Telus-Sheridan Research

Wireless Routing POC

July 2014 -DEC 2015

Telus-Sheridan Wireless Routing POC

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Purpose

The purpose of this PoC is to determine the potential feasibility and logistics required to leverage wireless indoor location context to create new call routing processes. Initially several historical indoor location concepts will be leveraged including RSSI Strength and SSID awareness. In later stages new forms of ILS will be researched and explored.

Project Background

TELUS has entered an agreement to sponsor Sheridan to conduct applied research projects to realize emerging opportunities of mobile technologies.

The Wireless Routing PoC is one of the avenues of research that supports that goal

The Wireless Routing PoC will be an application or server level placed software background process. The goal of the PoC will be real time analysis of network information to manage the routing process through different destinations. As this information will differ when the specific capture point is changed, we hope to use the variances in this data to create an effective mapping of different locations within an indoor space.

The PoC will be developed initially by students enrolled in the CST and SYDNE programs as paid Co-op placements throughout the summer and fall semesters of 2014. Further work on this PoC will be evaluated at that point.

The PoC will be tested as both a background application on a customer’s mobile client as well as server based application. If the PoC is deployed on customer’s handset directly the initial sequence would be as follows.

1. Incoming call from TELUS server reaches the handset.
2. The handset checks if there are specific conditions that would lead to a call being directed to a different location.
3. If there is data to suggest that the user would expect the call to be routed to a secondary location (I.E client is at their desk) the call would is re-routed in real time.
4. If there is data to suggest the client would expect the call to be directed to his handset, the call routing will go unchanged.

If the PoC were to be deployed on a TELUS or general telco Server then the initial sequence would be as follows.

1. TELUS Server receives notification that there is a routing request to a client device.
2. The Server pings a background listener application on the specific client handset to get local network information.
3. The Server analyzes the data and if it decides that data conditions are appropriate the call will be re-routed to the correct device. If the data conditions suggest that a user would most likely prefer to receive the call on their handset, then the routing would not be effective.

The behavioural pattern regarding which destinations calls should be routed to given specific data conditions would be established by users themselves.

uses surrounding network information not directly interacting with the client device to create a locational awareness that is accurate to within 20 feet

Communication service providers that offer a broad portfolio of services have a unique advantage in adding value to their cable or satellite TV offerings. With cable/satellite offerings often including hundreds of channels, choosing a program can often become work. This is where a “Recommender” system would be very useful. The advantage to a communications provider with a wide portfolio is that they should be able to produce better program recommendations since they could take advantage of information from a client’s internet and mobile communications activity (e.g. search in Google, Twitter). Although a high quality recommender system might be useful on its own, if the recommender system is combined with either clustering or categorizing software, the clients could be offered personal “virtual channels”. These channels

(e.g. MySports, MyBusiness, MyKnowledge,MyComedy) could be dynamically scheduled from the client’s package offerings and OnDemand offerings.

Project Objectives

Context Aware Systems

In this research, we aim at exploring new ideas in the area of context aware ubiquitous computing. Our research will focus on location awareness, activity recognition, and user identity. To this end, we will implement our ideas through small/medium size projects for which we will provide proofs of concept. Telus APIs will serve as the primary source for our raw data which will be used to form context information for our applications. The following are our proposed scenarios:

Geo fencing-triggered alerts to protect vulnerable people

The purpose of this project is to have a mechanism for setting up a geo fence that will provide some degree of comfort for people who are responsible for individuals who could pose a flight risk or could wander off and become disoriented. The vulnerable person would enjoy the benefits of freedom while at the same time eliminating the risk of becoming lost.

Brief Description

Users are fitted with a device capable of relaying their geographic location to a central server. Although preliminary investigations could involve using cell phones, the goal would be to provide an unobtrusive, wearable device, given that it is all too easy for someone with any degree of dementia to forget or misplace a cell phone.

Caregivers could register the user/device in a central application which would send SMS/phone alerts when the user strays away from a pre-defined geo fence. Caregivers would be able to set-up and modify this fence by using points on a map. Along with alerts, caregivers could access the user’s position in real time by logging onto the application or by using a custom-built app.

Home Automation Using Location Awareness

As we move towards the Internet of Things (IoT), the number of sensors deployed around the world increases; and our domestic lives are no exception to this growing phenomenon. The main goal of this project is to use location based services and user identity combined with a network of household devices in order to offer users the services necessary for controlling and manipulating these devices and therefore providing a more pleasant smart house experience.

In this project we will focus on multiple scenarios, providing a proof of concept for each. Our scenarios extensively use geo fences and location-aware devices. To this end, we will categorize the projects based on the size of the fence and the level of precision. While long range fences can cover a radius of several kilometres from the house, short range fences can extend to a house’s perimeter or even limit themselves to the area of a single room. Whereas short range fences naturally use more precise methods to acquire location information, long range fences can tolerate less accuracy. Therefore, the techniques used to acquire the location information will depend on both the size of the fence and on our application. For instance, we can use a cellular network for long range fences while we will need to use Wi-Fi, Bluetooth or even NFC technologies for shorter range fences. The following points encapsulate our proposed applications for geo fences:

Long range fences

Automatically controlling devices when you exit the fence

Receiving text messages about heating systems and lighting

Receiving a text message about starting your robot vacuum cleaner

Automatically controlling devices when you enter the fence

Turning on your heating system when you enter the fence

Turning on the oven

Short range fences

Switching communication channels (these applications also rely on the services provided by different devices, e.g. video)

Routing your calls from your cellphone to your landline

Routing your calls to your smart TV or computer

It is worth noting that the same applications can be used in other contexts, such as in the car or office

Opening the parking garage gate

Turning on/off the lights

Our plan is to investigate and explore each of the abovementioned scenarios individually and come up with a more generic framework for home automation based on Telus location based and user identity services.

Enhancing the Telus Optik Experience

The advantages and disadvantages of customer choice have been well-explored in both academia and in marketing studies. While choice may be useful in attracting a customer, it can also be debilitating when the customer is challenged to make a decision. A well-known study by Sheena Iyengar and Mark Lepperdemonstrated this by alternating displays of jams in a store to display 24 choices for one hour and then only six choices in the next. While more customers visited the display with more choices than the display with fewer choices (60% versus 40%), a much lower percentage went on to purchase any jams (3% versus 30%). A cable subscriber is often faced with hundreds of choices. This magnifies the difficulty of making a choice.

Media recommender systems have already been widely implemented. Tivo, Netflix, Youtube and others provide recommender systems. These recommender systems generate the recommendations from a user profile largely based on the user’s viewing behaviour. The advantage that Telus has over these media providers is that it often provides other services such as internet and mobile. The behaviour of a user on these other services during the day might be a better predictor of recommendations for viewing that night. For instance, the user’s search patterns on Google or tweeting behaviour on Twitter might be valuable is generating recommendations since it reflects the user’s current interests, not his historical interests.

Managing and displaying recommendations could be problematic, since with many recommendations could loop back to the same problem that we intended to address; too much choice. An alternative way to incorporate recommendations is to provide a small set of virtual channels that cluster/categorize the recommendations into channels. You might have channels for business, comedy, news, knowledge and sports. These channels could be scheduled using regularly scheduled broadcasting and on demand offerings based on both the customer’s historic viewing pattern and information from his/her internet or mobile interactions. A scenario is listed below.

Typical Scenario

John Smith’s viewing patterns include watching some business programming when convenient. If he watches TV in the morning, it is typically American business programming; but at night it is always Canadian business programming (BNN) and PBS. John Smith has the “Popular” package. Today at work, John has searched with terms including “Bombardier” three times, and tweeted once using the same term. Tonight when John returns home, the schedule for his custom MyBiz channel includes regularly scheduled (and current) programming from BNN and the Nightly Business Report from PBS, but the schedule is augmented with on demand content. For instance, one slot without appropriate current programming might show on demand content from the Discovery Channel’s World’s Most Expensive Rides dealing with Bombardier’s Global Express Business Jet.

Proposed PoC High-Level Architecture

Architecture diagram

List of Intersec nodes

For the PoC, there will be 4 nodes:-

IGLOO EP: Responsible to collect data stream from the probes and transform it for the core Igloo Engine. Also hosts the connectors for external apps.

IGLOO DB: Responsible to maintain the DB and to analyze the location data (core engine).

MCMS: The campaign manager which will be connected to IGLOO as any other external app will do. Campaigns based on geo-location.

“Probes”: Responsible to decode the protocol stream received from the TAPs and forward to IGLOO EP.

Hardware

Intersec will install two physical servers for the PoC, 1 server for “probe” and EP and 1 server for DB and MCMS

Server 1: “probe server” and EP

Minimum requirements:

2 x CPU 6-cores (Intel Xeon),

32 GB RAM,

2 x 150 GB Hard Drive,

1 additional Ethernet board dedicated for the stream from TAPs.

Probe dimensioning

For tap facing interface: The average rate is 100Mbps, it means after 10sec you will have 1 GB of data coming from this interface and after one hour you will have 360 GB of data.

The Intersec probe will analyse and filter the data inline and then transfer only what’s required to the IGLOO server. They will store very little amount of information on disks (just for some data caching). So, 150 GB isenough for them. They have requested for disk mirroring. Justification is their tools require mirroring. It will cost more (time and money) to modify these than duplicating the drives.

Server 2: DB and MCMS

Minimum requirements:

2 x CPU 6-core (Intel Xeon),

32 GB RAM,

2 x 500 GB Hard drive

Only the “probe server” needs to be collocated with the MSSs and TAPs.

We will have only “1 Probe server” at the Ontario MSS site for this PoC.

We will run the PoC in Ontario only.

Active Refresh functionality via the MLP

For the active refresh functionality (active to passive handoff) we aim to test handoff to our MLC. We will configure two MLP accounts on the MLC; one for Control plane and the other for SUPL.

From the Intersec perspective it is one MLP account that they will configure at a time to test these two scenarios.

The Intersec platform must throttle the number of requests towards the MLC

25 TPS for SUPL

10 TPS for Control Plane

This mechanism will be only for the PoC. In the event we decide to go ahead with Intersec, then this Intersecplatform will need to connect to the SDF via web-services.

Environment

Network Data – Probes / Taps

TELUS was looking into using the network data from the existing probes to feed into the Intersec Igloo product.

After studying the feasibility of using Netscout probes, we learnt that only Iu-PS is available today on Netscout.Iu-CS has not yet been made available. We might be able to use another network probe like Brix to capture Iu-CS but that will need some analysis as well.

We also know that Iu-CS carries the bulk of network events we are interested in. So we have to find a way to feed Igloo with Iu-CS events as we move ahead.

The best and quickest option is to process the Iu-CS and Iu-PS directly from the Taps. This approach also removes the dependence on network probes so might prove better from a stability stand point in the future. It also eliminates the need to operate with two different probes for Iu-CS and Iu-PS (Brix and Netscout)

TAPs will be used with Intersec probe servers

The vendor for our TAPs is VSS Monitoring.

An estimate of the bandwidth required (amount of data to be received from the TAPs) in bits/s or packets/s is an average 100Mbps, peak 300Mbps

As the TAPs are physically collocated with the MSSs. Intersec will need to implement one server at each MSS site

We have 4 sites, one in each province: BC, AB, ON, QC. Each site has between 1 and 2 Nokia-Siemens MSSs. All physical links of each MSS (16 per MSS) are tapped. Monitored traffic from TAPs is aggregated then by central VSS switch at each location. This aggregated traffic can be forwarded to Intersec probe server.

So for a country wide deployment we will need 4 Intersec probe servers.

If additional server is needed to analyze and correlate traffic from cross-country probes, it can be placed in ON.

Core network events used for location determination

The following core network events will be identified and handled by the Igloo platform

Network connection/disconnection

Cell ID enter/ Cell ID leave

Location update

Periodic Location Update

Call initiation/Call termination

SMS/MMS initiation/reception

IMSI Attach/Detach

Data session initiation/interruption

These core network events will be tagged along with the MSISDN/IMSI, timestamp and cell information. These are mandatory fields required for the PDC functionality.

Cell Cartography – BSA data

Igloo requires to be provisioned with the cartography of TELUS Network.

For each cell (2G, 3G), the following information must be present:

Cell Global ID (MCC, MNC, LAC, CI); SAI ; E-CGI

Center coordinates in the WGS84 coordinates system (latitude and longitude);

Cell radius;

Cell start and end angle.

Cell type (2G, 3G)

Unique Identifier (optional)

For POC purpose, Intersec will do conversion from TELUS file format, and only a sample is required at first. An automatic cartography update is optimal to avoid cartography errors (a cell id could be remapped to another city), but this automatic refresh will not be implemented during the POC.

Requirements: TELUS provides the cartography using a flat file format.

Geo-fences

A geo-fence is a virtual perimeter for a real-world geographic area. A geo-fence could be dynamically generated—as in a radius around a store or point location. Or a geo-fence can be a predefined set of boundaries, like school attendance zones or neighborhood boundaries.

The geo-fences will be drawn in urban as well as rural areas.

In each area, we will test two scenarios;

Geo-fence with passive location only

Geo-fence with for passive to active hand-off

For the passive to active hand-off, to ensure we test both Control plane as well as SUPL, we will test in twoscenarios.

1st scenario: Igloo ◊ MLP Control plane

2nd scenario: Igloo ◊MLP User plane SUPL

For this we will have two MLP LBA accounts created for Igloo, one for Control plane and the other for SUPL. Igloo would connect to the appropriate account for each scenario.

SMS notifications

The Igloo MCMS node will be responsible to deliver the SMS. MCMS will be connected to the SMSC (or SMS-GW if you have one) through SMPP.

The number of required connections depends on the throughput capabilities of the SMSC and the required redundancy. For the PoC, one connection is enough.

MCMS supports acknowledgement of successful message delivery/ Delivery reports.

Testers

We will require 50 testers with varied handset types. The breakdown of these 50 users;

15 iPhones

15 SUPL capable android & BlackBerry phones

15 non-SUPL capable phones

5 phones which will be configured for OPT-OUT / barring / blacklisting

It would be nice to have an SMS sent out to the users will contain a URL which users must click when SMS received. This URL will host a one question survey.

“Did you receive this message when you entered this location? YES /NO

If we cannot have this functionality implemented easily, we can also tie the timestamps between SMS deliveryand timestamp when network event reported on probe data seen on Igloo interface to understand the latency

OPT IN/OUT

For the scope of this PoC, we will have manually Opted-in testers and 5 which are Opted-out but will still be part of the testing. This will ensure we test how the system handles Opt IN/OUT logic.

The business logic for Opt IN/OUT will be out of scope of the PoC.

Checklist

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| --- | --- |
| Intersec to pull network feed from Taps. |  |
| Intersec to integrate with the TELUS SMSC |  |
| Intersec to integrate with MLC via MLP v3.0 for high accuracy DIPs  Two MLP accounts available, one for control plane and other for user plane SUPL |  |
| Minimum TELUS audience :  20 TELUS users;  5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones, 5 phones, any type. |  |
| Urban and rural geo-fenced zones identified.  e.g. Urban – Telus York  -- Eaton center  Rural – Some town up north  -- Wal-Mart up north |  |

Test Cases

Identify users in a 5km urban geo-fence

|  |  |
| --- | --- |
| Item | Description |
| Test case name | Identify users in a 5km urban geo-fence |
| Pre-conditions | Telus users and geo-fence identified |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 5km rural geo-fence

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| --- | --- |
| Item | Description |
| Test case name | Identify users in a 5km rural geo-fence |
| Pre-conditions | Telus users and geo-fence identified |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 500m urban geo-fence control plane

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| --- | --- |
| Item | Description |
| Test case name | Identify users in a 500m urban geo-fence control plane |
| Pre-conditions | Telus users and geo-fence identified  Igloo configured for MLP access to control plane |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  Intersec does a passive to active hand-off to drill down for higher accuracy  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 250m urban geo-fence control plane

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| --- | --- |
| Item | Description |
| Test case name | Identify users in a 250m urban geo-fence control plane |
| Pre-conditions | Telus users and geo-fence identified  Igloo configured for MLP access to control plane |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  Intersec does a passive to active hand-off to drill down for higher accuracy  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 500m rural geo-fence control plane

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| --- | --- |
| Item | Description |
| Test case name | Identify users in a 500m rural geo-fence control plane |
| Pre-conditions | Telus users and geo-fence identified  Igloo configured for MLP access to control plane |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  Intersec does a passive to active hand-off to drill down for higher accuracy  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 500m urban geo-fence user plane SUPL

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| --- | --- |
| Item | Description |
| Test case name | Identify users in a 500m urban geo-fence user plane SUPL |
| Pre-conditions | Telus users and geo-fence identified  Igloo configured for MLP access to SUPL |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  Intersec does a passive to active hand-off to drill down for higher accuracy  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 250m urban geo-fence user plane SUPL

|  |  |
| --- | --- |
| Item | Description |
| Test case name | Identify users in a 250m urban geo-fence user plane SUPL |
| Pre-conditions | Telus users and geo-fence identified  Igloo configured for MLP access to SUPL |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  Intersec does a passive to active hand-off to drill down for higher accuracy  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Identify users in a 500m rural geo-fence user plane SUPL

|  |  |
| --- | --- |
| Item | Description |
| Test case name | Identify users in a 500m urban geo-fence user plane SUPL |
| Pre-conditions | Telus users and geo-fence identified  Igloo configured for MLP access to SUPL |
| Audience | 20 users, (15 users are OPT-IN, 5 are OPT-OUT) |
| Handset types used | OPT-IN : 5 iPhones, 5 Non-SUPL phones, 5 SUPL android/Bberry phones  OPT-OUT : 5 phones, any type. |
| Testing procedure | Create a geo-fence and configure time of operation  Submit list of OPT-IN users  Submit list of OPT-OUT users  20 users monitored for location, must enter the geo-fence within testing window. |
| Testing window | ­  Up to 8 hours 9am-4pm |
| Success criteria | Intersec identifies users when entering / already in the geo-fence.  Intersec does a passive to active hand-off to drill down for higher accuracy  SMS is sent out to these OPT-IN users within acceptable delay < 6mins  SMS is not sent out to the configured OP-OUT users |
| Result with comments | Please note the user experience location accuracy and latency |

Density map Telus

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| --- | --- |
| Item | Description |
| Test case name | Igloo density map per zone |
| Pre-conditions | Telus users and geo-fence identified |
| Audience | Telus employees |
| Handset types used | NA |
| Testing procedure | Create a polygon zone.  From Igloo UI view the real-time density of devices in the zone . |
| Testing window | ­  NA |
| Success criteria | The density map is displayed correctly on the Igloo web interface |
| Result with comments | Please note the user experience |

Schedule

|  |  |  |  |
| --- | --- | --- | --- |
| PDC PoC | Start | Finish | Responsible |
| PoC Scope |  |  |  |
| Define High-Level Objectives | January 2, 2014 | January 13, 2014 | David deSouza |
| Define High-Level Network Architecture | January 2, 2014 | January 15, 2014 | David deSouza |
| Define Infrastructure Setup Verification Tests | January 2, 2014 | January 10, 2014 | David deSouza |
| Define Use Cases Scope | January 2, 2014 | January 15, 2014 | David deSouza |
| Define Test Plans | January 6, 2014 | January 18, 2014 | David deSouza |
| Issue Scope Document and Receive Feedback | January 17, 2014 | January 23, 2014 | David deSouza |
| Define Urban and Rural Geo-fences | January 23, 2014 | March 14, 2014 | Nadim Jamal |
| Gather Additional Hardware Requirements | January 15, 2014 | January 17, 2014 | David deSouza |
| Gather IP requirements, IP design with Telus | January 21, 2014 | February 7, 2014 | David deSouza |
| Paperwork with Intersec | January 17, 2014 | January 24, 2014 | David deSouza |
| Intersec deliver hardware | January 24, 2014 | February 7, 2014 | Intersec |
| TAPs integration | January 24, 2014 | February 23, 2014 | Intersec, Garry |
| FOA/CRD/SPR for implementation in production | January 23, 2014 | February 23, 2014 | David deSouza |
| BSA Data /Cell cartography | January 13, 2014 | February 23, 2014 | David deSouza |
| SMSC interconnectivity | January 23, 2014 | February 23, 2014 | Suresh? |
| Gather Testers and devices | January 23, 2014 | March 14, 2014 | Nadim Jamal |
| Run Test cases | March 17, 2014 | April 15, 2014 | David deSouza |
| Book Demos/Presentations to Internal Stakeholder Groups | April 16, 2014 | April 16, 2014 | David deSouza |
| Consolidate Results and Prepare Demos/Presentations | April 16, 2014 | April 21, 2014 | David deSouza |
| Provide Demos/Presentations to Internal Stakeholder Groups | April 21, 2014 | April 25, 2014 | David deSouza |
| PoC Conclusions |  |  |  |
| Issue PoC Conclusions (Matrix, Summary) | April 25, 2014 | April 30, 2014 | David deSouza |
| Phase 2 PDC PoC | Start | Finish | Deadline: June 30th |

Constraints

The following constraints apply to this project;

Resource availability from TELUS to work on this project

Access to Telus API’s and