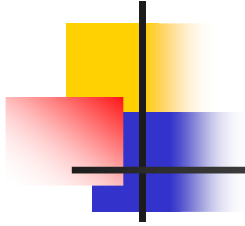


NS2 Simulation of TCP Over Satellite Links

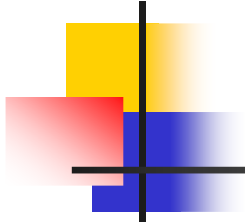


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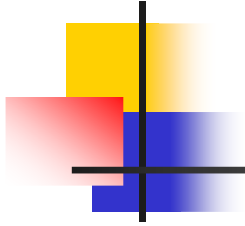
Overview

- Motivation
- Satellite links
- Simulation of satellite links
- Solutions



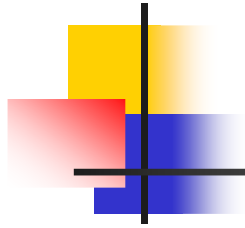
Motivation

- Demand to use satellite communication services increasing
- TCP/IP most widely used for data communication
- Characteristics of underlying physical layer have direct impact on performance
- Performance analysis of TCP/IP over satellite links needed



Satellite links

- High propagation delay
 - Large distance between ground station and the satellite
- High bandwidth
- Higher error rates



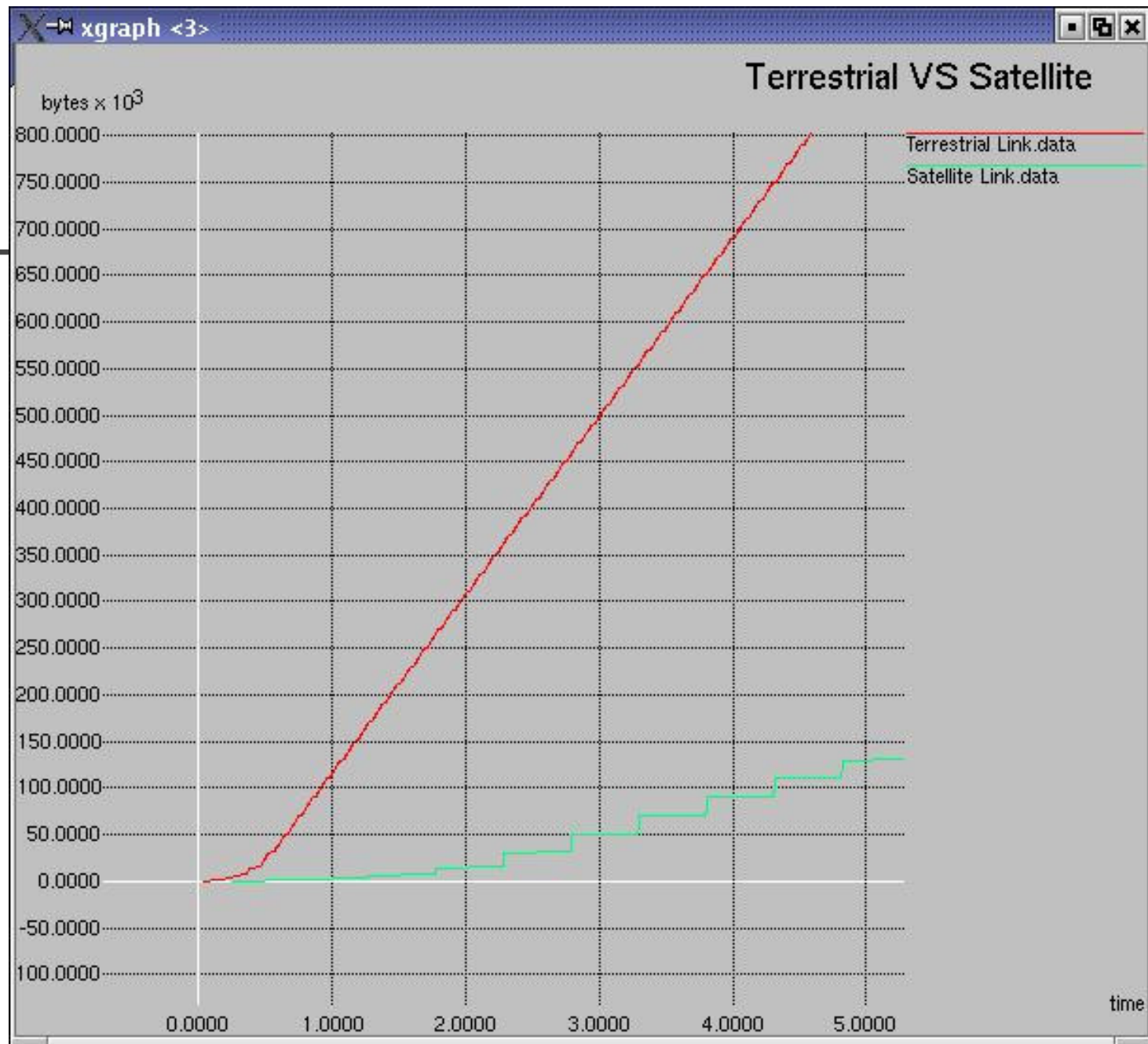
Satellite types

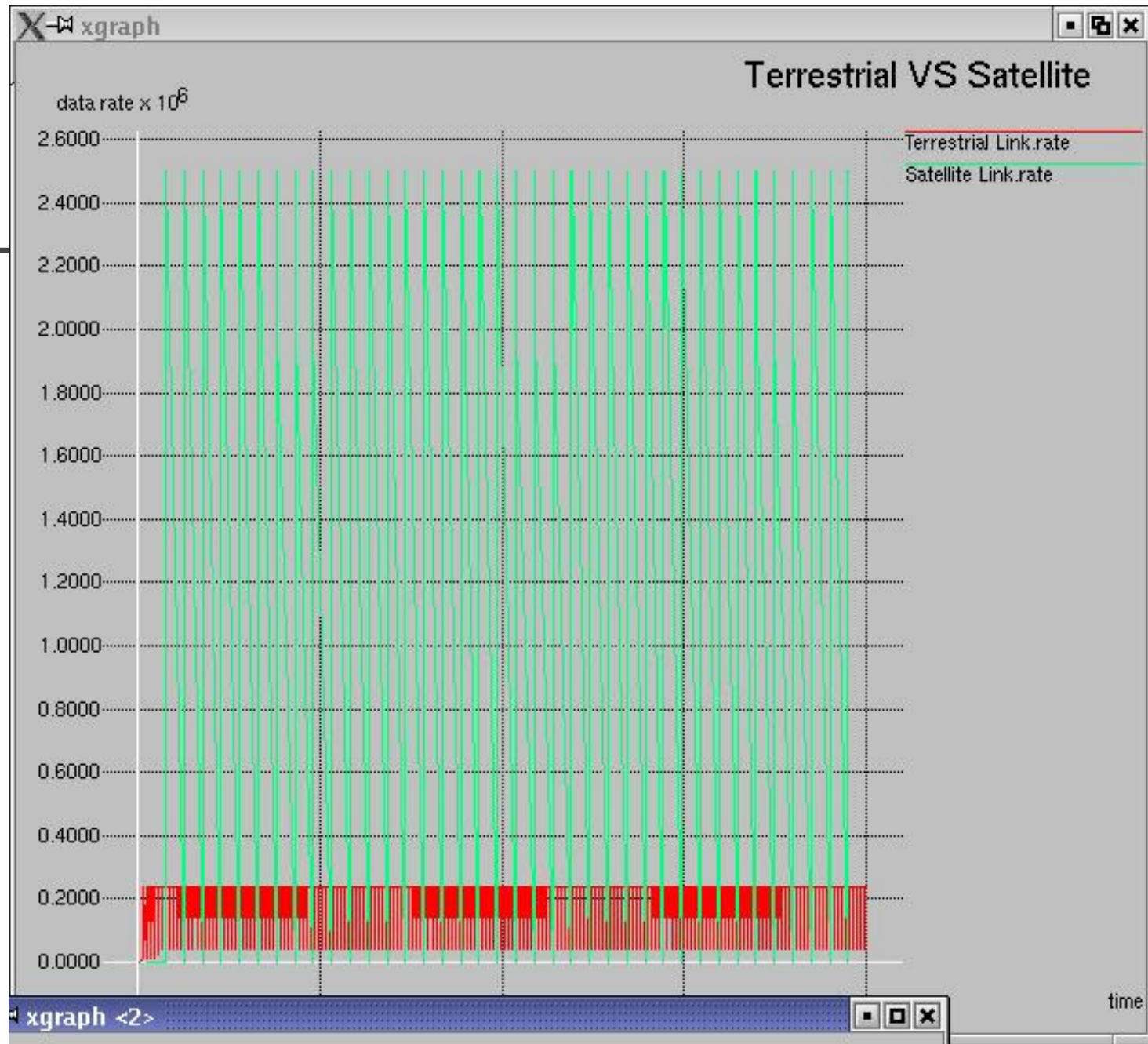
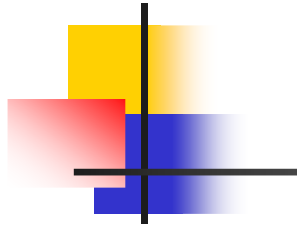
- Geosynchronous Equatorial Orbit (GEO) satellite
 - Bent pipe Satellite
 - On board Processing satellite

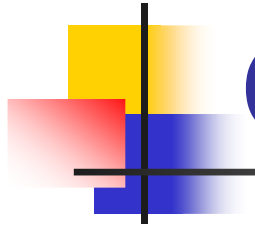


Simulation of Satellite link

- Used NS2 satellite module
- No errors
- GEO bent pipe satellite
 - Two terminals
- Terrestrial link with 2Mbps bandwidth and propagation delay = 50ms
- Satellite link with 20Mbps bandwidth and propagation delay = 560ms
- Application : Bulk Transfer (FTP)

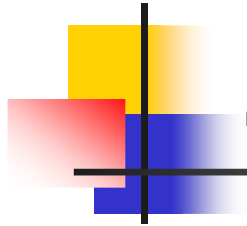






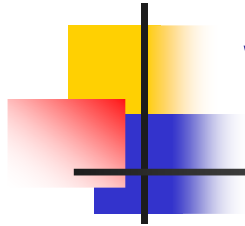
Observations

- Terrestrial link performs better than Satellite link
- Lots of bandwidth wasted due to large RTT
- Some “parameter tuning” needed for using TCP/IP on satellite links



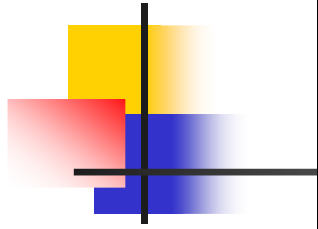
Solutions

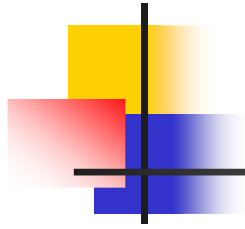
- Large window size
- Increasing segment size
- Large initial window size



Window Size

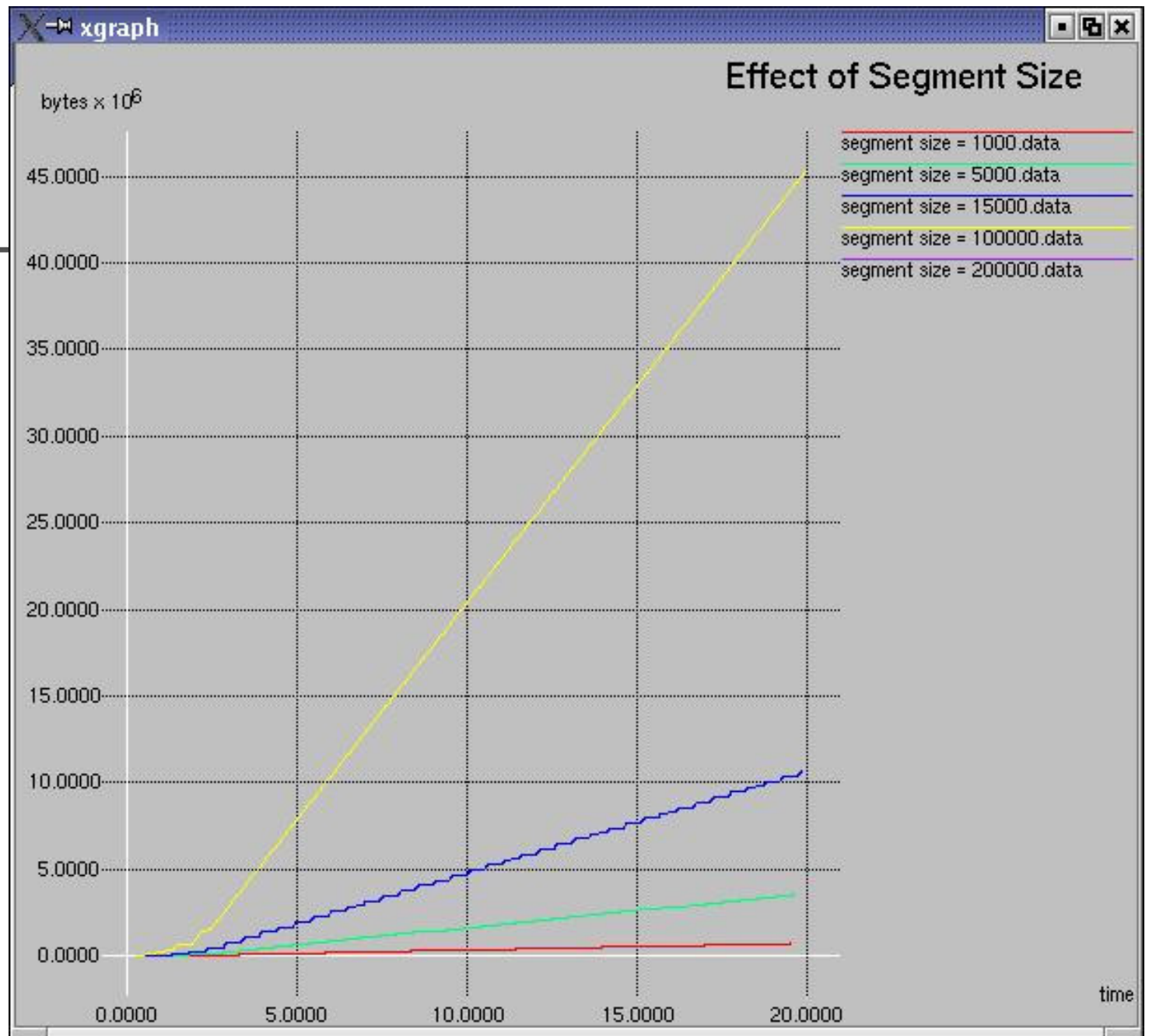
- Original TCP limits advised receive windows (16 bits)
- Maximum throughput = 940kbps
- Simulation of FTP on satellite links using different window sizes





Increasing segment size

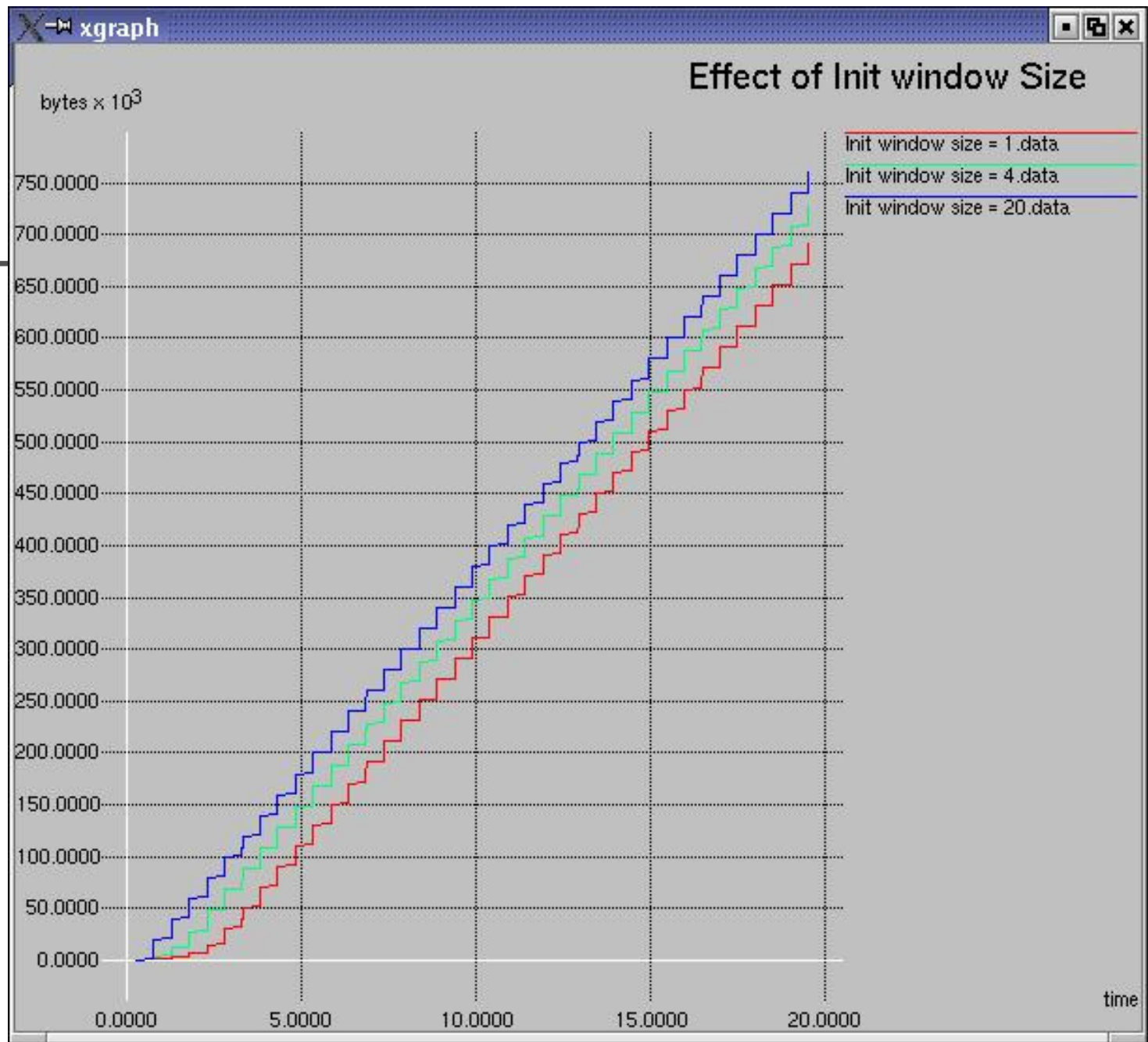
- Direct effect on TCP performance
- Because of high bandwidth much larger segment size must be used for satellite links
- Simulation of FTP on satellite links using different segment sizes

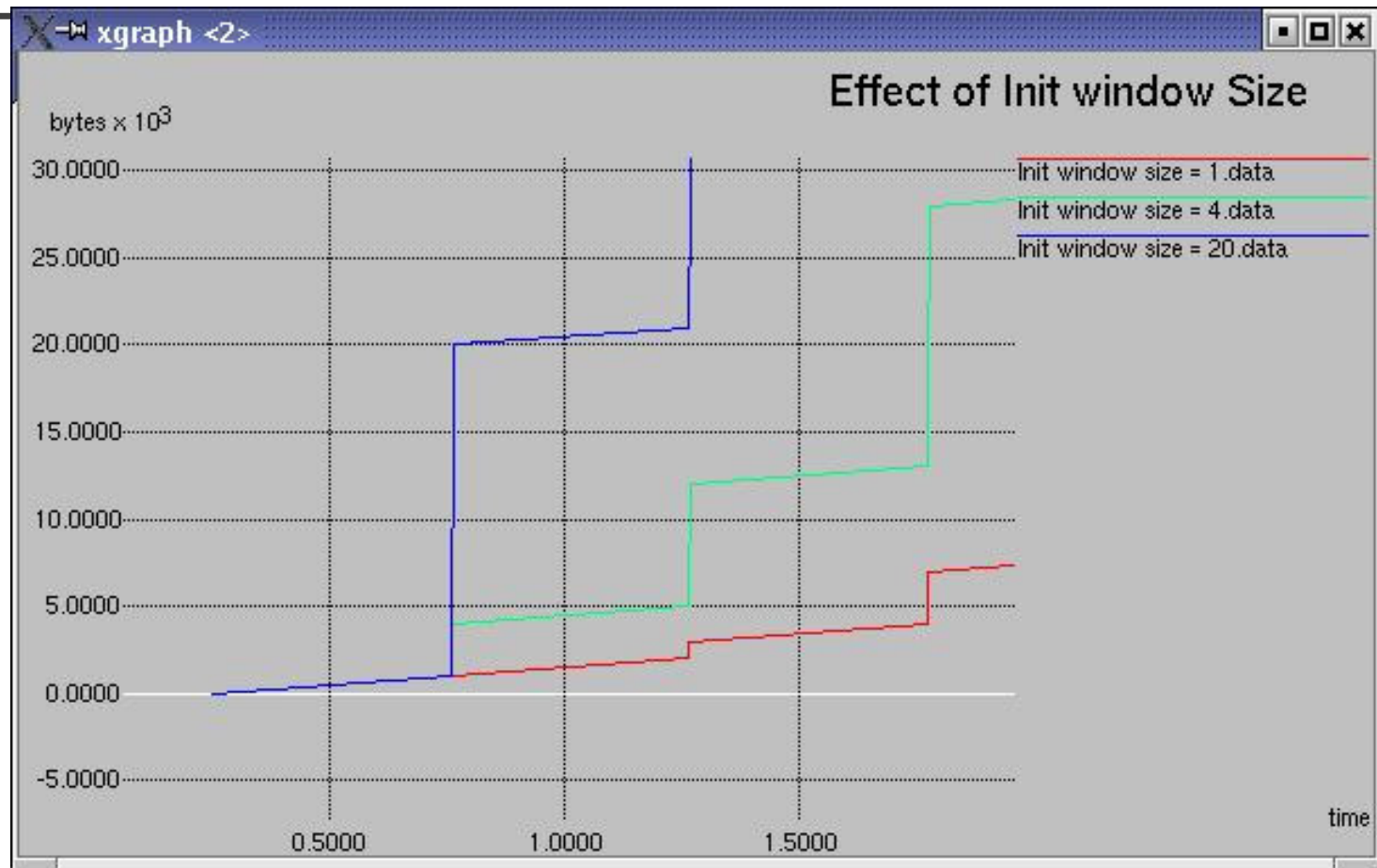
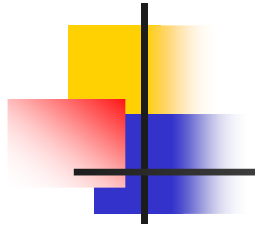


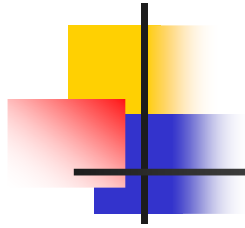


Large Initial window sizes

- Not much effect on bulk transfers
 - But will improve these too
- Important for interactive (telnet) transfers
- Simulation of satellite links using different initial window sizes

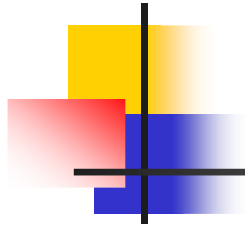






Conclusions

- Parameter tuning needed
- Larger window size will improve connection throughput for bulk transfers
- Suitable maximum segment will improve the throughput
- Larger initial window size will benefit interactive transfers



References

- Network Simulator (NS2) - <http://www.isi.edu/nsnam/ns/>
- Tanenbaum - Computer Networks
- Stallings – Data and Computer Communications