



# Regional Real-Time Transit Information System

---

## System Requirements VERSION 3.0

*Prepared for:*

***Metropolitan Transportation Commission***



*Original Prepared by:*



February 1, 2012

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

---

**DOCUMENT HISTORY**

Document Description	Date	Version Number
First draft release of the System Requirements to MTC	April 27, 2007	1.2
Second draft release of the System Requirements	August 22, 2007	2.0
Third draft release of the System Requirements (released to TAC)	October 17, 2007	2.1
Fourth release of the System Requirements (internal review only)	March 12, 2008	2.1 revised
Fifth release (internal review only)	April 1, 2008	2.1 revised2
Sixth release (released to TAC)	April 14, 2008	2.2
Seventh release	October 9, 2008	2.3
Eighth release - deleted RTD Extraction Tool Requirements	March 2, 2009	2.4
Ninth release-added time clock synchronization requirement and stop ID minimum digit requirement	May 15, 2009	2.5
Tenth release – revised stop ID numerical prefix requirement	June 8, 2009	2.6
Eleventh release – added requirement for stops served by multiple agencies, added requirements for agency transfer application, and added suggestions for stop name standardization.	June 24, 2009	2.7
Added a new requirement (C-018) defining stop ID reuse/retirement policy	January 8, 2010	2.7.1
Added new requirements related to tripID and vehicle location data	February 1, 2012	3.0

# TABLE OF CONTENTS

## 511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM SYSTEM REQUIREMENTS – VERSION 3.0

---

<b>1. GUIDING PRINCIPLES</b> .....	<b>1</b>
<b>2. SYSTEM REQUIREMENTS</b> .....	<b>1</b>
<b>TABLE 1: SYSTEM REQUIREMENTS</b> .....	<b>4</b>

## 1. GUIDING PRINCIPLES

For convenience, the set of guiding principles for the development, selection and implementation of the Regional Real-Time Transit Information System is provided below.

1. All data will be owned, shared, controlled and distributed as a regional asset amongst all participating stakeholders.
2. The system design, future upgrades and changes will be jointly determined by the MTC and participating stakeholder transit agencies.
3. Innovation will be planned and managed to mitigate risks, minimize equipment obsolescence, and maximize the system utility through the life-cycles of its component parts.
4. Application initiatives will be guided by established methodologies using an appropriately tailored systems engineering approach.
5. Technology infrastructure will be utilized and/or developed to facilitate integration and web-enabled services of data and systems.
6. The architecture shall utilize any existing communications infrastructure to the extent possible and feasible.
7. Secure network architectures will be employed.
8. Data and technology strategies will adhere to the National, State and Regional ITS Architectures, and federal ITS systems engineering practices to the extent possible.
9. IT systems will ensure recoverability to protect the integrity and continuation (up-time) of the system to the extent possible.
10. Open systems concepts will be leveraged to ensure portability, scalability, interoperability, and compatibility of the different systems.
11. Continuous process improvement strategies will be employed to improve the quality of the real-time transit information system over time.
12. The system and data exchange methodologies shall be based on standardized data formats and data structures, employing ITS recommended standards as applicable.
13. Technology strategies will be implemented which reduce maintenance efforts and enhance cost effectiveness.
14. Design strategies will be employed to maximize the potential for system expandability and migration to future systems.

These guiding principles will be continuously checked against any and all elements that formulate the Real-Time Transit Information System. This does not preclude revising these guiding principles to better suit the development of the System as the system requirements are further refined and decomposed and the system is implemented.

## 2. SYSTEM REQUIREMENTS

This section presents the system requirements for the Bay Area 511 Regional Real-Time Transit Information System. These set of the requirements are based on the evaluation criteria developed for the selection of the architecture, discussions with the MTC, the TAC and Telvent Farradyne, and on the existing procedures and features of the existing real-time system. These requirements are primarily focused on the performance of the 511 System and the data transfers with the transit agencies. Also,

# 511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM

## SYSTEM REQUIREMENTS – VERSION 3.0

---

these requirements do not include the regional sign application requirements which are covered in a separate document.

The set of requirements are grouped according to the following areas and are color coded to reflect whether the requirement is a transit agency requirement (**in red and bolded**) or a 511 system requirement (**in green**).

1. General (GEN)
2. Interface (INT)
3. Predictions (PRED)
4. Configuration (CONF)
5. Logging (LOG)
6. Notifications (NOT)
7. Announcements (ANN)
8. System Backup and Archiving (ARCH)
9. Security (SEC)
10. Expansion (EXPN)

### **1. General (GEN)**

These are the requirements that relate to the system wide or high level issues.

### **2. Interface (INT)**

These are the requirements that relate to the standardization of the exchange of data between the transit agencies and the 511 System.

### **3. Predictions (PRED)**

These are the requirements that include the performance metrics for the data exchange and response times between the transit agencies and 511 and internal processes within 511 for the arrival/departure predictions and vehicle location data.

### **4. Configuration (CONF)**

These are the requirements that relate to the definition, exchange and processing of the static configuration data from the transit agencies.

### **5. Logging (LOG)**

These are the requirements that relate to the logging of events.

### **6. Notifications (NOT)**

These are the requirements that relate to alarms and notifications for the system administrator to respond to.

### **7. Announcements (ANN)**

# 511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM

## SYSTEM REQUIREMENTS – VERSION 3.0

---

These are the requirements that relate to the announcements to the 511 users under the alarm or notification scenarios.

### **8. System Backup and Archiving (ARCH)**

These are the requirements that relate to the archiving of data for the system.

### **9. Security (SEC)**

These are the requirements that relate to network security and user access privileges.

### **10. Expansion (EXPN)**

These are the requirements that relate to expansion of the system.

The table (Table 1) below lists the requirements under each of the areas describe above.

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
G-001	The system shall be based on an open architecture including standardized interface definitions and communications protocols.	GEN	The system needs to have documented procedures, interfaces and protocols as necessary to allow system expansion and adding new transit agencies and their real-time systems.
G-002	The system shall not need any special or proprietary algorithms for the exchange, interpretation and dissemination of prediction and configuration data at the interface points.	GEN	The system needs to have documented procedures, interfaces and protocols as necessary to allow system expansion and adding new transit agencies and their real-time systems. Where proprietary elements are necessary, these elements shall not be at the interface points and shall not affect interoperability.
G-003	The system shall be able to operate unattended 24 hours a day, seven days a week.	GEN	The system shall be able to operate under normal conditions unattended by MTC and/or agency staff, except under conditions where manual intervention is necessary such as posting announcements on regional signs and troubleshooting.

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
<b>G-004</b>	The system shall attain a reliability of 99.9% "up time" when predictions are being received by the 511 System from the transit agency systems (i.e., no more than 8.8 hours per year of unplanned downtime). Planned System maintenance downtimes should be communicated to MTC well in advance and should be done during non-service hours.	<b>GEN</b>	Need to track the hours that the system is unavailable for 511 users and for updating/transferring of prediction and/or configuration data. This data transfer should be tracked on an agency basis. Downtime is when the system is not available to 511 users for real-time predictions, i.e., the 511 system is unable to provide any predictions for any agency.
G-005	The system shall include provisions for adding in levels of redundancy including server and database failover methods and processes.	GEN	A failover plan with redundant servers, databases and/or network redundancy is an option.
<b>I-001</b>	Data exchange between the transit agency systems and 511 shall be performed using Java Messaging Service (JMS) unless the transit agency obtains MTC approval to use Web Services instead.	<b>INT</b>	The default data exchange mechanism will be JMS using a publish/subscribe model. The exception is to use bundling of predictions (see P-004)
<b>I-002</b>	If an agency uses JMS, MTC will provide the JMS client, which shall reside in an agency-owned workstation located on the agency's premises.	<b>INT</b>	The agency is still responsible for providing the prediction and configuration data to the JMS client.
<b>I-003</b>	If using JMS or web services, the JMS client or agency web server located at each transit agency's facilities shall utilize an existing Internet connection at the transit agency's facilities that is able to handle the transfer of prediction and configuration data to 511 for that agency.	<b>INT</b>	Should the existing Internet connection be deemed inadequate for the requirements set forth herein (i.e., due to data transmission latencies or bandwidth), a dedicated private wide area connection shall be used instead for the exchange of data between that specific transit agency's real-time system and the 511 System.

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-004	With Java Messaging Service (JMS), all prediction data shall be exchanged using a publish/subscribe model. The data exchange for configuration and arrived status data shall use a request/reply model.	INT	Configuration data and arrived status data will be requested of each agency at most once per day. Thus, this data can be exchanged using a request/reply model.
I-005	If a transit agency uses JMS, the system shall comply with the specifications as defined in the latest version of the <i>Extensible Markup Language (XML) Document Type Definitions (DTDs) for Java Message Service (JMS) Implementation</i>	INT	
I-006	If using web services, all data (predictions, configuration data, and arrived status) shall be exchanged using a request/reply model.	INT	This requirement is intended to keep the transfer of configuration data, which are larger data files, away from the peak periods of usage of the 511 System.
I-007	If an agency uses web services, the agency's system shall comply with the specifications defined in the latest version of the <i>Extensible Markup Language (XML) Document Type Definitions (DTD) for Web Service Implementation</i> .	INT	
I-008	Agency shall synchronize its system time clock with a reliable internet time source, such as time.windows.com. The time source shall synchronize the system clock at a minimum rate of once per day.	INT	The internet time source time.windows.com is preferred as it is the source with which the 511 system is synchronized.
I-009	The 511 Phone System shall store the DNIS that will be used by each transit agency that wants to have their calls automatically route to the departure times feature.	INT	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

<b>TABLE 1 – SYSTEM REQUIREMENTS</b>			
<b>ID</b>	<b>Requirement</b>	<b>Allocation</b>	<b>Description</b>
<b>I-010</b>	<b>The 511 Phone System shall check the DNIS of every incoming call BEFORE checking the ANI to determine if the call is from a 511 user.</b>	<b>INT</b>	
<b>I-011</b>	<p><b>If the DNIS belongs to a transit agency:</b></p> <ul style="list-style-type: none"> <li>- <b>511 will play a custom greeting indicating they are in the 511 Departure Times feature for their agency</b></li> <li>- <b>The call will be routed to the Departure Times feature in the same manner as if the caller had requested a transit agency, then the Departure Times feature.</b></li> <li>- <b>The caller will be asked for their Stop ID or prompted for the route/direction information for the agency from which they were forwarded.</b></li> <li>- <b>After the first Stop ID request, regardless of whether any predictions are played, the caller shall be sent back to the top of the Departure Times feature and WILL be asked for their agency, if Stop ID is not known.</b></li> </ul>	<b>INT</b>	
<b>I-012</b>	<b>An additional report shall be created that totals the number of calls made by callers on each agency DNIS and the duration of those calls in minutes.</b>	<b>INT</b>	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
<b>I-013</b>	<b>Each agency that desires the DNIS-based call routing feature shall determine and install/configure a phone number/DNIS to be available for the feature. Agencies can either work with MTC to define a phone number/DNIS or use one of their own existing phone numbers.</b>	<b>INT</b>	
<b>I-014</b>	<b>When callers indicate to the agency operators that they want departure times information while using the agency phone system, the callers shall be forwarded to the assigned DNIS.</b>	<b>INT</b>	
P-001a	The system shall collect <i>up to four arrival/departure predictions from the transit agencies, but publish only the next three predictions per route/direction/stop combination for departure times of not more than 90 minutes.</i>	PRED	The agencies shall send to 511 up to four predictions or as many as possible for each route/direction/stop combination and within the 90 minute prediction window. All predictions beyond 90 minutes shall be filtered out at the agency's end and not be sent to 511. 511 will only play up to three predictions.
P-001b	For vehicle location data requests, the system shall collect a pair of latitude/longitude data for each trip.	PRED	The agencies shall send to 511 one pair of latitude/longitude data for each trip.
P-002	The 511 system shall update any and all prediction data that is received from each of the transit agency systems within five (5) seconds of receipt of the prediction data.	PRED	All predictions received by 511 shall take no longer than 5 seconds to update the database.
<b>P-003</b>	<b>With publish/subscribe, the transit agency systems shall publish any and all generated predictions and vehicle location to 511 within five (5) seconds of the predictions being generated.</b>	<b>PRED</b>	<b>This is intended to minimize the time from when a prediction is generated by the transit agency to when 511 updates the predictions.</b>

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
P-004	With publish/subscribe, bundling of predictions and vehicle location to send together will be allowed, if necessary, based on the transit agency’s system. Predictions can be bundled and sent every thirty (30) seconds but not to exceed one minute.	PRED	There may be some cases where an agency will only be able to send a few predictions within a short time window. Thus, it may be more efficient to gather a few more predictions in longer time slices.
P-005	With request/reply, the transit agency systems shall send any and all generated predictions and vehicle location within five (5) seconds of the receipt of a data request from the 511 System.	PRED	This is intended to minimize the time between a request by 511 and a reply by the agencies.
P-006	All generated predictions and vehicle location shall be published/sent to 511 whether or not the actual predictions have changed.	PRED	<p>The 511 System will perform the filtering of predictions when they are received by each agency.</p> <p>The 511 System takes the predictions and checks whether each prediction has changed. If a prediction has not changed, the time of update is changed based on the prediction timestamp. If a prediction has changed, the prediction and the time of update are both changed.</p> <p>511 views prediction updates on a route basis, not on a vehicle basis. Therefore, all predictions need to be sent so they stay in the same order in the data transfer file.</p>

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
P-007	Valid predictions (those that have already been filtered by the transit agency) for existing stops and vehicle location data shall be sent on for dissemination to 511 users or to other transit agencies if subscribed for.	PRED	A valid stop is one with a Stop ID, Route ID and Route name in the 511 configuration database.
P-008	New predictions for an existing stop received from the transit agencies that have not changed from a previous prediction shall be filtered out and not sent to for dissemination to the 511 users. However, the updates to the timestamp of the prediction shall be updated for dissemination to 511 users or to other transit agencies if subscribed for.	PRED	The last time that the predictions have been updated are meant for the 511 users.
P-009	If a stop does not have a prediction, it shall be checked against the current list of stops that have predictions. If it is an existing stop, the updated times shall be changed. If the stop is new, it shall be marked as a new and inactive stop and a flag shall be sent to the configuration processor and the event shall be logged.	PRED	All stops in the database should have a current prediction unless there is a data exchange error. All new stops in the prediction data, but not in the configuration database shall be brought to the attention of the agencies. All logged events shall have a date and time stamp.
P-010	The system shall check new predictions against current predictions. If the difference between the two predictions is one minute or longer, the new prediction shall replace the current prediction. If not, the current prediction shall remain and the new prediction discarded. All new predictions shall be truncated off to the minute before comparing with the current prediction.	PRED	Current prediction times are truncated. The predictions need to be truncated off to the minute. Only if the minute changes will the predictions times need to be updated.

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
P-011	All predictions with Stop IDs, Route IDs, Route Directions, and Trip IDs that are not recognized (in the configuration database) shall be filtered out and not sent for dissemination to the 511 user or to other transit agencies. All filtered out predictions shall be logged.	PRED	All predictions without a valid stop shall be identified in order to determine whether or not a stop exists or whether there is an erroneous prediction. All logged events shall have a date and time stamp.
P-012	All predictions that have times in the past shall be filtered out and not sent for dissemination to the 511 users or to other transit agencies.	PRED	This filters out all outdated or stale predictions.
P-013	<b>All predictions published or sent from a transit agency to 511 shall be compressed (zipped).</b>	PRED	<b>The file(s) shall be zipped to minimize the size of the data to be transferred. The zipping of the files shall be the last action prior to the data transfer.</b>
P-014	<b>All prediction and configuration data that are published/sent from the transit agencies shall be delivered, received, processed, and made available to the 511 users by the 511 System in twenty (20) seconds or less; including all communications and processing time.</b>	PRED	<b>This time for the data transfer shall account for the zipping of files.</b>
P-015	The 511 system shall support response times of no longer than two (2) seconds for requests from 511 users and 511.org users for real-time prediction information	PRED	The requirement is to provide a response in 2 seconds and this may include announcements of any errors or lack of prediction data.

*TABLE 1 – SYSTEM REQUIREMENTS*

ID	Requirement	Allocation	Description
<b>C-001</b>	<p><b>The process for the implementation of major updates to an agency’s configuration data shall conform to the following:</b></p> <ol style="list-style-type: none"> <li><b>1. The agency designates a single point of contact to coordinate with on any questions about proposed changes to the configuration data.</b></li> <li><b>2. The agency contact will copy the MTC contact on the e-mails that are being sent back and forth between the agency and their real-time vendor (if applicable) when going through the process of the getting ready for signups.</b></li> <li><b>3. The agency will notify the MTC contact when a test server (if applicable) is ready to be queried for updated configuration data transfer.</b></li> <li><b>4. MTC will query a test server (if applicable) to transfer the configuration data and compare the new configuration data with the existing configuration data and identify any changes. If a test server is not available, then the agency shall send a file containing the configuration data to MTC for testing on the 511 System’s testbed server (see C-012)</b></li> <li><b>5. The transit agency and/or its real-time vendor will address and fix any questions or issues with the configuration data and proposed changes that will have substantial impacts on the 511 system. These fixes shall be done in a timely manner – see C-002.</b></li> </ol>	<b>CONF</b>	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
C-002	The procedures called for under C-001 shall begin at least two weeks before a transit agency’s sign-up or software change goes live to the public to ensure that new configuration data is ready for implementation on 511 a minimum of 48 hours prior to the changes going live by the agency.	CONF	This requirement is intended to have the 511 System Integrators verify the data formats of the configuration data in advance so should there be a need to make any modifications, these modifications can be completed and ready to go prior to the agency’s changes going live.
C-003	When requested by the 511 System, the transit agency systems shall send the most current set of configuration data.	CONF	
C-004	The format of the configuration data, including any use of patterns and/or trips, shall comply with the specifications as defined in the latest versions of the Extensible Markup Language (XML) Document Type Definitions (DTDs) for Java Message Service (JMS) Implementation and the Extensible Markup Language (XML) Document Type Definitions (DTD) for Web Service Implementation.	CONF	Two types of direction keys will be allowed, direction names or patterns. For those agencies who use patterns, they must also provide a mapping table to allow MTC to map from the pattern to a direction name that will be reported to the 511 users. The required mapping table format is referenced in the two documents referenced in requirement C-004.
C-005	All stop names provided to 511 from transit agencies shall follow the guidelines laid out in the “511 Proposed Transit Stop Naming Guidelines” document.	CONF	Agencies integrated to the 511 regional real-time transit information system before 12/31/2011 may update their stop names over time, as agreed between MTC and the transit agency.
C-006	Arrived status data for designated stops from a transit agency shall be provided once per day to the 511 System.	CONF	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

*TABLE 1 – SYSTEM REQUIREMENTS*

ID	Requirement	Allocation	Description
C-007	Transit agencies shall use their internal numeric stop IDs as the real-time transit system stop ID for all public stop locations. For those agencies that use non-numeric characters for stop IDs for public stop locations, they shall convert these non-numeric stop IDs to numerics only. In the event an agency uses non-numeric stop IDs for non-production stops (stops not used by the public), these can be sent to the 511 System.	CONF	
C-008	Transit agencies shall utilize the real-time transit system for all stop ID postings at transit stops, other public notifications (e.g., websites) or marketing efforts.	CONF	
C-009	The 511 System shall perform quality control checks on the stop names and stop IDs provided by the transit agencies. The quality checks shall compare the existing and new set of stop names and stop IDs and identify any changes or differences. Any changes or differences shall be logged (see L-003).	CONF	
C-010	A new set of stop names and stop IDs shall be verified such that each stop name has an associated stop ID and that there are no duplicate stop IDs from an agency.	CONF	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

*TABLE 1 – SYSTEM REQUIREMENTS*

ID	Requirement	Allocation	Description
<b>C-011</b>	<b>In the event that a transit agency provides the 511 System with duplicate stop IDs (same numeric value) for the same or different stop names, the 511 System shall flag these occurrences immediately during nightly configuration updates. MTC will work with the transit agency to resolve any such problems. The transit agency shall resolve the differences and provide the resolution to MTC at least 48 hours before a transit agency sign-up or within 48 hours if the configuration data is already live.</b>	<b>CONF</b>	
<b>C-012</b>	<b>The transit agencies' configuration data shall be made available to the 511 System's testbed server prior to going live with the data for each sign-up. (see C-001 and C-009)</b>	<b>CONF</b>	<b>This requirement will enable MTC to conduct tests on the new configuration data prior to going live.</b>
<b>C-013</b>	<b>The 511 System shall filter out all non-numeric stop IDs for non-production stops (stops not used by the public) and discard them.</b>	<b>CONF</b>	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
C-014	<p>To prevent duplication of stop IDs between agency systems, a numerical prefix shall be used. Each agency will be assigned a unique numerical prefix which will consist of one or two digits.</p> <p>The prefix can either be added by the 511 system, or included as part of the stop IDs sent to the 511 System by the agencies. The combination of the agency’s numeric stop ID and the numerical prefix will form the real-time transit system stop ID. The exception is that no prefix shall be added for BART stop IDs.</p>	CONF	<p>For those agencies with less than 1000 stops, a two digit prefix will be assigned, and for those agencies with 1000 stops or more a single digit prefix will be assigned.</p> <p>It is MTC’s preference to keep the length of the stop IDs to a total of six digits or less including the unique agency prefix.</p> <p>MTC also prefers that the assigned stop ID prefix be maintained in the transit agency system and stop IDs be already prefixed when data is delivered to the 511 system.</p>
C-015	<p><b>All stop IDs provided to the 511 system <u>without</u> the numerical prefix shall be of two numerical digits or more.</b></p>	CONF	
C-016	<p><b>Directions for routes are optional. Should an agency provide directions for its routes, the names of the directions shall be such that the 511 caller will be able to recognize and use the direction name, e.g., inbound or loop.</b></p>	CONF	
C-017	<p><b>Stops served by multiple agencies will have multiple Stop IDs (one Stop ID per agency)</b></p>	CONF	<p><b>For example, if a stop is served by both Muni and Golden Gate, the stop will have one Stop ID for Muni predictions and a different Stop ID for Golden Gate predictions.</b></p>

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

*TABLE 1 – SYSTEM REQUIREMENTS*

ID	Requirement	Allocation	Description
<b>C-018</b>	<b>Once a stop is permanently removed from service, the Stop ID that was assigned to that stop shall be permanently removed from configuration data. A removed Stop ID shall never be reassigned to a different stop; may only be reactivated if the stop to which it was originally assigned is brought back into service.</b>	<b>CONF</b>	
<b>C-019</b>	<b>Agencies shall maintain and provide unique, persistent trip IDs to 511.</b>	<b>CONF</b>	<b>Agency AVL or other intermediate systems that processes and sends configuration data shall provide to 511 the Trip IDs received from the scheduling system, unaltered.</b>
L-002	The 511 system shall continuously and automatically monitor and log all error notifications that are published to the system administrator. This log of error notifications shall be kept for a minimum of one month. All logged events shall include date and timestamps.	LOG	
L-003	The system shall automatically and manually generate reports of any and all changes to each transit agency's configuration data. All logged events shall include date and timestamps.	LOG	Reports are already being generated
L-004	The 511 system shall generate a notification and log the event automatically when a change in a transit agency's configuration data is identified. All logged events shall include date and timestamps.	LOG	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

**TABLE 1 – SYSTEM REQUIREMENTS**

ID	Requirement	Allocation	Description
L-005	<p>The 511 system shall be able to store log files of the predictions, on an ad-hoc basis, into a format which can be entered into a database and stored in a computer that is not accessible via the Internet. The log files shall be deleted after a configurable period of time.</p> <p>The specific data to be captured during the logging shall include:</p> <ul style="list-style-type: none"> <li>• Agency name;</li> <li>• Time of day;</li> <li>• Prediction (sent from agency);</li> <li>• Route;</li> <li>• Stop code;</li> <li>• Trip ID;</li> <li>• Vehicle location;</li> <li>• Status field designating whether the 511 System registered a new prediction as either changed or unchanged since the last prediction received.</li> </ul> <p>The data shall be captured after it has been categorized by the 511 System.</p>	LOG	
L-006	<p><b>Transit agencies shall provide the capability to log the configuration, prediction and arrivals status data requests received from, and sent to the 511 System. Each log file entry shall be time stamped containing the date, hour, minute and seconds (optionally fractions of a second). Due to log file size concerns, agencies shall only be required to log requests and responses on an as-needed basis.</b></p>	LOG	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
N-001	The 511 system shall send an e-mail to the system administrator and log the events within five (5) seconds upon identification of an error in messages or communications. All logged events shall include date and timestamps.	NOT	
N-002	With publish/subscribe, an e-mail shall be sent to the system administrator and the event logged if no data is received by all transit agencies for a period of five (5) minutes. All logged events shall include date and timestamps.	NOT	This requirement refers to a scenario where no data is received by any agency for a period of five minutes.
N-003	With publish/subscribe, an e-mail shall be sent to the system administrator and logged if no data is received by at least one transit agency for more than fifteen (15) minutes. All logged events shall include date and timestamps.	NOT	This requirement refers to no data being received by an, e.g., AC Transit, for a period of fifteen minutes. Data could still be received by other agencies within the fifteen minute period.
N-004	With publish/subscribe, an e-mail shall be sent to the system administrator and logged if an updated prediction for a stop is not received for more than 60 minutes. All logged events shall include date and timestamps.	NOT	
N-005	With request/reply, an e-mail shall be sent to the system administrator and logged if an updated prediction for a stop is not received for more than 60 minutes. All logged events shall include date and timestamps.	NOT	
N-006	With request/reply, the 511 system shall send an e-mail to the system administrator automatically and log the event when requested <i>prediction data</i> from a transit agency is not available after a user-configurable number of request attempts. All logged events shall include date and timestamps.	NOT	

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
N-007	With request/reply, the 511 system shall send an e-mail to the system administrator automatically when requested <i>configuration data</i> from a transit agency is not available after a user-configurable number of attempts. All logged events shall include date and timestamps.	NOT	Currently, 511 requests configuration data once per day.
N-008	With request/reply, the 511 system shall send an e-mail to the system administrator automatically when requested <i>arrived status data</i> from a transit agency is not available after a user-configurable number of attempts. All logged events shall include date and timestamps.	NOT	
A-001	An announcement shall be presented to 511 users if no prediction data is available for a specific stop. This announcement shall be presented when the user specifically requests prediction data for a specific stop.	ANN	
Ar-001	The system shall have data archiving capabilities.	ARCH	
Ar-002	Nightly backups of the databases for the 511 real-time transit information system shall be performed.  The nightly backups shall be done for the configuration data, arrived status data and all logs, errors and notifications for each night and kept for 90 calendar days at a minimum.  For prediction data, the nightly backups shall be kept for 14 calendar days at a minimum.	ARCH	The backed up data may be transferred to another medium (e.g., DVD), but all data shall be accessible by transit agency staff when requested for, and approved by MTC.

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
Se-001	The system shall exchange data over secure network connections between the transit agencies and the 511 System.	SEC	If an Internet connection is utilized, a secure connection such as a virtual private network shall be used. Also the connections should be routed through agency firewalls and DMZs as deemed necessary by the agency for data security purposes.
E-001	The system shall be designed such that the system can be expanded to include all the Bay Area transit agencies and all their routes, stops and fleets plus an additional 30% demand.	EXPN	This requirement is to accommodate the inclusion of additional transit agencies as the system grows over time.
E-002	The system shall be designed such that the system can be expanded to include the collection of data for continuous real-time reporting of transit vehicle position.	EXPN	This is a future requirement to potentially include AVL data for transit vehicle tracking.

511 REGIONAL REAL-TIME TRANSIT INFORMATION SYSTEM  
SYSTEM REQUIREMENTS – VERSION 3.0

---

<b>Stop ID Prefixes</b>	
<b>Agency</b>	<b>Prefix digit(s)</b>
BART	NA
Muni	1
WestCAT	2
Samtrans	3
Golden Gate Transit	4
AC Transit	5
Dumbarton Express	5
SCVTA	6
Caltrain	70
Santa Rosa CityBus	80
TriDelta	81
Marin Transit	84
Emery Go Round	85
Wheels (LAVTA)	88
Vine (Napa County)	89