

Global Positioning System (GPS) for Time-Based Signal Coordination: Benefit-Cost Analysis

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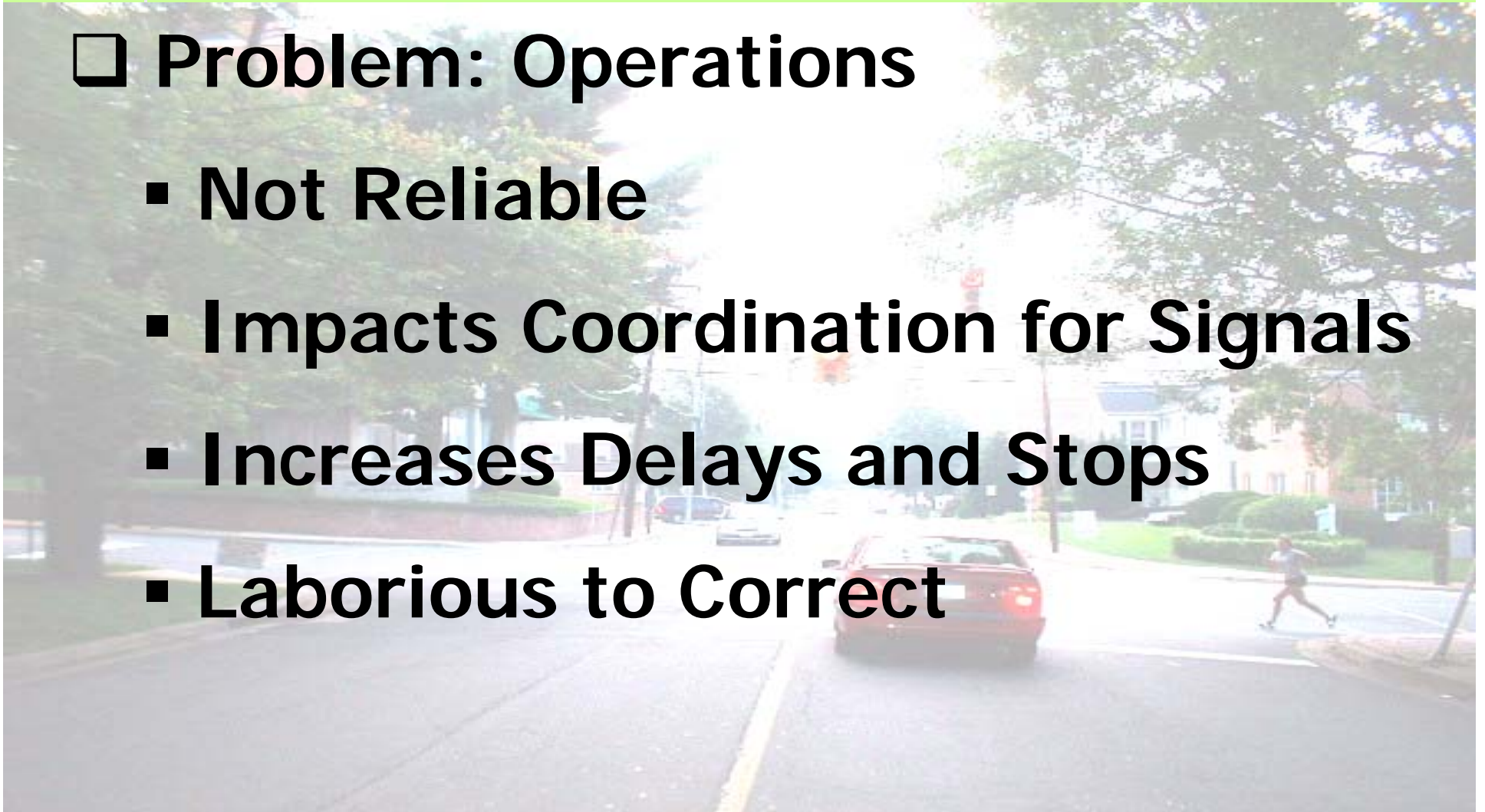
Time-Based Coordination

- ❑ What it is
- ❑ How it works
- ❑ The Problem!

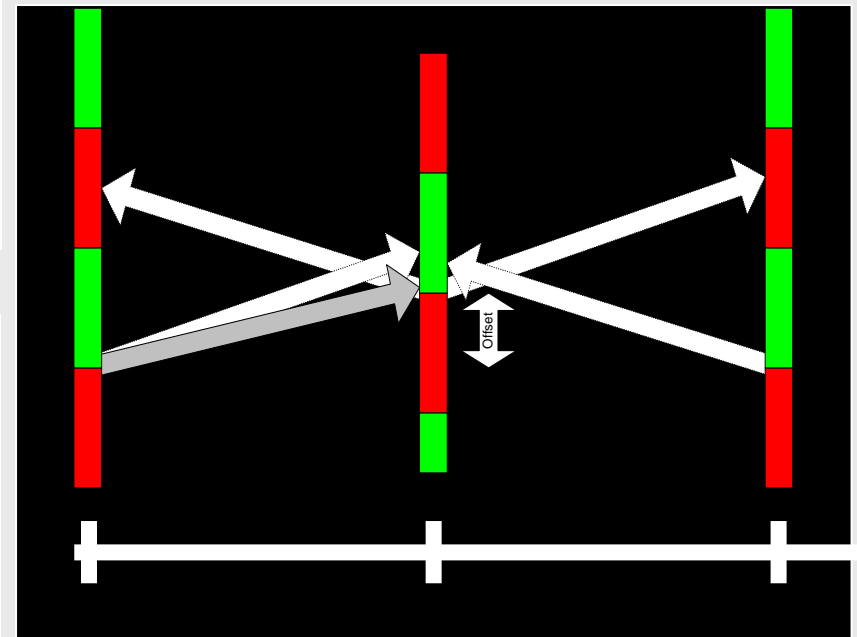
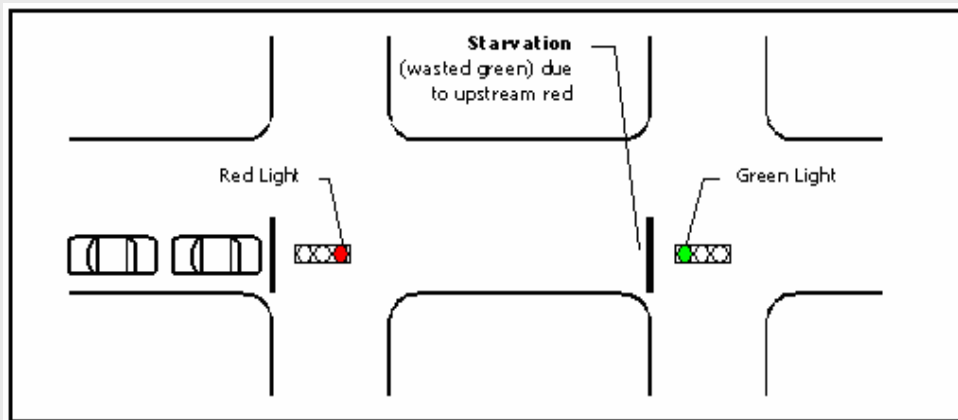
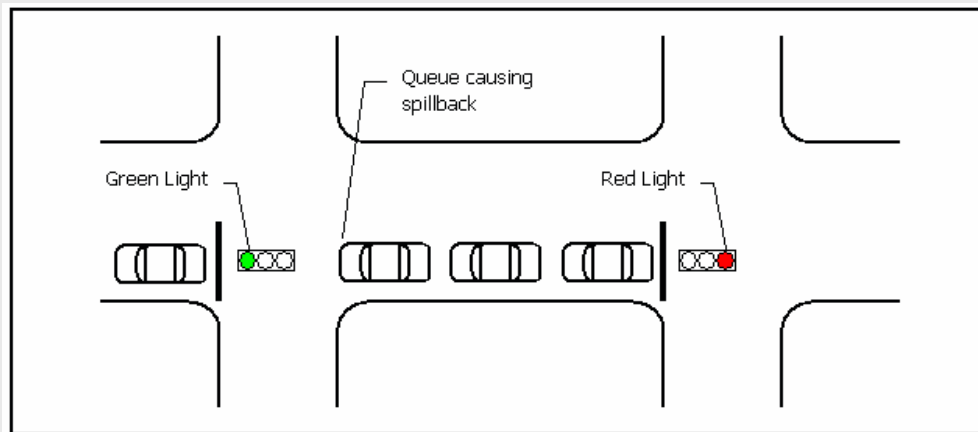


Time-Based Coordination

- ❑ **Problem: Operations**
 - **Not Reliable**
 - **Impacts Coordination for Signals**
 - **Increases Delays and Stops**
 - **Laborious to Correct**

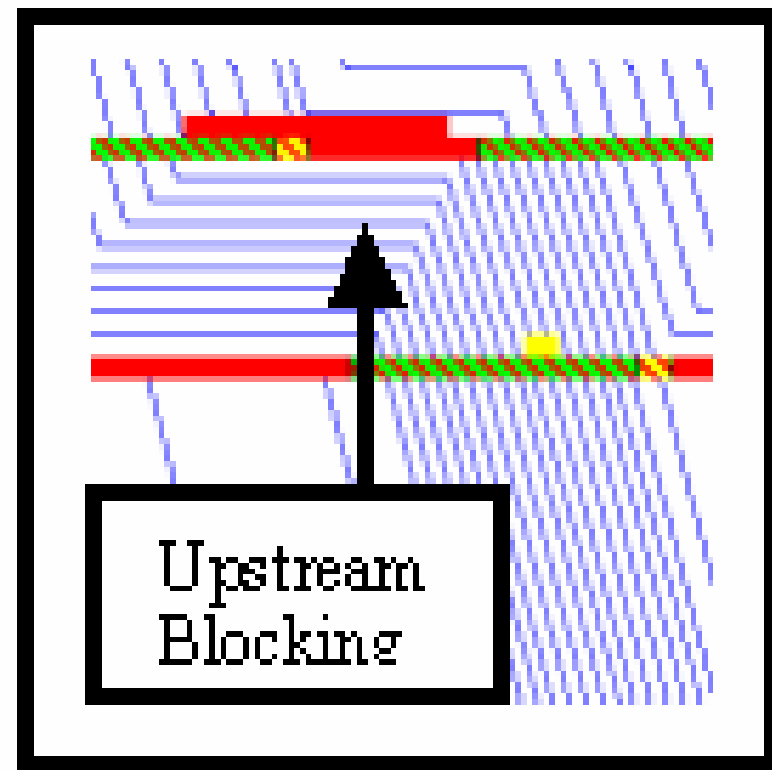
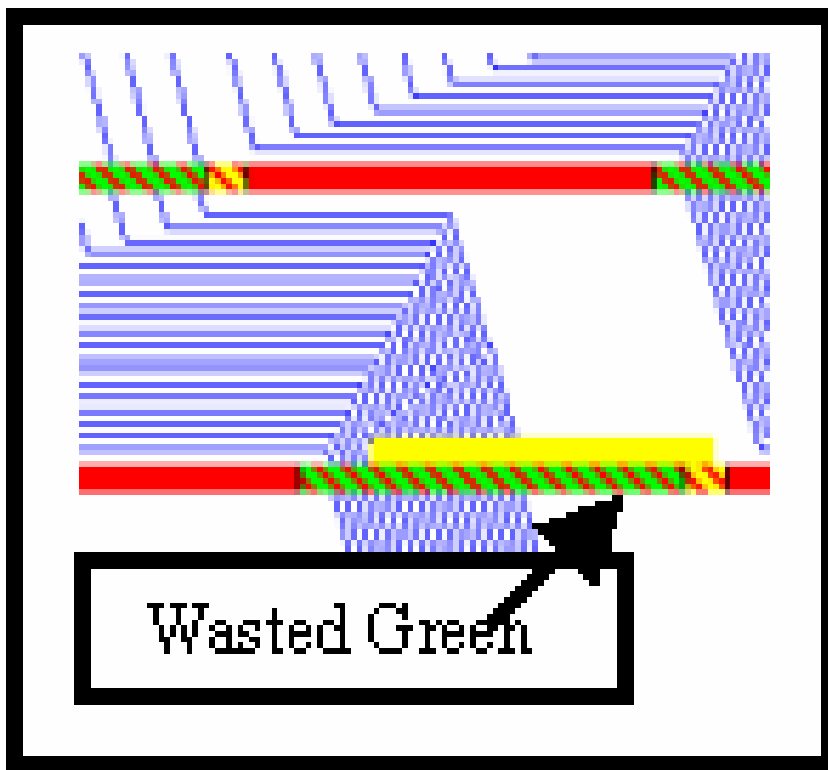


Time-Based Drift Challenges



Time-Based Drift Challenges

□ Offset Problems



Time-Based Coordination

- **Problem: Management**
 - **Wasted Resources**
 - **Expensive to Correct**
 - **Wrong Message to the Public**
 - **Complicates Inter-jurisdictional Coordination for Signals**

Time-Based Coordination

□ Alternative Means

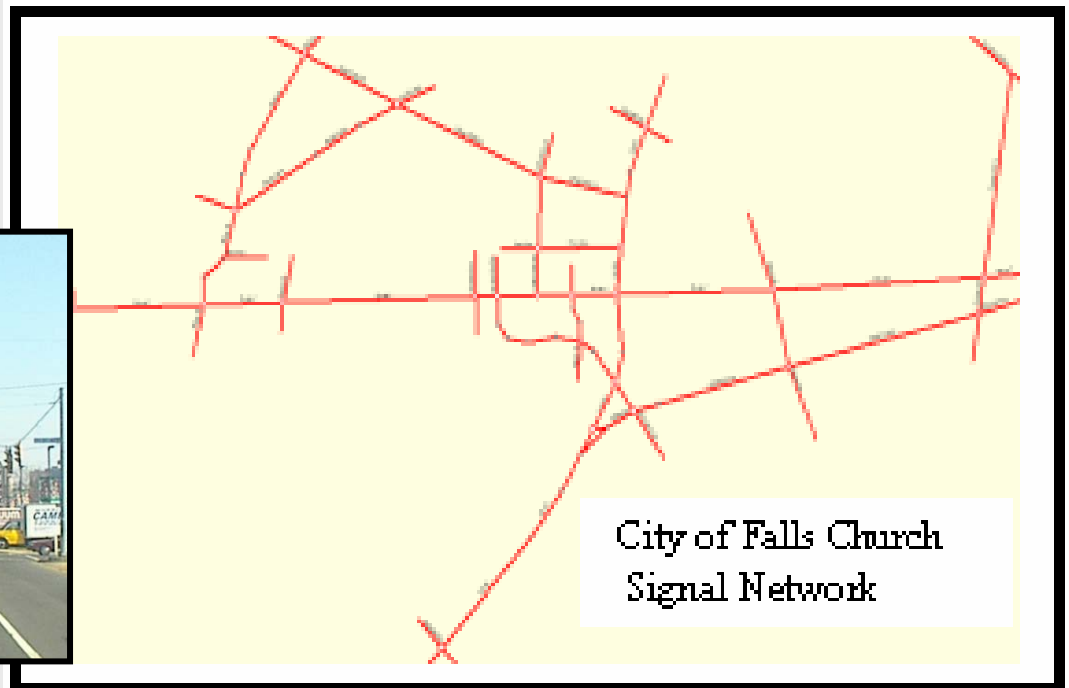
- **Hard-Wire Interconnect**
- **Closed Loop Signal System**
- **GPS Time Reference Receivers**

Case Study

□ City of Falls Church, VA

➤ 20 Not Interconnected Signals

➤ NEMA TS2



Time Drift (Seconds)

Intersection	Week 1	Week 2	Week 3
1	3	8	1
2	2	9	0
3	1	8	1
4	2	6	2
5	4	2	2
6	6	6	6
7	3	8	3
8	2	2	0

Case Study

□ City of Falls Church, VA

- 20 GPS TRR
- Cat 5 Cable
- RJ-45 Conn.
- RS 232 Adap.



Case Study

□ GPS TRR Cost & Labor

➤ \$ 1,250 Each

➤ 2 Hrs.

➤ One Person



Time-Based Coordination

□ GPS Cost-Benefit Assumptions

- **\$1.90 per gallons fuel consumed**
- **\$0.014 per stop and \$11.70 per hour of delay**
- **Benefits based on a 3-hour per peak period for each of the AM, Midday and PM peaks (260 days per year)**

Time-Based Coordination

□ GPS Benefits

- Avg. Delays Reduced by 7%
- Signal Delay Reduced by 9%
- Stops Reduced by 3%
- Travel Time Reduced by 4%

Time-Based Coordination

□ GPS Benefits/Findings

- Fuel Consumption Reduced by 4%
- Emissions Reduced by 3.6%
- \$750K Annual Savings
- Benefit-to-Cost Ratio of 30:1
- Would Recover Cost in 5 months

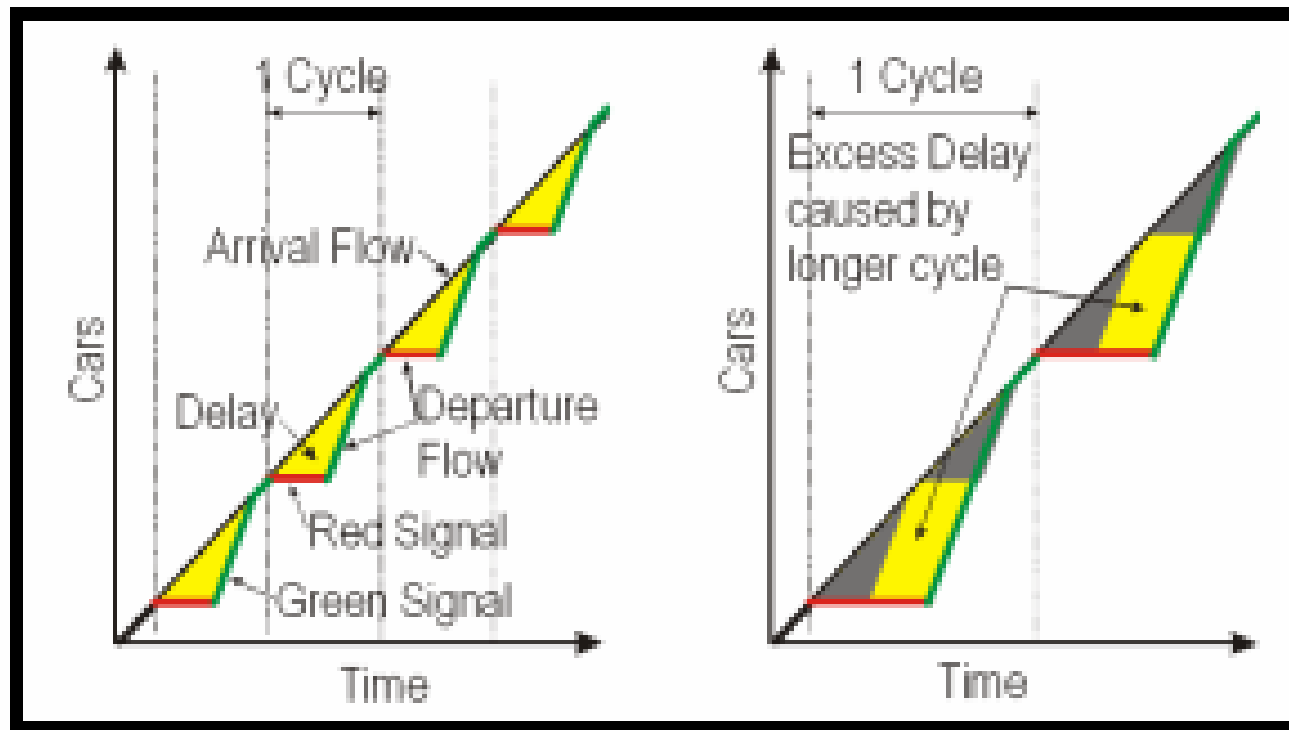
Summary—GPS Technology for TBC

- Proven Technology**
- Cost-Effective—B/C Ratio > 30**
- Can Reduce Delays and Stops**
- Can Recover Cost in a Few Months**
- Very Easy to Install**



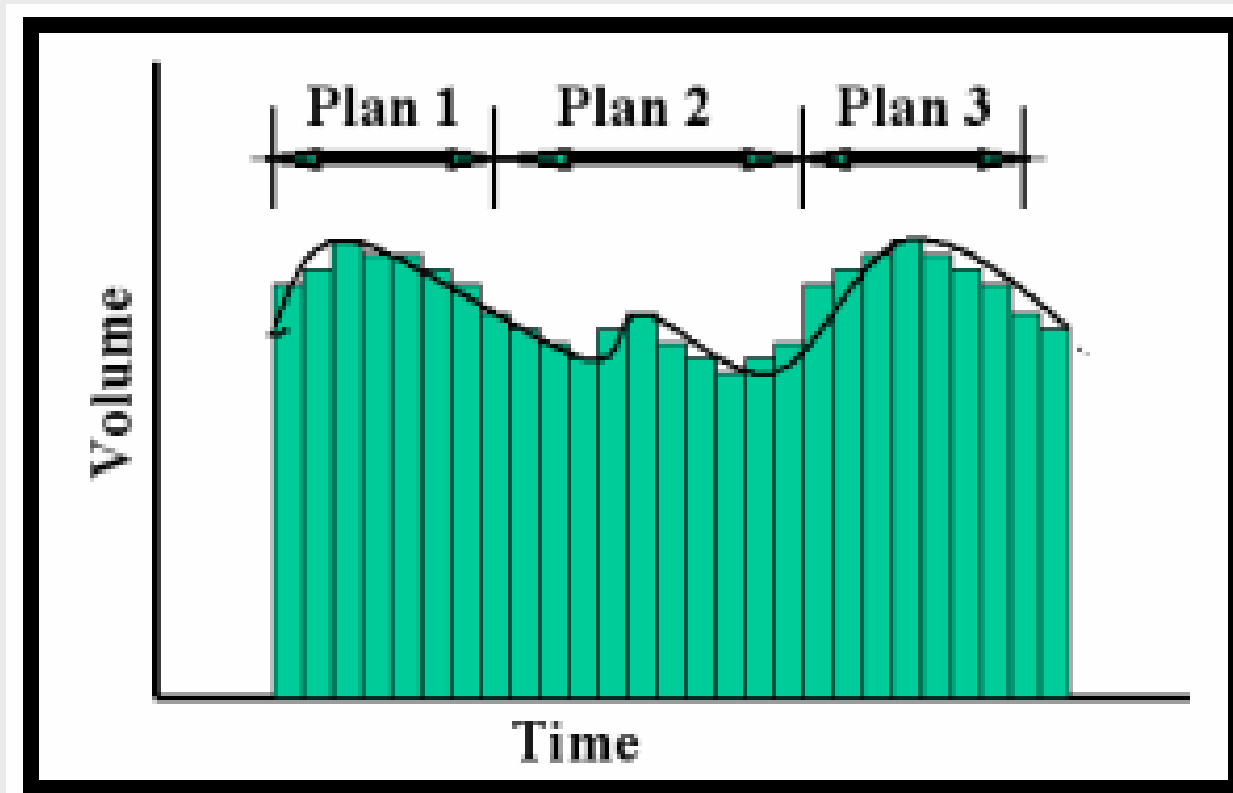
Coordination Strategies and Challenges

□ Cycle Length



Coordination Strategies and Challenges

□ Number of Timing Plans



Coordination Strategies and Challenges

Consider Lag Left phasing sequence

