

SNMP over UDP vs TCP

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- 1 Introduction
- 2 Study Details
- 3 Results
- 4 Conclusions

Outline

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Purpose

Measure performance of UDP vs TCP in lossy networks

- How SNMP performs in bad environments
- How to pick the right protocol for the right task

Why

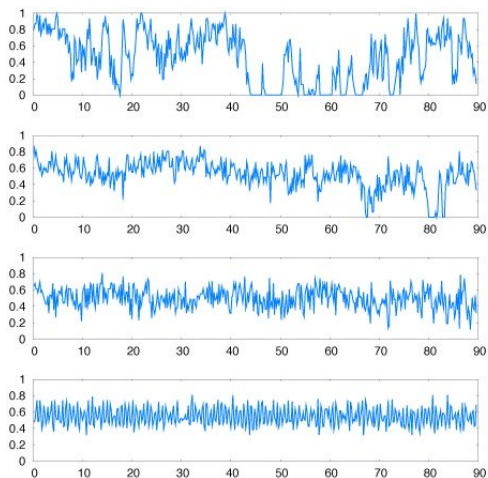
- Lossy networks are still common.
- Past UDP vs TCP studies
 - Aren't recent
 - TCP performance has increased recently
 - Often studied small losses only
 - (e.g. 1%)

Lossy Networks

Lossy networks exist because of...

- Congestion
- Mobility
- Wireless Meshes
 - Rarely 0% loss and loss rate
 - Aren't just 0 or 100%
 - "Links with intermediate levels of loss are the common case"
 - From: *Link-level Measurements from an 802.11b Mesh Network*
- Satellites
 - Affected by weather (Rain, Snow, Fog, ...)
 - Loss rates vary drastically (0% to 40%)

Case in Point: MIT's RoofNet



Constant Change

Worthy Notes

- This data will be obsolete tomorrow
- Lossy networks are here to stay
- Hope for the good, plan for the bad, expect the ugly

Continual Change: Help is always around the corner

- Channel path improvements
- TCP Improvements
 - TFRC, TCP Westwood, TCP-Real, ...
- Traffic prioritization

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Study Details

Very Quick Study

- ... but the results are still interesting
- Studies beget studies: lots of interesting follow-on potential

Study architecture

Study Environment

- Simulation environment: Emulab

Machine and Network Details

- Two 850MHz P-III Fedora8 linux systems
- Net-SNMP agent and a perl script client
- Linked via an emulab controlled link
- Loss rate was varied at each node's interface
 - eg, 2% potential loss on each means 3.96% loss total
- 1000 GET requests
 - SNMPv2c
 - sysContact.0

Outline

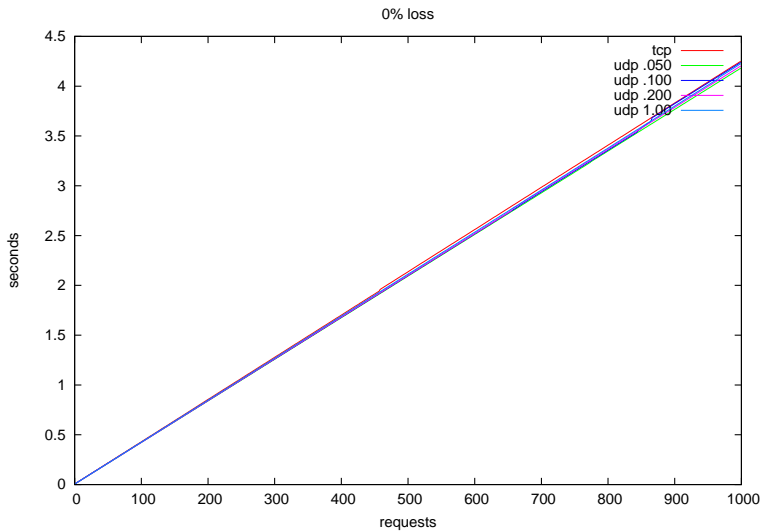
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Study 1: GET sysContact.0

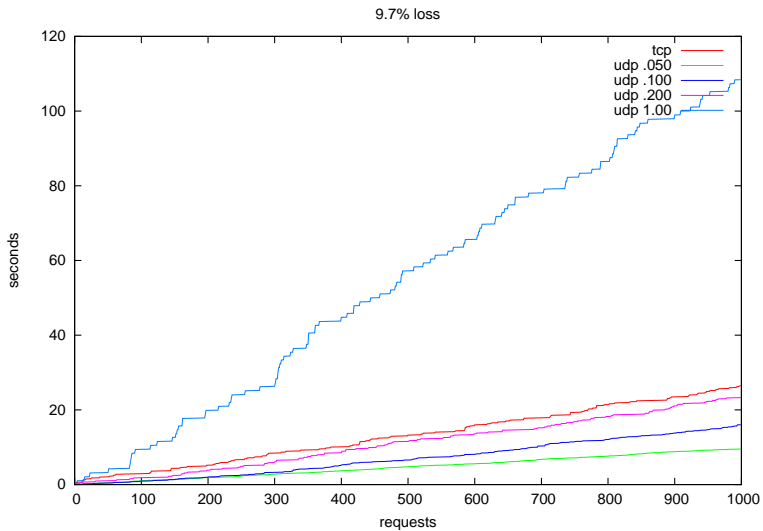
Study 1: GET sysContact.0

- A single sysContact.0 instance requested
- Maximum expected round trip time: .01s
- TCP maximum wait time fixed at 2 minutes
 - Beyond that, the manager gives up
- UDP retries set very high
- UDP timeouts varied
 - UDP .050 = 5X maximum
 - UDP .100 = 10X maximum
 - UDP .200 = 20X maximum
 - UDP 1.00 = 100X maximum

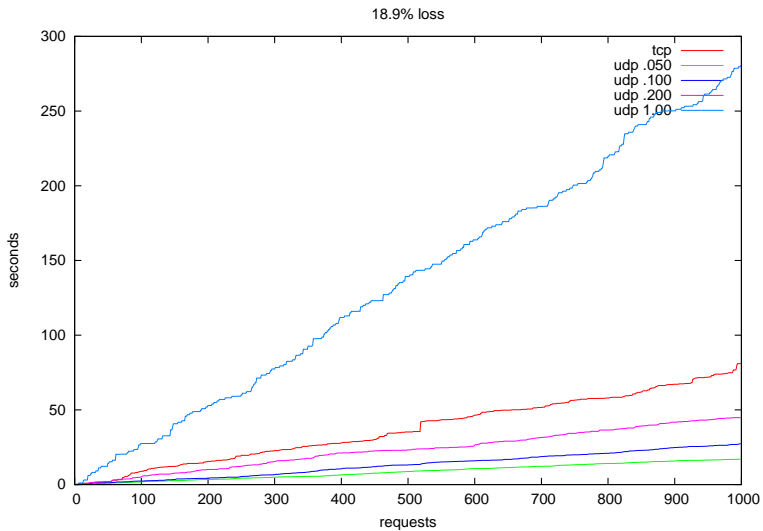
0% Loss



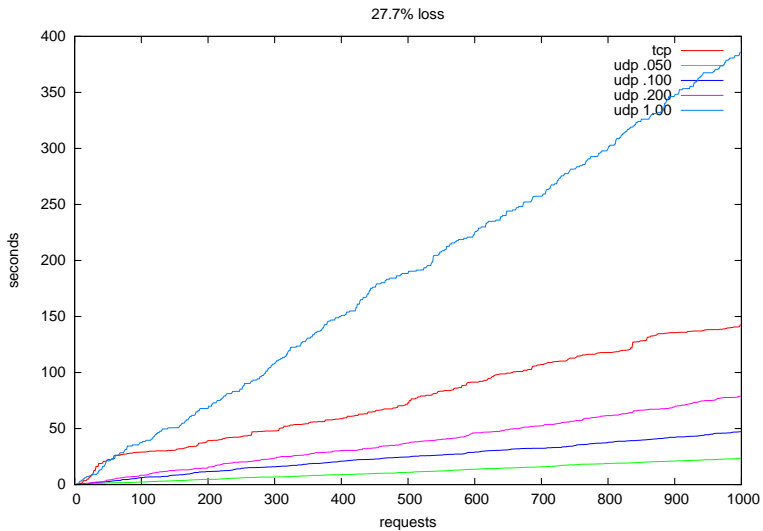
9.7% Loss



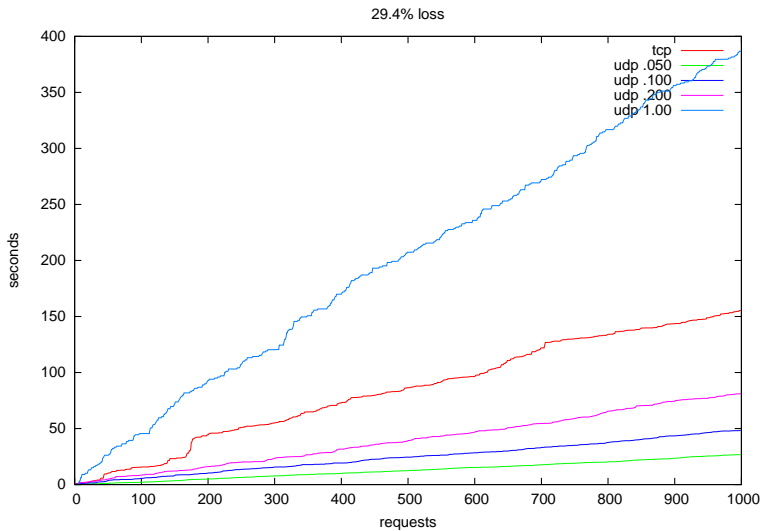
18.9% Loss



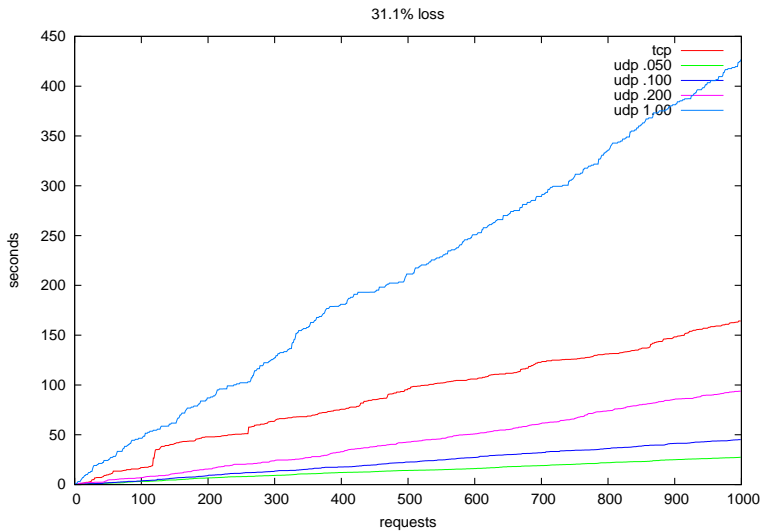
27.7% Loss



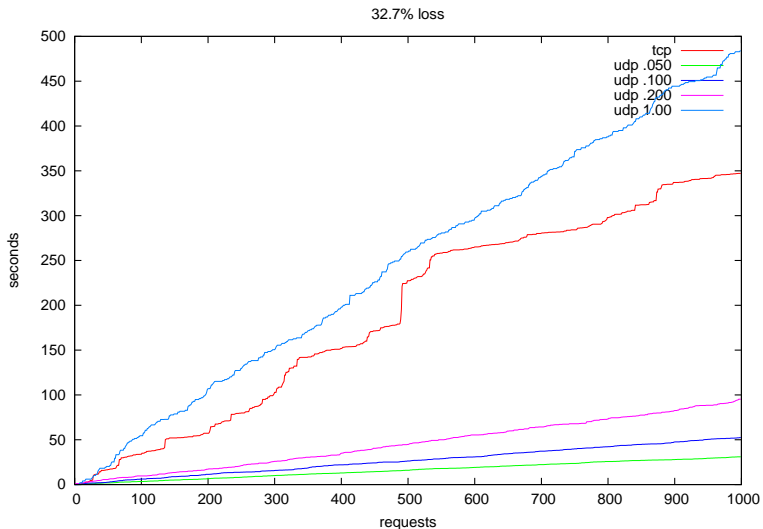
29.4% Loss



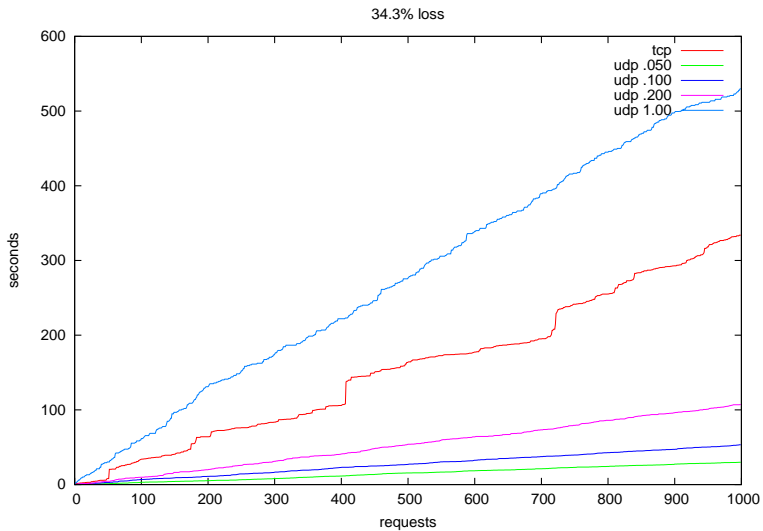
31.1% Loss



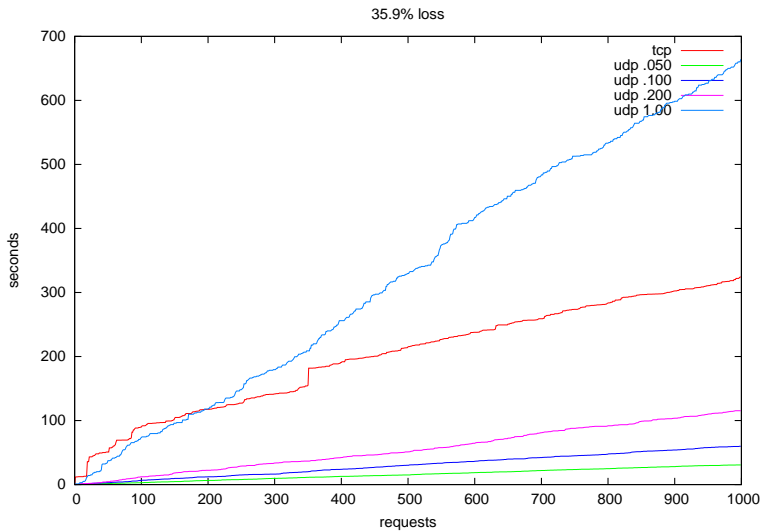
32.7% Loss



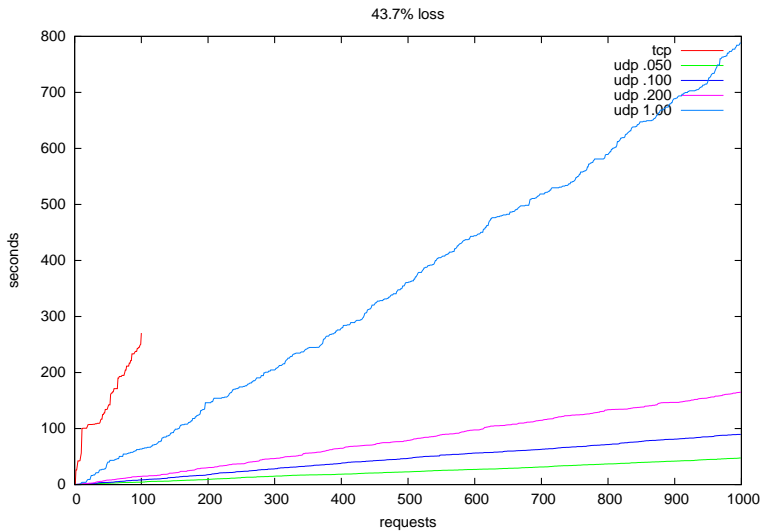
34.3% Loss



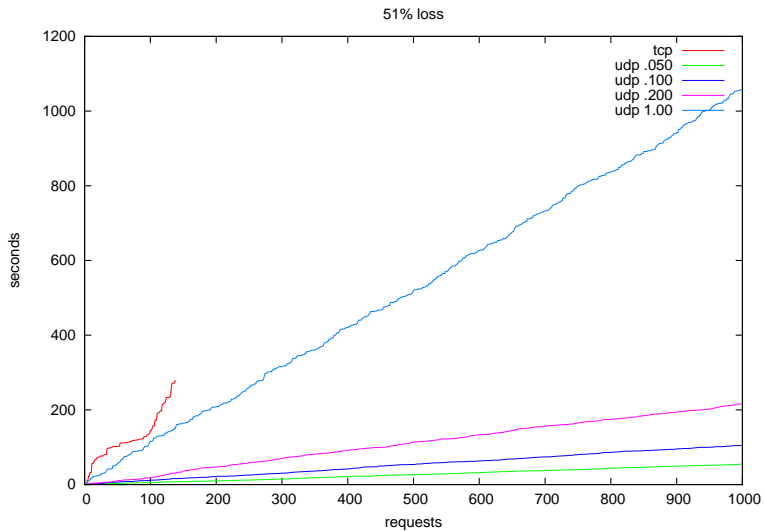
35.9% Loss



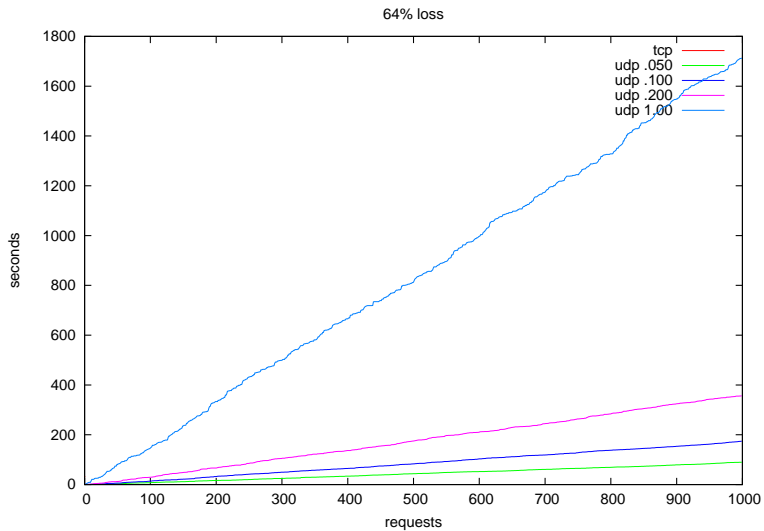
43.7% Loss



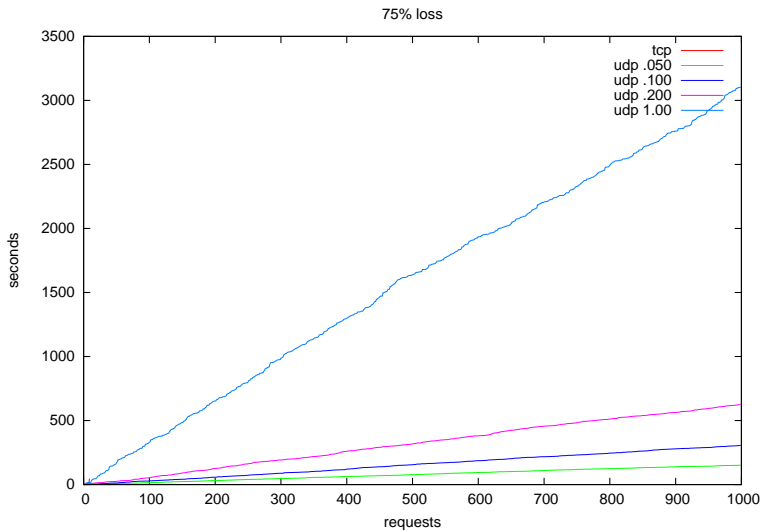
51.0% Loss



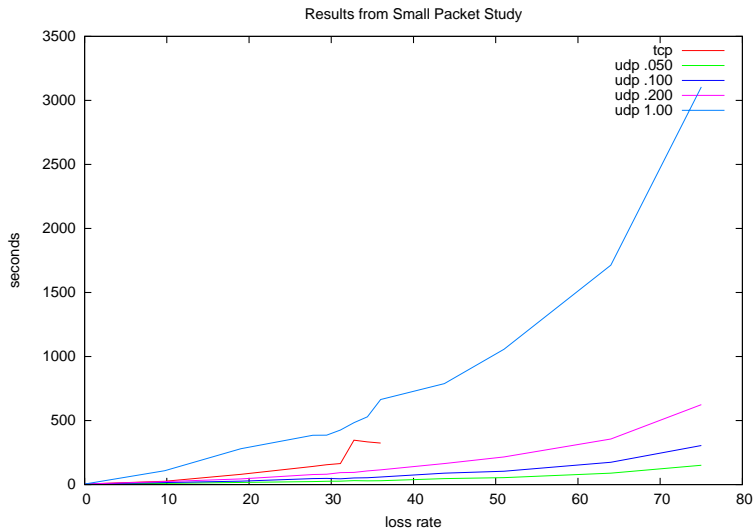
64.0% Loss



75.0% Loss



Loss vs Time



Study 2: GET 250 sysContact.0

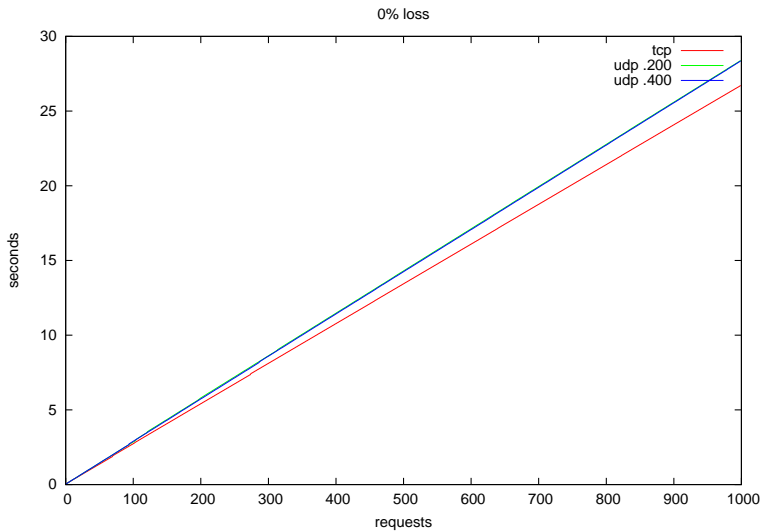
Study 2 Goals

- Medium quantities of data
 - (IE, more than an MTU in size)

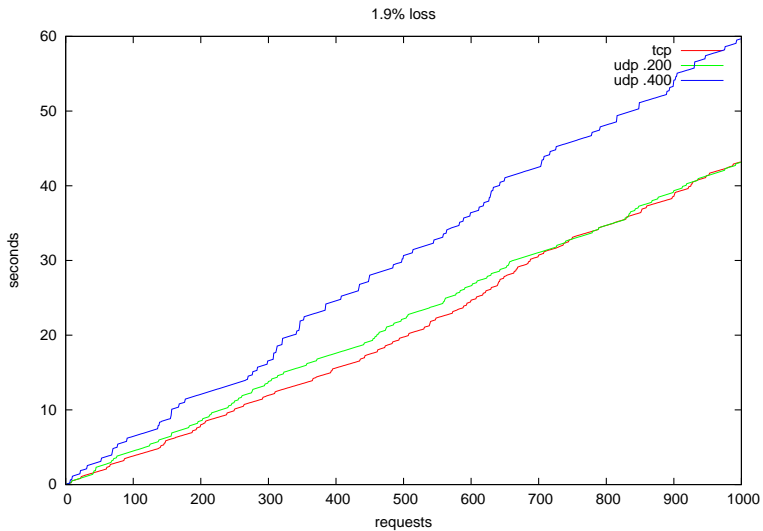
Study 2: GET 250 sysContact.0 instances

- SNMP GET of 250 sysContact.0
- Maximum expected round trip time = .05s
 - UDP .200 = 4X maximum
 - UDP .400 = 8X maximum
- Fragmentation results:
 - 3 GET fragments
 - 4 RESPONSE fragments
 - (sysContact.0 was 4 bytes containing "test")

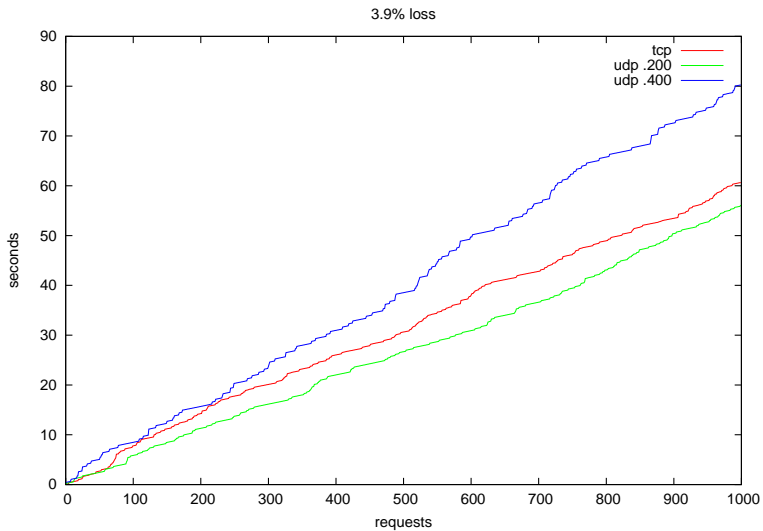
0% Loss



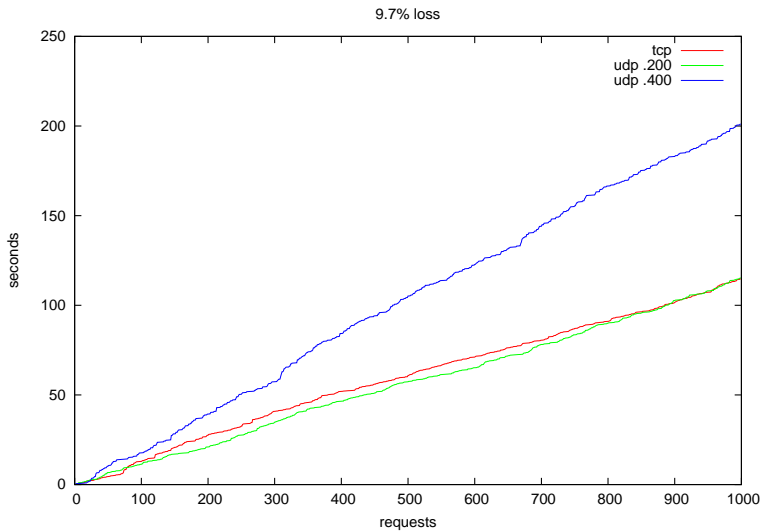
2.0% Loss



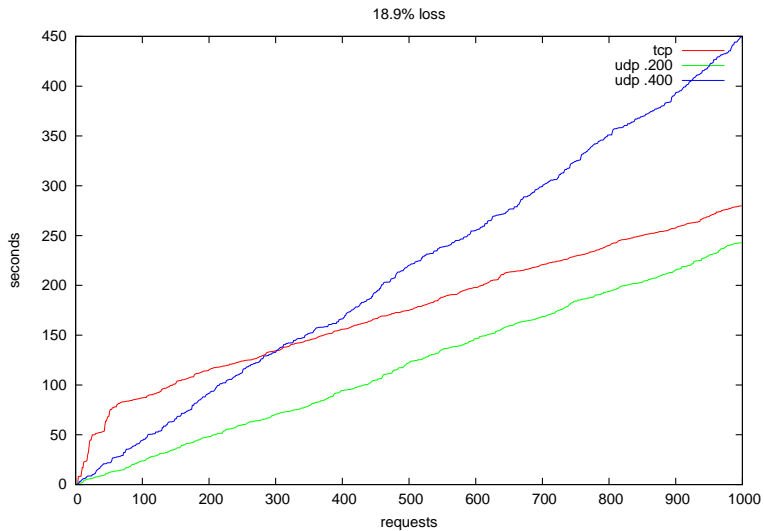
3.9% Loss



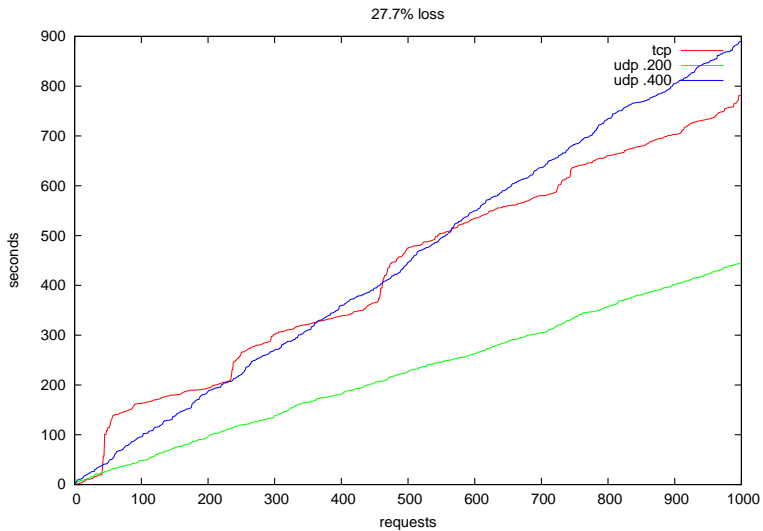
9.7% Loss



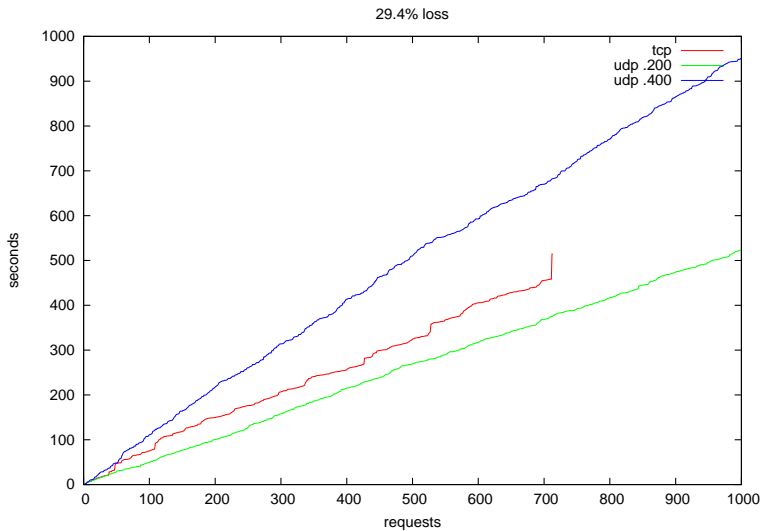
18.9% Loss



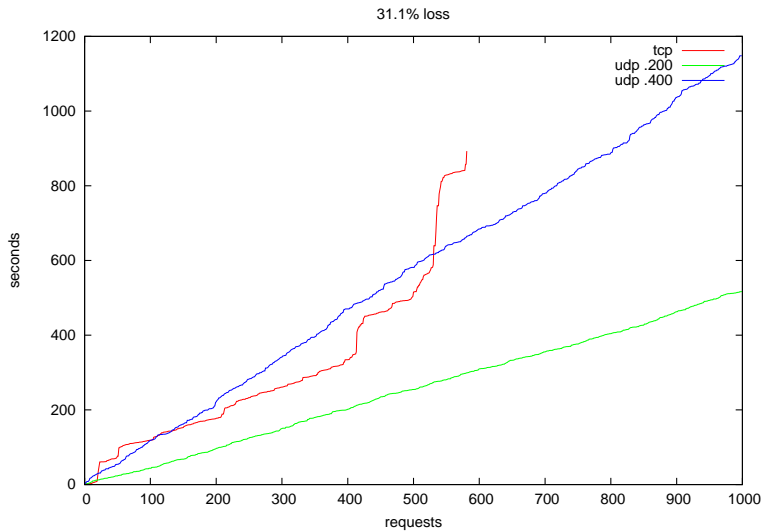
27.7% Loss



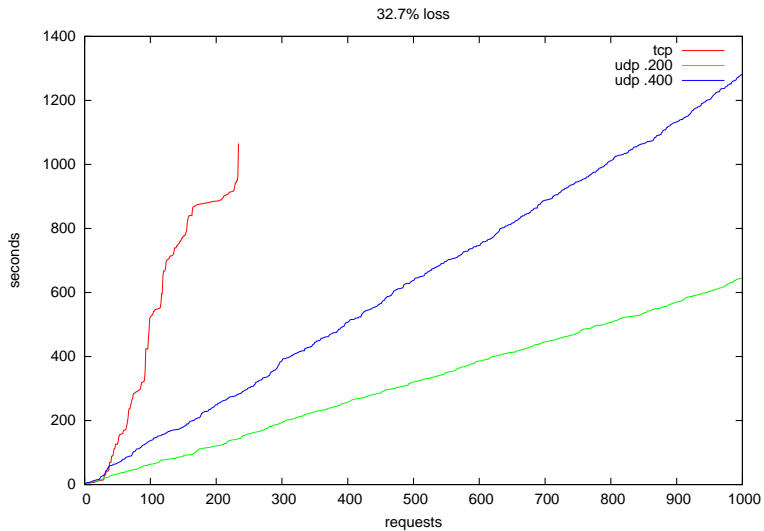
29.4% Loss



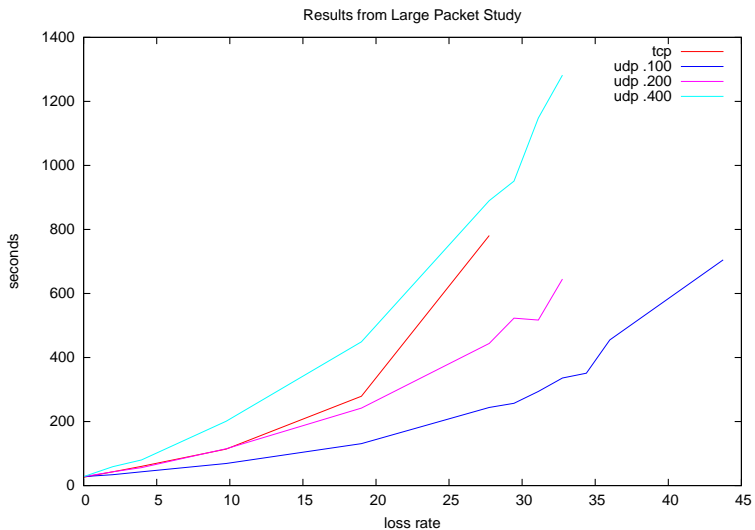
31.1% Loss



32.7% Loss



Loss vs Time

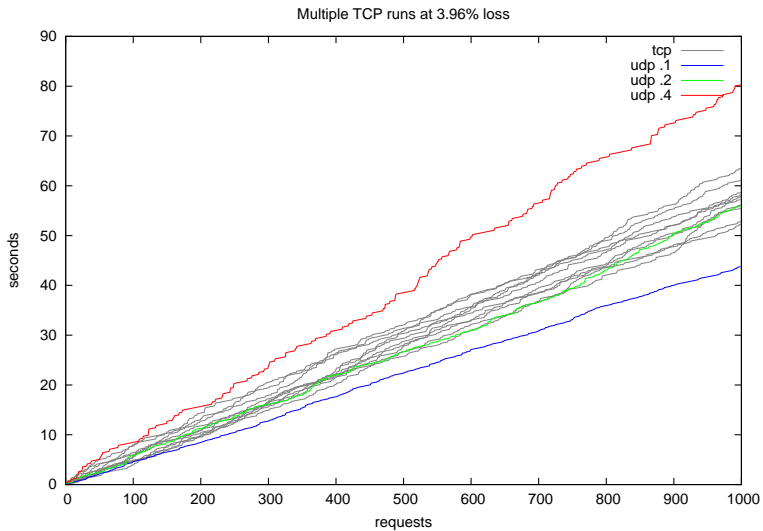


Study 3: Multiple TCP Sessions

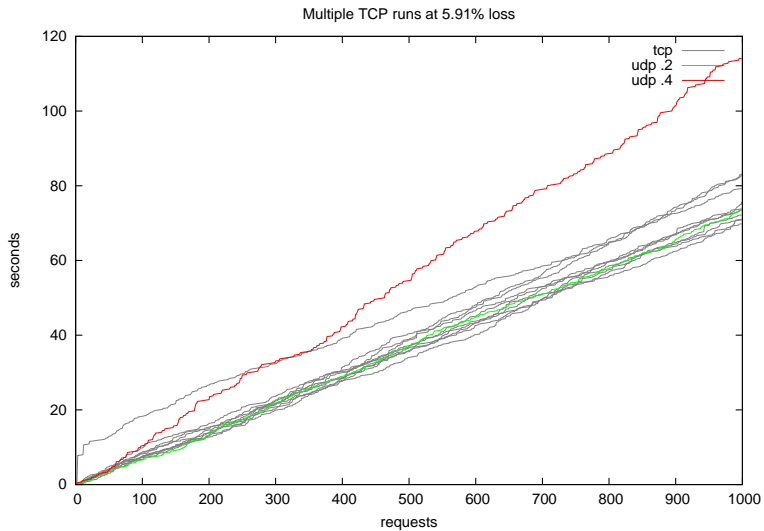
Study 3: GET sysContact.0

- 250 instances of the sysContact.0 requested
- Multiple runs at the same loss compared
- Goal: to test TCP performance variability

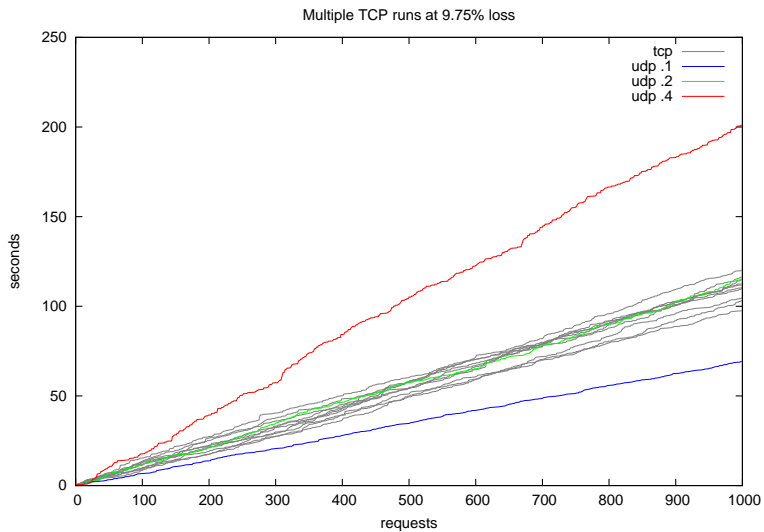
3.96% Loss



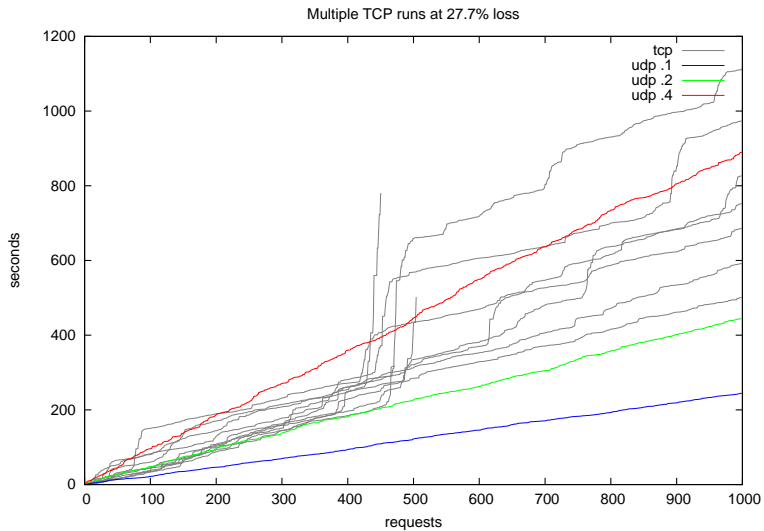
5.91% Loss



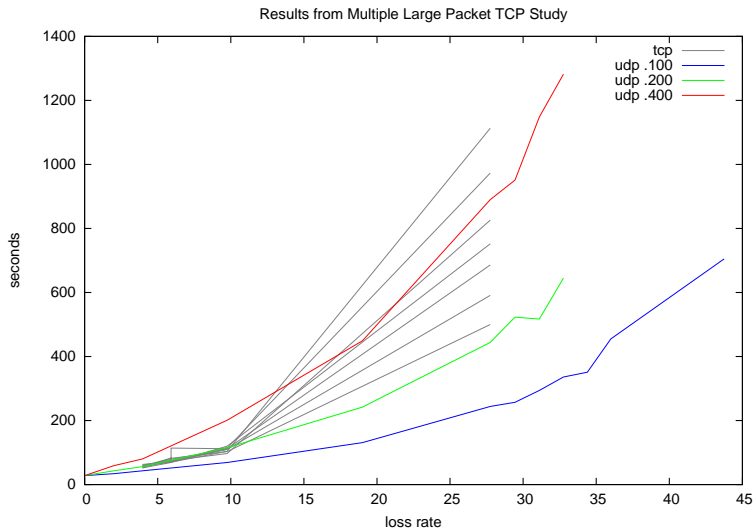
9.75% Loss



27.7% Loss



Loss vs Time



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Conclusions

Most conclusions up to you...

- I'm not going to draw elaborate conclusions
- Significant interpretation up to the reader/viewer

Questions for the viewer

- When is it wise to use UDP vs TCP?
- What types of management traffic...
 - Should be prioritized?
 - Should or sent via the best delivery method?
 - Should be sent via the most friendly route?

Minor Conclusions

Minor Conclusions

- TCP is great under ideal conditions and even mildly bad ones
- Proper setting of UDP timeout values is critical
 - No one sets them up properly
- Don't let UDP fragment.
- Knowledge is power

Future Work

Notes

- No immediate plans to perform follow-on work.
- Goal Reminder: isolate the comparison to just TCP vs UDP

Future Work

- Explore all the TCP option settings
- Compare managing a complete set of objects
 - sysContact.0 is predictable, unlike the full set of objects
- Compare varying rates of network delays
- Compare using changing loss rate over time
- Compare TCP using auto-kill-and-restart procedures
- Compare with effects of traffic prioritization

Questions

Questions?

?????