II. Terminology and Basic Relationships

Public Transport
Planning and Regulation:
An Introduction
Planning and Analysis
Building Blocks

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Focus of Discussion
## Basic Public Transport Terms

### Service
- Route Alignment
- Terminal (Route)
- Garage (Parking and Maintenance)
- Span of Service
- Interval (Frequency)
- Time
  - Running
  - Terminal
  - Cycle
- Bus Requirements

### Output
- Ridership
- Commercial Hours/KM
- Dead Hours/KM
- Vehicle Hours/KM
- Vehicle Capacity
- Passengers at Maximum Load Point
Comments on Terminology

- Public transport systems sometimes use different terms to define the same operating concepts

- This presentation uses common terminology found in many countries
Route Alignment

Path Over Which the Bus Travels

- Balance between coverage and directness
- Maybe different alignments based on time of day
  - Some systems give new route name to each separate alignment and/or direction
Terminal

The end of a route

- May be shared by several routes
- May also be served by different modes
  - Intercity bus or feeder
- Bus stations often provided at major terminals
Garage (Parking and Maintenance)

• Operating facility

• Functions (more added as number of buses increases)
  – Parking
  – Daily, routine servicing
  – Vehicle repair
  – Driver assignment
Span of Service

Total Clock Hours Over Which Public Transport Service is Operated

• Common spans of service
  – Work days
    • All day (covers both peak commuting periods)
    • AM, PM peak commuting hours only
    • “Owl” (early morning) service
  – Saturday service
  – Sunday (Friday) and holiday service
Interval (Frequency)

Time in Minutes Between Two Arrivals (or Departures) of Buses or Trains

e.g., At an interval of 10 minutes, a bus or train departs every 10 minutes

• Interval is the inverse measure of service frequency

\[(60/\text{interval}) = \text{Buses/Hour}\]
Running Time

Travel Time From One Terminal to the Other Terminal

e.g., The running time for a bus that leaves Terminal A at 7:00 AM and arrives at Terminal B at 7:50 AM is 50 minutes

• Running times often vary by direction and time of day, so monitoring is important:
  – Efficient scheduling of vehicles
  – Good passenger information
Terminal Time

*Time scheduled for a respective vehicle between when it arrives at a terminal and when it departs for its next trip*

e.g., “A bus arrives at Terminal B at 7:50 AM and departs on its next trip at 8:00 AM. The terminal time is 10 minutes”

- Reasons for terminal time
  - Time to get back on schedule if the trip arrives late at terminal
  - A rest break for the driver
- Often 12-18% of running time
- Requires space at terminal for parking the bus
Cycle Time

Total Time Required for a Vehicle to Make a Complete Round Trip on a Route

Cycle Time = Round Trip Running Time + Terminal Time

e.g., One-Way Running Time = 50 minutes each direction

Terminal Time = 10 minutes at each terminal

Cycle Time = (50 minutes $\times$ 2) + (10 minutes $\times$ 2)

= 120 Minutes
Bus Requirements

Number of buses (vehicles) required to operate a transport route for a given interval

Buses in service = Cycle time/Interval

e.g.,
Cycle time = 120 minutes
Interval = 10 minutes
Buses requirements = 120/10 = 12

• The number must be an integer (whole number)
The Planner’s Dilemma: Required Number of Buses Is Not An Integer

• **Problem**
  
  Cycle Time = 72; Interval = 11
  
  Buses in Service = 72/11 = 6.5

• **Solution 1:** Add additional terminal time
  
  Buses in Service = (72 + 5)/11 = 7

• **Solution 2:** Reduce interval
  
  Buses in Service = (72)/9 = 8

• **Solution 3:** “Stretch” interval
  
  Buses in Service = (72)/12 = 6
Ridership

Number of Passengers

- Boarding Passengers
  - Counted each time a passenger boards a vehicle
  - Most common measure of ridership
- Person (Origin-Destination) Trips
  - Counted once for each origin-to-destination journey, irrespective of transfers
  - Smaller number than boarding passengers
Boarding Passengers and Person Trips

One passenger travels from home to work

Boards Route 5, transfers to Route 33, and gets off at work

Boarding passengers = 2

Person trips = 1
Commercial Hours and Kilometers

*Hours and Kilometers Operated When Transport Vehicles Available to Public*

Includes:
- Running time
- Terminal time

- Sometimes called *effective hours or kilometers*
Dead Hours and Kilometers

*Hours and Kilometers Traveled By Transport Vehicle When Not In Revenue Service*

- Includes hours (KM) that a vehicle travels between either
  - The garage and route or
  - Two routes when the vehicle changes routes
Vehicle Hours and Kilometers

*Hours and Kilometers Traveled From Pull-Out from Garage to Pull-In*

- Includes
  - Commercial time
  - Dead time

- Does not include other KM/hours such as training
Capacity

Maximum number of passengers that can be carried on a vehicle = number of seats + the number of permitted standing passengers

e.g.,
Number of Seats on the Bus = 48
Number of Permitted Standing Passengers = 112
Capacity of the Bus = 48 + 112 = 160 Passengers
Reasons Vehicle Capacities Vary Among Public Transport Operators

- **Number of doors**
  - Affect loading/unloading times and seating space
- **Low-floor buses**
  - Less interior space, faster loading/unloading times
- **Space allocation for seats and standing areas**
  - Tradeoff between carrying capacity (operations efficiency) and quality of service provided to riders
  - More seats provided when standing times are long
- **Policies regarding standing passengers/meter²**
  - Tradeoff between carrying capacity (operations efficiency) and quality of service provided to riders
  - Reflect local norms regarding comfortable personal space
Passengers at the Maximum Load Point

Number of Passengers On-Board a Transit Vehicle as It Passes the Location on the Route with the Maximum Passengers On-Board

• Typically on the edge of downtown for routes serving the center city
• Used for scheduling vehicles to meet occupancy (load) factor standards or maximum allowed capacity
Passenger Demand Profile for Radial Route

![Bar graph showing passenger demand profile for a radial route. The stops are Electronic City, Kudlu Gate, Madiwala, Maharanis College, and City Market. The graph indicates the number of passengers boarding and leaving at each stop.]

- **Electronic City**: Low demand
- **Kudlu Gate**: Moderate demand
- **Madiwala**: Highest demand
- **Maharanis College**: Moderate demand
- **City Market**: Moderate demand
Summary

- Defined 15 key public transport terms

- Using common public transport terms makes it easier to:
  - Communicate with transport professionals,
  - Learn from other transport systems, and
  - Compare performance results