

CCTA

Why a Pulse System?



Why Use a Pulse?

- Most often used by small systems (12 or fewer local routes) with infrequent service (30 minutes or more)
- **Goal is connectivity**
 - With infrequent service, wait for transfers would be onerous without coordination

Transfers

- Minimize negative effects of transfers
 - One-seat rides always preferable for passengers
 - Not possible for all passenger trips
- Extra waiting time for transfer decreases convenience
- Comfortable, weather-protected waiting area mitigates the impact of transfer

CCTA Transfer Patterns

- 12% of all riders transfer (FY09 data)
- 81% of all transfers occur at Cherry Street
 - Over 900 passengers transfer at Cherry Street on an average weekday
 - 43% of all boardings at Cherry Street are transferring passengers
- Transfers occur among all routes

Route-to-Route Transfers

From Route	To Route						
	Wiliston	Essex Jct	Pine St	Shelburne	North Ave	City Loop	Riverside/ Winooski
Wiliston		31	16	31	24	16	29
Essex Jct	43		18	37	36	9	24
Pine St	28	27		11	26	8	8
Shelburne	30	38	4		25	14	13
North Ave	30	37	21	32		12	14
City Loop	13	9	8	13	15		6
Riverside/ Winooski	23	26	6	12	15	4	

Note: additional 35 transfers between Neighborhood Specials and local routes at Cherry Street, and another 10 transfers between LINK routes and local routes at Cherry Street

Waiting Times

- Research shows that 10 minutes of wait time equivalent to 25 minutes of travel time*
- Non-pulse systems must therefore operate at a high frequency to avoid long transfer wait times

*National Academy of Sciences, TCRP Report 100: Transit Capacity and Quality of Service Manual, Part 3, page 3-20

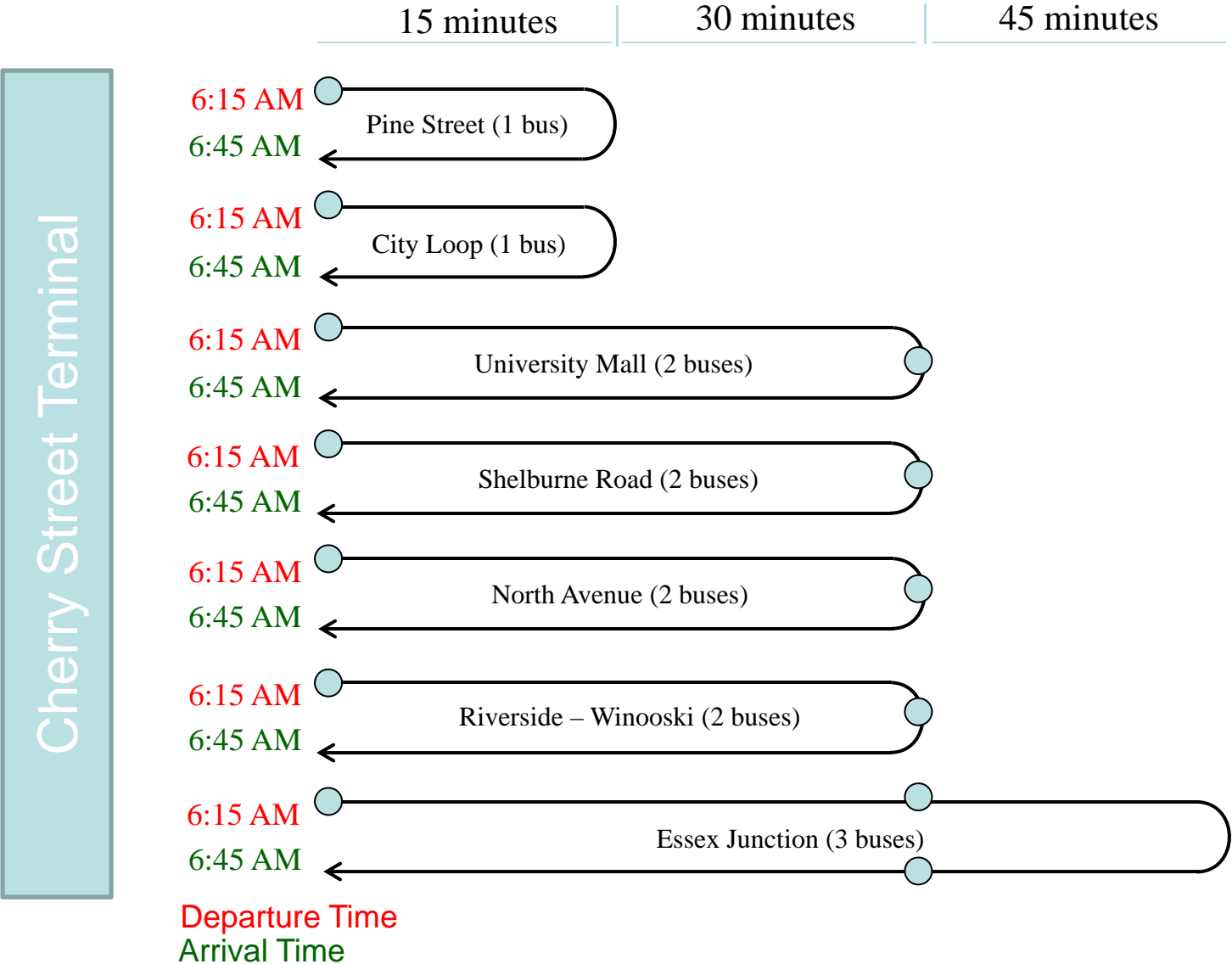
Bus Frequency

- With 30-minute headways, transfer wait times could be as long as 29 minutes
 - Equivalent to more than an hour of travel time
 - Would drive away riders
- Minimum service for non-pulse operation is headway of no more than 15 minutes—preferably 10—for all local routes all day
 - Results in wait times of less than 10 minutes

Current Pulse Operation

- Seven local bus routes depart from Cherry Street at 15 and 45 minutes past the hour, Monday-Saturday
 - Essex and Williston routes also have weekday peak period departures on the hour and half hour, and City Loop has 15 minute service for two hours in the AM Peak
 - Span of service is at least 6:45 a.m. to 6:15 p.m. on all pulse routes
- Three Inter-regional and two Regional Commuters
 - Timed to work with pulse (transfer to or from)
 - AM arrivals just before pulse
 - PM departures just after pulse

How the Pulse Works in Practice



Challenges of Pulse

- Restricts flexibility in route planning due to need for running time compatibility
 - Round trip running times (from station to end of line and back) of each route need to be multiples of each other
- Requires sufficient capacity at bus terminal for all routes at once

Alternative to Pulse 1: High Frequency

- Operate all seven local routes at 15 minutes
 - Capital cost of \$3 million for 8 new buses
 - Increased annual operating cost of \$2.5 million (for 12 hours of 15-minute service on weekdays)
- Operate all seven local routes at 10 minutes
 - Capital cost of \$6 million for 16 new buses
 - Increased annual operating cost of \$5.7 million (for 12 hours of 10-minute service on weekdays)
- Note: Maintenance facility currently at capacity for parking buses

Space Needs for High Frequency

- Similar number of bus berths needed for high frequency service as for pulse
- Buses need layover time and locations at station
 - Driver bathroom breaks
 - Makeup time for unusual traffic
 - Makeup time for unusually long ADA boardings on last trip
 - Transfers among buses

Alternative to Pulse 2: Split Pulse in Half

- Five routes departing every 15 minutes
 - Two fewer bus berths needed for local routes (5)
 - Possible ridership loss of 230 passengers per day
 - 25% of current transfers
 - 2.5% of total current ridership
 - About \$50,000 in revenue lost

- On the hour and half hour
 - Essex
 - Williston
 - City Loop (AM Peak)
 - Riverside/Winooski
 - Pine St.

- Quarter after and quarter of
 - Essex
 - Williston
 - City Loop
 - Shelburne
 - North Ave

Loss estimates based on -0.4 elasticity from Ecosometrics report, 1981

Alternative to Pulse 3: Distributed Departures

- Each route departs on its own schedule
 - Only four bus berths needed for seven local routes at current service level
 - Possible ridership loss of 360 passengers per day
 - 40% of current transfers
 - 3.9% of total current ridership
 - About \$75,000 in revenue lost

Loss estimates based on -0.4 elasticity from Ecosometrics report, 1981

Longer Term Implications

- TDP recommendations include 15-minute peak service for all local routes
 - North Ave and Shelburne Road next in line
- As service level increases, pulse becomes less necessary but space requirements at terminal increase
- Pulse still desirable for midday, evening and Saturday service for foreseeable future

Conclusions

- Sufficient space at downtown terminal needed now for pulse operations
 - Short-term alternatives too costly in terms of dollars or lost riders
- Sufficient space needed in the future for enhanced service level
 - Allow for expansion of service on current routes and new routes