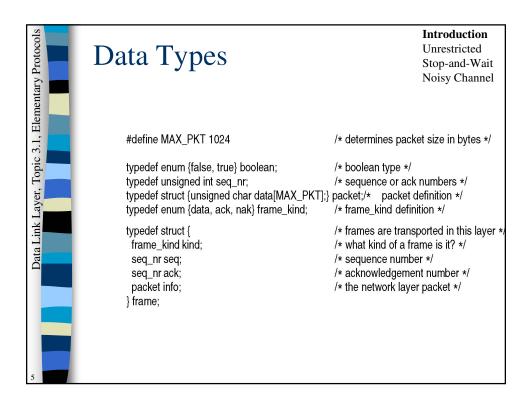
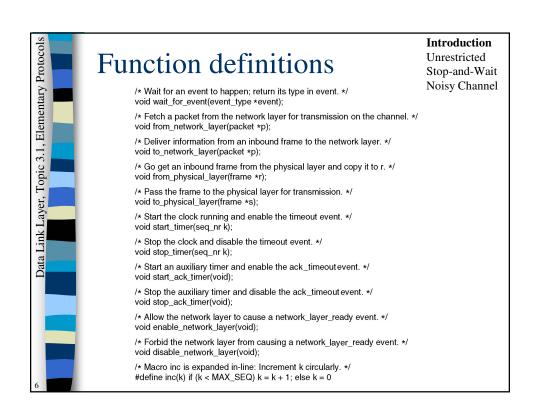


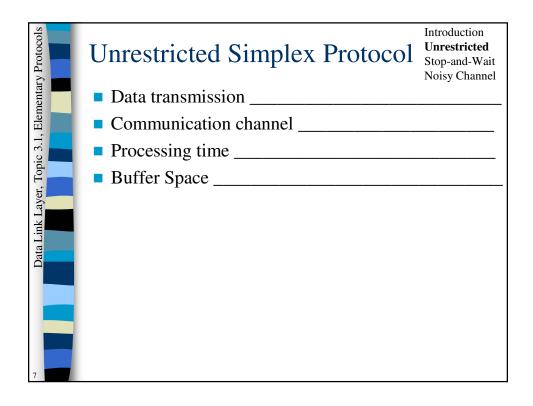
Elementary Protocols Introduction Unrestricted Stop-and-Wait Noisy Channel Assumptions & Declarations Unrestricted Simplex Protocol Simplex Stop and Wait protocol Simplex Protocol for a noisy channel

Data Link Layer, Topic 3.1, Elementary Protocols	Assumptions	Introduction Unrestricted Stop-and-Wait Noisy Channel
	Physical, Data link & network are all	
	Service being provided is	
	■ Data is always available	
	■ Machines do not crash	
	■ Treat all data as pure data although	
Data	Assume the existence of the Physical lay	er including
Н	to_physical_layer	
	from_physical_layer	
3	 Computation of the checksum 	

More assumptions	Introduction Unrestricted Stop-and-Wait Noisy Channel
wait_for_event	
 Normally this would be done with 	
■ Frame arrival will either cause	
<pre>- event = frame_arrival</pre>	
– event = cksum_err	
If everything is OK	
	wait_for_eventNormally this would be done with







```
Sender

Sender

Void sender1(void) {

frame s;

packet buffer;

while (true) {

from_network_layer(&buffer);

s.info = buffer;

to_physical_layer(&s);

}

}
```

```
Receiver

Void receiver1(void) {

frame r;

event_type event;

while (true) {

wait_for_event(&event);

from_physical_layer(&r);

to_network_layer(&r.info);

}

}
```

Layer, Topic 3.1, Elementary Protocols	Stop-and-Wait Protocol	Introduction Unrestricted Stop-and-Wait Noisy Channel
nenta	Data transmission	
, Elen	Communication channel	
ic 3.1	Processing time	
, Top	Buffer Space	
Data Link Layer	 The receiver can be flooded by the send prevent this we can Insert delays	

```
Sender

Sender

void sender2(void){

frame s;

packet buffer;

event_type event;

while (true) {

from_network_layer(&buffer);

s.info = buffer;

to_physical_layer(&s);

wait_for_event(&event);

}

}
```

```
Receiver
void receiver2(void){
frame r, s;
event_type event;
while (true) {
    wait_for_event(&event);
    from_physical_layer(&r);
    to_network_layer(&r);
    to_physical_layer(&s);
}
}
```

Data Link Layer, Topic 3.1, Elementary Protocols			_	ntroduction
toc	Results		J	Inrestricted
ro	1 ACSUITS			Stop-and-Wait
y I			N	Noisy Channel
T a	Simulating Protocol 2			
ner	Events	100000		
len	Timoute	30		
面	pkt_loss	0		
3.1	pkt_cksum	0		
, <u>2</u>		Process 0	Process 1	_
do	Total data frames sent	12580	0	
, T	Data frames lost	0	0	
yeı	Data frames not lost	12580	0	
La	Frames retransmitted	0	0	
뇜	Good ack frames rec'd	12579	0	
Li	Bad ack frames rec'd	0	0	
ata				
Õ	Good data frames rec'd	0	12580	
	Bad data frames rec'd	0	0	
	Payloads accepted	0	12580	
	Total ack frames sent	0	12580	
	Ack frames lost	0	0	
	Ack frames not lost	0	12580	
	Timeouts	0	0	
	Ack timeouts	0	0	
13				

Data Link Layer, Topic 3.1, Elementary Protocols	Protocol for a Noisy Channel	Introduction Unrestricted Stop-and-Wait Noisy Channel
nenta	Data transmission	
Elen,	Communication channel	
c 3.1,	- Corrupt Frames	
ayer, Topi	– Missing Frames	
ink L	Solution	
ata L	- Use a timer:	
	- Problem:	
	Use Sequence Numbers:	
	– PAR/ARQ:	
14		

```
Data Link Layer, Topic 3.1, Elementary Protocols
                                                                  Introduction
                                                                  Unrestricted
         Sender
                                                                  Stop-and-Wait
                                                                  Noisy Channel
         void sender3(void){
           frame s;
                                       packet buffer;
           event_type event;
                                       seq_nr next_frame_to_send = 0;
           from_network_layer(&buffer);
           while (true) {
               s.info = buffer;
                                      s.seq = next_frame_to_send;
               to_physical_layer(&s);
               start_timer(s.seq);
               wait_for_event(&event);
               if (event == frame_arrival) {
                    from_physical_layer(&s);
                    if (s.ack == next_frame_to_send) {
                          from_network_layer(&buffer);
                          inc(next_frame_to_send);
                     }
```

```
Introduction
Data Link Layer, Topic 3.1, Elementary Protocols
          Receiver
                                                                    Unrestricted
                                                                    Stop-and-Wait
                                                                    Noisy Channel
          void receiver3(void){
           frame r, s;
                                 event_type event;
           seq_nr frame_expected = 0;
           while (true) {
                wait_for_event(&event);
                if (event == frame_arrival) {
                     from_physical_layer(&r);
                     if (r.seq == frame_expected) {
                           to_network_layer(&r.info);
                           inc(frame_expected);
                     s.ack = 1 - frame_expected;
                     to_physical_layer(&s);
                }
```

ls			Introduction		
Data Link Layer, Topic 3.1, Elementary Protocols	D 1.		Unrestricted		
otc	Results			١., ا	
Pro	Tebuits		Stop-and-W		
>		Noisy Channel			
tan 💻	Simulating Protocol 3				
len	Events	100000			
iii —	Timeout	30			
菌	pct loss	20			
-,	pct cksum	15			
ω	F				
ojc		Process 0 Pr	rocess 1		
Jo_	Total data frames sent	5994	0		
L,	Data frames lost	1231	0		
.ie.	Data frames not lost	4763	0		
<u>a</u>	Frames retransmitted	2806	0		
	Good ack frames rec'd	2694	0		
<u> </u>	Bad ack frames rec'd	493	0		
1					
ate	Good data frames rec'd	0	4037		
	Bad data frames rec'd	0	726		
	Payloads accepted	0	2686		
	Total ack frames sent	0	4037		
	Ack frames lost	0	850		
	Ack frames not lost Timeouts	2806	3187		
	Ack timeouts	2806	0		
	Ack tilleouts	1 0	<u> </u>		
	Efficiency (payloads accepted/data pkts sent) = 44	1%			
	End of simulation. Time=100000	- /-			
17					
1 /					