Washington Metropolitan Area Transit Authority (WMATA)
Transit Intelligent Transportation Systems
State of Practice/Current Collected Data/ Future Plans

Background

WMATA operates the sixth largest bus service in the United States and transports a third of the federal workers and millions of tourists. WMATA provides fixed-route services for the District of Columbia, the suburban Maryland counties of Montgomery and Prince George's and the Northern Virginia counties of Arlington, Fairfax, and Loudon, and the cities of Alexandria, Fairfax, and Falls Church and serves approximately 134 million fixed route riders annually. WMATA operates 315 routes on 174 lines and covers a service area of just under 1500 sq. miles utilizing a 1500 fixed-route bus fleet. The WMATA bus fleet has several fixed-end and on-board systems which are capable of providing equivalent functionality such as Computer Aided Dispatch and Automatic Vehicle Location (CAD/AVL), next stop annunciation, passenger counting, monitoring of vehicle mechanical systems, etc.

State of Practice

Currently, WMATA operates an ACS OrbCAD CAD/AVL system with fixed-route dispatch operations located in Washington DC and Maryland. Dispatchers establish voice communications using the existing CAD/AVL system and the WMATA 490MHz CRCS Motorola trunked mobile radio system. Dispatch controlled communications (RTT & PRTT) are employed for all of the WMATA fixed-route revenue vehicles. Dispatcher administrative tasks are recorded using electronic forms as part of the CAD/AVL system.

Also, WMATA operates a Customer Information System (CIS) with 50 signs distributed throughout the WMATA operational area and bus arrival information is currently being displayed on these signs. The CIS server is interfaced to the CAD/AVL server to receive bus schedule and schedule adherence information.

The WMATA IT maintains and operates server facilities located in secure areas of Washington DC and Maryland. WMATA is using server virtualization technology to enhance availability of the IT systems, implement disaster recovery capabilities, increase efficiency of the server resources and reduce datacenter footprint. Virtual servers are hosted on WMATA's servers using VMware and mass storage is provided using WMATA's Enterprise Storage Area Network.

WMATA has implemented a Transit Database (TDB) that serves as the primary data interface between the various WMATA Intelligent Transportation Systems. The Transit Database contains all operational data (e.g., routes, schedules, personnel, operator assignments, etc.) required by the OrbCAD system and also serves as a repository for OrbCAD derived operational data that is used by other WMATA systems.

In addition, OrbCAD provides AVL and vehicle work assignment data to the TDB in support of the Customer Information System (CIS) that is operated under contract by NextBus. The OrbCAD interface provides AVL data to the TDB which is then passed to the NextBus CIS to perform the bus arrival prediction function.

Current Collected Data

a) Boardings, Alightings, Load – APC
b) Running Time, Speed, OTP – APC and/or AVL
c) Incident/Accident Trends – via Maximo integration and/or CleverCAD Reports
d) Farebox probing, ridership and status monitoring – via farebox integration
e) Vehicle Assignment Compliance – via Total Yard Management (TYM) integration

Critical Data Systems

	Trapeze	Cubic	Clever	OrbCAD	Maximo	PeopleSoft
Bus Users	BOSC, BTRA, BPLN	BMNT, BTRA, BPLN	BOSC, BMNT	BOCC	BMNT, BOCC	BTRA
Description	Scheduling (FX) and operator/ vehicle dispatch/ assignment (OPS); includes revenue, recovery, non-revenue and platform hours, miles, trips; assigned vehicle and operator trips, blocks, runs; payroll and bid processes	Farebox equipment and software; ridership and revenue source data; alarm data	Schedule exports (Bus Tools); destination signs; stop and public service announcements; automated vehicle monitoring (AVM); automatic passenger counters (APC)	Computer aided dispatch & automated vehicle location (CAD/AVL); incident and on time performance reporting; GPS, radio signals and time-point encounters; operator logon compliance	Maintenance & Materials Management System (MMMS); work order, incident and mileage reporting; vehicle division assignments	Operator ID and logon verification table; customer complaints; accident Investigations

Future Plans

WMATA is in the process of implementing a consolidated system from a single contractor which will encompass all of this functionality under the Consolidated Ancillary Bus Equipment and Fixed-end Systems (CoABE & FeS) project. In addition, this new system will transition away from using the WMATA 490MHz trunked radio system for data communications and will use cellular services for data communications between the fixed-end and vehicle systems. The vehicle fleet is comprised of 1500 active revenue buses and 64 non-revenue vehicles.

Currently, the WMATA bus fleet has several on-board systems which are capable of providing equivalent functionality; however, they were purchased from and/or managed by different vendors over the past ten (10) years. This has produced system integration issues between vendors, made technology upgrades costly, and increased the Authority's risk as it relates which vendor is responsible for fixes/modifications/repairs. Also, a number of the ancillary bus equipment and fixed end equipment are reaching end-of-life (EOL).

The CoABE and FeS are comprised of the following subsystems, but not limited to:
- Fixed-end System Computer Assisted Dispatch/Automatic Vehicle Location (CAD/AVL)
- On-board Automatic Vehicle Location (AVL)
- Automated Voice Annunciation (AVA)
- Automated Passenger Counting (APC)
- Automated Vehicle Health Monitoring (AVHM)
- Supervisor Mobile Data Terminal (MDT)

December13, Weekday Averages

Vehicle Trips	14,607	Boardings Per Mile	3.90	TP Ontime	79,424
Boardings	478,313	Boardings Per Hour	38.6	TP Early	9,485
Revenue Miles	122,673.5	Schedule Speed (MPH)	13.1	TP Late	9,019
Revenue Hours	12,386.8	Actual Speed (MPH)	12.1	Ontime (%)	81.1

Selected Trips

	Max Boardings Trip	Max Load Trip
Route	44:U8	14:X2
Direction	Loop	East
Time	2:08p	3:12p
Serial #	5937245	5976798
Trip #	98	152
Start Load	5	2
Max Load	63	74
End Load	0	4
Boardings	168	115

Time Period

					Per Trip	
Period	Trips	Board	Board Per Mi	Board Per Hr	Avg Board	Max Load
AM Early	744	18,877	2.83	30.5	25.4	53
AM Peak	3,451	114,362	3.99	39.5	33.1	69
Midday	3,587	138,019	4.58	44.2	38.5	70
PM Peak	4,353	153,149	4.16	40.2	35.2	74
Early Night	1,827	45,034	2.88	31.7	24.6	73
Late Night	645	8,871	1.88	17.2	13.8	54
All Periods	4,607	478,313	3.90	38.6	32.7	74

Top 10 Stops By Boardings

Stop	Dir	Board	Alight	Load
H ST NW/6TH ST NW	E	2,534	645	6,235
GEORGIA AVE/NEW HAM	N	2,210	943	7,231
MINNESOTA AVE NE/BE	S	2,186	328	8,955
FT TOTTEN STATION/BU	W	1,954	431	5,401
7TH ST/H ST	N	1,847	365	3,865
SILVER SPRING STATIO	E	1,828	2,312	2,688
ANACOSTIA STATION/BU	E	1,748	1,135	2,024
ANACOSTIA STATION/BU	W	1,671	906	1,934
MINNESOTA AVE STA/BU	S	1,630	1,938	2,192
IRVING ST NW/14TH ST	E	1,466	732	3,019

Top 10 Stops By Alightings

Stop	Dir	Board	Alight	Load
PENTAGON STATION/BU	W	50	2,941	324
H ST NW/7TH ST NW	W	490	2,387	4,888
SILVER SPRING STATIO	E	1,828	2,312	2,688
MINNESOTA AVE NE/BE	N	358	2,222	8,686
SILVER SPRING STATIO	E	1,153	2,140	2,106
17TH ST/I ST NW	S	1,128	2,033	2,977
MINNESOTA AVE STA/BU	S	1,630	1,938	2,192
SOUTHERN AVE/#1380	E	44	1,906	2,711
14TH ST/IRVING ST	N	1,317	1,898	4,610
16TH ST/K ST	S	174	1,698	2,824

Top 10 Trips By Boardings

Serial Number	Start Time	Latest Date	Route	Rt Dir	Block	Board	Alight	Max Load	Board Per Mi	Board Per Hr	Actual Speed (MPH)	Sch Speed (MPH)	Ontime (%)
5,937,245	2:08p		44:U8	L	PU-82	168	173	63	17.04	127.6	9.5	17.4	50.0
5,937,285	3:36p		44:U8	L	PU-80	148	148	46	14.96	116.4	7.9	18.6	53.6
5,970,821	5:08p		118:70	N	N-706	146	148	73	19.62	130.7	5.7	6.7	77.8
5,937,313	7:40a		44:U8	L	PU-80	143	142	49	14.50	122.6	8.5	19.7	65.0
5,970,812	3:20p		118:70	N	N-710	139	139	66	18.72	113.0	6.5	6.7	79.6
5,956,047	2:59p		93:32	W	W-305	137	139	56	10.06	73.8	9.0	8.4	81.8
5,937,249	3:08p		44:U8	L	PU-83	136	136	53	13.79	107.4	8.1	17.4	79.2
5,937,308	6:56a		44:U8	L	PU-81	133	133	59	13.52	125.0	8.6	23.7	25.0
5,956,045	2:00p		93:32	W	W-316	133	131	52	9.77	75.1	8.1	8.8	76.4
5,956,175	2:41p		93:32	E	W-310	130	125	58	9.95	71.4	7.7	7.8	70.5

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