An Evaluation of TCP with Larger Initial Windows

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Proposal

- Do we increase TCP's initial window (IW) from 1 segment to 2 segments?

- How about 3 or 4 segments?

- Outlined in [FAP97]

Advantages

- Advantages of increasing initial window:
  - Reduce the amount of time required to increase the window to the appropriate size.
  - Remove dependence on delayed ACK timer to ACK the first segment.
  - Benefit will be to short transfers; negligible impact on bulk transfers

Disadvantages

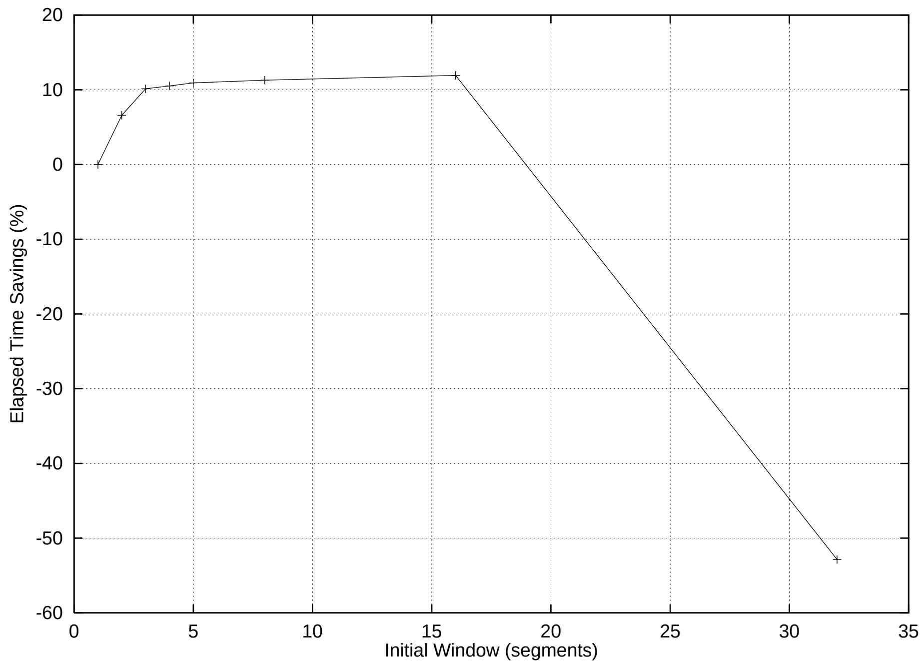
- Disadvantages of increasing the initial window:
  - May cause more loss:
    - Larger initial windows may cause a burst of segments that the network is not able to absorb.
    - Reduces size of file that will experience loss by IW-1.

Modem Tests

- We setup a dialup channel between two NetBSD machines.
  – Used short (16 KB) transfers to isolate startup behavior
  – No additional loss measured

Modem Tests (cont.)

- NetBSD modem tests (cont.)
  - Elapsed time was reduced by ≈7% with IW=2
  - Elapsed time was reduced by ≈11% with IW=4

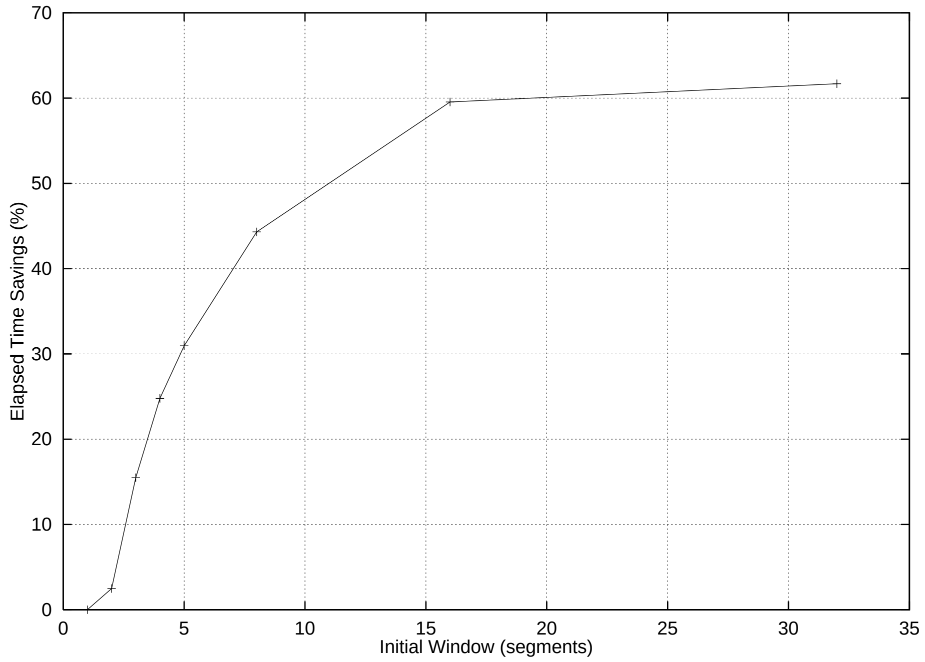


Internet Tests

- Internet Tests
  - NetBSD 1.2.1 sender at NASA Lewis
  - 100 remote Internet hosts
  - Our measurements throughout the tests indicate that the "shared path" to the 100 remote sites was not generally congested.
  - 16 KB transfers to isolate startup behavior

Internet Tests (cont.)

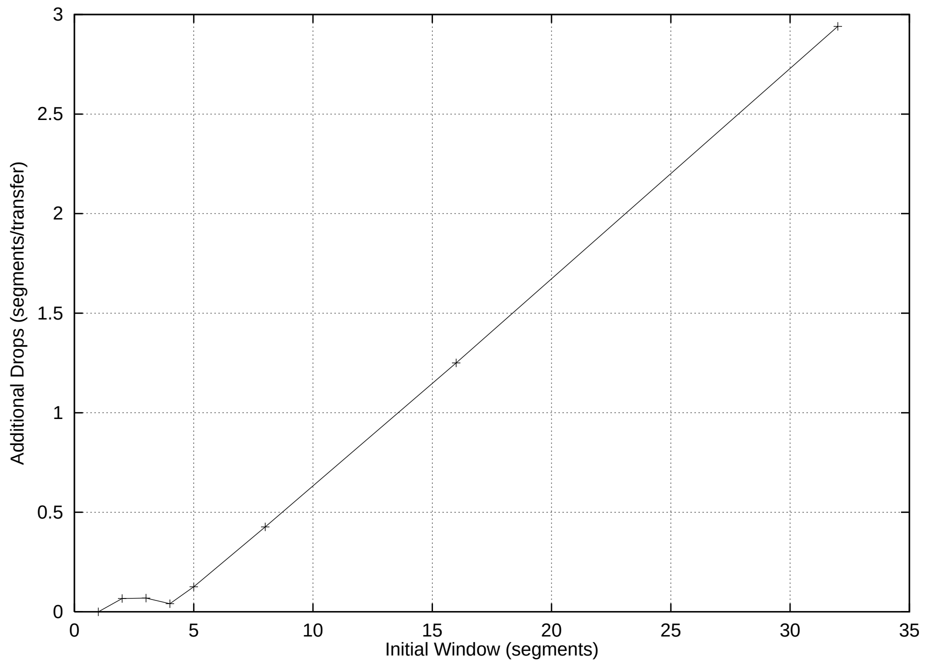
- Elapsed time was reduced by ≈2% with IW=2
- Elapsed time was reduced by ≈25% with IW=4



Internet Tests (cont.)

- Segments lost per transfer increased by ≈0.07 with IW=2

- Segments lost per transfer increased by ≈0.04 with IW=4



Conclusions

- IW=2 is OK
  - Bug in BSD TCP causes wide use of IW=2 already
- IW=3 or IW=4 is OK
  - Only in very congested environments will it work poorly (the Internet tests show this is not prevalent).

Future Work

- Partridge worried about a “capture effect” in Munich (i.e., short transfer with a larger initial window would steal bandwidth from longer transfers unfairly).

References

- [FAP97] Sally Floyd, Mark Allman, Craig Partridge. Increasing TCP's Initial Window, July 1997. Internet-Draft draft-floyd-incr-init-win-00.txt (work in progress).