

6.111 Project Proposal (P2P phone)

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Abstract:

The project is to build a phone system that consists of interconnected FPGAs. The goal is to allow any two nodes in the network to communicate using a peer-to-peer routing algorithm. It will enable multiple conversations to take place over the same medium. Finally, the system should use error correction to operate in the presence of noise.

This document outlines each of the modules in our project.

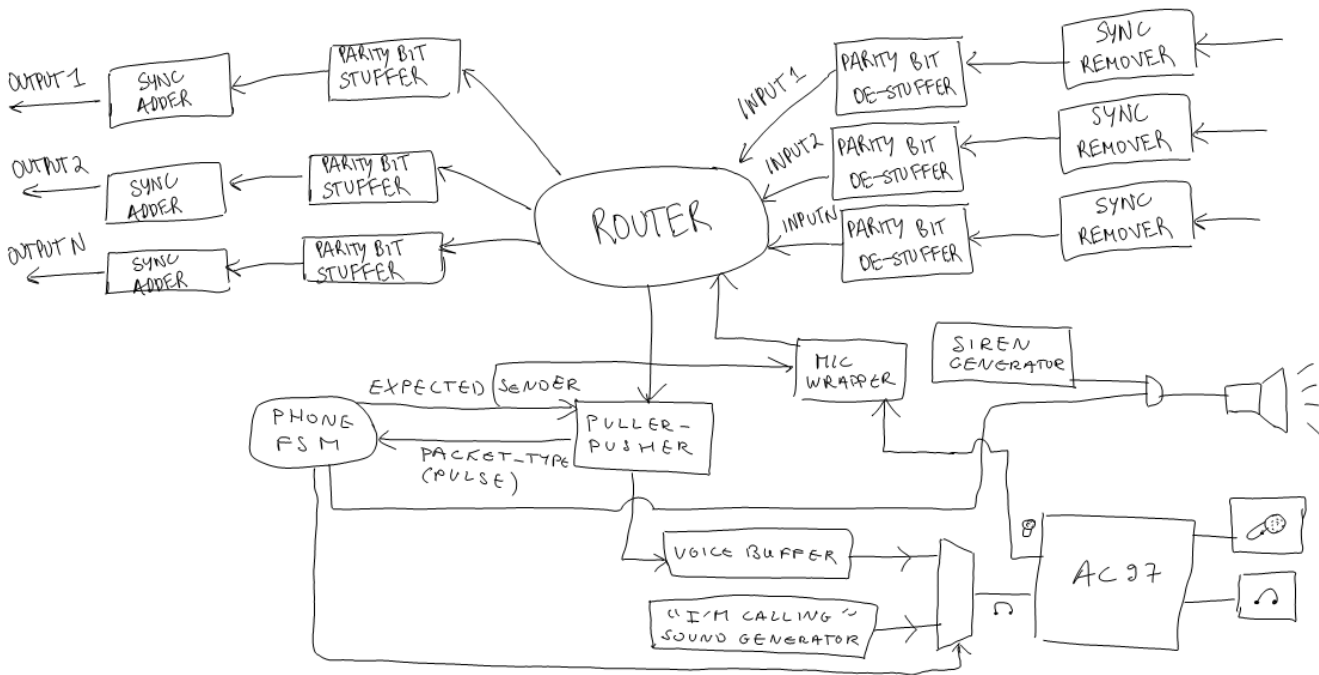


Figure 1: Project Block Diagram

Sync Adder

Adds a unique sequence of bits that allows the sync remover to detect a beginning of a packet. It also adds a length field to the beginning of a packet.

Sync Remover

Detects the beginning of a packet and buffers it so it can transmit it to the parity bit de-stuffer.

Parity Bit Stuffer

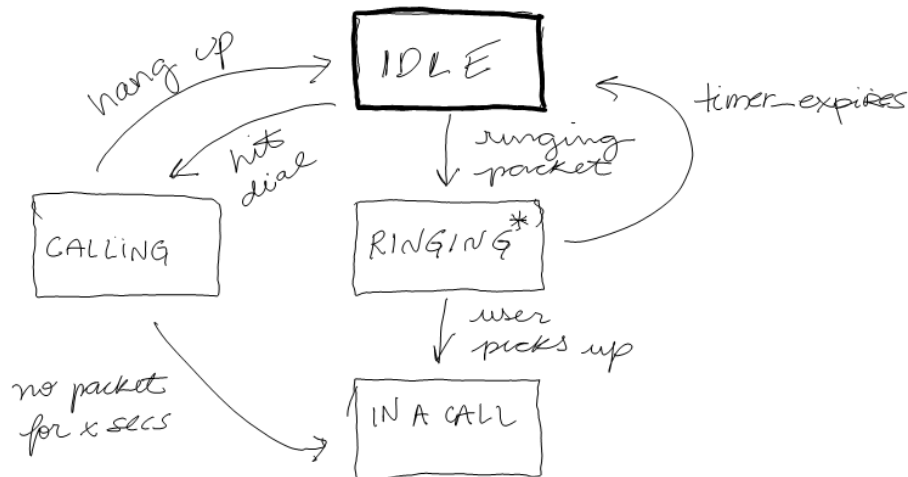
Gets data coming from the router and every 4 bits adds two parity bits. These bits are used to correct errors that might have occurred during transmission.

Parity Bit De-Stuffer

Gets a packet (that no longer has a sync at the head) and removes the stuffed parity bits. This module drops any packets that have non-correctable errors.

Phone FSM

Module that stores the current state of the phone. The possible states are "Idle," "Ringing," "In a Call," "Calling." Here is its transition diagram:



* somebody is calling you

Figure 2: FSM State Transition Diagram

Router

The router's responsibility is to forward packets to the right outputs. It examines packets coming in and uses a LSA (Link-State Advertisement) routing mechanism to detect which output the packet should be sent to. In order to achieve this, the router maintains an internal table of the nodes it can reach through each of the ports. It also periodically sends "hello" packets and updates its internal routing table based on "hello" packets it receives.

Puller-Pusher

The "puller-pusher" module reads incoming packets from the router and pushes them into the voice buffer. It produces a one clock cycle wide pulse specifying the packet type (ringing packet, voice packet

etc.). It takes in one input from the phone FSM indicating the expected sender (the ID of the FSM the conversation is taking place with). All packets that do not match this sender are dropped.

Mic-wrapper

The mic-wrapper creates packets from the microphone data and sends them to the router. It uses the “expected sender” signal to determine where to tell the router to send the packet. It uses the same encoding as the voice buffer.

Voice buffer

It is simply a buffer (FIFO) of voice packets. If this buffer is empty it just repeats the last packet. It decodes the data using the inverse encoding of “mic-wrapper.”

“I’m calling” sound generator

This module generates the tone you get when you are calling somebody.

Siren generator

This module generates the ringing sound heard when somebody is calling you. It is a modified version of the siren generator used in Lab 3.