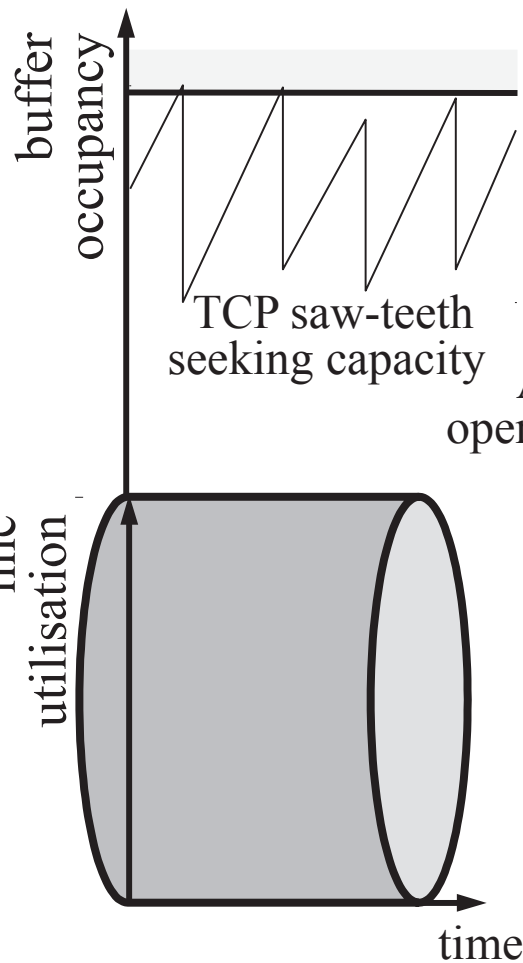# The Classic TCP dilemma: delay vs. utilization
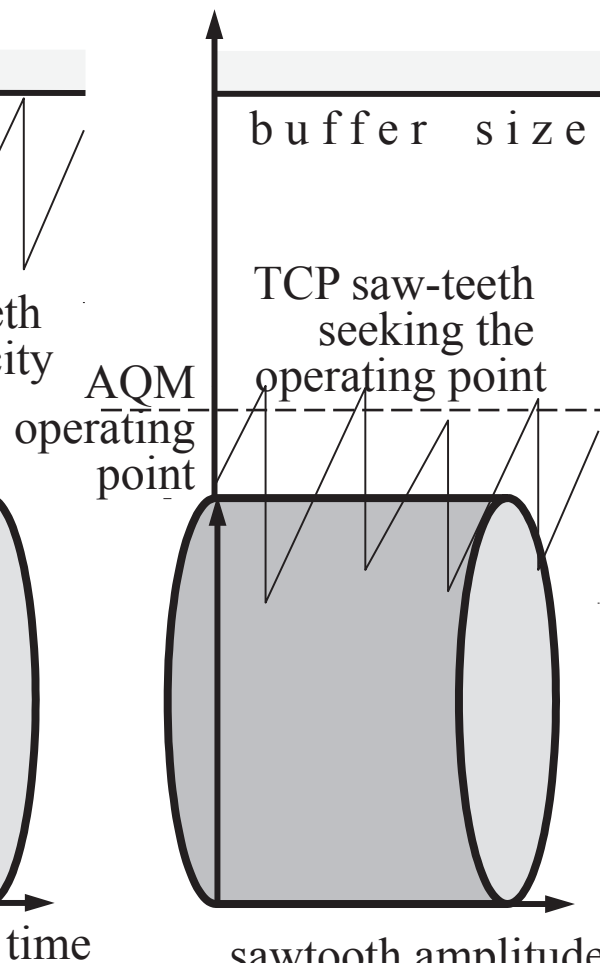
Today (typical)
TCP on end-systems
Drop-tail buffers
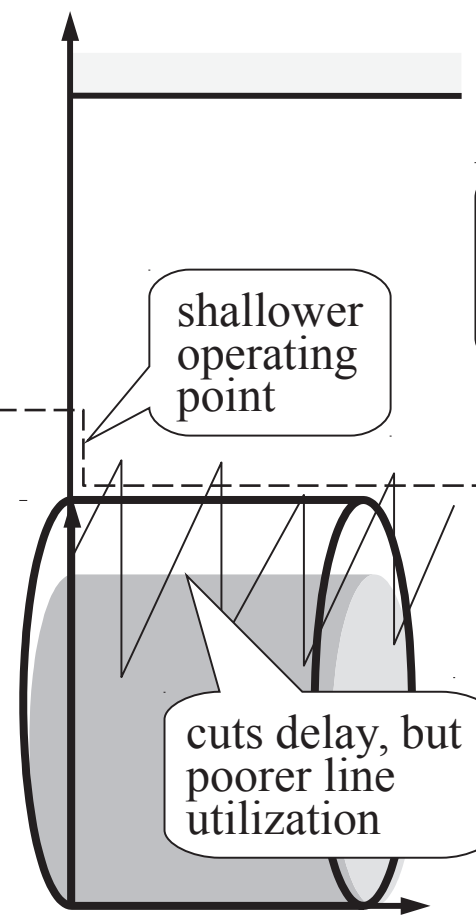
Today (at best)
TCP on end-systems
AQM at bottlenecks

delay-utilization
dilemma

A Scalable TCP
Resolves dilemma
Have to change TCP

buffer occupancy

buffer size

buffer kept
for bursts

queuing
delay
consistently
lower

TCP saw-teeth
seeking capacity

TCP saw-teeth
seeking the
operating point

shallower
operating
point

more smaller
saw-teeth

AQM
operating
point

line utilisation

cuts delay, but
poorer line
utilization

full line
utilisation

time

sawtooth amplitude:
~1 'typical' base RTT
(round trip time)

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