# Intro

You will be creating a two-player game of Pong. Each player uses a CY8CKIT-062S2-43012 and CY8CKIT-028-TFT kit to play their side of the game. The paddle on each kit is controlled by the CAPSENSE™ slider. When the ball reaches the edge of the screen opposite the paddle, it “jumps” to the other kit’s screen while maintaining the same direction and speed. The jumping feature is implemented by sending Bluetooth® messages between the kits.

One kit acts as a Bluetooth® Central and the other acts as a Peripheral. The Central connects to the Peripheral automatically after both kits are reset. A game starts automatically as soon as the connection is established.

Once a player fails to bounce the ball back to their opponent, a new game starts after one second.

The ball speeds up after each player gets a chance to bounce the ball back to their opponent.

We will provide the Pong Central application and you will create the Peripheral.

The Central has the following source files:

main.c: Initialization and Bluetooth® functionality.

capsenseTask.c/.h CAPSENSE® functionality for moving the paddle.

displayTask.c/.h Game functionality and display.

pong.h Ball and Paddle data structure definitions.

# Bluetooth® Info

The Central searches for and connects to a Peripheral with the Bluetooth® name of “pong\_peripheral”. You must change this to a unique name that matches the name of your Peripheral.

Be sure to use a different device address between the Central and Peripheral. The Central uses 00A051-XXXXXX.

The GATT database has one custom service containing one custom characteristic that has notifications enabled and no security required for any operations.

Service Name: Pong

Characteristic Name: Ball

Properties: Read, Write, Notify

Permissions: Read, Write

CCCD Permissions: Read, Write

The Ball Characteristic is an array of signed 16-bit integers with 5 elements. They are:

posX X position

posY Y position

speedX X speed

speedY Y speed

numBounces Number of times the ball has bounced off a paddle

The Central uses hard-coded values for the handle of the ball characteristic and its CCCD. Your GATT database must use the same handles, or you must change the Central to match what your Peripheral uses.

Ball Characteristic Handle: 0x09

Ball CCCD Handle: 0x0A

# Hints

The Central capsensTask.c/.h can be used exactly as-is for the Peripheral.

The Central displayTask.c/.h can be used with just minor changes for the Peripheral:

* The Central uses GATT Write operations to send data to the Peripheral.
* The Peripheral must use Notifications to send data to the Central.
* There is a Boolean variable called “hasBall” that keeps track of which kit currently controls the ball. It should be set to true for the peripheral so that the game starts up correctly. It should be set to false when you send the notification to the central.

The Central main.c will require significant changes since it handles most of the Bluetooth® functionality. It must be modified to operate as a Peripheral instead of a Central.

# Challenges

If you get the basic functionality working with time to spare, consider adding some additional functionality. Here are a few ideas but feel free to come up with your own.

* Add some color – change the ball from green, to yellow, to red depending on the number of bounces.
* Reduce the paddle size as the game progresses to make it more challenging.
* Use the location that the ball hits on the paddle to determine the angle of reflection – hitting further to the left has a steeper angle to the left, and so on.
* Instead of automatically starting a new game, use a button (either mechanical or CAPSENSE™) to start a new game.
* Show how many bounces have happened during the game on the display and show the high score on the screen between games.
* Save the high score to non-volatile memory so that it persists between power cycling.
* Save multiple high scores and add an interface for the user to enter their initials when they get a high score. Display the table of high scores between games.
* Implement service discovery on the Central so that it does not rely on hard-coded Characteristic Handles.
* Write an Android app to perform the Central role in the game.
  + I have an Android app that you can try, but you will need to set your Service and Characteristic UUIDs to match what I used:

Pong Service: DDC548CA-E353-4BEA-82D3-8B8D10AFAE19

Ball Characteristic: 95D6607F-1CE3-4EE1-9B4D-7DD3BCEF45F9