**SEQUENCE DIAGRAM 1**

M1: Driver requests to create an account on Web Interface

M1.1: Web Interface sends the request to Regional Toll Center

M1.2: Regional Toll Center sends the request to Customer Manager

M1.3: Customer Manager sends a request to the Regional Toll Center for Driver Info

M1.4: Regional Toll Center sends the request to Web Interface

M1.5: Web Interface displays the request to the Driver

M2: Driver inputs the driver info on Web Interface

M2.1: Web Interface sends the customer input to Regional Toll Center

M2.2: Regional Toll Center sends the driver info to Customer Manager

M2.3: Customer Manager attempts to create Transponder account

M2.4: Customer Manager receives confirmation that Transponder account is created

M2.5: Customer Manager sends message to Regional Toll Center that Transponder account has been created

M2.6: Regional Toll Center sends message to Web Interface

M2.7: Web Interface displays message to the Driver

**Loop [Incomplete Driver Info]**

M2.3A: Customer Manager cannot create account because of incomplete driver info and sends a request for all driver info to Regional Toll Center

M2.3A.1: Regional Toll Center sends the request for complete driver info to Web Interface

M2.3A.2: Web Interface outputs the request for complete driver info to the Driver

M2.3A.3: Driver inputs the driver info on Web Interface

M2.3A.4: Web Interface sends the customer input to Regional Toll Center

M2.3A.5: Regional Toll Center sends the customer input to Customer Manager

**SEQUENCE DIAGRAM 2**

N1: Driver requests to add funds on Web Interface

N1.1: Web Interface sends the request to Regional Toll Center

N1.2: Regional Toll Center sends the request to Customer Manager

N1.3: Customer Manager sends a request to Regional Toll Center for account username and password

N1.4: Regional Toll Center sends the request to Web Interface

N1.5: Web Interface displays request to Driver

N2: Driver inputs Username and Password on Web Interface

N2.1: Web interface sends Username and Password to Regional Toll Center

N2.2: Regional Toll Center sends Username and Password to Customer Manager

N2.3: Customer Manager attempts to get Transponder account using Username and Password

N2.4: Transponder account found by Customer manager using customer input

N2.5: Customer Manager sends request for Amount in multiples of $10.00 to be added to account funds to Regional Toll Center

N2.6: Regional Toll Center sends the request to Web Interface.

N2.7: Web Interface displays request to Driver

N3: Driver inputs amount on Web Interface

N3.1: Web Interface sends amount to Regional Toll Center

N3.2: Regional Toll Center sends amount to Customer Manager

N3.3: Customer Manager sends request for billing information to Regional Toll Center

N3.4: Regional Toll Center sends request for billing information to Web Interface

N3.5: Web interface displays request to Driver

N4: Driver inputs billing info on Web Interface

N4.1: Web Interface sends billing information to Regional Toll Center

N4.2: Regional Toll Center sends billing information to Customer Manager

N4.3: Customer Manager sends amount to be added and billing information to Regional Toll Center

N4.4: Regional Toll Center sends amount to be deducted from Credit Card account and billing info to Credit Card Service for validation

N4.5: Credit Card Service validates billing information, deducts amount from Credit Card account and sends message that amount billed to Regional Toll Center

N4.6: Regional Toll Center sends message to Customer Manager

N4.7: Customer Manager adds amount to Transponder Account

N4.8: Customer Manager sends message that funds have been added to Regional Toll Center

N4.9: Regional Toll Center sends the message to Web Interface

N4.10: Web Interface displays the message to Driver

**Loop [Invalid Username or Password]**

N2.4A: Transponder Account could not be found by Customer Manager using Username and Password

N2.4A.1: Customer Manager needs valid username and password and sends a request to Regional Toll Center

N2.4A.2: Regional Toll Center sends request to Web Interface

N2.4A.3: Web Interface outputs request Driver

N2.4A.4: Driver inputs Username and Password on Web Interface

N2.4A.5: Web interface sends Username and Password to Regional Toll Center

N2.4A.6: Regional Toll Center sends Username and Password to Customer Manager

N2.4A.7: Customer Manager attempts to get Transponder account using Username and Password

**Loop [Invalid Credit Card]**

N4.5A: Credit Card Service could not validate billing info (invalid) and sends message to Regional Toll Center

N4.5A.1: Regional Toll Center sends message to Customer Manager

N4.5A.2: Customer Manager sends a request for billing information to Regional Toll Center

N4.5A.3: Regional Toll Center sends request to Web Interface

N4.5A.4: Web Interface displays request to Driver

N4.5A.5: Driver inputs billing info on Web Interface

N4.5A.6: Web Interface sends billing information to Regional Toll Center

N4.5A.7: Regional Toll Center sends billing information to Customer Manager

N4.5A.8: Customer Manager sends amount to be added and billing information to Regional Toll Center

N4.5A.9: Regional Toll Center sends amount to be deducted from Credit Card account and billing info to Credit Card Service for validation

**SEQUENCE DIAGRAM 3**

O1: Vehicle Approaching sensor detects a vehicle and sends input to Vehicle Approaching Sensor Interface

O1.1: Vehicle Approaching Sensor Interface sends input that vehicle is detected to Highspeed Entry Control

O1.2: Highspeed Entry Control sends command to detect Transponder to Transponder Sensor Interface

O1.3: Transponder Sensor Interface commands Transponder Sensor to detect Transponder

O1.4: Transponder Sensor detects Transponder and sends input to Transponder Sensor Interface

O1.5: Transponder Sensor Interface sends input that Transponder is detected to Highspeed Entry Control

O1.6: Highspeed Entry Control sends request to Regional Toll Center to create record

O1.7: Regional Toll Center sends the request to Records Manager

O1.8: Records Manager attempts to create Record for current Driver

O1.8: Records Manager successfully created Record

O1.9: Records Manager sends the alert to Regional Toll Center that Record has been created

O1.10: Regional Toll Center sends the alert to Highspeed Entry Control

O1.11: Highspeed Entry Control sends command to Traffic Light Interface to switch light to green

O1.12: Traffic Light Interface commands Traffic Light to switch light to green

O1.13: Traffic Light switches light to green and Traffic Light Interface is alerted

O1.14: Traffic Light Interface sends alert to Highspeed Entry Control that Traffic Light has been switched to green

O1.15: Vehicle Leaving Sensor detects vehicle left and sends input to Vehicle Leaving Sensor Interface

O2: Vehicle Leaving Sensor Interface sends input that vehicle has left to Highspeed Entry Control

O2.1: Highspeed Entry Control sends command to Traffic Light Interface to switch light to red

O2.2: Traffic Light Interface commands Traffic Light to switch light to red

O2.3: Traffic Light switches light to red and Traffic Light Interface is alerted

O2.4: Traffic Light Interface sends alert to Highspeed Entry Control that Traffic Light has been switched to red

**Alternative [No Valid Transponder]**

O1.4A: Transponder Sensor does not detect Transponder and sends input to Transponder Sensor Interface

O1.4A.1: Transponder Sensor Interface sends input that Transponder is not detected to Highspeed Entry Control

O1.4A.2: Highspeed Entry Control sends command to Alarm Interface to sound alarm concurrently with Camera interface to capture license

O1.4A.3: Alarm Interface commands alarm to sound alarm

O1.4A.2c: Highspeed Entry Control sends command to Camera interface to capture license plate

O1.4A.3c: Camera Interface commands camera to capture license plate

O1.4A.4: Camera has taken image and Camera Interface is alerted

O1.4A.5: Camera Interface sends license plate image to Highspeed Entry Control

O1.4A.6: Highspeed Entry Control sends license plate image to Regional Toll Center

O1.4A.7: Regional Toll Center issues Ticket with license plate image and sends it to Police Department

O1.4A.8: Police Department sends confirmation to Regional Toll Center

O1.4A.9: Regional Toll Center alerts Highspeed Entry Control that ticket has been issued

**SEQUENCE DIAGRAM 4**

P1: Button is pressed and input is sent to Button Interface

P1.1: Button Interface sends input that Button is pressed to Full Service Entry Control

P1.2: Full Service Entry Control sends a request to Regional Toll Center to create record for the current driver

P1.3: Regional Toll Center sends the request to Records Manager

P1.4: Records Manager attempts to create Record for current Driver

P1.5: Records Manager successfully created Record

P1.6: Records Manager sends the alert to Regional Toll Center that Record has been created

P1.7: Regional Toll Center sends the alert to Full Service Entry Control

P1.8: Full Service Entry Control sends command to Printer interface to print ticket

P1.9: Printer Interface commands Printer to print ticket

P1.10: Printer finishes printing and Printer Interface is alerted

P1.11: Printer Interface sends alert to Full Service Entry Control that Printer is done printing

P1.12: Full Service Entry Control sends command to Barrier Interface to raise Barrier concurrently with Traffic Light Interface to switch light to green

P1.13: Barrier Interface commands Barrier to be raised

P1.12c: Full Service Entry Control sends command to Traffic Light Interface to switch light to green

P1.13c: Traffic Light Interface commands Traffic Light to switch light to green

P1.14: Traffic Light switches light to green and Traffic Light Interface is alerted

P1.15: Traffic Light Interface sends alert to Full Service Entry Control that Traffic Light has been switched to green

P2: Vehicle Leaving Sensor detects that vehicle has left and sends input to Vehicle Leaving Sensor Interface

P2.1: Vehicle Leaving Sensor Interface sends input that vehicle left to Regional Toll Center

P2.2: Full Service Entry Control sends command to Barrier Interface to lower Barrier concurrently with Traffic Light Interface to switch light to red

P2.3 Barrier Interface commands Barrier to be lowered

P2.2c: Full Service Entry Control sends command to Traffic Light Interface to switch light to red

P2.3c: Traffic Light Interface commands Traffic Light to switch light to red

P2.4: Traffic Light switches light to red and Traffic Light Interface is alerted

P2.5: Traffic Light Interface sends alert to Full Service Entry Control that Traffic Light has been switched to red

**Alternative [Insufficient Tickets]**

P10A: Printer finishes printing but is low on tickets and Printer Interface is alerted

P10A.1: Printer Interface sends alert that printer is low on tickets to Full Service Entry Control

P10A.2: Full Entry Control sends message alert to Regional Toll Center that printer is low on tickets

P10A.3: Regional Toll Center sends alert Full Entry Control that message has been sent

**SEQUENCE DIAGRAM 5**

Q1: Vehicle Approaching sensor detects a vehicle and sends input to Vehicle Approaching Sensor Interface

Q1.1: Vehicle Approaching Sensor Interface sends input that vehicle is detected to Highspeed Exit Control

Q1.2: Highspeed Exit Control sends command to detect Transponder to Transponder Sensor Interface

Q1.3: Transponder Sensor Interface commands Transponder Sensor to detect Transponder

Q1.4: Transponder Sensor detects Transponder and sends input to Transponder Sensor Interface

Q1.5: Transponder Sensor Interface sends input that Transponder is detected to Highspeed Exit Control

Q1.6: Highspeed Exit Control sends request to update record of driver to Regional Toll Center

Q1.7: Regional Toll Center sends the request Records Manager

Q1.8: Records Manager attempts to update Record for current Driver

Q1.9: Records Manager successfully updated Record

Q1.10: Records Manager sends the alert to Regional Toll Center that Record has been updated

Q1.11: Regional Toll Center sends the alert to Highspeed Exit Control

Q1.12: Highspeed Exit Control sends request to Regional Toll Center to calculate toll

Q1.13: Regional Toll Center sends the request to Records Manager

Q1.14: Records Manger requests calculated toll from Record

Q1.15: Record returns calculated toll to Records Manager

Q1.16: Records Manager sends calculated toll to Regional Toll Center

Q1.17: Regional Toll Center sends the amount to Highspeed Exit Control

Q1.18: Highspeed Exit Control sends request to Regional Toll Center to deduct toll amount from Transponder Account

Q1.19: Regional Toll Center sends the request to Customer Manager

Q1.20: Customer Manager attempts to deduct amount from Transponder Account

Q1.21: Toll deducted from Transponder Account

Q1.22: Customer Manager sends alert that toll has been deducted to Regional Toll Center

Q1.23: Regional Toll Center sends the alert to Highspeed Exit Control

Q1.24: Highspeed Exit Control sends request to Regional Toll Center to update record

Q1.25: Regional Toll Center sends the request to Records Manager

Q1.26: Records Manager attempts to update existing record in Record

Q1.27: Records Manager successfully updated record

Q1.28: Records Manager sends alert that record has been updated to Regional Toll Center

Q1.29: Regional Toll Center sends the alert to Highspeed Exit Control

Q1.30: Highspeed Exit Control sends command to Traffic Light Interface to switch light to green

Q1.31: Traffic Light Interface commands Traffic Light to switch light to green

Q1.32: Traffic Light switches light to green and Traffic Light Interface is alerted

Q1.33: Traffic Light Interface sends alert to Highspeed Exit Control that Traffic Light has been switched to green

Q2: Vehicle Leaving Sensor detects that vehicle has left and sends input to Vehicle Leaving Sensor Interface

Q2.1: Vehicle Leaving Sensor Interface sends input that vehicle left to Tollbooth Center Coordinator

Q2.2: Tollbooth Center Coordinator sends command to Traffic Light Interface to switch light to red

Q2.3: Traffic Light Interface commands Traffic Light to switch light to red

Q2.4: Traffic Light switches light to red and Traffic Light Interface is alerted

Q2.5: Traffic Light Interface sends alert to Highspeed Exit Control that Traffic Light has been switched to red

**Alternative [Insufficient Funds]**

Q1.21A: Transponder Account has insufficient funds

Q1.21A.1: Customer Manager deducts toll amount + fine from Transponder Account (now negative amount in account)

Q1.21A.2: Account successfully billed

**Alternative [Valid Transponder Not Detected]**

Q2A: Transponder Sensor does not detect Transponder and sends input to Transponder Sensor Interface

Q2.1A: Transponder Sensor Interface sends input that Transponder is not detected to Highspeed Exit Control

Q2.1A.1: Highspeed Exit Control sends command to Alarm Interface to sound alarm concurrently with Camera interface to capture license plate

Q2.1A.2 Alarm Interface commands alarm to sound

Q2.1A.1c: Highspeed Exit Control sends command to Camera interface to capture license plate

Q2.1A.2c: Camera Interface commands camera to capture license plate

Q2.1A.3: Camera captures license plate and Camera Interface is alerted

Q2.1A.4: Camera Interface sends license plate image to Highspeed Exit Control

Q2.1A.5: Highspeed Exit Control sends request to Issue Ticket with license plate image to Regional Toll Center

Q2.1A.6: Regional Toll Center issues ticket and sends it to Police Department

Q2.1A.7: Police Department sends confirmation to Regional Toll Center that ticket has been issued

Q2.1A.8: Regional Toll Center sends the confirmation to Highspeed Exit Control

**SEQUENCE DIAGRAM 6**

R1: Vehicle Approaching sensor detects a vehicle and sends input to Vehicle Approaching Sensor Interface

R1.1: Vehicle Approaching Sensor Interface sends input that vehicle is detected to Full Service Exit Control

R1.2: Driver inserts ticket into Card Reader

R1.3: Card Reader Collects ticket data and Card Reader Interface is alerted

R1.4: Card Reader Interface sends ticket data to Full Service Exit Control

R1.5: Full Service Exit Control sends request to update record of driver to Regional Toll Center

R1.6: Regional Toll Center sends the request Records Manager

R1.7: Records Manager attempts to update Record for current Driver

R1.8: Records Manager successfully updated Record

R1.9: Records Manager sends the alert to Regional Toll Center that Record has been updated

R1.10: Regional Toll Center sends the alert to Full Service Exit Control

R1.11: Full Service Exit Control sends request to Regional Toll Center to calculate toll

R1.12: Regional Toll Center sends the request to Records Manager

R1.13: Records Manger requests calculated toll from Record

R1.14: Record returns calculated toll to Records Manager

R1.15: Records Manager sends calculated toll to Regional Toll Center

R1.16: Regional Toll Center sends the amount to Full Service Exit Control

R1.17: Full Service Exit Control sends command to Display Interface to display bill

R1.18: Display Interface commands Display to display bill

R1.19: Display displays bill and Display Interface is alerted

R1.20: Display Interface sends alert to Full Sevice Exit Control that bill is displayed

Reference: [Payment is made]

R1.21: Full Service Exit Control sends command to Barrier Interface to raise Barrier concurrently with Traffic Light Interface to switch light to green

R1.22: Barrier Interface commands Barrier to be raised

R1.21c: Full Service Exit Control sends command to Traffic Light Interface to switch light to green

R1.22c: Traffic Light Interface commands Traffic Light to switch light to green

R1.23: Traffic Light switches light to green and Traffic Light Interface is alerted

R1.24: Traffic Light Interface sends alert to Full Service Exit Control that Traffic Light has been switched to green

R2: Vehicle Leaving Sensor detects that vehicle has left and sends input to Vehicle Leaving Sensor Interface

R2.1: Vehicle Leaving Sensor Interface sends input that vehicle left to Full Service Exit Control

R2.2: Full Service Exit Control sends command to Barrier Interface to lower Barrier concurrently with Traffic Light Interface to switch light to red

R2.3: Barrier Interface commands Barrier to be lowered

R2.2c: Full Service Exit Control sends command to Traffic Light Interface to switch light to red

R2.3c: Traffic Light Interface commands Traffic Light to switch light to red

R2.4: Traffic Light switches light to red and Traffic Light Interface is alerted

R2.5: Traffic Light Interface sends alert to Full Service Exit Control that Traffic Light has been switched to red

**SEQUENCE DIAGRAM 7**

Operator prompts Driver to select a type of payment

Driver selects payment by Credit Card

S1: Operator inputs selected payment by card on the KeyboardDisplay

S1.1: KeyboardDisplay Interface is alerted of Driver selection via the KeyboardDisplay

S1.2: KeyboardDisplay Interface sends alert of customer selection to Full Service Exit Control

S1.3: Full Service Exit Control sends command to Card Reader to wait for card

S1.4: Card Reader is waiting for card input

S2: Driver scans card on Card Reader

S2.1: Card Reader collects credit card info and Card Reader Interface is alerted

S2.2: Card Reader Interface sends credit card info to Full Service Exit Control

S2.3: Full Service Exit Control sends request to charge credit card to Regional Toll Center

S2.4 Regional Toll Center sends the request to Credit Card Service

S2.5: Credit Card Service approves charges and alerts Regional Toll Center

S2.6: Regional Toll Center sends the alert to Full Service Exit Control

S2.7: Full Service Exit Control sends request to update record of driver to Regional Toll Center

S2.8: Regional Toll Center sends the request Records Manager

S2.9: Records Manager attempts to update Record for current Driver

S2.10: Records Manager successfully updated Record

S2.11: Records Manager sends the alert to Regional Toll Center that Record has been updated

S2.12: Regional Toll Center sends the alert to Full Service Exit Control

S2.13: Full Service Exit Control sends command to Card Reader Interface to print receipt

S2.14: Card Reader Interface commands Card Reader to print receipt

S2.15: Card Reader finishes printing and Card Reader Interface is alerted

S2.16: Card Reader Interface sends alert to Full Service Exit Control that Card Reader has finished printing

**Alternative [Card not approved]**

S2.5A Credit Card Service does not approve charges and alerts Regional Toll Center

S2.5A.1 Regional Toll Center sends the alert to Full Service Exit Control

S2.5A.2: Full Service Exit Control send request for another payment to KeyboardDisplay Interface

S2.5A.3: KeyboardDisplay Interface commands KeyboardDisplay to display request to operator

S2.5A.4: KeyboardDisplay displays request to operator

**SEQUENCE DIAGRAM 8**

Operator prompts Driver to select a type of payment

Driver selects payment by Transponder

S1: Operator inputs selected payment by Transponder on the KeyboardDisplay

S1.1: KeyboardDisplay Interface is alerted of Driver selection via the KeyboardDisplay

S1.2: KeyboardDisplay Interface sends the alert of customer selection to Full Service Exit Control

S1.3: Full Service Exit Control sends command to Transponder Sensor Interface to scan Transponder

S1.4: Transponder Sensor Interface commands Transponder Sensor to scan Transponder

S1.5: Transponder Sensor collects Transponder Data and Transponder Sensor Interface is alerted

S1.6: Transponder Sensor Interface sends Transponder Data to Full Service Exit Control

S1.7: Full Service Exit Control sends request to bill Transponder Account to Regional Toll Center

S1.8: Regional Toll Center sends the request to Customer Manager

S1.9: Customer Manager attempts to deduct toll amount from Transponder Account

S1.10: Toll deducted from Transponder Account

S1.11: Customer Manager sends alert that Transponder Account has been billed to Regional Toll Center

S1.12: Regional Toll Center sends the alert to Full Service Exit Control

S1.13: Full Service Exit Control sends request to Regional Toll Center to update record

S1.14: Regional Toll Center sends the request to Records Manager

S1.15: Records Manager attempts to update existing record in Record

S1.16: Records Manager successfully updated record

S1.17: Records Manager sends alert that record has been updated to Regional Toll Center

S1.18: Regional Toll Center sends the alert to Full Service Exit Control

S1.19: Full Service Exit Control sends command to Card Reader Interface to print receipt

S1.20: Card Reader Interface commands Card Reader to print receipt

S1.21: Card Reader finishes printing and Card Reader Interface is alerted

S1.22: Card Reader Interface sends alert to Full Service Exit Control that Card Reader has finished printing

**Alternative [No valid transponder scanned]**

S1.5A: Transponder Sensor does not detect Transponder and sends input to Transponder Sensor Interface

S1.5A.1: Transponder Sensor Interface sends input that Transponder is not detected to Highspeed Exit Control

S1.5A.2: Full Service Exit Control send request for another payment to KeyboardDisplay Interface

S1.5A.3: KeyboardDisplay Interface commands KeyboardDisplay to display request to operator

S1.5A.4: KeyboardDisplay displays request to operator

**Alternative [Insufficient funds]**

S1.10A: Transponder Account has insufficient funds

S1.10A.1: Customer Manager deducts toll amount + fine from Transponder Account (now negative amount in account)

S1.10A.2: Account successfully billed

**SEQUENCE DIAGRAM 9**

Operator prompts Driver to select a type of payment

Driver selects payment by Cash

Driver pays amount

Operator gives change back to Driver

M1: Operator inputs selected payment by cash on the KeyboardDisplay

M1.1: KeyboardDisplay Interface is alerted of Driver selection via the KeyboardDisplay

M1.2: KeyboardDisplay Interface sends alert of customer selection to Full Service Exit Control

M1.3: Full Service Exit Control sends request to Regional Toll Center to update record

M1.4: Regional Toll Center sends the request to Records Manager

M1.5: Records Manager attempts to update existing record in Record

M1.6: Records Manager successfully updated record

M1.7: Records Manager sends alert that record has been updated to Regional Toll Center

M1.8: Regional Toll Center sends the alert to Full Service Exit Control

M1.9: Full Service Exit Control sends command to Card Reader Interface to print receipt

M1.10: Card Reader Interface commands Card Reader to print receipt

M1.11: Receipt Printer prints issues receipt for Operator

Operator issues receipt to Driver

**Alternative [Insufficient amount of money]**

Driver doees not have enough money

Operator requests customer'[S driver's license

Driver gives operator license

M1A: Operator requests to create Customer entity and Bill Customer on KeyboardDisplay

M1A.1: KeyboardDisplay alerts KeyboardDisplay Interface of request

M1A.2: KeyboardDisplay Interface sends request to Full Service Exit Control

M1A.3: Full Service Exit Control sends request to create Customer entity to Regional Toll Center

M1A.4: Regional Toll Center sends the request to Customer Manager

M1A.5: Customer Manager attempts to create Customer entity

M1A.6: Customer Manager successfully created Customer

M1A.7: Customer Manager alerts Regional Toll Center that Customer has been created

M1A.8: Regional Toll Center sends the alert to Full Service Exit Control

M1A.9: Full Service Exit Control sends request to Regional Toll Center to send bill to Customer