

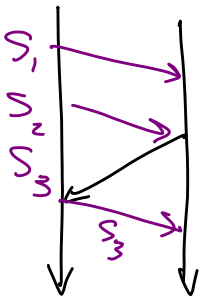
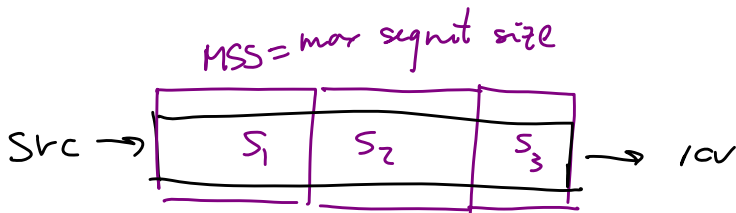
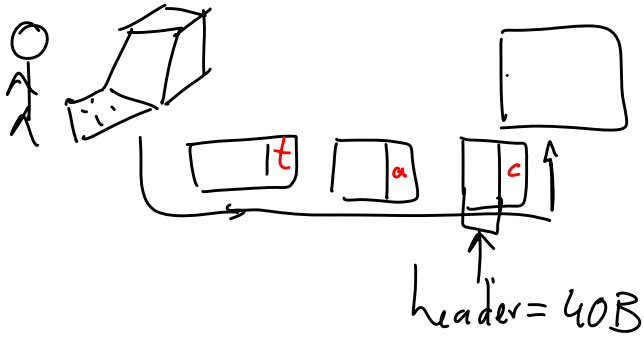
Lecture 4

Note Title

1/19/2005

Nagle's Algorithm

Historical background: in mid 80s, TCP used for $\left\{ \begin{array}{l} \text{FTP, bulk data, tx} \\ \text{email, news} \\ \text{telnet} \end{array} \right.$



Algorithm:

- packets of length $< MSS$ must wait for acks to all previous bytes

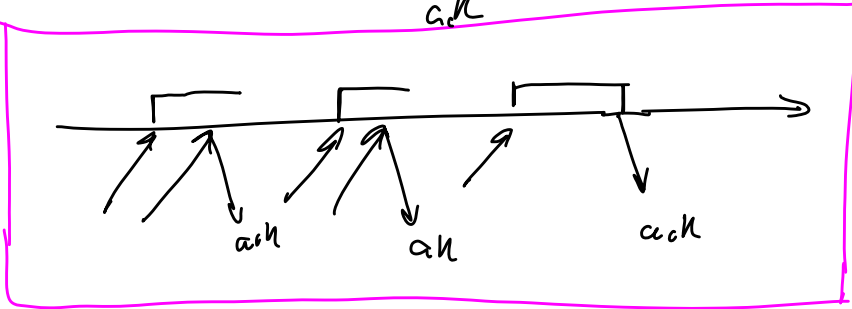
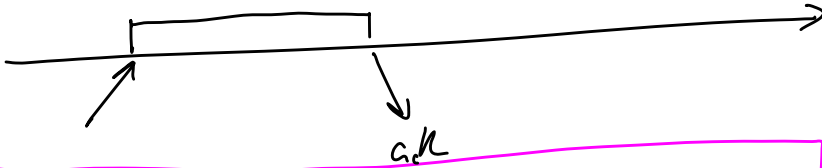
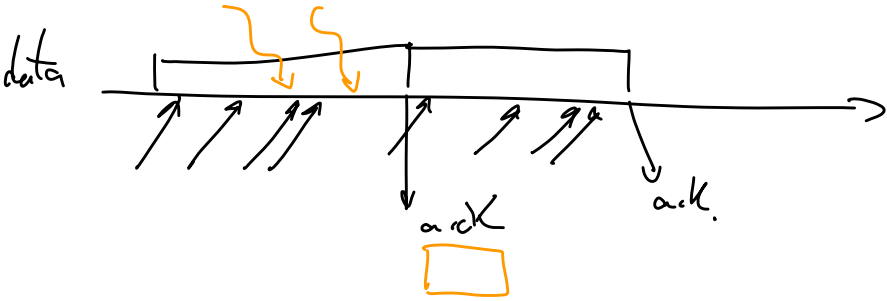
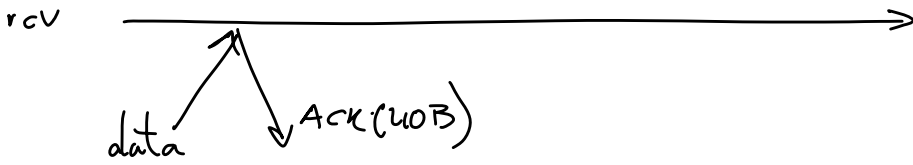
\Rightarrow at most one outstanding small (length $< MSS$) per RTT.

However, a bulk data transfer pays a penalty of an RTT at the end of file.

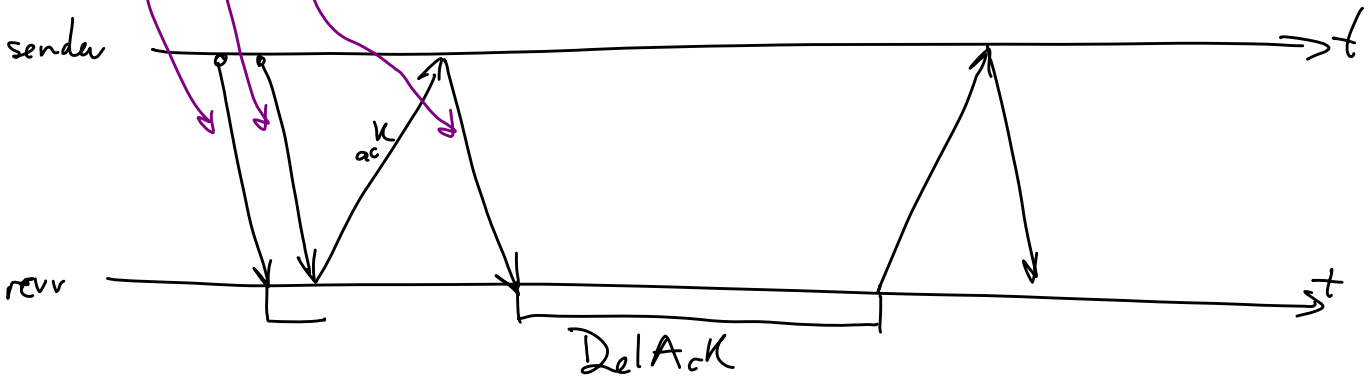
TCP NODELAY in `setsockopt(3SOCKET)`.

- get char from file on disk X
- write character on socket X
- read MSS bytes from file ✓
- send them

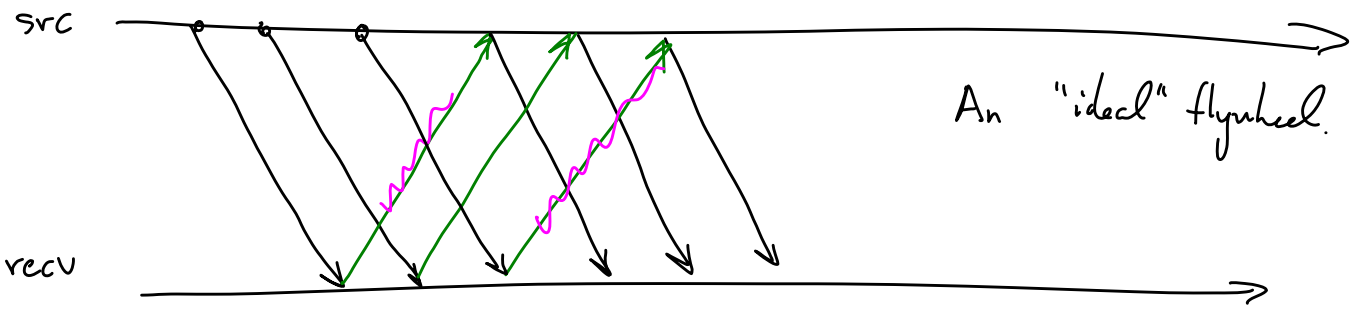
Delayed Acknowledged



MSS MSS MSS 1 X Nagle!



TCP Flywheel



An "ideal" flywheel.