

IX. Schedule Building

Public Transport Planning and Regulation: An Introduction



Planning and Analysis Building Blocks



Focus of Discussion	Schedule Building	Cost Analysis and Financial Planning
Performance Analysis		
Measures & Standards	Service Monitoring and Data Collection	
Network and Route Design	Fares and Revenue: Policy, Analysis, and Collection	
Market Factors and Demand Analysis	Terminology and Basic Relationships	





Why is Schedule Building Needed?

- **Passengers**
 - Provide dependable travel
 - Provide information to travelers
- **Operator**
 - Deploy vehicles and operators
 - Maximize operating efficiency
 - Analyze trade-offs between operating efficiencies and passenger crowding/waiting times



IX-3



Schedule Building A Five-Step Process



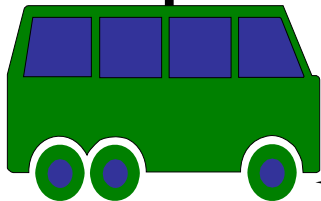
- 1. Determine needed intervals (frequencies)**
- 2. Prepare interval table (specific trips)**
- 3. Create vehicle assignments (blocking)**
- 4. Create driver assignments (run cutting)**
- 5. Estimate driver/conductor requirements (rostering)**



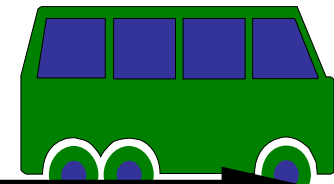


Determine Intervals

- **Demand interval**
 - Based on observed (forecast) demand
 - Interval set from efficiency point-of-view
- **Policy interval**
 - Maximum interval regardless of demand
 - Policy set either by:
 - Public authority
 - Operator (marketing concerns)

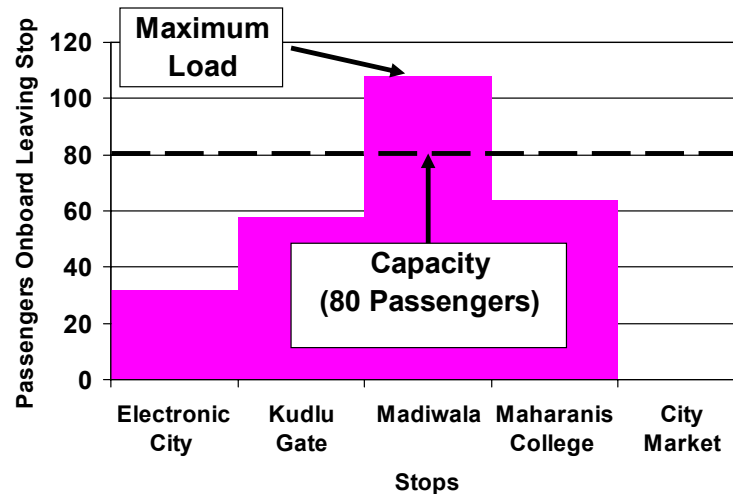


Interval



Demand Interval

- Provide sufficient vehicles to meet passenger demand



Operating Period	Seats	Acceptable Passenger Capacity
Crush Peak	40	80
Peak	40	60
Base	40	40



Demand Interval Calculations

Mairie to Corniche

Time Period	Passengers at Maximum Load Point	Acceptable Passenger Capacity	Demand interval
6:00 AM — 7:00 AM	240	60	15
7:00 AM — 8:00 AM	600	80	8
8:00 AM — 9:00 AM	400	60	9
9:00 AM — 10:00 AM	200	40	12
10:00 AM — 11:00 AM	100	40	24
11:00 AM — 12:00 PM	90	40	27



Policy Interval Adjustments Mairie to Corniche

Time Period	Demand Interval	Policy Interval	Adjusted Interval
6:00 AM — 7:00 AM	15	20	15
7:00 AM — 8:00 AM	8	10	8
8:00 AM — 9:00 AM	9	10	9
9:00 AM — 10:00 AM	12	20	12
10:00 AM — 11:00 AM	24	20	20
11:00 AM — 12:00 PM	27	20	20





Prepare Interval Table

- Determine key arrival (departure) times at key market location — *Schedule Building Point*
- Add (subtract) running times to determine arrival (departure) times at other time points



Determine Arrival (Departure) Times at the Schedule Building Point Mairie to Corniche

Trips to Corniche			
Trip Number	Arrival Time	Interval	Next Trip
1	6:00 AM	20	6:20 AM
2	6:20 AM	20	6:40 AM
3	6:40 AM	20	7:00 AM
4	7:00 AM	10	7:10 AM
5	7:10 AM	10	7:20 AM
6	7:20 AM	10	7:30 AM



Determine Arrival/Departure Times at Other Time Points Mairie to Corniche

Trips to Corniche			
Trip Number	Departure Time	Running Time	Arrival Time
1	5:35 AM	25	6:00 AM
2	5:55 AM	25	6:20 AM
3	6:15 AM	25	6:40 AM
4	6:35 AM	25	7:00 AM
5	6:45 AM	25	7:10 AM
6	6:55 AM	25	7:20 AM





Create Vehicle Assignments (Blocking)

- Link trips together at a common terminal point
 - Sometimes involves “deadheading” equipment between routes
- Match arrival and departure times at a terminal, allowing for “terminal time”
- Make minor schedule modifications (where necessary) to achieve good linkages



Example of Vehicle Blocking Mairie to Corniche

Block Number	Depart Mairie	Arrive Corniche	Depart Corniche ¹	Arrive Mairie	Time Ready for Next Trip ¹
	5:35 AM	6:00 AM	6:05 AM	6:30 AM	6:35 AM
	5:55 AM	6:20 AM	6:25 AM	6:50 AM	6:55 AM
	6:15 AM	6:40 AM	6:45 AM	7:10 AM	7:15 AM
	6:35 AM	7:00 AM	7:05 AM	7:30 AM	7:35 AM
	6:45 AM	7:10 AM	7:15 AM	7:40 AM	7:45 AM
	6:55 AM	7:20 AM	7:25 AM	7:50 AM	7:55 AM
	7:05 AM	7:30 AM	7:35 AM	8:00 AM	8:05 AM
	7:15 AM	7:40 AM	7:45 AM	8:10 AM	8:15 AM
	7:25 AM	7:50 AM	7:55 AM	8:20 AM	8:25 AM
	7:35 AM	8:00 AM	8:05 AM	8:30 AM	8:35 AM
	7:45 AM	8:10 AM	8:15 AM	8:40 AM	8:45 AM
	7:55 AM	8:20 AM	8:25 AM	8:50 AM	8:55 AM
	8:05 AM	8:30 AM	8:35 AM	9:00 AM	9:05 AM
	8:15 AM	8:40 AM	8:45 AM	9:10 AM	9:15 AM
	8:25 AM	8:50 AM	8:55 AM	9:20 AM	9:25 AM
	8:35 AM	9:00 AM	9:05 AM	9:30 AM	9:35 AM
	8:55 AM	9:20 AM	9:25 AM	9:50 AM	9:55 AM
	9:15 AM	9:40 AM	9:45 AM	10:10 AM	10:15 AM
	9:35 AM	10:00 AM	10:05 AM	10:30 AM	10:35 AM

¹5 minute layover at each route terminal



Creation of Vehicle Assignment (Block) 1

Block Number	Depart Mairie	Arrive Corniche	Depart Corniche1	Arrive Mairie	Time Ready for Next Trip ¹
1	5:35 AM	6:00 AM	6:05 AM	6:30 AM	6:35 AM
	5:55 AM	6:20 AM	6:25 AM	6:50 AM	6:55 AM
	6:15 AM	6:40 AM	6:45 AM	7:10 AM	7:15 AM
1	6:35 AM	7:00 AM	7:05 AM	7:30 AM	7:35 AM
	6:45 AM	7:10 AM	7:15 AM	7:40 AM	7:45 AM
	6:55 AM	7:20 AM	7:25 AM	7:50 AM	7:55 AM
	7:05 AM	7:30 AM	7:35 AM	8:00 AM	8:05 AM
	7:15 AM	7:40 AM	7:45 AM	8:10 AM	8:15 AM
	7:25 AM	7:50 AM	7:55 AM	8:20 AM	8:25 AM
1	7:35 AM	8:00 AM	8:05 AM	8:30 AM	8:35 AM
	7:45 AM	8:10 AM	8:15 AM	8:40 AM	8:45 AM
	7:55 AM	8:20 AM	8:25 AM	8:50 AM	8:55 AM
	8:05 AM	8:30 AM	8:35 AM	9:00 AM	9:05 AM
	8:15 AM	8:40 AM	8:45 AM	9:10 AM	9:15 AM
	8:25 AM	8:50 AM	8:55 AM	9:20 AM	9:25 AM
1	8:35 AM	9:00 AM	9:05 AM	9:30 AM	9:35 AM
	8:55 AM	9:20 AM	9:25 AM	9:50 AM	9:55 AM
	9:15 AM	9:40 AM	9:45 AM	10:10 AM	10:15 AM

¹5 minute layover at each route terminal



Final Blocking Mairie to Corniche

Block Number	Depart Mairie	Arrive Corniche	Depart Corniche1	Arrive Mairie	Time Ready for Next Trip ¹
1	5:35 AM	6:00 AM	6:05 AM	6:30 AM	6:35 AM
2	5:55 AM	6:20 AM	6:25 AM	6:50 AM	6:55 AM
3	6:15 AM	6:40 AM	6:45 AM	7:10 AM	7:15 AM
1	6:35 AM	7:00 AM	7:05 AM	7:30 AM	7:35 AM
4	6:45 AM	7:10 AM	7:15 AM	7:40 AM	7:45 AM
2	6:55 AM	7:20 AM	7:25 AM	7:50 AM	7:55 AM
5	7:05 AM	7:30 AM	7:35 AM	8:00 AM	8:05 AM
3	7:15 AM	7:40 AM	7:45 AM	8:10 AM	8:15 AM
6	7:25 AM	7:50 AM	7:55 AM	8:20 AM	8:25 AM
1	7:35 AM	8:00 AM	8:05 AM	8:30 AM	8:35 AM
4	7:45 AM	8:10 AM	8:15 AM	8:40 AM	8:45 AM
2	7:55 AM	8:20 AM	8:25 AM	8:50 AM	8:55 AM
5	8:05 AM	8:30 AM	8:35 AM	9:00 AM	9:05 AM
3	8:15 AM	8:40 AM	8:45 AM	9:10 AM	9:15 AM
6	8:25 AM	8:50 AM	8:55 AM	9:20 AM	9:25 AM
1	8:35 AM	9:00 AM	9:05 AM	9:30 AM	9:35 AM
2	8:55 AM	9:20 AM	9:25 AM	9:50 AM	9:55 AM
3	9:15 AM	9:40 AM	9:45 AM	10:10 AM	10:15 AM

¹5 minute layover at each route terminal



Implications of Peaking

- **The example shows more service in the peak than in the off-peak (10 versus 20 minute intervals)**
- **Some buses/drivers (blocks 4, 5, 6) only work during the peak**
 - **Inefficient use of vehicles (e.g., only 2 hours needed in each peak (AM, PM))**
 - **Significant percentage of time spent traveling to and from garage (deadheading)**
 - **Potentially low labor productivity**



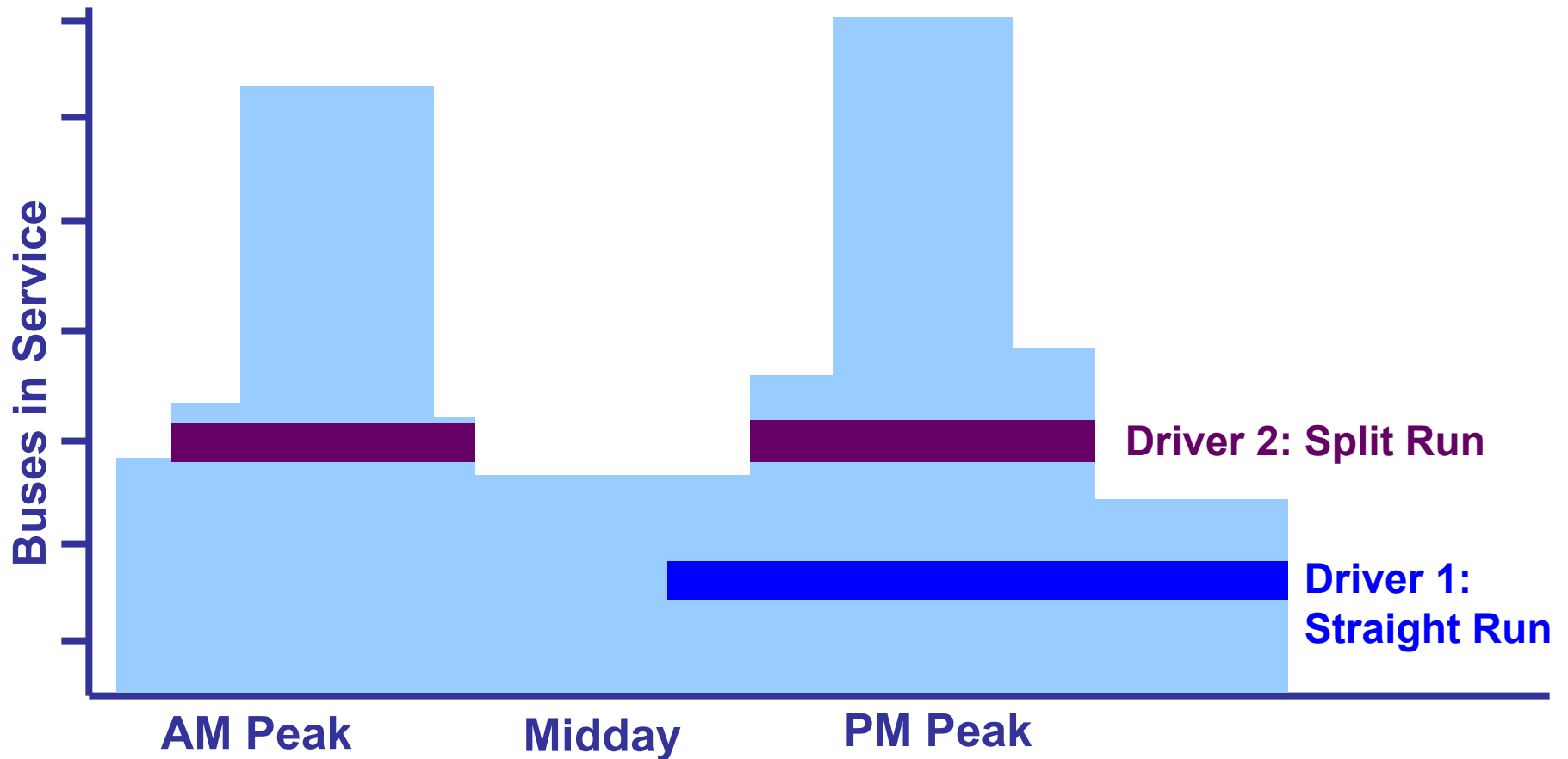


Create Driver Assignments (Run Cutting)

- If conductors are used, must also create conductor assignments
- Basic objective is to minimize driver (and conductor) costs
- Need to know:
 - Types of runs
 - Labor practices



Types of Runs





Estimate Driver/Conductor Requirements (Rostering)

- Determine number of 5-day driver/conductor assignments needed to operate 7-day service
- Determine number of drivers/conductors needed to cover absences (Extra Staff)
 - The absence rate varies
 - Amount of vacation, sick leave, holidays provided
 - Management attention to absenteeism
 - The absence rate can exceed 20%



Computers Often Are Used in Schedule Building

- **Labor saving for repetitive tasks**
 - Preparation of interval table
 - Creation of vehicle blocks
- **Creation/optimization of driver and conductor runs**
 - Important when complicated work rules
- **Provides passenger information**
 - Schedules for passengers
 - Interactive passenger trip planners (e.g., Internet, telephone, station)





Summary

- Described the five-step schedule building process
- ***Remember***, scheduling is important to:
 - Operators (operating efficiency and service responsive to passenger needs)
 - Passengers (reliability and information)

