Shared Autonomous Vehicles – Today and Tomorrow
Paul Buharin, Region Vice President @ First Transit.

Paul began his career in student transportation in 1983, advancing to a school bus location manager before joining First Transit in 1993. He progressed through positions of increasing responsibility including Project Manager, General Manager and his most recent position as Senior Director of Operations, Central Region.

Through his 35-year career he has gained extensive transportation experience including school bus, charter, fixed-route, paratransit, airport and university shuttle and Shared Autonomous Vehicle (SAV).

Paul holds a bachelor’s degree in education from the University of Minnesota. Go Gophers!

Paul is currently responsible for 11 operations and more than 1,100 employees.
FIRSTGROUP OVERVIEW

- **Greyhound**: 7,500 Employees, 1,700 Vehicles
- **First Bus**: 18,000 Employees, 6,300 Vehicles
- **First Student**: 57,000 Employees, 49,000 Vehicles
- **First Rail**: 7,500 Employees, 2,800 Vehicles
- **First Transit**: 19,500 Employees, 36,000 Vehicles
AUTONOMOUS VEHICLES TODAY

Shared autonomous vehicles exist today, why doesn’t everyone use them?
# Levels of Autonomy

*Here’s what you need to know about level 0-5*

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>There are no autonomous features.</td>
</tr>
<tr>
<td>Level 1</td>
<td>These cars can handle one task at a time, like automatic braking.</td>
</tr>
<tr>
<td>Level 2</td>
<td>These cars would have at least two automated functions.</td>
</tr>
<tr>
<td>Level 3</td>
<td>These cars handle “dynamic driving tasks” but might still need intervention.</td>
</tr>
<tr>
<td>Level 4</td>
<td>These cars are officially driverless in certain environments.</td>
</tr>
<tr>
<td>Level 5</td>
<td>These cars can operate entirely on their own without any driver presence.</td>
</tr>
</tbody>
</table>

*Source: SAE International*
REGULATORY RESTRICTIONS

Current status of regulatory approval for SAV

States with Autonomous Vehicles
Enacted Legislation and Executive Orders

Legend
- Enacted Legislation
- Executive Order
- Both
- None

Source: National Council of State Legislators
VEHICLES AND PLATFORMS

- Electric
- 6-15 passenger capacity
- Operating speed 15 mph
- Operates in most weather conditions*
FIRST TRANSIT SAV OPERATIONS

GoMentum Station testing begins Nov. 2016 in Concord, CA

Milo begins operation Aug. 2017 in Arlington, TX

SAV demonstration project begins June 2018 in Dublin, CA

Bishop Ranch pilot begins March 2017 in San Ramon, CA

SAV Roadshow operates Dec. 2017 to May 2018 in Minnesota
FIRST TRANSIT SAV VIDEO
HK4  Give further detail on each SAV project as talking points only, I would mention partners in each project as well, they are listed in the notes.

Hardin, Kayla, 9/13/2018
FIRST TRANSIT SAV OPERATIONS

GoMentum Station  
(Concord, CA)

Bishop Ranch Pilot 
(San Ramon, CA)

Milo 
(Arlington, TX)

Livermore Amador Valley Transit Authority SAV Pilot 
(Dublin, CA)

Minnesota SAV Roadshow 
(various locations, MN)
The first stop was at Nicollet Mall in downtown Minneapolis.
The second stop was at 3M Global Headquarters.
The third stop at the Minnesota Statehouse.
The fourth stop in Rochester, Minn., in partnership with the Destination Medical Center.
Final stop of the SAV roadshow is for public officials of Hennepin County, Minn.
FIRST TRANSIT SAV OPERATIONS – WHAT WE CAN BRING TO THE DISCUSSION!

• Fully trained staff will serve as onboard Customer Ambassadors

• Develop comprehensive maintenance plan

• Service and route planning

• Legislation experience

• AV-focused and regionally-based support

• Detailed implementation approach

• Experience with CV citywide networks
**OPERATIONAL QUESTIONS**

<table>
<thead>
<tr>
<th>Do these vehicles meet ADA standards?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• EasyMile and NAVYA</td>
</tr>
<tr>
<td>• Wheelchair ramp is 35” wide</td>
</tr>
<tr>
<td>• Supports a load of 771 lbs.</td>
</tr>
<tr>
<td>• On-board screens</td>
</tr>
<tr>
<td>• Braille labeling of buttons</td>
</tr>
<tr>
<td>• Working toward ADA compliance – EM</td>
</tr>
<tr>
<td>• Full ADA compliance, to include wheelchair securement and enhanced accessibility features, expected in 2019</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What limitations do you see with these vehicles?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bi-directional (Std.)</td>
</tr>
<tr>
<td>• No U-turn required</td>
</tr>
<tr>
<td>• Minimum turning radiuses</td>
</tr>
<tr>
<td>• Lower speed</td>
</tr>
<tr>
<td>• Still testing CV platform</td>
</tr>
</tbody>
</table>

Both vehicles have been proven to be wheelchair accessible in operations
COMMITMENT TO OUR CUSTOMERS

The Nexus of…

Shared “SMART Mobility”

Mobility

Management

Access

Data
WHAT WILL DRIVE THE SHIFT TOWARDS AV?

• Education on safety and the continued need for human intervention

• Powered by alternative energy sources

• Public education and adoption

• Integration with infrastructure, curb space, traffic patterns and other mobility modes

• Public policy

• Continued focus on equity

• Collaboration
THANK YOU FOR YOUR TIME TODAY

Paul Buharin
Region Vice President
Paul.Buhrain@firstgroup.com

@FirstTransit

FirstTransit.com