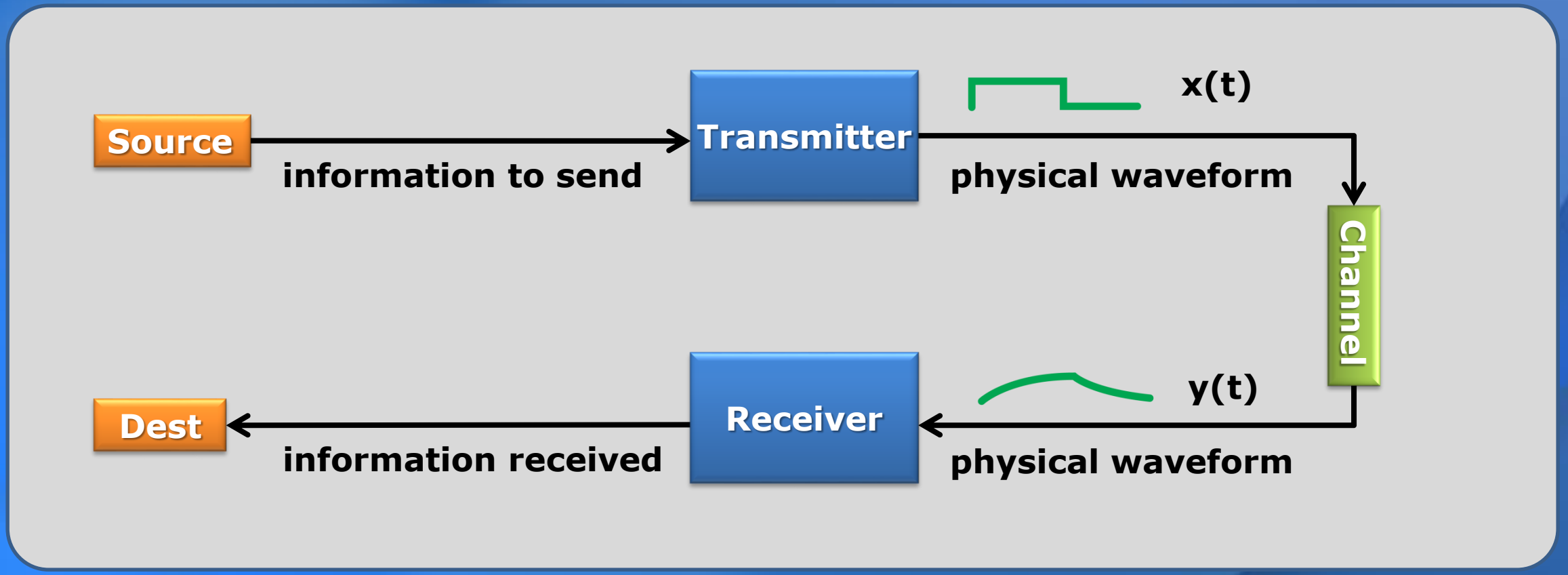
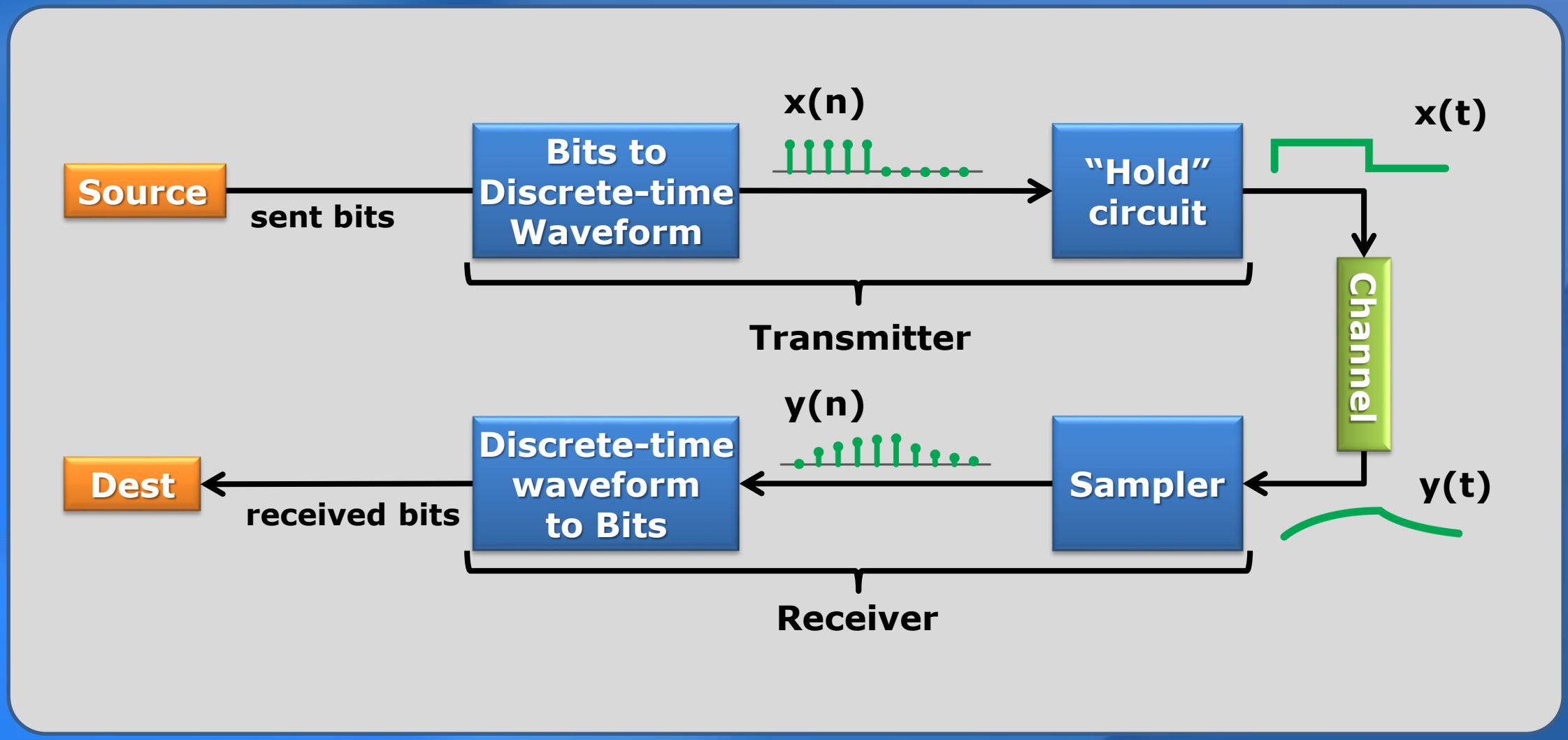
The Discrete Time Channel

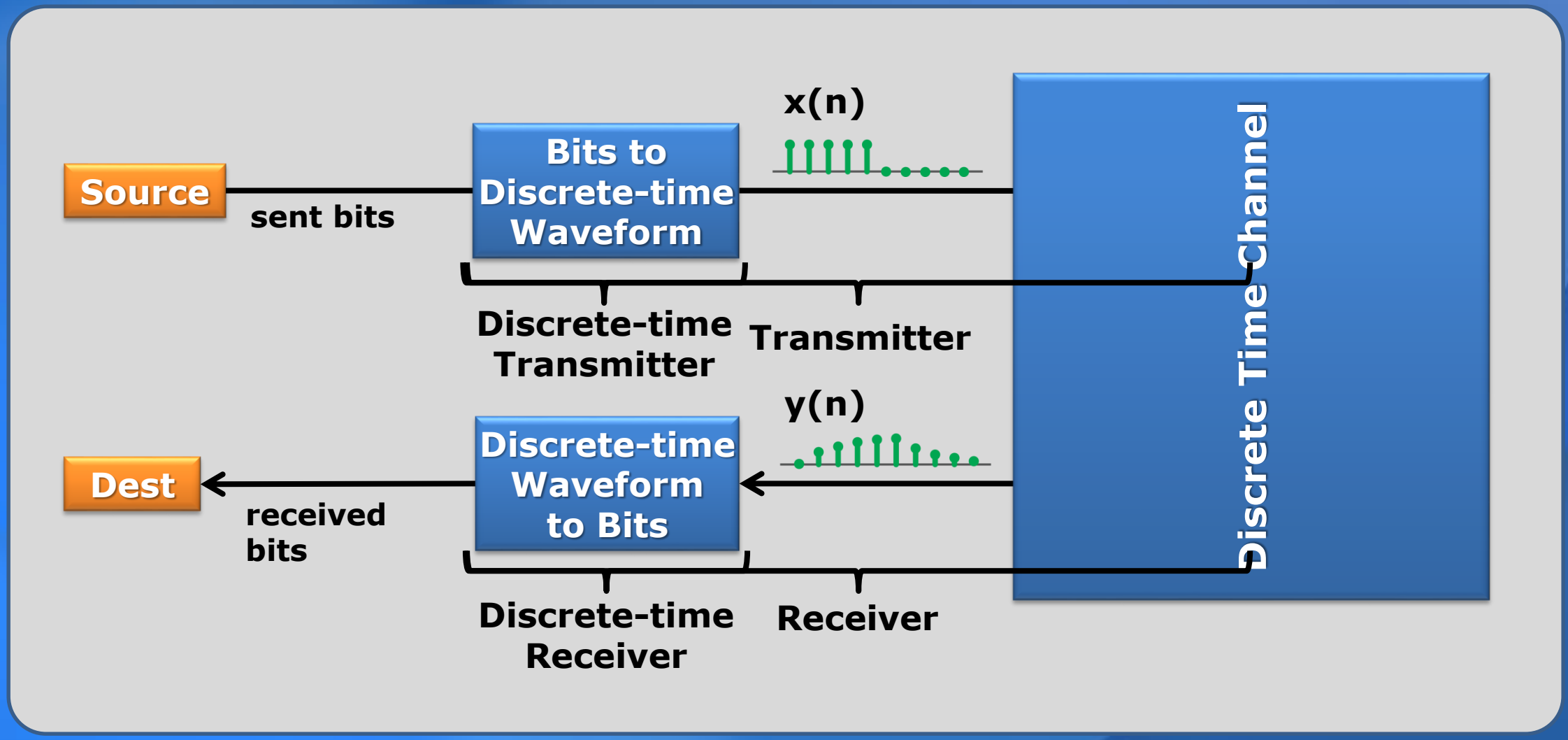
Communication System



Continuous Time Channel



Discrete Time Channel



Mathematical model

(Actual response)

$x(n) = u(n) - u(n-5)$ → Mathematical Model → $y_m(n) = \left(1 - a^{n+1}\right)u(n) + \ldots$

(Model response)

We have a good model if:

- The model and actual responses are similar, $y_m(n) \approx y_a(n)$
- The relationship between $y_m(n)$ and $x(n)$ is simple (easy to understand and calculate)

Why do engineers use models?

- Understand the operation of the system
  - What is the relationship between the input and the output of the channel?
- Predict the performance of a system
  - How fast can I transmit information over the channel?
- Develop modifications to the system that improve performance
  - What can I do to improve the speed?