Capabilities

- Call other FPGAs
- Leave a message
- Listen to saved messages
- Personalize voicemail
Building Blocks

- Several FPGAs
- Microphone and Headphones
- Buttons
- LEDs
- Wire
Finite State Machine

- LISTEN_MSG
- LISTEN_PRE
- NEW_PRE
- IDLE
- CALLING
- REC_PRE
- RINGING
- INCALL
- SEND_MSG
- REC_MSG
- SEND_PRE
Inputs

- Lead Conversation
- Initiate conversation or record/listen to messages
- Data from the other FPGAs
Outputs

- Send data to the other FPGAs
- Produce sound on the speakers
Error Correction

Good audio quality requires good data transmission between the FPGAs.

Error correction algorithms send extra information, which helps to detect and fix errors in the transmission.
Sending Data

FPGA -> Packet
- Address
- Header
- Data

Packet -> FPGA
- FPGA

Packet -> FPGA
- FPGA
Memory

- 128 Mbits of flash memory
- 1 minute messages downscaled to 6kHz
- Using 8 bit audio
  - 43 messages + 1 personal voicemail
- Using 12 bit audio
  - 28 messages + 1 personal voicemail
Stretch Goals

- Make it work with more than two FPGAs
- Using a display (current state, caller ID, etc.)
- No downsampling of the audio from the microphone
- Simulate real telephone system by separating the FPGAs by bigger distance
Questions?