Bus Rapid Transit

National Bus Rapid Transit Institute
Center for Urban Transportation Research
University of South Florida
The National Bus Rapid Transit Institute (NBRTI)

- Housed at the Center for Urban Transportation Research (CUTR), University of South Florida (USF) in Tampa

- Established in 2001 to work in partnership with the Federal Transit Administration to support the development of BRT in the U.S.

- Core Program Areas:
  - Clearinghouse and Outreach
  - Technical Assistance and Support
  - Research and Demonstration
A framework for BRT in the United States – Characteristics of Bus Rapid Transit

- Defines the U.S approach to the BRT concept
- Categorizes different BRT applications
- Defines performance measures and impacts of BRT deployment
- Consistent with U.S federal funding mechanisms
- Provides a database of information for BRT systems in the U.S and abroad
- Originally published in 2004. Can be downloaded at: www.nbrti.org
- Update to be published this year
What is a BRT system?

**BRT** is an integrated bus-based “rapid” transit system typically utilizing highly-flexible service and advanced technologies to improve customer convenience and reduce delays.
BRT in the U.S – A System of Systems

Integration of Elements

RUNNING WAYS

STATIONS

VEHICLES

SERVICE AND OPERATION PLANS

FARE COLLECTION

INTELLIGENT TRANSPORTATION SYSTEMS

MARKETING AND BRANDING

Metro Rapid

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Travel Ways

- **Exclusive or shared** transit ways
  - at-grade or grade-separated

- **Bus priority/HOV** lanes (Houston)

- **Dedicated** transit

- **Transit streets or transit malls**

- **Mixed traffic** (signal priority)

- **Queue jumps**
  - permit BRT vehicles to “jump” ahead of traffic queues
Arterial Bus Lanes

London
Quality Bus Corridor

Boston: Silver Line
Bus/Transitway on Freeway ROW

Median
Houston: Transitways

Shoulder
Brisbane: SE Busway
Running Ways

Arterial Median Busway
Rouen, France: TEOR
Service Alternatives

- **Premium service**
- **Higher average speeds** than local service
- **Average speeds comparable to LRT**
- Parallel local and express service
- **Major commuter corridors**
- **Skip stop**
- **Reliable**
- **High frequency**
- **All day**
- Reduced dwell time
- **Highly flexible**
- **No schedule**
Route Structures

- More direct than local service
- “Off-line” stations
- Anchored by major activity centers
- **Major corridors**
- Feeder routes
- Operate in low-density residential
- **Flexible**
- Effect on Land use
- No map
Stations

- Differentiated from regular bus stops
- Enhanced shelters and/or transit center design
- Designated passenger “platform,” possibly raised
- Enclosed
- Can be multi-modal
- Other facilities (taxi stands, parking, etc.)
- Customer information (real-time)
- Joint-development/multi-use
- Facilitates quick boarding and exit
- Precision docking
- ADA accessible
Level Boarding is the key to creating a rail-like experience. All of the above examples are bus-based systems that use it.
Vehicles

- Unique/distinct aesthetic design/look
- Environmentally friendly
- Variable propulsion systems
- **High capacity** (articulated, bi-articulated)
- Wide aisles, increased passenger comfort
- **Low-floor**
- Large window design
- Increased amenities (laptop connections)
- **Multiple double-wide doors**
- Dual-sided entry/exit
- LRT like
Range of BRT Vehicle Options: Conventional Buses

- Van Hool 300AG
- Zuidtangent
  - Amsterdam
- York Rapid Transit
  - Toronto
- New Flyer 60LF
- Vancouver 98, 99B
- Ottawa Transitways
Specialized BRT Vehicles

- Irisbus Civis
  - Las Vegas MAX

- ATS Phileus
  - Eindhoven, Netherlands
Well-Lit, Open, Quiet Interior
Vehicle Guidance

Curb-Guided (O-Bahn)
- Adelaide: US$9 million/mile

Embedded Guiderail
- Nancy, France
- Rouen, France

Optical Guidance
- Leeds, UK: US$5 million/mile
Technology Demonstration

• **Vehicle Assist and Automation**
  - Assists or automates movement of buses to allow precise operations in extremely narrow lanes, at stations, and bus maintenance facilities
  - Includes precision docking, lateral guidance, and collision warning and avoidance
  - Project currently underway in Oakland, CA and Eugene, OR

• **Intermittent Bus Lanes**
  - Provides exclusive access to buses for finite time periods using signaling technology and access restrictions
  - Currently seeking an industry partner
ITS – Advanced Technologies

- Automated vehicle location
  - real-time information
  - next vehicle
  - stop announcements
  - “ITEC” on-board info system
- Signal priority/preemption
  - reduce vehicle bunching
  - consistent wait times
  - on-time performance
- Surveillance & security
  - at stations
  - on vehicles
Signal priority and low floor vehicles aided in a:

- 28 to 33% decrease in travel time
- 30% increase in ridership, 14% net new
- No appreciable impact on cross-street traffic
Passenger Information

UIVA Blue
Cornell 05 Mins
12:09p
Leslie Street

 Hospital Intercom
Faster Fare Collection

- Fast, efficient so as to speed boarding
- **Simple** to understand
- Minimal on-vehicle transactions
- **Cashless**
  - smart cards (multi-use)
  - pre-purchased tickets
  - passes
- **Proof of payment**
  - enter station
Off–Board Fare Collection Options

Proof-of Payment: TVM
York, On. Rapid Transit

Smart Card Fare Gates
TransMillenio, Bogota
## Similar Operating Characteristics

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Rapid Transit Mode</th>
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<tbody>
<tr>
<td></td>
<td><strong>BRT</strong></td>
<td><strong>LRT</strong></td>
<td></td>
</tr>
<tr>
<td>ROW Options</td>
<td>Exclusive or Mixed Traffic</td>
<td>Exclusive or Mixed Traffic</td>
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</tr>
<tr>
<td>Station Spacing</td>
<td>1/4 to 1 Mile</td>
<td>1/4 to 1 Mile</td>
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<tr>
<td>Vehicle Seated Capacity</td>
<td>40 to 85 Passengers</td>
<td>65 to 85 Passengers</td>
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<tr>
<td>Average Speed</td>
<td>15-30 mph</td>
<td>15-30 mph</td>
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</tr>
<tr>
<td>P/H/D (exclusive ROW)</td>
<td>Up to 30,000</td>
<td>Up to 30,000</td>
<td></td>
</tr>
<tr>
<td>P/H/D (arterial)</td>
<td>Up to 10,000</td>
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<tr>
<td>Capital ROW Cost/Mile</td>
<td>$0.2M to $25M/Mile</td>
<td>$20M to $55M/Mile</td>
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<tr>
<td>Capital Cost/Vehicle</td>
<td>$0.45M to $1.5M</td>
<td>$1.5M to $3.5M</td>
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<tr>
<td>O&amp;M/SH</td>
<td>$65 to $100</td>
<td>$150 to $200</td>
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Range and Cost of BRT applications
- Runningway Type is a core issue

- Mixed Traffic: $1M per mile
- Bus lanes: $5M per mile
- Busways: $25M per mile
Bus Rapid Transit in the U.S.
BRT in the United States: A Range of Complexity

- Beginning to Catch On
- Debate between BRT and LRT
- BRT Lite
- Rail-Like BRT
- Tradeoffs
  - Permanence vs. Flexibility vs. Affordability
Overview of BRT Implementation in the U.S.

Mixed Traffic Operation

Shoulder / Median Bus lanes

Exclusive Busways

= operating

= planned

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Exclusive Busways
Conclusions

- Offer as “Premium” service
- **Brand** as unique, integrated service
- **Unique** characteristics
  - vehicles
  - stations
  - fare payment
  - “running way”
  - higher speed
  - highly flexible
  - ITS
- Environmentally friendly
- The future
  - precision docking
  - magnetic guidance (driverless)
Conclusions

- BRT can provide effective solutions
- Characteristics suited to high and lower density environments
- Offer advantages in early & incremental implementation
- Ultimately its reliability, directness, convenience
- Low cost, high capacity alternative
Thank you for your attention

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