**Answer:**

In order to clearly understand the whole architecture, I list the key point of the whole functions and processes here:

HM: Home mobile network

RM: Roaming mobile network

**Conventional:**

1. Service provider(HM) makes roaming agreement with another network service provider(RM) if the provider(HM) cannot cover a particular city or country.
2. CDR is generated based on usage data from switch center. (CDR: Information like date, times, caller, callee, state, code, rate)
3. Rated CDRs sent to HM and charges based on predefined service. HM and RM partners settle financials monthly based on CDRs reports.
4. Clearinghouse works as an interface between different RM partners to help them exchange CDRs based on agreements. Clearinghouse receives billing record.
5. TAP, RAP

Q1:

The blockchain-based method to replace or augment the “Clearing House”:

**Public blockchain:** A public blockchain is a permissionless blcokchain, anyone can join the network which means anyone can read and write.

Record data(if data size is large)

Non-Blockchain

Component

CDR exchange(if data size is large)

Users

Roaming Partners

Roaming Partners

Roaming Partners

Home Mobile Network

Record audit(encrypted)

Report generated

Block chain

CDR exchange(if data size is small and encrypted)

On-chain

Off-chain

Bill record exchange

Resolving dispute

Roaming agreement

Description:

The record process of users’ information should not be on chain, since anyone can read and write it except the information get encrypted, and only the one who has private key has right to use data. But if the data size is large, using conventional way is better.

The bill record exchange can use off-chain, since the way of the transaction is confidential and the bill is between two parties.

Roaming agreement setup use off-chain, since transfer agreements between 2 parties and it can trusted by authorities.

If the CDR data size is huge, we can use conventional way to exchange data, but this cannot make sure the immutability of data. And if the data size is small, we can think of using on-chain by encrypting data, so as to guarantee the data immutability, integrity and confidentiality.

Resolving dispute is the issue between the providers, it can use on-chain block chain to solve the dispute, so that the history can be approved.

**Private blockchain:** A private block chain is a permissioned block chain. In this case, the home mobile network and roaming mobile network are permissioned.

Record data(if data size is large)

Non-Blockchain

Component

CDR exchange(if data size is large)

Users

Roaming Partners

Roaming Partners

Roaming Partners

Home Mobile Network

Record audit(encrypted)

Report generated

Block chain

On-chain

Off-chain

Bill record exchange

CDR exchange(if data size is small)

Roaming agreement

Resolving dispute

Description:

The record process of users’ information should use on-chain blockchian(encrypted like customer list and total number), since the data should be immutable and confidential. When the report of users’ information generated, we can use report generated link number to locate the complete information, so we can put the report number off-chain, because it would not cost too much and it is immutable.

The bill record exchange can use off-chain, since the way of the transaction is confidential and the bill is between two parties.

Roaming agreement setup use off-chain, since transfer agreements between 2 parties and it can trusted by authorities.

If the CDR data size is huge, we can use conventional way to exchange data, but if the data size is small, we can think of using on-chain by encrypting data, sosas to guarantee the data immutability, integrity and confidentiality.

Resolving dispute is the issue between the providers, it can use on-chain block chain to solve the dispute, so that the history can be approved.

Q2:

**Public Blockchain:**

Name: Commercial Confidentiality for telecommunication companies.

Description: network cannot reveal customer lists, total number, total number of customer to other network.

Attribute: confidentiality

Environment: different network

Stimulus:

Response:

Reasoning why architecture deals with the risk:

Q3:

In my opinion, using private block chain is better, since the home mobile network and roaming mobile network is like partners and some of the transactions and agreement would be convenient by using private blockchain, and it also can