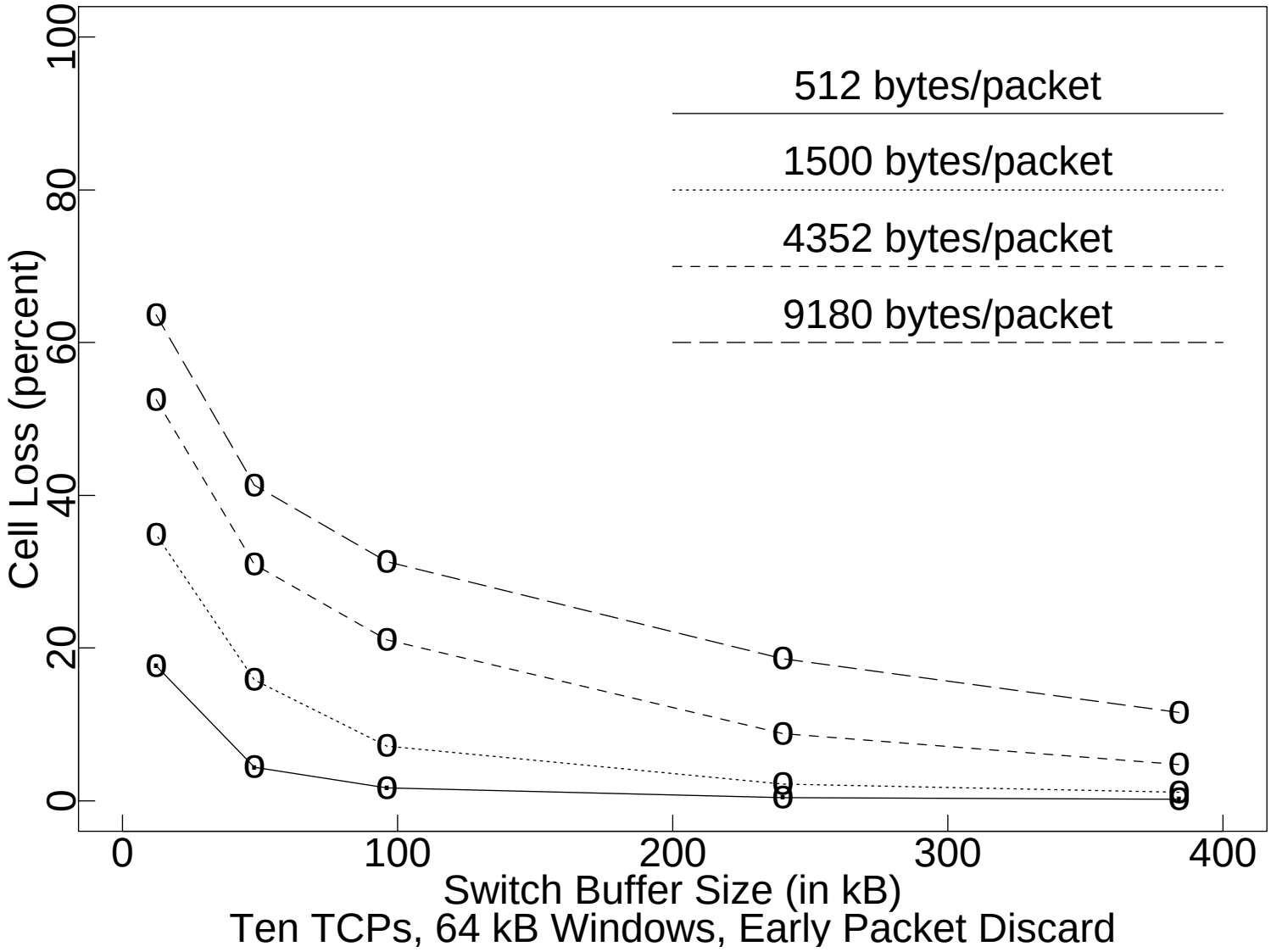
EPD: Cell Loss Rate by Buffer Size



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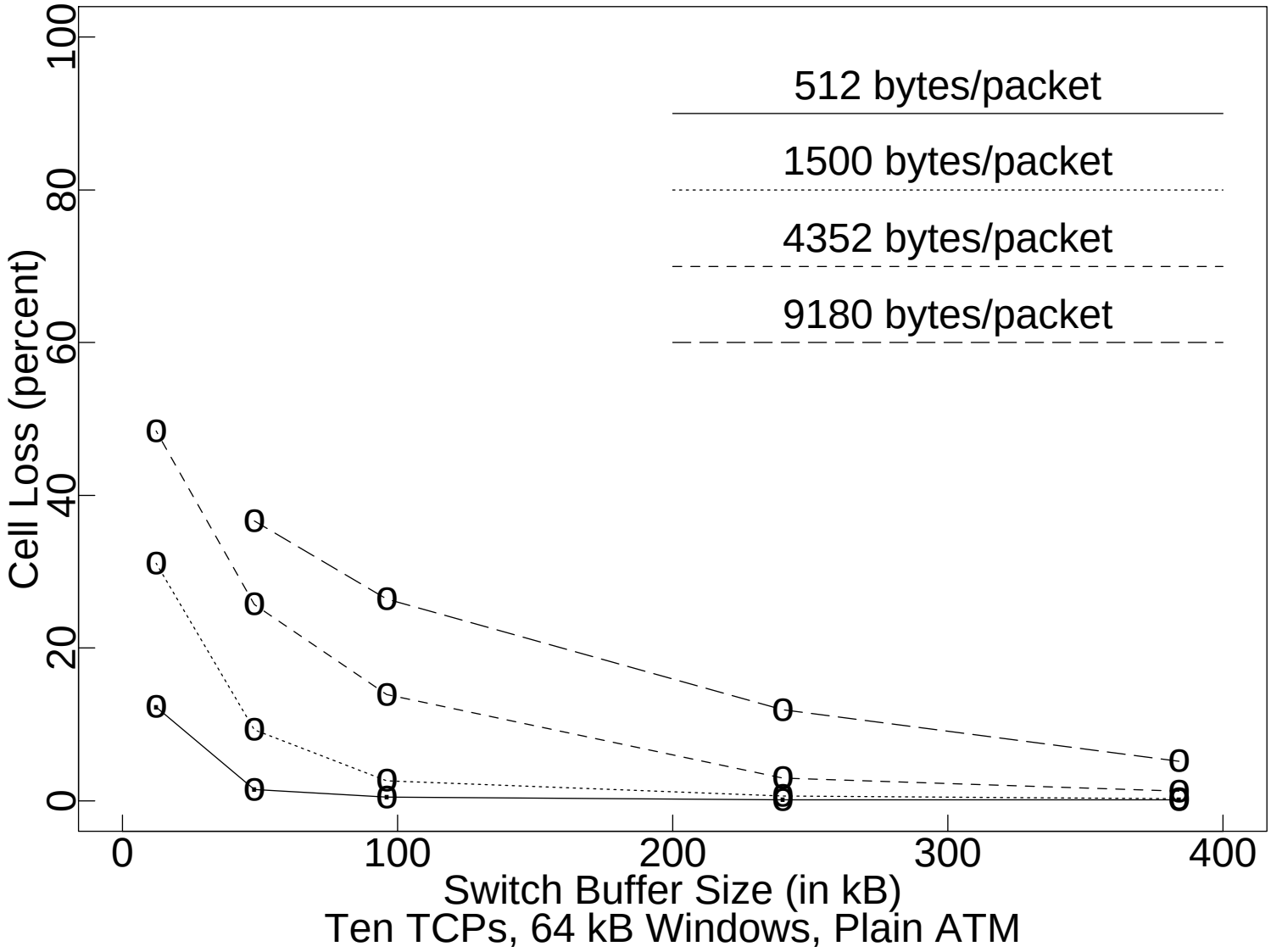
Plain ATM: Cell Loss Rate by Buffer Size



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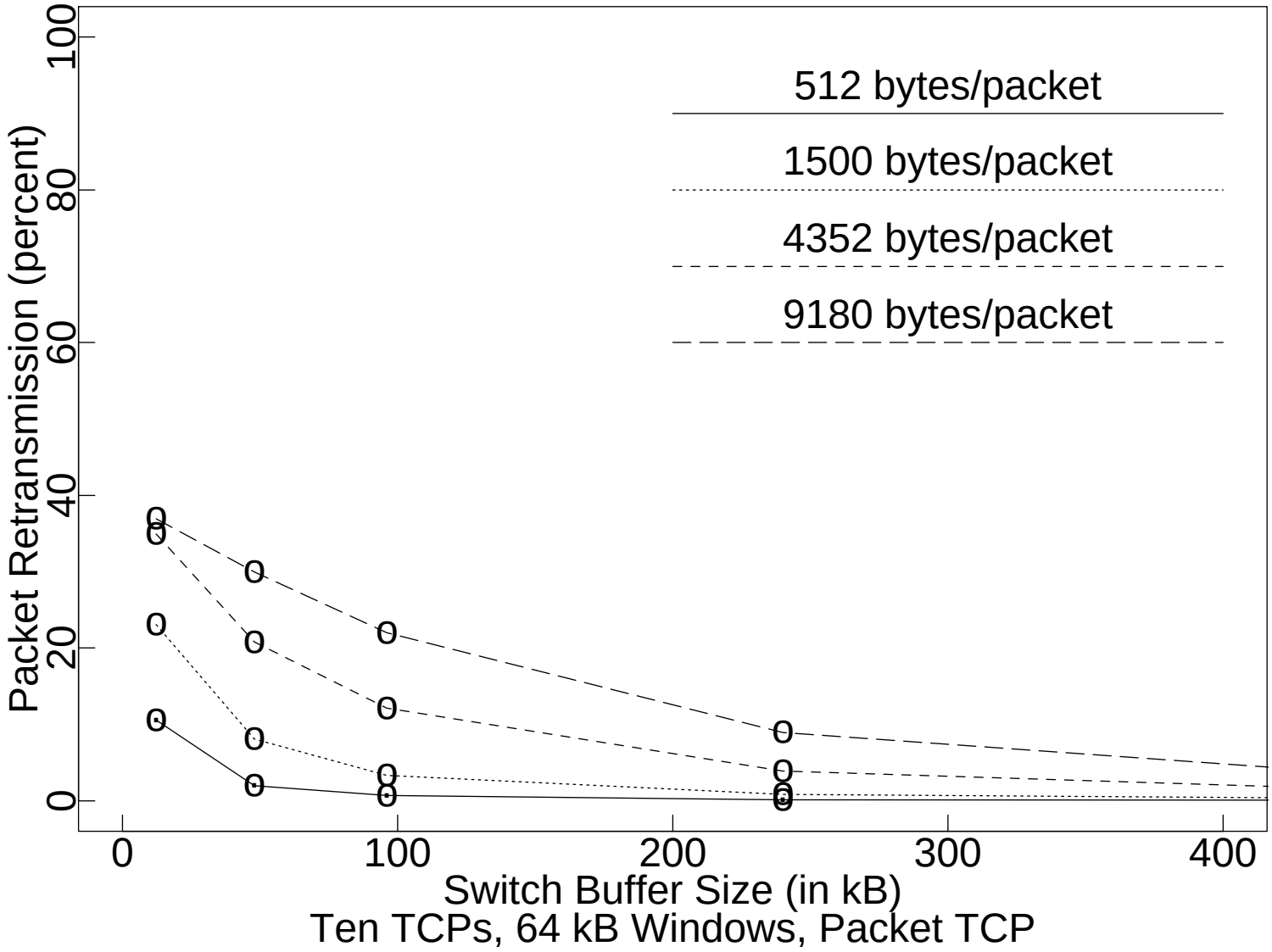
Packet TCP: Percent Pkt Retransmission by Buffer Size



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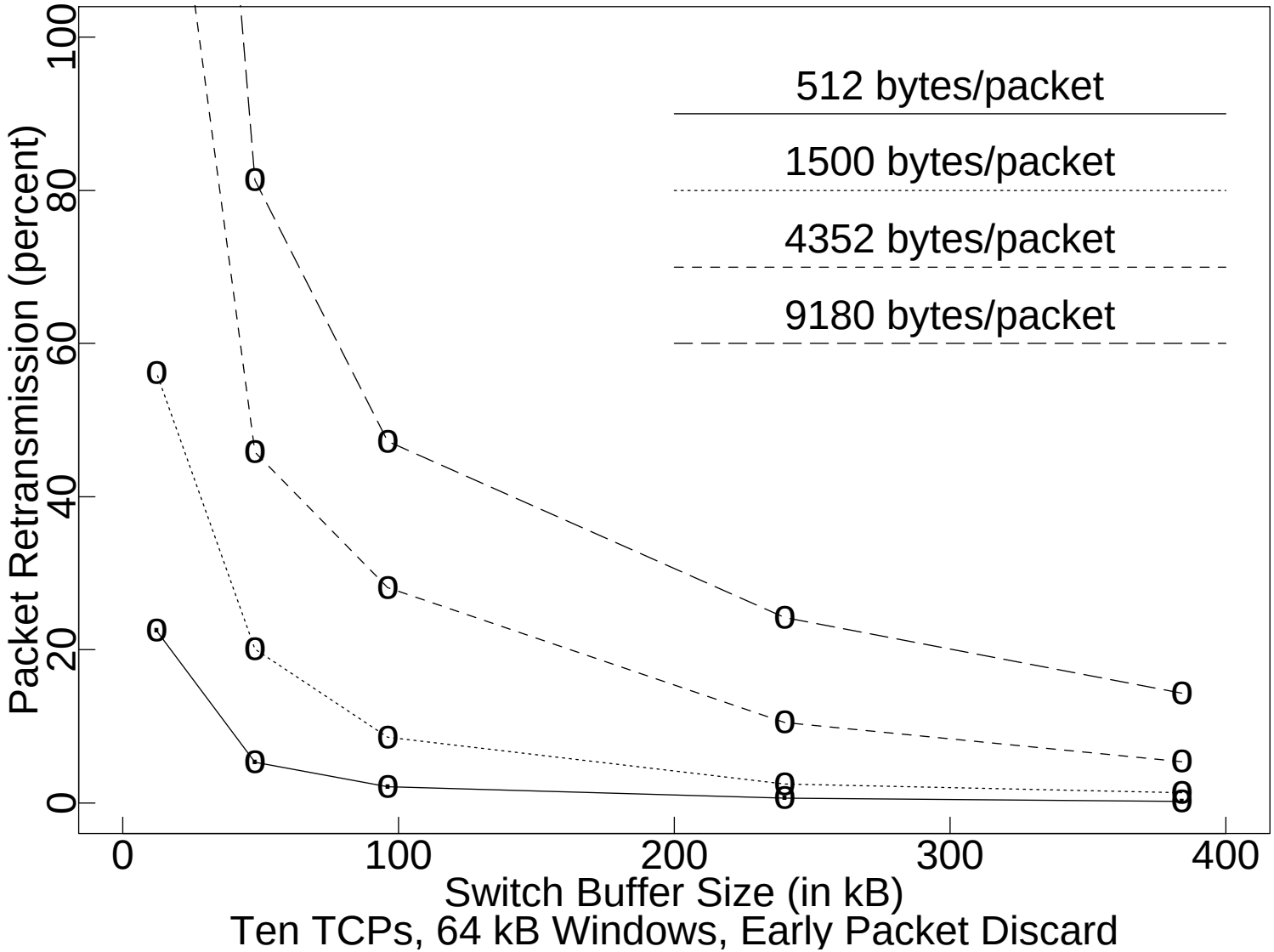
EPD: Percent Pkt Retransmission by Buffer Size



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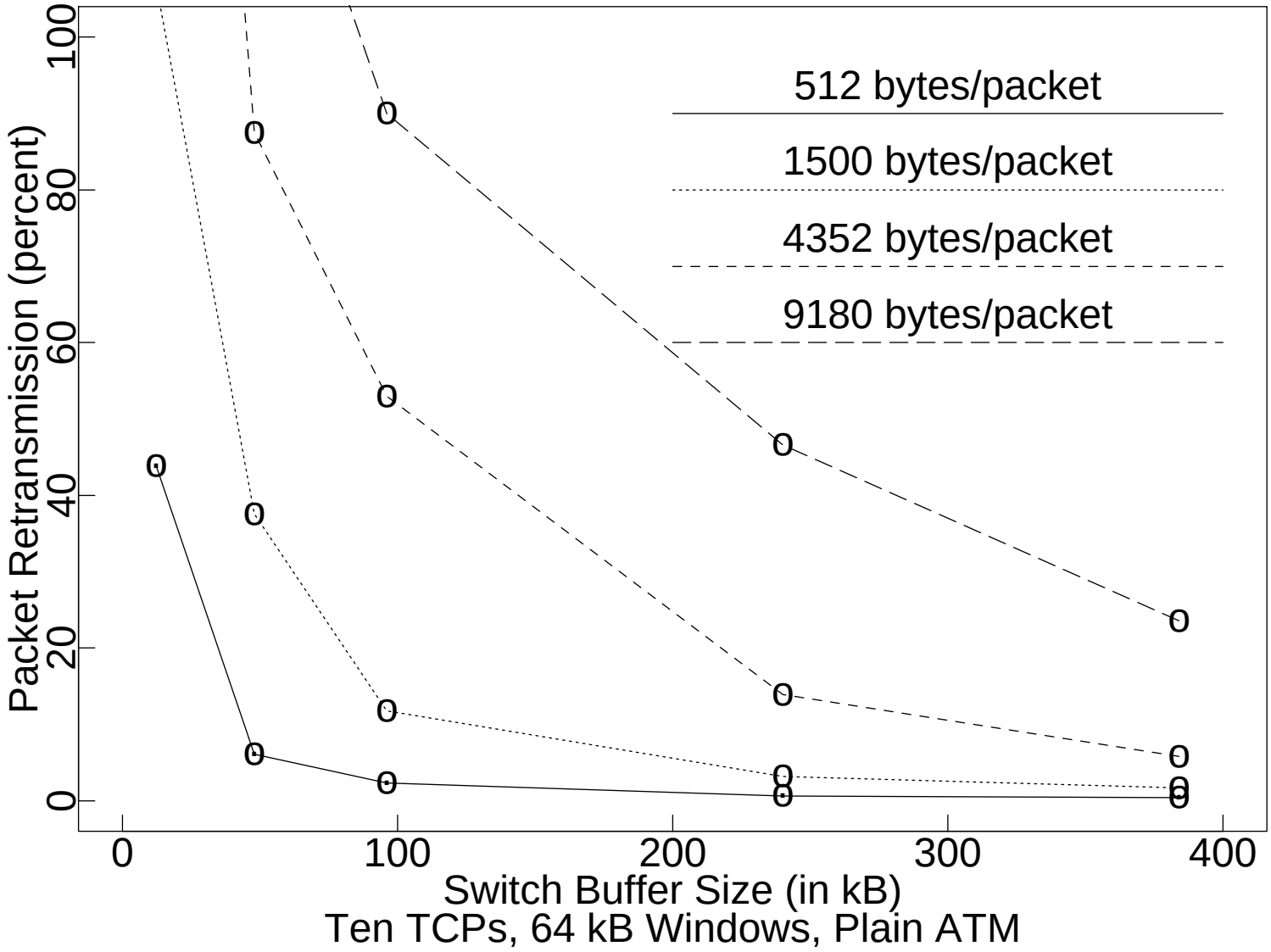
Plain ATM: Percent Pkt Retransmission by Buffer Size



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Future Work

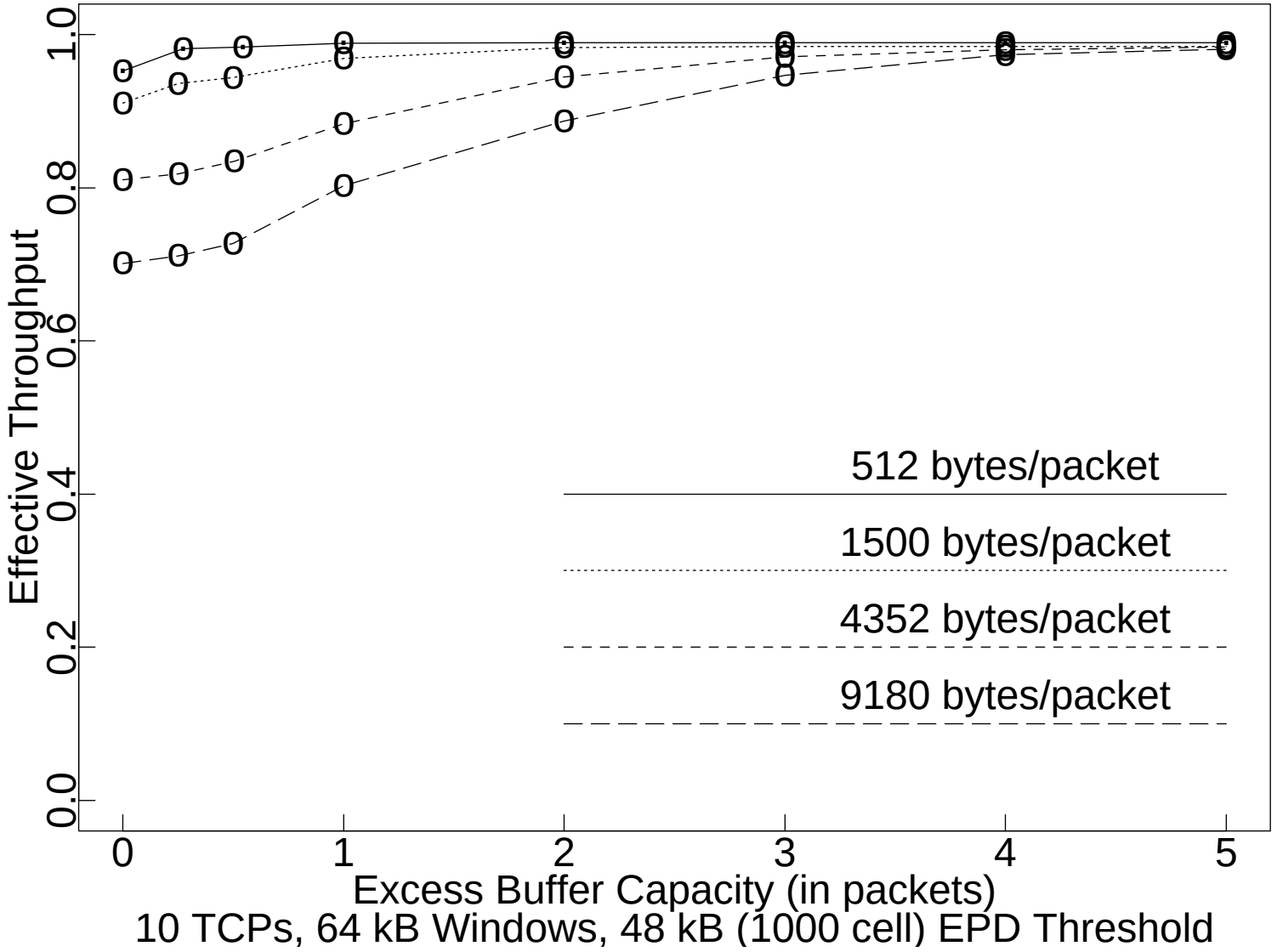
- **Investigate PPD/EPD with**
  - **different traffic models**
  - **different congestion control schemes**
  - **richer topology - more switches**

- **Modifications to TCP**
  - **Explicit notification**
  - **Dynamic packet size, window size**

More about Early Packet Discard

- Improves throughput
- Does not address fairness,
  controlling misbehaving users, low delay
- Can be used with other traffic control mechanisms
- Tolerates occasional buffer overflow
- May not have low retransmission rate
- Performance for non-TCP protocols -
  similar to packet switch
- Bias against small packets
- Doesn’t require cooperation among switches, hosts

EPD Threshold: 1000 Cells



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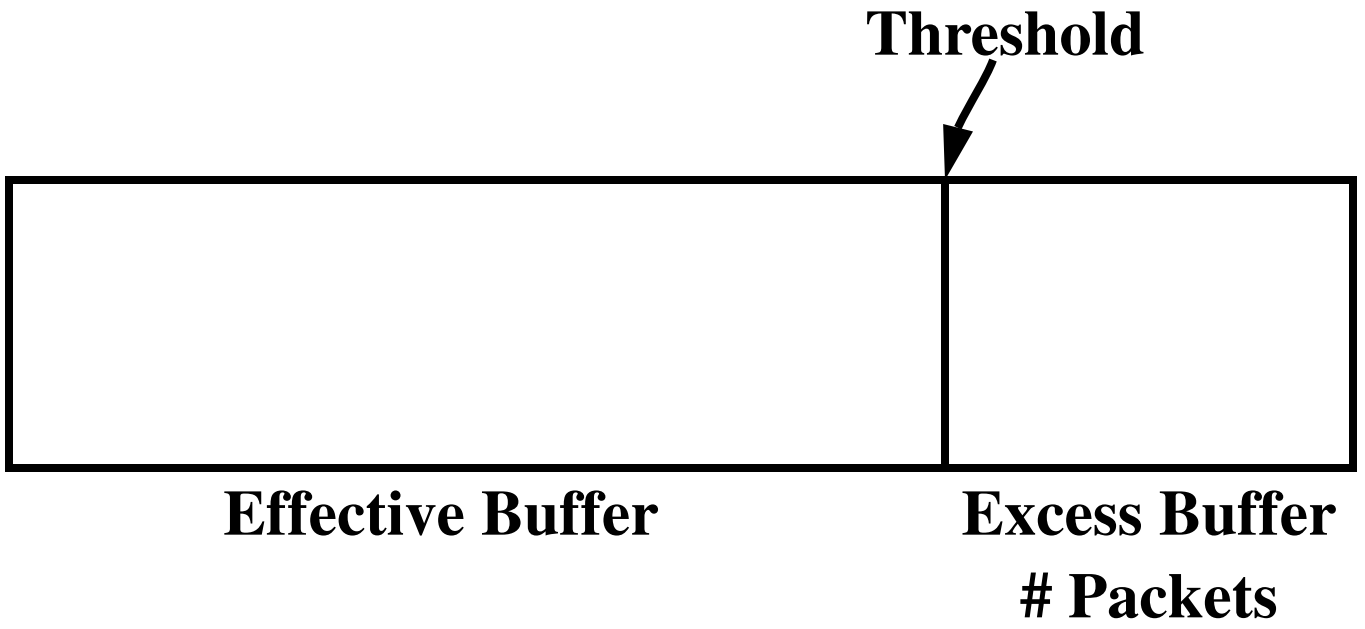
Setting the EPD Threshold



Setting the EPD Threshold

- **Efficient use of buffer vs. dropping cells**

- **Size of excess buffer depends on**
  - **Distribution of packet sizes**
  - **Traffic**
  - **Duration of congestion epoch**
  - **Interaction with congestion control mechanisms**

Early Packet Discard

- Drop complete packets
- High effective throughput
- Implementation
  - AAL5
  - Signal on a per VC basis
  - Threshold

Early Packet Discard: Effective Throughput by Buffer Size