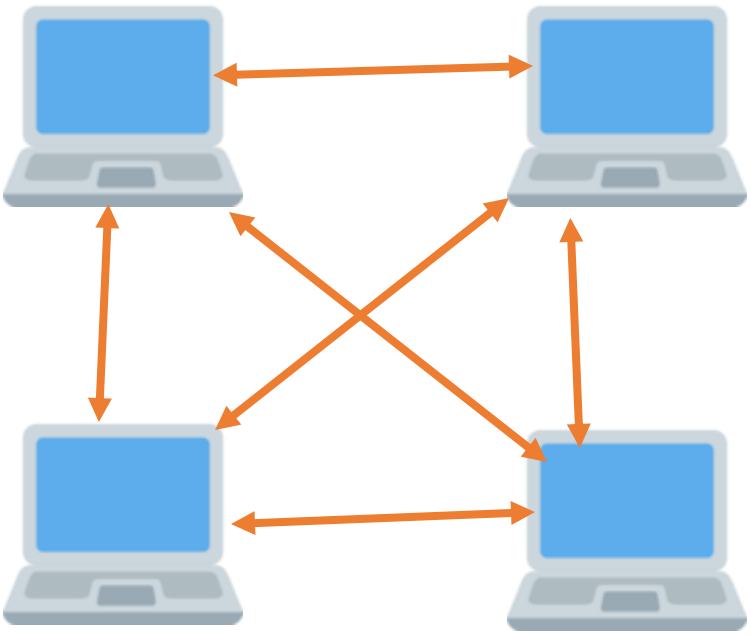
Blockchain Cryptography

Blockchain is peer-to-peer network every node is link with others



(Peer-to-peer Network)

Napster

Torrent

4 Things which are to be concern when we talk about network.

1:**Confidentiality**

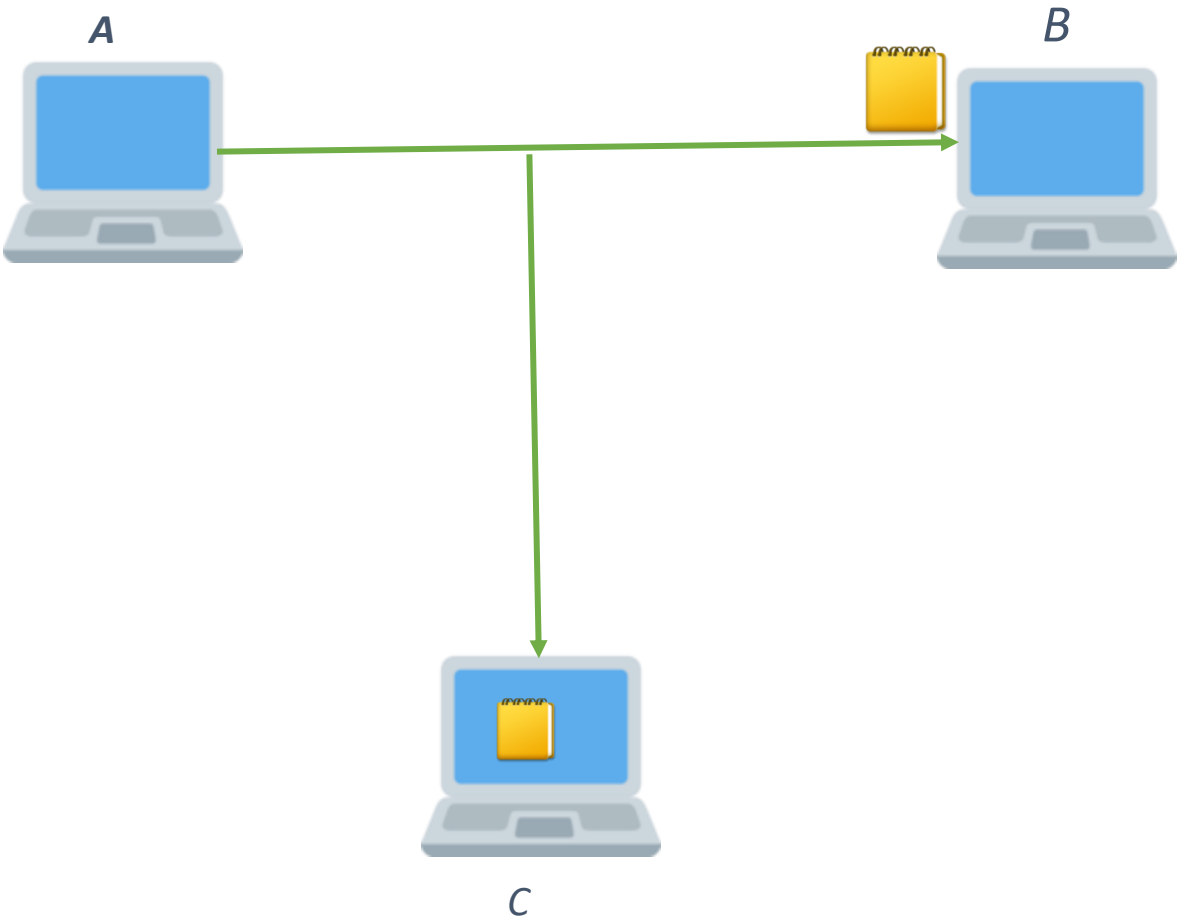
2:**Integrity**

3:**Non Repudiation**

4:**Authentication**

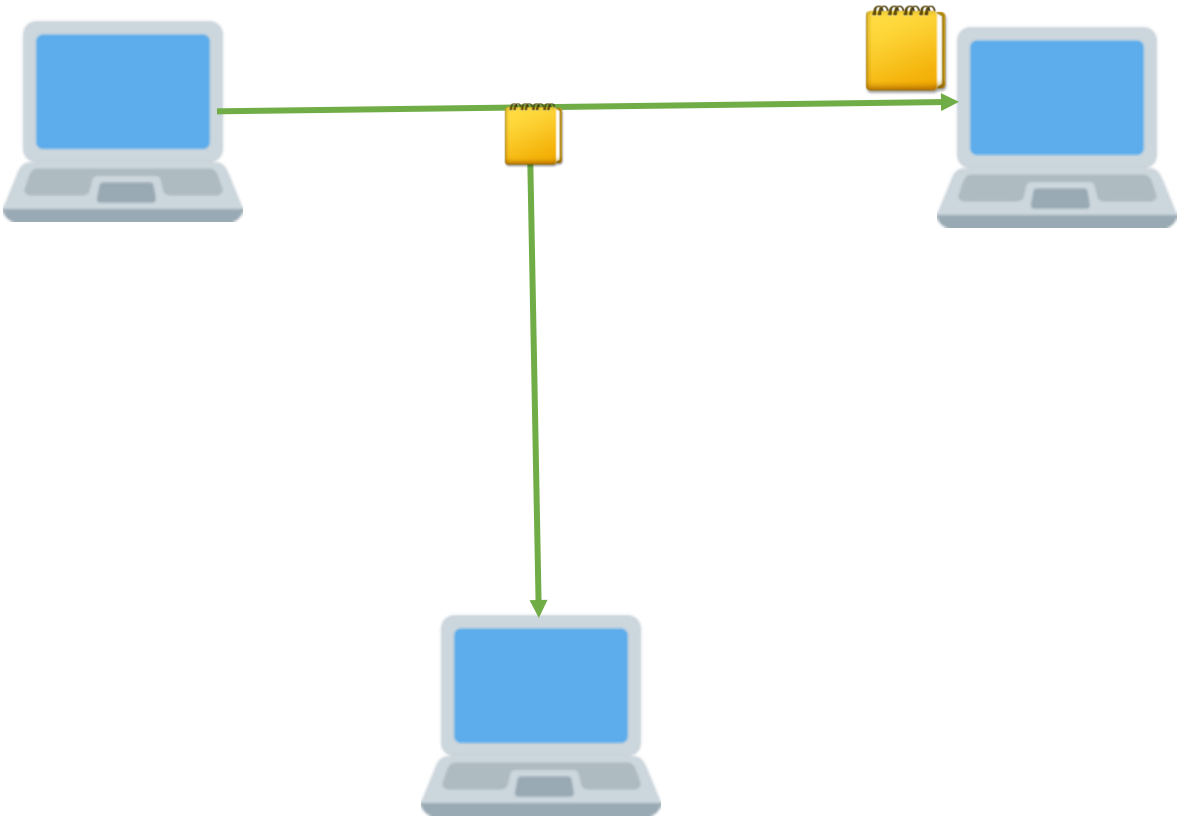
Confidentiality

Lets we want System A to send some secret message to System B and we don't want system C can see the message .



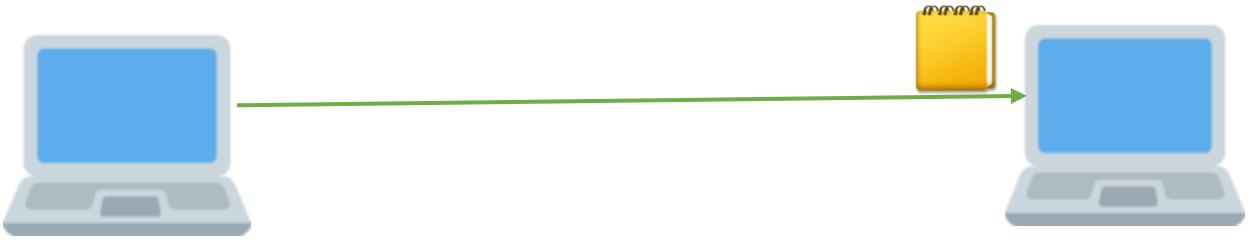
Integrity

In integrity we don’t wanted the message we sent to B is tempered by C and then sent to B.



Non-Repudiation

If system A has sent the message to system B then there must has a proof of it that A has sent message.



Authentication

It should be authenticated that if A sent message to B then B must receive this message only from A not C who can change the name of like A' message

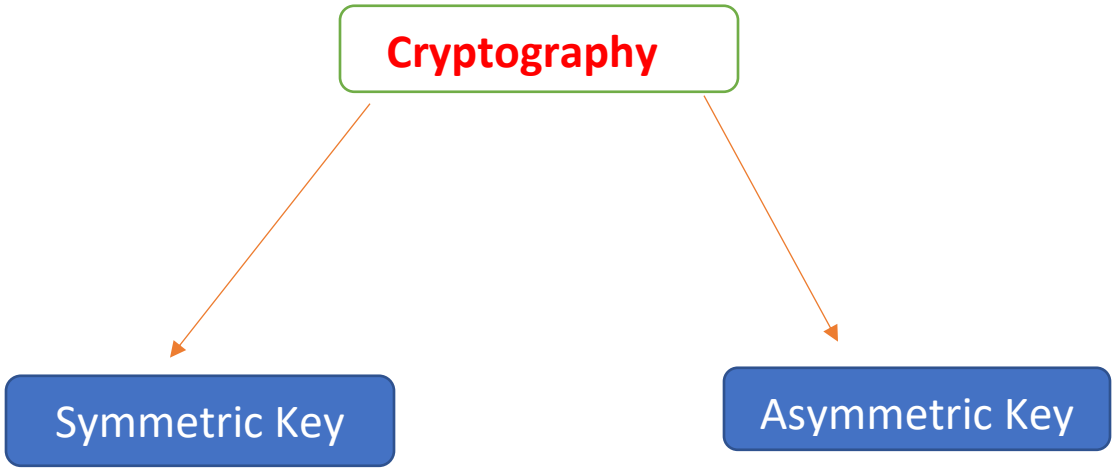
Here we can solve these 4 problems by using Cryptography

Crypt → Secret/Hidden

graphy → Writing

The process of cryptography is to convert your message into cipher(encrypted form) which cant read by others but only reciever.

Types of Cryptography



Symmetric Key Cryptography:

In Symmetric key cryptography every **Node(system)** has its own keys like**,k1,k2,k3** and etc.

If a **Node A** wants to send a message to **Node B** than **Node A** encrypt(means that message cant be read by others) the message using key **K1** and Node B also use Key **K1** to decrypt(to read it) it.

No if **Node A** want to send message to **Node C** than it must be used different key not the key which already used by it when interact with **Node B**.

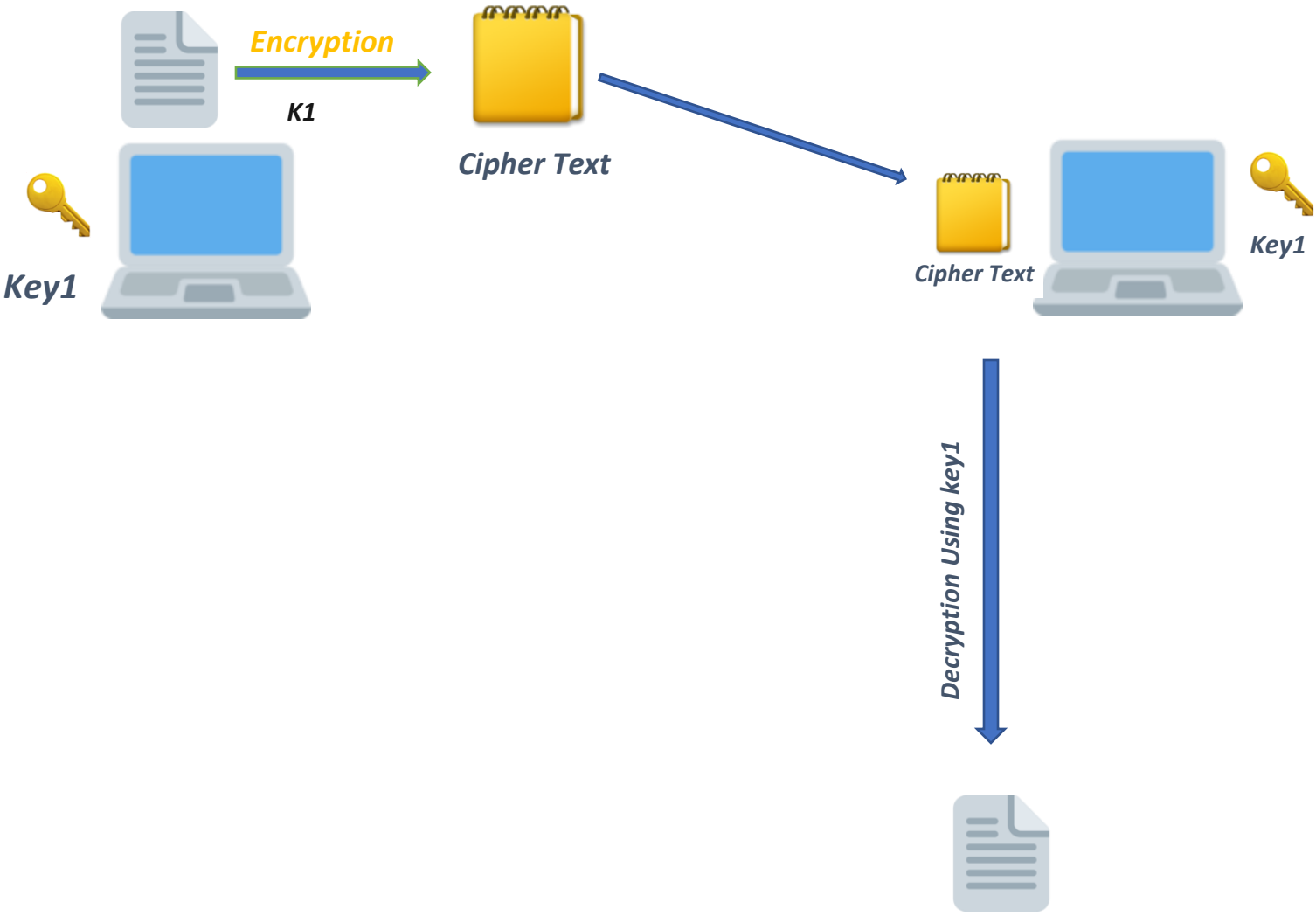
So **Node A** will use key **K2 for** to send message to **Node C**

So there will be bunch of keys which is very difficult to manage and remember

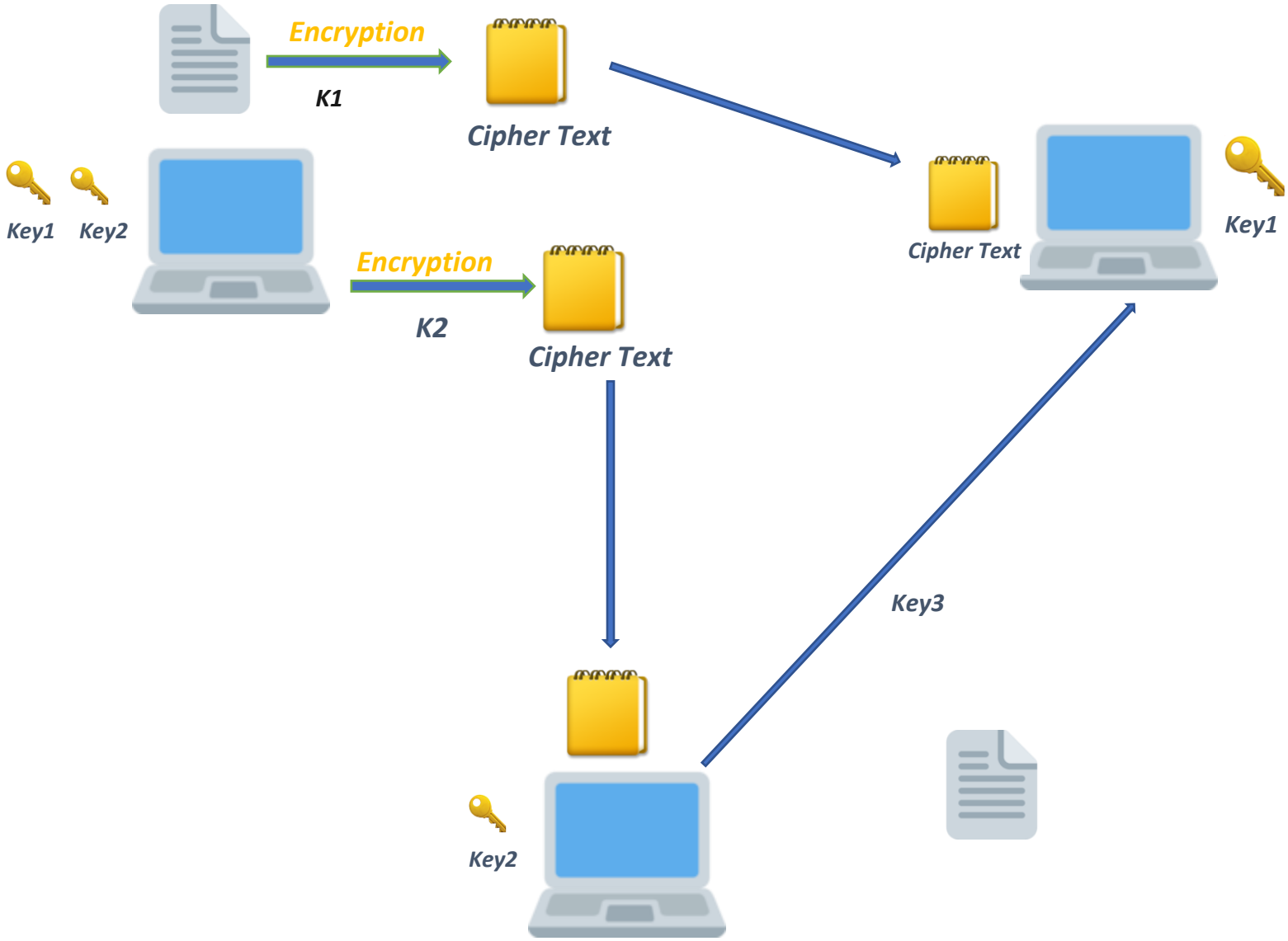
That's is the main drawback of Symmetric Key CryptoGraphy

We see it in detail in following diagrams.

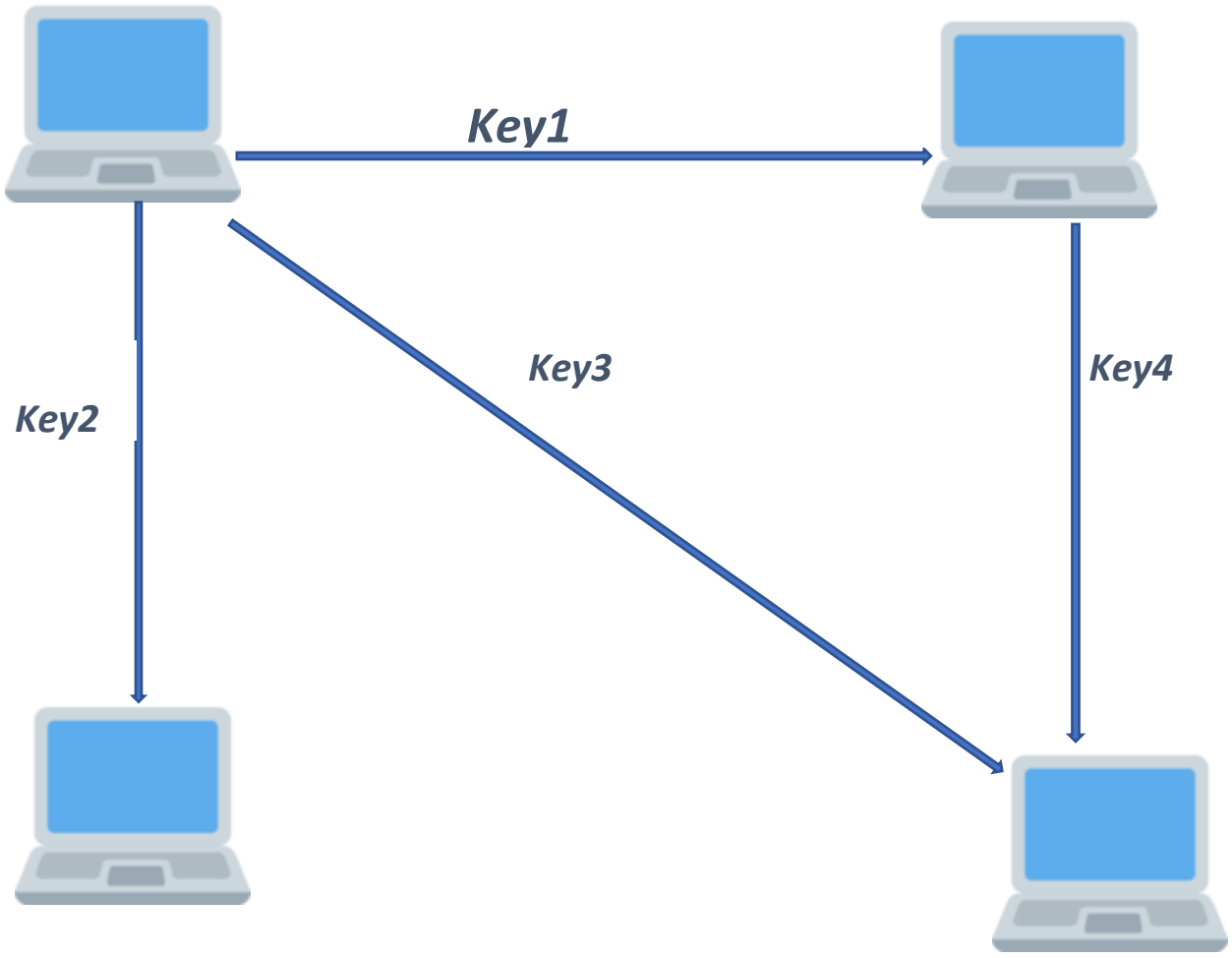
Note: **Cipher text is the converted encrypted form which cant be directly readed.**


Encryption
K1
Cipher Text
Key1
Cipher Text
Key1
Decryption Using key1

(Picture1)


Encryption
K1
Cipher Text
Key1
Key2
Encryption
K2
Cipher Text
Cipher Text
Key1
Key3
Key2

(Picture2)



(Picture3)

Asymmetric Key Cryptography

Also known as public key cryptography

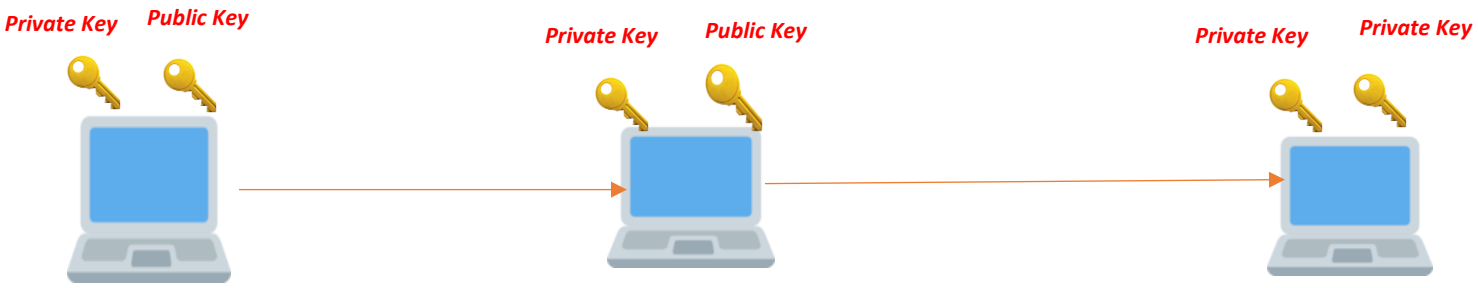
We used here two different keys i.e

1:Private key

2:Public Key

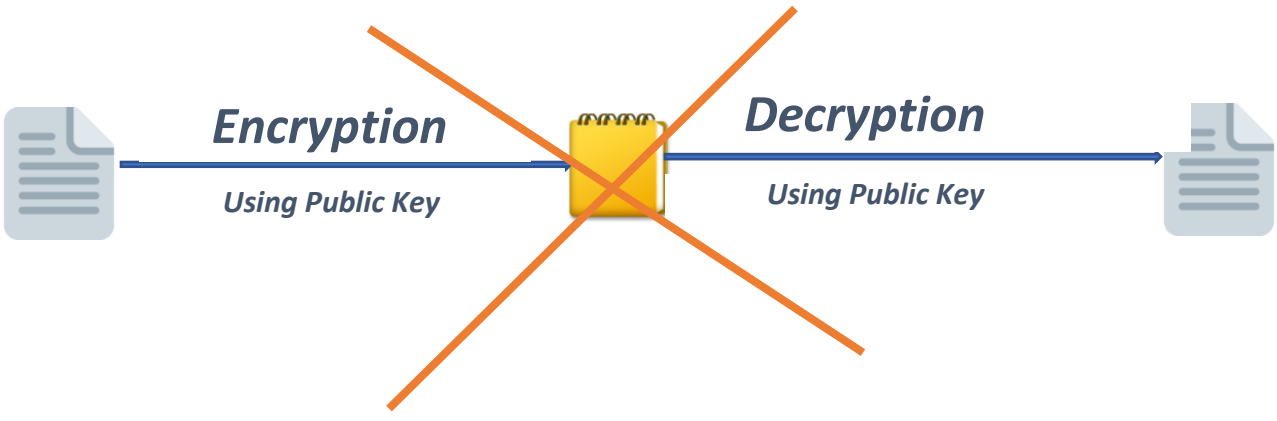
Every Node has both Public and Private key which is used to encrypt or decrypt the message. If a system A uses its Private Key to encrypt the message then System B should use its Public key to encrypt it not its Private key

Both key will be used in this process.

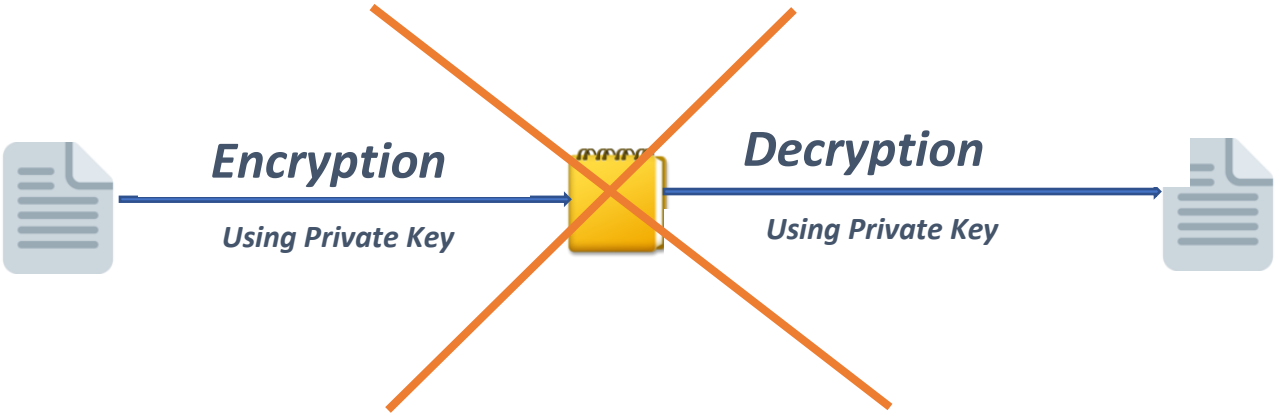


(Acceptable)

(Acceptable)



(Not Acceptable)



(NOT ACCEPTABLE)

Lets assume system A wants to send message(transaction) to system B so how asymmetric cryptography make it secure?

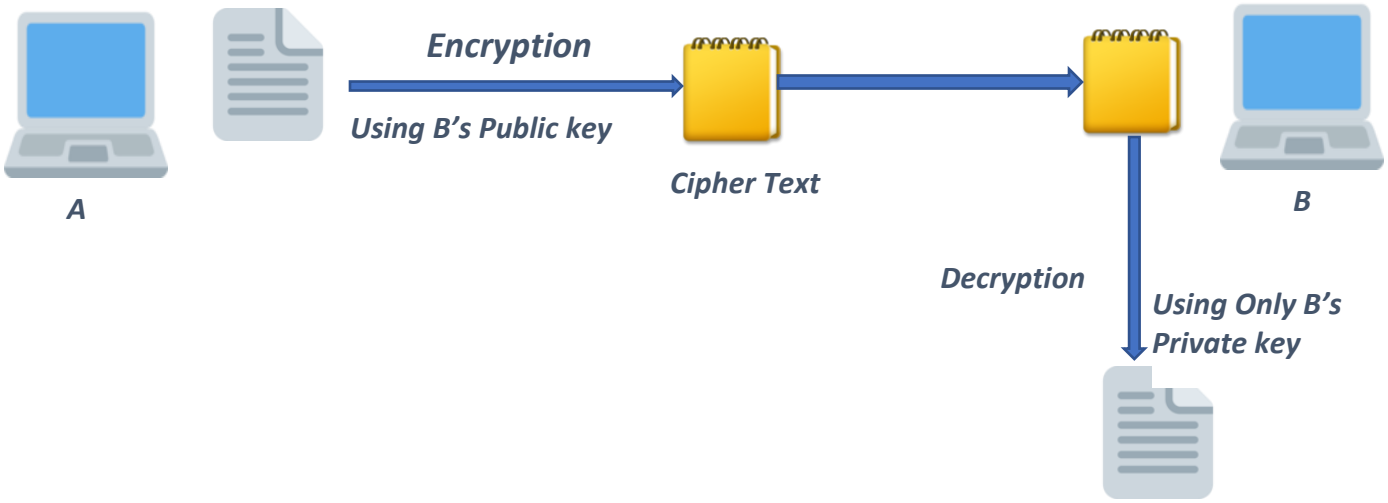
Lets understand the whole concept of asymmetric cryptography.

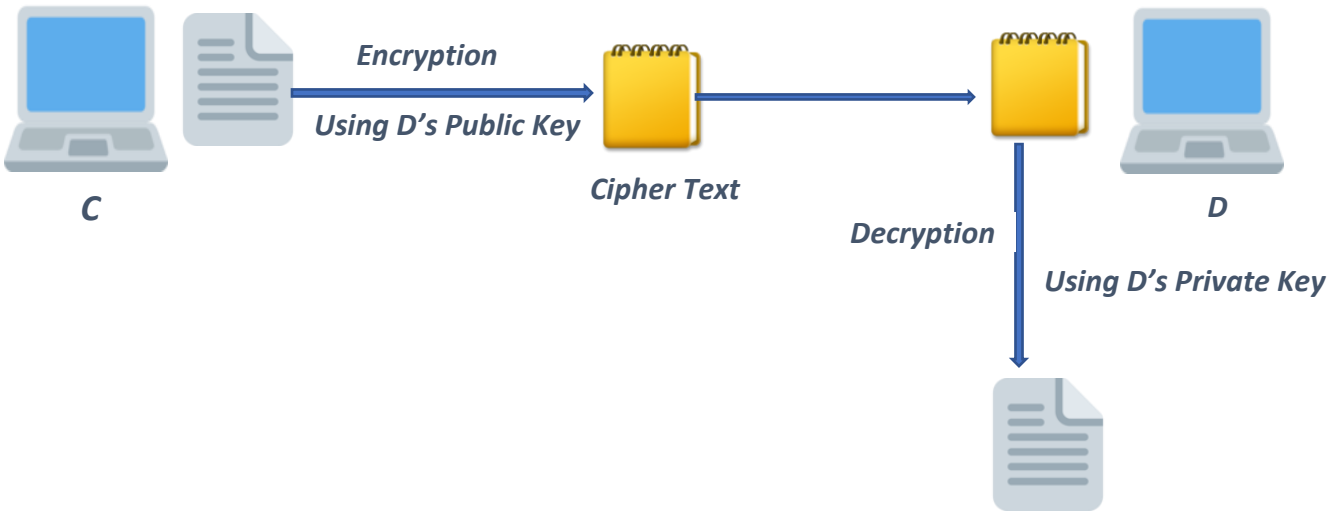
Assume we have 5 **Nodes** in blockchain and every **Nodes** have its Public and Private key.

Public keys are open and every node know about the public keys of each other.

If **Node A** wants to send the message to **Node B** then **Node A** will used **Node B**'s public Key to encrypt the message and everyone can see the encrypted message but no one can decrypt it.

Only **NodeB** whose public key is used by **NodeA** can decrypt the message


Encryption
Using B's Public key
Cipher Text
A
B
Decryption
Using Only B's
Private key


Encryption
Using D's Public Key
Cipher Text
C
D
Decryption
Using D's Private Key