COSE352

Software Engineering

2MB(Two Medical Block)

2013210063 Gi Jun Moon

Outline

- Operational Concept Description
- Prototype
- System and Software Requirements Definition
- System and Software Architecture Description
- Life Cycle Plan
- Feasibility Rationale Description

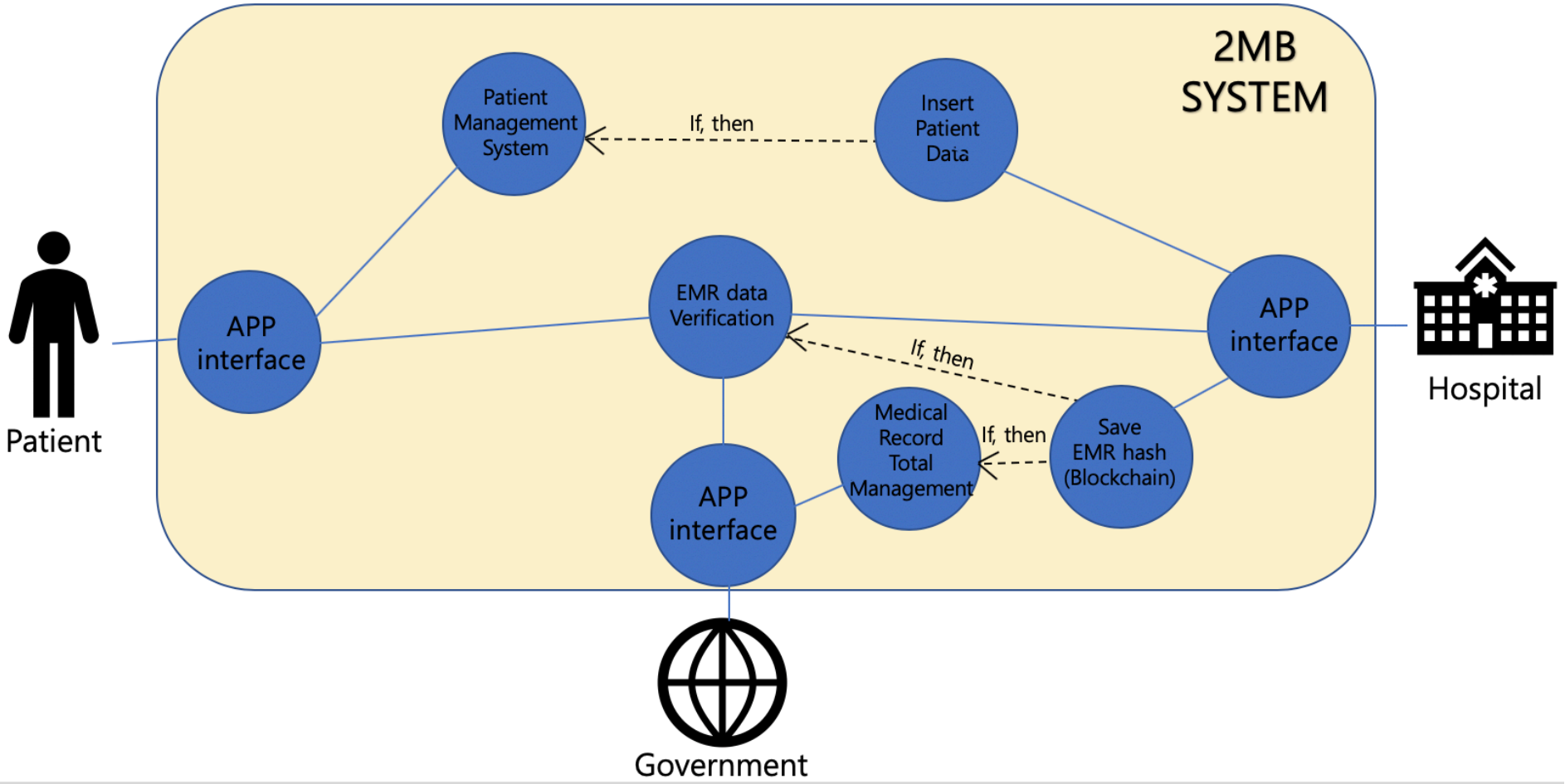
System Capability Description

- Problem: No existing mechanism to verify originality of Electronic Medical Record, and track modification.
- Proposal: Allow patients, hospital, and government to verify originality of EMR via application.
- Benefits:
  - Allow EMR data to have power of evidence during medical lawsuit
  - Easier use of features (verification by QR code)

Operational Concept Description (OCD)

- Current system
  - EMR data belongs to Hospital / can be modified anytime by person in charge
  - EMR data can be accessed through Intranet only (cannot be approached easily)
- Current system shortfalls:
  - Altering/using EMR data for personal usage is currently prohibited by law.
- How our system had overcomes those shortfalls
  - Therefore this app has legal validity, because we are not using the entire data of EMR. We are only using it's hash to verify the originality.

WebMail-OCD: Proposed model



Operational Concept Description (OCD)

- Proposed entity model
  - Proposed new entities:
    - Android App
    - Blockchain Engine
  - Hospital saves the medical data & EMR on blockchain database, and the patients are given the QR code containing hash value of the EMR data
  - Patient scans the QR code to access his/her medical data records.
  - Blockchain CA verifies individuals' credentials by comparing the received & original hash value and grants access to clients
  - EMR verification result is provided to clients

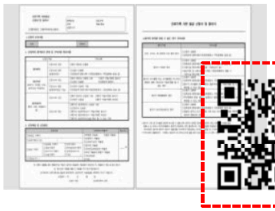
Operational Concept Description (OCD)

- Capabilities of proposed system
  - Accessible from the App
  - Database based on Blockchain Engine
  - High-level security for private medical data
    - Credential Verifications
- Levels Of Service
  - Provide access to blockchain database anytime, anywhere
  - Simple User Interface considering main clients are patients & hospital
  - Maintain Blockchain database & server steadily, prevent failure

Prototype

When Patient B is killed in hospital A and allegations of a medical accident are raised, B's immediate family, C, attempts to resolve the medical dispute by submitting the results from the government-run 2BM as evidence.

1. Patient B's immediate family C is in hospital A Issue hash value of EMR and documents with QR code from hospital A



3cR8vf1GDUAPvbBqHW7pmTBjZ2mCqX4Gic4QNiK7N6mj

3. Update ACL list of 2BM Blockchain

Government DB

Access_mode	Object	p_Pubkey	Subject
read	9f3da495bfad24cd2b3dca1ee49d072f	0xaaaaaa	3fbddf7e400afda2fbc24d647375e629

INSERT entity

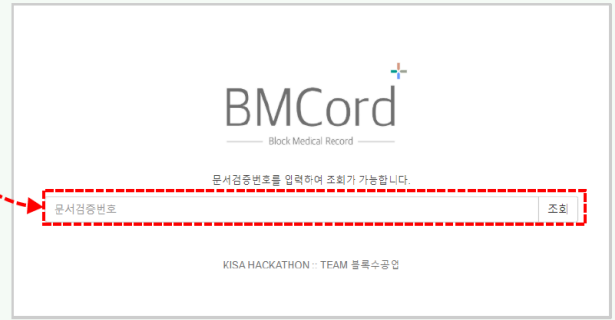
Acess_mode	Object	Pointer of Pubkey	Subject

5. Get result from Blockchain win response to ID of the patients

```
{"EMRs": [
{
"hash":
"3cR8vf1GDUAPvbBqHW7pmTBjZ2mCqX4Gic4QNiK7N6mj",
"amount": "1437",
"fee": "146",
"from": "HjDCHX5ojm7boJcwXCms5BWPYFSsC98E",
"to": "HhzTVoNd4RV6W8Vm4oXTr3NrZENa4cx9",
 …
“emr”:
"6Th7PrVsTM6vuGWsNSHNd9UYS4m8fnv1baFrqy5Fochd",
“emrID”:”001”,
“time”: “180103”,
“operation”: “INIT”, …}…]}
```

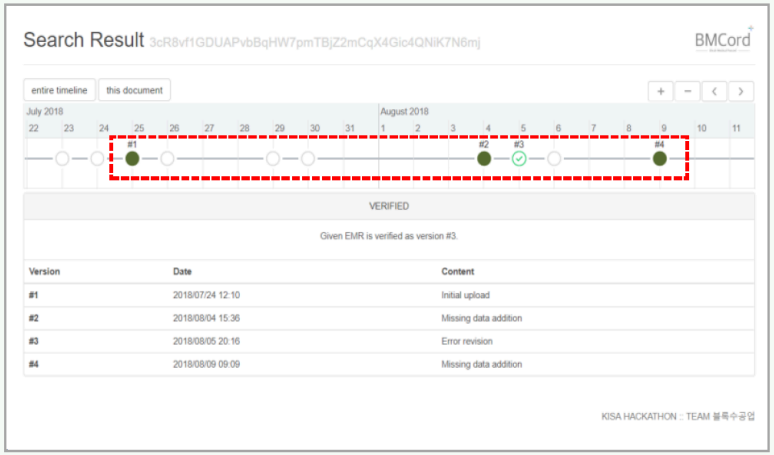
2. Personal Identification proceed on the 2BM application

4. Insert QR code to 2BM Application



6. result page that shows to C

- Same EMR ID
- Same EMR ID & same hash



It can be confirmed that electronic medical records issued by hospitals are not final copies.

System and Software Requirements Definition (SSRD)

- Project requirements
  - Security should be obtained by Blockchain Network
  - Run on Android/Windows OS. Has to be compatible in any conditions
  - All systems have to be built within certain budget
- System Requirements
  1. Accessible from Android App – LogIn Required
  2. 2 Clients : Hospital Mode & Patient Mode
     - EMR/metadata stored in blockchain system (high security data)
     - Verify Individuals and display EMR verification result
     - Provide plausible error screens in case of system/server failure
  3. Recommend appropriate medical services / regular checkups

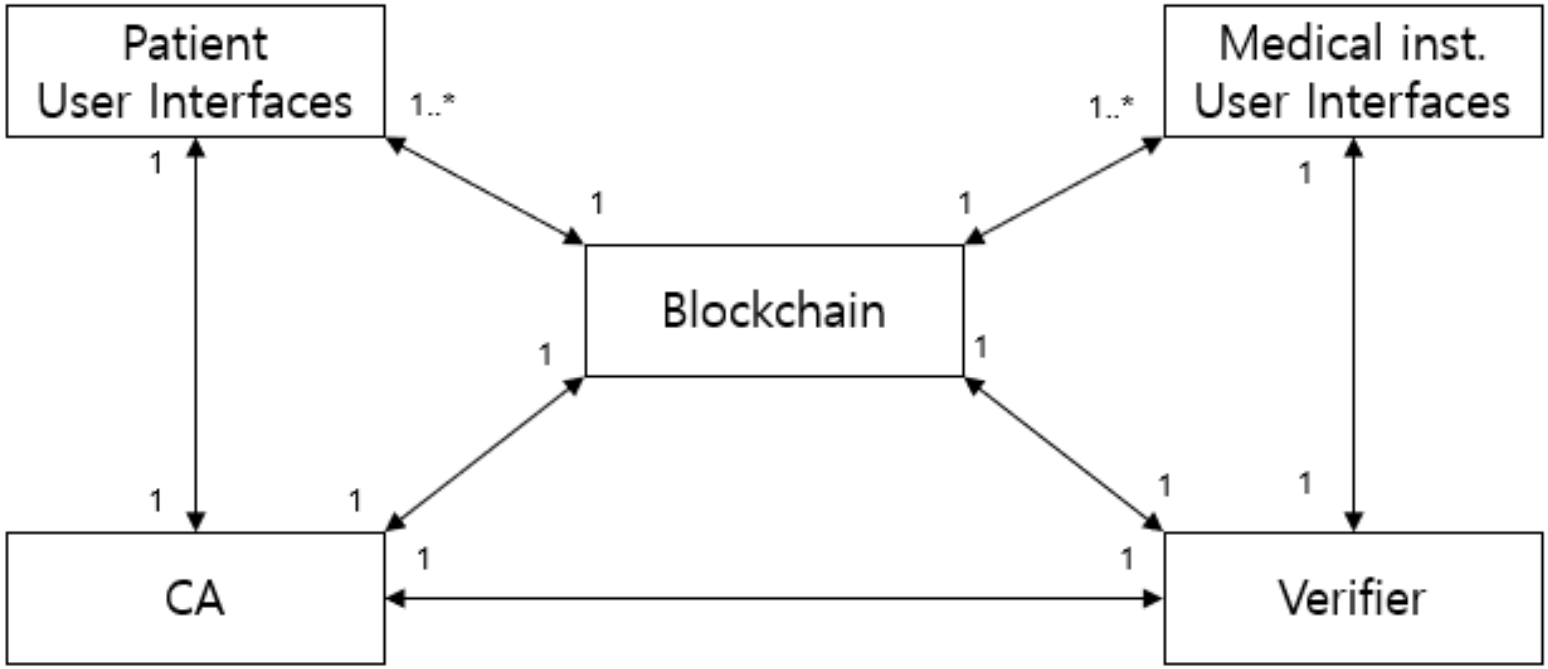
System and Software Requirements Definition (SSRD)

- Interface Requirements
  - User interface: Android App
  - Interface with Blockchain Engine
    - Verify User Credentials
  - Interface with Server
    - QR Code / User Info Database
- Level Of Service Requirements
  - Accessible anytime, from anywhere
  - Easy UI Map
  - Maintain Blockchain database & security

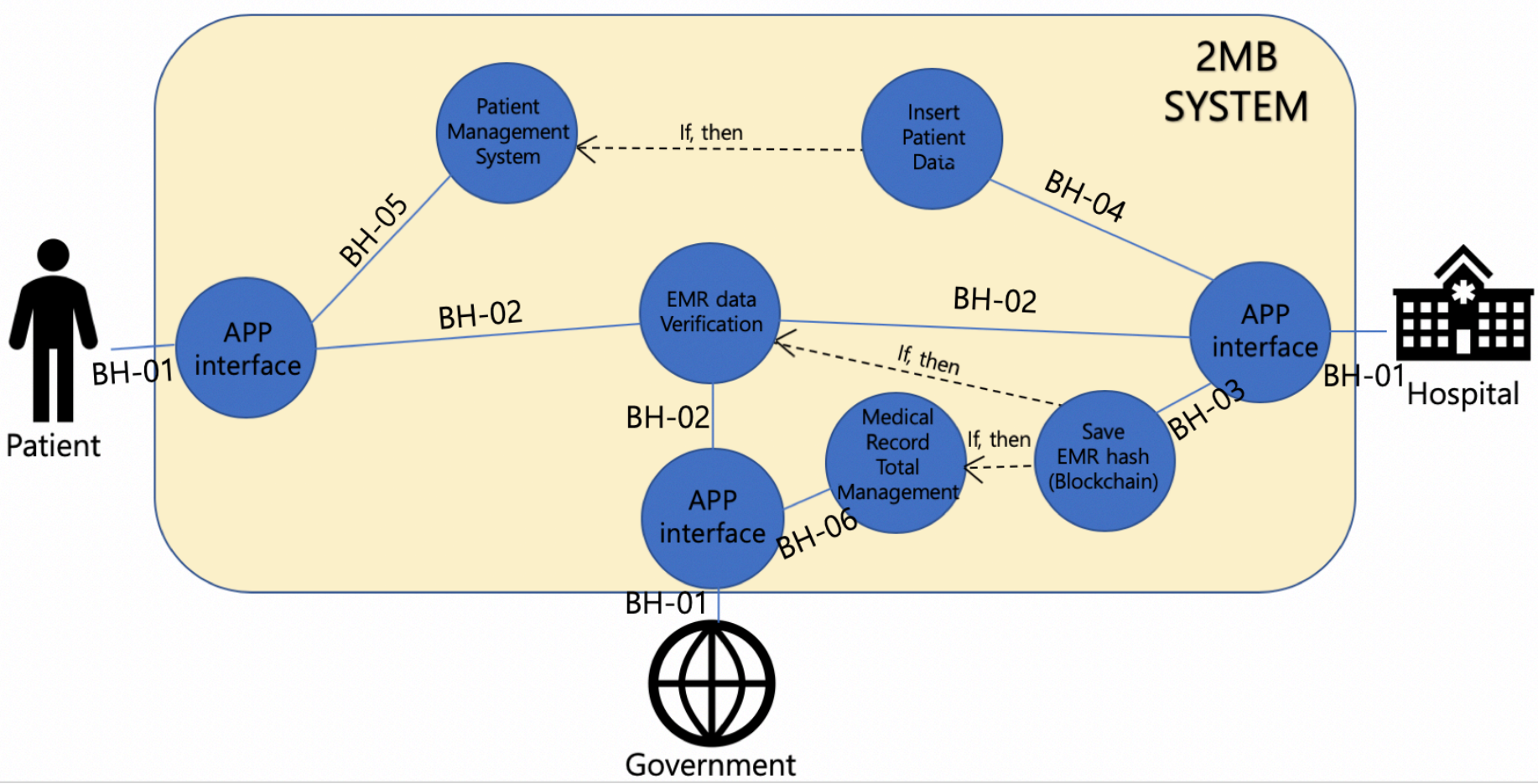
System and Software Requirements Definition (SSRD)

- Evolution requirements
  - Provide Guide Manual
  - Extensible for signing into multiple accounts simultaneously
  - Extensible to accommodate latest technologies
    - E.g. Introduce distributed storage

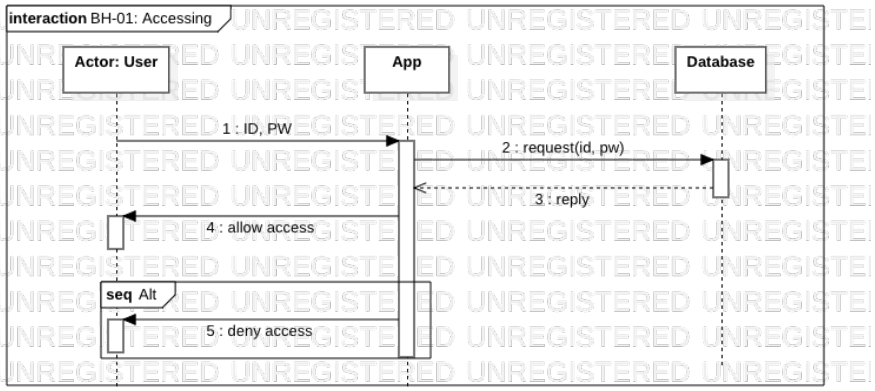
System and Software Architecture Description (SSAD) - Component Model

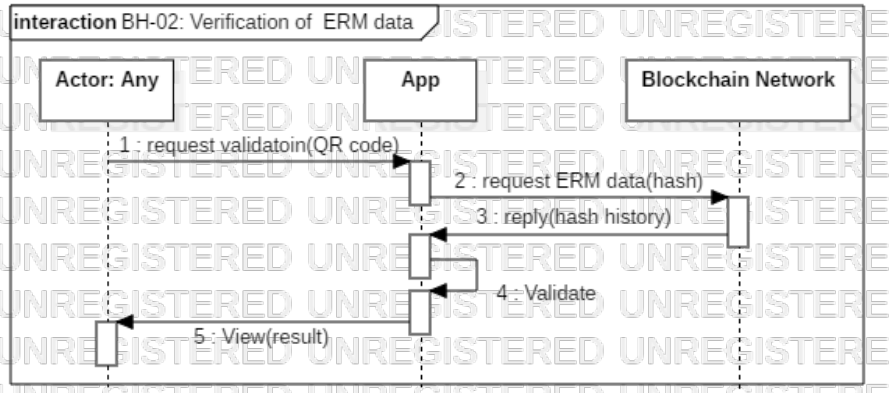


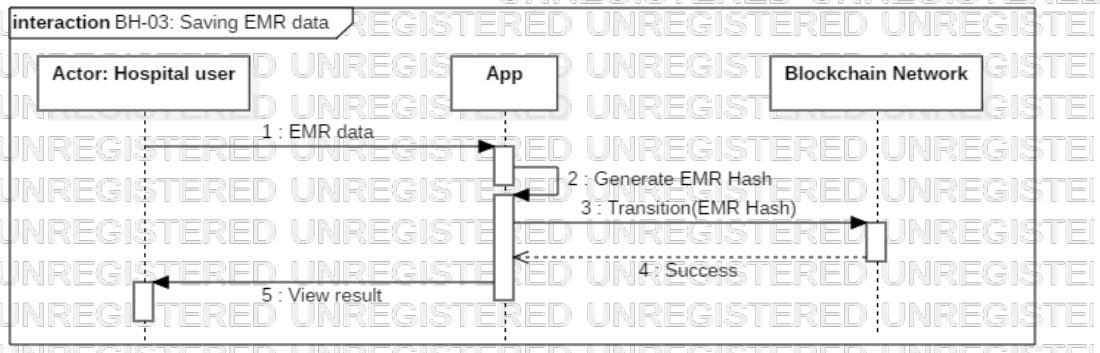
System and Software Architecture Description (SSAD) – Behavior Model I



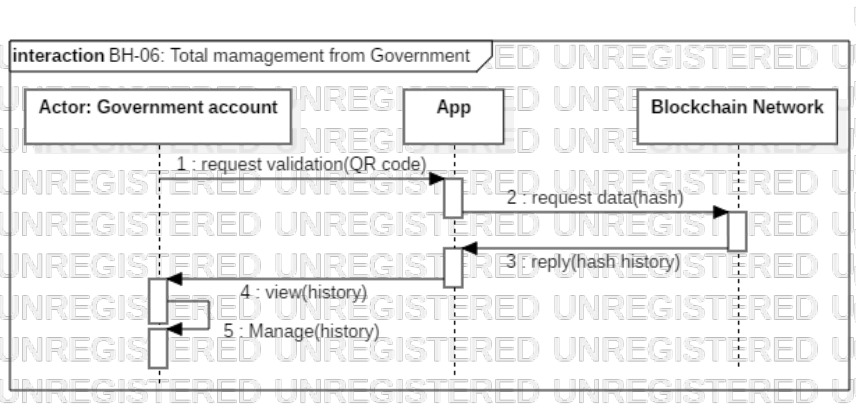
System and Software Architecture Description (SSAD) – Behavior Model II

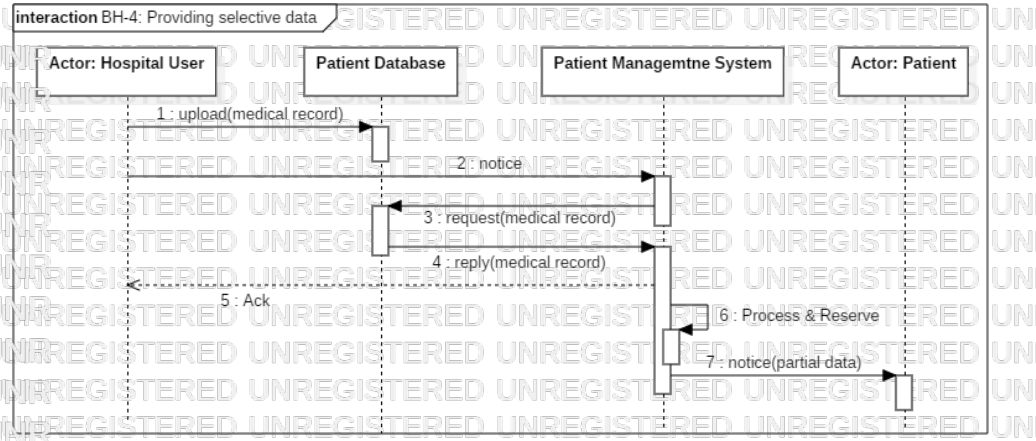


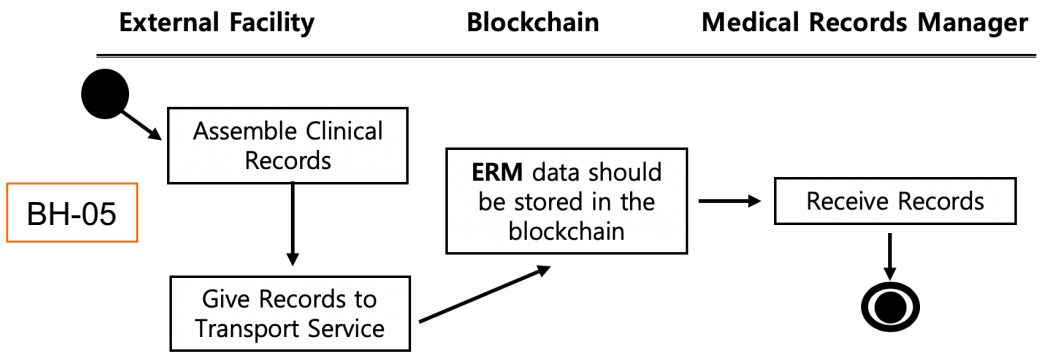




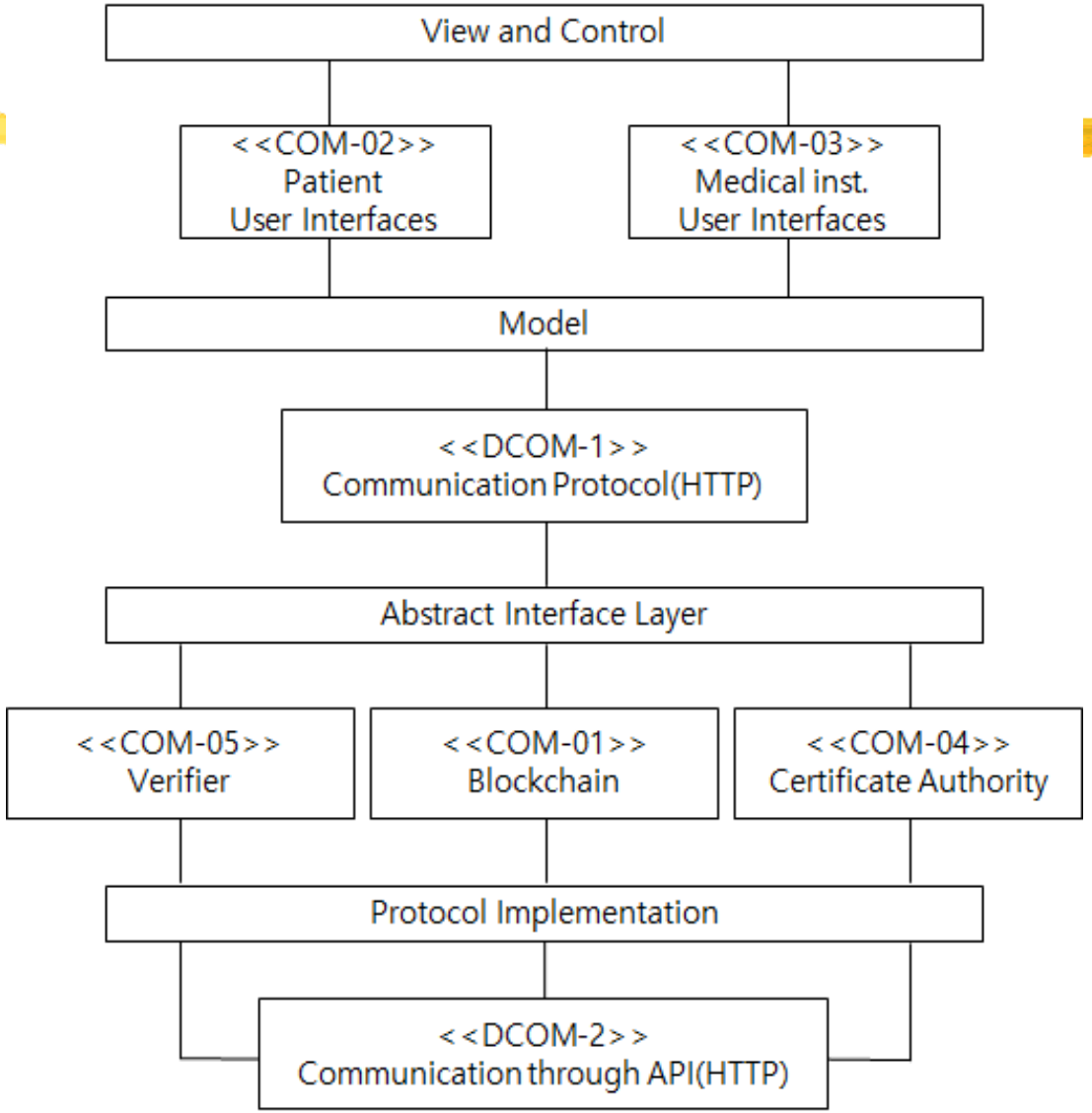
System and Software Architecture Description (SSAD) – Behavior Model III



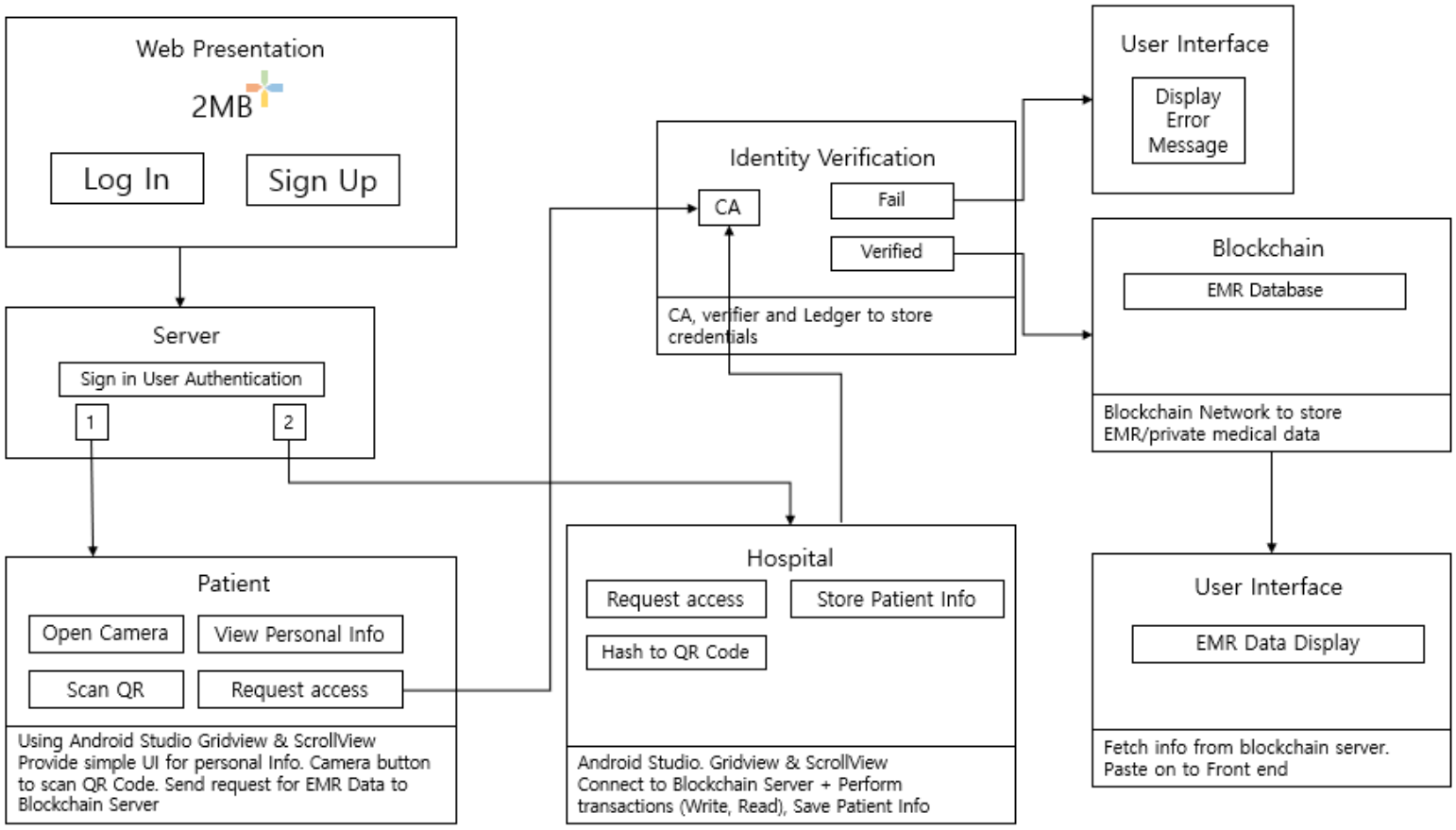




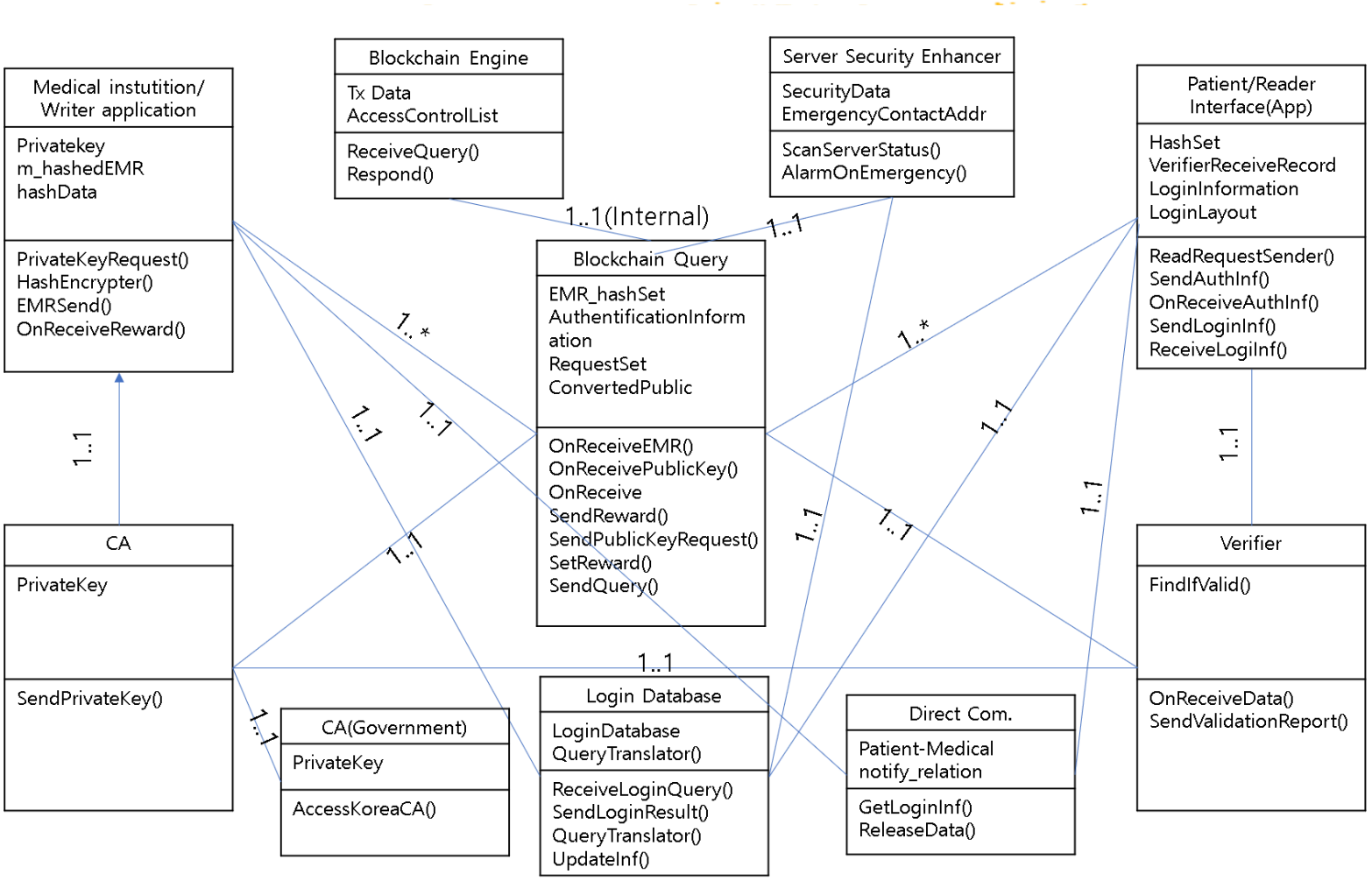
SSAD – System Topology



System and Software Architecture Description (SSAD) – Logical Component View



System and Software Architecture Description (SSAD) – Object Model



2MB-LCP: Plan(who-do-what-by when)

2MB-LCP: Stakeholders (who?)

Role	Name & title	Organization	Responsability
Developer	9 CS students	Team 2MB	Provide Win Condition. Analyze, design and implement the system. Provide milestones deliverables. Manage the product development process.
Customer	Local hospital	Hospital	Provide Win Conditions. Procure required resources. Provide feedback on project.
User	Random sample of patients	Public	Provide Win Conditions. Review the product.

WebMail-LCP: Plan (when?)

Stage	Phase	What	Who
Engineering	Inception Elaboration	LCO package (11/16/2019) LCA package (11/30/2019) RLCA package (December 2019)	Team 2MB, Hospital and patients. Team 2MB and Hospital. Team 2MB and Hospital
Production	Construction Transition	TRR package (January 2019) RRR package (March 2019) 2PM Released (May 2019)	Team 2MB and Hospital Team 2MB and Hospital
Support			Hospital

Business Case Analysis

- Total Cost $17,500
- Benefits
  - Immediate
    - Request Advertisement for prototype App to Medical/Hospital Community (Medigate)
    - Request local hospital to adapt our service
    - QR Code / other server related fees
  - Strategic
    - Allow App to be released with no obstacles (server, domain etc), easier expansion to bigger hospital & communities, furthermore grasp public attention as clean, trustworthy service

Requirements Satisfaction

SSRD Requirement	How Requirement Met
12-week implementation	Iterative development of features
Accessible from App	Develop with Android Studio & connect server & blockchain engine
Verify individual credentials to grant access to data	QR Code with Hash Values – compare them with ones in blockchain database
2 Clients (Hospital, Patients)	Develop 2 versions of App, display different ones after sign-in (User type verification)
Security	Use of Blockchain network, plus individual verification provided by the goverment
Evolution requirements	Flexible UI and server management

Risks

- Schedule
  - Iterative development
- Performance
  - Performance from combining blockchain engine with front end and main server
  - Tool for testing performance
- Personnel Shortfalls
  - Find local hospitals that will cope with our service
- Team Consistency
  - Complete, thorough engineering artifacts