INF 1342 - Assignment 1C
Prof. Yu

Emergency Department Wait Time Application (EDWTA)

Reconciling and Combining Results from the two classes of techniques

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The Purpose of the Project

1a. The User Business or Background of the Project Effort

Emergency Department [ED] wait times or ED Lengths of Stay [EDLOS] constitute a fundamental challenge to the public's confidence in the health care system. With this mobile phone application, we shall improve the efficiency and quality of emergency health care by quickly providing people in need of emergency care with an awareness of all available emergency room options in their area. Patients are often unaware, for instance, that another emergency room exists in their area and this emergency room might in fact be less busy than the one they were planning on going to. Similarly, one might become aware of an emergency room that is actually closer than the one they were planning on going to; however, this one may be busier. The patient will then have a choice to either travel to the farther but less busy ER, or the closer but busier ER. This heightened awareness will provide patients with the ability to make better decisions on which ER to go to. In the status quo, patients often make thoughtless decisions on which ER to attend. They are often in pain and therefore do not give a second thought to where to go - they just go where they've always gone, or the nearest hospital they can find. This has resulted in mass accumulations of people at the most well-known hospitals, while more available ERs remain largely unexploited.

Additionally, our application will aid in ameliorating patient frustration by providing them with previously unavailable knowledge. Patients are often frustrated by their inability to know how many people are ahead of them in line. Additionally, the requirement to have to remain sitting in the ER until they are finally called exacerbates this frustration. With our application, the patient will know how many are ahead of them in line and receive an estimate on how long their wait should be based on historical data. They will also be able to leave the ER and return closer to their call time, based on this estimate.

Our application ties in with the mission values of Health Canada as an Information Provider. As their website states, "through performing high quality science and research, we support policy development, regulate increasingly-sophisticated products and provide the services, information and management essential to affordable and world-class health care for Canadians." This application will provide Canadians with previously inaccessible yet highly relevant information.

1b. Goals of the Project

A study of five countries remarked that Canadians are "more likely to say that they had waited two hours or more to be treated" (Schoen et al., 2004). We find this problematic. We therefore want to:

1b.1 Lessen the amount of time that an individual has to spend waiting in the emergency room

1b.2 Provide estimate wait times/ED Lengths of Stay [EDLOS] for area hospitals for:

- **1b.2.1** critical conditions
- **1b.2.2** non-critical conditions.

This application would be supported and funded by the Ontario Ministry of Health. What advantage does this application bring to the MOH? It ties in with their core values, namely "guiding resources to bring value to the health system" and "monitoring and reporting on the performance of the health system and the health of Ontarians." (http://www.health.gov.on.ca/en/ministry/default.aspx) In terms of measureable satisfaction:

1b.3 Surveys will show an increase in patient approval ratings

1b.4 Hospital data will show a decrease in wait times at previously swamped emergency rooms.

1. The Stakeholders

2a. The Client

2a.1 Ontario Ministry of Health (MOH)
http://www.health.gov.on.ca/transformation/length_of_stay/index.html

2b. The Customer

2b.1 Member of the Public of Ontario (Normal Operator)
2b.2 Member of EMT/EMS (Functional Beneficiary - User of EDWTA Data)

2c. Other Stakeholders

2c.1 Sponsor Ontario Ministry of Health (MOH)

2c.2 Interfacing Technology (Existing Hardware Systems)

2c.2.1 Rogers http://www.rogers.com/web/content/add-ons
2c.2.2 Bell http://www.bell.ca/shopping/PrsShpWls_MusicTVMore.page
2c.2.3 Telus http://www.telusmobility.com/en/ON/appsdownloads/index.shtml?INTCMP=ILCq4srves4c

2c.3 Testers (Core Team Members) - Prototype

2c.3.1 Customers/Users - Member of Public (Normal Operator)
2c.3.2 ED Staff
- **2c.3.2.1** ED Triage Nurse
- **2c.3.2.2** ED Nurse
- **2c.3.2.3** ED Physician
- **2c.3.2.4** ED Ward Clerk

2c.3 Business Analyst (Core Team Member)

2c.4 Technology Experts

2c.5 System Designers

2c.5.1 Kyle Faas
2c.5.2 Gabriela Mircea
2c.5.3 Grant Patten

2c.6 Marketing Experts

2c.6.1 Client (MOH) Responsibility

2c.7 Legal Experts

2c.7.1 Client (MOH) Attorney
2c.7.2 Interfacing Technology Attorneys
- **2c.7.2.1** Rogers Attorney
- **2c.7.2.2** Bell Attorney
- **2c.7.2.3** Telus Attorney

2c.8 Domain Experts

- **2c.8.1** Emergency Communications Supervisor
- **2c.8.2** ED Nurse
- **2c.8.3** ED Physician

2c.9 Usability Experts

2c.10 Representatives of External Associations

- **2c.10.1** Health Canada (Health Care System Publications)
  http://www.hc-sc.gc.ca/hcs-sss/pubs/index-eng.php
- **2c.10.2** Government of Ontario (Service Ontario)
  http://www.ontario.ca/en/services_for_residents/index.htm
- **2c.10.3** Government of Canada (Service Canada)
  http://www.servicecanada.gc.ca/eng/subjects/health/index.shtml
- **2c.10.4** National Emergency Number Association - Ontario Chapter
  http://www.nenaontario.com/
- **2c.10.5** Canadian Association of Emergency Physicians
  http://www.caep.ca/
- **2c.10.6** Registered Nurses Association of Ontario - PDA "Client Centred Care"
  http://www.rnao.org/pda/client/
  - **2c.10.6.1** Values and Beliefs of Client Centred Care - "Timeliness"
    http://www.rnao.org/pda/client/page3.html
- **2c.10.7** Rogers Mobile Data Alliance
  http://your.rogers.com/business/wireless/enterprise/mda.asp
- **2c.10.8** Bell Portals and Web Application development
  http://www.bell.ca/enterprise/EntPrd_Web_Devpt.page
- **2c.10.9** RIM (Blackberry) Representative
  http://www.rim.com/newsroom/media/executive/
- **2c.10.10** Apple (iPhone) Representative
  http://developer.apple.com/iphone/program/
- **2c.10.11** Palm Representative
  http://developer.palm.com/
- **2c.10.12** Ontario Ministry of Transportation (Traffic System) Representative
  http://www.mto.gov.on.ca/english/traveller/trip/traffic_reports.shtml
- **2c.10.13** Environment Canada (Weather) Representative
  http://www.weatheroffice.gc.ca/forecast/canada/index_e.html?id=ON
- **2c.10.14** U.S. Air Force Space Command **(**GPS) Representative
  http://www.afspc.af.mil/

2c.11 Existing Software Systems

- **2c.11.1** EDRS
- **2c.11.2** GPS
  - **2c.11.2.1** Rogers GPS Navigation
  - **2c.11.2.2** Bell GPS Nav
  - **2c.11.2.3** Telus Navigator
- **2c.11.3** MOH Statistics Database

2c.11.4 Environment Canada (Weather)
2c.11.5 Ontario Ministry of Transportation (Traffic System)
2c.11.6 Transit System (TTC Service Alerts)
http://www3.ttc.ca/RSS/Service_Alerts/index.rss

2c.12 Maintenance Operators
2c.12.1 EDWTA
2c.12.1.1 Webmaster
2c.12.1.2 System Maintenance Operator
2c.12.2 Mobile Service Provider Maintenance
2c.12.2.1 Rogers
2c.12.2.2 Bell
2c.12.2.3 Telus
2c.12.3 Mobile Service Provider GPS Maintenance
2c.12.3.1 Rogers GPS Navigation
2c.12.3.2 Bell GPS Nav
2c.12.3.3 Telus Navigator
2c.12.4 EDRS Maintenance

2c.13 Operational Support
2c.13.1 EDWTA Technical Support
2c.13.1 EDWTA Helpline
2c.13.2 EDWTA Tutorial
2c.13.3 EDWTA Trainers
2c.13.2 Mobile Service Provider Technical Support
2c.13.2.1 Rogers Wireless Tech Support
2c.13.2.2 Bell Mobility Support - Maintenance and Troubleshooting
2c.13.2.3 Telus Data and Network Assistance

2d. The Hands-On Users of EDWTA
2d.1 Member of the Public of Ontario (Normal Operator)
2d.1.1 User role
2d.1.1.1 log onto EDWTA
2d.1.1.2 check the wait times
2d.1.1.3 check the GPS mapping.
2d.1.1.4 at hospital interface application with current hospital wait times
2d.1.1.5 after treatment, submit EDLOS results to MOH to refine statistical data in ongoing improvement process.
2d.1.2 Subject matter experience: Novice
2d.1.3 Technological experience: Novice
2d.1.4 Other User characteristics
2d.1.4.1 Average health/age
2d.1.4.2 ED level of criticality (CTAS)
2d.1.4.3 Average intellect
2d.1.4.4 Receptive to technology
2d.1.4.5 Undergraduate education
2d.1.4.6 Average linguistic skills (English/French)

2d.2 Disabled Member of the Public of Ontario (Normal Operator)

2d.2.1 User role

2d.2.1.1 log onto EDWTA

2d.2.1.2 check the wait times

2d.2.1.3 check the GPS mapping.

2d.2.1.4 at hospital interface application with current hospital wait times

2d.2.1.5 after treatment, submit EDLOS results to MOH to refine statistical data in ongoing improvement process.

2d.2.2 Subject matter experience: Novice

2d.2.3 Technological experience: Novice

2d.2.4 Other User characteristics

2d.2.4.1 Physical disability (i.e. poor vision)

2d.2.4.2 ED level of criticality (CTAS)

2d.2.4.3 Average intellect

2d.2.4.4 Receptive to technology

2d.2.4.5 Undergraduate education

2d.2.4.6 Average linguistic skills (English/French)

2d.3 Remote Member of the Public of Ontario (Normal Operator)

2d.3.1 User role

2d.3.1.1 log onto EDWTA

2d.3.1.2 check the wait times

2d.3.1.3 check the GPS mapping.

2d.3.1.4 at hospital interface application with current hospital wait times

2d.3.1.5 after treatment, submit EDLOS results to MOH to refine statistical data in ongoing improvement process.

2d.3.2 Subject matter experience: Novice

2d.3.3 Technological experience: Novice

2d.3.4 Other User characteristics

2d.3.4.1 Average health/age

2d.3.4.2 ED level of criticality (CTAS)

2d.3.4.3 Average intellect

2d.3.4.4 Receptive to technology

2d.3.4.5 Undergraduate education

2d.3.4.6 Average linguistic skills (English/French)

2d.3.4.7 Located outside of urban centre

2d.4 Member of EMT/EMS (Functional Beneficiary - User of EDWTA Data)

2d.4.1 User role

2d.4.1.1 log onto EDWTA

2d.4.1.2 check the wait times

2d.4.1.3 check the GPS mapping.

2d.4.1.4 at hospital interface application with current hospital wait times

2d.4.1.5 after treatment, submit EDLOS results to MOH to refine statistical data in ongoing improvement process.

2d.4.2 Subject matter experience: Master

2d.4.3 Technological experience: Journeyman
2d.4.4 Other User characteristics
2d.4.4.1 Average health/age of EMT
2d.4.4.3 Average intellect of EMT
2d.4.4.4 Receptive to technology
2d.4.4.5 Undergraduate education/EMT training
2d.4.4.6 Average linguistic skills (English/French)

2e. Personas

2e.1 Key User - Joanna

2e.1.1 33 years old
2e.1.2 Manager of a restaurant (8 hour shifts)
2e.1.3 Single
2e.1.4 Lives in downtown Toronto
2e.1.5 Frugal
2e.1.6 Uses public transportation (TTC)
2e.1.7 Pragmatic use of new technology

Joanna is 33 and single. She is a manager at a restaurant. She lives in downtown Toronto in her own condo. She is a frugal woman – puts most of her money away in savings and doesn't like to spend very often. It is for this reason that Joanna still does not have a car and always takes public transit. Joanna likes technologies that provide a direct and practical benefit to her life – she is therefore not interested in silly "just for laughs" applications but found the EDWTA quite promising.

While working with a few of the cooks in her restaurant's kitchen one day, Joanna burns her arm. The burn is severe enough to warrant ER attention and thus she consults the EDWTA on her iPhone. She sees that there are two hospitals near her and picks the one with the lowest wait time estimate. She also checks the GPS for that hospital and pulls up directions on how to most quickly get there via public transit. Joanna quickly bandages her arm and rushes off to the subway. Arriving at the hospital, Joanna is seen by the Triage Nurse and assigned a CTAS Level 3 (Urgent). Joanna also interfaces the EDWTA with the hospital's EDRS in order to get the most accurate time prediction. After about 30 minutes, as estimated by the data, Joanna is seen and treated for her burn. Joanna later submits the results of her EDLOS to the Ministry of Health to contribute to the public database and improve future estimates.

Joanna represents the most important type of user. We will need users in Joanna's category to provide a high degree of user participation, as their input is critical for the interface prototyping and usability design of the application.

2e.2 Secondary User - Ron

2e.2.1 28 years old
2e.2.2 EMT (12 hour shifts)
2e.2.3 Married
2e.2.4 Lives in Mississauga

2e.2.5 Average consumer
2e.2.6 Uses own vehicle for transportation
2e.2.7 Tentative/Pragmatic use of new technology

Ron is a 28-year-old emergency response technician; specifically, a paramedic. Ron works long hours 5 days a week, usually 12 hour long night shifts. Ron is not much of a techie – he only uses gadgets if they aren't complicated and relate directly to his job. He had heard about the EDWTA and thought that it might make his job easier. Often, Ron and his driver wind up taking a patient to a crowded hospital when there was actually a less crowded one nearby.

Ron and his driver receive an emergency dispatch on an individual who was just hit by a car. Realizing immediately that this is a CTAS Level 1 scenario, Ron consults his EDWTA, as this is actually faster than communicating with dispatchers over the radio. Through the app, Ron sees which hospital's ER is the least busy and instructs the driver where to go with this patient based on that.

We will need users in Ron's category to provide some contribution to the application design. Although Ron is not a key user in that he does not actually go into the ER and his role essentially stops at the hospital entrance, he is still important in that his use of the application allows those patients who are non-ambulatory to take advantage of the improved efficiency that the EDWTA offers.

2e.3 Unimportant User - Jake

2e.3.1 16 years old
2e.3.2 Student
2e.3.3 Single
2e.3.4 Lives in Oakville
2e.3.5 Spends large amounts of money
2e.3.6 Uses public transportation (TTC)
2e.3.7 Early adopter of new technology

Jake is a 16-year-old student. He is tech savvy, although does not have access to a mobile phone himself. He occasionally uses his mom's Blackberry when she isn't around and plays around with various applications on the phone just for fun. One day he sees that she has installed the EDWTA on her phone. Jake explores the application a little bit and decides to pretend that he has an emergency just to explore the functionality of the application and "see what it can do."

2h. Maintenance Users and Service Technicians

2h.1 Hardware Maintainer(s):
2h.1.1 iPhone Representative
2h.1.2 RIM (Blackberry) Representative
2h.1.3 Palm Representative
2h.1.4 Google Representative
2h.2 Software Maintainer(s), with:

2h.2.1 Java ME experience
2h.2.2 HTML/CSS experience
2h.2.3 Objective-C experience

3. Mandated Constraints

3a. Solution Constraints

3b. Implementation Environment of the Current System

3b.1 Mobile Service Provider
3b.1.1 Rogers
3b.1.2 Bell
3b.1.3 Telus

3b.2 GPS System
3b.2.1 Rogers GPS Navigation
3b.2.2 Bell GPS Nav
3b.2.3 Telus Navigator

3b.3 EDRS Statistics Database
3b.3.1 http://edrs.waittimes.net/en/ProvincialSummaryCTAS.aspx (from 2008)

3b.4 Ontario MOH Database
3b.4.1 Historical EDLOS data (before 2008)
http://edrs.waittimes.net/en/SearchSelection.aspx?view=0

3c. Partner or Collaborative Applications

3c.1 Ontario Ministry of Transportation Traffic Database
3c.1.1 http://www.mto.gov.on.ca/english/traveller/trip/map.shtml

3c.2 Environment Canada Weather Database
3c.2.1 http://www.weatheroffice.gc.ca/city/pages/on-143_metric_e.html (example)

3c.3 Public Transportation Service Interruptions
3c.3.1 http://www3.ttc.ca/RSS/Service_Alerts/index.rss (Toronto example)

3d. Off-the-Shelf Software

3d.1 No COTS planned for this project

3e. Anticipated Workplace Environment

3e.1 EDs have a high volume of traffic
3e.2 ED patients (EDWTA Users) in waiting room may experience:
3e.2.1 physical pain/shock (ED Staff responsibility)
3e.2.2 frustration/anger, and will want more information on why they're waiting

3e.2.3 stress/anxiety (ED Staff responsibility)
3e.2.4 boredom, and will want some form of entertainment
3e.3 EDs are noisy, so audible signals might not work
3e.4 EDWTA User will be in a sitting/semi-supine/supine position the majority of EDLOS, and will require EDWTA be easy to control with one hand
3e.5 Travel to ED is subject to weather, traffic and/or transportation service variations

3f. Schedule Constraints

3f.1 reasonable timeline

3g. Budget Constraints

3g.1 none

4. Naming Conventions and Definitions

TERM	DEFINITION
AMA	Against Medical Advice
CTAS	Canadian Triage and Acuity Scale Level 1 Resuscitative. • Level 2 Emergent. • Level 3 Urgent. • Level 4 Less urgent. • Level 5 Non-urgent
ED	Emergency Department
EDRS	Emergency Department Reporting System
EDLOS	ED Lengths of Stay
EDWTA	Emergency Department Wait Time Application
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
GPS	Global Positioning System
HSPA	High Speed Packet Access
JAD	Joint Application Development
MOH	Ontario Ministry of Health
RAD	Rapid Application Development

5. Relevant Facts and Assumptions

5a. Relevant Facts

5a.1 GPS and HSPA/HSPA+ coverage in Ontario:

5a.1.1 Rogers http://www.wirelesswave.ca/rogers_coverage_maps_region.asp?RegionID=38

5a.1.2 Bell http://www.wirelesswave.ca/bell_coverage_maps_region.asp?RegionID=61

5a.1.3 Telus http://www.wirelesscityinc.com/telus-coverage-maps/

5a.2 Overall applicable coverage for this application (HSPA/HSPA+ networks) is limited to Southern Ontario at first, with expansion possible across Canada

5a.3 GPS/HSPA-capable phone sales up in 2009 (predicted to be 25% increase), with 40% of phone users getting turn-by-turn directions via GPS
http://www.nytimes.com/2009/07/08/technology/08gps.html?_r=1

5a.4 Number of hospitals with EDs proportionate to area population, meaning primarily an urban user base for EDWTA

5a.5 Average EDLOS in Canada expected to be over 2 hours

5a.6 Statistical models approximate EDLOS under average weather/ED patient load conditions

5a.7 EDLOS is defined as the elapsed time between admission to the ED by a Triage Nurse, and discharge from the ED by an attending ED Physician (or self-discharge via Patient AMA).

Application will be able to capture the wait times between:

5a.7.1 Admission by Triage Nurse and called by ED Nurse

5a.7.2 Consultation with ED Nurse and consultation with ED Physician

5a.7.3 Consultation with ED Physician and discharge from ED

5b. Business Rules

5b.1 ED staffing levels vary depending on hour of day

5b.1.1 ED Nurse shifts 0700-1930, 1900-0730 or 1100-2330

5b.1.2 ED Nurse shifts 0700-1530, 1100-1900 or 1500-2330

5b.1.3 ED Physician shifts 0700-1930, 1900-0730 or 0700-0730 (1900-1930)

5b.2 Hospitals in Toronto allow mobile phone use in the ED

5b.3 ED Admission time entered directly into EDRS, while times in **5a** noted in Patient Chart and then entered into EDRS by Ward Clerk regularly

5b.4 Mobile phone applications generally sponsored or purchased; business model for EDWTA must benefit providers as well as the MOH, through:

5b.4.1 Market research opportunities (see **5b.4.2**)

5b.4.2 Platform for offering new beta forms of content (music/video/other entertainment as distraction, while waiting in ED)

5b.4.3 Tax incentive

5c. Assumptions

5c.1 Use of GPS turn-by-turn navigation in smartphones will continue to increase

5c.2 Statistical models based on historical averages for:

- **5c.2.1** patient load
- **5c.2.2** weather conditions
- **5c.2.3** CTAS distribution

5c.3 Average statistical data reliably predictive of EDLOS

5c.4 Data from EDRS will be captured dynamically by EDWTA server

5c.5 User of product will possess a GPS-enabled device

5c.6 MOH Statistical Database will provide access to required data for the product

5c.7 User ED Case Number is not the User's OHIP Number (or other identifying number)

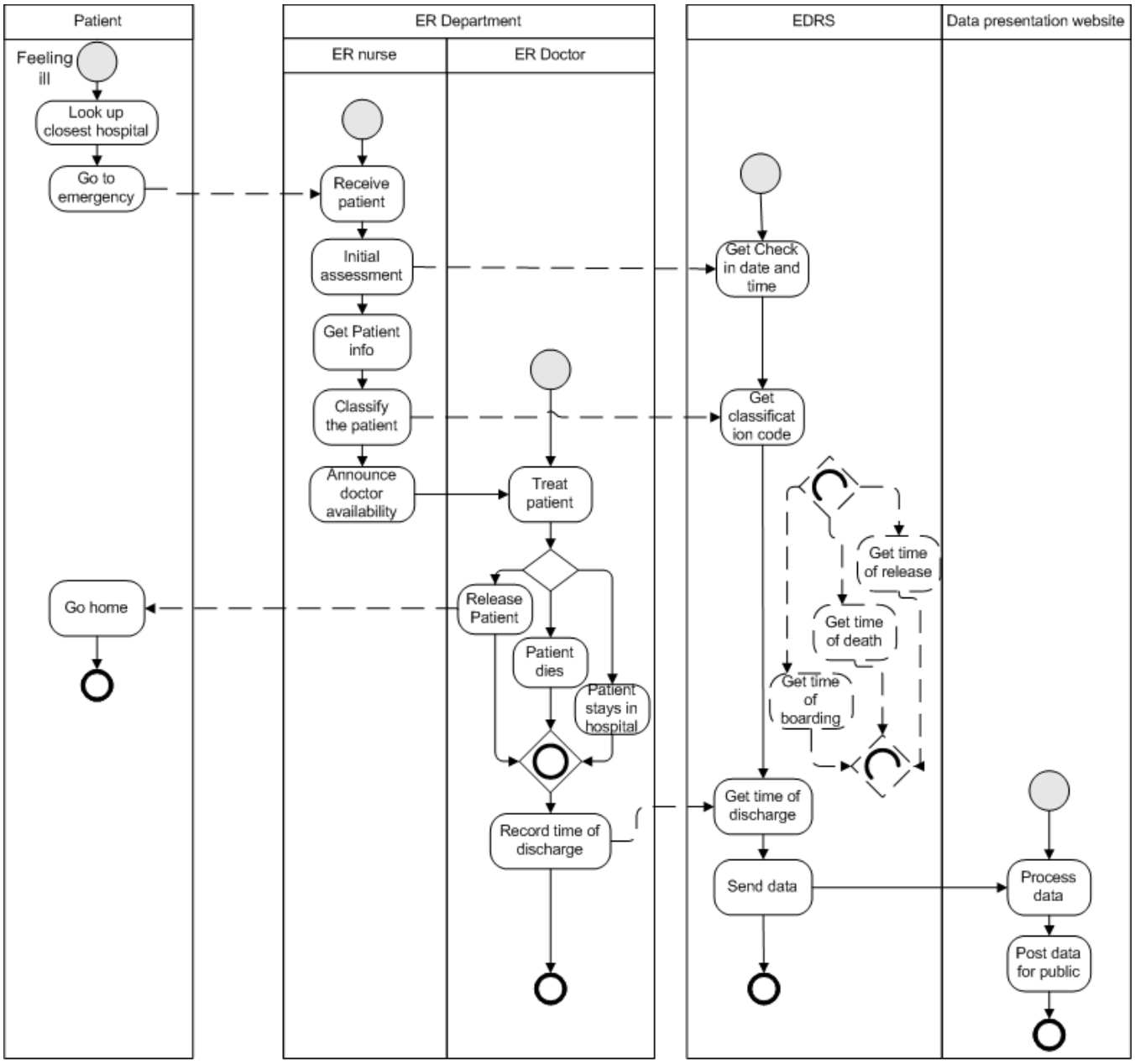
5c.7 User mobile device will be capable of voice operation

5c.8 User will be in area with HSPA coverage

6. The Scope of the Work

6a. The Current Situation

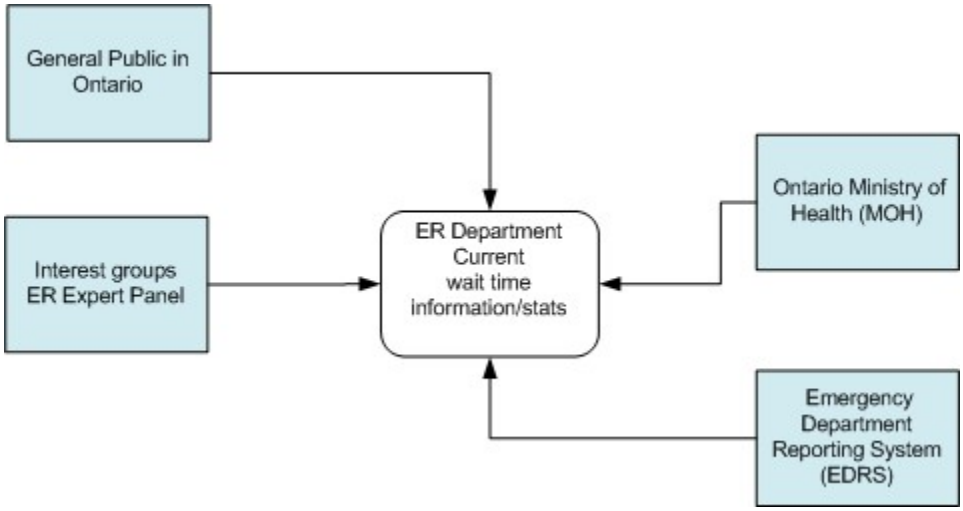
6a.1 The AS-IS situation is manual, with no live data available to the users of ER services



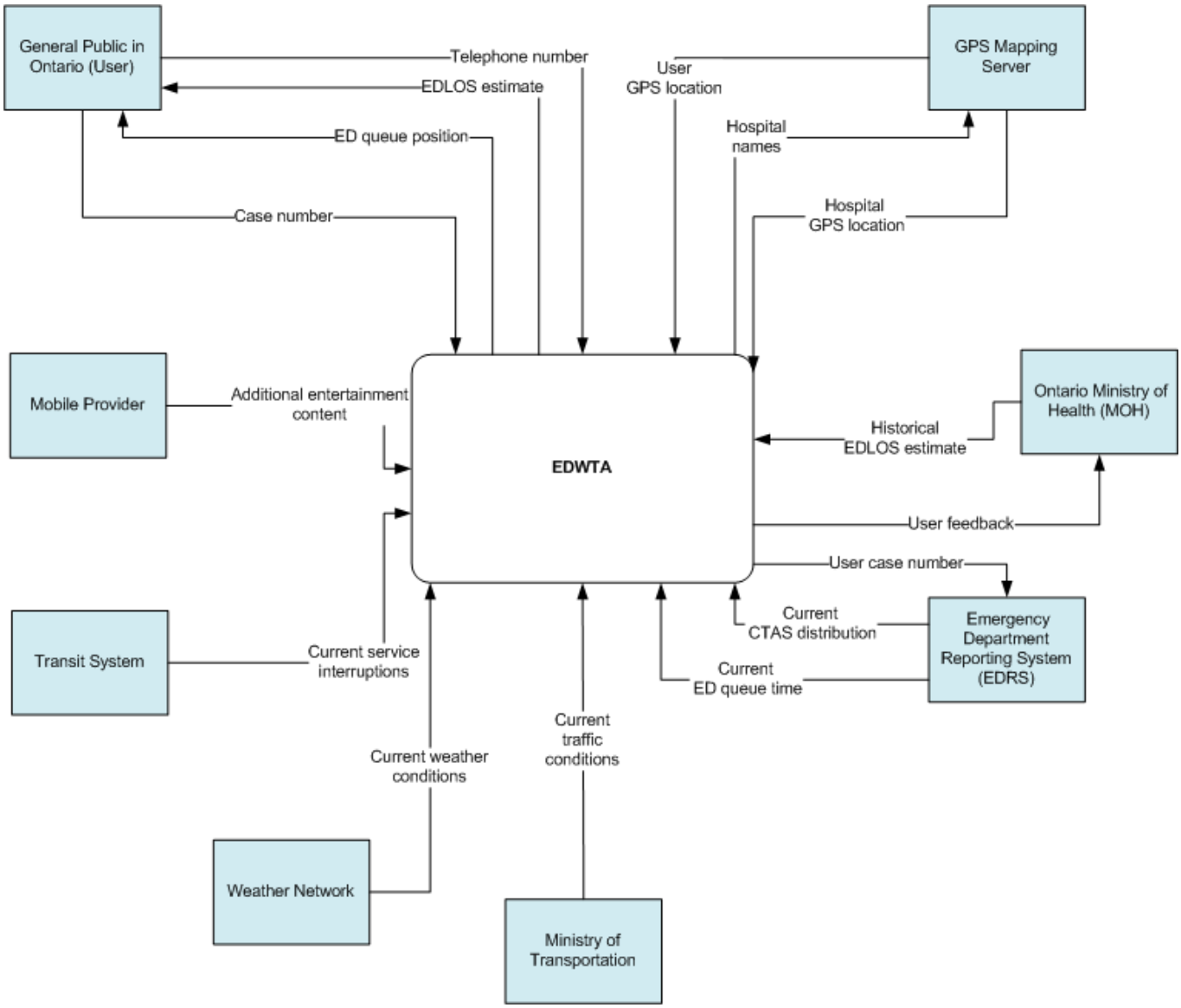
BPMN ER – waiting data generation

6b. The Context of the Work

6b.1 The context diagram illustrates the general As-Is environment, in terms of existing connections



6b.2 The context diagram below illustrates the To-Be environment



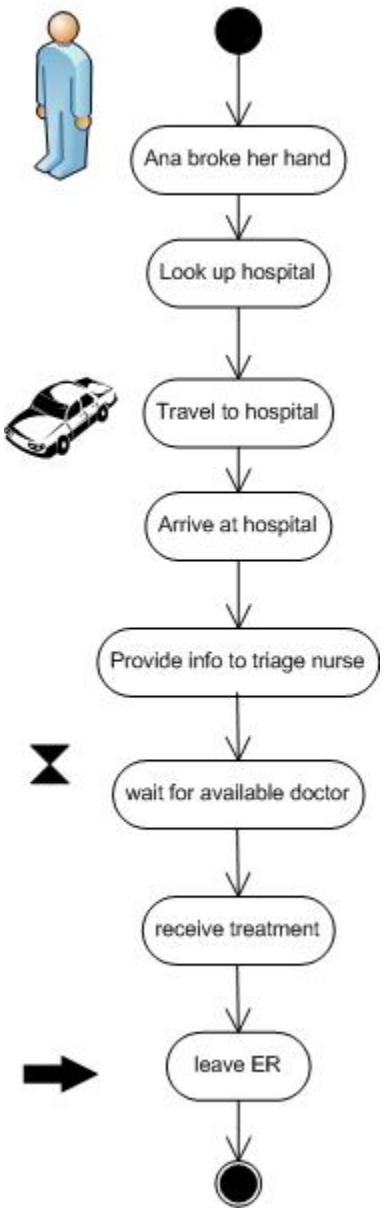
6c. Work Partitioning

Business Event List (As-Is)

Event Name	Input and Output	Summary of BUC
6c.1 Patient shows up at ER	Personal information (in) Date and time (in/out)	Record personal information in database
6c.2 Patient is "seen" by a Triage Nurse	Symptoms (in)	Record the symptoms

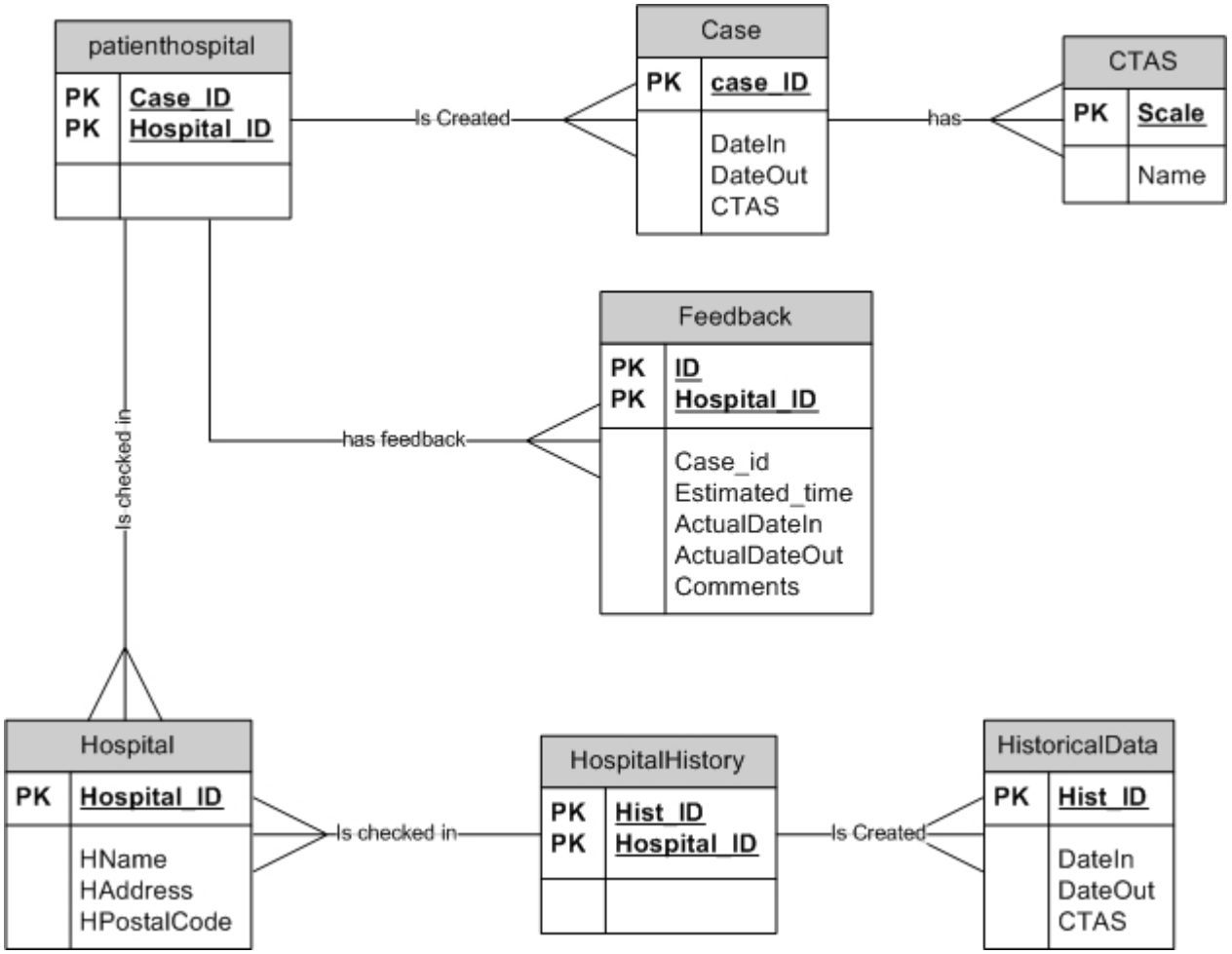
		Record the Canadian Triage and Acuity Scale (CTAS)
6c.3 Nurse evaluates the acuity of the situation	Canadian Triage and Acuity Scale (CTAS) (in)	• CTAS I Resuscitation • CTAS II Emergent • CTAS III Urgent • CTAS IV Less-Urgent • CTAS V Non-Urgent
6c.4 Patient seen by a doctor	Treatment (in/out)	Record treatment information
6c.5 Patient is discharged	Date and time (in)	Record the date and time of discharge

6d. Specifying a BUC



7. Business Data Model

7a. Data Model

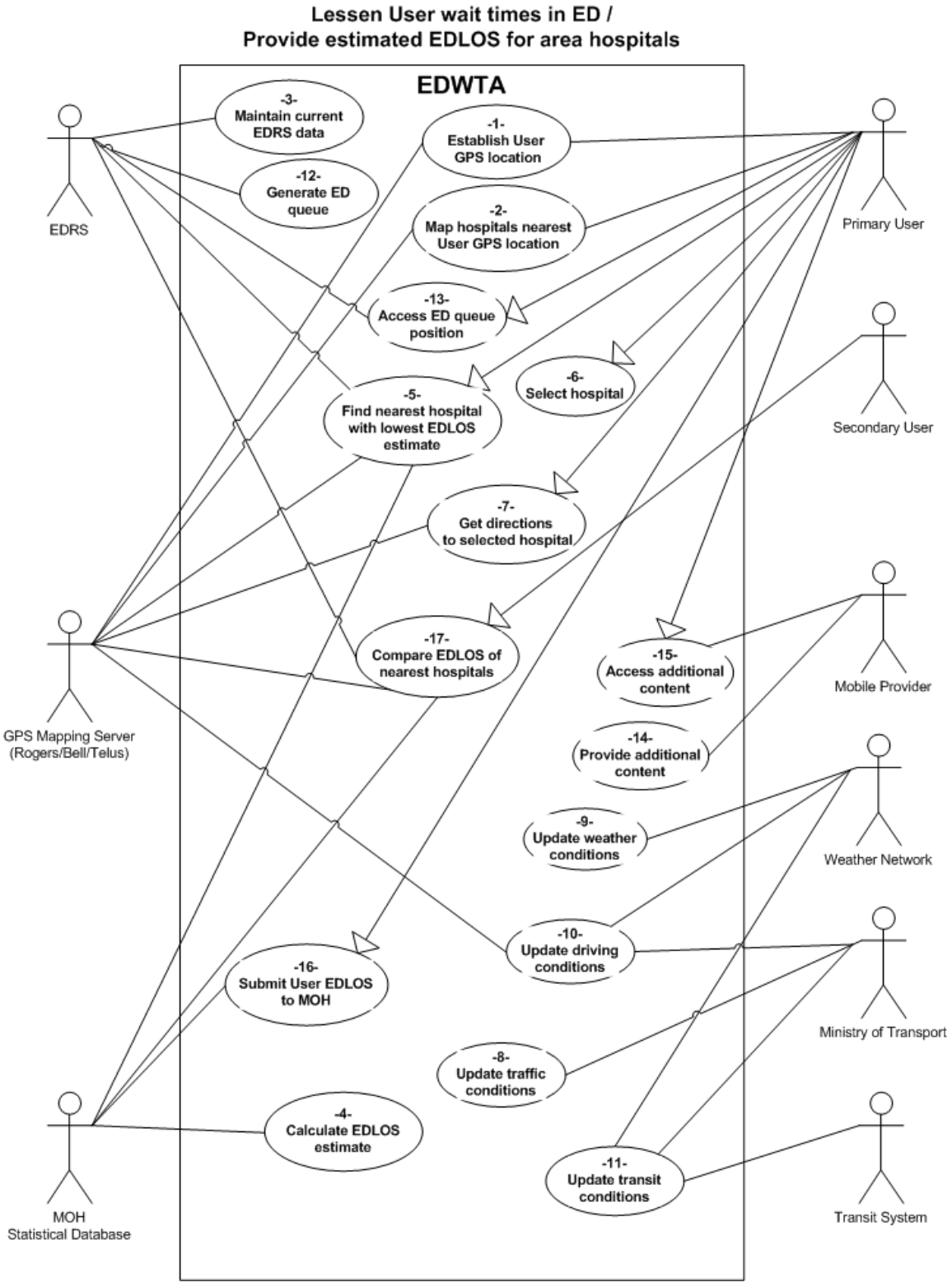


7b. Data Dictionary

Name	*Content*	*Type*
DateIN	Patient's arrival date at the ER YY/MM/DD HH/MM/SS 24 hour clock	Element
DateOut	Date of patient's departure from the ER YY/MM/DD HH/MM/SS 24 hour clock	Element
Hist_ID	Historical data case ID	Element
HName	Hospital's name	Element
HAddress	Hospital's address	Element
HPostalCode	Hospital's postal code	Element
Feedback_ID	Feedback unique ID number	Element
Estimated_time	The initial time estimated	Element
ActualDateIn	The actual time when the patient was admited o ED	Element
ActualDateOut	The actual time when the patient was released form ED	Element
Comments	Comments received from users	Element
CTAS - ER Acuity Cathegories	Canadian Triage and Acuity Scale (CTAS) • CTAS I Resuscitation • CTAS II Emergent • CTAS III Urgent • CTAS IV Less-Urgent • CTAS V Non-Urgent	Class
Hospital	Hospital's information	Class
HistoricalData	Historical data for all the hospitals used for statistics	Class
Case	The table holds information for the cases currently in the emergency room	Class
Feedback	This table hold feedback information from users	Class

8. The Scope of the Product

8a. Product Boundary



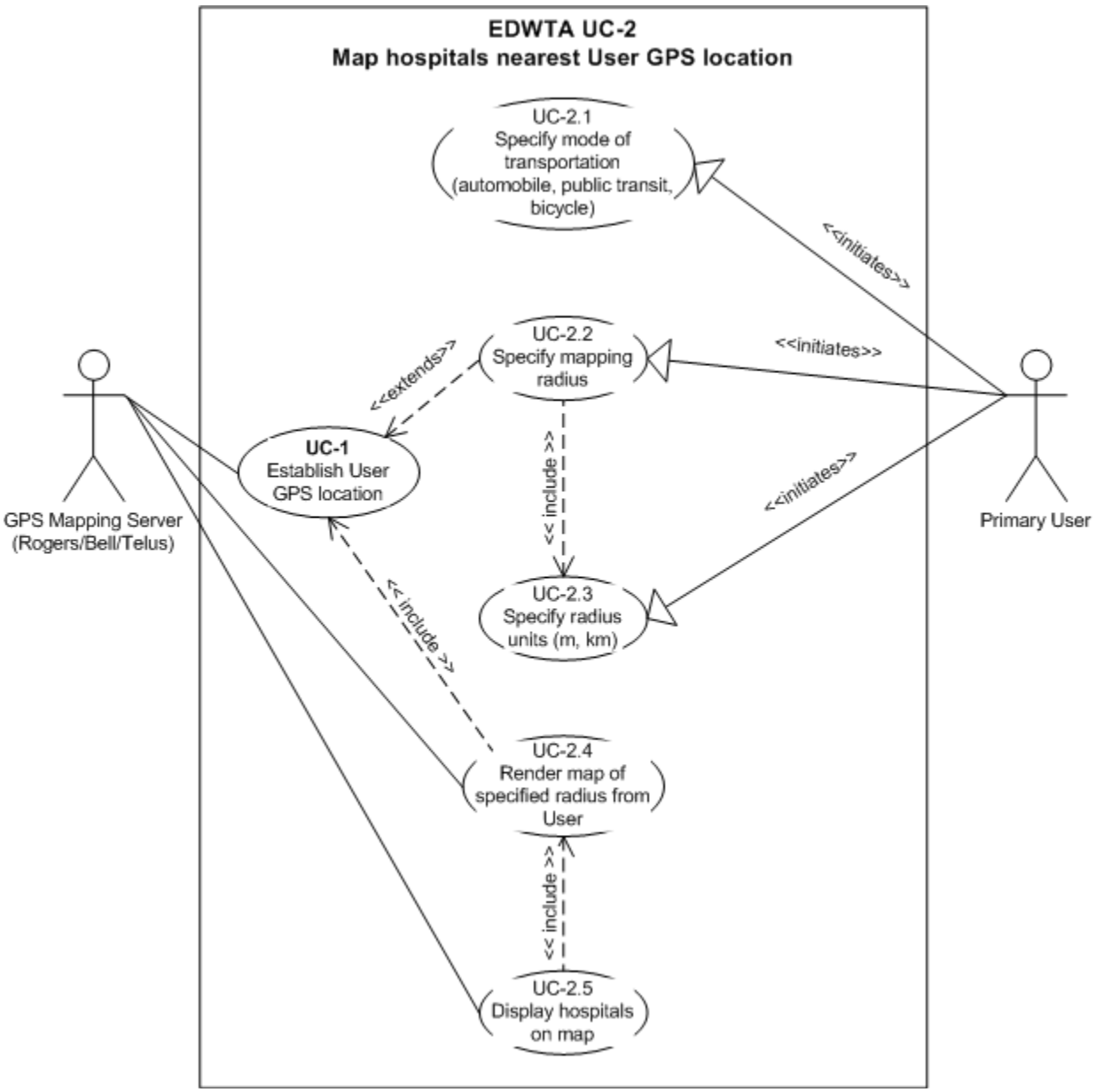
8b. Product Use Case List

UC #	UC Name	UC Description	Participating Actors
UC-1	Establish User GPS Location		PU, GPS
UC-2	Map hospitals nearest User GPS Location		PU, GPS
UC-3	Maintain current EDRS data	Dynamic updating of hospital EDLOS	EDRS
UC-4	Calculate EDLOS estimate		MOH
UC-5	Find nearest hospital with lowest EDLOS estimate		PU, GPS, EDRS, MOH
UC-6	Select hospital		PU
UC-7	Get directions to selected hospital	Obtain GPS turn by turn directions	PU, GPS
UC-8	Update traffic conditions	Update road closures, accidents	MOT
UC-9	Update weather conditions	Update weather affecting visibility, driving safety	WN
UC-10	Update driving conditions	Update UC-7 with data from UC-8 and UC-9	MOT, WN, GPS
UC-11	Update transit conditions	Update transit service interruptions	WN, TS
UC-12	Generate ED queue	Generate queue based on hospital CTAS distribution	EDRS
UC-13	Access ED queue position		PU, EDRS
UC-14	Provide additional content	Provide entertainment content on mobile device	MP
UC-15	Access additional content		PU, MP
UC-16	Submit User EDLOS to MOH		PU, MOH
UC-17	Compare EDLOS of nearest hospitals		SU, GPS, EDRS, MOH
UC-1G	Access ED queue time (EDLOS data)	Combines UC-1, UC-2, UC-5, UC-6, UC-7	PU, GPS, EDRS, MOH
UC-2G	Access hospital GPS mapping coordinates	Combines UC-1, UC-2, UC-5, UC-6, UC-7, UC-17	SU, GPS, EDRS, MOH
UC-3G	Access hospital GPS mapping coordinates	Combines UC-3, UC-4, UC-12, UC-13, UC-16	PU, EDRS, MOH
MUC-16	Submit User EDLOS to MOH	Misuse Case of UC-16	PU, MOH, HK
MUC-4G	Access ED queue time (EDLOS data)	Misuse Case of UC-16	PU, EDRS, MOH, HK

Legend - Participating Actors

PU	Primary User
SU	Secondary User
GPS	GPS Mapping Server
EDRS	Emergency Department Reporting System
MOH	MOH Statistical Database
MOT	Ministry of Transportation
WN	Weather Network/Environment Canada
TS	Transit System
MP	Mobile Provider
HK	Hacker

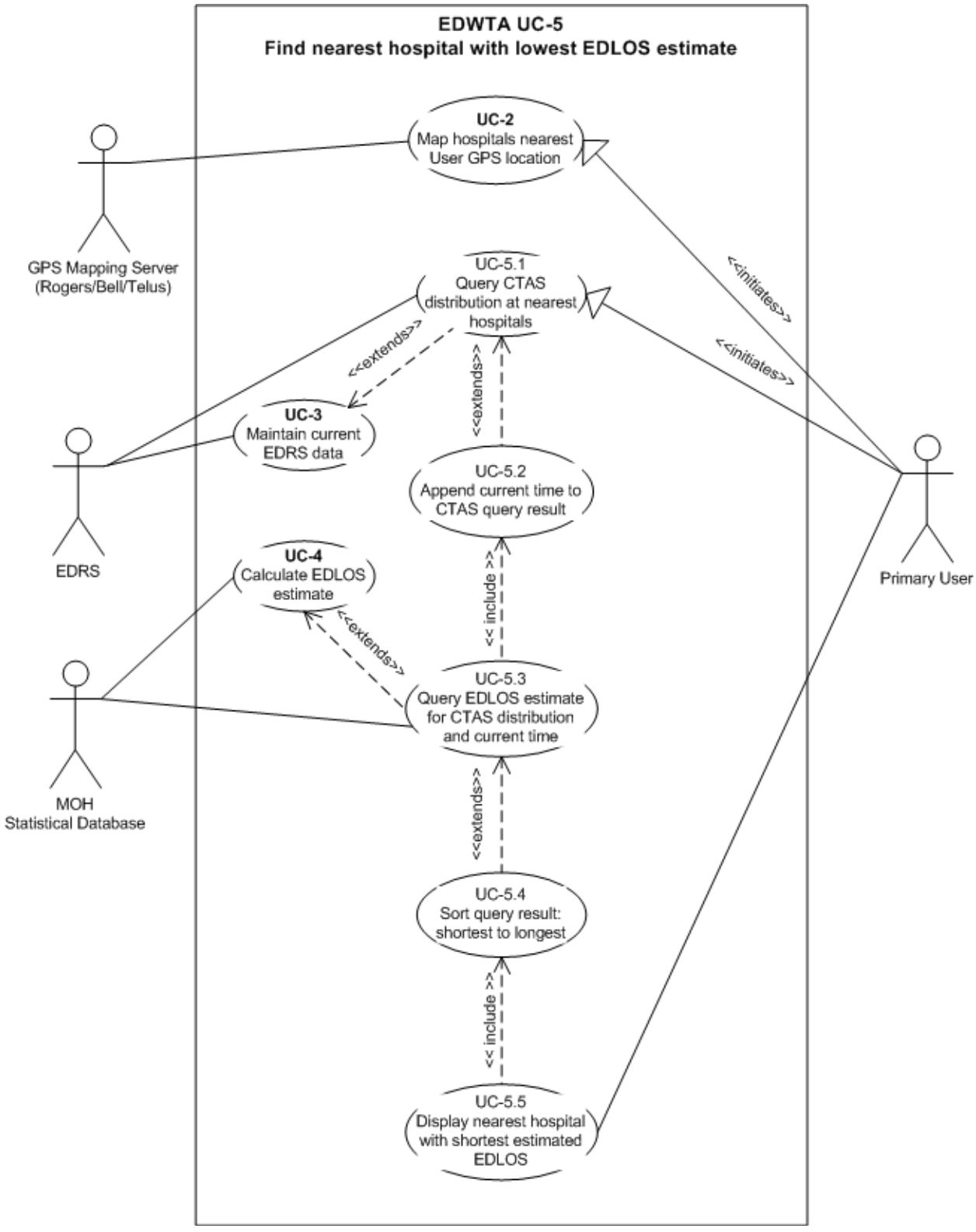
8c. Individual Product Use Cases



Author(s): Kyle Faas **Date: February 4, 2010**
Version:

Use Case Name:	Map hospitals nearest User GPS location	**Use Case Type:** Product Use Case
Use Case ID:	UC-2	
Priority:	High	
Source:	Goal 1b.2, UC-5	
Primary Business Actor:	Customer 2b.1(Primary User)	
Other Participating Actors:	Interfacing Technology 2c.2.1, 2c.2.2, 2c.2.3 (GPS Mapping Server (Rogers/Bell/Telus))	
Other Interested Stakeholders:		
Description:	This Use Case describes the event of a Customer (Primary User) obtaining a map of the nearest hospitals to their location. The Customer specifies the mode of transportation to get to the hospital, the mapping radius, and the units (metres/kilometres) of the specified radius.	
Precondition:	UC-1	
Trigger:	This Use Case is initiated when the Customer runs EDWTA	
Typical Course of Events:	**Actor Action**	**System Response**
	1. Customer specifies mode of transportation	2. System verifies mode of transportation
	4. Customer specifies mapping radius	3. System prompts Customer to enter mapping radius
	6. Customer specifies mapping radius units	5. System prompts Customer to enter mapping radius units (metres/kilometres)
		7. System downloads map of specified radius from Interfacing Technology
		8. System queries hospitals ("Services") from Interfacing Technology
		9. System displays and highlights hospitals on map
Alternate Courses:	Alt 4. Customer enters mapping radius exceeding Interfacing Technology maximum. System prompts Customer to re-enter mapping radius Customer enters non-integer value for mapping radius. System prompts Customer to re-enter mapping radius Alt 7. Customer exceeds allowable data transfer for Interfacing Technology account. System prompts Customer to call EDWTA Helpdesk, and concludes Use Case. Alt 8. Interfacing Technology cannot be queried for hospitals. System performs web search of hospitals and inputs addresses into Interfacing Technology Alt 9. Customer determines mapping radius is too high or too low. Customer navigates back to mapping radius specification (3). Customer enters new mapping radius value (4). System prompts Customer to reconfirm mapping radius units. System proceeds to 7	
Conclusion:	This Use Case concludes when hospitals are displayed and highlighted on map	
Postcondition:	The System requires hospitals on map (9) to proceed to UC-5.	
Business Rules:		

Implementation Constraints and Specifications	
Assumptions:	1. Interfacing Technology permits multiple destination mapping
Open Issues:	1. Interfacing Technology classification of hospitals must be verified

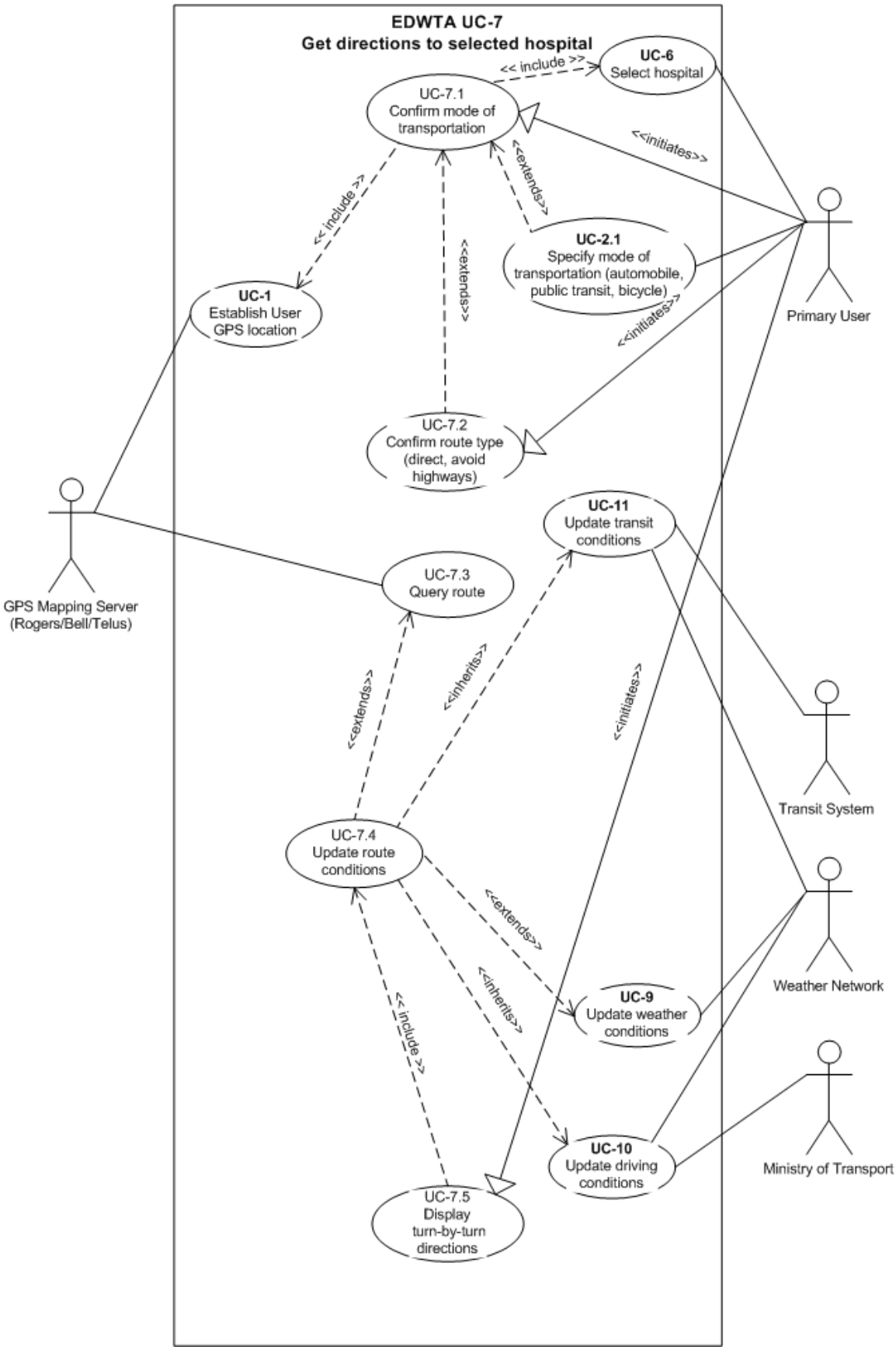

EDWTA UC-5
Find nearest hospital with lowest EDLOS estimate
UC-2
Map hospitals nearest User GPS location
GPS Mapping Server (Rogers/Bell/Telus)
UC-5.1
Query CTAS distribution at nearest hospitals
<<initiates>>
<<initiates>>
<<extends>>
<<extends>>
UC-3
Maintain current EDRS data
EDRS
UC-5.2
Append current time to CTAS query result
UC-4
Calculate EDLOS estimate
<<include>>
<<extends>>
Primary User
UC-5.3
Query EDLOS estimate for CTAS distribution and current time
MOH
Statistical Database
<<extends>>
UC-5.4
Sort query result: shortest to longest
<<include>>
UC-5.5
Display nearest hospital with shortest estimated EDLOS

Author(s): Kyle Faas **Date: February 4, 2010**

Version:

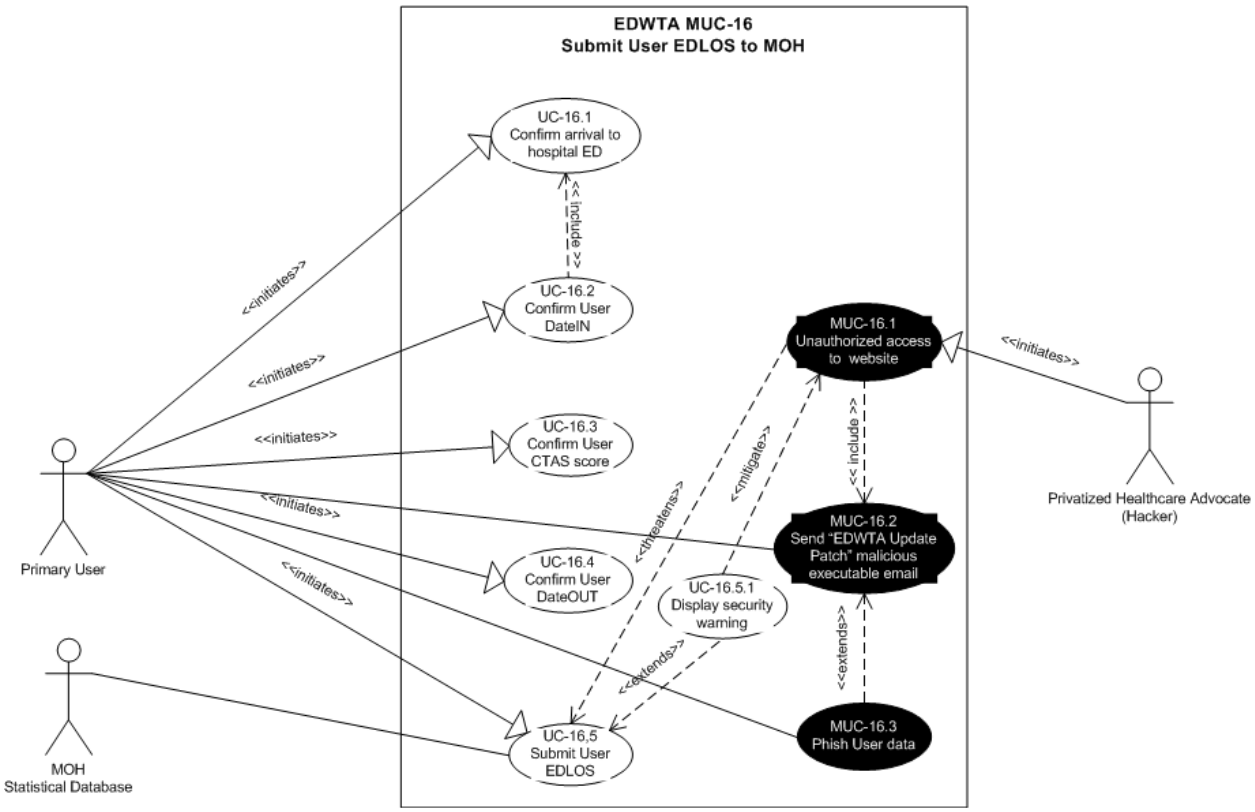
Use Case Name:	Find nearest hospital with lowest EDLOS estimate	**Use Case Type:** Product Use Case
Use Case ID:	UC-5	
Priority:	High	
Source:	Goal 1b.1, 1b.2, UC-2	
Primary Business Actor:	Customer 2b.1 (Primary User)	
Other Participating Actors:	Interfacing Technology 2c.2.1, 2c.2.2, 2c.2.3 (GPS Mapping Server (Rogers/Bell/Telus), Existing Software System 2c.11.1 (EDRS), 2c.11.3 (MOH Statistical Database)	
Other Interested Stakeholders:		
Description:	This Use Case describes the event of a Customer (Primary User) obtaining the nearest hospital to their location with the shortest estimated EDLOS.	
Precondition:	UC-2	
Trigger:	This Use Case is initiated when the Customer completes UC-2	
Typical Course of Events:	**Actor Action**	**System Response**
	1. Customer completes UC-2	2. System queries EDRS for CTAS distribution at nearest hospitals from UC-2
		3. System appends current date and time to CTAS distribution query result
		4. System uses information from (3) to query MOH Statistical Database for EDLOS estimate of each hospital from UC-2
		5. System sorts query result of (4) from shortest to longest estimated EDLOS
		6. System highlights and displays first hospital from the result of (5) with estimated EDLOS
Alternate Courses:	Alt 2. System cannot obtain CTAS distribution from EDRS for nearest hospitals from UC-2. System then queries MOH Statistical Database in (4) with current date and time only Alt 3. System cannot retrieve current date and time from Customer mobile phone. System uses Customer GPS location from UC-1 to query web for current date and time (i.e. http://www.timeanddate.com/worldclock/custom.html?continent=namerica) Alt 4. System cannot retrieve EDLOS estimate from MOH Statistical Database. System then uses CTAS distribution data from (2) to display hospital in (6)	
Conclusion:	This Use Case concludes when nearest hospital with lowest estimated EDLOS is highlighted and displayed	
Postcondition:	The System requires query results from (2), (4) or from both to complete (6) and proceed to UC-6	
Business Rules:		

Implementation Constraints and Specifications	
Assumptions:	1. Interfacing Technology permits multiple destination mapping 2. Existing Software Systems allow queries based on hospital and time
Open Issues:	1. Interfacing Technology current date and time must be verified as accurate


EDWTA UC-7
Get directions to selected hospital
UC-6
Select hospital
<< include >>
UC-7.1
Confirm mode of transportation
<<initiates>>
<<extends>>
<< include >>
<<extends>>
UC-2.1
Specify mode of transportation (automobile, public transit, bicycle)
<<initiates>>
Primary User
UC-1
Establish User GPS location
UC-7.2
Confirm route type (direct, avoid highways)
UC-11
Update transit conditions
GPS Mapping Server
(Rogers/Bell/Telus)
UC-7.3
Query route
<<extends>>
<<inherits>>
<<initiates>>
Transit System
UC-7.4
Update route conditions
<<extends>>
<<inherits>>
<< include >>
Weather Network
UC-9
Update weather conditions
UC-10
Update driving conditions
Ministry of Transport
UC-7.5
Display turn-by-turn directions

Use Case Name:	Get directions to selected hospital	**Use Case Type:** Product Use Case
Use Case ID:	UC-7	
Priority:	High	
Source:	Goal 1b.2, UC-6	
Primary Business Actor:	Customer 2b.1 (Primary User)	
Other Participating Actors:	Interfacing Technology 2c.2.1, 2c.2.2, 2c.2.3 (GPS Mapping Server (Rogers/Bell/Telus), Existing Software Systems 2c.11.4 (Weather Network), 2c.11.5 (Ministry of Transportation), 2c.11.6 (Transit System)	
Other Interested Stakeholders:		
Description:	This Use Case describes the event of a Customer (Primary User) obtaining directions to the hospital chosen in UC-6 from their location. The Customer confirms mode of transportation and confirms route type to obtain turn-by-turn directions to the hospital	
Precondition:	UC-6	
Trigger:	This Use Case is initiated when the Customer completes UC-6	
Typical Course of Events:	**Actor Action**	**System Response**
		1. System prompts Customer to confirm mode of transportation from UC-2.1
	2. Customer confirms mode of transportation	3. System prompts Customer to choose route type (direct, avoid highways, etc)
	4. Customer chooses route type	5. System queries Interfacing Technology for specified route type
		6. System queries Existing Software Systems for updated route conditions
		7. System updates route conditions
		8. System informs Customer of route conditions
	10. Customer chooses direction output type	9. System prompts Customer for direction output type (display or audio)
		11. System outputs turn-by-turn directions
Alternate Courses:	Alt 2. Customer denies mode of transportation. System prompts Customer to choose mode of transportation (UC-2.1) and proceeds to (3) Alt 5. Interfacing Technology does not permit route type queries. System queries websites for directions by route type, and proceeds to (7) Alt 7. Existing Software Systems do not provide all route conditions for Customer location. System updates available route conditions and proceeds to (8) Alt 10. Customer chooses audio direction output type, then navigates back to choose display type. System resumes at (11) Alt 11. Interfacing Technology does not permit turn-by-turn directions. System queries websites for turn-by-turn directions, and concludes Use Case	
Conclusion:	This Use Case concludes when Customer arrives hospital	
Postcondition:	The System requires arrival at hospital to proceed to UC-13	

Business Rules:	
Implementation Constraints and Specifications	
Assumptions:	1. Existing Software Systems are dynamically updated
Open Issues:	1. Definition of route types for Customers using public transit or walking

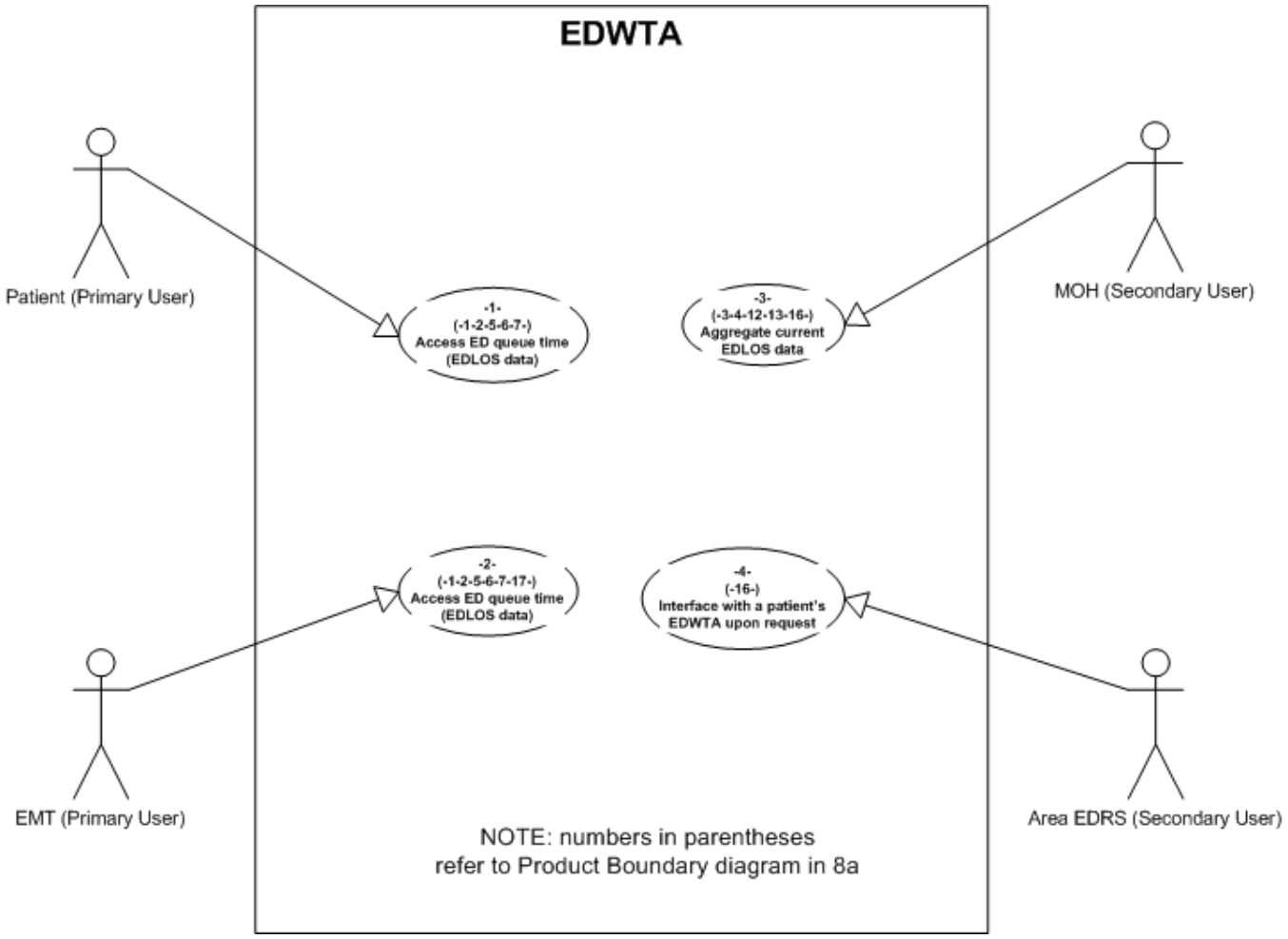


Author(s): Kyle Faas

Date: February 4, 2010
Version:

Misuse Case Name:	Submit User EDLOS to MOH	**Misuse Case Type:** Product Misuse Case
Misuse Case ID:	MUC-16	
Priority:	High	
Source:	Goal 1b.2, UC-16	
Primary Business Actor:	Customer 2b.1 (Primary User)	
Other Participating Actors:	Existing Software System (MOH Statistical Database), Privatized Healthcare Advocate (Hacker)	
Other Interested Stakeholders:		
Description:	This Misuse Case describes the event of a Customer (Primary User) submitting their EDLOS data to the Existing Software System (MOH Statistical Database) upon discharge from the ED, while the Privatized Healthcare Advocate (Hacker) attempts to phish the Customer from the MOH Statistical Database site and/or the EDWTA site or server	
Precondition:	Customer confirms arrival to hospital ED	
Trigger:	This Misuse Case is initiated when the Customer is discharged from the ED, after the Hacker installs malware on the MOH Statistical Database site and/or on the EDWTA site or server	
Typical Course of Events:	**Actor Action**	**System Response**
	1. Customer confirms arrival to hospital ED	2. System prompts Customer to confirm User DateIN
	3. Customer confirms User DateIN	4. System prompts Customer to confirm User CTAS score
	5. Customer confirms User CTAS score	6. System prompts Customer to confirm User DateOUT
	7. Customer confirms User DateOUT	8. System prompts Customer to submit User EDLOS to MOH Statistical Database
	9. Customer submits User EDLOS to MOH Statistical Database	10. Malware on server sends Customer an "EDWTA Update Patch" malicious executable email attachment or MMS
	11. Customer installs malicious executable on mobile phone	12. Malicious executable mines Customer mobile phone and/or email for valuable information
	13. Customer's identity is stolen	
Alternate Courses:	Alt 1. Customer confirms arrival to hospital ED after reading EDWTA Security Warning. Customer is aware that updates will only come to the email account used when installing EDWTA, and not in response to any use of the EDWTA. When malware sends "EDWTA Update Patch" email, Customer knows to delete it Alt 10. System routinely scans EDWTA server and Existing Software System server for malware. When Hacker installs malware, it is removed immediately	
Conclusion:	This Misuse Case concludes when Customer's identity is stolen, or when the System disconnects from Customer's mobile phone after (9) is completed	
Postcondition:	N/A	
Business Rules:		

Implementation Constraints and Specifications	
Assumptions:	1. Existing Software System (MOH Statistical Database) is not secured from phishing attacks 2. Malware is able to mine Customer's mobile phone number
Open Issues:	



UC-1G	#1 Access hospital GPS mapping coordinates (Joanna)
Iteration	Filled
Summary	The patient uses the app to find locations of available hospitals using a GPS mapping system.
Basic path	Bp-1. Joanna selects the app on her cell phone. Bp-2. The system provides the app interface. Bp-3. Joanna selects to see EDLOS aggregation of area hospitals. Bp-4. Joanna selects to see GPS mapping for a particular hospital.

	Bp-5. Joanna selects to save these GPS mapping coordinates remotely in the app for quick reference. Bp-6. Twenty minutes later, Joanna again selects the app on her device from the subway. Bp-7. The system provides the saved GPS mapping coordinates. Joanna navigates her way to the hospital using this.
Alternative paths	Ap-1. The system notifies the user that the GPS mapping coordinates cannot be saved because memory card is missing.
Exception paths	Ep-1. The system notifies the user that the GPS mapping coordinates cannot be saved because memory card is full. Joanna deletes some of her memory and returns to Bp-5.
Trigger	Joanna selects the EDLOS aggregation feature on the app.
Assumptions	A-1. Aggregated EDLOS data is accurate. A-2. GPS mapping data is accurate.
Preconditions	Pre-1. User's device has sufficient free memory to save data. Pre-2. User's device has a battery that is not dying.
Postconditions	Post-1. GPS mapping coordinates have been successfully saved into the system.
Related business rules	Br-1. Users must be registered to gain access to the application.
Author	Grant Patten
Date	2010.01.30

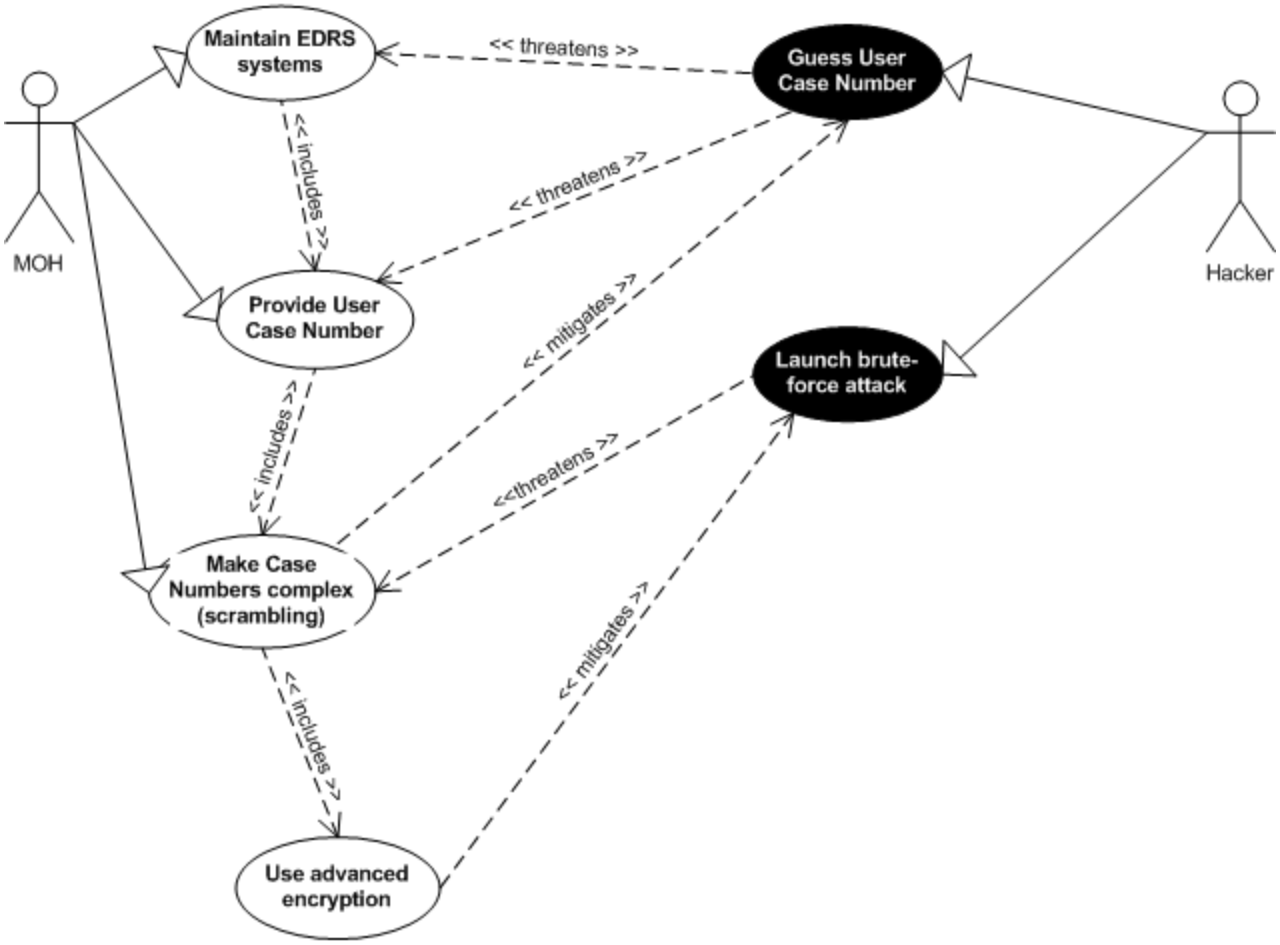
UC-2G	#2 Access hospital GPS mapping coordinates (Robert)
Iteration	Filled
Summary	The patient uses the app to find locations of available hospitals using a GPS mapping system.
Basic path	Bp-1. The patient, Robert, selects the app on his cell phone. Bp-2. The system provides the app interface. Bp-3. Robert selects to see EDLOS aggregation of area hospitals. Bp-4. Robert selects to see GPS mapping for a particular hospital. Bp-5. Robert gets in his car and must sync his cell GPS with his car GPS navigation system. Robert navigates his way to the hospital using this.
Alternative paths	Ap-1. Robert's car GPS navigation system stops working. Ap-2. Robert's mobile does not offer wireless protocol exchange, e.g. Bluetooth. Ap-3. Robert's car GPS navigation system does not offer wireless protocol exchange.

Exception paths	Ep-1. Robert's car GPS navigation system stops working but he instead uses the audio functionality on the mobile with headphones to navigate his way to the hospital.
Trigger	Robert selects the EDLOS aggregation feature on the app.
Assumptions	A-1. Aggregated EDLOS data is accurate. A-2. GPS mapping data is accurate.
Preconditions	Pre-1. User's devices have batteries that are not dying. Pre-2. User's devices are wireless protocol-enabled.
Postconditions	Post-1. Mobile GPS mapping coordinates have been successfully transferred to the car navigation system.
Related business rules	Br-1. Users must be registered to gain access to the application. Br-2. Application must be compatible with existing wireless protocol-enabled car navigation systems.
Author	Grant Patten
Date	2010.01.30

UC-3G	#3 Sync application with hospital's EDRS
Iteration	Filled
Summary	The patient uses the app to interface with the particular hospital's EDRS for the most current information and, thereby, gaining more accurate time estimations.
Basic path	Bp-1. After registering with the nurse, the patient selects the app on their device. Bp-2. The system provides the app interface. Bp-3. The patient selects which hospital they are at. Bp-4. The patient enters in their registration number. Bp-5. The system pulls the individual's private information from the hospital's official EDRS and syncs it into the app. Bp-6. The system provides a means of keeping track of the patient's spot in the cue. Bp-7. The system provides multiple means of alerting the patient when their call time is near. Bp-8. The system uses the hospital's EDRS to indicate whether or not the patient was successfully admitted in to see the physician. Bp-9. The system uses the hospital's EDRS to keep track of how long it took for the patient to leave the physician's office. Bp-10. The system provides the patient with an option to submit the results of their stay to the MOH and EDWTA website for system refinement. Plus comments field for qualitative data.
Alternative paths	Ap-1. The patient leaves the ED after Bp-4 and misses their spot after failing to notice the system's indications.

Exception paths	Ep-1. The patient enters incorrect registration number. System should recognize this and provide error notification.
Trigger	The patient enters in a correct registration number.
Assumptions	A-1. Nurse(s) are continually updating the EDRS with up-to-date information.
Preconditions	Pre-1. User's device has a battery that is not dying. Pre-2. The hospital's EDRS is functioning smoothly.
Postconditions	Post-1. The system has logged activity of the patient's cycle through the EDRS.
Related business rules	Br-1. Users must be registered to gain access to the application. Br-2. All areas hospitals are mandated to interface their EDRS with EDWTA.
Author	Grant Patten
Date	2010.01.30

EDWTA MUC 4 (MUC 16)
Submit User EDLOS to MOH



NOTE: number in parentheses
refers to Product Boundary diagram in 8a

MUC-4G	#4 Intercept and/or tamper with transmission of private data
Summary	Hacker intercepts a patient's private information as they are submitting it to the MOH and the EDWTA website at the end of their stay.
Basic path	Bp-1. Hacker compromises network remotely. Bp-2. Hacker identifies data that is MOH-related. Bp-3. Hacker updates, deletes, or saves private data for records. Hacker may publish private data online to prove that the system is flawed.
Alternative paths	Ap-1. Hacker attacks MOH database or EDWTA website directly after private data has been uploaded.

Mitigation points	Mp-1. Introduce stronger encryption technology when transmitting data across the network. Mp-2. Parse an individual's private data rather than sending it all at once. The disassociation of elements may confuse the hacker. Reassemble on other end. Mp-3. Introduce stronger security measures on MOH database and EDWTA websites, e.g. SSL security. Mp-4. Enclose all stakeholders within a VPN.
Extension points	[...]
Trigger	A patient agrees to transmit their data to the MOH database and EDWTA website at the end of their stay.
Preconditions	Pre-1. The network is not 100% secure against remote attacks.
Assumptions	A-1. Data is transmitted directly from EDRS database to MOH database and not through a third party.
Mitigation guarantee	Do not transmit personal data across the network in the first place. Paper-based transmission is a possibility, although database refinement will take longer.
Related business rules	Br-1. Data from patients' stays should be used to dynamically refine and improve the aggregated MOH database.
Potential misuser profile	Skilled. Knowledge of databases and network transmission processes.
Stakeholders and threats	St-1. MOH: compromised integrity of their system. St-2. Individual hospitals: compromised integrity of their EDRS database(s). St-3. Patient: loss of private information.
Terminology	SSL: Secure Socket Layer VPN: Virtual Private Network
Scope	May compromise integrity of entire system.
Abstraction level	Misuser goal.
Author	Grant Patten
Date	2010.01.30

9. Functional and Data Requirements

Requirement #: S1-1	Requirement Type: 9a, 11a, 11e, 12g	Event/BUC/PUC #: SC-2/UC-2
Description: The product shall offer voice operation		
Rationale: To be able to serve Customers unable to use their hands		
Originator: Kyle Faas - System Designer		
Fit Criterion: 100% of members of a test panel shall be able to complete a series of core function EDWTA tasks without touching their mobile phone		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using Customer input and navigation		Conflicts: NF-10, NF-11
Supporting Materials: 8a, 8b, 5c.7, S2-1, S2-6		
History: Created February 4, 2010; revised February 20, 2010		

Notes
- ties in with S2-1 (GPS coordinates in a text format)
- ties in with S2-6 (audio output)
- also addresses legal concern of mobile use while driving (Ontario, Nova Scotia, Quebec, Newfoundland and Labrador), facilitating scalability across Canada
- conflicts with NF-10, NF-11 requirements for Speed and Latency, and may conflict with Volere 13b requirements for Interfacing with Adjacent Systems
- led to creation of Assumption 5c.7 User mobile device will be capable of voice operation

Requirement #: S1-2	Requirement Type: 9a, 12a	Event/BUC/PUC #: SC-2/UC-2
Description: The product shall offer default values for Customer inputs		
Rationale: To decrease time spent navigating through product		
Originator: Kyle Faas - System Designer		
Fit Criterion: 75% of members of a test panel shall be able to navigate to UC-5 input within 5 seconds on first attempt		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using Customer input		Conflicts: 12c
Supporting Materials: 8a, 8b, 5c.5, G-6, S2-10		

History: Created February 4, 2010; revised February 20, 2010	

Notes
- ties in with G1-6 (minimum User input)
- ties in with S2-10 (User prompted to associate phone number with EDWTA account)
- potentially conflicts with Volere 12c requirements for precision/accuracy; group decided G-6 would limit this conflict
- led to creation of Assumption 5c.5 User of product will possess a GPS-enabled device

Requirement #: S1-3	Requirement Type: 12c	Event/BUC/PUC #: SC-5/UC-5
Description: Product accuracy of estimated EDLOS shall be within 30 minutes 75% of the time		
Rationale: To increase Customer confidence in the product		
Originator: Kyle Faas - System Designer		
Fit Criterion: N/A		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using Existing Software System databases		Conflicts: 13a
Supporting Materials: 8a, 8b, 13b, 5c.3		
History: Created February 4, 2010; revised February 20, 2010		

Notes
- ties in with Assumption 5c.3 Average statistical data reliably predictive of EDLOS
- led in part to creation of Assumption 5c.4 Data from EDRS will be captured dynamically by EDWTA server
- potential conflict with 13a Requirements for expected physical environment
- led to creation of Assumption 5c.8 User will be in area with HSPA coverage
- by combining historical data with real time, group felt 75% accuracy was reasonable

Requirement #: S1-4	Requirement Type: 9a, 12c	Event/BUC/PUC #: SC-5/UC-5
Description: Product shall dynamically update estimated EDLOS every 5 minutes		
Rationale: To increase product accuracy and satisfy S1-03		
Originator: Kyle Faas - System Designer		
Fit Criterion: N/A		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using		Conflicts: 11a, NF-10

Existing Software System databases	
Supporting Materials: 8a, 8b,	
History: Created February 4, 2010	

Notes
- ties in with S2-7 (User connected to area EDRS throughout EDLOS)
- ties in with G1-7 (Maintain feedback from Users to refine EDLOS estimates)
- potential conflicts with 11a Ease of Use, NF-10 requirements; group felt that making EDWTA server based would limit these conflicts

Requirement #: S1-5	Requirement Type: 12d, 12c, 13b, 15b	Event/BUC/PUC #: SC-7/UC-7
Description: The product shall only update route conditions using data from Existing Software Systems and/or websites which dynamically update their content		
Rationale: To prevent incorrect data from being introduced		
Originator: Kyle Faas - System Designer		
Fit Criterion: Traffic conditions shall be updated a minimum of once every 10 minutes Weather conditions shall be updated a minimum of once every 10 minutes		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using Existing Software Systems		Conflicts: NF-10, NF-23
Supporting Materials: 4, 8a, 8b, G1-5, G1-9, G1-10		
History: Created February 4, 2010; revised February 20, 2010		

Notes
- ties in with G1-5 (EDWTA interface with other applications)
- ties in with G1-9 particularization of G1-5 (EDWTA interface with GPS applications)
- ties in with G1-10 particularization of G1-5 (EDWTA interface with transit applications)
- again, group felt conflicts with Performance Requirements would be limited by making EDWTA server based

Requirement #: S1-6	Requirement Type: 9a	Event/BUC/PUC #: SC-7/UC-7
Description: The product shall record a complete log of all data provided to Customer		
Rationale: To compensate for reduced functionality of Interfacing Technology, and to protect Client from legal action		
Originator: Kyle Faas - System Designer		
Fit Criterion: The recorded data shall agree with data found on Interfacing Technology servers and Existing Software Systems servers and shall be updated with every communication between product server and Customer mobile device		

Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using Customer input, Interfacing Technology input and output, Existing Software Systems input and output		Conflicts: NF-10, NF-18, NF-23, NF-48
Supporting Materials: 8a, 8b, G1-3		
History: Created February 4, 2010; revised February 20, 2010		

Notes
- ties in with G1-3 (informing User of liability limitations when activating EDWTA)
- conflicts with Performance requirements limited by server based EDWTA
- conflicts with Privacy requirements limited by Assumption 5c.7 User ED Case Number is not the User's OHIP Number (or other identifying number)

Requirement #: S1-7	Requirement Type: 15a	Event/BUC/MUC #: MUC-16
Description: The product shall protect itself from phishing and other malware attacks		
Rationale: To increase confidence in the security of the product		
Originator: Kyle Faas- System Designer		
Fit Criterion: The product shall allow no anonymous public access to its servers, and shall restrict all data retrieved from Interacting Technologies/Existing Software Systems to text, scannable forms and non-executables; product shall only forward scanned files to User		
Customer Satisfaction:	Customer Dissatisfaction:	
Dependencies: All requirements using inputs from Interacting Technology and Existing Software Systems		Conflicts: NF-10, NF-11, NF-30, NF-31, NF-39, NF-16
Supporting Materials: 8a, 8b, S2-7		
History: Created February 4, 2010; revised February 20, 2010		

Notes
- ties in with S2-7 (User connected to EDWTA throughout EDLOS), due to its encryption requirement
- by making EDWTA server based, with Administrative control through VPN, security is centralized and conflicts with NF-10, NF-11 Performance and NF-30, NF-31 Interfacing with Adjacent Systems requirements are limited
- however, centralized security will possibly conflict with NF-16 99% uptime requirement

Requirement Shell		
Requirement#: S2-1 Revised	Requirement Type: Functional	Event/Use Case#: 1
Description: Application includes function to convert GPS map coordinates into textual form that is compatible with voice operation. Coordinates may be saved for remote access.		
Rationale: Patients will need to access the coordinates in an out-of-service area such as when they		

are traveling via subway. Textual representation allows for lower memory power requirements.	
Originator: Patient	
Fit Criterion: The patient will be able to access previously saved mapping coordinates while in an out-of-service area, e.g. subway.	
Customer Satisfaction: 5	Customer Dissatisfaction: 5
Priority: Must	Conflicts: NF-10, NF-11
Supporting Materials: Use Case #1, Bp-5.	
History: Created 19 February, 2010	

Notes:
- Revised S2-1 to reflect new requirement.
- Ties in well with requirement S1-1.
- It was determined that requirement S2-1 was a little too ambitious. We agreed that asking the application to store GPS coordinates in visual map form was asking for too much memory power.
- Scaling down the scope of the requirement, we determined that instead of the map, the coordinates could be translated through the application into textual form. This connects to S1-1 voice operation requirement in that the voice technology may use the text to read directions.
- New requirement: functionality built into application to translate GPS map coordinates into voice operation-compatible textual form.

Requirement Shell		
Requirement#: S2-2	Requirement Type: Functional	Event/Use Case#: 1
Description: Application contains a memory store.		
Rationale: Patient will be able to save coordinates within application in case of a missing or full memory card with material that the patient does not want to delete.		
Originator: Patient		
Fit Criterion: The patient will be able to access previously saved mapping coordinates while in an out-of-service area, e.g. subway after saving without memory card.		
Customer Satisfaction: 5	Customer Dissatisfaction: 5	
Priority: Must	Conflicts: not as much random-access memory available for other tasks; NF-30, NF-33	
Supporting Materials: Use Case #1, Ep-1.		
History: Created 31 January, 2010		

Notes:
- THIS REQUIREMENT MAY BE REDUNDANT, as S2-1 Revised essentially states the same thing but more specifically.
- As this requirement ties in directly with S2-1, the changes to S2-1 are reflected here. The decision to demand less RAM capacity from the application means that the memory store will not have to be as expansive, but the requirement remains. Only textual information will have to be saved now.

Requirement Shell

Requirement#: S2-3	Requirement Type: Functional	Event/Use Case#: 2
Description: Application is interoperable with the three most popular car GPS navigation systems on the North American market.		
Rationale: When patient is moving from cell phone to car, they may sync the GPS coordinates with their car GPS navigation via wireless protocol.		
Originator: Patient		
Fit Criterion: The car system will register that is has found the mobile and then displays the GPS data from the mobile.		
Customer Satisfaction: 5	Customer Dissatisfaction: 4	
Priority: Should	Conflicts: may be excluding certain less popular car navigation system brands	
Supporting Materials: Use Case #2, Bp-5.		
History: Created 31 January, 2010		

Notes:
- Ties in with the general G1-5 requirement. This requirement would count as interfacing with another application. (EDWTA to GPS)

Requirement Shell		
Requirement#: S2-5	Requirement Type: Functional	Event/Use Case#: 2
Description: Application data is transferable to another user's EDWTA once patient has registered with hospital's EDRS.		
Rationale: When patient has registered at the hospital, a concerned friend or family member may want to view patient's progress in real time using their EDWTA.		
Originator: Patient's friend or family member		
Fit Criterion: The patient's friend is able to view the patient's progress in line after data has been transferred between EDWTAs.		
Customer Satisfaction: 4	Customer Dissatisfaction: 4	
Priority: Could	Conflicts: privacy implications – perhaps not secure enough to transfer data this way.	
Supporting Materials: Use Case #2, Bp-5.		
History: Created 31 January, 2010		

Notes:
- Ties in with the general G1-5 requirement. This requirement would count as interfacing with another application. (EDWTA to EDWTA)
- Discussions about this requirement led to the creation of S2-10.

Requirement Shell		
Requirement#: S2-6 Revised	Requirement Type: Functional	Event/Use Case#: 2
Description: EDWTA offers audio output functionality.		

Rationale: When the patient's car GPS system has died or they simply prefer to listen to coordinates, they may use audio output.	
Originator: Patient	
Fit Criterion: The patient hears the requested directions after turning on speakerphone or inserting headphones into their device.	
Customer Satisfaction: 5	Customer Dissatisfaction: 4
Priority: Should	Conflicts: NF-43
Supporting Materials: Use Case #2, Ep-1.	
History: Created 19 February, 2010	

Notes:
- Revised S2-6 to avoid mandating that a specific piece of technology must be used. S2-6 called for headphones specifically. S2-6 Revised is more general.
- Also ties in well with S1-1. The coordinates could be translated through the application into textual form. This connects to S1-1 voice operation requirement in that the voice technology may use the text to read directions.

Requirement Shell		
Requirement#: S2-7	Requirement Type: Functional	Event/Use Case#: 3
Description: Application is fully connected with all area EDRSs from initial registration through to patient leaving hospital.		
Rationale: The application will be able to provide ongoing monitoring of EDRS so that EDWTA user(s) may remain informed about all data.		
Originator: EDWTA user(s)		
Fit Criterion: The EDWTA will update in real time with EDRS data as it is entered by hospital employees from registration to final exit.		
Customer Satisfaction: 5	Customer Dissatisfaction: 5	
Priority: Must	Conflicts: NF-22	
Supporting Materials: Use Case #3, Bp-3 through to Br-2.		
History: Created 31 January, 2010		

Notes:
- Ties in with S1-4. This requirement is more of a general statement, but S1-4 specifies that the lengths of stay should be updated every five minutes.
- Fulfilling this requirement would involve providing the patient with a sufficiently encrypted registration number, as evidenced in the use/misuse case diagram from S2. This requirement therefore ties in with S1-7, as the encryption helps protect the product from security breaches.

Requirement Shell		
Requirement#: S2-8	Requirement Type: Functional	Event/Use Case#: 3
Description: EDWTA provides multiple means of alerting the patient when their call time is near.		

Rationale: Patient may be in an environment where or state in which hearing or seeing the application is challenging. Providing multiple alert forms makes up for this.	
Originator: Patient	
Fit Criterion: Patients become aware of their call time through different means – not just visual or auditory.	
Customer Satisfaction: 4	Customer Dissatisfaction: 4
Priority: Must	Conflicts: NF-43
Supporting Materials: Use Case #3, Bp-7.	
History: Created 31 January, 2010	

Notes:
- Also ties in with S1-1. Voice operation may be considered one of these multiple means of alerting the patient.

Requirement Shell		
Requirement#: S2-9	Requirement Type: Functional	Event/Use Case#: 3
Description: EDWTA provides the patient with an option to submit the results of their stay to the MOH and EDWTA website.		
Rationale: To refine the MOH database with the most current data and ensuring that correct time estimates were made, thereby improving the EDWTA. Also providing room for qualitative feedback from patient.		
Originator: Ministry of Health		
Fit Criterion: Once the EDRS has indicated that the patient has left the hospital, the EDWTA prompts the user to allow their data to be submitted to the MOH.		
Customer Satisfaction: 1	Customer Dissatisfaction: 1	
Priority: Should	Conflicts: NF-47, NF-48	
Supporting Materials: Use Case #3, Bp-10.		
History: Created 31 January, 2010		

Notes:
- Ties in with G1-7 and G1-8. Those requirements also call for eliciting feedback from the user. G1-8 is the more specific requirement, calling for a form to be displayed for the user to complete.

Requirement Shell		
Requirement#: S2-10	Requirement Type: Functional	Event/Use Case#: 2
Description: An account is automatically associated with each EDWTA. User should be prompted to associate phone numbers with this account upon launch.		
Rationale: When patient has registered at the hospital, a concerned friend or family member may want to view patient's progress in real time using their EDWTA.		
Originator: Patient's friend or family member		
Fit Criterion: The patient's friend is able to view the patient's progress in line after data has been transferred between EDWTAs.		

Customer Satisfaction: 4	Customer Dissatisfaction: 4
Priority: Could	Conflicts: privacy implications – perhaps not secure enough to transfer data this way.
Supporting Materials: Use Case #2, Bp-5.	
History: Created 19 February, 2010	

Notes:
- This requirement was inspired by discussions about S2-5.
- We agreed that creating an account for each user is necessary to fulfill S2-5, so that the user may specify who they would like to be informed when an emergency situation occurs. The privacy issue may be ameliorated here by only requiring phone numbers to be entered and no other information.
- Ideally, the user would specify these individuals before an emergency situation occurs. However, there should also be functionality to specify this information after the emergency situation has occurred. The user may enter this data while waiting to see the doctor(s), for instance.
- New requirement: an account associated with each EDWTA user in which they may specify friends/family members to be contacted in case of emergency. Form should only request phone numbers.

Requirement Shell		
Requirement#: G1-1	Requirement Type: Functional	Event/Use Case#:
Description: The application should provide accurate data		
Rationale: No data transformation shall take place on the data received from Emergency Department Reporting System (EDRS)		
Originator: Gabriela		
Fit Criterion: The data received from EDRS is the data presented to the end user		
Customer Satisfaction: 1	Customer Dissatisfaction: 5	
Priority: 1	Conflicts:	
Supporting Materials: Appendix 1 – goal modeling – the patient depends on Emergency Department Wait Time Application (EDTWA) to provide accurate data		
History: Created on January 31, 2010		

Notes:
- After a closer examination as a group we thought that this is rather a non functional requirement.

Requirement Shell		
Requirement#: G1-2	Requirement Type: Functional	Event/Use Case#:
Description: The application should store historical data		
Rationale: To be able to calculate approximate wait time based on historical data and provide some general guidance in case EDRS is down		
Originator: Gabriela		
Fit Criterion: Even with EDRS being down the application should be able to provide some information to the user, but specify that data is not live		
Customer Satisfaction: 2	Customer Dissatisfaction: 5	
Priority: 1	Conflicts:	
Supporting Materials: Appendix 1 – goal modeling – our application depends on data being provided the EDRS		
History: Created on January 31, 2010		

Requirement Shell		
Requirement#: G1-3	Requirement Type: Functional	Event/Use Case#:
Description: The application shall inform the user every time before usage about the liability limitations		
Rationale: In order to limit the liability that may result from decisions made based on information provided by the application		
Originator: Gabriela		
Fit Criterion: The user shall be asked to click trough a liabilty limitation information page		
Customer Satisfaction:	Customer Dissatisfaction:	
Priority: 1	Conflicts: NF-10, NF-11	
Supporting Materials: Appendix 1 – goal modeling; Terms of Use presented by other sites in similar situations http://www.hco-on.ca/english/Terms-of-Use/?REDIRECT=http%3a%2f%2fwww.hco-on.ca%2fenglish%2fsearch%2fDefault.aspx		
History: Created on January 31, 2010		

Notes:
- Ties in with S1-6 “The product shall record a complete log of all data provided to Customer”

Requirement Shell		
Requirement#: G1-4	Requirement Type: Functional	Event/Use Case#:
Description: The application must support the following mobile browsers Opera, iPhone, Nokia, iTouch, Blackberry, Sony PSP, Sony Ericsson, Open Wave, Android		
Rationale: In order for this service to be available to as many users a possible we need to support the most popular browsers		
Originator: Gabriela		
Fit Criterion: All browsers mentioned above shall be able to run the web based application as long as they have java enabled		
Customer Satisfaction: 2	Customer Dissatisfaction: 4	
Priority: 1	Conflicts: S1-7, S2-4 (omitted)	
Supporting Materials: Appendix 1 – goal modeling; http://techcrunchies.com/most-popular-mobile-browser-2008-2009/		
History: Created on January 31, 2010		

Notes:
- This requirement conflicted with both S1-7 and S2-4.
- Keeping this requirement meant giving up S2-4 that stated ": Application provides automatic updating to retain compatibility with three most popular car GPS navigation systems in North America".
- S1-7 "The product shall protect itself from phishing and other malware attacks"

Requirement Shell		
Requirement#: G1-5	Requirement Type: Functional	Event/Use Case#:
Description: The application shall interface with other applications		
Rationale: In order to get data from EDRS and to connect with other GPS/travel services		
Originator: Gabriela		
Fit Criterion: The application shall be able to get live data from EDRS		
Customer Satisfaction: 1	Customer Dissatisfaction: 5	
Priority: 1	Conflicts:	
Supporting Materials: Appendix 1 – goal modeling; soft goal "interface with other applications"		
History: Created on February 2, 2010		

Notes:
- ties in with more specific S2-3 requirement, which states "application is interoperable with 3 most popular GPS". EDWTA shall interface with GPS.

- also ties in with S2-5 that states “data is transferable to another user’s EDWTA once patient has registered” (EDWTA to EDWTA)
- S1-5 “The product shall only update route conditions using data from Existing Software Systems and/or websites which dynamically update their content”

Requirement Shell		
Requirement#: G1-6	Requirement Type: Functional	Event/Use Case#:
Description: The interface shall require minimal user input		
Rationale: Most users needing this application will have some level of distress		
Originator: Gabriela		
Fit Criterion: Be able to pass on the application the current user location based on global positioning system (GPS) data		
Customer Satisfaction: 3	Customer Dissatisfaction: 3	
Priority: 2	Conflicts:G1-7, NF-2, NF-37	
Supporting Materials: Appendix 1 – goal modeling		
History: Created on February 2, 2010		

Notes:
- S1-2 “The product shall offer default values for Customer inputs”

Requirement Shell		
Requirement#: G1-7	Requirement Type: Functional	Event/Use Case#:
Description: Maintain feedback data from users		
Rationale: In order to continuously improve the time estimates		
Originator: Gabriela		
Fit Criterion: Record in and out actual dates and times reported by users		
Customer Satisfaction: 2	Customer Dissatisfaction: 3	
Priority: 2	Conflicts: G1-6	
Supporting Materials: Appendix 1 – goal modeling; reliability		
History: Created on February 2, 2010		

Notes:
- ties in with S2-9 .”EDWTA provides the patient with an option to submit the results of their stay to the MOH and EDWTA website”
- S1-3 “Product accuracy of estimated EDLOS shall be within 30 minutes 75% of the time” and S1-4 “Product shall dynamically update estimated EDLOS every 5 minutes”

Requirement Shell		
Requirement#: G1-8	Requirement Type: Functional	Event/Use Case#:
Description: Display feedback form		
Rationale: In order for users to be able to provide data from personal experience		
Originator: Gabriela		
Fit Criterion: User can input estimated time and actual time for a specific hospital		
Customer Satisfaction: 2	Customer Dissatisfaction: 3	
Priority: 1	Conflicts:	
Supporting Materials: Appendix 1 – goal modeling		
History: Created on February 2, 2010		

Notes:
- ties in with S2-9 ”EDWTA provides the patient with an option to submit the results of their stay to the MOH and EDWTA website”

Requirement Shell		
Requirement#: G1-9	Requirement Type: Functional	Event/Use Case#:
Description: Interface with GPS to provide directions		
Rationale: Give user direction to get to the desired hospital		
Originator: Gabriela		
Fit Criterion: The user should receive directions on GPS to the chosen hospital		
Customer Satisfaction: 1	Customer Dissatisfaction: 5	
Priority: 1	Conflicts:	
Supporting Materials: Appendix 1 – goal modeling		
History: Created on February 4, 2010		

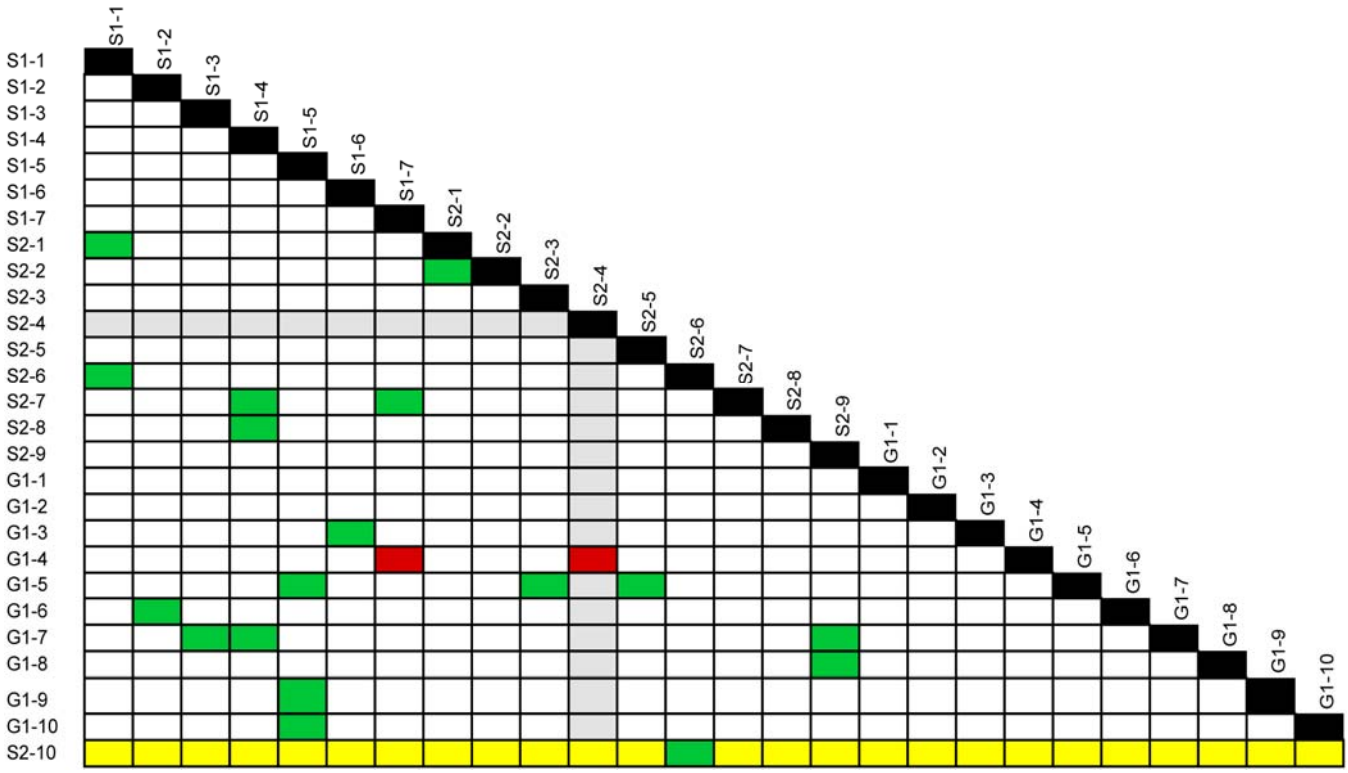
Notes:
- This is a particularization of G-5 “The application shall interface with other applications”. This requirement will be removed during consolidation.

Requirement Shell		
Requirement#: G1-10	Requirement Type: Functional	Event/Use Case#:
Description: Interface with local transit where available		
Rationale: Provide the user with directions an how to get to the hospital using public transportation		
Originator: Gabriela		

Fit Criterion: The user should receive transit directions to the chosen hospital	
Customer Satisfaction: 2	Customer Dissatisfaction: 3
Priority: 1	Conflicts:
Supporting Materials: Appendix 1 – goal modeling	
History: Created on February 4, 2010	

Notes:
- This is a particularization of G-5 “The application shall interface with other applications”. This requirement will be removed during consolidation.

Requirements Comparison - Scenario and Goal Modeling



Req	Type	Volere	Description	Commonalities	Discrepancies
S1-1	F	9a, 11a, 11e, 12g	Product shall offer voice operation	S2-1, S2-6, 5c.7	NF-10, NF-11
S1-2	F	9a, 12a	Product shall offer default values for Customer inputs	G1-6, S1-10, 5c.5	12c
S1-3	NF	12c	Product accuracy of estimated EDLOS shall be within 30 minutes 75% of the time	5c.3, 5c.4, 5c.8	13a
S1-4	F	9a, 12c	Product shall dynamically update estimated EDLOS every 5 minutes	S1-3, S2-7, G1-7	NF-10
S1-5	NF	12c, 12d, 13b, 15b	Product shall only update route conditions using data from Existing Software Systems and/or websites which dynamically update their content	G1-5, G1-9, G1-10	NF-10, NF-23
S1-6	F	9a	The product shall record a complete log of all data provided to Customer	G1-3, NF-10, NF-52	NF-18, NF-23, NF-48
S1-7	NF	15a	The product shall protect itself from phishing and other malware attacks	S2-7	NF-10, NF-11, NF-16, NF-30, NF-31, NF-39
S2-1	F	9a	Product shall include function to convert GPS map coordinates into text form that is compatible with voice operation; coordinates shall be saved for remote access	S1-1	NF-10, NF-11
S2-2	F	9a	Product shall include a memory store	S2-1, NF-21, NF-22, NF-25	NF-30, NF-33
S2-3	F	9a	Product shall be interoperable with 3 most popular car GPS navigation systems on North American market	G1-5	NF-43
S2-4	OMITTED				
S2-5	F	9a	Product data transferable to another User's product, once User has registered with hospital EDRS	S2-10, G1-5, NF-46	NF-47, NF-48
S2-6	F	9a	Product shall offer audio output functionality	S1-1	NF-43
S2-7	F	9a	Product shall be fully connected with all area EDRS systems, from User hospital registration to discharge	S1-4, S1-7	NF-22
S2-8	F	9a	Product shall provide multiple means of alerting User when call time is approaching	S1-1	NF-43
S2-9	F	9a	Product shall provide User with option to submit EDLOS results to MOH and product website	G1-7, G1-8, NF-2, NF-37, NF-49, NF-50	NF-47, NF-48
S2-10	F	9a	Product shall automatically associate User with product account; product shall prompt User to confirm phone number upon activation	S2-5	
G1-1	NF	12c	Product shall provide accurate data		
G1-2	F	9a	Product shall store historical data		
G1-3	F	9a	Product shall inform User of liability limitations before each product use	S1-6, NF-51	NF-10, NF-11
G1-4	F	9a	Product shall support mobile browsers: Opera, iPhone, Nokia, iTouch, Blackberry, Sony PSP, Sony Ericsson, Open Wave, Android	NF-30, NF-31, NF-33,	S1-7, S2-4 (omitted)
G1-5	F	9a	Product shall interface with other applications	S1-5, S2-3, S2-5	

G1-6	F	9a	Product interface shall require minimal User input	S1-2, NF-1, NF-5, NF-7, NF-8, NF-9, NF-34	G1-7. NF-2, NF-37
G1-7	F	9a	Product shall maintain feedback data from Users	S1-3, S1-4, S2-9	G1-6
G1-8	F	9a	Product shall display feedback form	S2-9	
G1-9	F	9a	Product shall interface with GPS to provide directions	G-5	
G-10	F	9a	Product shall interface with local transit where available	G-5	

Functional Requirements Consolidation

Req	Source	Description	Commonalities	Discrepancies
F-1	S1-1	Product shall offer voice operation	S2-1, S2-6, 5c.7	NF-10, NF-11
F-2	S1-2	Product shall offer default values for Customer inputs	G1-6, S1-10, 5c.5	12c
F-3	S1-4	Product shall dynamically update estimated EDLOS every 5 minutes	S1-3, S2-7, G1-7	NF-10
F-4	S1-5	Product shall only update route conditions using data from Existing Software Systems and/or websites which dynamically update their content	G1-5, G1-9, G1-10	NF-10, NF-23
F-5	S1-6	The product shall record a complete log of all data provided to Customer	G1-3, NF-10, NF-52	NF-18, NF-23, NF-48
F-6	S2-1	Product shall include function to convert GPS map coordinates into text form that is compatible with voice operation; coordinates shall be saved for remote access	S1-1	NF-10, NF-11
F-7	S2-2	Product shall include a memory store	S2-1, NF-21, NF-22, NF-25	NF-30, NF-33
F-8	S2-3	Product shall be interoperable with 3 most popular car GPS navigation systems on North American market	G1-5	NF-43
F-9	S2-5	Product data transferable to another User's product, once User has registered with hospital EDRS	S2-10, G1-5, NF-46	NF-47, NF-48
F-10	S2-6	Product shall offer audio output functionality	S1-1	NF-43
F-11	S2-7	Product shall be fully connected with all area EDRS systems, from User hospital registration to discharge	S1-4, S1-7	NF-22
F-12	S2-8	Product shall provide multiple means of alerting User when call time is approaching	S1-1	NF-43
F-13	S2-9	Product shall provide User with option to submit EDLOS results to MOH and product website	G1-7, G1-8, NF-2, NF-37, NF-49, NF-50	NF-47, NF-48
F-14	S2-10	Product shall automatically associate User with product account; product shall prompt User to confirm phone number upon activation	S2-5	

F-15	G1-2	Product shall store historical data		
F-16	G1-3	Product shall inform User of liability limitations before each product use	S1-6, NF-51	NF-10, NF-11
F-17	G1-4	Product shall support mobile browsers: Opera, iPhone, Nokia, iTouch, Blackberry, Sony PSP, Sony Ericsson, Open Wave, Android	NF-30, NF-31, NF-33,	S1-7, S2-4 (omitted)
F-18	G1-5	Product shall interface with other applications	S1-5, S2-3, S2-5	
F-19	G1-6	Product interface shall require minimal User input	S1-2, NF-1, NF-5, NF-7, NF-8, NF-9, NF-34	G1-7. NF-2, NF-37
F-20	G1-7	Product shall maintain feedback data from Users	S1-3, S1-4, S2-9	G1-6
F-21	G1-8	Product shall display feedback form	S2-9	

11-15. Nonfunctional Requirements

Req	Volere	Description	Fit Criterion	Notes
NF-1	11a	The interface shall be easy to use with no training by anyone over the age of young adulthood	95% of a reasonably sized test group shall be able to use the interface without any guidance, and shall be able to determine the right ED for their needs in less than 3 minutes	A user survey taken after ED discharge shall show an 80% satisfaction rate when comparing estimated to actual EDLOS
NF-2	11a	The system shall prompt User to enter correct Case Number		
NF-3	11b	The interface shall be offered in both English and French; the user shall be able to switch languages easily		
NF-4	11b	The system shall include visual configurability		
NF-5	11c	The user shall not need any training to use interface	95% of a reasonably sized test group of average age shall be able to use interface without any training	
NF-6	11c	The system shall include a "How To" file	file shall be available within EDWTA at all times	
NF-7	11d	The interface shall be simple, with minimum information, using a common language		
NF-8	11d	The system shall prioritize symbols over text within interface		
NF-9	11e	The interface shall follow the standards imposed by the Accessibility for Ontarians with Disabilities Act		
NF-10	12a	The system shall have a response time of >5 seconds for 90% of requests on devices that meet minimum system requirements		
NF-11	12a	The system shall be fast enough to prevent User abandoning it		
NF-12	12b	The system shall include information in MOH Terms of Use document specifying it shall not be used when driving		
NF-13	12c	The accuracy of GPS mapping coordinates shall be within visual range of User		
NF-14	12c	The accuracy of initial EDLOS estimate shall be within a few minutes		
NF-15	12c	The accuracy of EDRS EDLOS estimate once User has registered shall be within a few minutes		
NF-16	12d	The system shall be available 24-7 with an uptime of 99.99 (not including scheduled maintenance)		maintenance downtime shall be kept >1 hour/year, with no more than 10 minutes downtime at one time
NF-17	12d	The system shall indicate expected return to function when server is down		
NF-18	12e	The system shall cache all possible data to operate on its own when EDRS system is down		
NF-19	12e	The system servers shall have at least one uninterruptible power source capable of sustaining system for a minimum of 2 hours		
NF-20	12e	The system shall indicate nature of problem when connection is lost with EDWTA server		

NF-21	12e	The system EDLOS aggregation function shall work independently of GPS		
NF-22	12e	The system GPS directions shall work independently of EDLOS aggregation		
NF-23	12f	The system shall support 300 concurrent users		1000 concurrent users shall be considered worst case scenario
NF-24	12f	The system shall be able to interface with all area EDRS systems		
NF-25	12f	The system shall be able to store at least 2 locations		
NF-26	12g	The system shall be scalable to 500 concurrent users within 3 years		
NF-27	12g	The system shall be scalable with expected population growth		
NF-28	12g	The system shall be extensible throughout Canada and internationally		
NF-29	12h	The system shall operate for 3 years within budget without major updates		
NF-30	13a	The system shall be web based and able to run on a mobile web browser		
NF-31	13b	The system shall run on the last 3 releases of Internet Explorer, Safari, Firefox, Chrome and Opera		
NF-32	13b	The system shall interface with the EDRS system in order to collect data	the data on arrival time, acuity and historical data shall be retrieved from EDRS; web services shall be used to communicate with EDRS	
NF-33	13c	The system shall be available using a Java-enabled web browser		
NF-34	13c	The system shall be easy to access by an untrained User		
NF-35	13c	The system shall be free		
NF-36	13d	The system shall be upgraded on the system server; no user action required to access latest version		
NF-37	13d	New releases of the system shall incorporate User feedback		
NF-38	14a	The system shall be maintainable at lowest usage hours without service interruption		
NF-39	14a	The system shall automatically report critical errors to Maintenance Operators		
NF-40	14b	Telephone, chat and email support shall be available 20x4		
NF-41	14b	The system shall include a "How To" file	file shall be available within EDWTA at all times	
NF-42	14b	The system shall have support available to Users and Maintenance Operators 24-7		
NF-43	14c	The system shall run on all mobile devices		
NF-44	14c	The system shall run on all operating systems		
NF-45	15a	The server shall be physically accessible only by authorized personnel		Remote access of designated administrators shall be allowed using VPN only

NF-46	15a	The system shall assign a unique identifier to User upon registration		
NF-47	15b	The system shall not use or store any personal information		The data shall be stored as it was received
NF-48	15c	The system shall use no private data		
NF-49	15c	The system shall prompt Users for permission to integrate their data into MOH or other systems		
NF-50	15c	The system shall ensure data is transmitted securely across network		
NF-51	15c	The system shall notify Users of changes to its information policy		
NF-52	15d	The system shall maintain access logs for 7 years		
NF-53	15d	The system registration process shall allow MOH to track use of EDWTA		
NF-54	15e	The system server room shall be secure, with authorized access only		
NF-55	15e	The system servers shall be secured using firewalls and appropriate security packages		

Nonfunctional Requirements from Functional Requirements Consolidation

Req #	Volere #	Description	Commonalities	Discrepancies	Source
NF-56	12c	Product accuracy of estimated EDLOS shall be within 30 minutes 75% of the time	5c.3, 5c.4, 5c.8	13a	S1-3
NF-59	12c	Product shall provide accurate data			G1-1
NF-57	12c, 12d, 13b, 15b	Product shall only update route conditions using data from Existing Software Systems and/or websites which dynamically update their content	G1-5, G1-9, G1-10	NF-10, NF-23	S1-5
NF-58	15a	The product shall protect itself from phishing and other malware attacks	S2-7	NF-10, NF-11, NF-16, NF-30, NF-31, NF-39	S1-7

Nonfunctional Requirements Consolidation

Req #	Volere #	Description	Fit Criterion	Notes	
NF-1	11a	The interface shall be easy to use with no training by anyone over the age of young adulthood	95% of a reasonably sized test group shall be able to use the interface without any guidance, and shall be able to determine the right ED for their needs in less than 3 minutes	A user survey taken after ED discharge shall show an 80% satisfaction rate when comparing estimated to actual EDLOS	
NF-2	11a	The system shall prompt User to enter correct Case Number			
NF-3	11b	The interface shall be offered in both English and French; the user shall be able to switch languages easily			
NF-4	11b	The system shall include visual configurability			
NF-5	OMITTED (same as NF-1)				
NF-6	11c	The system shall include a "How To" file	file shall be available within EDWTA at all times		
NF-7	11d	The interface shall be simple, with minimum information, using a common language			
NF-8	11d	The system shall prioritize symbols over text within interface			
NF-9	11e	The interface shall follow the standards imposed by the Accessibility for Ontarians with Disabilities Act			
NF-10	12a	The system shall have a response time of >5 seconds for 90% of requests on devices that meet minimum system requirements			
NF-11	OMITTED (same as NF-10)				
NF-12	12b	The system shall include information in MOH Terms of Use document specifying it shall not be used when driving			
NF-13	12c	The accuracy of GPS mapping coordinates shall be within visual range of User			
NF-14	OMITTED (same as NF-56)				
NF-15	OMITTED (same as NF-56)				

NF-56	12c	Product accuracy of estimated EDLOS shall be within 30 minutes 75% of the time			S1-3
NF-58	12c	Product shall provide accurate data			G1-1
NF-16	12d	The system shall be available 24-7 with an uptime of 99.99 (not including scheduled maintenance)		maintenance downtime shall be kept >1 hour/year, with no more than 10 minutes downtime at one time	
NF-17	12d	The system shall indicate expected return to function when server is down			
NF-18	12e	The system shall cache all possible data to operate on its own when EDRS system is down			
NF-19	12e	The system servers shall have at least one uninterruptible power source capable of sustaining system for a minimum of 2 hours			
NF-20	12e	The system shall indicate nature of problem when connection is lost with EDWTA server			
NF-21	12e	The system EDLOS aggregation function shall work independently of GPS			
NF-22	12e	The system GPS directions shall work independently of EDLOS aggregation			
NF-23	12f	The system shall support 300 concurrent users		1000 concurrent users shall be considered worst case scenario	
NF-24	12f	The system shall be able to interface with all area EDRS systems			
NF-25	12f	The system shall be able to store at least 2 locations			
NF-26	12g	The system shall be scalable to 500 concurrent users within 3 years			
NF-27	12g	The system shall be scalable with expected population growth			
NF-28	12g	The system shall be extensible throughout Canada and internationally			
NF-29	12h	The system shall operate for 3 years within budget without major updates			
NF-30	OMITTED (same as NF-33)				
NF-31	13b	The system shall run on the last 3 releases of Internet Explorer, Safari, Firefox, Chrome and Opera			

NF-32	13b	The system shall interface with the EDRS system in order to collect data	the data on arrival time, acuity and historical data shall be retrieved from EDRS; web services shall be used to communicate with EDRS		
NF-33	13c	The system shall be available using a Java-enabled web browser			
NF-34	13c	The system shall be easy to access by an untrained User			
NF-35	13c	The system shall be free			
NF-36	13d	The system shall be upgraded on the system server; no user action required to access latest version			
NF-37	13d	New releases of the system shall incorporate User feedback			
NF-38	14a	The system shall be maintainable at lowest usage hours without service interruption			
NF-39	14a	The system shall automatically report critical errors to Maintenance Operators			
NF-40	14b	Telephone, chat and email support shall be available 20x4			
NF-41	14b	The system shall include a "How To" file	file shall be available within EDWTA at all times		
NF-42	14b	The system shall have support available to Users and Maintenance Operators 24-7			
NF-43	14c	The system shall run on all mobile devices			
NF-44	14c	The system shall run on all operating systems			
NF-45	15a	The server shall be physically accessible only by authorized personnel		Remote access of designated administrators shall be allowed using VPN only	
NF-46	15a	The system shall assign a unique identifier to User upon registration			
NF-57	15a	The product shall protect itself from phishing and other malware attacks			S1-7
NF-47	15b	The system shall not use or store any personal information		The data shall be stored as it was received	

NF-48	OMITTED (same as NF-47)				
NF-49	15c	The system shall prompt Users for permission to integrate their data into MOH or other systems			
NF-50	15c	The system shall ensure data is transmitted securely across network			
NF-51	15c	The system shall notify Users of changes to its information policy			
NF-52	15d	The system shall maintain access logs for 7 years			
NF-53	15d	The system registration process shall allow MOH to track use of EDWTA			
NF-54	OMITTED (same as NF-45)				
NF-55	15e	The system servers shall be secured using firewalls and appropriate security packages			

Reflections on Gathering Requirements

In comparing how the two modeling techniques helped us and what were the different levels where we found one more useful than the other or equally useful, it must be noted that the application of the two techniques was not balanced in our group. We had only one member of the group use the goal modeling, while two members used scenarios.

Literature in the area of requirements discovery using goals and scenarios notes that “[g]oals are used in the refinement of functional and non-functional requirements” (Liu, 2001), but in our particular case this was not evident. Rather, goals were helpful in the discovery of an additional non-functional requirement (NF-59), which was later omitted during consolidation as it lacked the specificity of NF-56, which was discovered during scenario modeling. However, our group found goal modeling useful in refining the functional requirements discovered using use-cases and scenarios, as the operationalizing of Client liability prevention and User feedback were not elicited using scenarios. Lastly, goal modeling led to the discovery of a new functional requirement (F-14 or S2-10) through the iterative process of group discussion and project scope refinement; indeed, we found i* modeling particularly useful in the latter.

Scenarios led to the discovery of a number of predominately functional requirements, as expected; however, upon refinement through group discussion and goal modeling, a number of these functional requirements were determined to actually be non-functional in nature (S1-3 or NF-56, and S1-7 or NF-58). While this may have been a by-product of using the Volere Template to elicit non-functional requirements, scenario modeling does allow for the inclusion of some "soft goals" found using i*; likewise, many of the tasks and resources modeled using i* result in the discovery of addition functional requirements more typically expected of scenario and use-case modeling.

As a general rule, however, use-cases themselves elicited more functional requirements in our group than either scenarios or goal modeling. While scenarios were used in this assignment after their corresponding use-cases had already been diagrammed and written, they seem to function better as a bridge between goal modeling and use-cases. Presumably, a designer might best begin gathering requirements using i*, continuing to refine the scope of the project through goal modeling, but also use scenarios to refine use-cases and possibly elicit additional soft goals for use in goal modeling. In essence, not one of these three techniques provided a clear shortcut through the iterative process of requirements discovery, though each proved to refine the others.

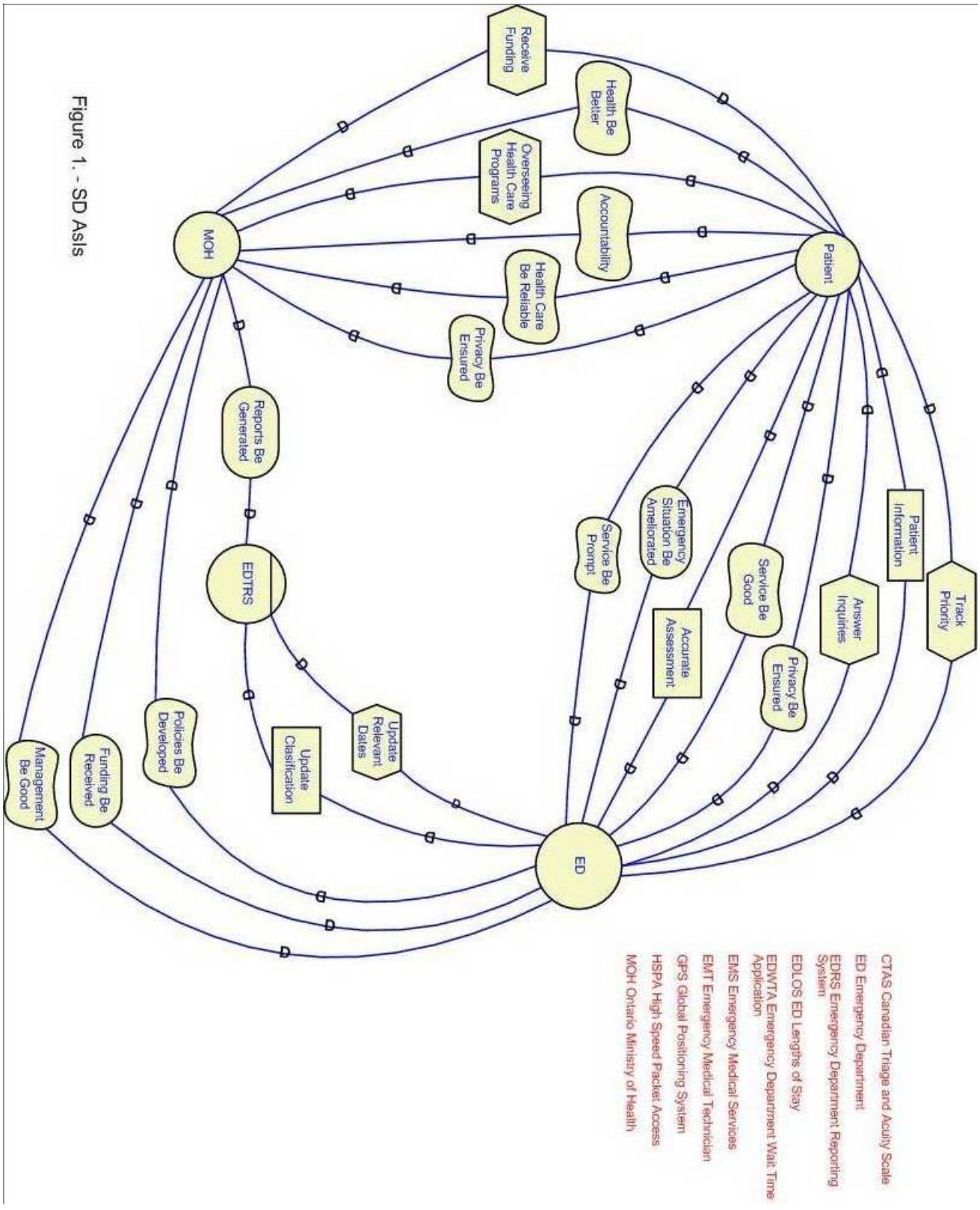


Figure 1. - SD Asls

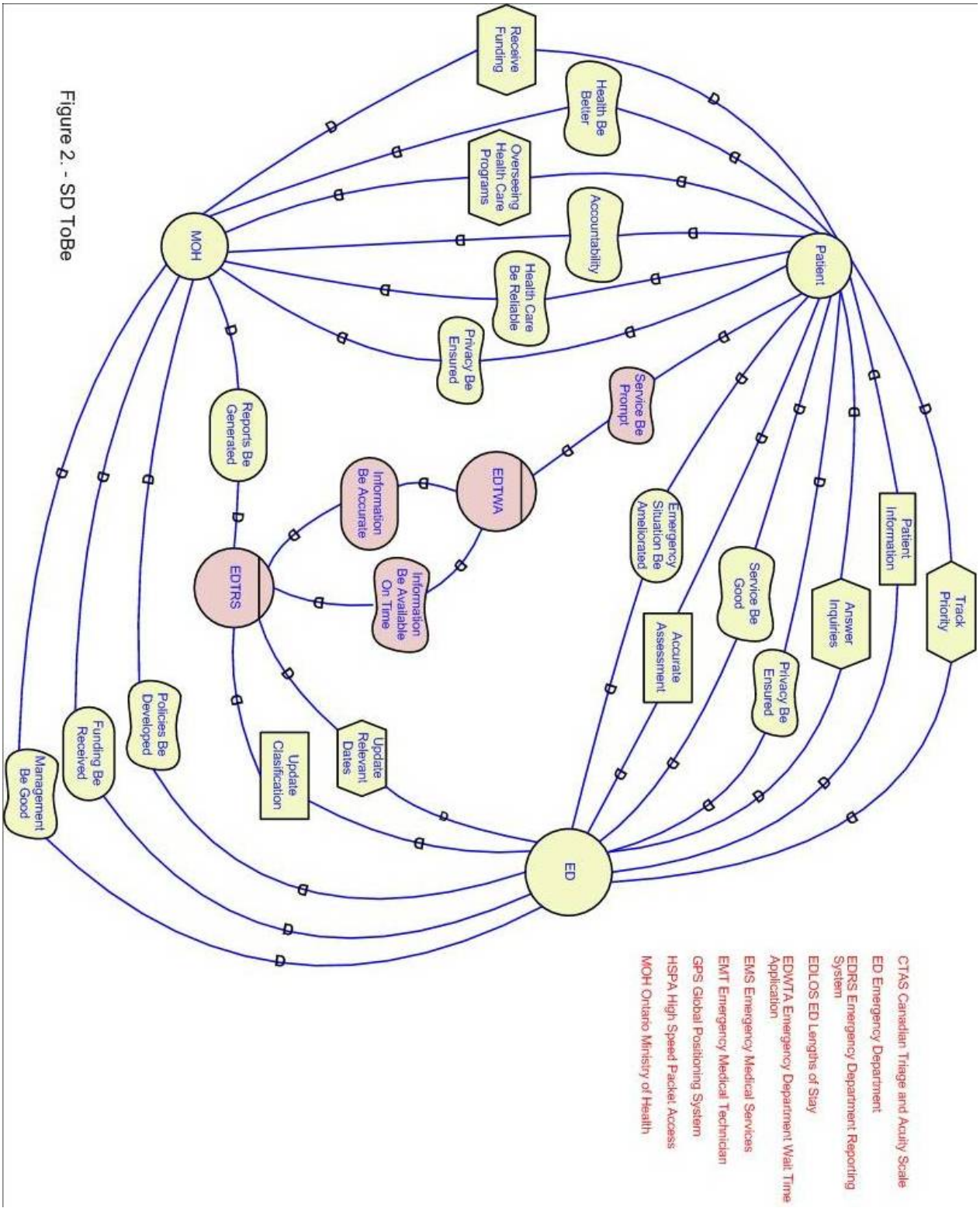


Figure 2. - SD ToBe

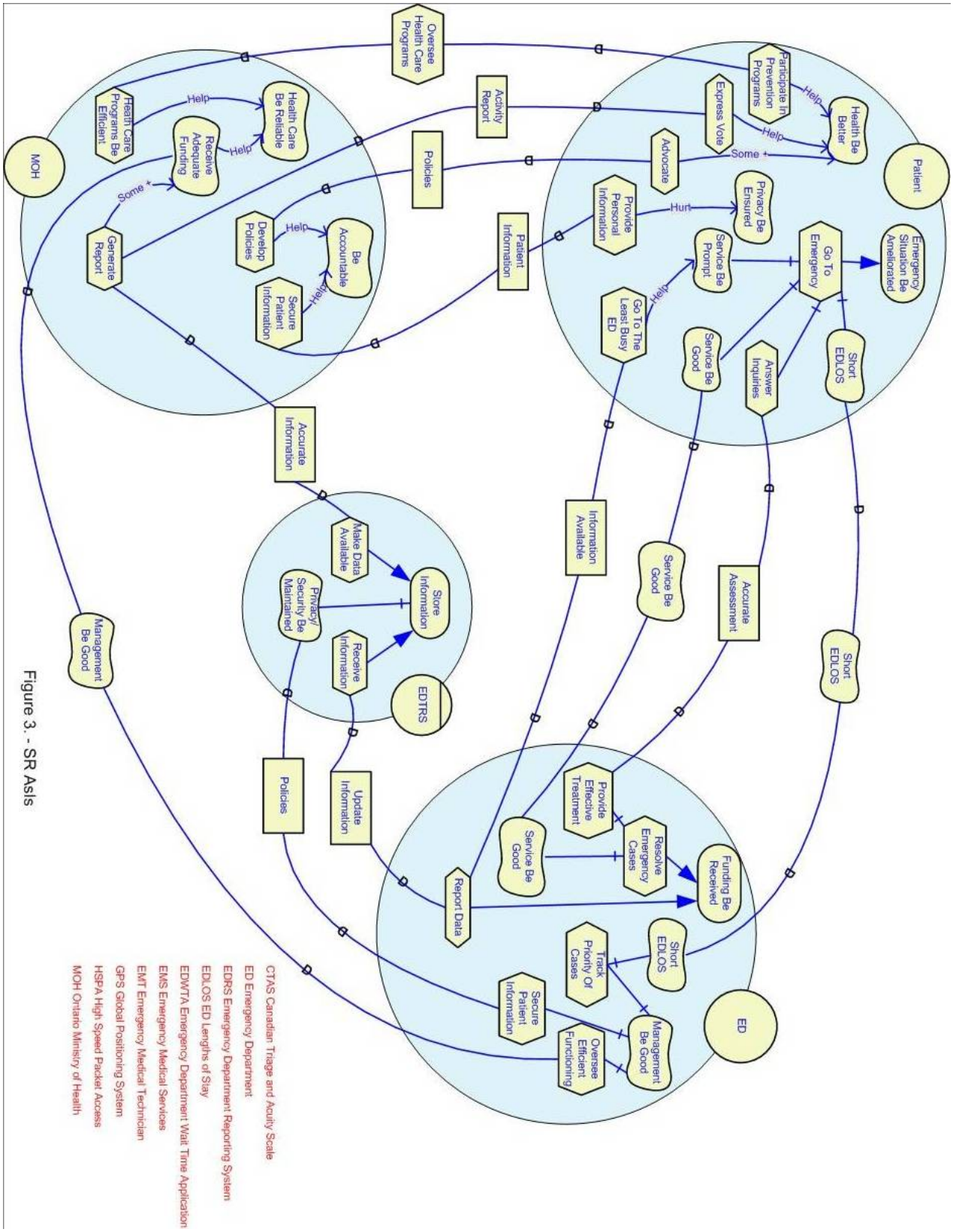


Figure 3. - SR AsIs

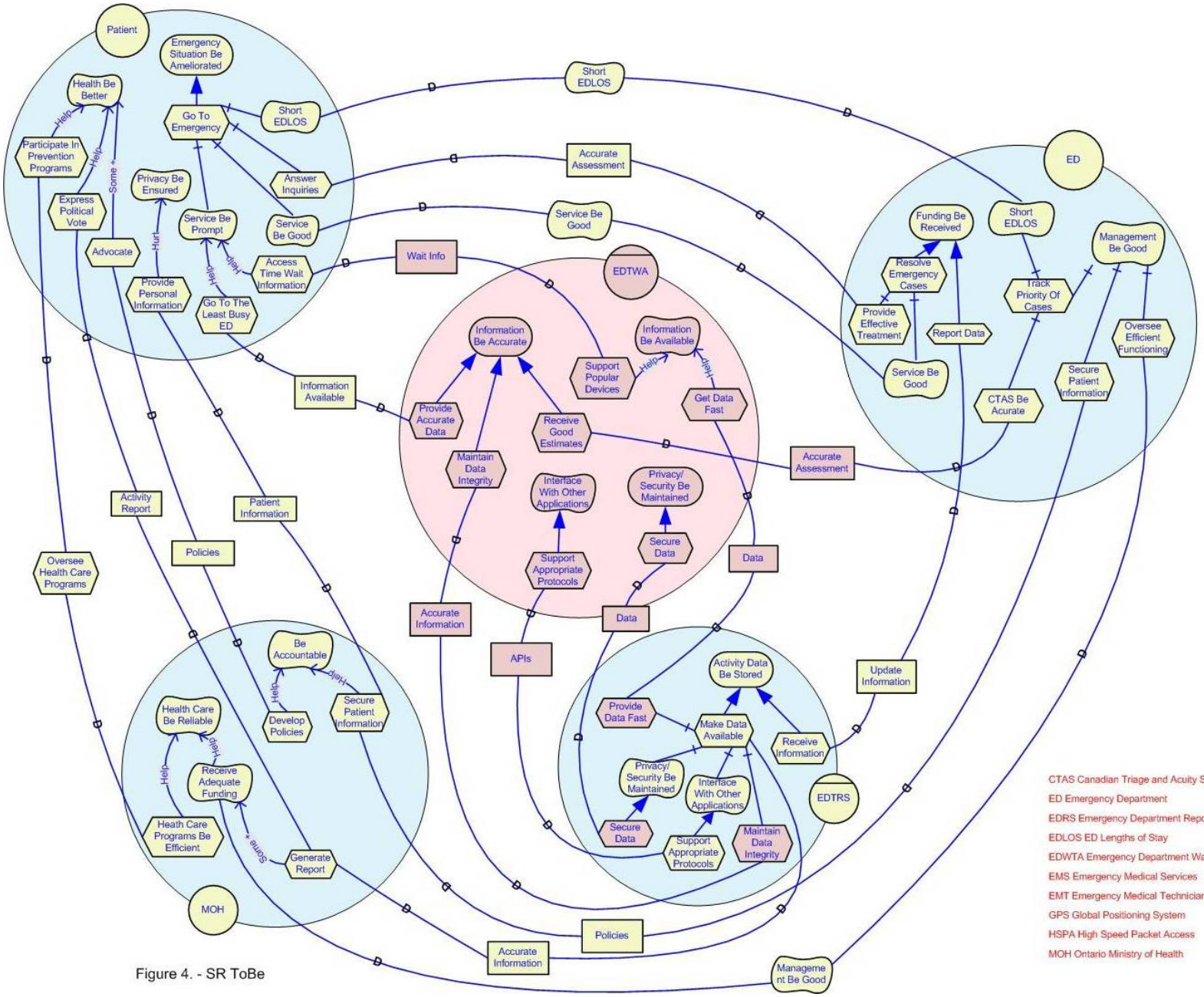


Figure 4. - SR ToBe

CTAS Canadian Triage and Acuity Scale
ED Emergency Department
EDRS Emergency Department Reporting System
EDLOS ED Lengths of Stay
EDWTA Emergency Department Wait Time Application
EMS Emergency Medical Services
EMT Emergency Medical Technician
GPS Global Positioning System
HSPA High Speed Packet Access
MOH Ontario Ministry of Health

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