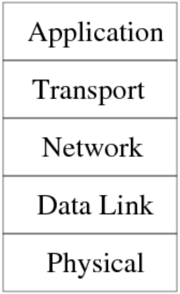
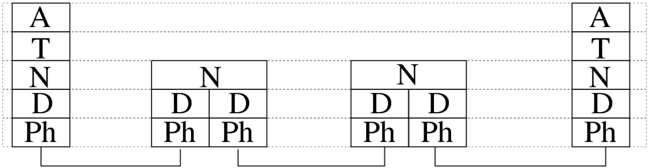
Where Are We?

Basics:
Network Classification
Network Architecture
Reliable Data Transfer
Delay Models
Implementation:
Protocol Design

Layered Architecture



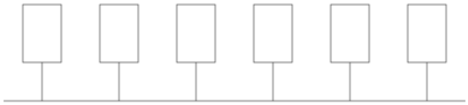
Layered Architecture



Functionality

- Reliable Delivery of Frames
- Flow Control
- Error Detection
- Error Correction

Multiaccess Media



Ethernet

Multiaccess Media

Wavelan

Cocktail Party

Multiaccess Media

Rules

- “Don’t interrupt when someone else is speaking”
- “Raise your hand if you have a question”
- “Give everyone a chance to speak”

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Multiaccess Protocols

- Channel Partitioning (Cellular Wireless Networks)
- Random Access (Ethernet, WiFi)
- Taking Turns (Token Ring)

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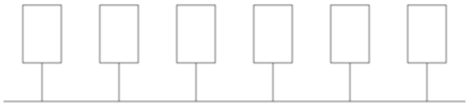
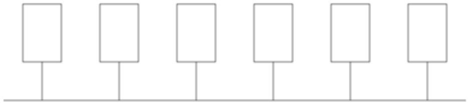


Ethernet

- Hosts broadcast packets
- When a collision occurs, all transmitted packets are lost
- Lost packets have to be retransmitted



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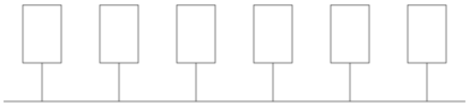
Protocols for Multiaccess Networks



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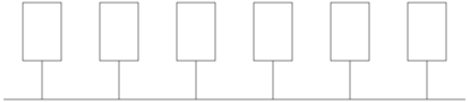

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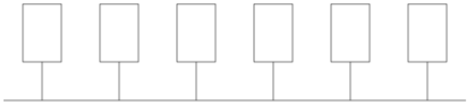

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$=>$ **Need Multiaccess Protocol**

Protocols for Multiaccess Networks

Goal:

- Understand Multiaccess Protocols
- Understand Ethernet and IEEE 802.11 Protocol

Issues:

- How to deal with collisions? $(- >$ Protocol design)
- Maximal traffic load? $(- >$ Protocol performance)

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Model - Slotted Aloha

- Time is divided into slots:

unit time = $\frac{L}{C}$ seconds

- Packet arrival rate (over all hosts) of λ packets/time unit
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- Immediate Feedback: 0, 1, e
- (Re-)transmission Probability: q_r
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- λ: aggregated arrival rate
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and we obtain

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Note: Arrivals according to a Poisson distribution with rate G:

$$p_k = \frac{G^k}{k!}e^{-G}$$

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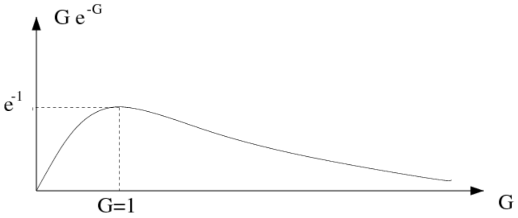

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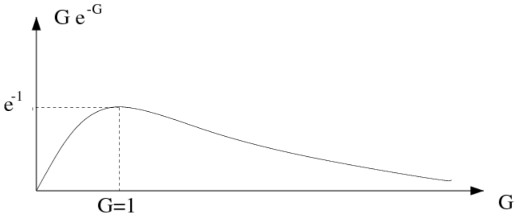

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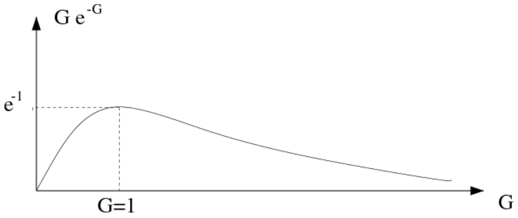

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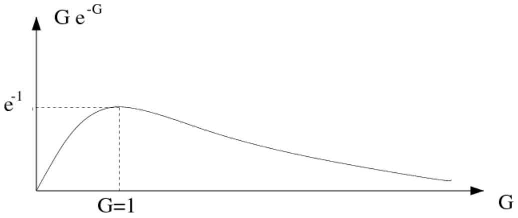

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- q_r should dynamically change

Binary Exponential Backoff

- $q_r = 2^{-k}$

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