Some Ground Rules

- Let’s make this educational and enjoyable.
- It’s a big class, and it’s easy for things to get out of hand, so please...
  - Let me orchestrate the questions.
  - Listen to other people’s questions.
  - Be here.
  - Be here on time.
Let's begin

- An Introduction to the mail system
- An Introduction to the Internet
Characteristics of the mail system

- Each envelope is individually routed.
- No time guarantee for delivery.
- No guarantee of delivery in sequence.
- No guarantee of delivery at all
  - Things get lost
  - How can we acknowledge delivery?
  - Retransmission
    - How to determine when to retransmit? Timeout?
    - Need local copies of contents of each envelope.
    - How long to keep each copy.
    - What if an acknowledgement is lost?

An Introduction to the mail system

Network Layer

Transport Layer

Application Layer

Link Layer
An Introduction to the Internet

O.S.  
Transport Layer  
Application Layer  
Network Layer  
Link Layer

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No guarantee of delivery at all!
- Things get lost
- Acknowledgements
- Retransmission
  - How to determine when to retransmit? Timeout?
  - Need local copies of contents of each packet.
  - How long to keep each copy?
  - What if an acknowledgement is lost?
Characteristics of the Internet (2)

- No guarantee of integrity of data.
- Packets can be fragmented.
- Packets may be duplicated.

Layering in the Internet

- **Transport Layer**
  - Provides reliable, in-sequence delivery of data from end-to-end on behalf of application.

- **Network Layer**
  - Provides “best-effort”, but unreliable, delivery of datagrams.

- **Link Layer**
  - Carries data over (usually) point-to-point links between hosts and routers; or between routers and routers.
An Introduction to the mail system

Some questions about the mail system

- How many sorting offices are needed and where should they be located?
- How much sorting capacity is needed?
  - Should we allocate for Mother’s Day?
- How can we guarantee timely delivery?
  - What prevents delay guarantees?
  - Or delay variation guarantees?
- How do we protect against fraudulent mail deliverers, or fraudulent senders?