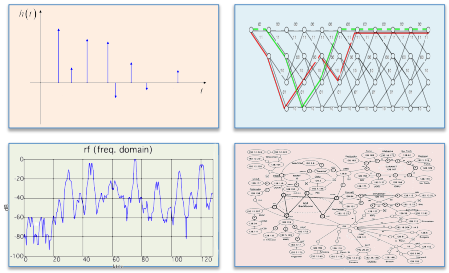


INTRODUCTION TO EECS II

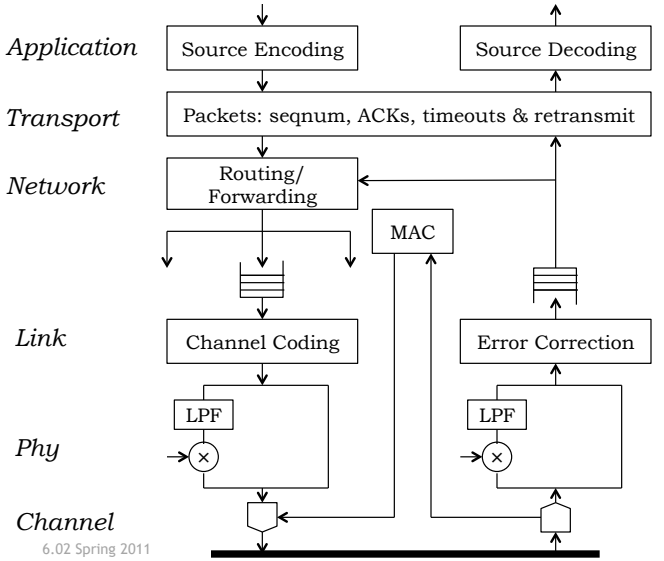
DIGITAL COMMUNICATION SYSTEMS

6.02 Spring 2011 Lecture #24

- Wrap-up
- Your feedback

HKN Eval!

What We Built



Reliability

- Digitization
- Error detection
  - Gaussian noise models, predicting BER
  - CRC, checksums
  - Parity, block codes, convolutional codes
- Error correction
  - Single-error correction in block codes
  - Viterbi algorithm: maximum-likelihood decoder
- Reliable sharing via media access control
- Best-effort packet switching
  - Retransmission to recover from dropped packets
- Approaches to reliability
  - Redundancy
  - Detect failure, invoke recovery mechanism
  - Accurate models → simulation

Sharing & Scalability

- Dedicated links are impossibly expensive
- Time-division multiplexing
- Contention protocols for bursty traffic
- Frequency domain
  - Spectrum sharing by bandwidth-limited signals
  - Modulation/demodulation
  - Filters
- Network-level sharing
  - MAC protocols (TDMA, contention)
  - Best-effort packet networks, queues
  - Queues
- Scalability
  - Use local mechanism instead of global mechanism

Approach

- Understand **tools and techniques**
  - Concepts and principles
  - Labs
  - Small problems (calculations, analysis)
- Begin to understand **trade-offs**
  - The essence of all engineering systems
  - Science, art, or a mix?
  - Principles and tools matter, as do intuition and experience

Trade-Offs

- A number of techniques – how to apply them and make them work together?
- Reliability: apply redundancy in creative ways to build reliable systems out of unreliable components
- Sharing: reduce the amount of resources consumed
- Scalability: hide information, reduce amount of state to be managed

EECS Ideas

- Signals and systems
  - LTI, superposition, unit-sample response, frequency response, modulation
- Algorithms, centralized and distributed
  - Viterbi decoding, shortest paths (Dijkstra), distance vector (Bellman-Ford), compression (Huffman, LZW)
- Computer systems
  - Protocols, abstraction and modularity, layering
- Applied probability
  - Continuous-domain probability (PDF & CDF): bit errors
  - Discrete-domain probability: MAC protocol analysis
  - Basic queueing models: packet switch sharing analysis
- Methods: design, simulation, experimentation

Discussion

- Which activities worked well?
  - Lectures
  - Recitations
  - Labs: did they help you understand the material? Were they interesting?
  - Lecture notes?
  - Online psets: how effective?
  - Tutorial problems & problems at end of chapters?
  - Were the quizzes fair?
- Did we cover too much? Too little?
- Would you like to be an LA in a future term?