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6.033 Computer System Engineering
Spring 2009

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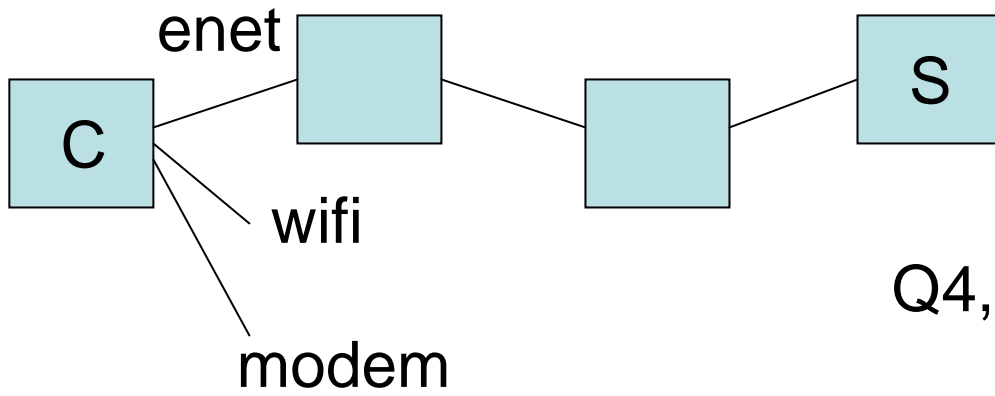
Best Effort Networks

- Delays - propagation + xmit + queuing + proc
- Loss
- Reordering
- Duplication

Dealing w/ Complexity

- Modularity – Layering
- Protocols → Rules

Layering



App
`send("s", msg)`

Q4,5 → E2E

Q3
Net
Pick next link

Q2
Link

Encapsulation

Each layer add/remove its header/trailer

Don't look at / use payload from higher layers

Link Layer Issues

Digital → Analog → Digital

Framing

Channel Access

Carrier sense

Collision Detect

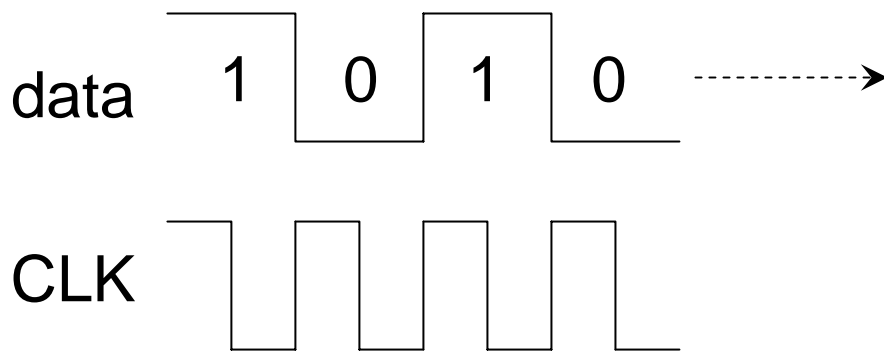
TDM

Error Detection/Correction

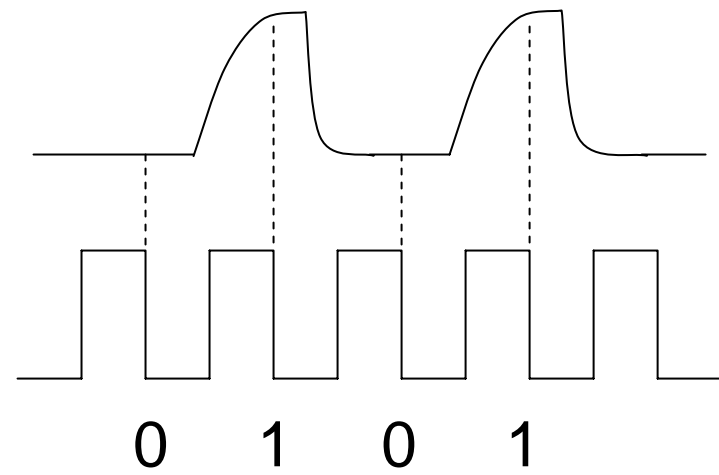
D → A → D

Sender

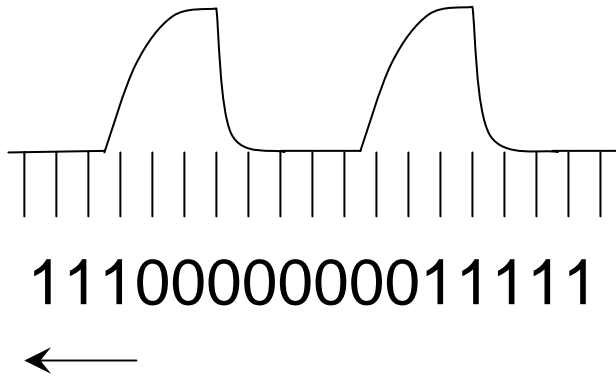
1010



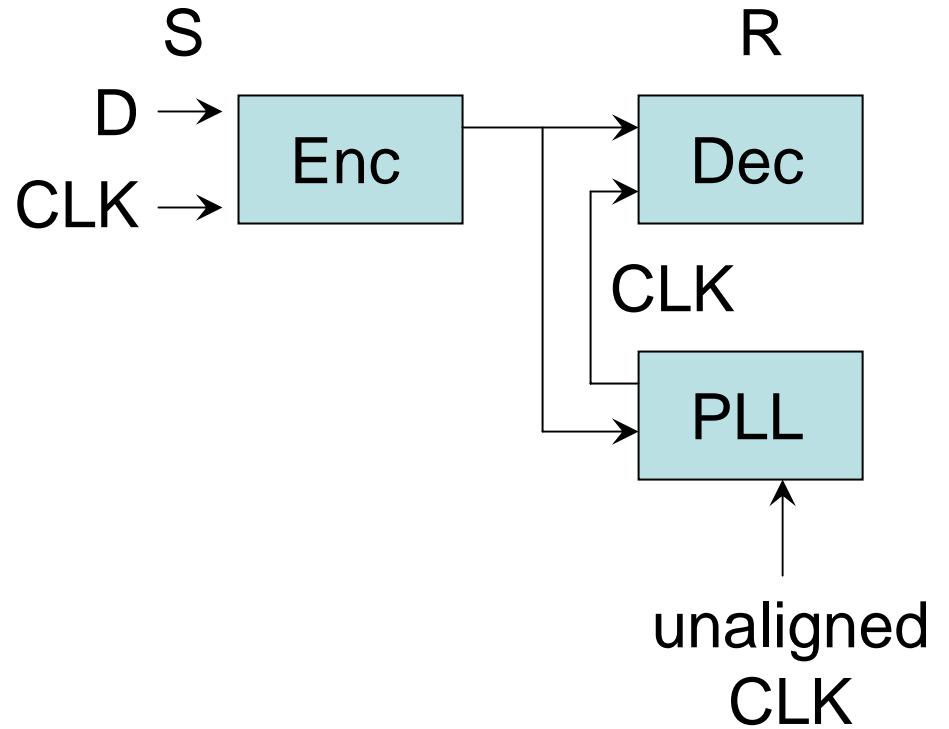
Rcvr



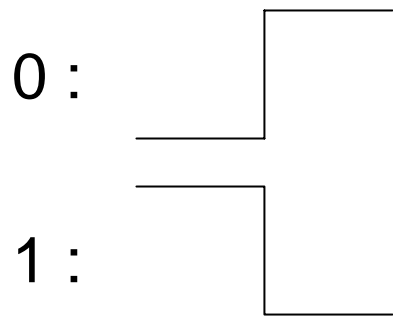
PLL



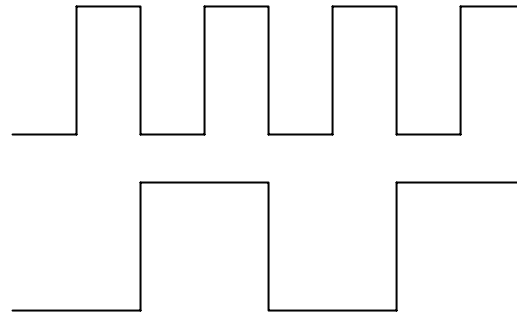
8x oversampling



Manchester Encoding



000



010

