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M20AIE313

Vanet - Assignment - II

1 transaction = message transfer from vehicle to Block chain server.

Terminology =

- AE - Encryption
- DE - Decryption
- K - Hashing
- Xo - XOR
- co - concatenation

Q1) How much time it will take to propagate all these messages (from M_1 to M_4) including all computation and communicational cost?

Ans:-

Computational cost

① Vehicle computational cost.

2 - Concatenate operation

1 - Encryption

1 - Hashing

2 - ID's

$$2C_0 + 1C_{AE} + 1C_K$$

⑥ Computational cost at RSU.

- 1- Decryption.
- 1- Hashing
- 2- Concatenation.
- 1- Encryption.

$$1C_{DE} + 1C_K + 1C_{AE} + 2C_{CO}$$

⑦ Block chain server

- 1 Decryption
- 1 Encryption.

$$1C_{DE} + 1C_{AE}$$

⑧ Computational cost at Controller

- 4- Concatenation
- 2- Hash
- 1- Encryption

$$4C_{CO} + 2C_K + 1C_{AE}$$

⇒ Total computational cost

$$2C_{CO} + 1C_{AE} + 1C_K$$

$$2C_{CO} + 1C_{AE} + 1C_K + 1C_{DE}$$

$$4C_{CO} + 1C_{AE} + 2C_K$$

$$1C_{AE}$$

$$1C_{DE}$$

$$8C_{CO} + 4C_{AE} + 4C_K + 2C_{DE}$$

We can ignore $8C_{CO}$ - concatenation

Vehicle

$$1C_{AE} + 1C_K$$

$$1.534 + 0.0083 = 1.5423$$

RSU

$$1C_{AE} + 1C_K + 1C_{DE}$$

$$1.534 + 1.834 + 0.0083$$

$$= 3.3763$$

Controller

$$1C_{AE} + 2C_K$$

$$1.534 + 2 \times 0.0083$$

$$= 1.5506$$

Block chain

$$1C_{AE} + 1C_{DE}$$

$$1.534 + 1.834$$

$$= 3.368$$

Server

$$4C_{AE} + 4C_K + 2C_{DE}$$

$$9.8372 \text{ milli sec}$$

Communication cost

∴ 2mbps channel given

$$2/250$$

 M_1

2 byte

$$1 \text{ mbps} = 125000 \text{ byte/sec}$$

$$5/250$$

 M_2

5 byte

$$= 125 \text{ byte/milli sec}$$

$$10/250$$

 M_3

10 byte

$$2 \text{ mbps} = 250000 \text{ bytes/sec}$$

$$18/250$$

 M_4

18 byte

$$2 \text{ mbps} = 250 \text{ bytes/milli sec}$$

$$0.008 \text{ milli seconds} \leftarrow M_1$$

$$\leftarrow M_2$$

$$0.02$$

$$\leftarrow M_3$$

$$0.04$$

$$\leftarrow M_4$$

$$0.072$$

total communicational
cost including computation

$$M_1 \rightarrow 9.8372 + 0.008 \Rightarrow 9.8452 \text{ mins}$$

$$M_2 \rightarrow 9.8372 + 0.02 \Rightarrow 9.8572 \text{ mins}$$

$$M_3 \rightarrow 9.8372 + 0.04 = 9.8772 \text{ mins}$$

$$M_4 \rightarrow 9.8372 + 0.072 = 9.9092 \text{ mins}$$

Q2) What will be the storage requirement to store complete one transaction (including everything required to propagate the information) in the network for each type of message?

Assumption:- message's M_1, M_2, M_3 & M_4 are communicated over channel which doesn't come under storage cost.

AE - Encryption
K - Hashing
V - variable

Vehicle

P - variable

O - Hashing

X - Encryption

$$\Rightarrow 1V + 1K + 1AE$$

$$\Rightarrow 1 + 1 + 1$$

$$\Rightarrow 3 \text{ bytes.}$$

RSU

Q' — Hashing
 Y — variable
 Z — Encryption

Hashing
 variable
 Encryption
 $1C_K + 1V + 1C_{AE}$

$$\Rightarrow 1 + 1 + 1$$

$\Rightarrow 3 \text{ bytes}$

Controller

M_{Info} — variable

TH — Hashing

PH — Hashing

BI — Variable

W — Encryption

$$2V + 2C_K + 1C_{AE}$$

$$\Rightarrow 2 + 2 + 1$$

$\Rightarrow 5 \text{ bytes}$

Blockchain server

S — Encryption

$$1C_{AE}$$

1 byte

- (ii) Including everything required propagate the information in the network for each type of message.

$M_4 \Rightarrow$ From above computation $3 + 3 + 5 + 1$
 $= 12 \text{ bytes}$

$$M_1 \rightarrow 2 \text{ bytes} + 12 = 14 \text{ bytes}$$

$$M_2 \rightarrow 5 + 12 = 17$$

$$M_3 \rightarrow 10 + 12 = 22$$

$$M_4 \rightarrow 18 + 12 = 30$$

Q3 If an accident happen at bad conditioned construction road.

a) How many messages are required.

3, messages are required.

accident M_1

Bad road M_2

Construction M_3

b) what time it will take to transmit from vehicle to controller?

b) Explain which type of message will be transmitted first & why?

M_3 Messages will be delivered in order of M_1 , M_3 & M_4 .

Priority and size of the message is in order of $M_1 < M_3 < M_4$

~~$M_1 < M_3 < M_4$~~