

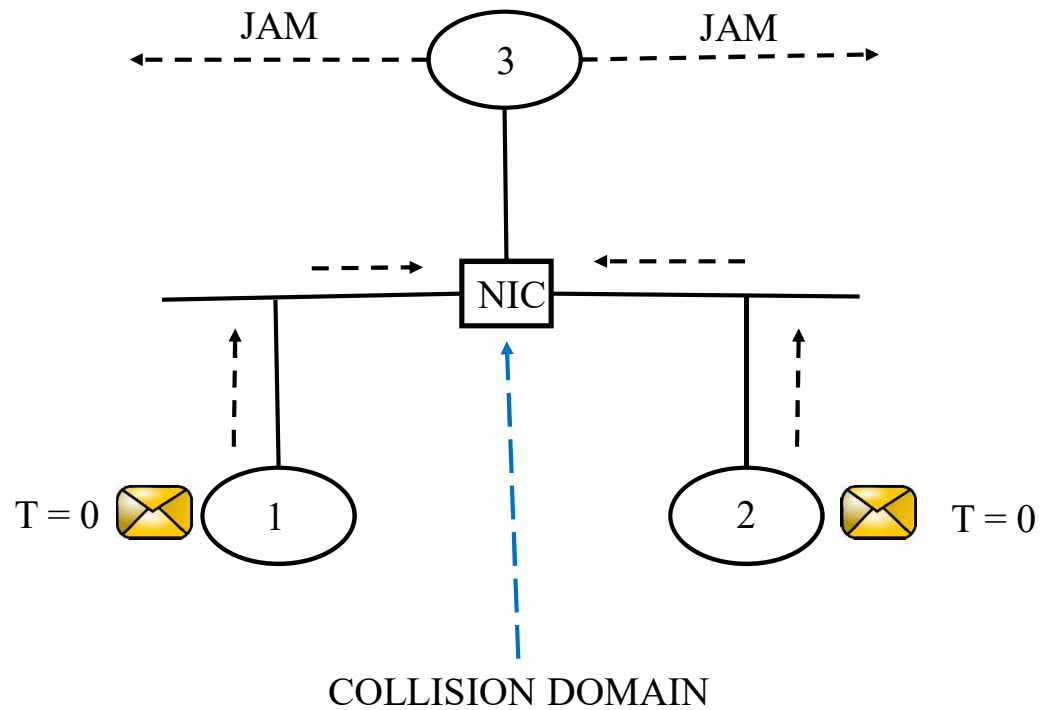
Introduction

- Carrier Sense Multiple Access with Collision Detection
- Ethernet
 - Connectionless communication at layer 2 (Data Link Layer)
 - No Flow Control & packet level error control
 - Uses the bus Topology
 - Uses CSMA-CD as access control mechanism

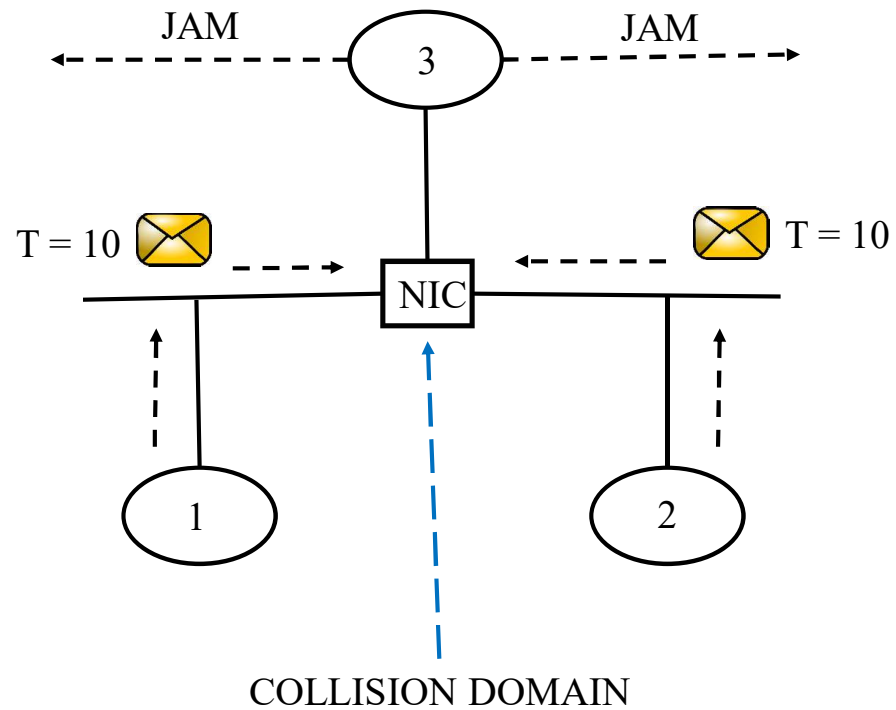
Terminologies:

- Carrier Sense
 - Sense the channel, whether the communication is taking place or not. If Yes then wait else transmit the data packet.
 - Channel is sensed in terms of voltage level
 - If $V = 0$ then No waveform, Channel is Free, Can transfer the data packet.
 - If $V \neq 0$ then somebody is already using the channel, Need to wait for some time.
- Multiple Access
 - If more than one systems find the channel free they can transfer the data simultaneously.
 - Medium is shared among the systems.
- Collision Detection
 - If collision occur, JAM signal is used to detect the occurrence of collision and send to the systems in the channel.

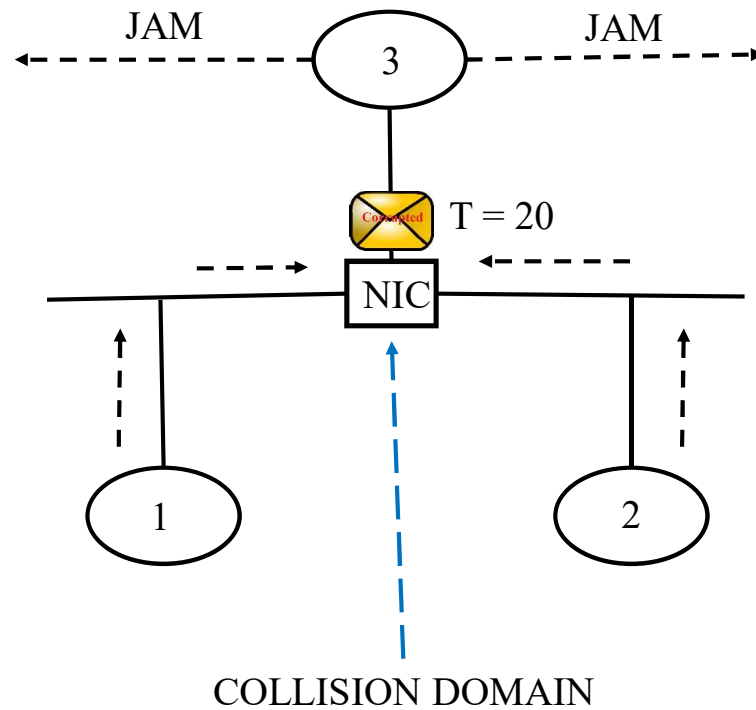
Graphical Representation



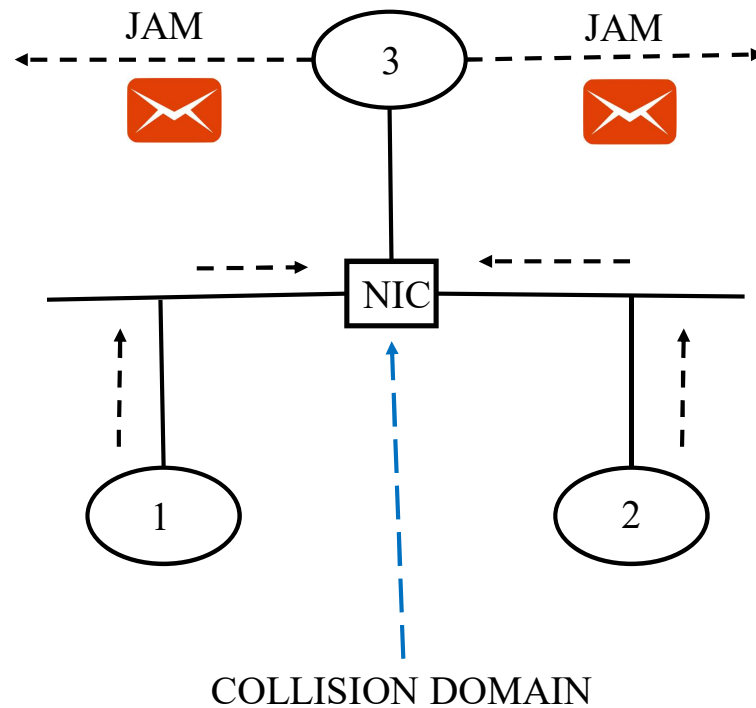
Graphical Representation



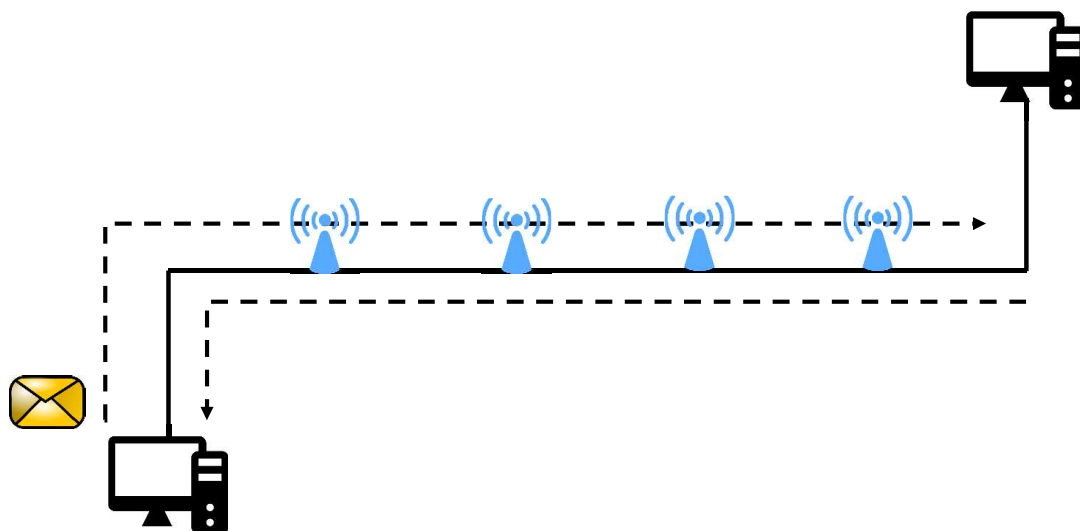
Graphical Representation



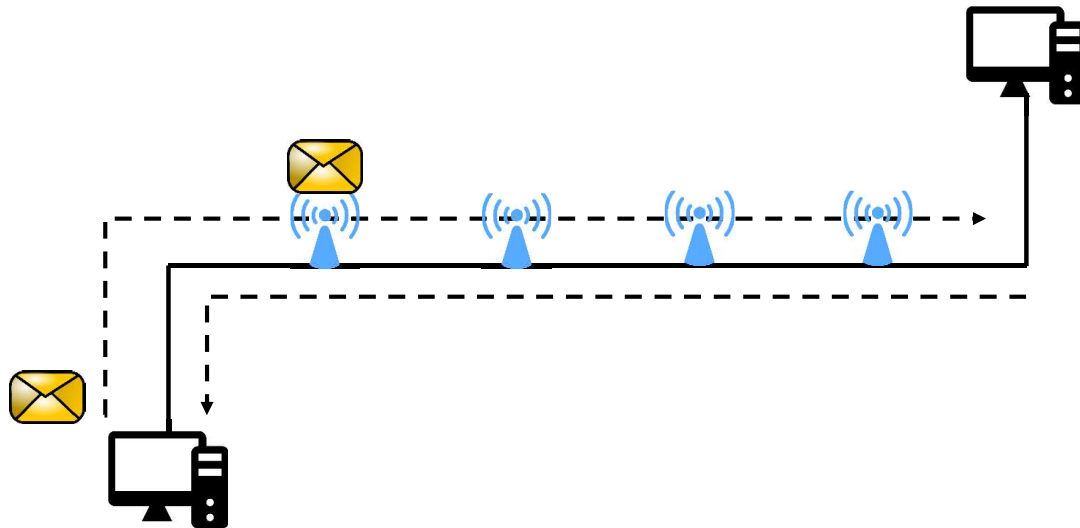
Graphical Representation



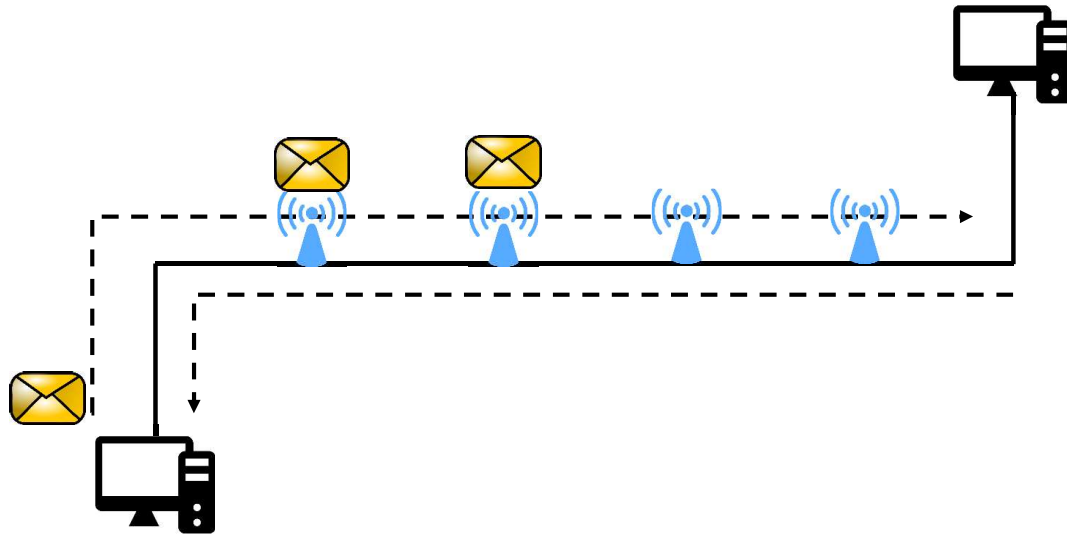
Frames Vanished During Collision Detection



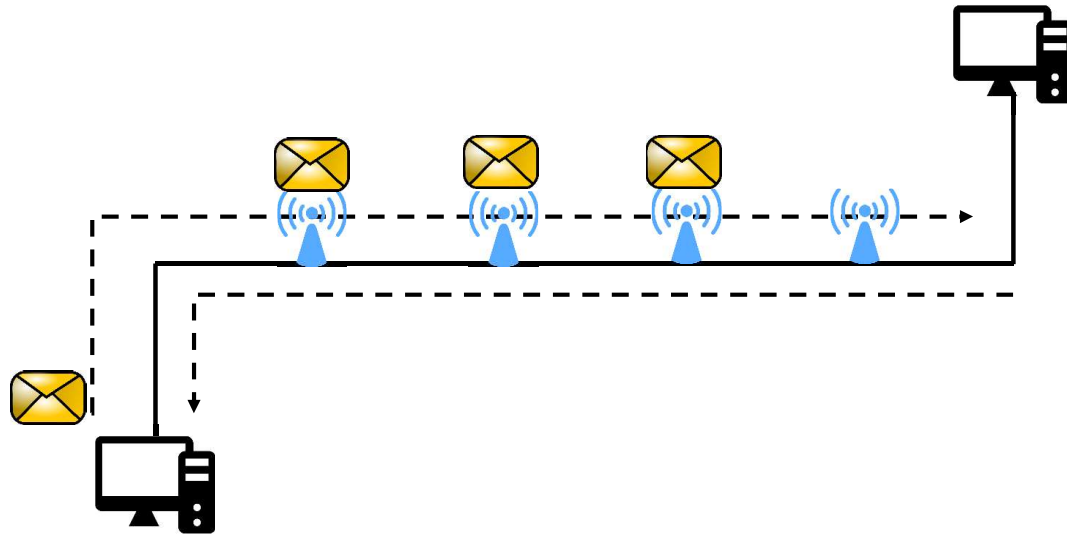
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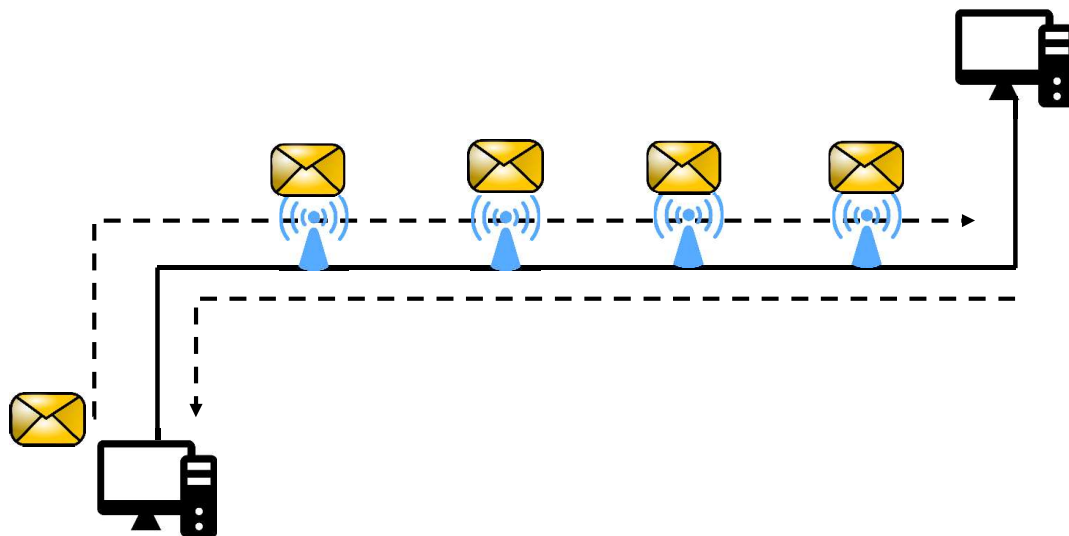
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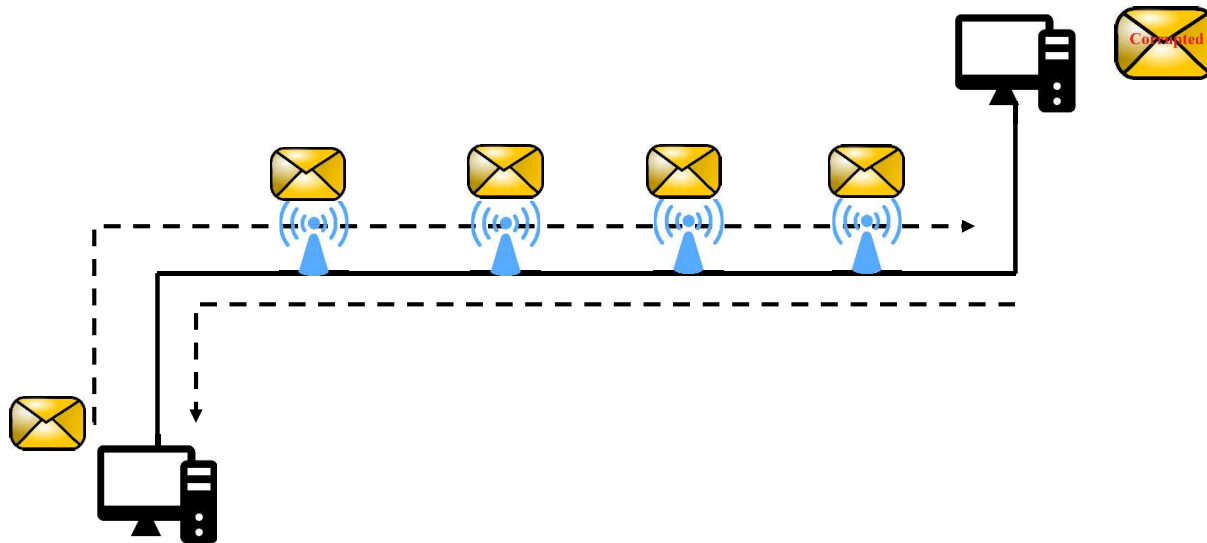
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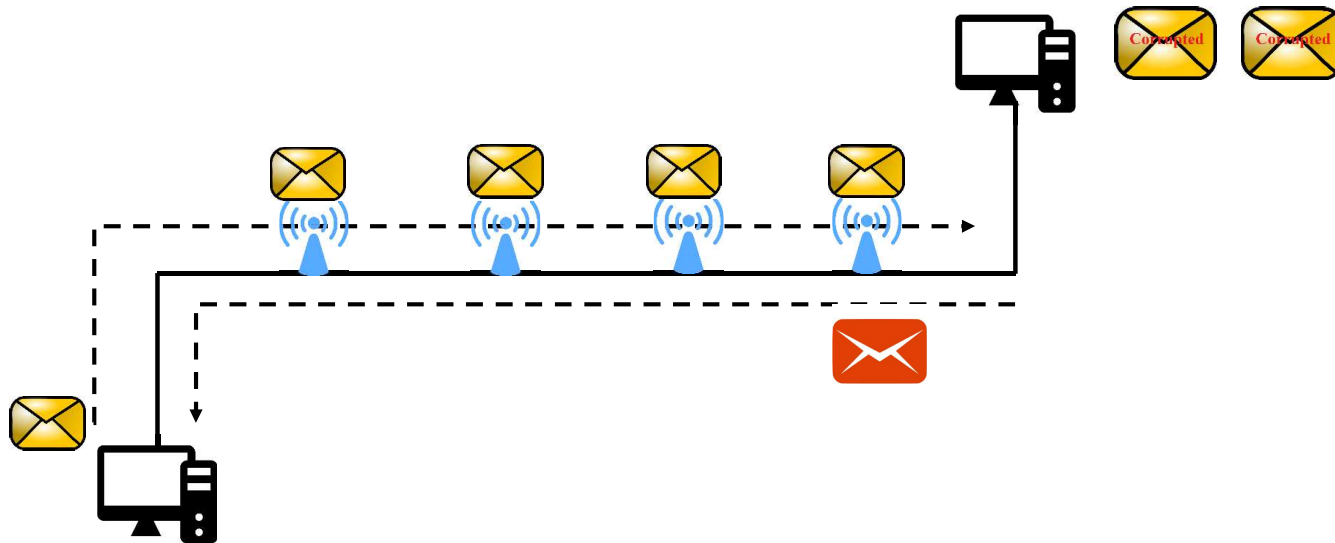
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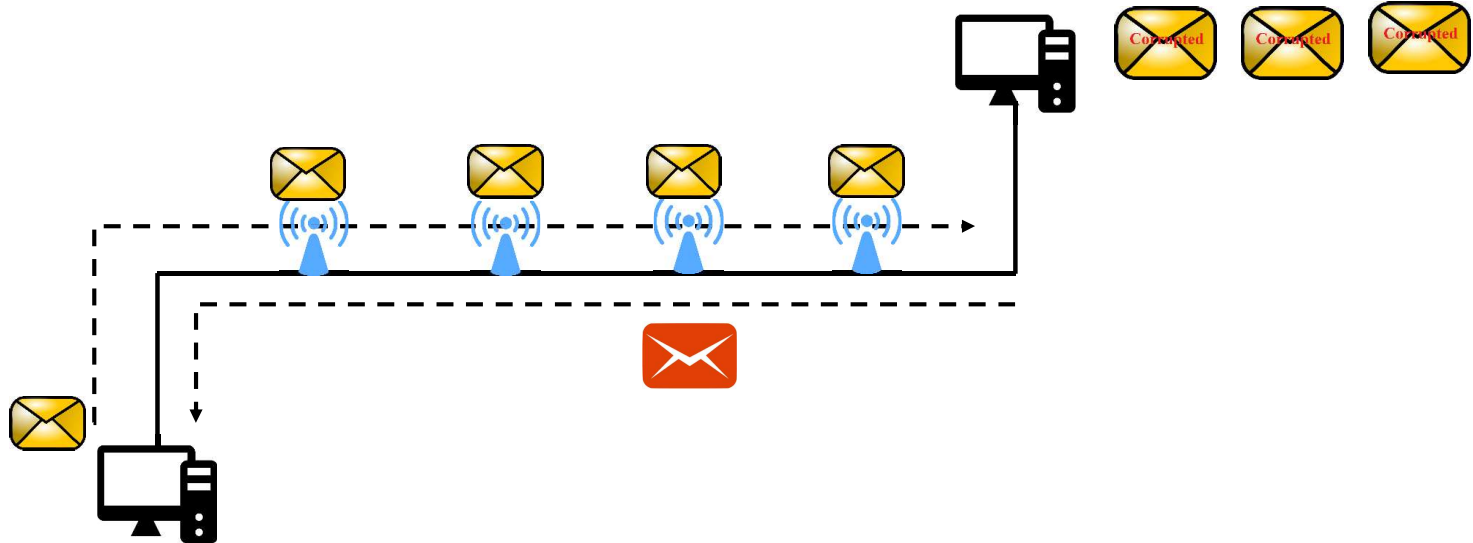
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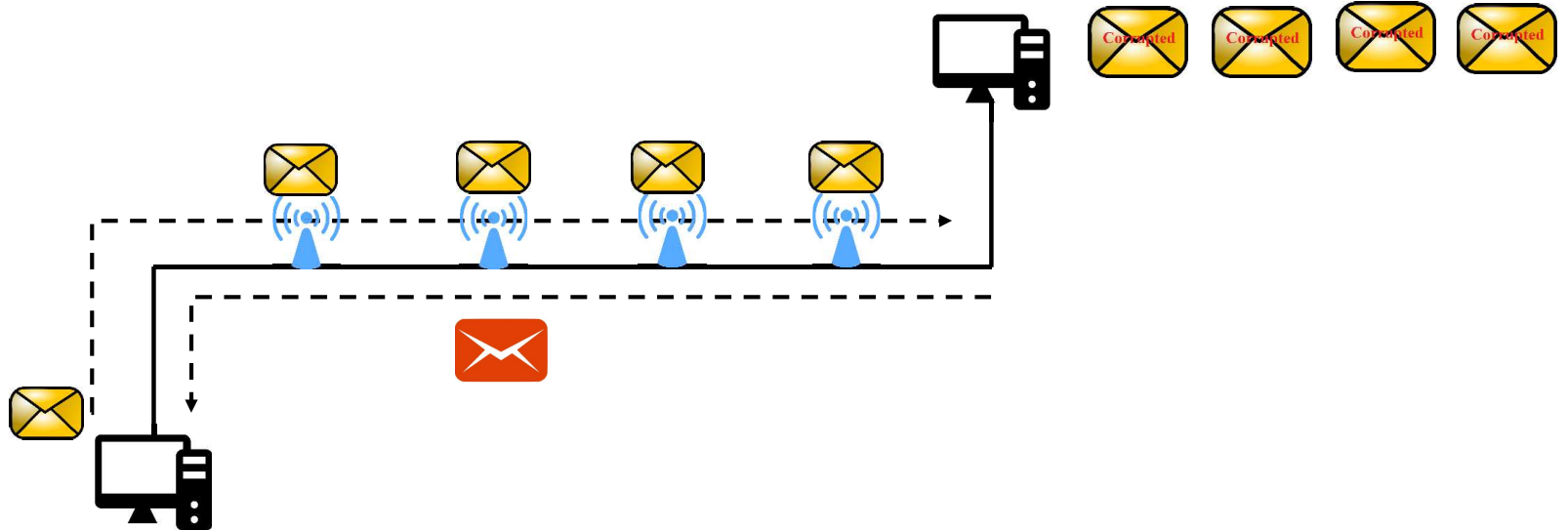
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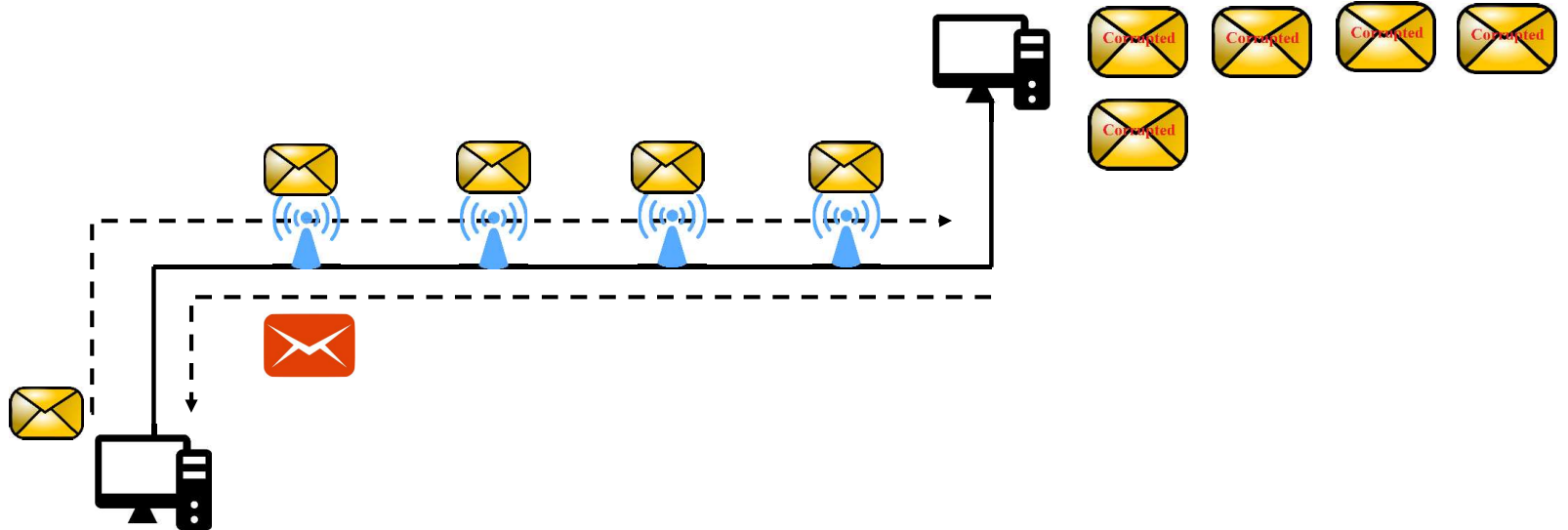
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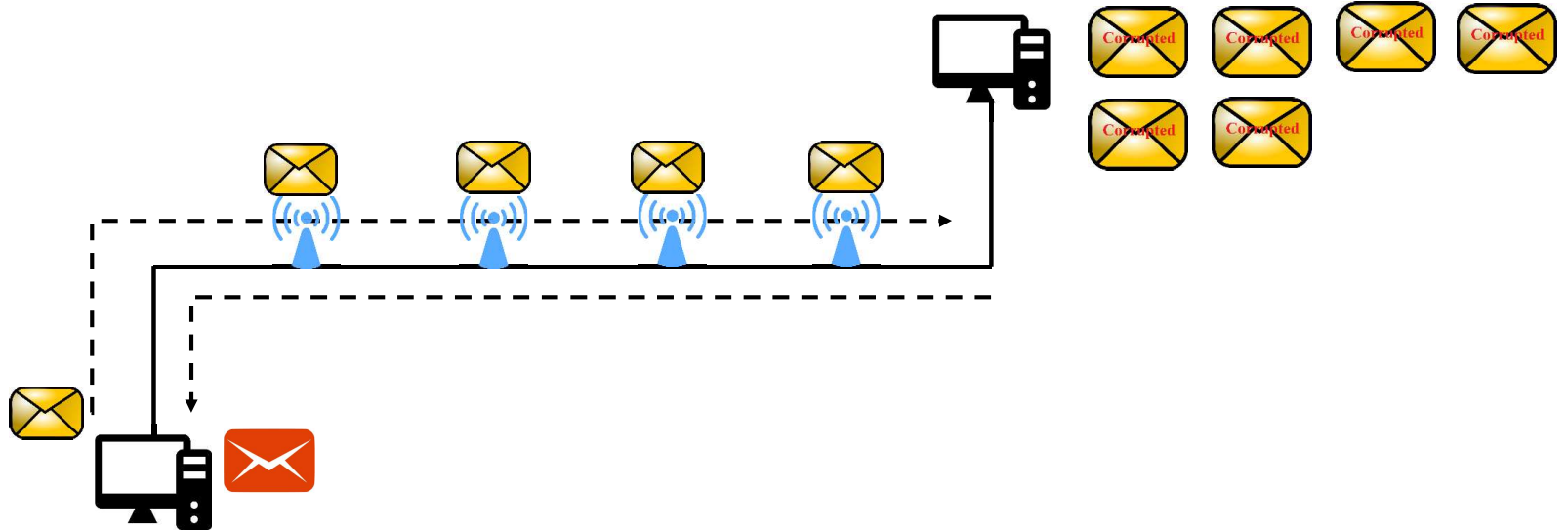
Frames Vanished During Collision Detection



Frames Vanished During Collision Detection



Frames Vanished During Collision Detection



Condition for Minimum Frame Size

$$\text{RTT} = \text{Transmission Delay}$$

$$2 * \frac{d}{v} = \frac{L}{B}$$

Where-

$$d = 250 \text{ mtr}$$

$$v = 300000 \text{ km/s (light speed)}$$

$$B = 100 \text{ mbps}$$

So-

$$L = 576 \text{ bits or } 72 \text{ Bytes}$$

Back-Off Algorithm

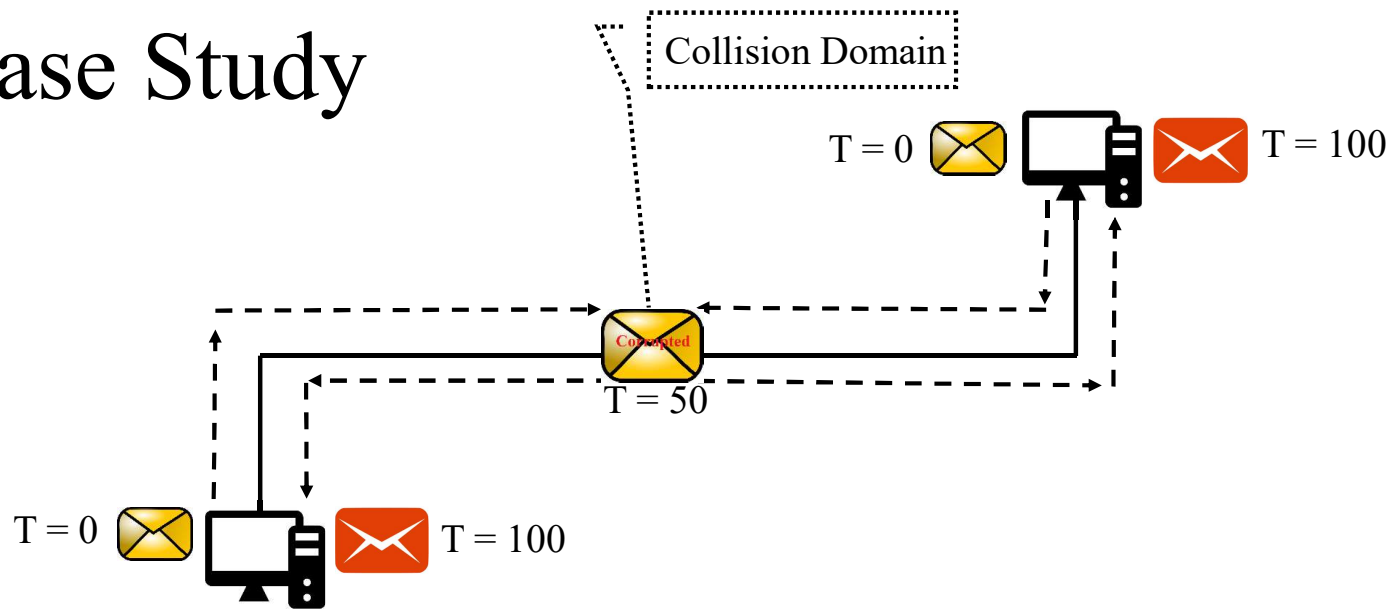
- It gives the waiting time for the stations which are involved in the collision.

$$\text{Waiting Time} = k * 51.2 \mu s$$

Where-

k is randomly derived from 0 to $2^n - 1$ (where n = collision number)

Case Study



Let $n = 1$ So,
 $K = 0$ to $2^1 - 1$ i.e. $\{0, 1\}$

Select $K = 0$ Then

Waiting Time = $0 * 51.2 \mu s$

Waiting Time = $0 \mu s$

Let $n = 1$ So,
 $K = 0$ to $2^1 - 1$ i.e. $\{0, 1\}$

Select $K = 1$ Then

Waiting Time = $1 * 51.2 \mu s$

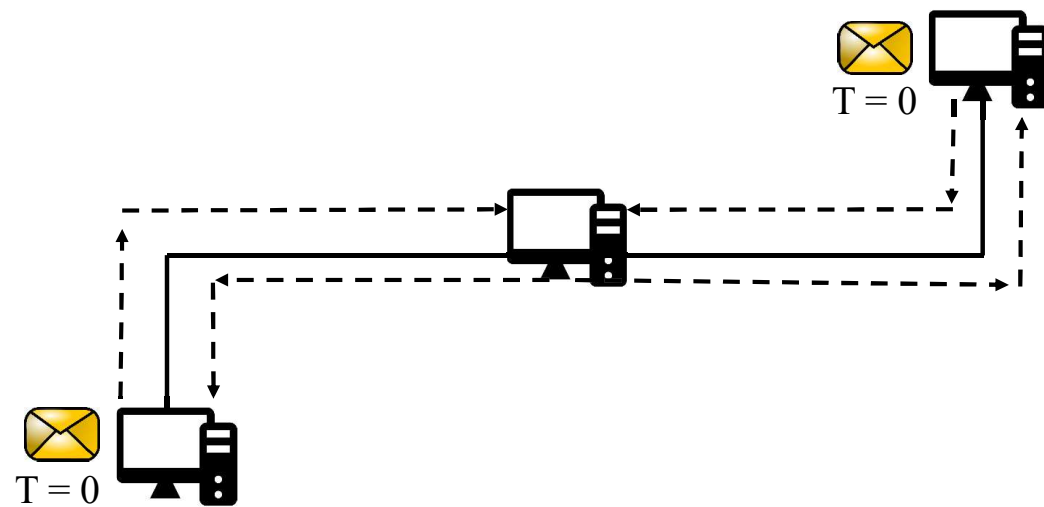
Waiting Time = $51.2 \mu s$

Limitation of Back-Off Algorithm

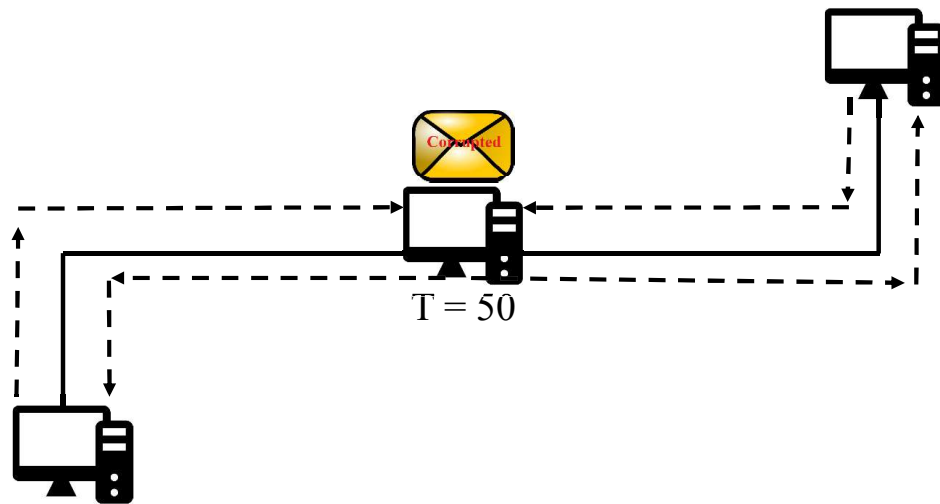
- Capture Effect

- The channel capture effect is a phenomenon where one user of a shared medium "captures" the medium for a significant time.
- This effect was first seen in networks using CSMA/CD on Ethernet.
- During this period (usually 16 frames) other users are denied use of the medium.
- The channel capture effect happens when one user continues to "win" the link.
- The channel capture effect creates a situation where one station is able to transmit while others are continually backing off, thus leading to a situation of short-term unfairness.

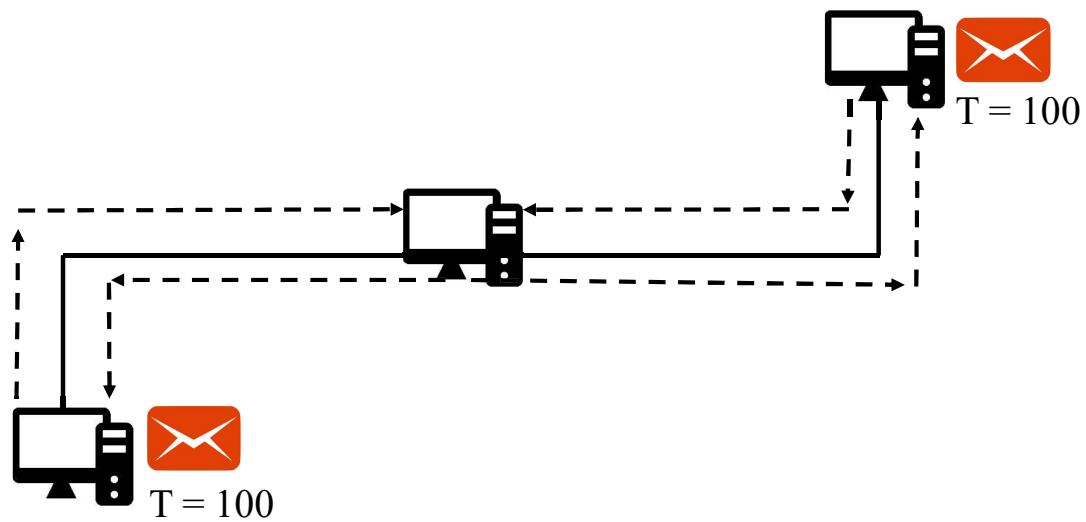
Case Study



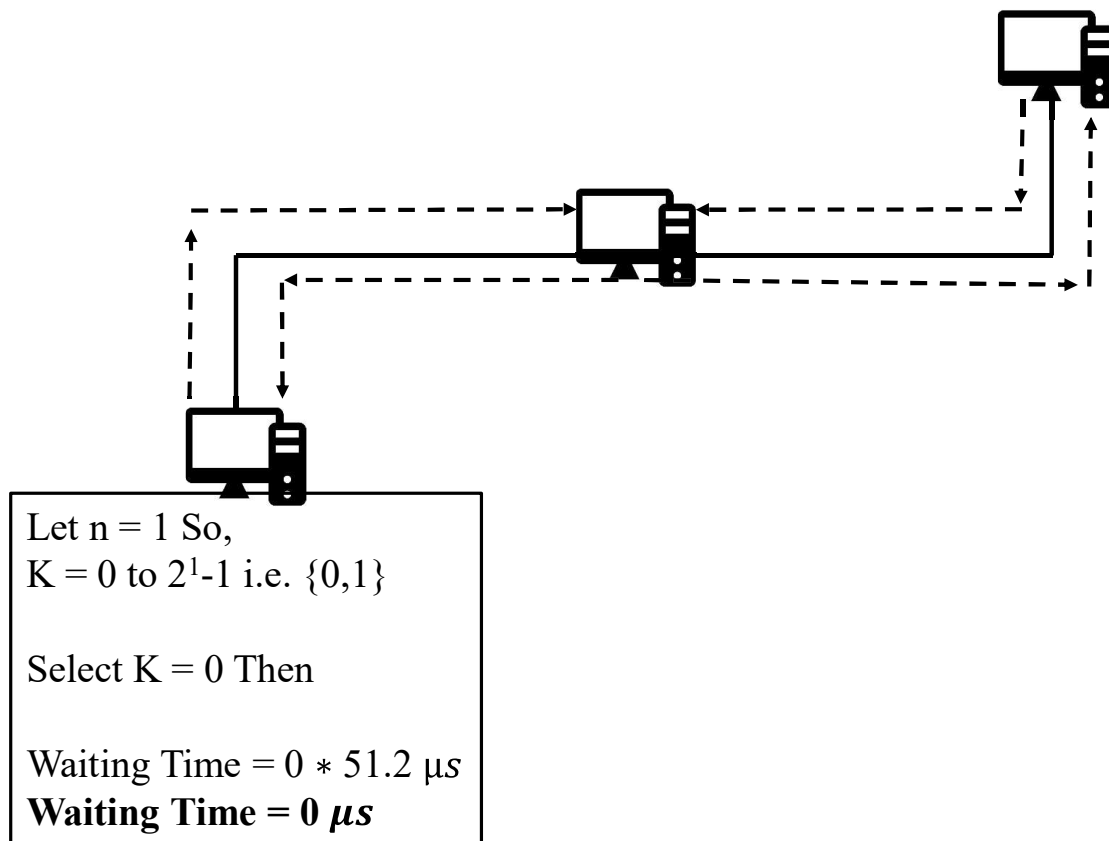
Case Study



Case Study



Case Study

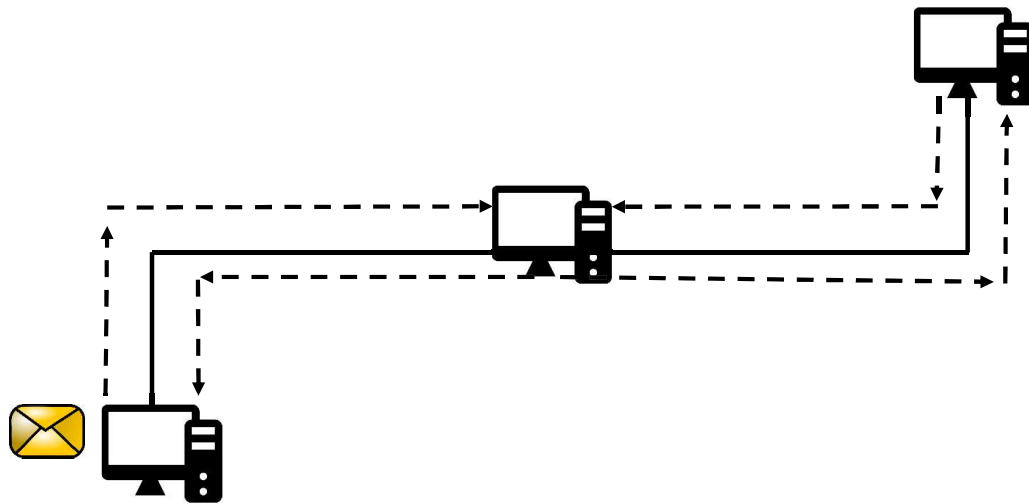


Let $n = 1$ So,
 $K = 0$ to $2^1 - 1$ i.e. $\{0, 1\}$

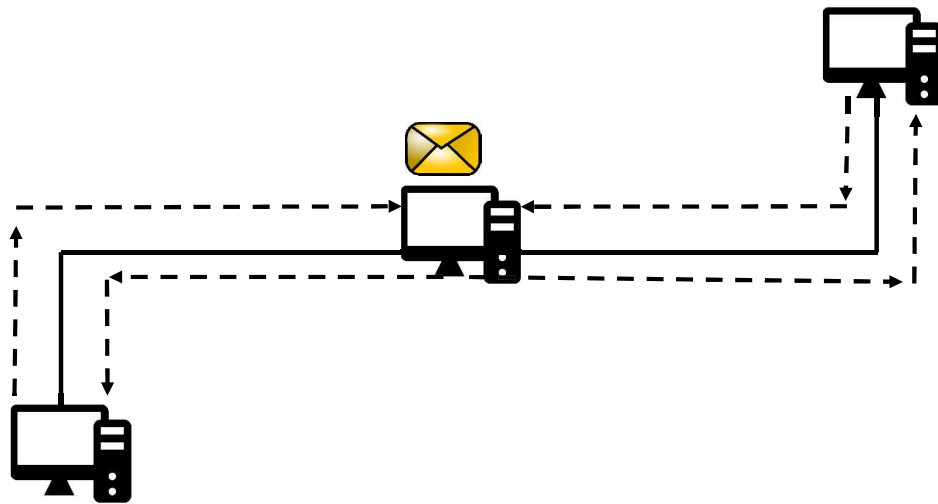
Select $K = 1$ Then

Waiting Time = $1 * 51.2 \mu s$
Waiting Time = $51.2 \mu s$

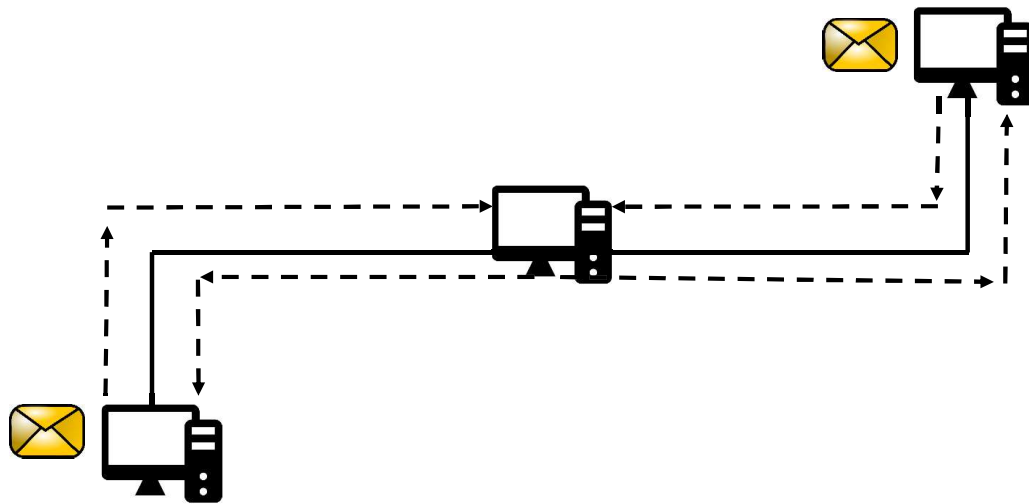
Case Study



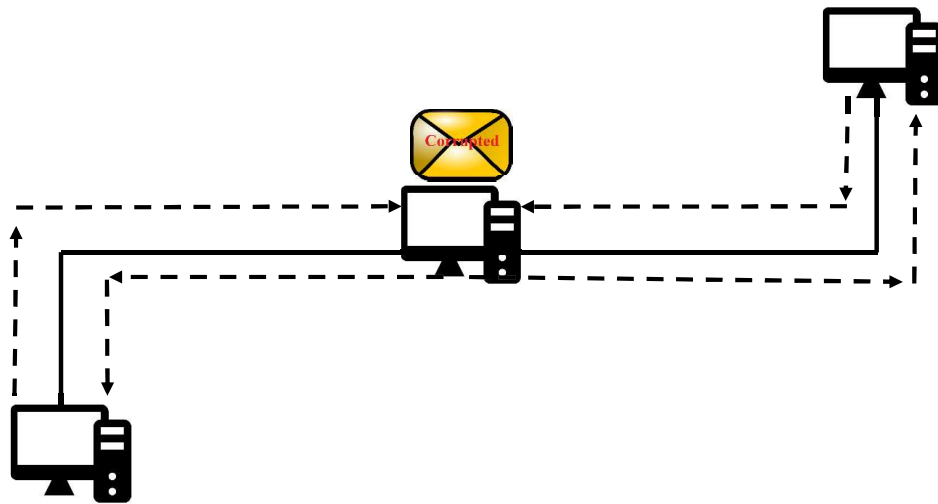
Case Study



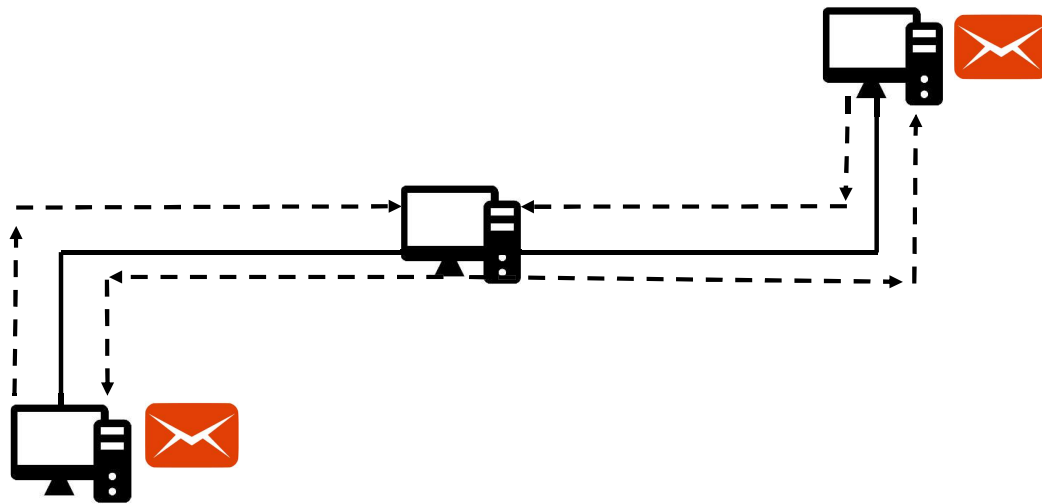
Case Study



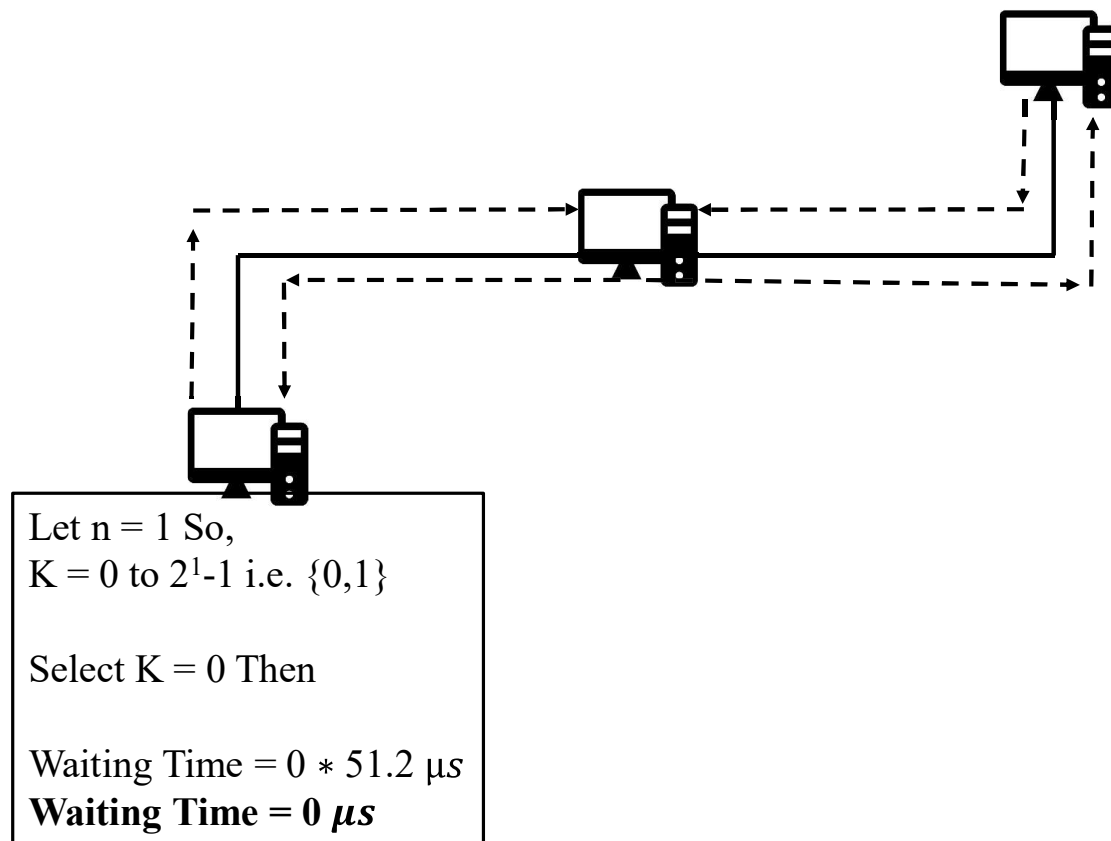
Case Study



Case Study



Case Study



Let $n = 2$ So,
 $K = 0$ to $2^2 - 1$ i.e. $\{0, 1, 2, 3\}$

Select $K = 2$ Then

Waiting Time = $2 * 51.2 \mu s$
Waiting Time = $102.4 \mu s$

Thank You!

Any Questions?