquired Portland startup GlobeSherpa, the company that developed TriMet's mobile ticketing app, in June, 2015.

If Portland is to be one of the 5 finalists for the Smart City proposal, an autonomous element might bring it home.

Consider these Portland strengths.

- Google autonomous car is built upon a Daimler Smart for Two frame, using a Tesla power train. Tesla builds electric powertrain components for the Daimler Smart For Two, the Toyota RAV4 EV, and Freightliner's Custom Electric Van.

- Daimler is the world's commercial-vehicle leader and is working on trucks that steer, brake and accelerate independently. Daimler's self driving truck was developed here in Portland. The Inspiration Truck with Highway Pilot was the world´s first autonomous truck to be granted a license for road use.

- Jaguar Land Rover opened a research center in Portland to explore the market with Intel. It

opened April, 2015 in the Pearl. They invited Pangea Motors of Vancouver, which makes a 16 passenger electric bus as a partner.

- Portland startup urban.systems builds fleet management tools for urban transportation. It was also selected to be part of Jaguar's partnership.

- Portland startup GlobeSherpa, the company developed TriMet's mobile ticketing app, and allows users to search for and compare time and costs across various ground transport options.

- Portland-based Cargo has developed hardware and software that opens the trove of information being generated by vehicles, everything from speed and acceleration, to location, to real-time fuel economy and whether the air bags are working.

- OpenTripPlanner, an open-source multimodal trip planning software system, can use biking and walking data from Open Street Maps while integrating the General Transit Feed Specification (GTFS) data from local transit agencies.

- Vancouver's Pangea Motors makes a 16-passenger electric shuttle. The lithium battery provides up to a 100km range on a 5-hour, 220V charge.

Hayden Island, just south of Vancouver, Washington, is Portland's only island community, with a population of 2,300 on 1,900 acres, encompassing 1.69 sq miles. About 10,000 people a day shop at the Jantzen Beach Shopping Center. The shopping center is not served by Light Rail. Hayden Island is less than a mile from Columbia Blvd, where Portland's Smart City proposal envisioned an urban freight corridor using connected vehicles with DRCS wireless connectivity.

Portland light rail trains do not now go to Jantzen Beach. A light rail bridge connecting the Expo Center terminus to Jantzen Beach would be expensive. A bike-size lane would be cheap.

Google-type autonomous cars could shuttle people from shopping on Hayden Island and deliver them to the nearest Personal Rapid Transit station.

After bugs are addressed on the island, the testing agency could look at dedicated PRT bridges or lane extensions for direct connectivity between Vancouver and the Expo Center.

The entire developmental initiative would be largely funded by grants and sponsorships.

The project could start with 3-4 driver-less shuttles (Personal Rapid Transit) so consumers could travel around the (now pedestrian un-friendly) Jantzen Beach Shopping Center.

Why not Light Rail to Vancouver?

- Each Max Light Rail car is 95 feet long, weights 100,000 lbs (X2), and costs about $3.7 million each. The Tilikum Crossing Light Rail Bridge cost $134.6 million. It needs expensive (and ugly) overhead power infrastructure for the trains.

- The Portland Streetcar can travel on Max tracks, too. Portland Streetcar is smaller (66 feet), weighs about 80,000 lbs, and costs about $2.2 million each (although manufacturer United Streetcar is currently in hiatus).

- Rail is big, heavy and expensive. It requires a big, expensive bridge. New infrastructure.

Autonomous people movers are 8-16 ft long and weigh under a ton. They can use existing pedestrian/bike bridges ($25 million vs $125 million). Cheaper, more attractive bridges. Zero pollution. Less congestion. Vancouver's Pangea Motors makes a 16-passenger electric shuttle. The lithium battery provides up to a 100km range on a 5-hour, 220V charge.

Pangea Motors has attracted political leaders in several continentsand currently operates its electric buses in Manila. It will distribute 10,000 of their electric vehicles in The Philippines as a part of a three-year purchase agreement between Pangea Motors and transport group Pasang Masda.

Take Robocar to the Max and avoid I-5 congestion. It saves money. It benefits the environment. It enhances the economy. In 5 years autonomous cars will pick you up at home. Intel's Freeway to the Future survey found almost half of Americans aspire to live in a driverless city; more than one-third believe it will happen this decade.

We can plan for it now.

The autonomous car concept starts as a very small test. It is largely experimental and inherently much riskier than bike sharing.

This initiative hopes to enable a variety of local companies to develop hardware and software – in the real-world – by 2020.
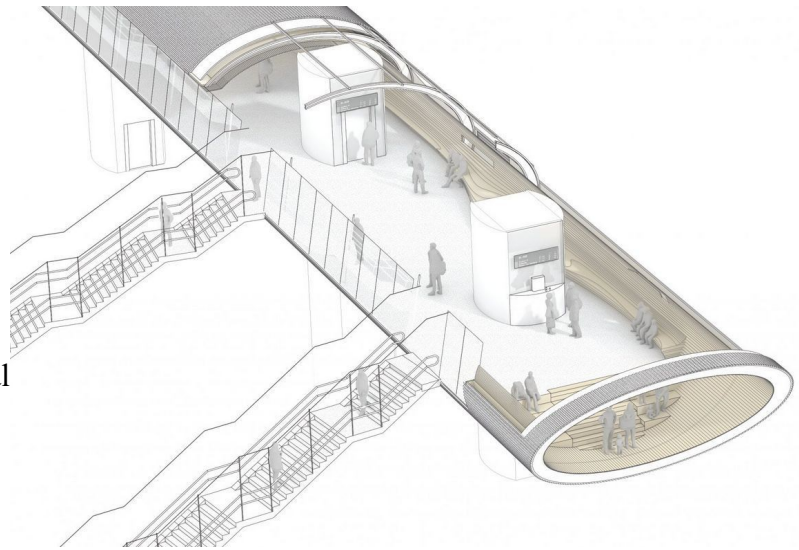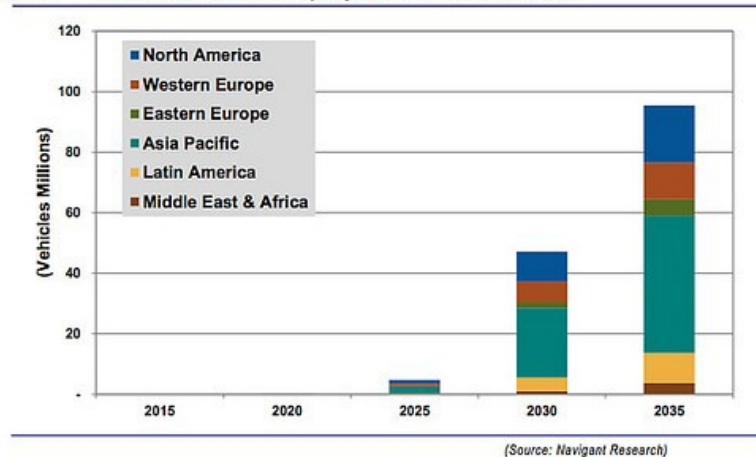

Chart 1.1   Autonomous Vehicle Sales by Region, World Markets: 2015-2035

(Source: Navigant Research)

General Motors, Nissan, Mercedes, Toyota and others are all racing to develop their own self-driving cars. Intel is working with leading automakers on In-Vehicle Technologies. Intel is working with Portland officials on volunteering air quality data to help understand real-time pollution risks.

The Jantzen Beach SuperCenter could host solar-powered charge stations. Ev4oregon combines Solarworld panels with Enphase microinverters, battery storage and 220 volt utility feeds. A wireless charging system, with inductive coupling, eliminates cables. Autonomous cars could self-charge.
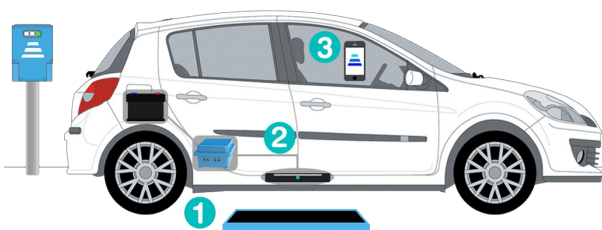
Economic Rationale:

Connections to downtown Vancouver WA and the Oregon Expo Center light rail would be enabled by adding new bike lanes and autonomous POD lanes on current bridges.

Small autonomous electric vehicles enable Washington commuters to catch mass transit without the cost of a new bridge. Tri-Met could easily add more Yellow Line trains to ease congestion.

Oregon Dept of Transportation didn't consider rubber-tired, autonomous vehicles for the Columbia River Crossing. Rail-based PRT systems are expensive. Rails, the guideway, and providing power are most of the expense. Small, light, autonomous vehicles eliminate all of that. Rubber-tired, battery-powered PRT vehicles use existing infrastructure. They're cheaper and lighter. They're available now.

Nimbler Portland utilizes TriMet's Open Trip Planner and General Transit Feed Specification (GTFS). Nimbler provides transit directions, bike directions and combinations of the two and integrates with TriMet's real-time vehicle location feed to provide real-time arrival predictions.

Portland's Car2Go has added 30 all-electric Smart Cars to its Portland-area fleet. One option would be to add an autonomous package to Daimler's electric Smartcar.

- Shared-knowledge base: Autonomous systems
- Citizen-centred design for transport: feasibility study

Neighborhood Electric Vehicles or 2-passenger vehicles, likeGM's EN-V, could pick people up and even cross bridges on bike-wide lanes. No light-rail bridge necessary. No drivers, either.

The project might be 1/100th the cost of building a new Columbia River bridge ($2.4 billion). Without cars or light rail, the bridge could be significantly cheaper. This concept wouldn't require a $190 million study.

It is our belief that autonomous vehicles are ready for public testing.

The proposed regional test would attract transportation grants and be 100% self-funded. Who might provide funding? Ford, Jaguar, Freightliner, Mercedes, Toyota, Nissan, Qualcomm, Intel and Google would be among the likely candidates.
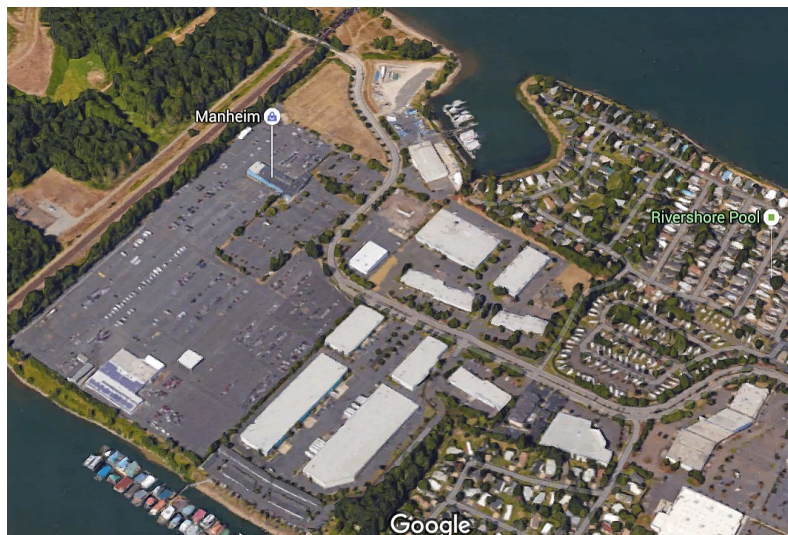
Manheim's Car Auction facility on Hayden Island might have space for testing. There appears to be space available just north of their property. Alternatively, PCC Cascade at 705 N. Killingsworth, could house the autonomous car lab, a short few blocks from the Columbia Avenue test site described in the city's Ubiquitous Mobile PDX proposal.

The Hayden Autonomous Car proposal, a real-world implementation of autonomous vehicles, promises to off-load traffic from the Interstate 5 bridge and improve pedestrian access to Jantzen Beach. It offers the following benefits:

– The "Hayden Eye" Skybridge concept reduces congestion and provides access to Jantzen Beach Super Center.

– Hayden Island is only 8 miles from the Daimler Swan Island manufacturing facility and provides a manageable real-world environment isolated from other locations by water.

– The 2,000 population of Hayden Island skews to older populations. It consists of houseboat owners, condo dwellers and a large manufactured home population. Incomes of Hayden Island residents vary widely.

– Intel could test their 5G connectivity inititives in a real-world environment utilizing their cloud based Radio Access Network, in partnership with Ericsson and AT&T.

– Portland General Electric benefits from a switch to electric cars rather than fossil fuels and would be eligible for federal grants.

– The expertise of Intel Infomatics, Daimler Trucks, and software developers like Globe Sherpa and Cargo could be utilized.

– The Oregon Department of Transportation and Tri-Met would likely be eligible for additional matching grants, while the City of Portland and Multnomah County could be the lead agencies for rights of way and infrastructure.

– The City of Portland benefits by attracting new high-wage jobs and developing its leadership in sustainability and innovation. Portland has pledged to having 20% of the City's 2,800 vehicles run on electricity by 2030.

– Drive Oregon, the Oregon State agency tasked with promoting a business development hub around sustainable transportation, would lead in developing an RFP, along with PGE, ODOT, the Hayden Island Community, and others.

– The test could conditioned on 100% funding and no taxpayer money.

– Google's Sidewalk Labs, which is behind LinkNYC, provides local fiber nodes.

– Hayden Island residents benefits with convenient, low cost transportation options that save time and money over current Dial A Ride options and provides better service.

– Phase Two would add access to and from the Expo Center Light Rail. Access would be proved by a new AutoCar/Bike lane added to the West side of the North Portland Harbor bridge or a dedicated bike/autonomous-car bridge.

– Phase Three would add access to and from Vancouver. Access would be proved by a new AutoCar/Bike lane added to the side of the bridge, similar to the Hawthorne Bridge extension.
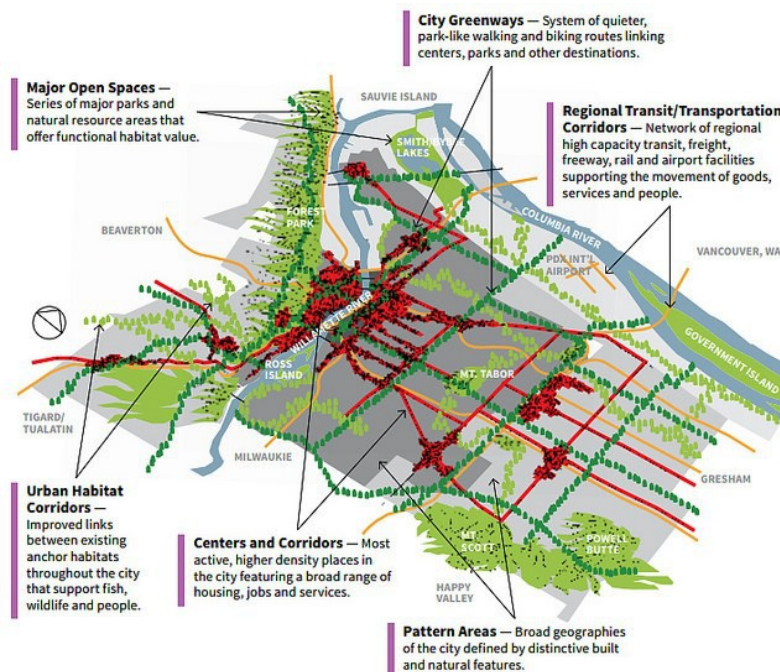
Portland's 20-year comprehensive plan map shows it is betting everything on making car-lite transportation dramatically more attractive than it is now. Portland's 2035 Comprehensive Plan mapshows "how changes to land use, transportation and infrastructure will help make Portland a more livable city".

Driverless transit may now be feasible:

- Cheaper bridges could be built. Battery-powered, rubber-wheeled enclosed vehicles are lighter than trains. They can move 4-8 people and go anywhere (within limits).

- Autonomous vehicles can move people from a transit stop to their destination. It's a "last mile" solution and could deliver people to individual shops at Jantzen Beach. It could boost business. Enable mobility. Reduce parking.

- It's a test. It might be the first real-world autonomous transit study in the United States. Grant money would be available with a viable proposal. Portland has the Daimler Benz plant on Swan Island.

- Intel's 5G initiative, Daimler/Freightliner, Cargo/GlobeSherpa and Portland's open source leadership could be fully leveraged for market leadership.

Portland has the technology and infrastructure. We have the expertise. Global leaders such as Freightliner, Intel, Globe Sherpa, Jaguar/Land Rover, and others are headquartered here. An autonomous test could have a big payoff. Conditioned on 100% funding and no taxpayer money.

Portland's proposal to the US DOT's "Smart City" initiative showed the way. But Portland must compete with Austin, with Google's autonomous cars, Google Fiber, software and manufacturing expertise.

An autonomous car component for Portland's Smart City proposal would addresses real-world congestion issues and leverage the expertise that already exists in the Portland region.