

CTIS411 SENIOR PROJECT-I SOFTWARE REQUIREMENTS SPECIFICATION (SRS)

BilPay

Okyay Say

Team 4

Canberk Demirci

Altuğ Ankaralı

Fatih Yavuz

Yiğit Usta

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1 Product Overview

1.1 Product Perspective

BilPay is a blockchain-based payment gateway for ecommerce websites and individuals who needs instant, secure and decentralized payment solution. It aims to provide better alternative to traditional payment systems currently used by ecommerce websites. Currently cryptocurrencies are not suitable for small and high frequency transactions because of high fees and slow confirmations on transactions. Bilpay is dedicated to provide high transaction speed which ecommerce websites needs, and also safety and stability for both customers and business owners.

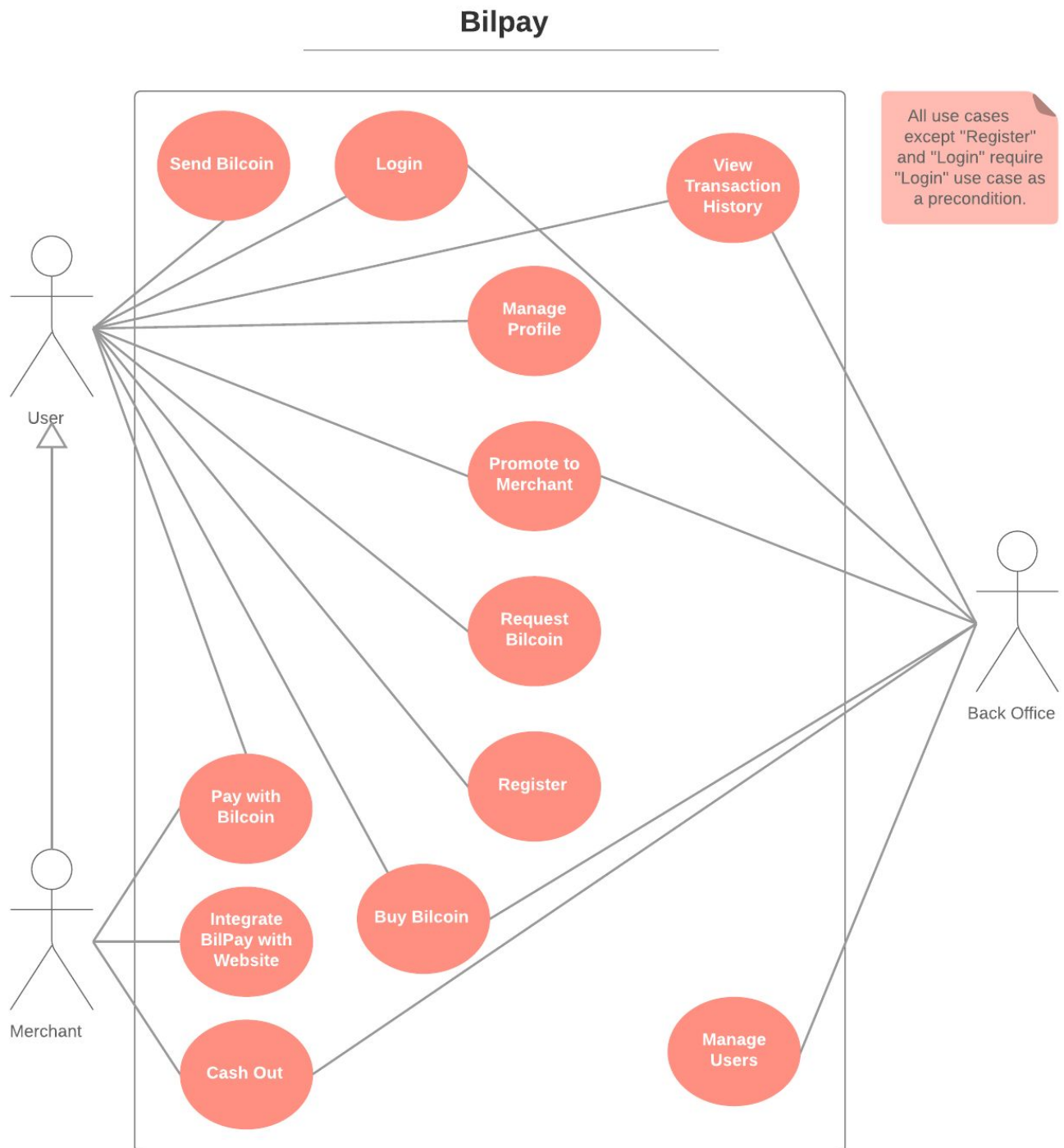
Bilpay is a self-contained system with cross platform clients and blockchain backend and our SDK for ecommerce websites will be designed as component of larger system.

1.2 Product Features

- Cross-platform software for provide great user experience while making payment.
- Bilpay is blockchain backed for fast and safe transactions.
- Easy to use SDK for ecommerce owners and individuals who make online sales.
- BilPay's transactions will be stored in Private Blockchain structure, with that unauthorized users or merchants will not be able to see transactions which provides great privacy for users as well as merchants.
- Well-developed QR Code Scanning technology to prevent data inconsistency.
- Well-designed management system that enables Administrator to manage users, monitor activities, transaction histories and cash out requests.
- Comprehensive software structure, aims to prevent generic errors and provide useful user experience in all events.
- Highly consistent exchange system to provide exact rates while converting Bilcoin to supported currencies, converting supported currencies to Bilcoin or converting Bilcoin to cash
- Well-designed user interface that enables users to manage Bilcoins (sending Bilcoin to another user, getting Bilcoin from another user, buying Bilcoin, making payment with Bilcoin, checking transaction history) and user informations.
- Well-designed merchant interface that enables merchants to manage Bilcoins (sending Bilcoin to another user, getting Bilcoin from another user, buying Bilcoin, making payment with Bilcoin, checking transaction history, cash out), and merchant informations.

2 Functional Requirements

2.1 Use Case Diagram



2.2 Use Cases Narratives

Use Case Name:	Send Bilcoin
Use Case ID:	1
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	None
Description:	User sends Bilcoin to another user.
Precondition:	User completes Login use case.
Trigger:	User navigates to send Bilcoin section of BilPay mobile app.
Main Scenario:	<p>1- User enters Bilcoin amount to be sent. Enters BilPay ID of the receiving user and a description to be shown to the receiving user.</p> <p>2- System verifies that the user has sufficient balance.</p> <p>3- System validates the given BilPay ID comparing to own records.</p> <p>4- System shows the user transaction details and asks for confirmation.</p> <p>5- User approves the transaction.</p> <p>6- System atomically performs the transaction process: The amount is subtracted from the sending user's balance and added to the receiving user's balance.</p> <p>7- Notification is sent to the sending and receiving users through e-mail.</p>
Alternate Scenarios:	<p>5a- User does not approve the transaction.</p> <p>1. Return to step 1 in main scenario.</p>
Exceptions:	<p>*a- At any time, the internet connection is lost:</p> <p>1- Prompt user to connect to internet.</p> <p>2- Logout user and return user to beginning of the Login use case.</p> <p>2a- Amount exceeds user's balance:</p> <p>1. User is prompted buy more Bilcoins to send money in order to proceed.</p> <p>2. Return to step 1 in main scenario.</p> <p>3a- The given user records do not exist in the system:</p> <p>1. A message indicating the entered records do not match to a user is sent and displayed on BilPay Mobile App.</p> <p>2. Return to step 1 in main scenario.</p>
Conclusion:	The payment amount is subtracted from user's balance and added to receiving user's balance.
Open Issues:	None

Use Case Name:	Login
Use Case ID:	2
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User, Back Office
Participating Actor(s):	None
Description:	User completes Login use case.
Precondition:	None
Trigger:	User opens BilPay mobile app.
Main Scenario:	1- User enters credentials: E-mail and password. 2- User chooses login option. 3- The credentials are verified by the system. 4- User is directed to the main screen of mobile app.
Alternate Scenarios:	None
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Return to step 1 in main scenario. 4a- The given credentials do not match to any of the records. 1. User is prompted to enter credentials again. 2. Return to step 1 in main scenario.
Conclusion:	User can view and enter other sections of mobile app.
Open Issues:	None

Use Case Name:	View Transaction History
Use Case ID:	3
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User, Back Office
Participating Actor(s):	None
Description:	Viewing previous transactions of a user.
Precondition:	User or Back Office completes Login use case.
Trigger:	One of the primary actors navigates to "View Transaction History" section of the mobile app.
Main Scenario:	1- User selects a period. (Period can be one of the types: last # month(s), last # year(s), last # week(s)) 2- User views a list of the transactions of a period selected. 3- User chooses a transaction. 4- User sees the details of transaction such as description, time and sender's details.
Alternate Scenarios:	1a- Back Office is prompted to enter BilPay ID: 1- System retrieves the transactions for a given user. 1a- User does not exist: 1- Prompt Back Office to enter another BilPay 2- Continue from step 1 in main scenario.
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	Transaction history and transaction details of a transaction are successfully read.
Open Issues:	None

Use Case Name:	Manage Profile
Use Case ID:	4
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	None
Description:	User changes existing profile details to new ones.
Precondition:	User completes Login use case.
Trigger:	User navigates to Manage Profile section of BilPay mobile app.
Main Scenario:	1- User views his/her profile details(e-mail, number and, full name) 2- User chooses one of the details. 3- User enters input. 4- The entered input is changed with the related information user records.
Alternate Scenarios:	2a- User chooses his e-mail: 1. User enters a new e-mail address. 2. E-mail verification code is sent to the given e-mail. 3. An input field appears and the user is prompted to enter the sent verification code there. 4. User enters the verification code. 5. Code is verified. 6. User's e-mail address is updated in user records.
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case. 2a- E-mail address is used by another user . 1- User is prompted to enter another email address.
Conclusion:	Chosen profile detail is changed.
Open Issues:	None

Use Case Name:	Promote to Merchant
Use Case ID:	5
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	Back Office
Description:	User gains merchant perks by doing a KYC process.
Precondition:	User completes Login use case.
Trigger:	User navigates to Promote to Merchant section of BilPay mobile app.
Main Scenario:	1- System requests user to enter company legal name, country, address, city, tax number. 2- User enters the requested company information. 3- System requests user to enter company director's full name, country, address, city and E.164 phone number. 4- User enters the requested company director's information. 5- System requests to upload one of certificate of incorporation, certificate of shareholders, certificate of registered address, passport copy of the signing director, utility bill of the signing director. 6- User uploads the requested papers. 7- Back office approves user's promotion to merchant request. 8- System notifies the user he/she is a BilPay merchant now and provides access to merchant perks.
Alternate Scenarios:	7a- Back office does not approve promotion. 1- User receives an e-mail about denial
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	User gains merchant perks.
Open Issues:	None

Use Case Name:	Request Bilcoin
Use Case ID:	6
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	None
Description:	User creates a QR code with his BilPay ID and shares it to request Bitcoins.
Precondition:	User completes Login use case.
Trigger:	User navigates to Request Bilcoin section of BilPay mobile app.
Main Scenario:	1- User views the QR code with his BilPay ID. 2- User shares the QR code using one of the options: Facebook, E-mail, Twitter, Whatsapp, Telegram.
Alternate Scenarios:	None.
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	User obtains a QR Code and share, allowing BilPay users scanning this QR Code to send him/her Bitcoins.
Open Issues:	None

Use Case Name:	Register
Use Case ID:	7
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	None
Description:	Registration of a user to BilPay.
Precondition:	None
Trigger:	User opens BilPay mobile app.
Main Scenario:	<p>1- User enters credentials: E-mail and password.</p> <p>2- User chooses register option.</p> <p>3- User is taken to another section with the copies of E-mail and password he/she entered.</p> <p>4- User is prompted to enter his/her full name and the password second time.</p> <p>5- User chooses to confirm his/her registration info.</p> <p>6- The system checks for user's e-mail address against other users' records and validates it is unique.</p> <p>7- The system sends an e-mail to the e-mail address with a verification code. At the same time, an input field appears and the user is prompted to enter the verification code there.</p> <p>8- User enters the verification code.</p> <p>9- Code is verified.</p> <p>10- A new user record is created with the e-mail address, full name and password.</p> <p>11- User is directed to his/her profile page with the name, phone number he entered and the e-mail he entered.</p> <p>12- Continue from manage profile use case.</p>
Alternate Scenarios:	<p>6a- Email is already in use</p> <p>1- User is prompted to enter another email</p> <p>8a - Invalid verification is entered</p> <p>2- User is prompted to either enter another verification code or resend verification email</p>
Exceptions:	<p>*a- At any time, the internet connection is lost:</p> <p>1- Stop all the actions and prompt user to connect to internet to continue.</p>
Conclusion:	A new user record is created and the user is able to login.
Open Issues:	None

Use Case Name:	Buy Bilcoin
Use Case ID:	8
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	Back Office
Description:	User buys Bilcoins using US dollars.
Precondition:	User completes Login use case.
Trigger:	User navigates to buy Bilcoin section of BilPay mobile app.
Main Scenario:	1- User enters Bilcoin amount. 2- Total amount is calculated in US dollars regarding to Bilcoin's current sell rate. 3- User is prompted to do a wire transfer to Back Office's bank account with his/her BilPay ID in description with a BBT. 4- User completes the wire transfer. 5- Back Office validates the wire transfer and transfers the Bilcoins to user's account.
Alternate Scenarios:	None
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	The Bilcoin amount is added to user's balance.
Open Issues:	None

Use Case Name:	Pay with Bilcoin
Use Case ID:	9
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	User
Participating Actor(s):	None
Description:	User navigates to a merchant's site, adds products to basket and chooses payment method as BilPay.
Precondition:	User completes Login use case. Merchant's website has BilPay SDK integrated.
Trigger:	User chooses BilPay payment method on merchant's site.
Main Scenario:	<p>1- Merchant's site requests the system to generate a QR code that contains Merchant's BilPay ID and the payment amount that user is going to pay with client secret and client key.</p> <p>2 - The system generates and responds with the QR code.</p> <p>3- Merchant's site receives QR code and displays it to the user</p> <p>4- User opens BilPay mobile app's QR code scanner.</p> <p>5- User scans the QR code.</p> <p>6- The QR code is verified by the system.</p> <p>7- System verifies the user has sufficient balance.</p> <p>8- Mobile app shows transaction details and prompts user to approve the transaction.</p> <p>9- User approves the transaction.</p> <p>10- Merchant's site is notified with transaction approval.</p> <p>11- Notification is sent to the sending and receiving users through channels of their preferences.</p>
Alternate Scenarios:	<p>8a- User does not approve the transaction:</p> <ol style="list-style-type: none"> 1. Continue from step 4 in main scenario.
Exceptions:	<p>*a- At any time, the internet connection is lost:</p> <ol style="list-style-type: none"> 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case. <p>1a- Merchant is not recognized by the system:</p> <ol style="list-style-type: none"> 1. The system responds with an error status and the main scenario is terminated. <p>7a- User does not have sufficient balance:</p> <ol style="list-style-type: none"> 1. App displays an error indicating total exceeds user's balance. 2. Merchant's site is informed with the error and payment flow is terminated. <p>6a- Invalid QR Code is read:</p> <ol style="list-style-type: none"> 1. Mobile app displays an error message indicating a wrong QR code is scanned. 2. Return to step 3 in main scenario.
Conclusion:	The payment amount is subtracted from user's balance and added to merchant's balance.
Open Issues:	None

Use Case Name:	Integrate BilPay with Website
Use Case ID:	10
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	Merchant
Participating Actor(s):	None
Description:	Merchant integrates BilPay with his/her website to receive payments.
Precondition:	None.
Trigger:	Merchant navigates to API credentials section of BilPay's mobile app.
Main Scenario:	1- Merchant obtains integration credentials from BilPay mobile app. 2- Merchant downloads BilPay SDK. 3- Merchant adds the SDK to his website code. 4- Merchant configures the SDK with his/her credentials.
Alternate Scenarios:	None.
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	Merchant is able to receive payments through his website.
Open Issues:	None

Use Case Name:	Cash Out
Use Case ID:	11
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	Merchant
Participating Actor(s):	Back Office
Description:	Merchant exchanges Bilcoins for cash.
Precondition:	Merchant completes Login use case.
Trigger:	Merchant navigates to Cash Out section of BilPay app.
Main Scenario:	1- Merchant enters an amount of Bilcoins to be exchanged for cash. 2- The entered amount of Bilcoins are calculated in terms of US dollars. 3- Merchant enters a bank account number. 4- Merchant approves the request. 4- Cash out requests are saved. 5- Back Office views and approves cash out request. The money is transferred to given bank account. 6- The entered amount of Bilcoins is subtracted from Merchant's balance.
Alternate Scenarios:	None
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	Merchant exchanges his/her Bilcoins into cash.
Open Issues:	None

Use Case Name:	Manage Users
Use Case ID:	12
Use Case Type:	System Analysis
Version Number:	1.0
Included Use Case(s)	None
Extending Use Case(s)	None
Primary Actor(s):	Back Office
Participating Actor(s):	None
Description:	Back Office views users' profiles and can ban users.
Precondition:	Back Office must be logged in.
Trigger:	Back Office navigates to Manage Users section of BilPay's mobile app.
Main Scenario:	1- Back Office is prompted to enter BilPay ID. 2- Back Office retrieves the profile of the selected user with a ban button. 3- Back Office bans the user.
Alternate Scenarios:	2a- Back Office retrieves the profile of a banned user with an unban button: 1- Back Office unbans the user.
Exceptions:	*a- At any time, the internet connection is lost: 1- Prompt user to connect to internet. 2- Logout user and return user to beginning of the Login use case.
Conclusion:	Back Office retrieves user list and bans/unbans users.
Open Issues:	None

3 Other Requirements

3.1 Non-Functional Requirements of the Product

- Users must change the initially assigned login authentication information (password) immediately after the first successful login. The initial password may never be reused.
- The BilPay shall ensure that data of all users will be stored securely.
- Passwords shall never be viewable at the point of entry or at any other time.
- The system shall be accessible from mobile and web user interfaces.
- The BilPay shall achieve 99.9% up time.
- Unless the system is non-operational, the system shall present a user with notification informing them that the system is unavailable.
- The BilPay shall be fully scalable for any technical and non-technical operations.
- The BilPay shall ensure that users' national security numbers whether correct or not.
- The initial system shall be able to handle the entry of payments by customers at a minimum rate of 15 second.
- Complete report summaries of the current business day's payments shall be available one minute after transaction completion.
- Routine maintenance that is executed while users are active shall not cause a perceptible increase in response time for any function of more than 5% over the response time when no maintenance process is executing.
- The precision of exchange rate calculations with derived data shall be at the same degree of precision as the originating source data.
- The authorization transaction match process shall require a 100-percent match to post a transaction.
- The account update process shall roll back all related updates when any update fails to commit.
- When an update failure is detected all updates performed during the failed session shall be rolled back to restore the data to pre-session condition.
- The system shall prevent access to failed functions while providing access to all currently operational functions.
- All payment transactions shall pass BilPay's internal security validation before committing transaction update.
- All timestamps recorded by the transaction processing system shall be in UTC (Universal Time Coordinated) when placed into BilPay's permanent storage.
- QR Code payment transactions shall be created and validated by BilPay.

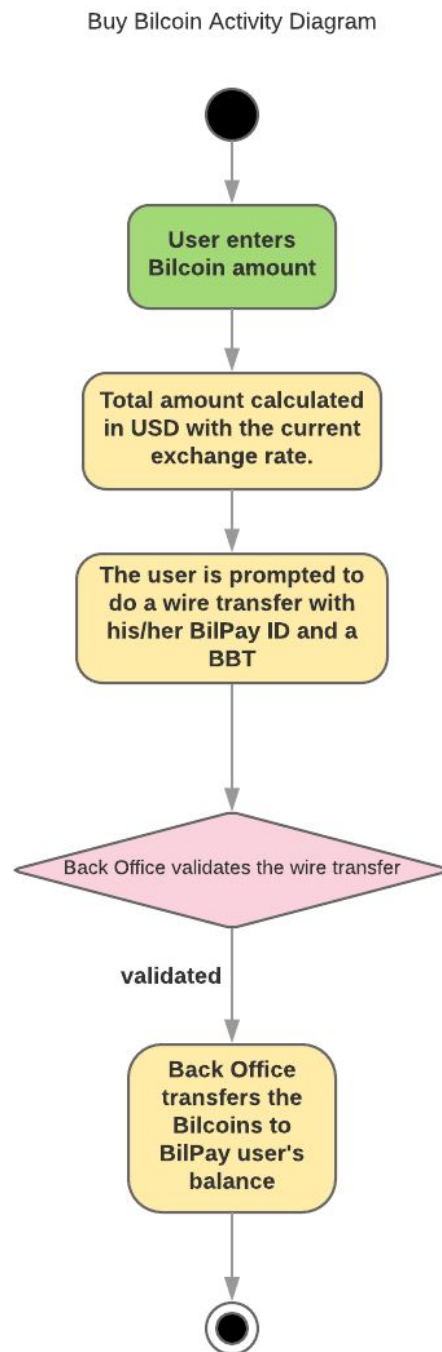
3.2 Constraints of the Product

- BilPay must use Blockchain to handle financial transactions.
- Internal Exchange Conversions during financial transactions must be handled and validated by TCMB's current conversion rates.
- BilPay must not encounter with data corruption or loss and must take necessary security measures.

4 System Models

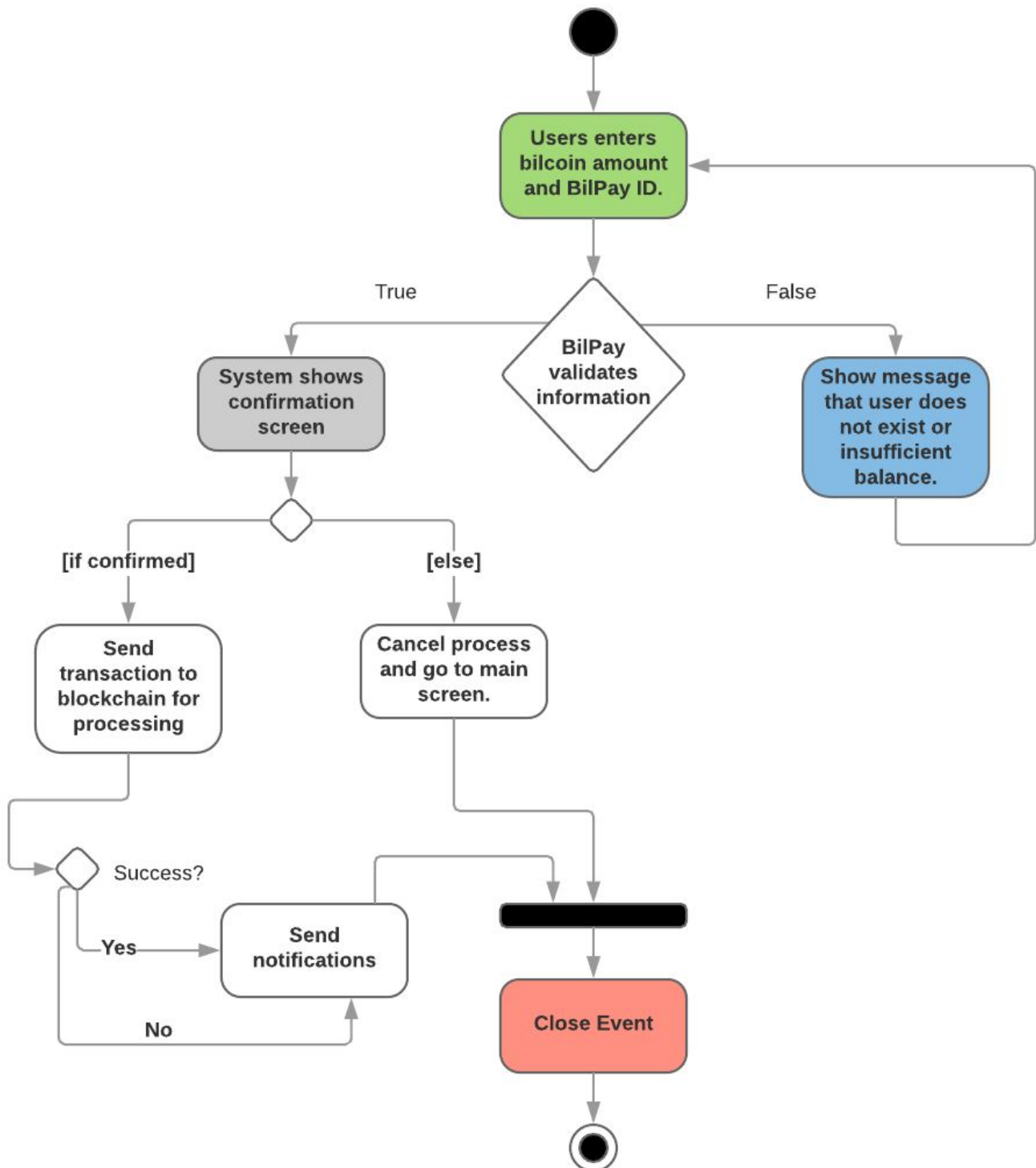
4.1 Activity Diagrams (with swim-lanes) or State Diagrams

4.1.1 Buy Bilcoin



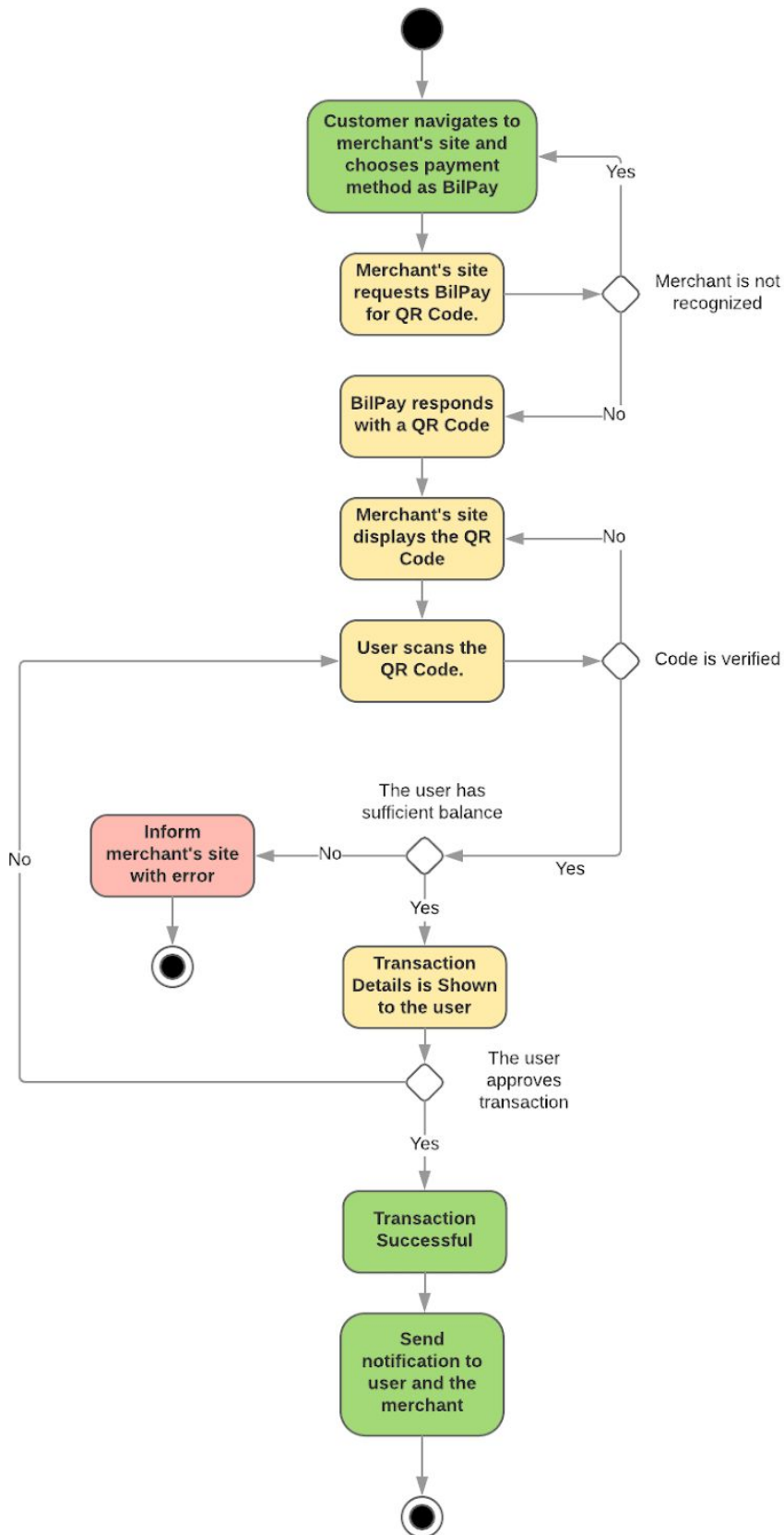
4.1.2 Send Bitcoin

Send Bitcoin Activity Diagram



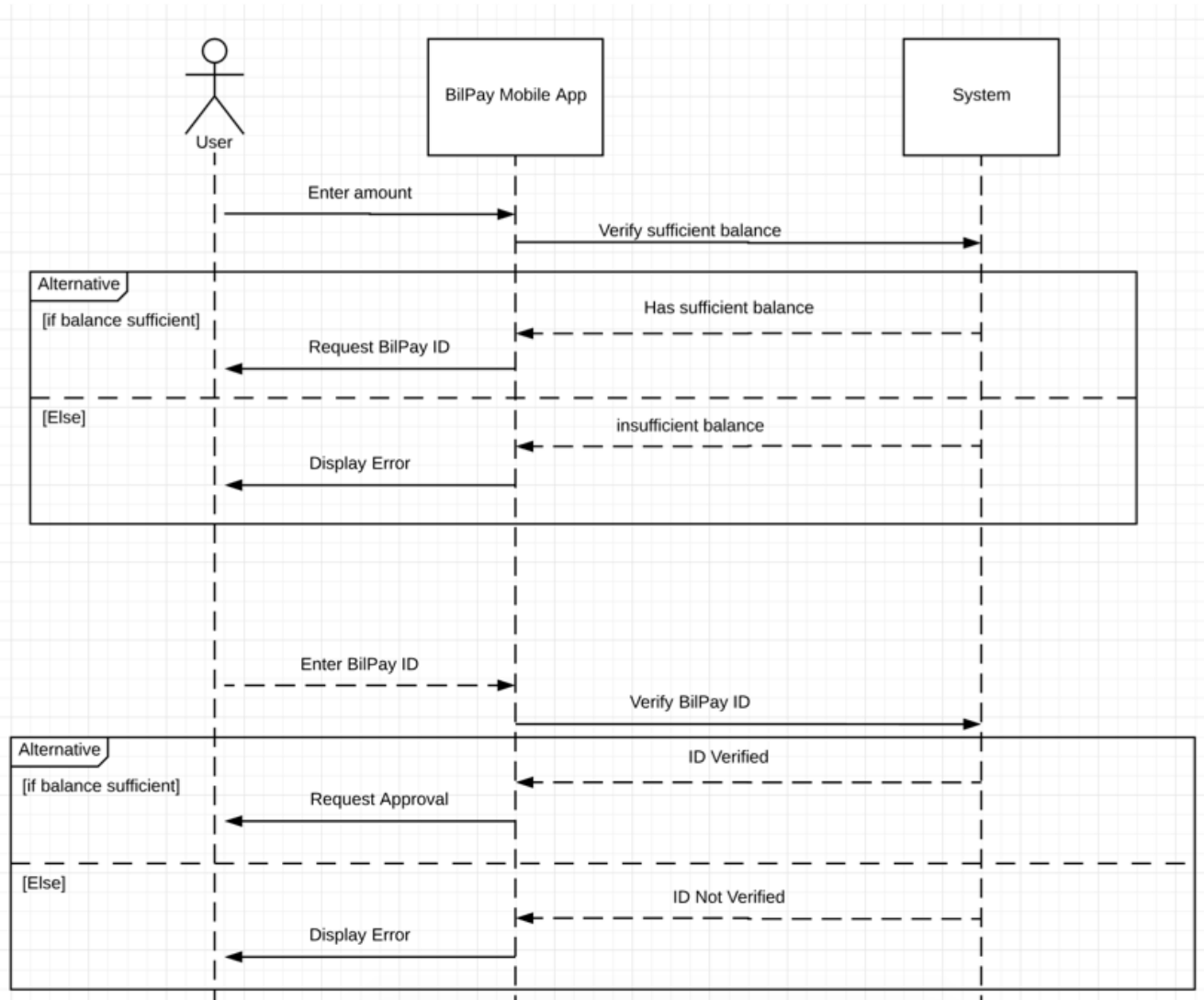
4.1.3 Pay with Bilcoin

Pay with Bilcoin Activity Diagram

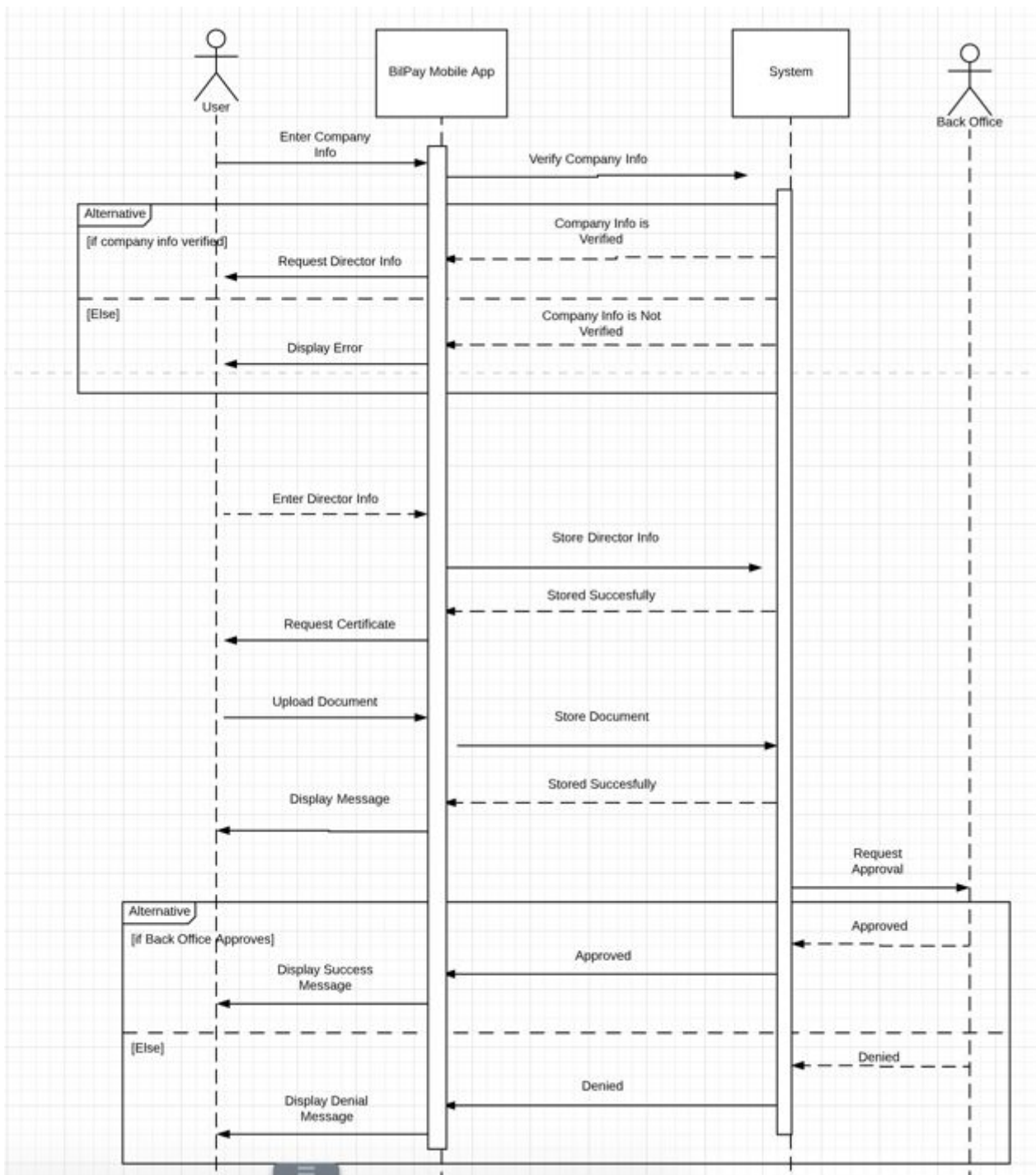


4.2 System Sequence Diagrams

4.2.1 Send Bilcoin

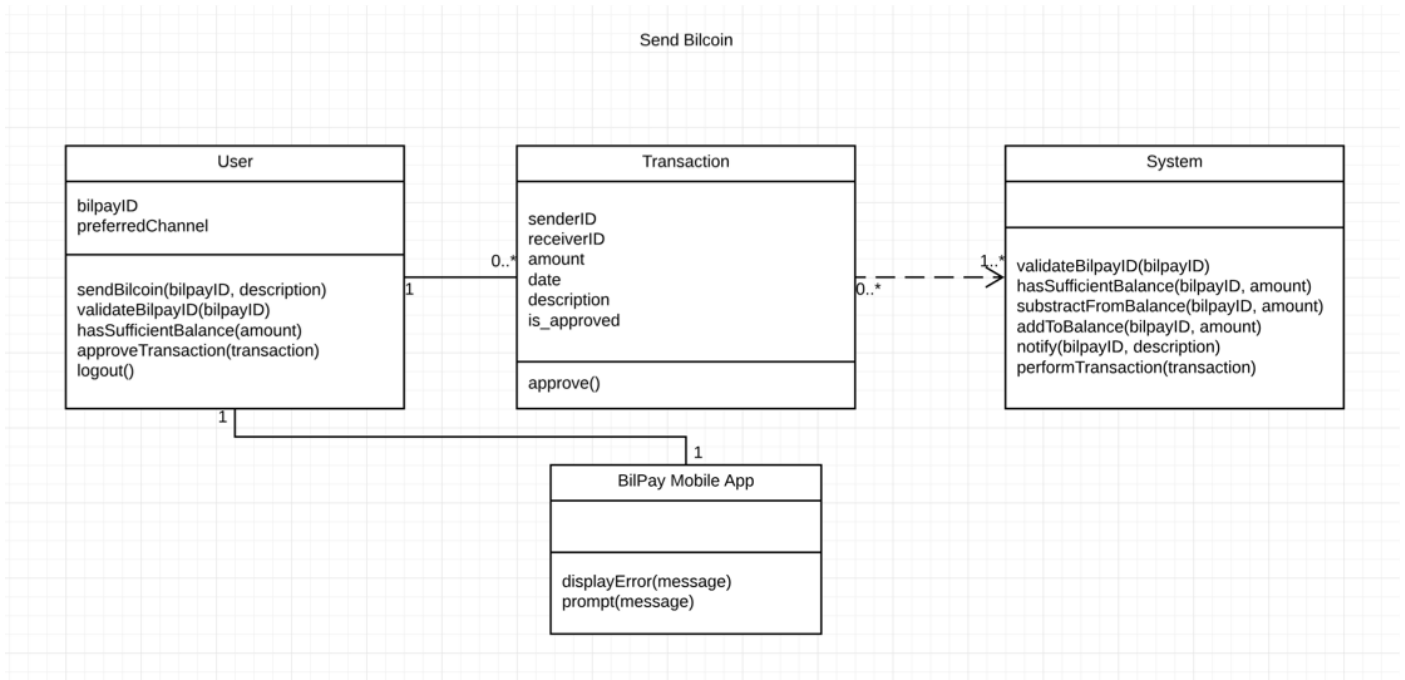


4.2.2 Promote to Merchant

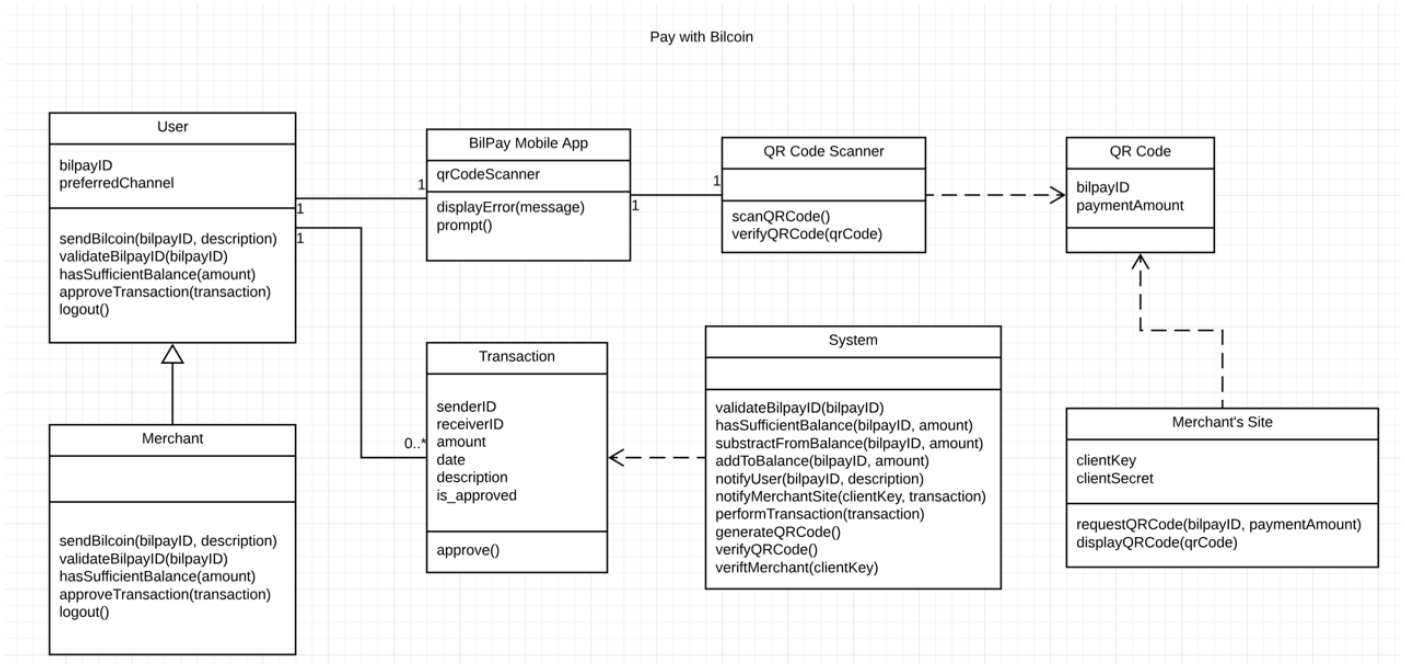


4.3 Analysis Class Diagram

4.3.1 Send Bitcoin

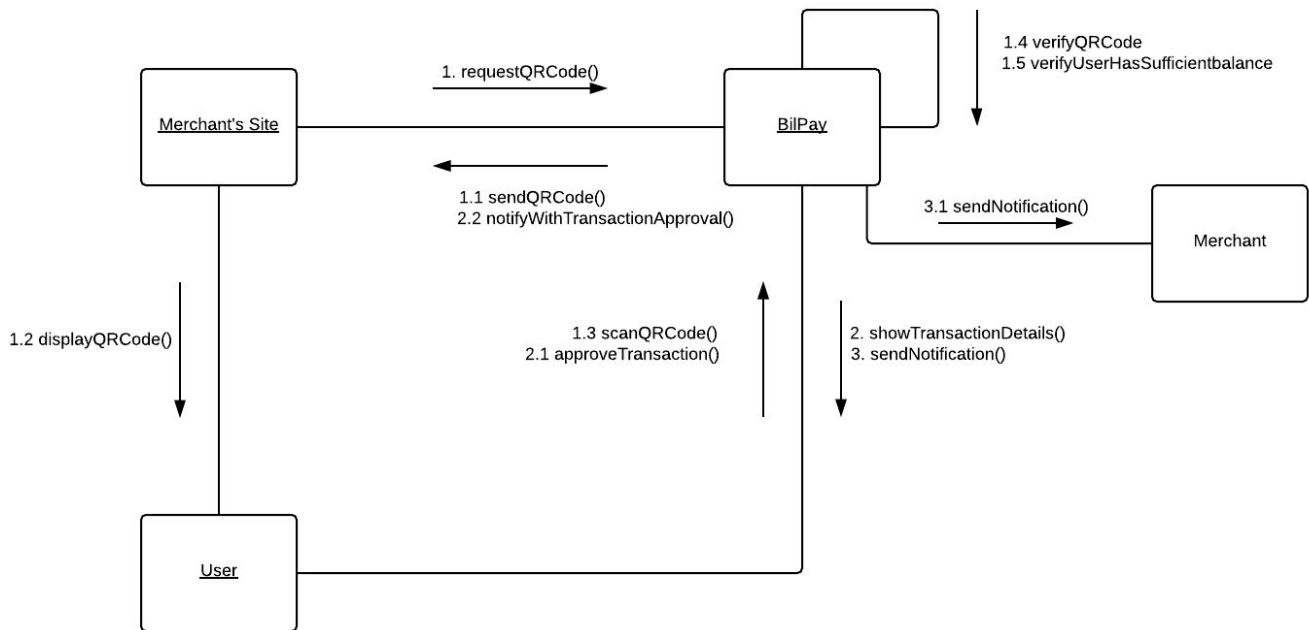


4.3.1 Pay with Bitcoin

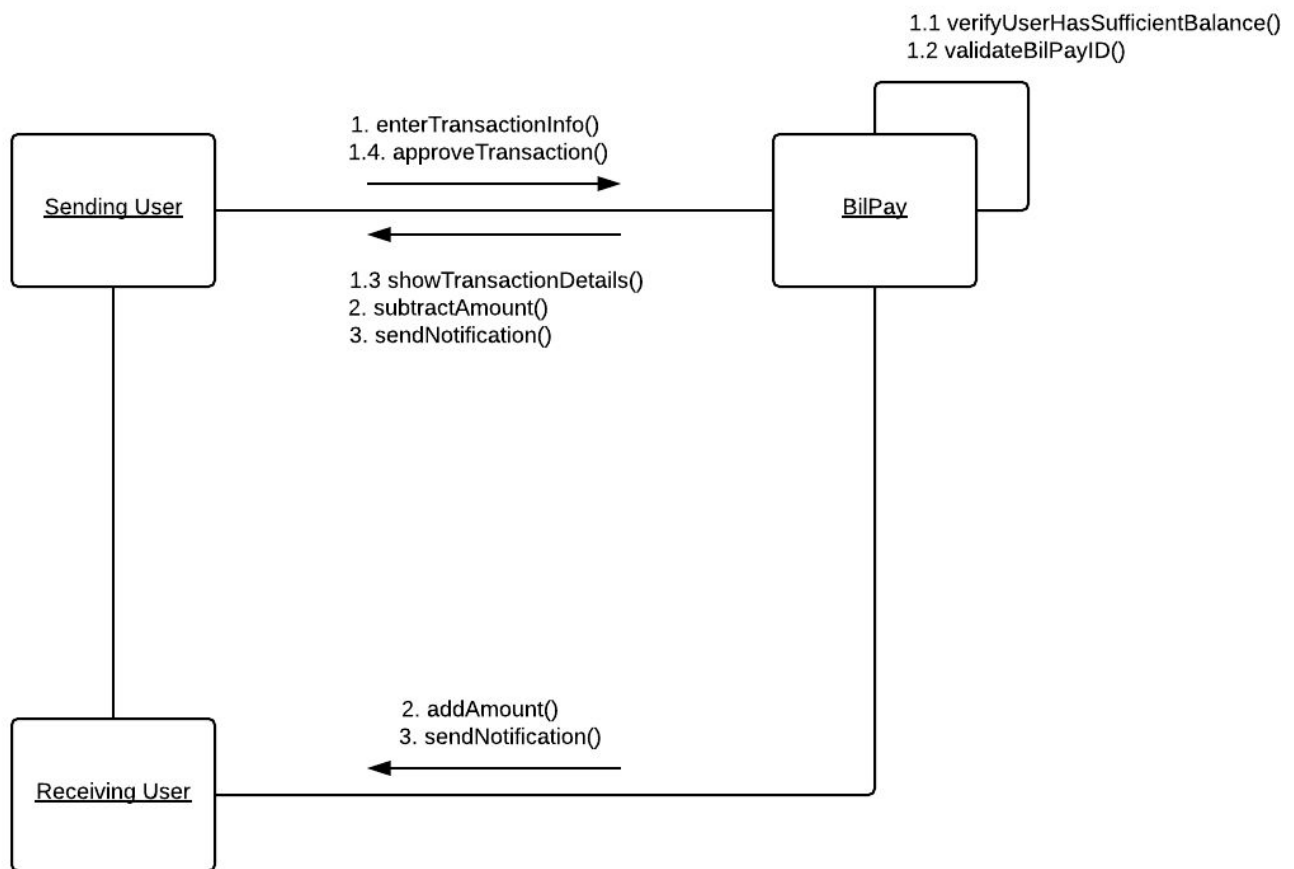


4.4 Analysis Interaction (Sequence or Communication) Diagrams

4.4.1 Send Bilcoin



4.4.2 Pay with Bilcoin



5 References

Usta Y, Yavuz F, Demirci C, Ankaralı A. “BilPay Initial Plan”, Ankara, 2018 Non-print Document

Larman C. “Applying UML and Patterns”, 1998, Book

6 Definitions and Acronyms

Term	Definition and Information
Bilcoin	A cryptocurrency used within BilPay system
Transaction	A unit of money transfer process containing sender, receiver and date information
Merchant perks	Being able to access to BilPay API and to create cashout request
QR Code	A machine readable code containing either BilPay ID or BilPay ID and amount
Invalid QR Code	A QR Code that is not generated by BilPay
Bilcoin's current sell rate	1 Bilcoin's equivalent to 1 Dollar.
BBT	Buy Bilcoin Token. Unique number to identify wire transfer.
BilPay SDK	A wrapper library to communicate with BilPay API
Sufficient Balance	The situation that users balance is greater than the transaction amount during sending Bilcoin or paying with it
Channel	The way to inform user. Push notification or email.
API Credentials	Private and public keys for merchant to encrypt the requests and authenticate.
Ban	Unauthorizing user for BilPay features.