

## UPP Parking System Requirements

---



# Urban Partnership Program

---

## System Requirements For UPP Parking 1.0 (FINAL)

*Prepared for:*

***Metropolitan Transportation Commission***



*Prepared by:*

**TELVENT** and



January 20, 2010

UPP PARKING  
SYSTEM REQUIREMENTS – FINAL

---

**DOCUMENT HISTORY**

<b>Document Description</b>	<b>Date</b>	<b>Version Number</b>
First draft release of the System Requirements to MTC	September 23, 2009	0.1 (Draft)
MTC comments	November 9, 2009	0.1 (Draft)
Second draft release of the System Requirements to MTC	December 4, 2009	0.2 (Draft)
MMTP Comments MTC comments	December 11, 2009	0.2 (Draft)
Draft Final release of the System Requirements to MTC	December 28, 2009	0.2 (Draft)
MTC comments	December 31, 2009	0.2 (Draft)
Final release of the System Requirements to MTC	January 5, 2010	1.0 (Final)
MTC final edits	January 20, 2010	1.0 (Final)

**TABLE OF CONTENTS**  
**UPP PARKING**  
**SYSTEM REQUIREMENTS – FINAL**

---

**1. GUIDING PRINCIPLES** ..... 1

**2. SYSTEM REQUIREMENTS** ..... 1

**TABLE 1: SYSTEM REQUIREMENTS** ..... 4

# UPP PARKING SYSTEM REQUIREMENTS – VERSION 1.0

---

## 1. GUIDING PRINCIPLES

For convenience, the set of guiding principles for the development, selection and implementation of the Parking System is provided below. These general principles will also apply to the development, selection, and implementation of the parking features.

1. 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.
2. Application initiatives will be guided by established methodologies using an appropriately tailored systems engineering approach.
3. Technology infrastructure will be utilized and/or developed to facilitate integration of current data and systems with multiple external entities who provide parking information.
4. The parking architecture shall utilize any existing communications infrastructure to the extent possible and feasible.
5. Secure network architectures will be employed.
6. Data and technology strategies will adhere to the National, State and Regional ITS Architectures, and federal ITS systems engineering practices to the extent possible.
7. IT systems will ensure recoverability to protect the integrity and continuation (up-time) of the system to the extent possible.
8. Open systems concepts will be leveraged to ensure portability, scalability, interoperability, and compatibility of the different systems.
9. Continuous process improvement strategies will be employed to improve the quality of the parking data and user interfaces system over time.
10. The system and data exchange methodologies shall be based on standardized data formats and data structures, employing existing ITS standards as applicable.
11. The implemented system shall minimize costs and optimize functionalities, to the extent possible.
12. Technology strategies will be implemented which reduce maintenance efforts and enhance cost effectiveness.
13. Design strategies will be employed to maximize the potential for system expandability and migration to future technologies/systems.

These guiding principles will be continuously checked against any and all elements that formulate the UPP Parking 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 Urban Partnership Program Bay Area Parking System. These requirements are based on the evaluation criteria developed for the selection of the architecture, discussions with MTC, identified parking stakeholders, Telvent Farradyne and ICx Technologies, and other potential parking data providers. These requirements are primarily focused on the functionality and performance of the 511 System interfaces between parking vendors and MTC, and the 511 user interface dealing with providing parking information to the public via the phone, web site

# UPP PARKING SYSTEM REQUIREMENTS – VERSION 1.0

---

and MY 511. Also, these requirements do not specifically include any requirements of how the parking vendors' systems work except for how they interface with 511.

To accommodate parking features, 511 systems will be updated to provide parking data to the public.

These requirements are grouped according to the following areas and are color coded to reflect whether the requirement is a parking provider requirement (in green and bolded) or a 511 system requirement (in black).

General (GEN)  
Parking Interface - 511 (PI511)  
Parking Interface - Parking Vendors (PIV)  
Voice User Interface (VUI)  
Web user Interface (WEB)  
MY 511 (MY511)  
Expansion (EXPN)  
Traffic Open Messaging Service (TOMS)  
Notification (NOT)  
Application Programming Interface (API)

## 1. General (GEN)

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

## 2. Parking Interface-511 (PI511)

These are requirements that relate to the 511's interface with the Parking Vendors' systems.

## 3. Parking Interface-Parking Vendors (PIV)

These are requirements that relate to the Parking Vendors' interface with 511 systems.

## 4. Voice User Interface (VUI)

These are the requirements that relate to how callers will interact with the 511 phone system to retrieve parking information.

## 5. Web User Interface (WEB)

These are the requirements that relate to how callers will interact with the 511 web site to retrieve parking information.

## 6. MY 511 User Interface (MY511-WEB & MY511-PHONE)

These are the requirements that relate to how users will interact with the MY 511 web and phone systems to configure and retrieve parking information.

NOTE: Recent planning efforts for an enhanced, more integrated MY 511 website have resulted in the following recommendation: place the design and implementation of the MY 511 parking enhancement

## UPP PARKING SYSTEM REQUIREMENTS – VERSION 1.0

---

on hold until the new vision of the MY 511 website can be planned and designed. The vision calls for a more fully integrated MY 511 service with 511.org and its sister pages. The UPP parking enhancement will be included in the planning efforts, and after completed, MTC will move forward with updating the MY 511 requirements included in this document.

### 7. Expansion (EXPN)

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

### 8. Traffic Open Messaging Service (TOMS)

These are requirements regarding the TOMS/JMS interface to third parties.

### 9. Notification (NOT)

These are requirements regarding how the system will provide notifications regarding system errors

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

### 10. Application Programming Interface (API)

These are requirements regarding the API to third parties.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
G-001	The parking 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. In particular, the data formats shall be based on existing ITS standards, when possible.
G-002	The parking system shall not need any proprietary algorithms for the exchange, interpretation and dissemination of parking data at the interface points.	GEN	To the extent possible, proprietary functions such as one to convert a street address to a latitude/longitude shall not be used. Open functions shall be used and documented.
G-003	The parking 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, their contractors, and/or agency staff, except under conditions where manual intervention is necessary such as when the system is undergoing scheduled maintenance, and to integrate additional parking vendors.
G-004	The 511 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.
G-005	The parking system shall have a registration process for parking vendors.		
I-001	The 511 system shall provide an open, standards-based parking interface to collect parking data from parking vendors.	PI511	511 will provide a template application that meets system interface requirements that Parking data providers could use to start their system development.
I-001.1	The parking interface shall be secure, requiring valid login credentials for access.	PI511	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-001.2	The parking interface shall be behind a firewall.	PI511	Parking vendors shall not be able to access the system without providing their connections information in an off-line registration process.
I-001.3	The parking interface shall be architected to provide load balancing and/or a backup server so that if a single server or service fails, the parking interface will remain operational.	PI511	
I-001.4	The parking interface shall be scalable.		
I-002	The 511 system shall request/collect parking data from all registered parking vendors' systems.	PI511	
I-002.1	Parking data shall be received from all parking vendors' systems in the standard format defined by the project.	PI511	
I-003	The 511 system shall request/collect parking static data from all registered parking vendors' systems.	PI511	
I-003.1	The 511 system shall be able to request/collect static data on a scheduled basis.	PI511	
I-003.2	The 511 system shall request/collect static parking data at least once per day.	PI511	Explore if static data collection is not needed this frequently.
I-003.3	The 511 system shall be able to request/collect static data on demand, when needed.	PI511	
I-003.4	The 511 system shall use a shared central static database with the 511 Multimodal Trip Planner.	PI511	Details of database structure, communication processes, operations and maintenance will be defined during the Detailed Design process.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-004	The 511 system shall be able to log every message received from every parking vendors' system data, depending on system settings. At a minimum, logging shall include:	PI511	
I-004.(a)	Date and time of day	PI511	
I-004.(b)	The parking vendor name and IP address	PI511	
I-004.(c)	The full content of the received messages, including error messages.	PI511	
I-004.1	The system logging settings shall include the level of logging, with at least options for full logging or errors only. Full logging shall include the logging of every message received from every external system, and the details of how it was processed.	PI511	Every message includes both dynamic and static data.
I-004.2	The system shall be able to store the log files of the dynamic data received by the parking vendor's systems 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.	PI511	This is for logging and storing dynamic data received by the parking vendor's systems.  Consider storing data on a continuous basis to provide for predictive estimates of parking availability. Explore the desire for this in focus groups.
I-004.3	The system settings shall include a parameter that defines how long log files will be kept before being archived.	PI511	See comment on I-004.2.
I-004.4	The system shall be able to generate a summary report of logged files on a daily, monthly, quarterly and yearly basis.	PI511	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-005	If dynamic parking data is not received from any one parking vendors' system for more than a configurable amount of time, during defined business hours, a trap shall be sent.	PI511	
I-006	If there is no response from any one parking vendor's system for static data for a defined period of time after a request, a trap shall be sent.	PI511	
I-007	The 511 system shall produce and e-mail to a defined set of e-mail addresses a summary of received static data to include:	PI511	
I-007.(a)	The number and types of errors	PI511	
I-007.(b)	The names of facilities with changes and the nature of those changes	PI511	
I-007.(c)	The names of new facilities	PI511	
I-007.(d)	The names of removed facilities	PI511	
I-008	Upon receipt of dynamic parking data, the parking interface shall convert it to a format that can be accepted by the phone, web, Multimodal Trip Planner, and MY 511 systems and send the converted data to those systems using a defined protocol.	PI511	During detailed design, explore in-built messaging feature that can be used by various dissemination channels.  Also explore a shared central dynamic database with the 511 Multimodal Trip Planner. Could be combined with shared static database.
I-009	The parking interface shall log all format and content errors for both static and dynamic parking data.	PI511	
I-009.1	Log data shall be analyzed for quality control.	PI511	Explore automated quality control processes and scripts.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-010	Any message or discrete portion of a message, relating to one or more parking facilities with a format or content error shall be otherwise ignored, and not forwarded to other systems or stored in a database, other than to log the errors.	PI511	
I-011	All parking vendors' systems shall respond to 511 requests for static data within 15 seconds of their receipt of each request.	PIV	For static data, this will be a pull methodology; for dynamic, push.
I-012	With publish/subscribe, the parking vendor's system shall publish any and all dynamic data to 511 within five (5) seconds of the dynamic data being generated.	PIV	This is intended to minimize the time from when a piece of dynamic is generated by the parking vendor's system to when 511 updates the dynamic data.
I-013	With publish/subscribe, bundling of dynamic data to send together will be allowed, if necessary, based on the parking vendor's system. Dynamic data can be bundled and sent every thirty (30) seconds but not to exceed one minute.	PIV	There may be some cases where a parking vendor's system will only be able to send a few dynamic data items within a short time window. Thus, it may be more efficient to gather a few more dynamic data items in longer time slices.
I-014	The parking vendor's system 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.	PIV	The internet time source time.windows.com is preferred as it is the source with which the 511 system is synchronized.
I-015	All parking vendors shall define to MTC their hours of operation during which they shall provide dynamic parking data.	PIV	This data should be stored in vendor configuration tables.
I-016	Parking vendors' systems shall publish dynamic parking data at least once every five minutes, during the following periods:	PIV	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-016.(a)	Defined business hours	PIV	
I-016.(b)	Holidays and special events	PIV	
I-017	Parking vendor's static and dynamic data shall be published in the format defined by the project and using the protocol defined by the project.	PIV	
I-018	Every parking vendors' system shall have the ability to log the full content of every message that is sent to the 511 System. If desired, the parking vendor can develop a method of enabling and disabling the logging.	PIV	
I-019	All parking data sent by a parking vendor must be accurate and complete.	PIV	<p>In this context, accurate indicates that the correct and current information that the parking lot vendor has access to must be sent without modification. Complete indicates that all available information must be sent, and no information shall be filtered.</p> <p>Vendors may need to employ performance monitoring processes to ensure data quality.</p>
I-020	The parking interface shall not send parking information if older than a configurable time.	PIV	
I-021	The parking interface shall indicate that no information is available for parking facilities where information is not available.	PIV	
I-022	If parking information for at least one facility is available, it shall be sent as soon as it is available.	PIV	Do not wait for all lot information to be available to send dynamic data. Send the data as soon as possible.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-023	Parking vendors shall send at a minimum the following dynamic parking data:	PIV	
I-023.(a)	Facility ID	PIV	
I-023.(b)	Number of available spaces	PIV	
I-023.(c)	Time and date information was updated	PIV	
I-024	Parking vendors shall send other dynamic parking data defined in the interface document as optional, this may include:	PIV	No other information shall be sent besides that defined in the interface document as optional.
I-024.(a)	Types of spaces available	PIV	
I-024.(b)	Dynamic vehicle pricing information	PIV	
I-025	Parking vendors shall send at a minimum the following parking static data:	PIV	This list is the minimum set of data that is required. Other data could include, but is not limited to: facility ID, hours of operation, contact information, type of facility, types of spaces, payment options, payment time periods and rates, available services, entrance locations, entrance height, and maximum time limit.
I-025.(a)	Facility name	PIV	
I-025.(b)	Facility location	PIV	Address & latitude/longitude
I-025.(c)	Total number of spaces	PIV	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
I-025.(d)	Parking rates	PIV	
I-026	Parking vendors shall be able to send other parking static data that is defined in the interface document as optional.	PIV	This is not required, but desirable if it exists. No other information shall be sent besides that defined in the interface document as optional.
I-027	Parking vendors shall notify MTC within one hour of the information being confirmed, if the vendor's system's parking interface will be offline for any amount of time during their defined business hours.	PIV	In this instance, offline means not able to provide dynamic or static parking information. It would be expected that MTC accept the outage, and request the system be configured to not expect data during the outage.
I-028	Parking Vendors shall not change any parking facility identification information (such as ID, name, etc) unless approved by MTC.	PIV	Will avoid unnecessary O&M
I-029	Parking vendors shall enable error monitoring in their system such that the system shall send out automated alerts to a list of system maintenance personnel whenever an error is detected.	PIV	One mechanism is by use of SNMP Traps.
V-001	The Bay Area 511 Phone System shall include a parking menu that provides parking information from the parking system.	VUI	
V-001.1	The parking menu shall be available from the Bay Area 511 Phone System main menu.	VUI	
V-001.2	The parking menu shall be available from the Bay Area 511 Phone System traffic menu.	VUI	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
V-002	The parking menu shall use touchtone and voice interfaces following the same organization as all other menus within 511.	VUI	Users shall be able to enter commands via voice or touch tone. If they press 0 in the parking menu they shall be able to hear all the touch tone options.
V-003	The parking menu shall allow users to request parking information by selecting individual parking facilities.	VUI	
V-003.1	Facilities may include lots, garages, and/or defined areas containing on-street parking.	VUI	
V-003.2	The parking menu shall allow users to select individual parking facilities by facility name.	VUI	This is the initial concept and will be tested in focus groups. Facility names might also include on-street groupings. Alternatively, intersections or other location-based selection schemes might be used.
V-003.2.1	Users shall be able to select individual parking facilities by speaking the parking facility name.	VUI	
V-003.2.2	Users shall be able to select individual parking facilities by selecting from a list of facility names for each city.	VUI	If zones
V-003.2.2.1	A list of cities shall be defined for one or more parking facilities.	VUI	
V-003.2.2.2	Each parking facility shall be associated with at least one city.	VUI	
V-003.2.3	The system shall allow users to select parking by available zones (if parking zones, on-street zone or other zones are defined).	VUI	This is the initial concept and will be tested in focus groups. Zones might include both lots/garages and on-street. We will also explore intersection based selections.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
V-003.3	The parking menu shall allow users to request parking information by parking facility ID, if different from the facility name.	VUI	This is the initial concept and will be tested in focus groups. Facility ID's might also include on-street groupings.
V-003.3.1	Users shall be able to select individual parking facilities by speaking the parking facility ID, if different from the facility name.	VUI	
V-003.3.2	Users shall be able to select individual parking facilities by selecting from a list of parking facility IDs for each city, if different from the facility name.	VUI	
V-003.3.2.1	A list of cities shall be defined and associated with one (zero?) or more parking facilities.	VUI	During the design phase, explore recognizing the major Bay Area cities and responding with “there are no participating facilities at this time for this city” for cities where 511 has no data. Alternatively, after a configurable number of misrecognitions, the system plays a message that tells the user to say “list all.”
V-003.3.2.2	Each parking facility shall be associated with at least one city.	VUI	
V-003.3.3	The system shall allow users to select individual parking facilities by available zones (if parking zones, on street-zone or other zones are defined).	VUI	
V-004	The parking menu shall provide users parking information for individual parking facilities based on the parking facility selected.	VUI	
V-004.1	The system shall inform users that they can say “What are my choices” or “list all” at every level to get a list of possible information that could be requested for a selected facility.	VUI	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
V-004.2	After a parking facility is identified, the system shall play the number of available spaces.	VUI	This might be played as a raw number, percentage, or some other scale – to be explored in focus groups.
V-004.2.1	After availability information has played, the system shall play pricing information.	VUI	To be further explored in the focus groups if pricing should be played at the top level, and/or if other information is desirable at the top level.
V-004.2.1.1	If there is a pricing change coming within a defined number of minutes, the system will play pricing information for the pending changes after the current pricing if available from the vendor.	VUI	To be further explored in focus groups on how best to play for the callers.
V-004.3	The system shall ask users what additional information they want, or to say “All” to get all the information about an individual parking facility.	VUI	When a caller says they want “all information” for a particular lot, all information that is known about a lot will be played. Focus groups will explore priority order of the information. If a particular piece of information about a lot is unknown, the system will not play that information. For example, if total spaces are known, but pricing information is unknown for a lot, the total spaces shall be played, but the system shall play the total spaces, not play any information about pricing. To be further explored in the focus groups.
V-004.4	If no information is available for a facility selected via ID, name or location, the 511 phone system shall indicate that no information is available.	VUI	
V-005	The 511 system shall be capable of playing any facility feature using text-to-speech format if a recording is not available.	VUI	This will expedite adding lots and features.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
V-006	The parking system shall be designed such that it can be expanded to provide transfers to vendor parking reservation systems, where available.	VUI	
W-001	The Bay Area 511 web site shall display the following types of static parking information.	WEB	These requirements are in addition to the original 511 Web site requirements.
W-001.(a)	Facility name	WEB	
W-001.(b)	Facility ID	WEB	
W-001.(c)	Hours of operation	WEB	
W-001.(d)	Contact information	WEB	
W-001.(e)	Location	WEB	
W-001.(f)	Type of facility, to include:	WEB	
W-001.(f).1	Garages	WEB	
W-001.(f).2	Lots	WEB	
W-001.(f).3	On-street parking	WEB	
W-001.(g)	Total number of spaces	WEB	
W-001.(h)	Types of spaces	WEB	
W-001.(i)	Payment options	WEB	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
W-001.(j)	Static parking rates	WEB	
W-001.(j.1)	Payment time periods & rates (15 minute increments/hourly rates, daily, rates, monthly rates, early bird rates, special event rates)	WEB	Where data is available.
W-001.(k)	Available services (e.g., valet parking)	WEB	
W-001.(l)	Entrance locations	WEB	
W-001.(m)	Entrance height	WEB	
W-001.(n)	Maximum time limit	WEB	
W-002	The Bay Area 511 web site shall display dynamic parking information for individual parking facilities.	WEB	Where available.  Explore in focus groups if predicted estimates of availability for future trips based on historical averages is desirable.
W-002.1	The following dynamic parking information shall be displayed when available.	WEB	
W-002.1.(a)	Available spaces	WEB	“Full” if there are no available spaces. This might be displayed as a raw number, color coding, percentage, or some other scale – to be explored in focus groups.
W-002.1.(b)	Current pricing	WEB	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
W-002.1.(c)	Future pricing	WEB	
W-002.1.(d)	Time of pricing changes	WEB	This would apply to either dynamic pricing changes or scheduled pricing changes.
W-002.1.(e)	Date and timestamp for information	WEB	
W-002.1.(f)	Hours of operation	WEB	
W-002.2	The message “No Data” shall be displayed if no data is available for a data item.	WEB	
W-003	The Bay Area 511 web site shall display the location of parking facilities on the parking map.	WEB	
W-003.1	The Bay Area 511 web site shall allow users to turn the display of parking facility types on and off on the map.	WEB	
W-003.2	The Bay Area 511 web site shall allow users to select the types of parking facilities to be displayed on the map.	WEB	Other map filtering options could be provided.
W-003.2.1	The map shall provide distinct identifiers for each type of parking facility.	WEB	Parking facilities could be identified through icons, color-coding, and/or labeling.
W-003.2.2	The map shall allow users to toggle on/off different facility types.	WEB	
W-004	The Bay Area 511 web site shall provide users the ability to search for a parking location.	WEB	We will explore desired search criteria in the focus groups. This may include other criteria beyond that defined in this requirement.
W-004.1	Users shall be able to search by street address.	WEB	The user may specify a complete address or city and state or zip code.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
W-004.2	Users shall be able to search by distance radius from a street address.	WEB	The user may specify a complete address or city and state or zip code. Users shall also be allowed to search by landmark if landmark data is provided within the geofiles.
W-004.3	Users shall be able to search by facility name, and ID.	WEB	
W-005	The 511 web site shall display search results.	WEB	
W-005.1	The 511 web site shall display search results on the map.	WEB	Users will be presented high level information (name, availability, pricing) with the opportunity to click for more info – to be further explored in the focus groups.
W-005.2	The 511 web site shall display search results in a text list.	WEB	Users will be presented high level information (name, availability, pricing) with the opportunity to click for more info – to be further explored in the focus groups.
W-006	The 511 web site shall provide the ability to refine a search or sort the results, where the data is available, by:	WEB	
W-006.(a)	Type of space	WEB	
W-006.(b)	Type of facility	WEB	
W-006.(c)	Availability	WEB	Explore in focus groups if predicted estimates of availability for future trips based on historical averages is desirable.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
W-006.(d)	Distance from specified location	WEB	Within a radius as the crow flies.
W-006.(e)	Price	WEB	
W-006.(f)	Payment options	WEB	
W-006.(g)	Hours of operation	WEB	
W-007	The Bay Area 511 web site shall display a message to users in the event of a parking data feed outage.	WEB	
M-001	The Bay Area 511 system shall provide personalized parking information via the MY 511 web site.	MY511- WEB	These requirements are in addition to the original MY 511 requirements.
M-001.1	The MY 511 system shall display parking information for up to six parking locations on the users' personalized home page.	MY511- WEB	
M-001.2	Each location will display user-selected facilities up to a configurable number.		
M-002	The MY 511 web site registration process shall provide users the ability to specify parking facilities for which parking information is desired.	MY511- WEB	
M-003	The MY 511 web site registration process shall provide users the ability to select non-trip-related parking facilities.	MY511- WEB	Usability research will determine how best to allow users to tie parking facilities to their saved trips, if at all, and how best to display the information together.
M-003.1	The user shall be able to search for parking facilities.	MY511- WEB	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
M-003.2	Users shall be able to filter their parking facility selections based on the search process from the general parking web page.	MY511- WEB	
M-003.3	MY 511 shall allow a user to name each personalized parking location from a predefined list of names (and facility IDs).	MY511- WEB	The list of names will be recognized on the 511 phone service as 511 Parking locations.
M-004	The MY 511 service shall allow users to configure parking alerts for selected parking facilities.	MY511- WEB	Will be sent accordingly to configured MY 511 alert notification frequency.
M-004.1	The alerts shall be in sent in text or e-mail format.	MY511- WEB	
M-004.2	Allow users to set up to receive a phone call alert.	MY511- WEB	
M-004.3	Users can set up the phone numbers to receive calls from the list of numbers they added to their registration page.	MY511- WEB	
M-004.4	Users can set up a schedule for the MY 511 system to call them about parking information.	MY511- WEB	
M-005	The MY 511 text, call-out and e-mail parking alerts shall include:	MY511- WEB	
M-005.(a)	Day	MY511- WEB	
M-005.(b)	Time of day	MY511- WEB	
M-005.(c)	Availability	MY511- WEB	
M-005.(d)	Pricing	MY511- WEB	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
M-005.(e)	Location	MY511- WEB	
M-006	MY 511 shall allow the user to define and save up to six parking locations.	MY511- WEB	
M-006.1	MY 511 shall allow the user to define up to a maximum (and configurable) predefined limit of facilities per location.	MY511- WEB	The appropriate maximum will be explored in focus groups.
M-006.1.1	MY 511 shall allow users to select the number of facilities up to a configurable maximum number.	MY511- WEB	
M-006.1.2	MY 511 shall allow system administrators to configure the maximum number of facilities.	MY511- WEB	
M-007	MY 511 shall display a message on the users' homepage in the event of a total parking data feed outage down to an outage of only one facility.	MY511- WEB	
M-008	The 511 Phone System shall be able to accept parking location registrations from the MY 511 system.	MY511- PHONE	This requirement is in addition to the current driving time and transit options.
M-009	The 511 phone system shall play the parking facility information for up to six MY 511 parking locations.	MY511- PHONE	Parking lot information shall be separate from driving and transit stops.
M-009.1	For each parking location, the phone system shall play the names of the user-selected parking facilities.	MY511- PHONE	
M-009.2	For each parking facility, the phone system shall play the number of available spaces.	MY511- PHONE	
M-009.3	For each parking facility, the phone system shall play the current pricing information.	MY511- PHONE	This could be played as additional information under MY 511; we will explore in focus groups.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
M-009.4	If there is a pricing change coming within a defined number of minutes, the system will play pricing information for the pending changes after the current pricing.	MY511-PHONE	
M-009.5	For each MY 511 parking location, the phone system shall play up to a defined (and configurable) maximum number of facilities.	MY511-PHONE	The appropriate maximum will be explored in focus groups.
M-009.5.1	The phone system shall allow system administrators to configure the maximum number of facilities.	MY511-PHONE	
M-0010	If no information is available for a facility selected via the MY 511 system, the 511 phone system shall indicate that no information is available.	MY511-PHONE	
M-0011	If the option to call a MY 511 user is selected for a parking registration, the Bay Area 511 phone system shall call the user.	MY511-PHONE	
M-0011.1	The phone system shall call the number registered by the user.	MY511-PHONE	
M-0011.2	The phone system shall call users using a schedule defined by users.	MY511-PHONE	
M-012	If the outbound call is answered, the system shall request that the caller confirm that they are the intended party and want the parking information.	MY511-PHONE	
M-012.1	If a user answers and confirms that they want parking information, the system shall play the same information as if they had called the system with a phone number identified by 511 and had requested the parking location associated with the outbound call request.	MY511-PHONE	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
M-013	If the outbound call is not answered, or the recipient does not confirm that they want the parking information the call will be terminated. During registration, the user can select to be called back if there is no answer or the call goes to voicemail.	MY511-PHONE	If the call is answered by voice mail, it can not be confirmed.  The rescheduling option will be further explored in focus groups.
M-013.1	If an outbound call is rescheduled, it shall use system wide parameters for the time period to wait between outbound attempts, and the maximum number of times to retry.	MY511-PHONE	
M-014	At the end of the playback of the location request, the system shall ask the MY 511 user if they want to be called back.	MY511-PHONE	
M-014.1	If a MY 511 user indicates they want to be called back, the system shall ask them in how many minutes, and accept a number between one and 60 minutes for a return call.	MY511-PHONE	
M-014.2	If the caller terminates the call or leaves the MY 511 menu before the return call question can be asked and answered, the system shall not call them back.	MY511-PHONE	
M-015	MY 511 shall play a message at the MY 511 main menu in the event of a parking data feed outage.	MY511-PHONE	
E-001	The parking system shall be designed such that the system can be expanded to include all the Bay Area parking facility providers that choose to participate in the project, and meets the project requirements.	EXPN	This requirement is to accommodate the inclusion of additional parking facilities as the system grows over time. This comment refers to the design/configuration of hardware, software, database, and network capacity.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
E-002	The parking system shall be designed such that it can be expanded to include data from any data aggregator that chooses to participate and meets system requirements.	EXPN	This requirement is to accommodate the inclusion of smaller parking facilities through an aggregator, to allow any lot to participate. This comment refers to the design/configuration of hardware, software, database, and network capacity.
T-001	A new subscription shall be added to TOMS which shall provide dynamic and static parking information to third parties.	TOMS	
T-002	TOMS shall publish parking information so it is available to all third parties that subscribe for parking information.	TOMS	
T-003	TOMS shall publish dynamic parking data via TOMS within one minute of it being received from parking vendors.	TOMS	
T-004	If any dynamic real-time parking information is restricted from being distributed directly to the public, it shall not be published via TOMS.	TOMS	
T-005	TOMS shall provide a request interface which will allow third parties to request static information.	TOMS	
T-006	TOMS shall respond to requests for static parking information within one minute of receiving a request for static parking information with a message containing all available static parking information.	TOMS	
T-007	TOMS schema and user documentation shall be updated to include the format for all dynamic and static parking messages.	TOMS	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
N-001	The parking interface shall integrate with the same SNMP Manager (currently What's up Gold) as the other 511 components.	NOT	Could explore Big Brother.
N-002	The system shall be configured to catch SNMP traps when the Parking interface detects an error and throws a trap.	NOT	
N-003	When the SNMP Manager catches traps sent by the Parking Interface, it shall perform notifications based on its configuration, using a process consistent with the process used to perform notifications when traps from other 511 components are caught.	NOT	
N-004	A standard operating procedure shall be developed that lists steps to be taken when errors are received. The procedures shall contain the following:	NOT	
N-004.(a)	Who or which group is responsible for responding to the alerts	NOT	
N-004.(b)	Types of errors that can be received	NOT	
N-004.(c)	Steps to take for each type of error	NOT	
N-004.(d)	Contact information for each of the parking vendors consisting of a list of who to contact for each type of error received.	NOT	
A-001	The parking system shall provide an Application Programming Interface (API) for data submission and retrieval.	API	
A-001.1	The API shall communicate using existing standard communication protocols (e.g., HyperText Transfer Protocol - HTTP).	API	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
A-002	The API shall be based on existing standard interface protocols (e.g., Simple Object Access Protocol – SOAP, REST, etc.).	API	
A-003	The API shall use a message structure based on standard data interchange languages (e.g., eXtensible Markup Language - XML, JavaScript Object Notation - JSON).	API	
A-004	The API shall use encryption for the storage and transmission of private/personal and/or sensitive data (e.g., user account information, credit card information).	API	
A-005	The API shall prevent unauthenticated and unauthorized access to data.	API	
A-005.1	The API shall prevent unauthenticated access to data using one or more existing standard security mechanisms (e.g., WS-Security, Web Services-Interoperability Username Token Profile).	API	
A-005.2	The API shall prevent unauthorized access to data using some form of role-based security.	API	Within an organization, roles are created for various job functions. The permissions to perform certain operations are assigned to specific roles. Members of staff (or other system users) are assigned particular roles, and through those role assignments acquire the permissions to perform particular system functions.
A-005.3	There shall be a registration process by which users receive security tokens to receive authorized access to the API data.	API	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
A-005.3.1	System Administrators shall be able to modify the API registration database.	API	
A-005.3.2	System Administrators shall be able to generate usage statistics of registrations and API usage.	API	
A-005.3.2.1	The API system shall generate registration statistics.	API	
A-005.3.2.2	The API System shall allow System Administrators to view the registration statistics.	API	
A-005.3.2.3	The API system shall generate API usage statistics.	API	
A-005.3.2.4	The API system shall allow System Administrators to view the API usage statistics.	API	
A-006	The API will support the following standard Web development languages/systems:	API	
A-006.(a)	Java	API	
A-006.(b)	Microsoft.NET	API	
A-006.(c)	Perl	API	
A-006.(d)	PHP	API	
A-006.(e)	Python	API	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
A-006.(f)	Ruby	API	
A-007	The API shall be created using standard development languages/systems (e.g., Java, Microsoft .NET, PHP).	API	
A-008	The API shall provide access to static parking system data, to include:	API	
A-008.(a)	Facility Name	API	
A-008.(b)	Facility ID	API	
A-008.(c)	Hours of Operation	API	
A-008.(d)	Contact Information	API	
A-008.(e)	Location	API	
A-008.(f)	Type of Facility, to include:	API	
A-008.(f).1	Garages	API	
A-008.(f).2	Lots	API	
A-008.(f).3	On-street parking	API	
A-008.(g)	Total Number of Spaces	API	
A-008.(h)	Types of Spaces	API	

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
A-008.(i)	Payment Options	API	
A-008.(j)	Static Parking Rates	API	
A-008.(j.1)	Payment Time Periods & Rates (15 minute increments/Hourly rates, Daily, rates, Monthly rates, Early Bird rates, Special Event Rates)	API	
A-008.(k)	Available Services (e.g., valet parking)	API	
A-008.(l)	Entrance Locations	API	
A-008.(m)	Entrance Height	API	
A-008.(n)	Maximum Time Limit	API	
A-009	The API shall provide access to dynamic parking system data, to include:	API	Where available
A-009.(a)	Available spaces	API	“Full” if there are no available spaces. This might be displayed as a raw number, color coding, percentage, or some other scale – to be explored in focus groups.
A-009.(b)	Current pricing	API	
A-009.(c)	Future pricing	API	
A-009.(d)	Time of pricing changes	API	This would apply to either dynamic pricing changes or scheduled pricing changes.

UPP PARKING  
SYSTEM REQUIREMENTS – VERSION 1.0

---

<i>TABLE 1 – SYSTEM REQUIREMENTS</i>			
ID	Requirement	Allocation	Description
A-009.(e)	Date and timestamp for information	API	
A-009.(f)	Hours of operation	API	
A-009.1	The message “No Data” shall be displayed if no data is available for a data item.	API	
A-010	The API shall be documented in a manner consistent with existing API documentation and include a developer’s guide with examples. (e.g., Amazon Web Services, Twitter API).	API	