

# TRANSITLIVE CONFIGURATION OVERVIEW\*

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TransitLive is a real-time municipal transit informational resource for transit users and administrators. TransitLive was conceived as a software/hardware system that would track transit buses in real-time. It provides this information to a user interface for transit customers to allow them to know where their bus is in real-time.

## A. TransitLive Architecture

The overall architecture of the TransitLive system is illustrated in the figure below.

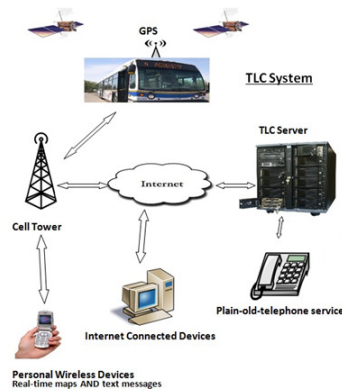


Figure 1. System Overview

As seen in figure 1, the TransitLive system architecture was developed to provide user interface access from as many devices as possible. TransitLive was created primarily as a web-based application but also provides user interaction through other technologies such as plain-old-telephone service and text messaging.

The on-vehicle hardware and software provide GPS coordinates to a back-end cloud server via the cell data network. The server acts as the intermediary and provides information to the user interfaces as required.

## B. Interface

The TransitLive interface is a web application interface that derives its functionality through web technologies such as JavaScript and the jQuery and leaflet libraries.

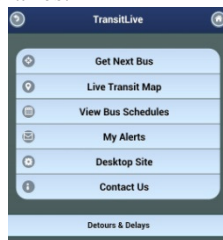


Figure 2. Mobile Interface Front-Page

The interface enables device specific functions through the jQuery library such as the geo-location of the device.



Figure 3. Geo-Location Enabled

The map interface is generated by a tile server using OpenStreetMaps data and utilizing the Cascadenik map style.

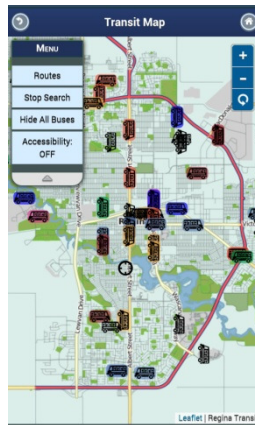


Figure 4. Real-Time Transit Map

### IMPLEMENTATION

The interface has been designed iteratively and gone through several iterations. Originally, the interfaces for desktops and mobile devices were developed entirely separately. The original desktop version utilized the Google Flash API to provide the live map.

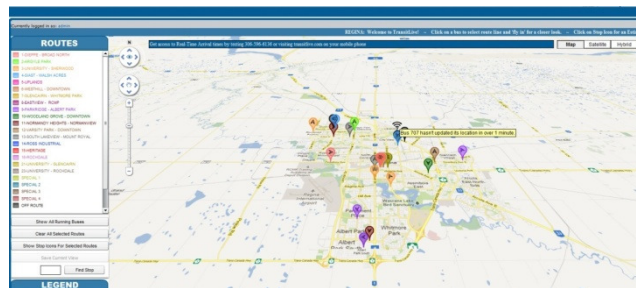


Figure 5. Original Flash-based Desktop GUI

The original mobile interface was created with JavaScript and HTML with a Google map background.

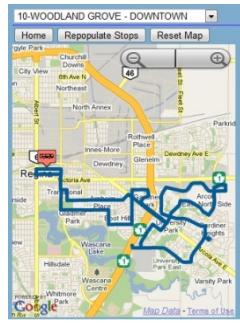


Figure 6. Original Mobile Live Map Interface

The interfaces in figure 5 and 6 were first developed without any significant input from the user base. Following several meetings with the client and feedback from the user base, the interfaces were completely redesigned. The redesign resulted in incorporating the jQuery and leaflet libraries and the convergence of the code base in order to provide a more consistent user experience between desktop and personal devices. This effort improved the maintenance of the code base and allowed features to be rolled out simultaneously to all devices. There are currently only two fundamental differences between the desktop and mobile implementation. The opening page view and the header viewable for any subsequent pages while viewing the application on desktops versus mobile devices.

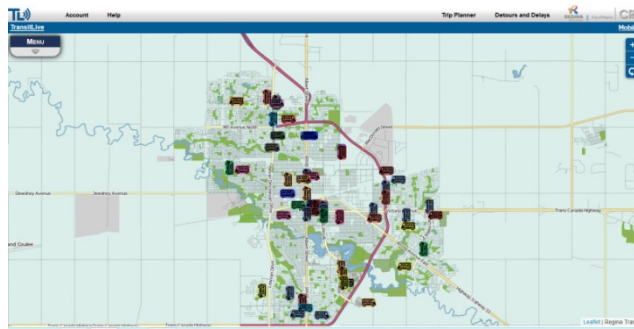


Figure 7. Modified Web Application

Figure 7 shows a consistent desktop interface with the mobile interface as shown in figure 4. The re-design and focus on consistent web technologies brought about a seamless user experience to the application across all devices.

## RESULTS

The usage statistics of the system indicate both an increase in usage and a shift in the overall usage from desktop to mobile devices. The following graph in figure 8 shows the increase in usage of the system over time. The significant increase in usage is not necessarily indicative of the interface change to a more consistent user experience because the increase can partially be explained by users becoming aware of the system's existence. However, since there is a steady growth in usage, the interface changes cannot be considered negative because the system did not see any decrease in usage after the change-over.

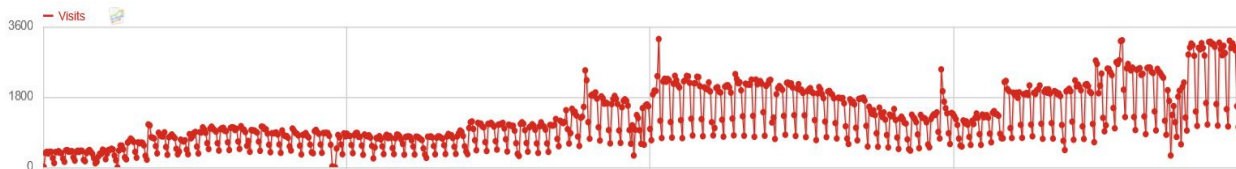


Figure 8. Web Interface Visits

Figure 8 shows a steady increase in usage over a two year period. Each plot point indicates the number of visits for a given day. The regular deviations that show lower usage in the graph are weekend usage statistics versus regular

weekday usage. The large deviations from the norm for particular points can be explained by particular events on given days. For example, the public announcement of the system is indicated by the spike in the middle of the graph where many people may have been curious to view the site for the first time. Another example would be the usage over Christmas holidays as indicated by the significant decrease in usage closer to the right-hand side of the graph.

Over one million visits to the web application have been logged since the recording of the application's usage has been actively captured. Usage statistics from the major browsers are shown in the figure below.

Safari	536168
Chrome	193686
Internet Explorer	155203
Firefox	83313
BlackBerry	35262
Unknown	3265
Opera	2800
PlayBook	1506
ABrowse	934
Chrome Frame	699

Safari 6.0	207231
Safari 4.0	198103
Safari 5.1	78022
Internet Explorer 8.0	56652
Internet Explorer 9.0	49013
Safari 7.0	36490
Chrome 31.0	24270
Internet Explorer 10.0	21496
Chrome 18.0	15696
Chrome 32.0	15669

Figure 9. Browser Usage

Figure 9 indicates that all the major browsers and associated versions are actively being utilized by the users of the application. The Safari browser is the most often used browser because both Android and iOS provides the Safari browser by default to mobile users. The operating system statistics are shown in the following figure.

iPhone	270680
Android	242282
Windows 7	217036
Windows XP	96781
Mac OS	48871
BlackBerry	31708
Windows Vista	25459
Windows 8	22864
iPad	18985
Linux	11749

Figure 10. Operating System Usage

Figure 10 shows that the major operating systems are all being utilized to view the application by users.

It is the trends in usage over time that provides the most interesting results. The usage trend changed significantly after the merging of the interface to a more consistent user experience between the desktop and mobile interface.

Mobile	330795
Desktop	294159
Unknown	2433

Figure 11. Before User Interface Change

Mobile	249926
Desktop	131437
Unknown	4936

Figure 12. After User Interface Change

Figures 11 and 12 indicate a significant change in usage patterns took place after the interface changes that were described in Section III. This is likely due to the increased usability of the mobile interface which is a result of the compatibility and functionality of utilizing JavaScript libraries such as jQuery.

Another trend worth noting is the decrease in BlackBerry usage after the changes to the user interface.

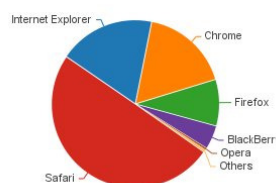


Figure 13. Browsers Before User Interface Change

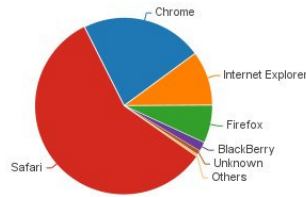


Figure 14. Browsers After User Interface Change

Figures 13 and 14 shows a significant decrease in Blackberry usage occurred after the user interface change. The decrease was approximately 5% of visits to less than 2% of visits to the site by Blackberry browsers. Of note is the use of the jQuery library significantly decreased the application response time for users with older Blackberry browsers because of the library's execution overhead. The older Blackberry browsers also experienced JavaScript crashes utilizing the newer interface and this subsequently disabled JavaScript on older Blackberries. The result was that users had to restart their phones when a crash occurred before JavaScript was once again usable on their Blackberry devices. There may have been other external factors that contributed to the decrease in Blackberry usage such as the company's decline in market-share of their devices. However, the usability for these devices also decreased after the interface change-over and as such may have also contributed to this decline in usage.

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