**Consider the cross-country example shown in Figure 3.17. How big would the window size have to be for the channel utilization to be greater than 98 percent? Suppose that the size of a packet is 1,500 bytes, including both header fields and data.**

Data packet
a. A stop-and-walt protocol In operation
Figure 3.17 Stop-and-wait versus pipelined protocol
Data packets
ACK pac

**Answer with detailed explanation**

dtrans= L/R  
packet size is 1500 bytes  
link is 1gbps  
Therefore  dtrans= 1500 bytes\*8/109  
                 = 0.000012 sec  
                 =0.012 milliseconds  
So, packet need 0.012 ms to be sent on the link   
As per the problem , the utilization = 0.98 is required  
Usender= (L/R)/RTT+(L/R)   
Here RTT=30  
dtrans= L/R=0.012ms  
Let's assume windows size is x  
U=(L/R)\*x/RTT+(L/R)=0A.012\*x/30.012  
=0.98  
So x=2450.98