Outline

- ATN Description
- Existing Systems
- Stations and Guideways
- Characteristics
- PRT Consulting
Automated Transit Networks

- Automated transit networks (ATN)
  - Group rapid transit (GRT)
  - Personal rapid transit (PRT)
Group Rapid Transit (GRT)

- Driverless vehicles on a guideway
- Twenty to fifty seated/standing passengers
- Offline stations (on sidings)
  - Few intermediate stops
- Service on demand – not scheduled
- Short headways (seconds)
Personal Rapid Transit (PRT)

- Driverless vehicles on a guideway
- One to six seated passengers plus luggage
- Direct origin to destination service
  - No need to transfer or stop
- Service on demand – not scheduled
- Very short headways (seconds)
GRT and PRT can operate on separate infrastructure
Or on the same infrastructure
ATN Benefits

• Can attract drivers
  – Has little or no waiting
  – Provides service with few stops
• Low infrastructure needs
  – Costs less to build and operate
  – Relatively easy to retrofit
• Is 10 times safer
• Uses much less energy
• No on-site emissions
• Can also carry freight
ATN System Types

Open Guideway (2getthere)
Vehicle steers itself

Captive Bogey (Vectus)
Guideway steers vehicle

Suspended (Mister)
Vehicle hangs from, and is steered by guideway
Example Systems

- 2getthere
- Vectus
- ULTra
- Morgantown
2getthere

- Vehicles carry 4 – 20 passengers
- Max. speed = 25mph (40 km/h)
- PRT Capacity up to 2,500 pphpd
- GRT Capacity up to 12,000 pphpd
- Automated operations since 1997
- Masdar PRT Project operating since 2010
2getthere Masdar PRT Vehicle
2getthere Masdar PRT System
Vectus

- Subsidiary of POSCO
- Test track in Sweden
- Swedish safety certification
- Suncheon Project (2013)
Vectus PRT System

- Linear induction motors
- Good all-weather capability
- Capacity up to 5,000 pphpd
- 43 mph (70 km/h)
Vectus GRT System

- Linear induction motors
- Good all-weather capability
- Capacity over 10,000 pphpd
- Under development
ULTra PRT System

- 2,650 lb gross weight
- 25 mph (40 km/h)
- 2KW continuous battery power
- Heathrow public operation since April 2011
- Rave passenger reviews
ULTra System Features

- Footbridge-like elevated guideway
- 4 passengers
- PRT capacity up to 2,500 pphpd
Morgantown, West Virginia

- In operation since 1975
- 15 second headways
- 5,000 pphpd
- Intermediate stations are bypassed
- 98.5% availability (Transit LOS A)
- 140 million injury-free passenger miles
Morgantown, West Virginia

- Speeds up to 30mph (48 km/h)
- 10% maximum gradient
- Capital cost ($126M) overran budget
- Operating cost $3.3M/year ($1.50/passenger, $0.94/passenger mile)
- 6 additional stations being planned
3 PRT Trips

Link to YouTube version
• ATN stations are typically smaller (even for same capacity)
• Sized according to demand
• Tight radii (15’ (5m)) and steep (10%) gradients add to flexibility
Vectus Elevated/At Grade
Guideway Concepts
Vectus Guideway
ULTra Guideway at Heathrow
ATN Characteristics

- Level of service
- Transit mode share
- Capital costs per mile
- Operating cost per passenger
- Capacity
- Energy use
- Emissions
- Viability
## Level of Service Comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>Transit</th>
<th>Car</th>
<th>PRT</th>
<th>GRT</th>
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Good ✔️  Acceptable ○  Poor ✗
Transit Mode Share Percent

Source: Studies in named cities
Capital Cost per Mile ($M)

Source: Booz Allen Hamilton
Operating Cost ($ Per Passenger)

Source: Booz Allen Hamilton
Capacity & Speed Comparison

Person Capacity (peak direction passengers per hour)

Average Travel Speed (mph)

Sources: TCRP Report 100 Transit Capacity and Quality of Service Manual, PRT Consulting

Note: This is guideway/corridor capacity ATN’s strength is network capacity
Capacity/Cost & Speed Comparison

Note: This is guideway/corridor capacity
ATN’s strength is network capacity

Sources: TCRP Report 100 Transit Capacity and Quality of Service Manual, PRT Consulting
Sources: PRT Vendors
USDOT
- No point-of-use emissions
- Power from the grid
• ULTra
  – Public service at Heathrow Airport since early 2011
  – BAA is major stockholder
  – Amritsar, India, 2014 (PRT)
  – Gurgaon, India, 2015 (PRT)
• 2getthere
  – Ten-year track record with similar systems in Holland
  – Public service in Rotterdam 1999 (GRT)
  – Public service in Masdar 2010 (PRT)
• Vectus
  – Subsidiary of Posco
  – Certified by Swedish Rail Authority
  – Suncheon S. Korea 2013 (PRT)
PRT Consulting

• Professional engineering and planning consultancy
• Specializing in ATN since 2005
• Three subject matter experts with over 10,000 hours ATN experience each
• Specialized ATN simulation modeling tools
• Independent of all ATN suppliers
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