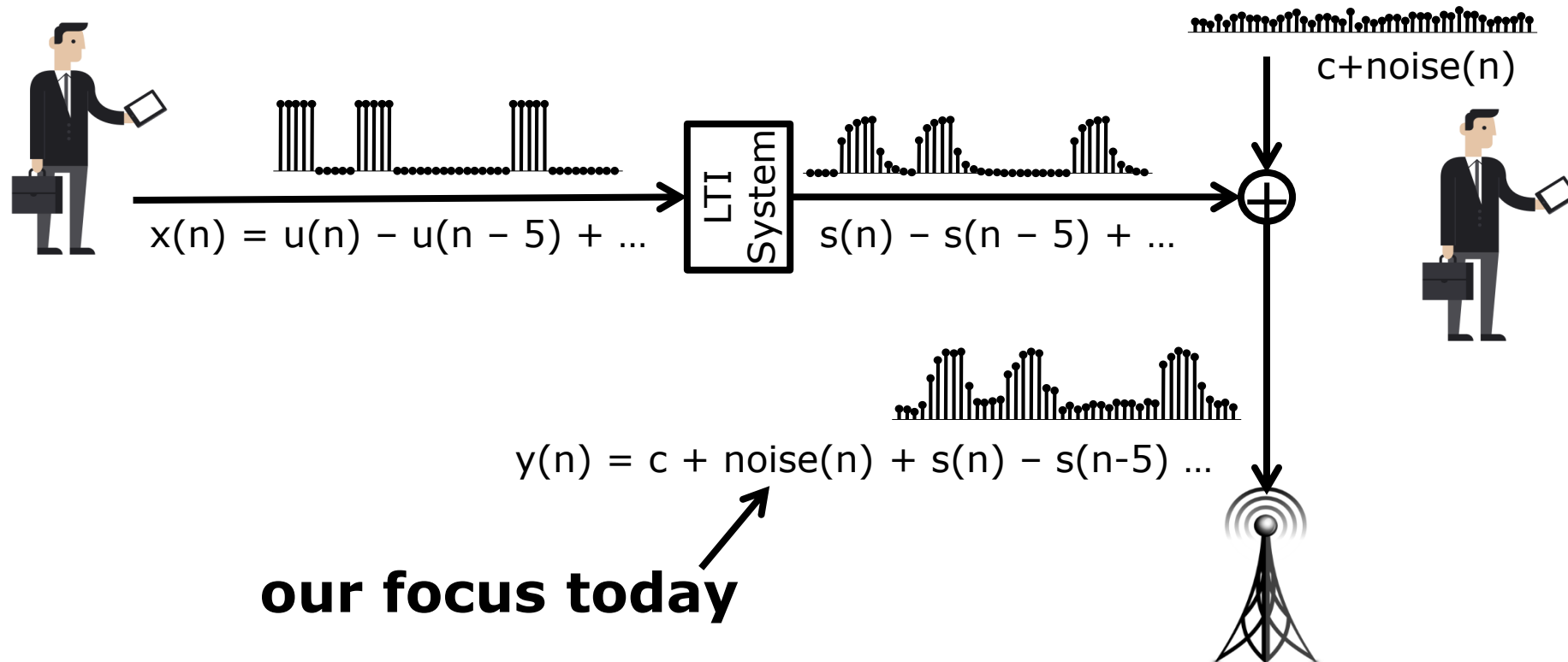


Noise

The Received Signal

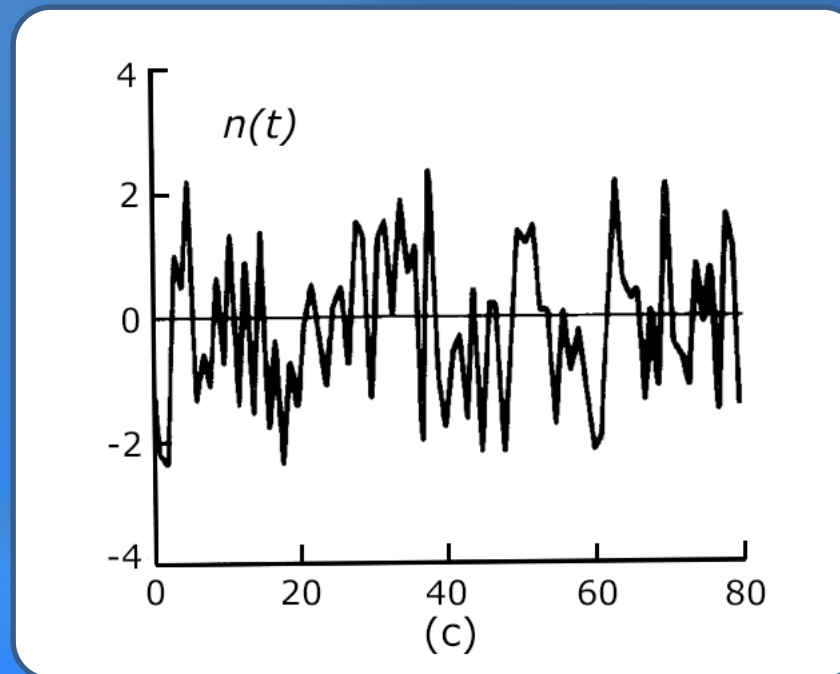
The signal at the receiver is the sum of two parts:

- The response to the input, which can be computed from the step response according to the LTI assumption
- Signals, such as offset (c) and noise, that are introduced by the environment (e.g. other users, electronic components)



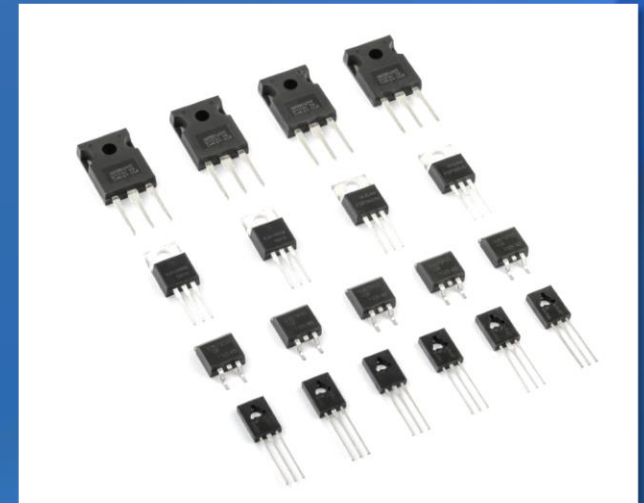
Noise

- Noise is one of the most critical and fundamental concepts in communications systems
- Without noise this course would not exist!
- Noise occurs everywhere and a typical noise signal may look like
- It is essentially a “random signal”



Where does noise come from?

- Noise occurs naturally in nature and the most common type is thermal noise
- Resistors, devices and the atmosphere are all sources of thermal noise
- Thermal noise is simply due to the ambient heat causing electrons to move and vibrate and create random voltages and emissions
- Noise arises internally in systems as well as externally from such things as the atmosphere



Why is noise so critical?

- Without noise, you would be able to talk very, very, very, very quietly and you would still be heard and understood.
- The amount of noise determines the minimum signal of what you can understand.
- Noise determines the minimum signal that can be decoded by radios and receivers.
- We like to use small signals to save energy.
- If the desired signal falls below the noise level, bit errors increase significantly.

