計網 HW3 Document

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Abstract

我們主要是模擬 TCP 的運作，並將一些與作業較沒關係的部分予以簡化。另外我們還有 implement Congestion Control 跟 Flow Control。

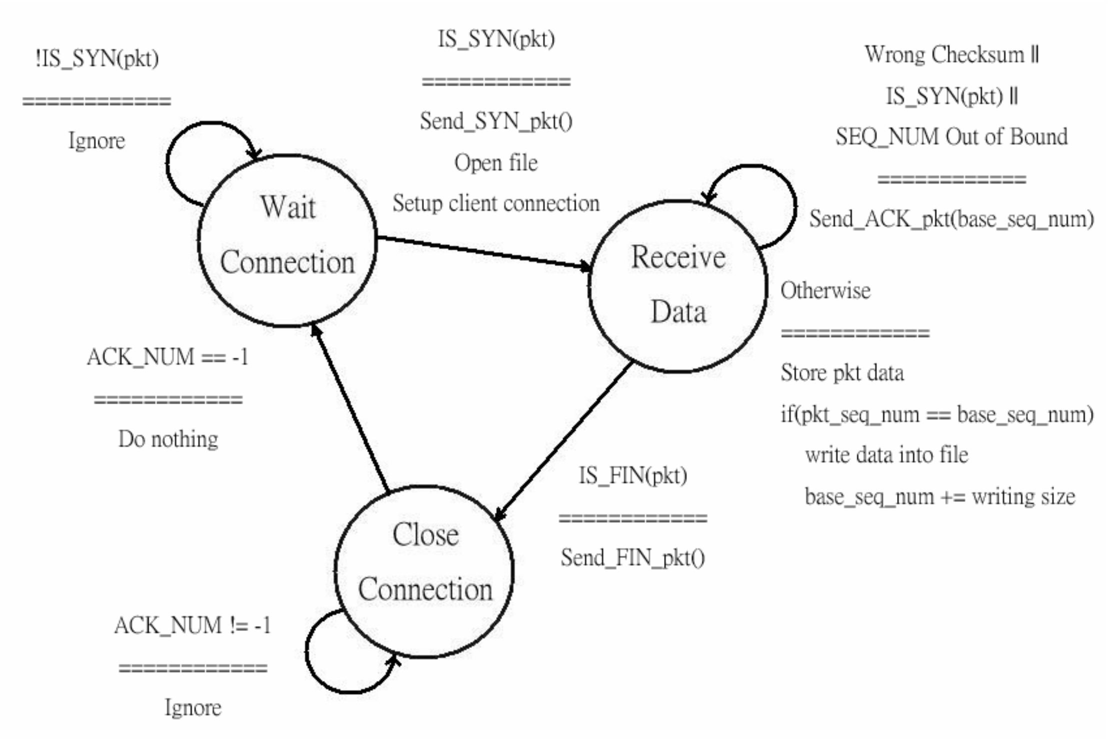
Header Format

Total Length： 20 bytes
欄位內容如下表：

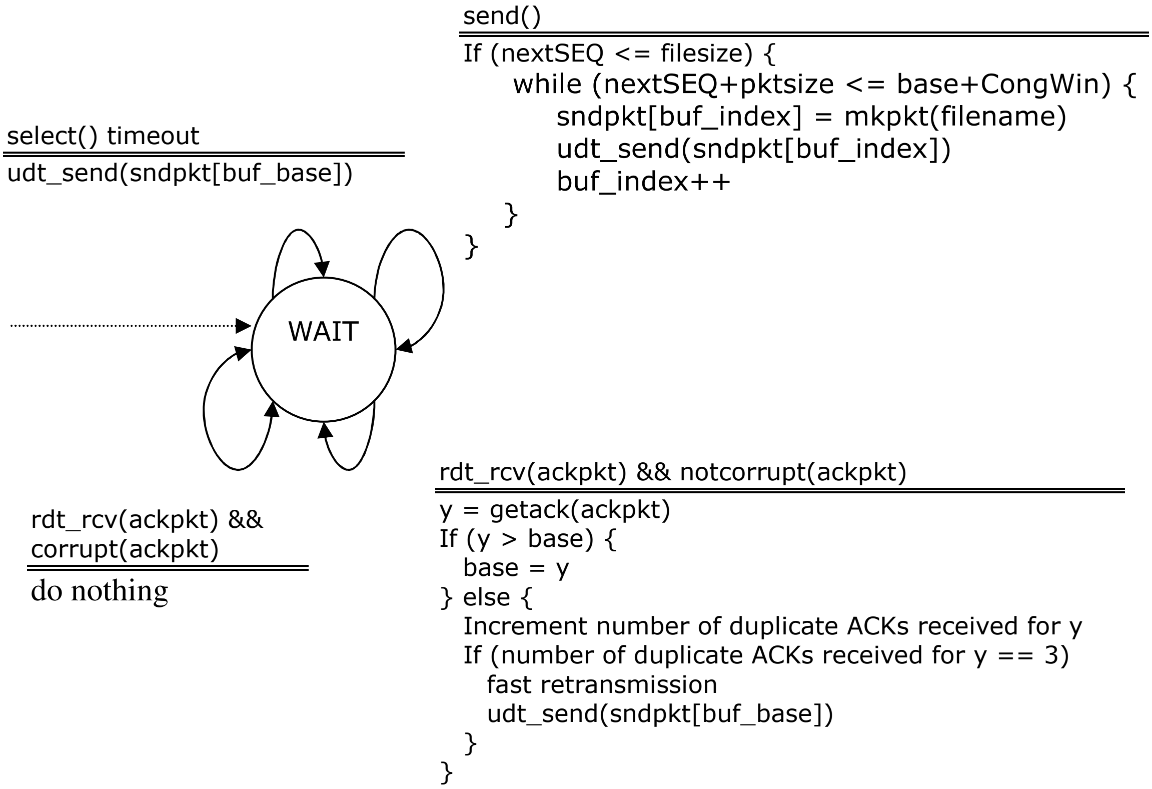
4(bytes)	4	4	4	1	3
Checksum	Seq Num	Ack Num	Pkt Length	Flag	Optional

(PS: Data size < 1024 bytes)

Server Side Mechanism



Client Side Mechanism



```
send()
-----------------------------------------------
If (nextSEQ <= filesize) {
    while (nextSEQ+pktsize <= base+CongWin) {
        sndpkt[buf_index] = mkpkt(filename)
        udt_send(sndpkt[buf_index])
        buf_index++
    }
}
```

```
select() timeout
-----------------------------------------------
udt_send(sndpkt[buf_base])
```

```
rdt_rcv(ackpkt) &&
corrupt(ackpkt)
-----------------------------------------------
do nothing
```

```
rdt_rcv(ackpkt) && notcorrupt(ackpkt)
-----------------------------------------------
y = getack(ackpkt)
If (y > base) {
  base = y
} else {
  Increment number of duplicate ACKs received for y
  If (number of duplicate ACKs received for y == 3)
    fast retransmission
    udt_send(sndpkt[buf_base])
  }
}
```

Why Reliable?

我們的FSM主要是模擬TCP的運作，利用SEQ_NUM跟ACK_NUM傳遞的方式在Sender跟Receiver之間做溝通，Sender利用SEQ_NUM告知Receiver他所要傳送的data segment，而Receiver則藉由ACK_NUM告知Sender他所接收到的data segment有哪些，因此藉由這些溝通就可以保證每個data segment都會被接收到。另外由於packet也有可能傳來錯誤的資料，因此我們多加了checksum的機制來做多一層的檢驗, 將錯誤率降低。

Flow Control

我們讓 Sender 跟 Client 擁有同樣大小的 BUFFER WINDOW SIZE，所以無論如何 total size of unacked packet 不會超過 BUFFER WINDOW SIZE 以上大小。

Congestion Control

State	Event	TCP Sender Congestion-control Action	Commentary

SS	ACK receipt for previously unacknowledged data	CongWin = CongWin + pktsize,
		If (CongWin > Threshold)
		CongState = SS
			Doubling of CongWin every RTT received

CA	ACK receipt for previously unacknowledged data	CongWin = CongWin + pktsize * (pktsize/CongWin)	Additive increase, increase CongWin by 1 pktsize every RTT

SS or CA	Loss event detected by triple duplicate ACK	Threshold = CongWin/2,
		CongWin = Threshold,
		CongState = CA
			Fast recovery

SS or CA	Timeout	Threshold = CongWin/2,
		CongWin = 1 pktsize,
		CongState = SS
			Enter SS, resend packet

SS or CA	Duplicate ACK	Increment duplicate ACK count for segment being acknowledged	CongWin and Threshold not changed