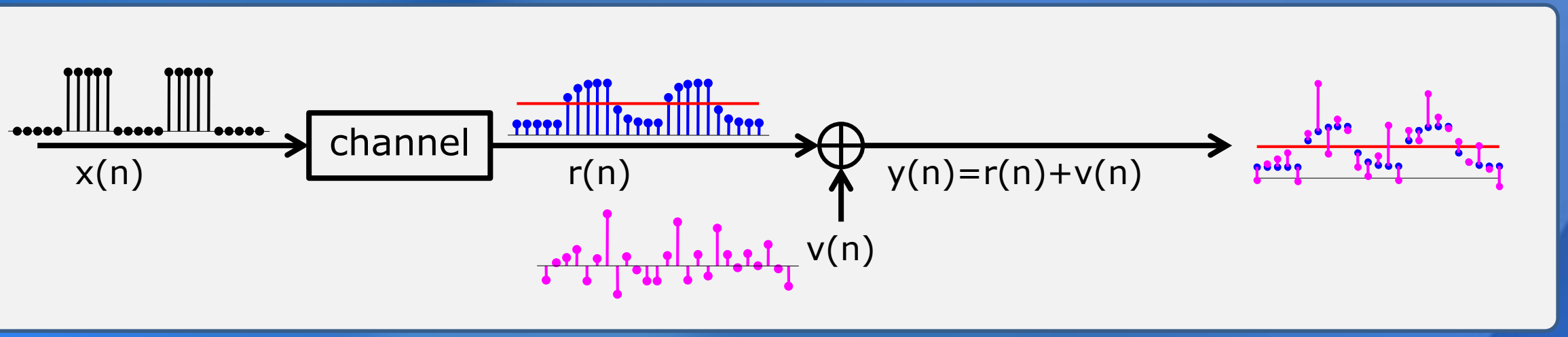
Channel Coding

Bit Errors



- Noise added during transmission causes bit errors in our digital data stream.
- It is usually impossible to completely eliminate errors.
- Often, the best we can do is to bound the probability of bit error.
- Channel coding is a way to detect or correct bit errors by adding redundancy to the transmission.

Photo from: http://www.eecs.umich.edu/shannonstatue/

Claude Elwood Shannon

Father of Information Theory

Electrical engineer, mathematician, and native son of Gaylord. His creation of information theory, the mathematical theory of communication, in the 1940s and 1950s inspired the revolutionary advances in digital communications and information storage that have shaped the modern world.

This statue was donated by the Information Theory Society of the Institute of Electrical and Electronics Engineers, whose members follow gratefully in his footsteps.

Dedicated October 6, 2000
Eugene Daub, Sculptor

Shannon's Noisy Channel Coding Theorem:

A noisy channel has a channel capacity C, the maximum rate at which useful information can be transmitted.

For any data rate R < C, there exists a way to encode the data such that the probability of error is arbitrarily small.

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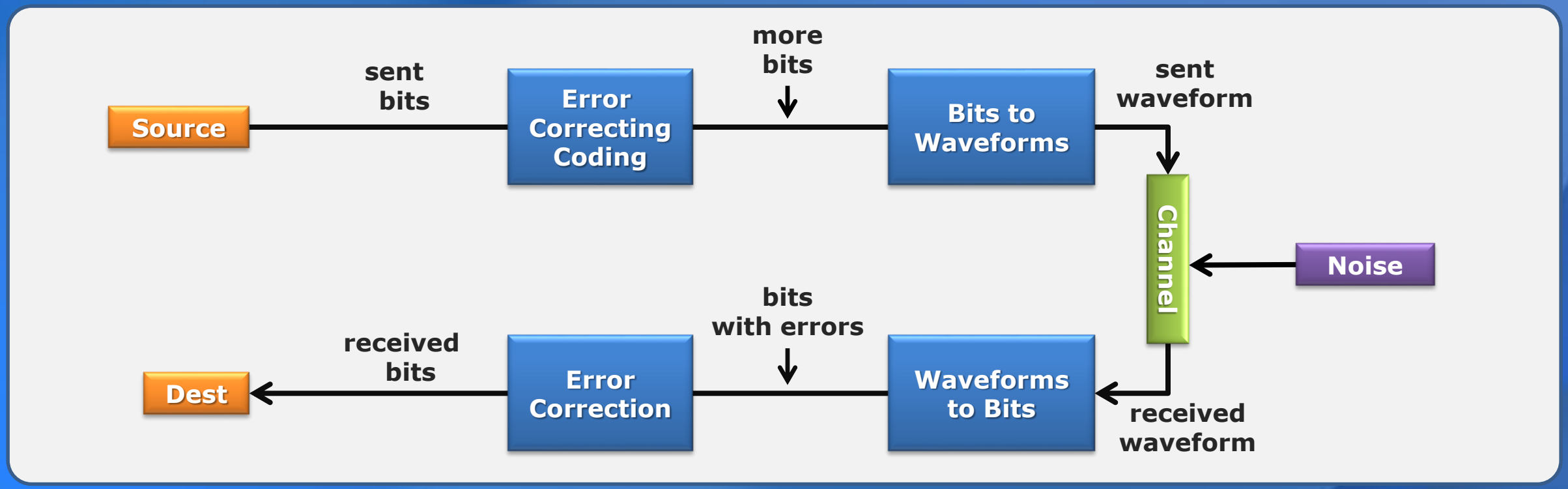

- We add redundant information to the transmitted bit stream, so that we can detect errors at the receiver.
- Ideally we'd like to
  - correct commonly occurring errors.
  - detect uncommon errors and deal with them by methods like retransmission.