The Bandwidth-Delay Product "Conundrum"

• Heavy data transfer applications relying on TCP protocol suffer from TCP’s window-based behavior
• TCP window used primarily for congestion control

TCP window grows slowly (usually one segment size a time)
• When loss or congestion occurs, the window size is abruptly reduced (AIMD - Additive Increase, Multiplicative Decrease behavior)
• The sawtooth pattern
• In high capacity links, throughput might take a long time to recover after TCP congestion control reduces the window

Solution
• Modify TCP? Many systems to reconfigure/patch
• New end-to-end transport protocol? Again, many systems to reconfigure/patch

Our answer: ONE = Phoebus + perfSONAR

What is Phoebus:
• A session layer on top of TCP/IP transport layer, implemented by Phoebus Gateways (PGs)
• This session layer is capable of dividing a single end-to-end TCP connection into multiple network (transport) segments
• Phoebus manages each segment, chooses best transport protocol for it → increased performance
• Phoebus can utilize dynamic virtual circuits for segments
• Loss and retransmission are limited to segments, not to whole end-to-end connection → faster throughput recovery times, optimized congestion control
• Can use available performance measurement architecture – such as perfSONAR – to gather topology and performance data