ENSC 833-3: Network Protocols and Performance
CMPT 885-3: Special Topics: High-Performance Networks
Final Project Presentations

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Analysis of a Billing Trace of a CDPD Network

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Overview

- The Trace
- The Questions
- The Answers (so far)
- The Future...

The Trace
(General)

- Billing data from Telus' CDPD network
  - approximately 2 weeks
  - begins 11:30 am Dec 21, 2000
- What's CDPD?
  - Cellular Digital Packet Data (aka Wireless IP)
  - Transmission speed 19.2K (perceived 33.6K)
  - Doesn't really matter for this analysis

The Trace (Contents)

- Series of “Traffic Matrix Segments” (TMS)
- Rows represent events of 3 types: Registration, Deregistration, Data
  - Cell ID (IP address)
  - User ID (IP address)
- Collected approximately every 15 minutes

The Trace (Registration/Deregistration Row)

- User mobile attempts to register with a cell or terminates association to a cell
- Registration may fail or succeed
- Deregistration always suceeds
- Timestamped

The Trace
(Data Row)

- Data rows contain no timestamp
  - Minimum granularity is at the TMS level (about 15 minutes)
- Data rows contain:
  - Data packet count
  - Data octet count
  - Control packet count
  - Control octet count
  - Discarded packet count

The Question

We have this data, what can we say about it?

The Questions
(Overview)

- Three basic categories of questions:

  1) Network static characteristics

  2) Network dynamic characteristics

  3) User behaviour

The Questions
(Network Static Characteristics)

- How many cells?
- How many users?
- What % of registrations rejected?
- What % of packets are dropped?
- What does the network look like?

The Questions (Network Dynamic Characteristics)

- When is the network busiest?
- (Does busiest mean max # of users? Max # of packets/octets? Max # of events? Max # of packets dropped?)
- Are discards and registration rejections related?

The Questions
(User Behaviour)

- Do they move from cell to cell?
- Is there a correlation between movement and amount of data transmitted?
  Number of packets dropped?
- Are there different classes of users?

The Answers
(Overview)

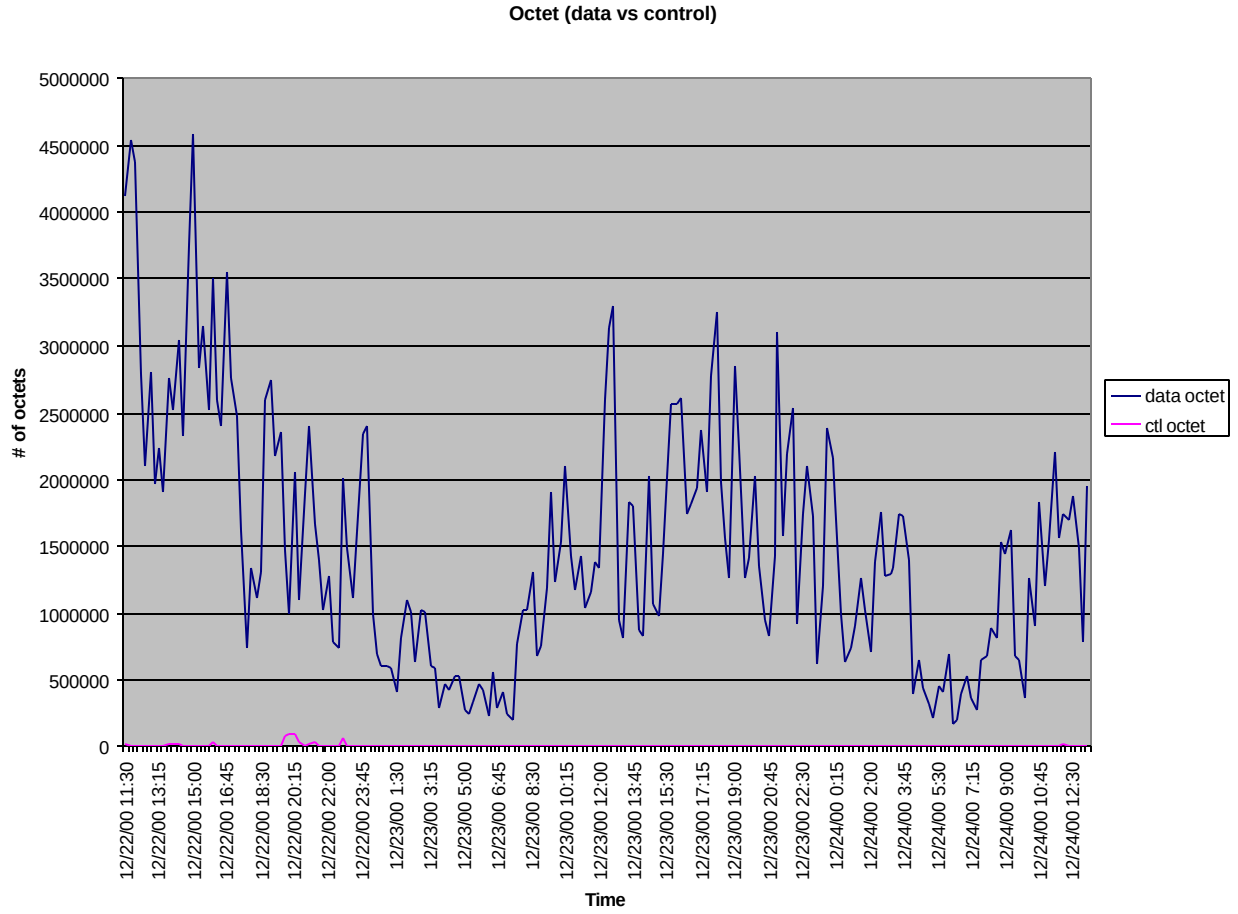
- Java parser & number-cruncher
- Working with a 50 hour slice of the trace
  - Data runs take ~ 10 minutes on this.
- Results are extremely preliminary

The Answers
(Network Static Characteristics)

- Total of 1,580,236 events (full trace)
  - 691,009 registration, 71,741 deregistration, 889,227 data
- Within the 50 hour slice
  - 932 unique users, 59 unique cells
  - % of rejected registrations: 63.5%
  - % of packets dropped: 0.6%
- Network Topology
  - still in progress

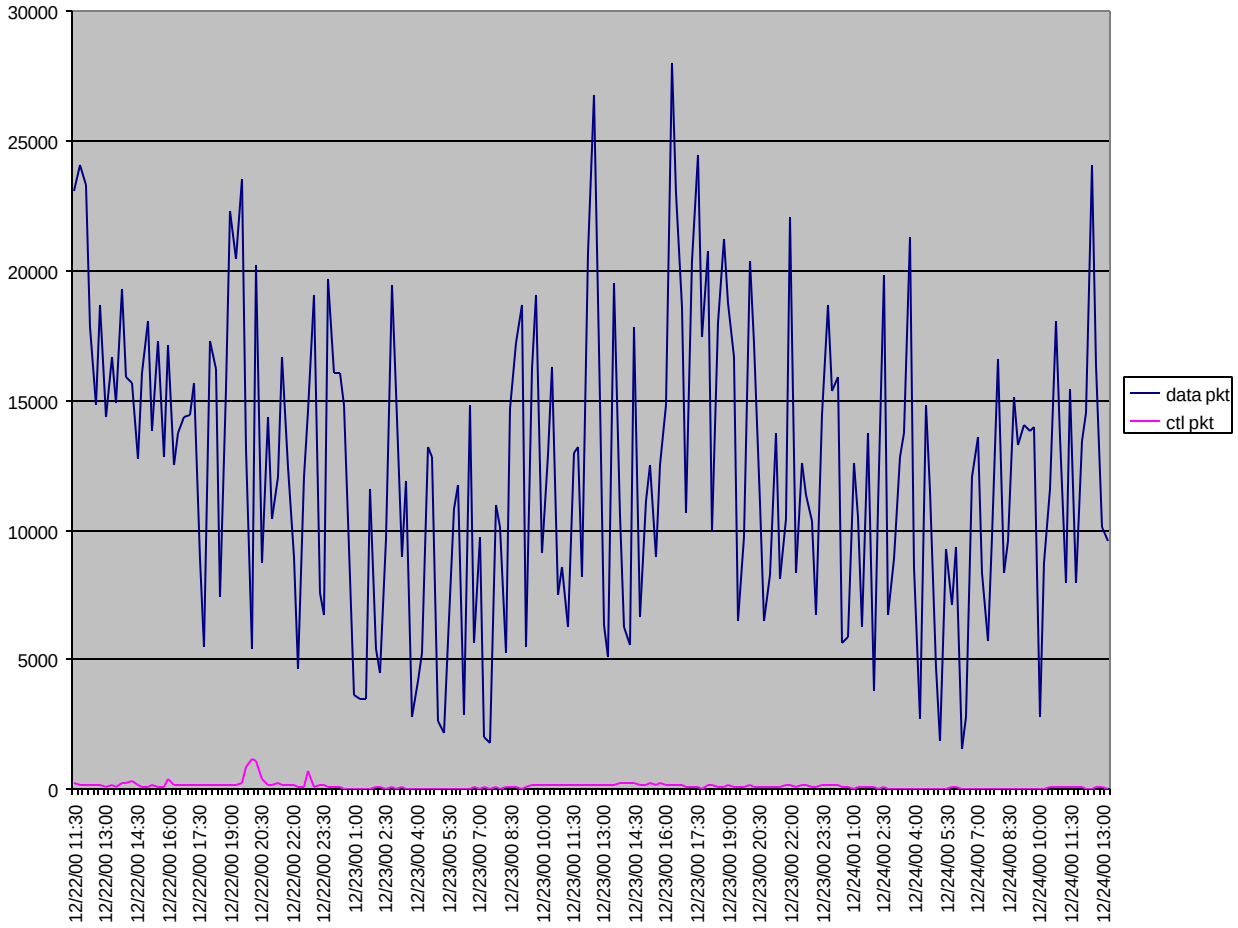
The Answers (Network Dynamic Characteristics 1)

- data octets & control octets



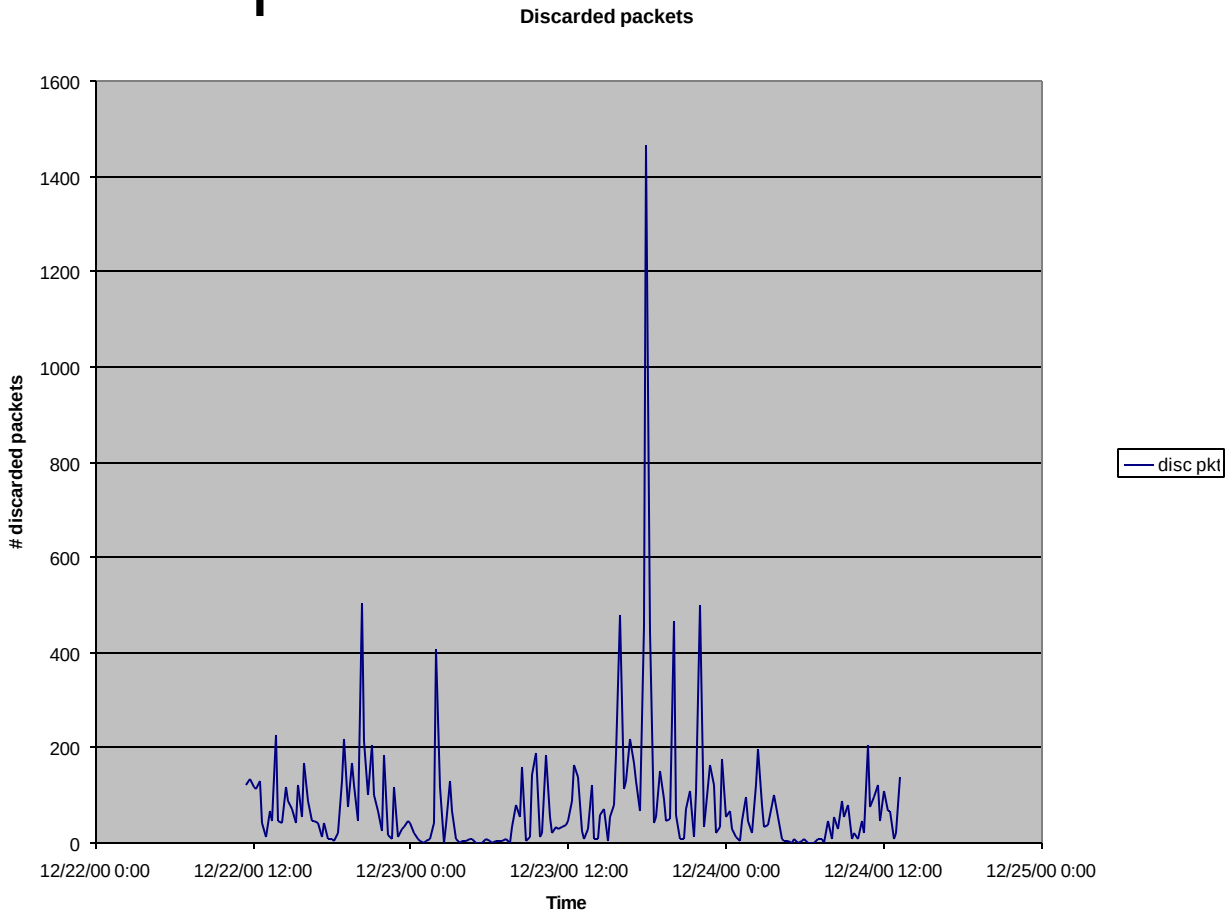
The Answers (Network Dynamic Characteristics 2)

- data packets & control packets



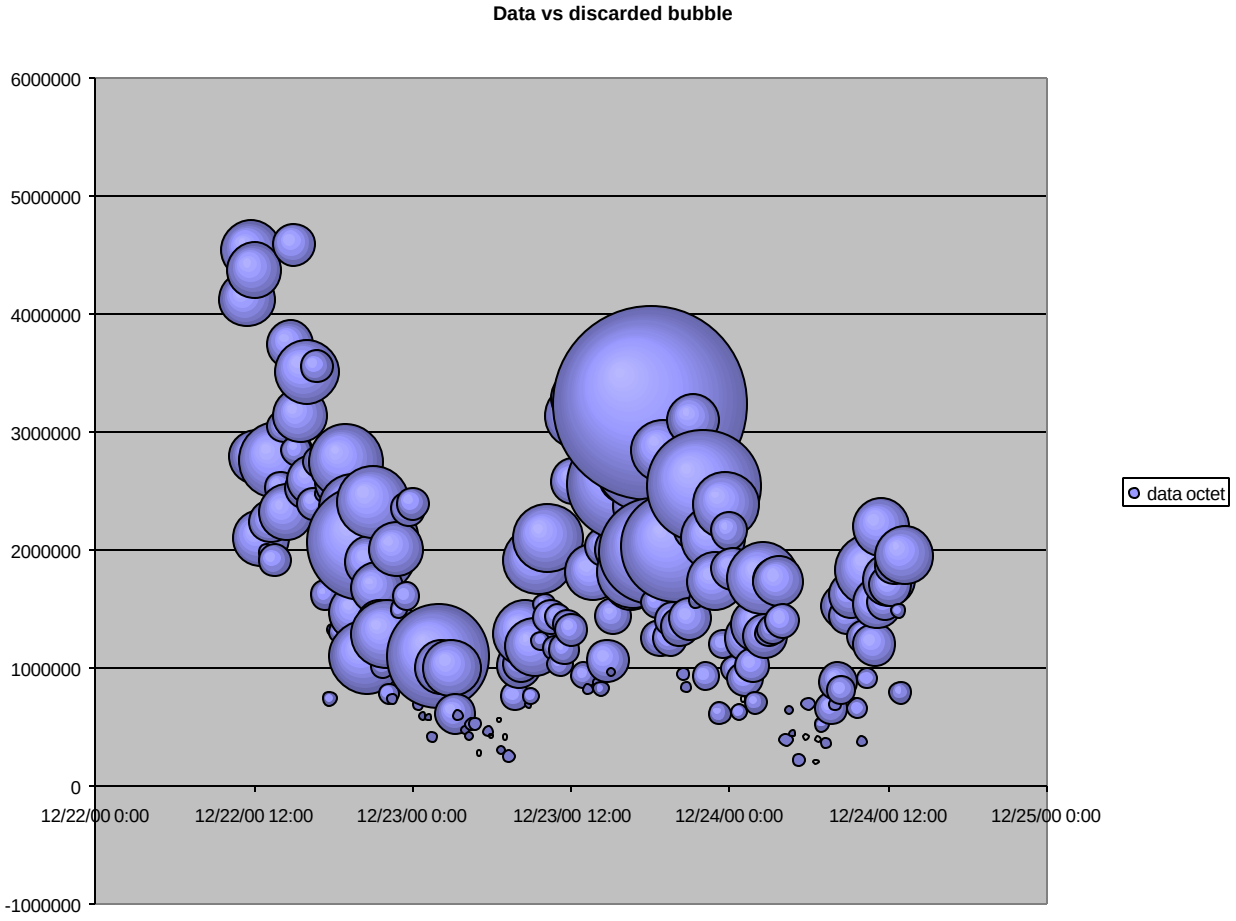
The Answers (Network Dynamic Characteristics 3)

- discarded packets



The Answers (Network Dynamic Characteristics 4)

- data vs. discard packets



The Answers
(User Behaviour)

- Largely unanalyzed at this point
- Have correlated events by user
- Have sorted registration/deregistration events
- Have identified ‘edges’ in the network topology based on user movement (during a TMS)

The Future ...

- Run all analysis on the whole trace
- Run Autoclass on the full set of rows
  - discover user classes
- Run Autoclass on just the data rows
- Map the network topology
  - graph the edges discovered by user mobility
- Comment my code...

References

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