

Fairfax County Public Schools

Bell Time Study *Presentation of Results*

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Tom Platt
Andy Forsyth



Study Objectives

1. Conduct a targeted analysis to find cost-effective alternatives that would:
 - ✓ Maintain three bell schedule but move high school start times to between 8 and 9 a.m.
 - ✓ Middle school and elementary school start times would be a mix of earlier and later than the high school start times
2. Identify the least possible additional resources that would be required to implement.
3. Provide a project plan for implementation.



Agenda

1. Review the performance & status of the current system
2. Review key factors influencing transportation efficiency and effectiveness
3. Review results of the analysis and its implications



AF1

Performance of the Current System *Cost Effectiveness*

Measure & National Guideline:	Total	Regular Education	Special Education
M&R Cost per Vehicle Equivalent	\$2,033		
Guideline Range	\$1,000 - \$1,400		
Annual Cost per Student	\$744	\$549	\$3,377
Guideline Range	\$650 - \$750	\$470	\$5,100
Annual cost per Bus	\$63,808	\$58,118	\$81,372
Guideline Range	\$42,000 - \$53,000		



Performance of the Current System *Measures Influencing Cost & Service*

<i>WHAT IS BEING MEASURED</i>	<i>CALCULATION</i>	<i>PERFORMANCE GUIDELINE</i>	<i>FCPS VALUE</i>
Avg. Buses per 100 Students Transported	Total Buses/ (total students/100)	1.00 - 1.30	1.00 morning 0.96 afternoon
Percent of planned capacity being utilized	Actual passengers/ Planned bus capacity	60% - 70%	ES 48% HS 84% MS 74% SpEd 26%
Daily runs per bus (morning/afternoon)	Total runs / total buses	3.0	3.2 morning 3.4 afternoon

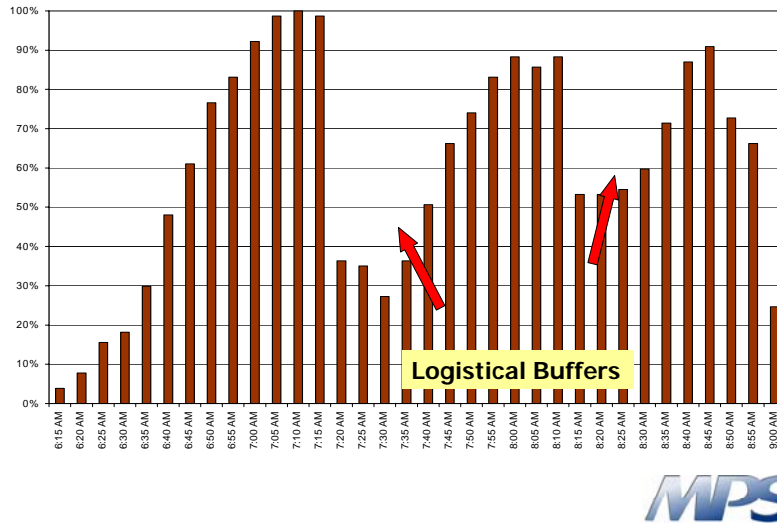


Why Are These Indicators Impressive?

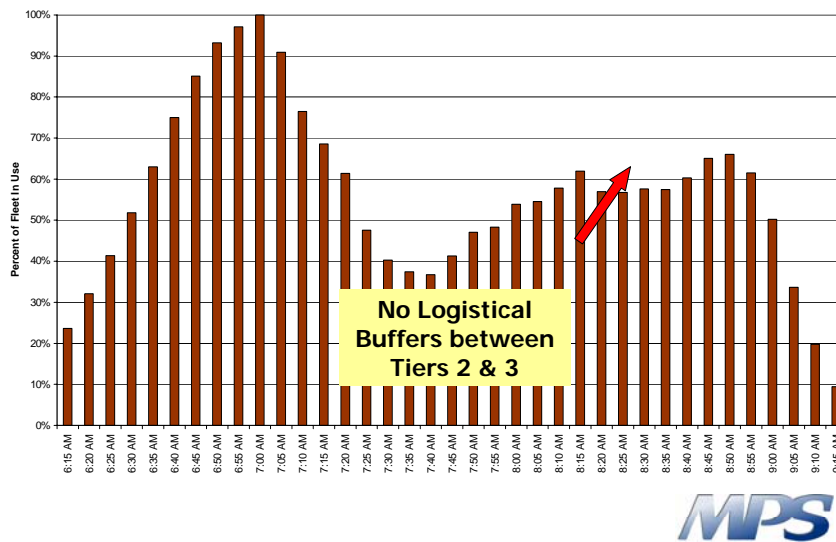
- 1. Service demands are extremely high**
 - ✓ Variability in length of the instructional day
 - ✓ Numerous special schools and programs
 - ✓ District-wide and cross-boundary attendance at schools & programs
- 2. District topography is complex**
 - ✓ Long travel time & distances for some schools & programs
 - ✓ Extremely high traffic congestion
 - ✓ Complex school boundary & transportation configurations

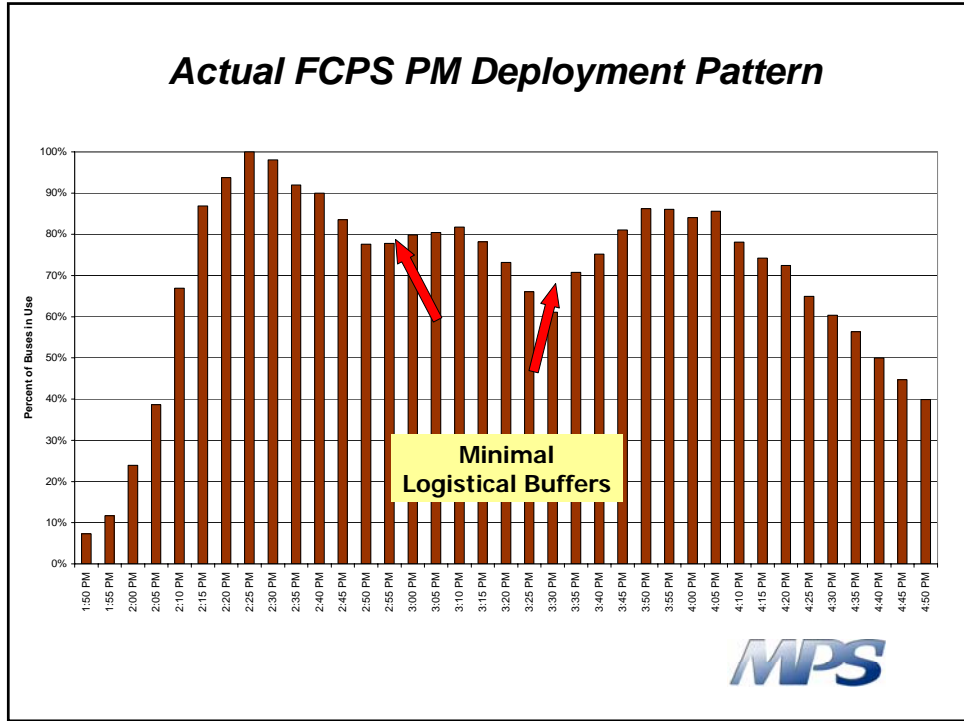


Impact of Service Demands on Fleet Deployment Example of a Typical 3-Tier Deployment Pattern



Actual FCPS AM Deployment Pattern





- ### What Challenges Does This Present?
- System is already being pushed very hard
 - No slack in terms of underutilized capacity (combination of buses and time)
 - Variance in length of instructional day complicates transportation bell time alignments
 - Cross-boundary programs result in long run times and bell time coordination difficulties
 - Indistinct feeder patterns & time tiers restricts analytical approach
- MPS**

Assumptions & Constraints: Scenarios A through C

- High schools start between 8:00 – 9:00
- No (initial) restriction on bell time placement of middle and elementary schools
- No changes to instructional day length
- Primary school age children will not wait at stops in darkness (civil twilight)
- Ride time standards will be maintained
- Current arrival / departure windows will be maintained



Initial Results - Summary

RESOURCE IMPACT ANALYSIS - PRELIMINARY RESULTS		Count of Runs	
		Morning	Afternoon
SCENARIO A - HIGH SCHOOLS IN TIER 3			
Chantilly Pyramid	HS Start = 9:00 AM		
	Total of all Runs Within Pyramid	62%	58%
	Total of All Runs with Time Conflicts	21%	20%
Woodson Pyramid	HS Start = 9:10 AM		
	Total of all Runs Within Pyramid	44%	49%
	Total of All Runs with Time Conflicts	29%	16%
SCENARIO B - HIGH SCHOOLS IN TIER 2			
Marshall Pyramid	HS Start = 08:15 AM		
	Total of all Runs Within Pyramid	60%	56%
	Total of All Runs with Time Conflicts	8%	13%
Mt. Vernon Pyramid	HS Start = 08:10 AM		
	Total of all Runs Within Pyramid	57%	57%
	Total of All Runs with Time Conflicts	9%	14%
SCENARIO C - HIGH SCHOOLS IN TIER 2 OR 3			
Chantilly Pyramid	HS Start = 08:25 AM		
	Total of all Runs Within Pyramid	62%	58%
	Total of All Runs with Time Conflicts	20%	21%
Lake Braddock Pyramid	HS Start = 09:10 AM		
	Total of all Runs Within Pyramid	51%	53%
	Total of All Runs with Time Conflicts	17%	11%
Total of All Runs with Time Conflicts		17%	16%

Consensus Changes: Scenarios D & E

	Tier 1	Tier 2	Tier 3
Scenario "D"	Elementary Schools – 7:45 AM	High Schools – 8:15 AM to 8:30 AM Middle Schools – Same or 20 to 30 minutes later	Elementary Schools – 9:15 AM
Scenario "E"	Elementary Schools – 7:45 AM	High Schools – 8:15 AM to 8:30 AM Elementary Schools – 8:20 AM	Middle Schools – 9:15 AM Elementary Schools – 9:15 AM

Key Elements:

- Reduces transportation time window to 1hr. 30 min.
- Restricts high school start to middle tier
- Restricts middle school start to middle or last tier
- Restricts elementary school start to 7:45 a.m. or later



Summary of Bell Times Scenario D & E Revised

Scenario D	Scenario E
<i>Mt Vernon Pyramid</i>	<i>Mt Vernon Pyramid</i>
<ul style="list-style-type: none"> • HS – 8:30 • MS – 8:55 • ES – 7:45 or 9:15 	<ul style="list-style-type: none"> • HS – 8:30 • MS – 9:15 • ES – 7:50, 8:15, 9:15
<i>Woodson Pyramid</i>	<i>Woodson Pyramid</i>
<ul style="list-style-type: none"> • HS – 8:30 • MS – 8:35 • ES – 7:40, 7:45, or 9:15 	<ul style="list-style-type: none"> • HS – 8:30 • MS – 8:35 • ES – 7:40, 7:45, or 9:15



Summary of Results *Scenario D & E Revised*

Scenario D

Mt Vernon Pyramid

- 54 Additional Buses
- 57% increase
- \$3,417,160

Scenario E

Mt Vernon Pyramid

- 47 Additional Buses
- 50% increase
- \$2,974,194

Woodson Pyramid

- 66 Additional Buses
- 53% increase
- \$4,176,528

Woodson Pyramid

- 55 Additional Buses
- 44% increase
- \$3,480,440



Discussion

Key Factors Influencing Analysis

- Broad interdependence throughout system:
 - Difficult to find representative subset
 - “Domino effect” of changes made anywhere in system
- Impact of “rolling” bell schedule:
 - Cause or effect?
 - Key point: system has evolved and remained efficient through adaptation, not design
 - Precise estimate of impact on resources requires reconstruction of entire system in simulation



Discussion

Key Factors Influencing Results

Primary:

- Very minimal logistical buffers in the current system
- Impact of varying instructional day lengths
- Influence of cross-boundary programs on run lengths
- Reduction in transportation window from 1:45 to 1:30
- Significant morning twilight conflicts for ES causing split routes

Secondary:

- Influence of indistinct tier structure
- Influence of indistinct feeder patterns



Conclusions

- The current system is very cost effective given service demands
- The current system has no slack to absorb major changes without a complete redesign
- Service delivery (ride times, on-time arrivals, etc.) in the current system is beginning to erode
- Analysis brackets the likely resource impacts between low and high cost options



Conclusions (con't)

- Analysis results are detailed and accurate for the options presented
- Analysis reveals key factors influencing the ability to implement the proposed change
- Substantial improvement over high cost option requires flexibility on multiple fronts:
 - Less variance in length of instructional day
 - Wider allowable transportation time window
 - Slide start times later to minimize impact of twilight
 - Judicious use of rolling bell schedule



Options for Refining the Analysis

- **Option 1** – Same, using rolling bell times
 - *Marginal expected improvement*
- **Option 2** – Same, with looser constraints
 - *Significant expected improvement*
- **Option 3** – Combine options 1 & 2
 - *Same expected improvement as Option 2, but with higher confidence in the results*

