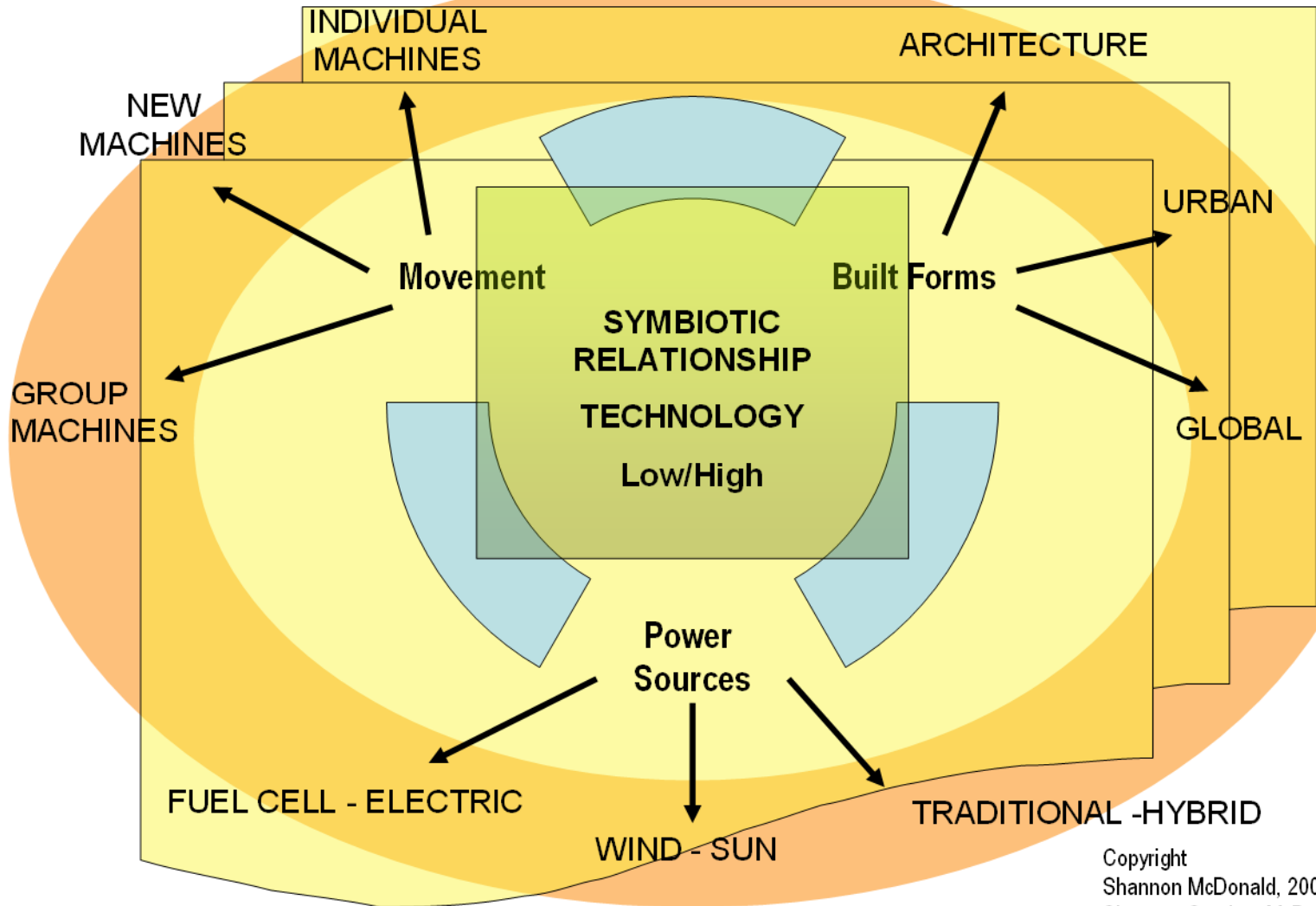# INTEGRATED MOBILITY

## *Automated Transit (PRT) /Land Use/Architecture*

Man and Machine
Low and High Tech
*Movement*
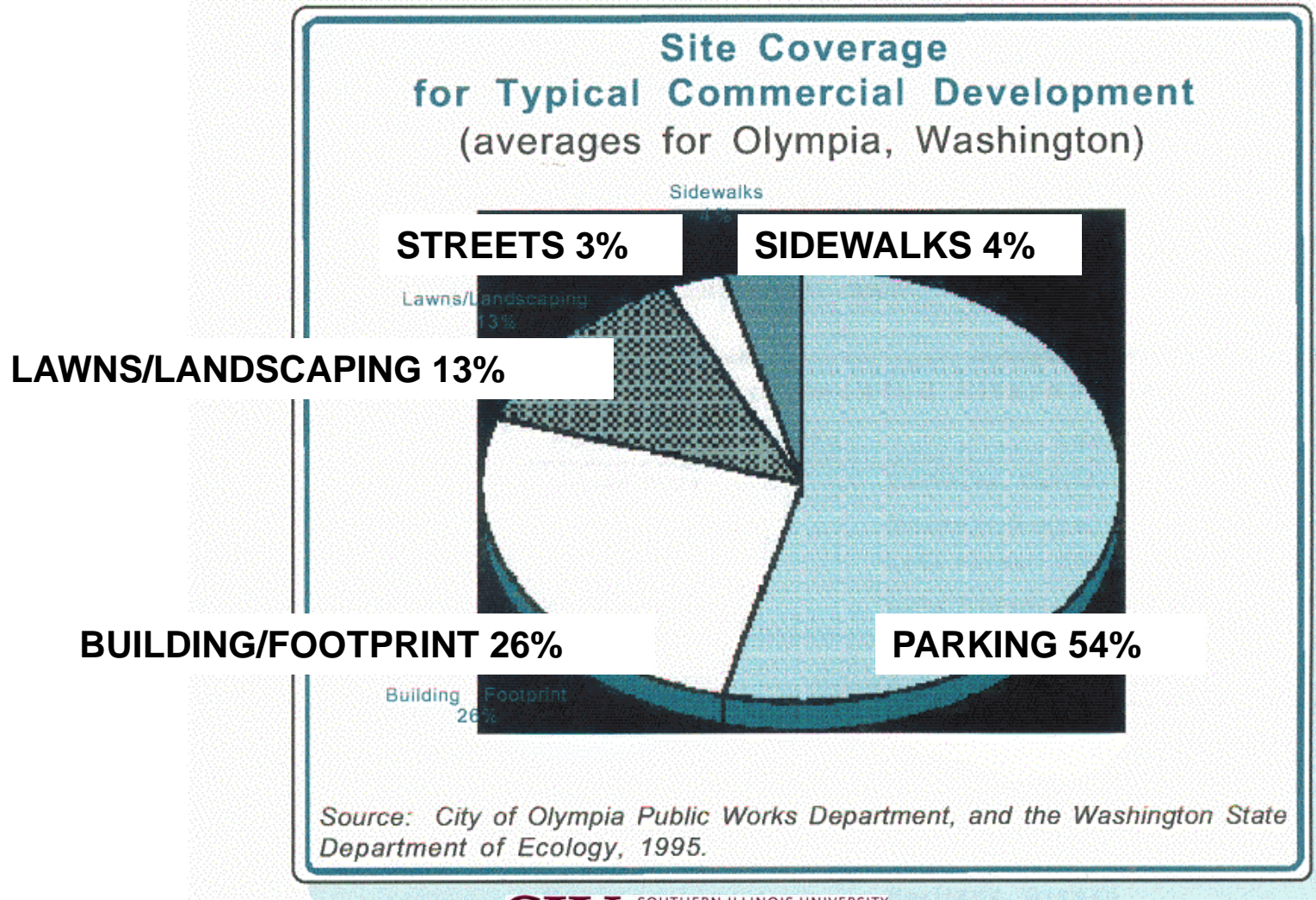
people, architecture, urban design,
energy, sustainability, transportation
and their future synergies

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Shannon Sanders McDonald, AIA

RELATIONSHIPS SUPPORTING EACH OTHER
CREATING NEW COMMUNITY VISIONS

INDIVIDUAL MACHINES

ARCHITECTURE

NEW MACHINES

URBAN

Movement

Built Forms

SYMBIOTIC RELATIONSHIP

TECHNOLOGY

Low/High

GROUP MACHINES

GLOBAL

Power Sources

FUEL CELL - ELECTRIC

WIND - SUN

TRADITIONAL -HYBRID

Copyright
Shannon McDonald, 2004
Shannon Sanders McDonald

# Only New Movement Technologies Can Change Design



Site Coverage
for Typical Commercial Development
(averages for Olympia, Washington)

STREETS 3%

SIDEWALKS 4%

LAWNS/LANDSCAPING 13%

BUILDING/FOOTPRINT 26%

PARKING 54%

Source: City of Olympia Public Works Department, and the Washington State Department of Ecology, 1995.

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# Only New Movement Technologies Can Change Design

history and culture

transportation

engineering

parking

built world

aesthetics

**How can WE weave all of these aspects to create a healthier, safer, saner environment for all as technology continues to change?**

energy - power
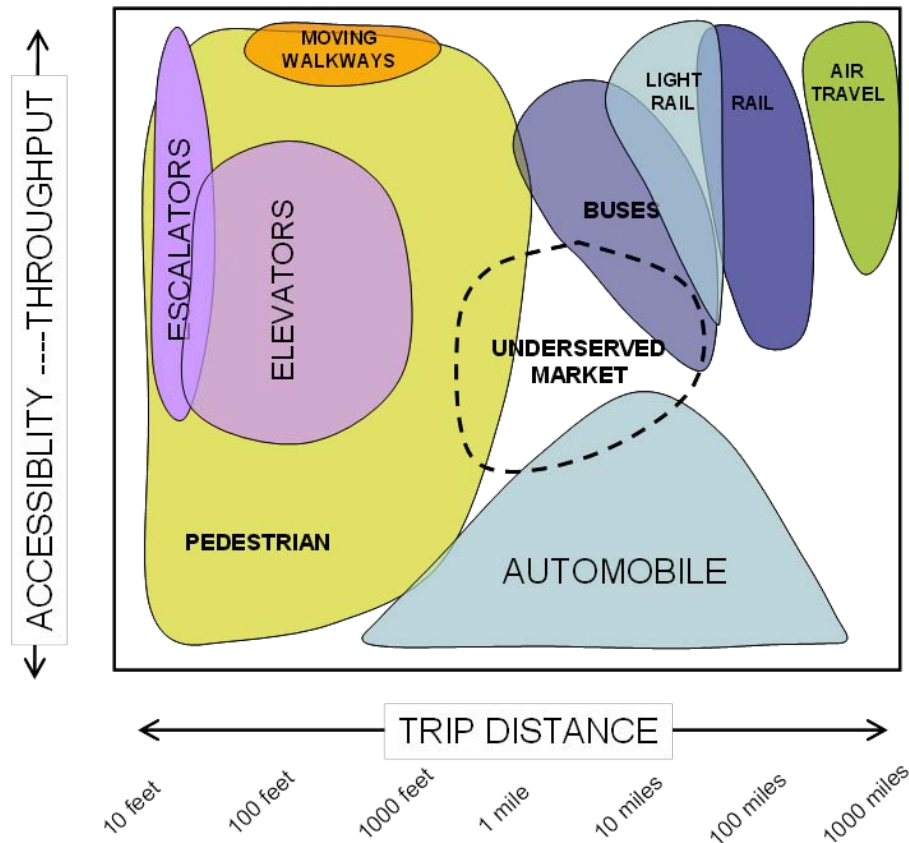
construction

landscape

architecture

people

zoning and land-use

environmental issues

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# TRENDLINES

| SMALL SCALE CHANGES | LARGE SCALE CHANGES |
|---|---|
| Pay-On-Foot / Pay–On-Foot Solar | **Automated Parking** |
| Parking by Cell Phone | **Automated Transportation Systems -PRT** |
| Car - Sharing Programs | **New Fuel and Energy Sources** |
| Dynamic On-Street Parking/Road Pricing | **Road Infrastructure** |
| **LOW TECH** | **HIGH TECH** |
| **Walkable Communities** | GIS – Geographic Information Systems |
| **Universal Design** | GPS – Global Positioning System |
| **Utilizing Existing Infrastructure and Vacant and Unusual Lot Configurations** | AVI – Automatic Vehicle Identification |
| **Bicycle Connections** | LPR – License Plate Recognition |
| | PGAS - Parking Guidance Automated Systems |

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# INTEGRATED MOBILITY

## PRT (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment



Conceptual comparison of modes in the Accessibility – Throughput spectrum from Young, Miller, McDonald. Keys to Innovative Transport Development. Presented at the 87 Annual Meeting of the Transportation Research Board, Washington, D.C., 2007.

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# Overlapping Issues

- Modes of Transportation

- Energy Source/Sustainability

- Human Interface

- Physical Location

=

- Design for Architectural, Land Use and Planning Interfaces

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# Architectural, Land Use and Planning Interfaces

- Design for the Specific Community
- Opportunities for multi-dimensional solutions
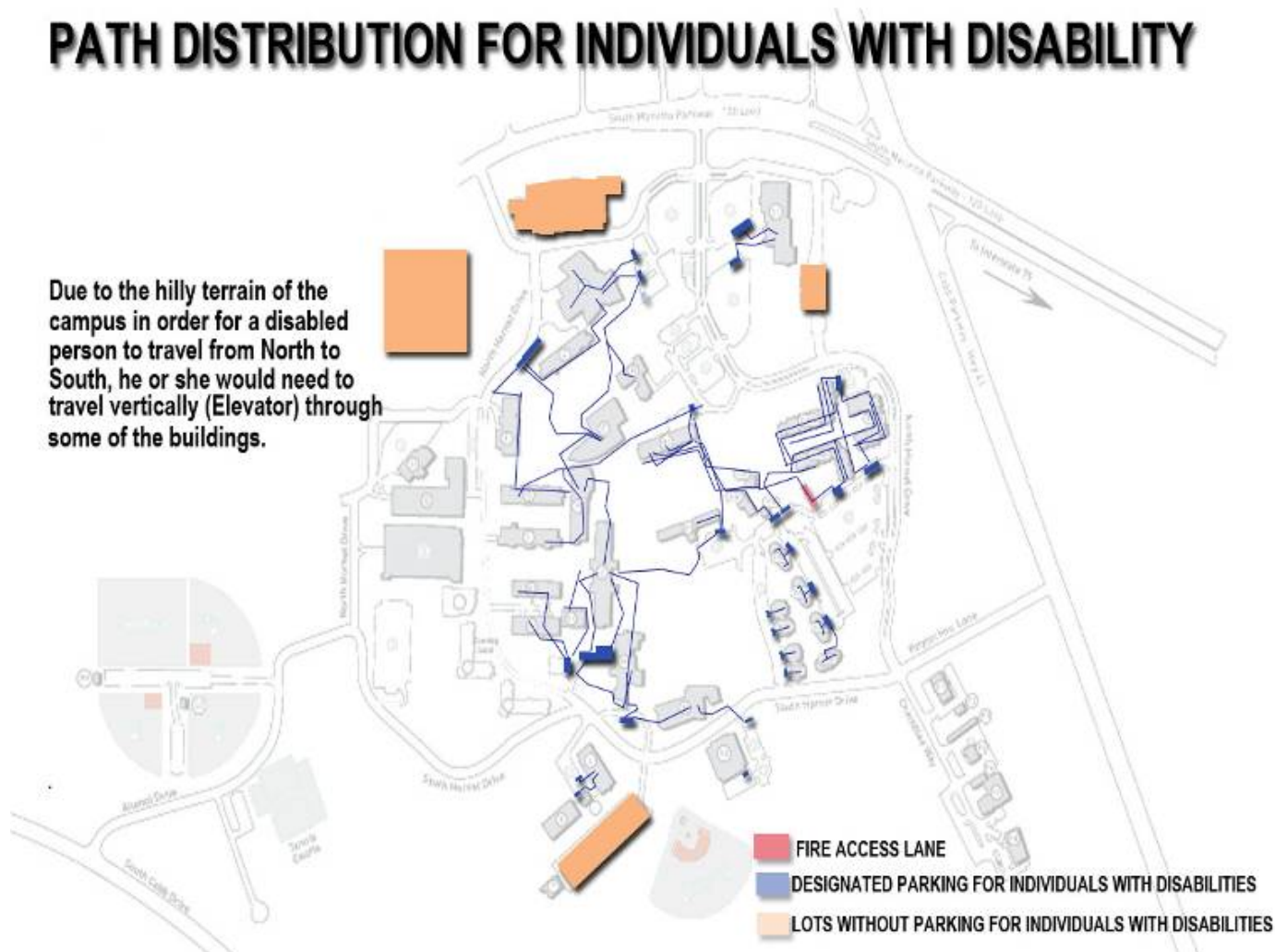- More frequent community based stations
- Mixed-Use applications
- Fully accessible

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# PATH DISTRIBUTION FOR INDIVIDUALS WITH DISABILITY



Due to the hilly terrain of the campus in order for a disabled person to travel from North to South, he or she would need to travel vertically (Elevator) through some of the buildings.

FIRE ACCESS LANE

DESIGNATED PARKING FOR INDIVIDUALS WITH DISABILITIES

LOTS WITHOUT PARKING FOR INDIVIDUALS WITH DISABILITIES

# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

**PRT,  GRT OR DUAL-MODE**

As environmentally sustainable fuels sources have greater applications the *PRT* system can be fueled by other generating sources such as solar panels and other renewable energy sources linked to the power grid.

Eventually the Starr Car System as envisioned by William Alden where the "personal automobile" links with other "personal automobiles" to form transit now called dual-mode can occur.





StarrCar—Photo courtesy of Bill Alden of Self-Transit Systems

Shannon Sanders McDonald, AIA

# INTEGRATED MOBILITY

## *PRT* *(Personal Rapid Transit)*

### *& Connections with Other Modes and the Built Environment*
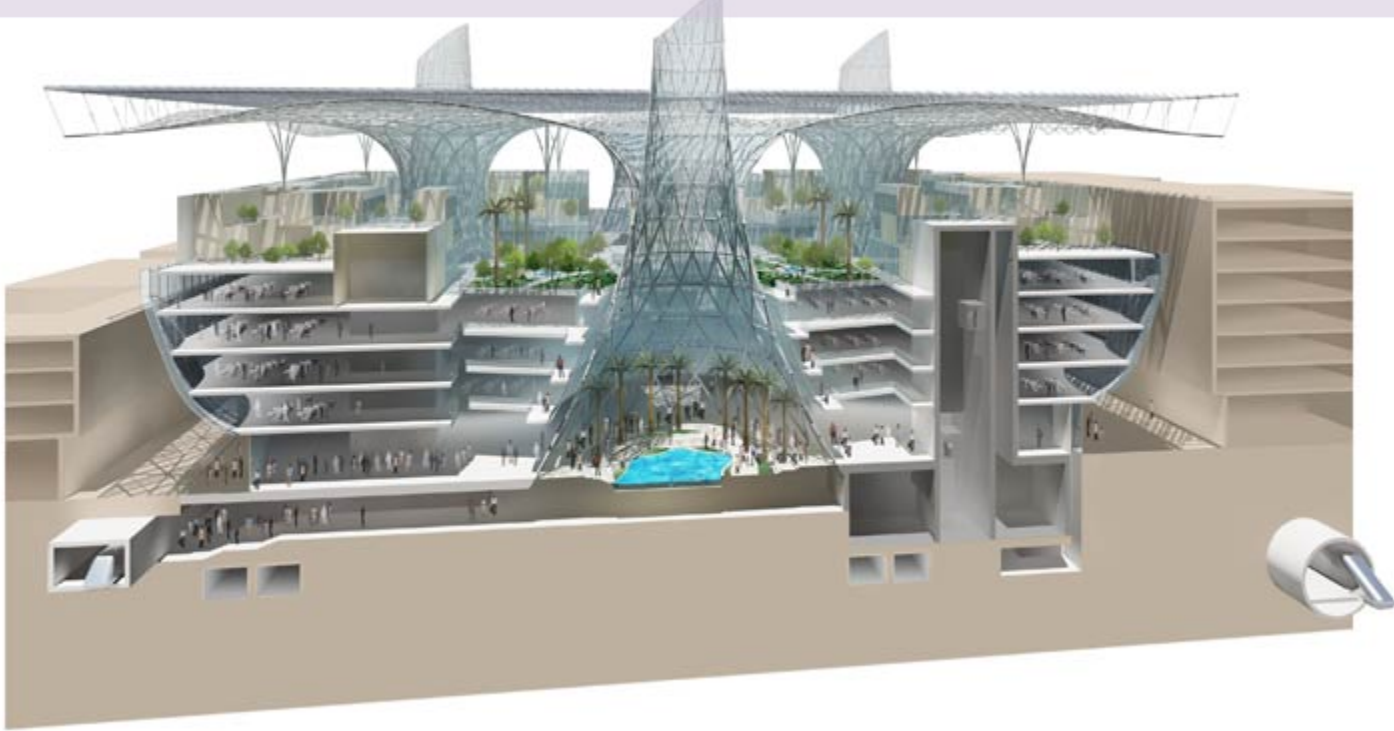


## New Interconnections

• Complete linkages between transit, architecture, energy, parking, and urban planning

• Environmentally sustainable solutions

• Pedestrian and machine oriented environments

• Totally integrated walkable land use decisions

*Evolving City*—Paul Rudolph and Ulrich Franzen, *The Evolving City,* New York: American Federation of the Arts, 1974, p.74-75.

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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment



Masdar City is the world's first carbon-neutral zero waste city and is head- quarters of the International Renewable Energy Agency (IRENA)  PRT is part of the underground infrastructure as a part of a complete package including all forms of transit in this car-free city.

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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

## & Connections with Other Modes and the Built Environment



- Connects Business Parking with T5
- 2.4 miles of single guideway
- 21 vehicles
- 3 stations
- 5min journey time

Traverses
2 rivers and 7 roads
Green belt land
Negotiates Aircraft surfaces
Bridges in-ground services
Conforms to T5 architecture
Looks "Intended"

Courtesy Martin  Lowson:© ULTra Advanced Transport Systems Ltd.

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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

- 18 miles of track

- 80% elevated

- 350 vehicles

- 50 stations

Courtesy Martin  Lowson:© ULTra Advanced Transport Systems Ltd.
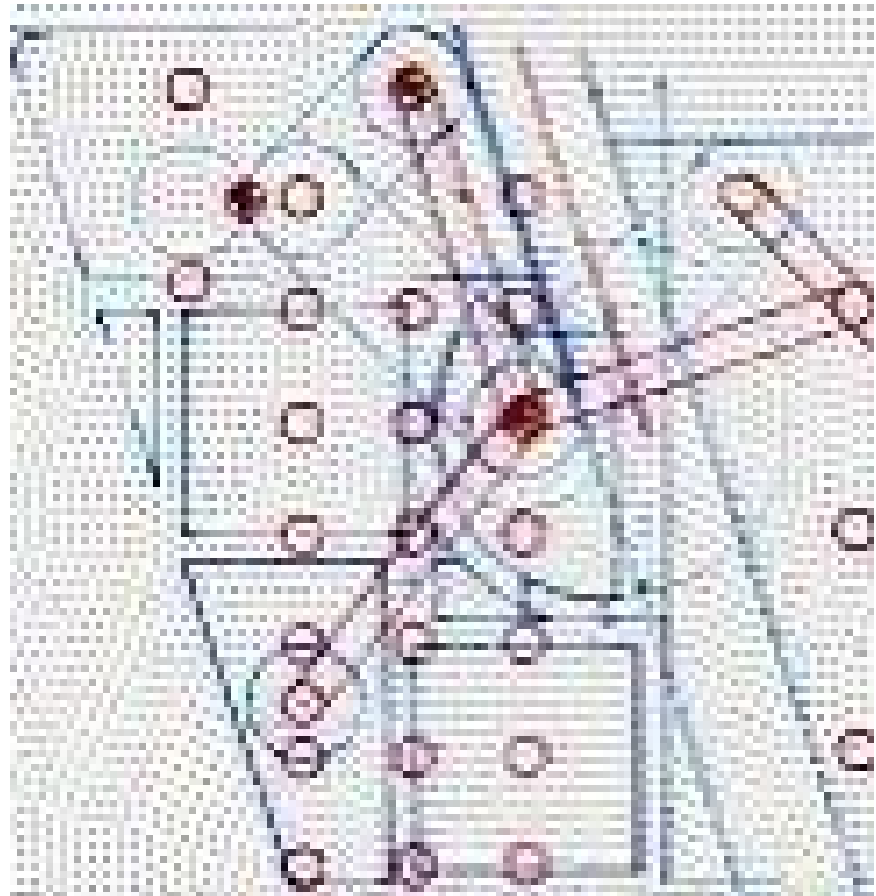
# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

*In-building station:* Configurations, strategies and multiple synergies

What are the **design** and code issues?

*Basic Design Issues:*

visual
connections for people and machine
people interactions between uses
small scale
operations display
accessibility
safety
security
sustainable approaches



photo credit: Shannon Sanders McDonald, Architect

                    Shannon Sanders McDonald, AIA

# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

*In-building stations, Configurations, strategies and multiple synergies*



*Basic Code Issues:*

ASCE People Mover Standards – Part 3

NFPA-130, (2007) 5.1.1.2
    "Special considerations necessary"

NFPA 101, other NFPA as appropriate for
    specific details

IBC Fire

Other IBC and local code requirements as
    appropriate to the building type and
    building type mix

photo credit: Shannon Sanders McDonald, Architect

Shannon Sanders McDonald, AIA

# INTEGRATED MOBILITY

## *PRT*  (Personal Rapid Transit)

### *& Connections with Other Modes and the Built Environment*

**Plan Connections:** *Configurations strategies and multiple synergies*

- Multi-directional

- Fully networked

- Multiple smaller stations for each
  community

- Potential for spatial or multi-level
  connections

- Potential to create fully walkable
  accessible communities
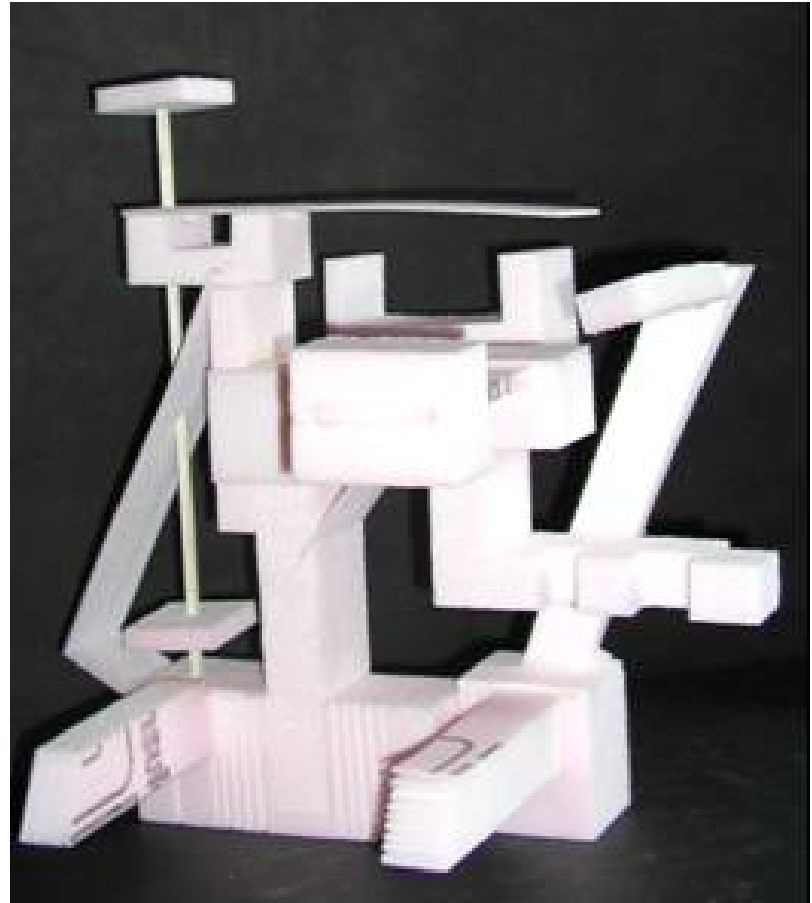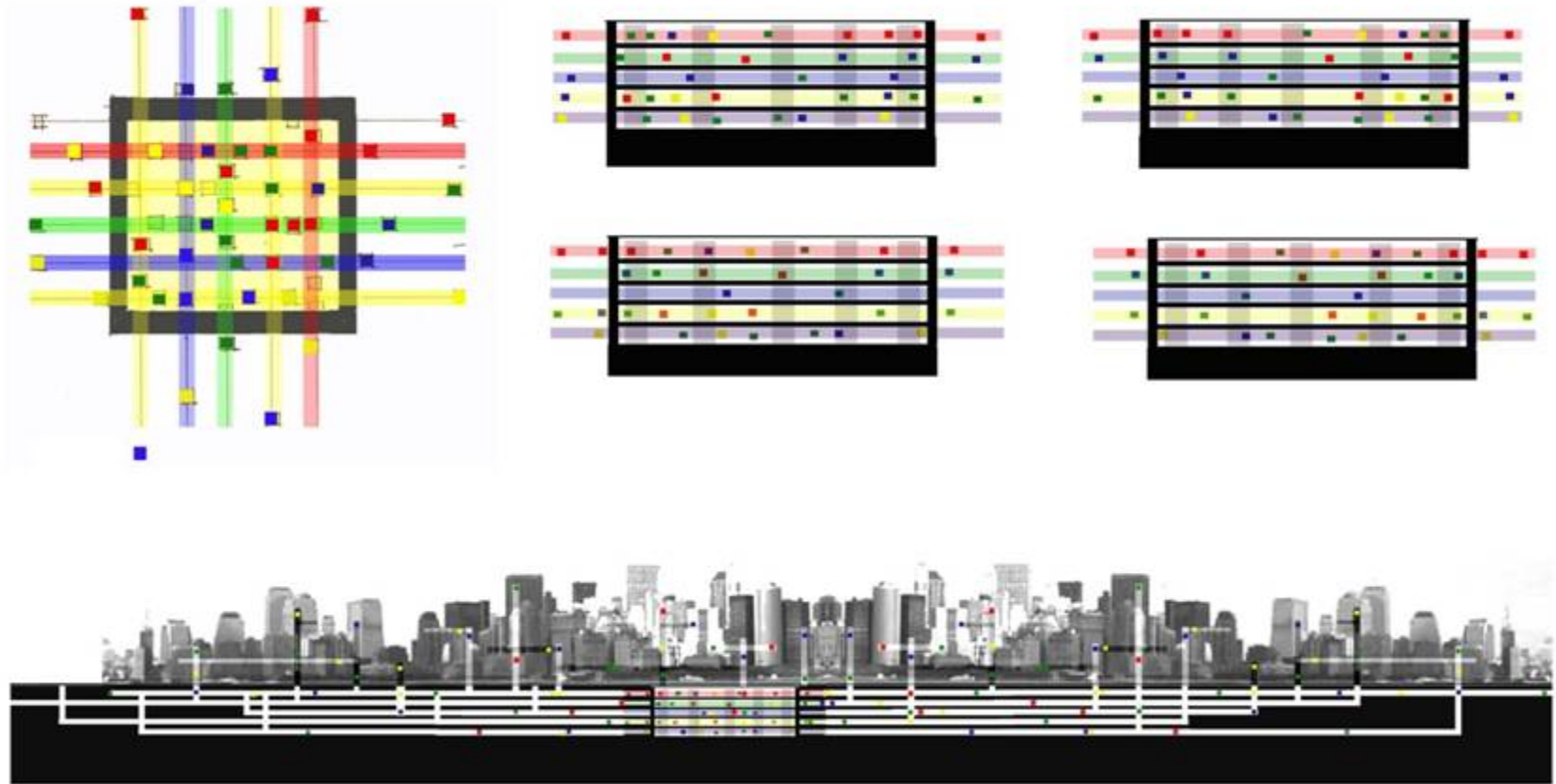
Student: Montana State University Matthew Killiam,
2002

Shannon Sanders McDonald, AIA

# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

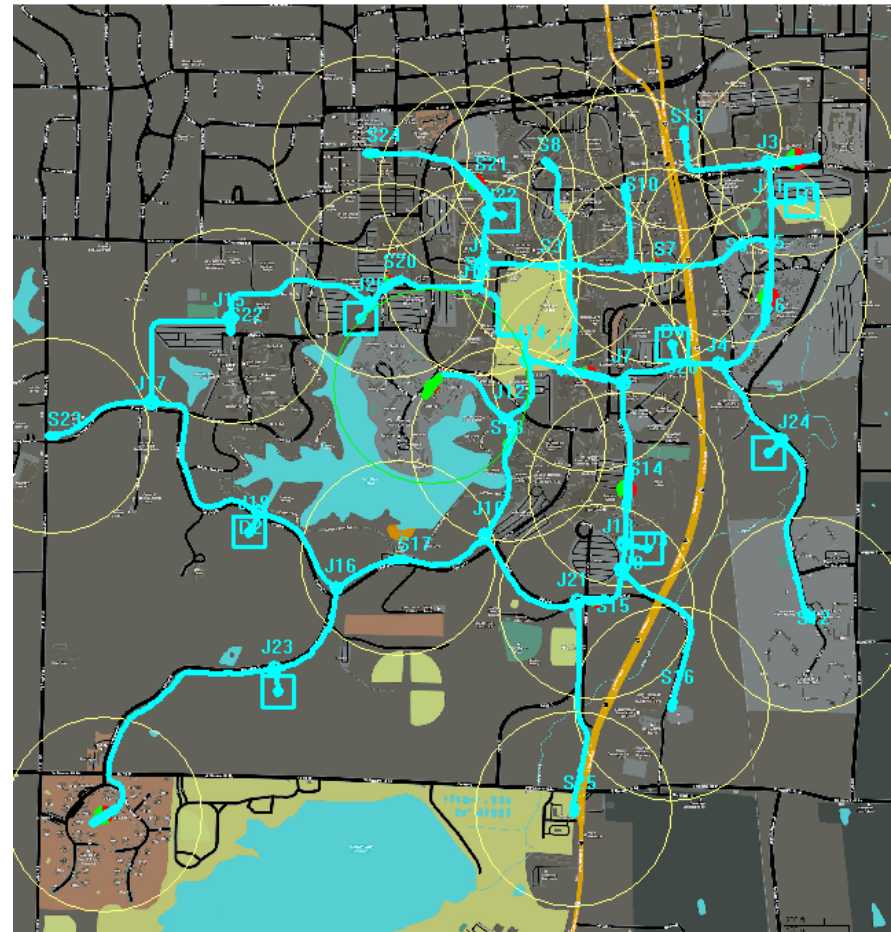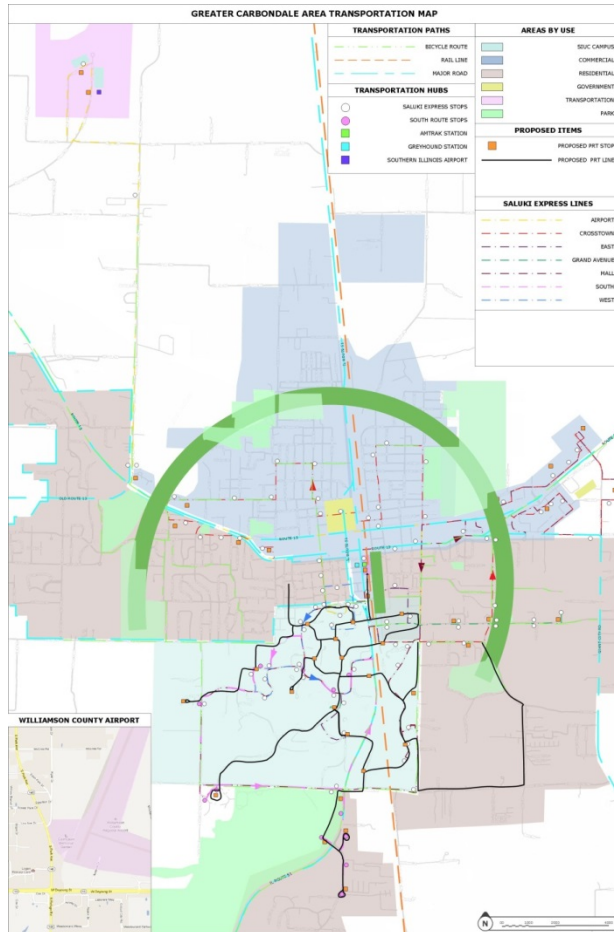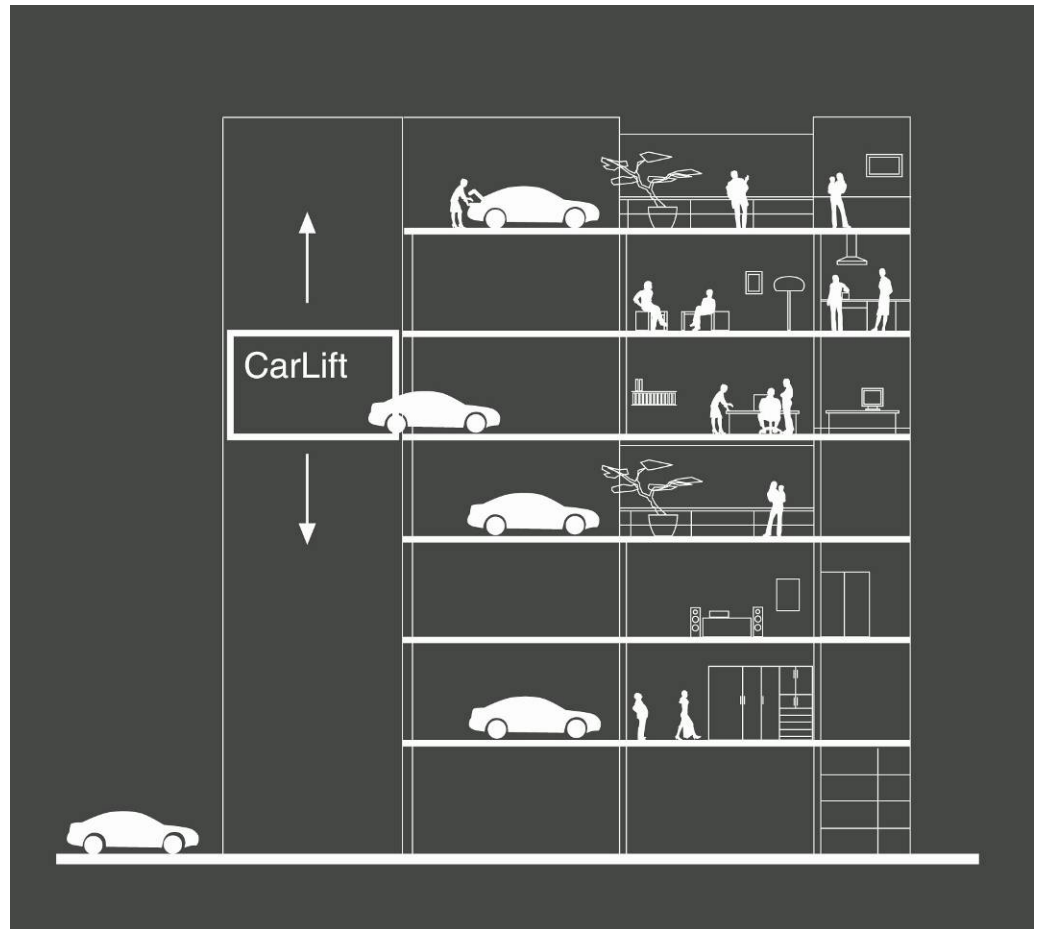*Section Connections: Configurations strategies and multiple synergies*

- Multi-directional

- Fully networked

- Multiple smaller stations for each community

- Potential for spatial or multi-level connections

- Potential to create fully walkable accessible communities



Student: Brandon Zahurba University of Nebraska 2001

# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment



Montana State Student work – Eryn Mikelson, 2002

# INTEGRATED MOBILITY

## *PRT* *(Personal Rapid Transit)*

### *& Connections with Other Modes and the Built Environment*

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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment
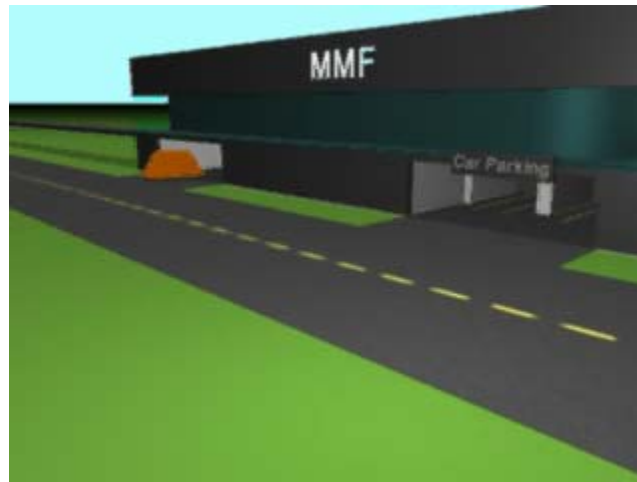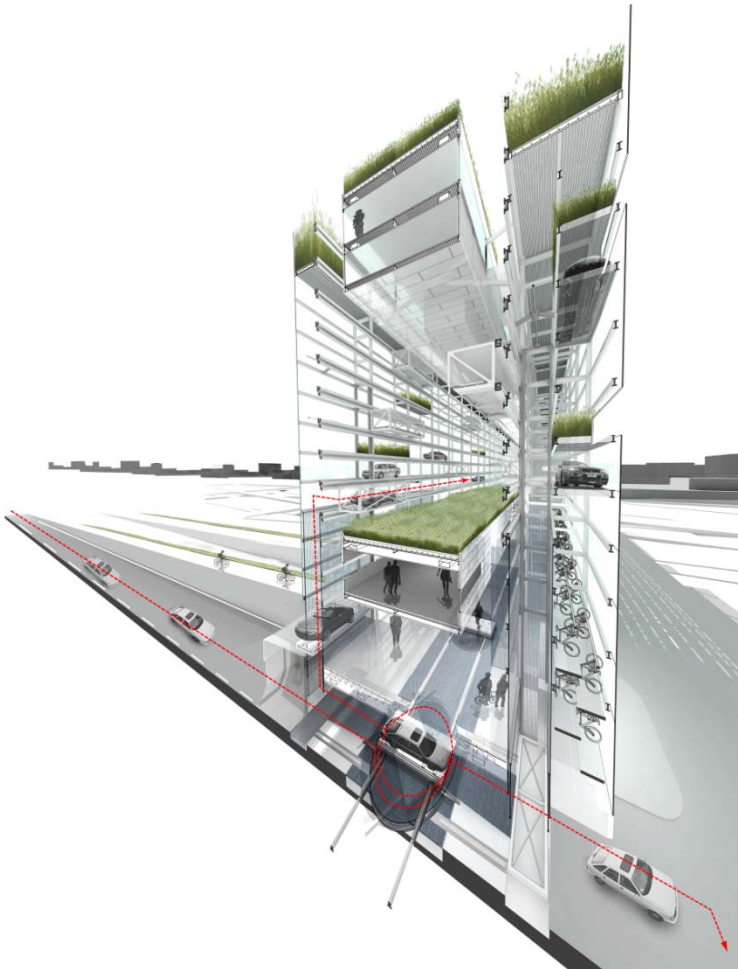
## We can move a PRT

- by elevator

- by ramp



CarLoft, Berlin, Germany

# INTEGRATED MOBILITY

## *PRT* **(Personal Rapid Transit)**

### *& Connections with Other Modes and the Built Environment*

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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment





photo credit: Shannon Sanders McDonald, Architect

Shannon Sanders McDonald, AIA

# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

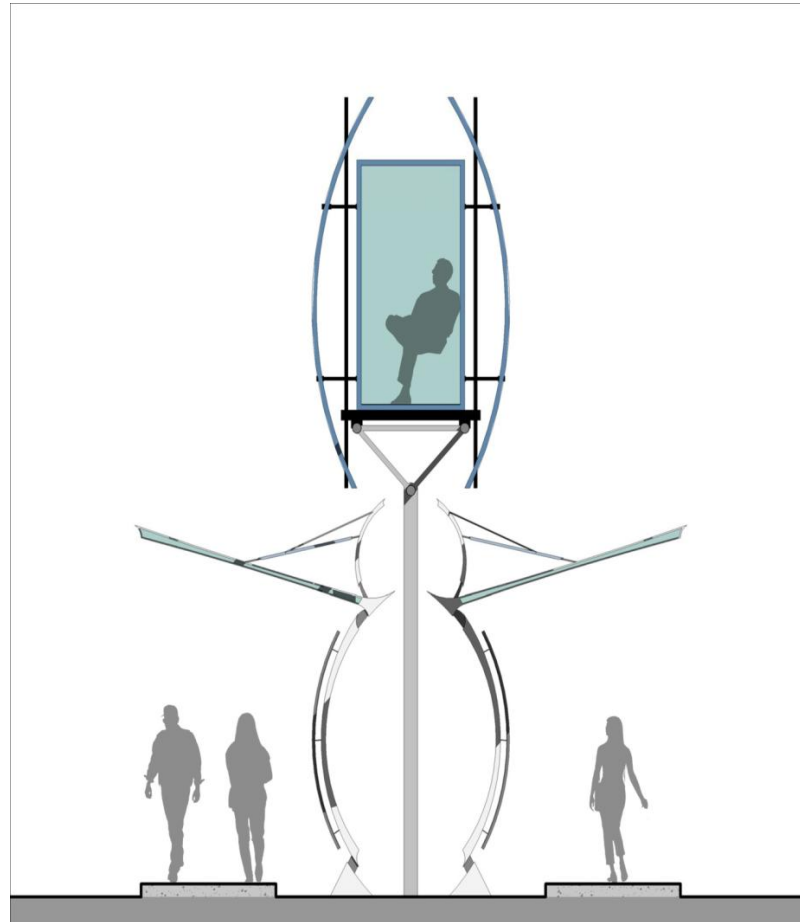### & Connections with Other Modes and the Built Environment



*Filter Garden*—Leven Betts Studio.

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# INTEGRATED MOBILITY

## *PRT* *(Personal Rapid Transit)*

## *& Connections with Other Modes and the Built Environment*
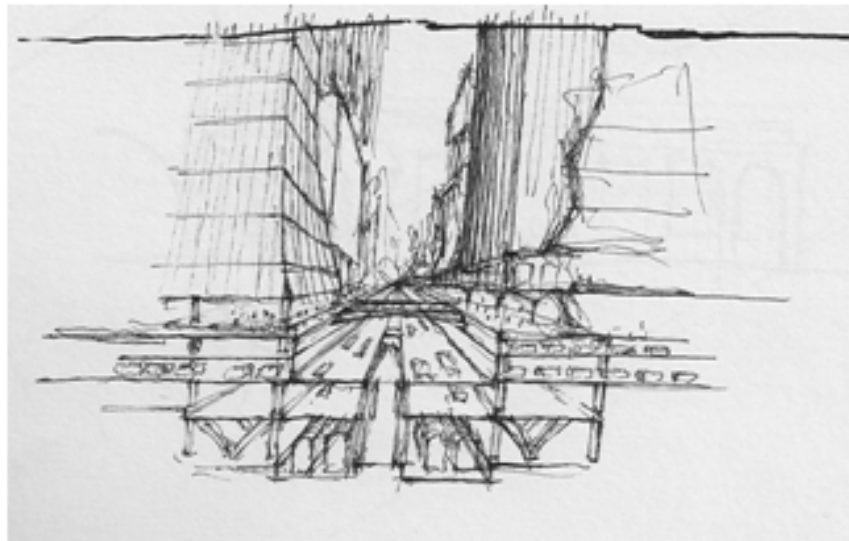


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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment



Connecting the Campus

In order for SPSU to be fully connected to other enclaves, it needs a space to serve as its outlet for commuting across multiple scales. Metropolitan Atlanta has so far failed to effectively create diverse methods of connection between its neighborhoods, districts, cities, counties. The primary transportation system is the road network. This system has the potential to operate across almost any distance, but its isn't the most efficient at all scales.

Scale

| Enclave/district | City | Metropolitan | State/Country |
|---|---|---|---|
| PRT | Highway | Inner-city Rail | High Speed Rail |

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# INTEGRATED MOBILITY

## PRT (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

Four Transportation Systems:
P R T ,   R o a d ,   S u b w a y ,   T r a i n

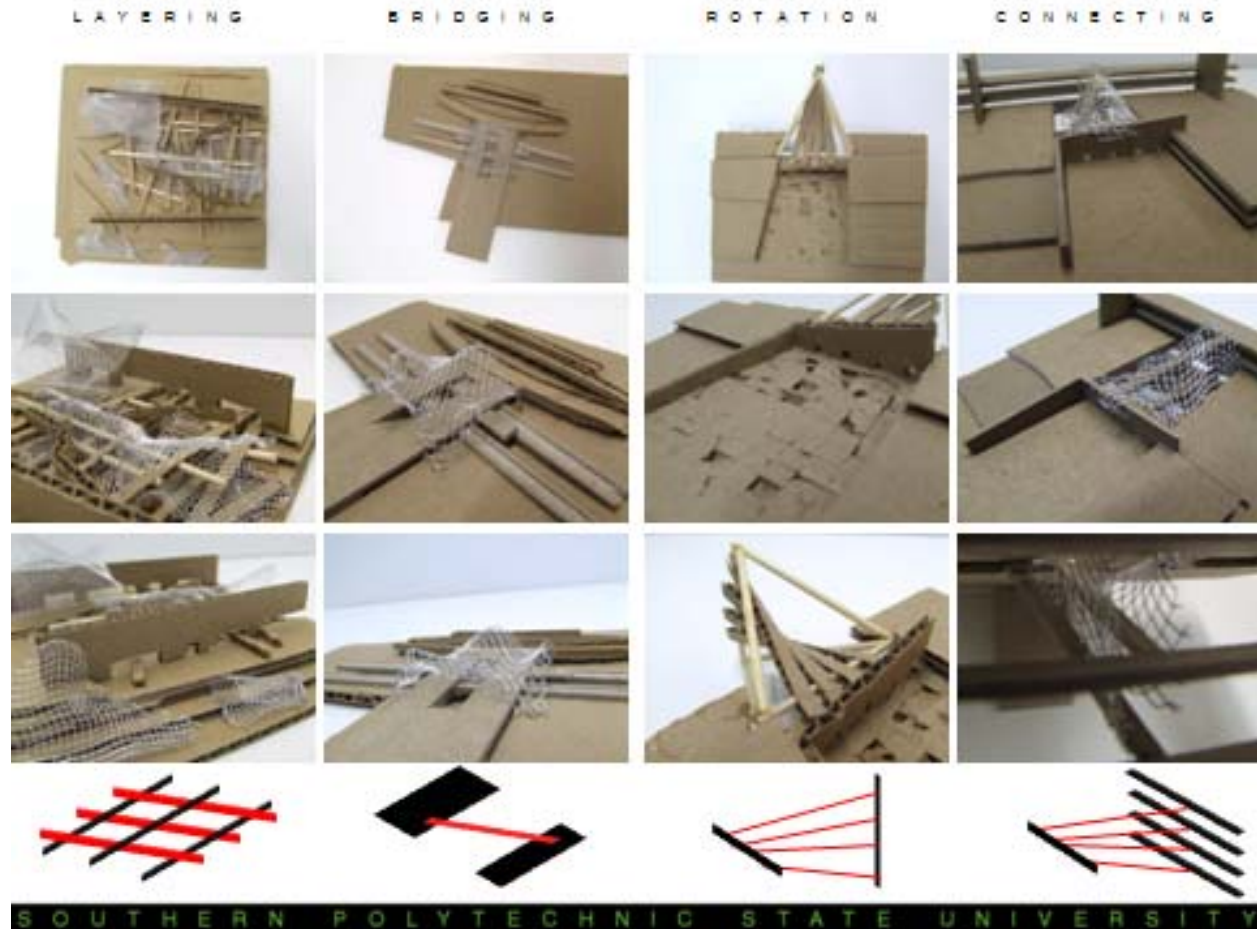| System | Distance (range) | Capacity (per range) |
|---|---|---|
| PRT | s, m, L | 1–4 (currently) |
| Road (car, truck, bus, etc.) | s, m, L, xL | 1–5 (car), 1–55 (bus) |
| Subway (inner city rail) | m, L | 150 (theoretical per car) |
| Train (national rail system) | L, xL | 800 (average) |



S O U T H E R N   P O L Y T E C H N I C   S T A T E   U N I V E R S I T Y

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# INTEGRATED MOBILITY

## *PRT* (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

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# INTEGRATED MOBILITY

## *PRT*  *(Personal Rapid Transit)*

### *& Connections with Other Modes and the Built Environment*

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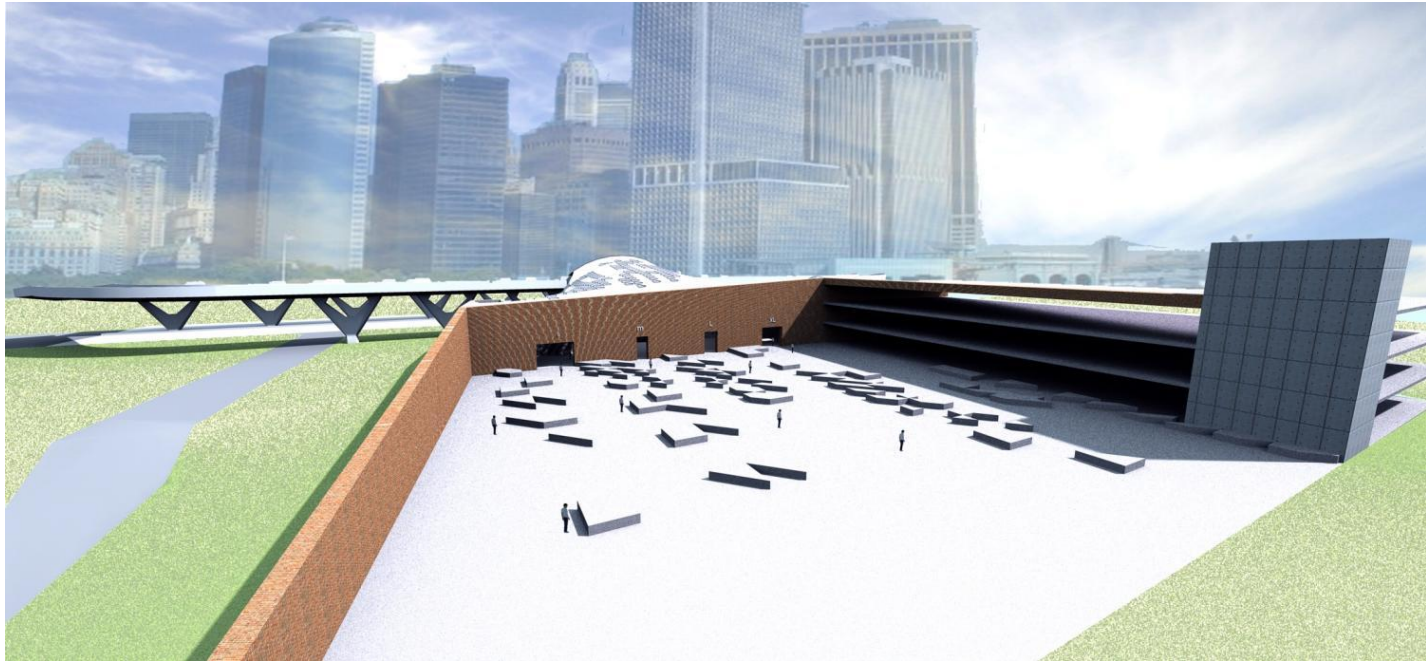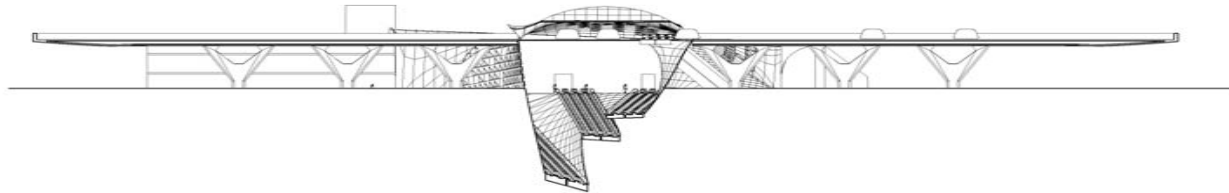
# INTEGRATED MOBILITY

## *PRT* (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

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# INTEGRATED MOBILITY

## PRT  (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment

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# INTEGRATED MOBILITY

## *PRT* (Personal Rapid Transit)

### & Connections with Other Modes and the Built Environment



PRT Station

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# INTEGRATED MOBILITY

## *Automated Transit (PRT) /Land Use/Architecture*

Man and Machine
Low and High Tech
*Movement*

people, architecture, urban design,
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and their future synergies

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