



New York City Select Bus Service

BRT Background

- MTA New York City Transit:
 - Operator of New York City's public transit system
 - Part of Metropolitan Transportation Authority (New York State)
 - Over 5.3 million subway and 2.2 million bus trips per day
- New York City Department of Transportation:
 - Operator of New York City's 6,000 miles of streets, 787 free bridges, 12,000 traffic lights, and the Staten Island Ferry
- Agency partnership key to project success

BRT Corridors In Progress



Features of Select Bus Service

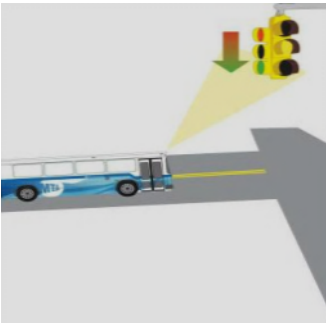
Bus Lanes



Off Board Fare Collection



Bus Signal Priority



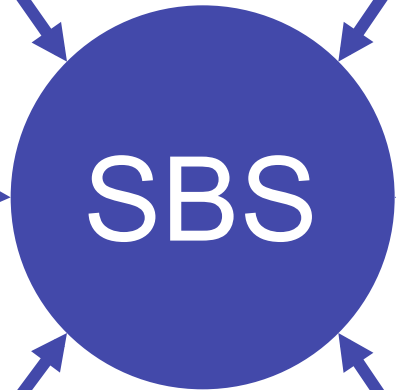
Branding



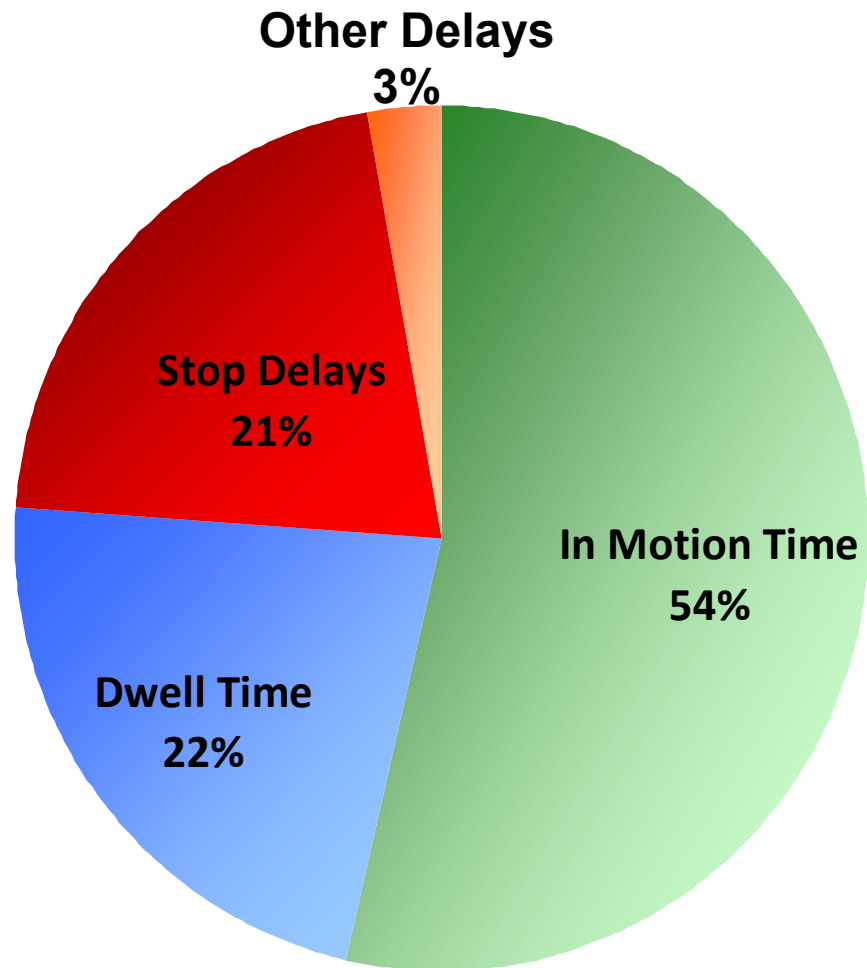
Passenger Info



Stations & Bus Bulbs



Sources of Bus Delay



Bus Lanes



- **Installed by NYCDOT**
- **Painted red for visibility**
- **Both curb side and off set, depending on street width**
- **Strictly enforced**

Bus Lanes - Enforcement

- **Bus Lane Video Cameras**
- **Additional NYPD Enforcement**
- **Extensive Education Campaign**



Bus Lane Enforcement - Cameras



- Approved in 2010 - First cameras installed by NYCDOT November 2010
- Cameras currently operating on First Avenue/Second Avenue, 34th Street, Fordham Road
- ~250 violations captured per day at 20 locations
- Adding additional locations, upcoming corridors

SBS Bus Stations & Bus Bulbs



- Feature of most SBS routes
- Allow level boarding
- Speeds wheelchair boarding
- Saves about 4-5 seconds at each station

Pre-Payment/Off Board Fare Collection



- **Payment system allows full integration with NYCT subway and bus network**
- **No fares collected on board**
- **\$100 fare evasion fine**
- **Random enforcement by NYCT Eagle Team**

Signal Priority

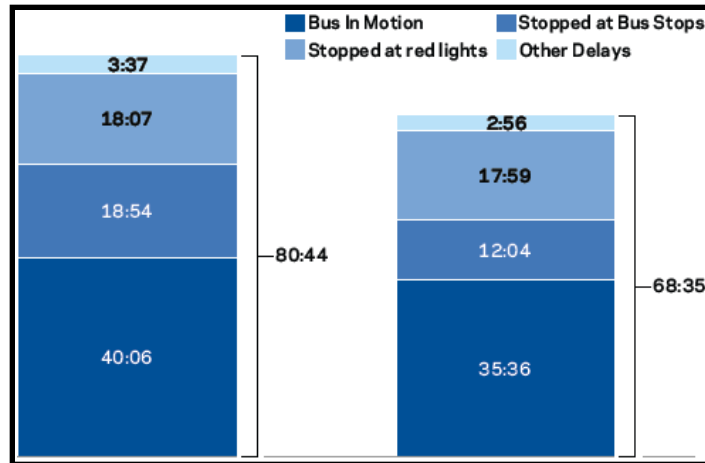


- **On two SBS routes only:**
 - **Bx12 SBS in the Bronx - 20 signals**
 - **M34 SBS in Manhattan - at 7th Avenue**
- **Field testing on M15 SBS to determine optimal communication mode, hardware configuration and TSP specifications**
- **NYCDOT and NYCT secured Federal funding for the bus-related components of TSP**

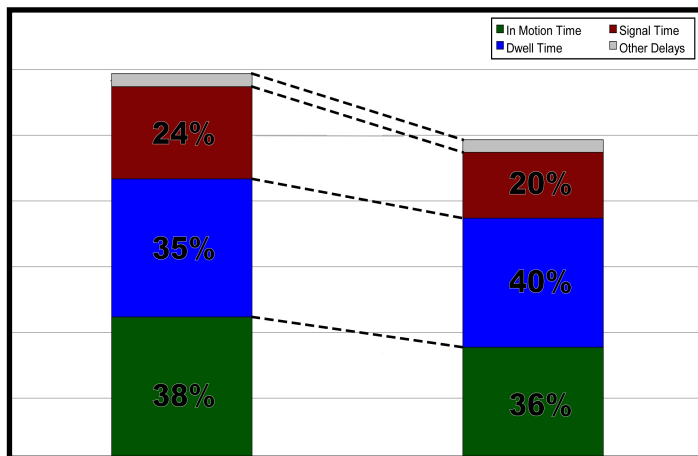
Improved Total Running Times

Average Total Running Time Improvement about 20%

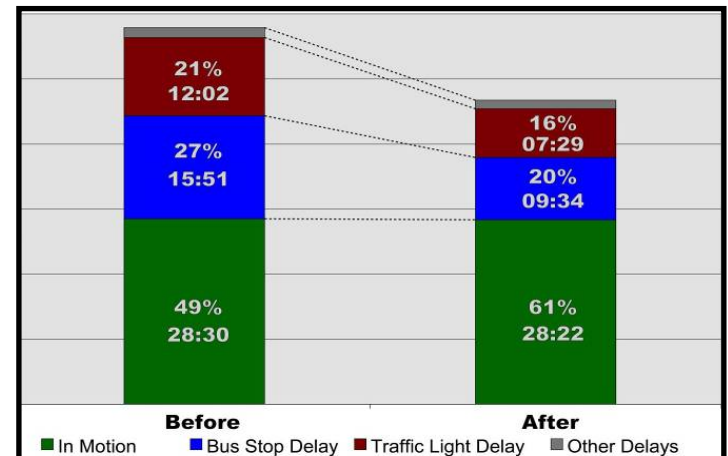
M 15



M 34



Bx 12



Manual Data Input for Time & Delay

Developed for Geary BRT in San Francisco

Microsoft Excel - M15 SBS NB PM AMS 110210

2/10/2011 5:30:08 PM

File Edit View Insert Format Tools Data Window Help Adobe PDF

Check Point F2, Signal Stop Delay F6, Right Turning Vehicle F7, Skip Record F12, Re-assign Function Keys Ctrl F12, spare buttons

Initialize Run Shift F2, Change to Street Loading F3, Close Doors F4, Parking Delay F8, Double Parking F9, Transfer Results Alt F2, Lock Keyboard Alt F2, spare F1

X	Run	Dir	ID	Bus Stop	Landmarks	Arrival			Bus Stop Loading Data			Stop Delay Events			Comment	
						Time	Type	Departure	Run	Dir	ID	Type	Start	End		
18	1275	N	13		Pearl St and Fulton St	16:17:54			1275	N	68	S	16:33:48	16:34:32		
20	1275	N	14	Y	Pearl St. and Fulton St.	16:18:07	C	16:18:25	16:18:25	1275	N	73	S	16:35:48	16:36:33	
21	1275	N	15		Pearl St and Beekman St	16:18:30			1275	N	76	S	16:37:48	16:38:27		
22	1275	N	16		Pearl St and Peck Slip	16:19:49			1275	N	86	S	16:39:48	16:40:38		
23	1275	N	18		Pearl St and Frankfort St	16:19:53			1275	N	89	S	16:41:43	16:42:20		
24	1275	N	19		St James St. and R.F. Wagner Sr. Place	16:20:51			1275	N	87	S	16:43:50	16:44:28		
25	1275	N	20		Pearl St. and St James Pl	16:21:06			1275	N	101	RT	16:45:13	16:45:20		
26	1275	N	21		St James Pl. and Madison St	16:21:19			1275	N	102	S	16:45:48	16:46:42		
27	1275	N	22		Madison St and James St	16:21:41			1275	N	102	RT	16:46:43	16:46:46		
28	1275	N	23		Madison St and Oliver St	16:21:51			1275	N	105	S	16:47:57	16:48:01		
29	1275	N	24	Y	Madison St. and Catherine St.	16:22:01	C	16:22:26	16:22:26	1275	N	116	S	16:49:57	16:50:36	
30	1275	N	25		Madison St. and Catherine St	16:22:31			1275	N	129	S	16:52:44	16:53:21		
31	1275	N	26		Madison St. and Market St	16:23:08			1275	N	137	S	16:55:08	16:55:45		
32	1275	N	27		Madison St. and Pike St	16:23:24			1275	N	148	O	16:58:26	16:58:35	eagle team	
33	1275	N	28		Pike St and Henry St	16:24:01			1275	N	160	S	17:00:53	17:01:33		
34	1275	N	28		Pike St and E. Broadway	16:24:10			1275	N	161	O	17:01:44	17:02:05	unable to pass	
35	1275	N	30		Pike St and Division St	16:24:22			1275	N	161	S	17:02:27	17:03:25		
36	1275	N	31		Allen St and Canal St	16:24:24			1275	N	165	S	17:04:13	17:04:44		
37	1275	N	32		Allen St and Hester St	16:24:34			1275	N	166	RT	17:04:51	17:05:12		
38	1275	N	33	Y	Allen St. and Grand St.	16:24:40	C	16:25:04	16:25:36	1275	N	167	S	17:05:49	17:08:28	
39	1275	N	34		Allen St and Grand St	16:25:36			1275	N	168	S	17:09:00	17:09:42		
40	1275	N	35		Allen St and Broome St	16:25:45			1275	N	169	O	17:09:48	17:10:02	M116 turn	
41	1275	N	36		Allen St. and Delancey St	16:27:04			1275	N	170	S	17:11:13	17:11:20		
42	1275	N	37		Allen St and Rivington St	16:27:26			1275	N	171	RT	17:11:59	17:12:50		
43	1275	N	38		Allen St. and Stanton St	16:27:34			1275	N	171	S	17:12:51	17:13:05		
44	1275	N	39		1st Ave. and Houston St	16:28:39			1275	N	171	O	17:13:07	17:13:36	RFK Bridge	
45	1275	N	40		1st Ave. and E. 1 St	16:28:49			1275	N	172	O	17:13:50	17:14:48	RFK Bridge	
46	1275	N	41		1st Ave. and E. 2 St.	16:29:05			1275	N	173	S	17:15:32	17:16:43		
47	1275	N	42	Y	1st Ave. and E. 2 St.	16:29:14	C	16:29:23	16:29:25	1275	N	173	O	17:16:44	17:17:03	RFK Bridge
48	1275	N	43		1st Ave. and E. 3 St.	16:29:31			1275	N	173	S	17:17:53	17:18:45		
49	1275	N	44		1st Ave. and E. 4 St.	16:29:39			1275	N	173	O	17:18:48	17:22:42	RFK Bridge	
50	1275	N	45		1st Ave. and E. 5 St.	16:30:31			1275	N	174	S	17:23:03	17:23:29		
51	1275	N	46		1st Ave. and E. 6 St.	16:30:42			1275	N	174	O	17:24:27	17:26:56	RFK Bridge	
52	1275	N	47		1st Ave. and E. 7 St.	16:30:50			1275	N	175	O	17:27:06	17:30:04	RFK Bridge	
53	1275	N	48		1st Ave. and St Marks Pl	16:30:59			1275	N	177	O	17:30:13	17:33:16	RFK Bridge	
54	1275	N	49		1st Ave. and E. 9 St	16:31:06			1275	N	178	O	17:33:20	17:38:41	rk bridge	
55	1275	N	50		1st Ave. and E. 10 St.	16:31:12										
56	1275	N	51		1st Ave. and E. 11 St.	16:31:21										
57	1275	N	52		1st Ave. and E. 12 St.	16:31:32										
58	1275	N	53		1st Ave. and E. 13 St.	16:31:41										



IVN Data Analysis for Time & Delay

Intelligent Vehicle Network

Bus events are logged with time and location

```
BWLog04611120119 - Notepad
File Edit Format View Help
18,05:59:06, GpsMon, 40.709332, -73.960857, 0, -1,000576
18,05:59:06, Misc, 40.709332, -73.960857, 0, -1,000576
18,05:59:07, GpsMon, 40.709328, -73.960857, 0, -1,000576
18,05:59:07, GpsMon, 40.709328, -73.960857, 0, -1,000576
18,05:59:07, Dwell, 40.709328, -73.960857, 0, -1,000576
18,05:59:08, GpsMon, 40.709328, -73.960857, 0, -1,000576
18,05:59:08, GpsMon, 40.709328, -73.960857, 0, -1,000576
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18,05:59:10, GpsMon, 40.709328, -73.960857, 0, -1,000576
18,05:59:11, Dwell, 40.709328, -73.960857, 0, -1,000579
18,05:59:11, GpsMon, 40.709328, -73.960857, 0, -1,000579
18,05:59:11, GpsMon, 40.709328, -73.960857, 0, -1,000584
18,05:59:12, GpsMon, 40.709328, -73.960857, 0, -1,000586
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18,05:59:13, GpsMon, 40.709300, -73.960857, 0, -1,000598
18,05:59:14, GpsMon, 40.709267, -73.960838, 0, -1,000613
18,05:59:15, GpsMon, 40.709223, -73.960860, 0, -1,000633
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18,05:59:16, Misc, 40.709170, -73.960873, 0, -1,000668
18,05:59:17, GpsMon, 40.709110, -73.960897, 0, -1,000673
18,05:59:18, GpsMon, 40.709057, -73.960923, 0, -1,000689
18,05:59:18, GpsMon, 40.709057, -73.960923, 0, -1,000689
18,05:59:19, GpsMon, 40.709012, -73.960947, 0, -1,000699
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18,05:59:20, Misc, 40.708982, -73.960958, 0, -1,000702
18,05:59:21, GpsMon, 40.708973, -73.960960, 0, -1,000702
18,05:59:21, GpsMon, 40.708973, -73.960960, 0, -1,000702
18,05:59:21, Misc, 40.708973, -73.960960, 0, -1,000702
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18,05:59:25, GpsMon, 40.708973, -73.960960, 0, -1,000702
18,05:59:25, IopMgr, 40.708973, -73.960960, 0, -1,000702
18,05:59:25, Misc, 40.708973, -73.960960, 0, -1,000702
```

```
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111557.00
~vertask: (WARNING) unable to check for paratransit servicetype!
MEAV3_00_Sentence parsing GPRMC, CP# 108-3, Heading at slow speed
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111558.00
5, DWELL_EVENT_BUS_STOPPED_MOVING,In:01,dwellstop=-1,(00:00:00),(0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111559.00
TRE,TRG,TPR,TCE,CCE,0,261,87,0,0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111600.00
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111601.00
1, DWELL_EVENT_BUS_STARTED_MOVING,In:00,dwellstop=-1,(00:00:00),(0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111602.00
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MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111603.00
TRE,TRG,TPR,TCE,CCE,0,270,90,0,0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111604.00
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111605.00
TRE,TRG,TPR,TCE,CCE,0,280,93,0,0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111606.00
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111607.00
~vertask: (WARNING) unable to check for paratransit servicetype!
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111608.00
TRE,TRG,TPR,TCE,CCE,0,289,96,0,0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111609.00
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111610.00
: CAMVHardBrakeenh Addpoint. Vehicle speed just reached 0! Setting
: CAMVHardBrakeenh:Addpoint - hLastStopcapturewindowcompleteEvent
: (J1939) :ProcessNextMessage Overlapping hLastStopTriggeredEvent
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111611.00
SAGE_ID_RTG_DOORSTATE
5, DWELL_EVENT_DOOR_OPEN,In:01,dwellstop=-1,(00:00:00),(00:00:00)
jit,Info,Init,Completed
TRE,TRG,TPR,TCE,CCE,0,298,99,0,0
MEAV3_00_Sentence parsing GPRMC, CP# 108-3, Heading at slow speed
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111612.00
~vertask: (WARNING) unable to check for paratransit servicetype!
5, DWELL_EVENT_BUS_STOPPED_MOVING,In:03,dwellstop=-1,(02:01:02),(0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111613.00
conSpeedFrontOpenAlgorithm() Door opened in 1202 milliseconds
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111614.00
SAGE_ID_RTG_DOORSTATE
99, DWELL_EVENT_DOOR_CLOSE,In:12,dwellstop=-1,(10:02:10),(10:05:10
547
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111615.00
TRE,TRG,TPR,TCE,CCE,0,309,103,0,0
MEAV3_00_Sentence RMC parse Err:LatLonOutOfRange>$GPRMC,111616.00
voltageMonitorThread, CP# 777-10 A, INFO: observed that AudioInItD
conSpeedFrontCloseAlgorithm() Door closed in 840 milliseconds
```

Potential of IVN Data Analysis Program

- Central computer (IVN) logs “events” like door openings or dwells
- Working toward:
 - Automate data import of IVN bus logs
 - Extracting records indicating each instance bus makes in-service stop or other event
 - Calculate running time and delays matching dwells and other events to bus stop locations, traffic signal locations, etc.