

# BLE HID Mouse

## 1.0

## Features

- BLE HID over GATT Profile in HID Device Role operation
- Simulates mouse moving in square clockwise position
- Simulates battery charging
- DeepSleep mode demonstration
- Reporting workflow status through UART
- LED status indication

## General Description

This project demonstrates the mouse movement and button click HID reports in the boot and protocol mode. The example also demonstrates handling the suspend event from the central device and enters the low power mode when suspended.

## Development Kit Configuration

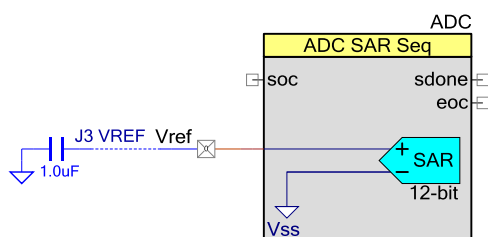
The device has the following configuration:

- The UART RX pin is connected to port 1 pin 4.
- The UART TX pin is connected to port 1 pin 5.
- A mechanical button (port 2 pin 7) is used for a mouse click, to wake up the device, start re-advertising.
- The green LED (port 3 pin 6) is used to indicate an advertising state.
- The red LED (port 2 pin 6) is used to indicate a BLE disconnection state.
- The blue LED (port 3 pin 7) is used to indicate simulation events.
- Connect the CY8CKIT-042 BLE Pioneer Kit board to the PC using a USB cable.
- Launch any of the RS-232 terminal applications on the PC and configure it to use the 'KitProg USB-UART' port with the speed of 115200 bps.
- Build the project and program the hex file into the CY8CKIT-042 BLE Pioneer Kit.
- Observe the results on the terminal application.

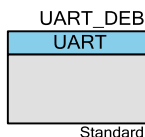
## Project Configuration

The example project consists of the following components: BLE, UART, digital output pin, and digital input pin. ADC is not used by default. Battery voltage measurement could be enabled in `bas.h` header file. The UART is used for transmitting the debug information. The output pins are used to reflect the line signal output on the LED. The input pin is configured to the resistive pull up mode and is used as a mouse click button. The top design schematic is shown in **Figure 1**.

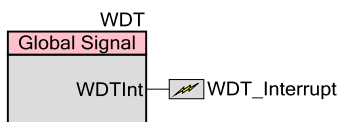
### BLE HID Mouse Example Project



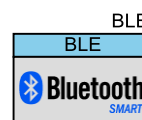
ADC measures battery voltage.



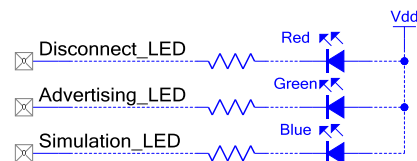
UART is used for transmitting the debug information.



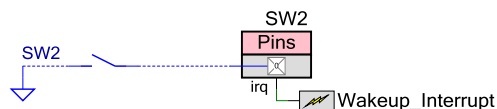
WDT is used as a generic timer for mouse event simulation.



BLE component is configured as HID device and simulates mouse moving in a square clockwise direction.



The red LED is used to indicate that the device is disconnected. The green LED is used to indicate that the device is advertising. The blue LED is used to indicate an events simulation.



The button is used to wake the device up from hibernate mode and a mouse click.

Figure 1. Top design schematic

The BLE component is configured as HID over the GATT Profile in the HID Device role (GATT Server). The HID Device has one instance of the HID Service, Battery Service, Device Information Service, and Scan Parameters Service.

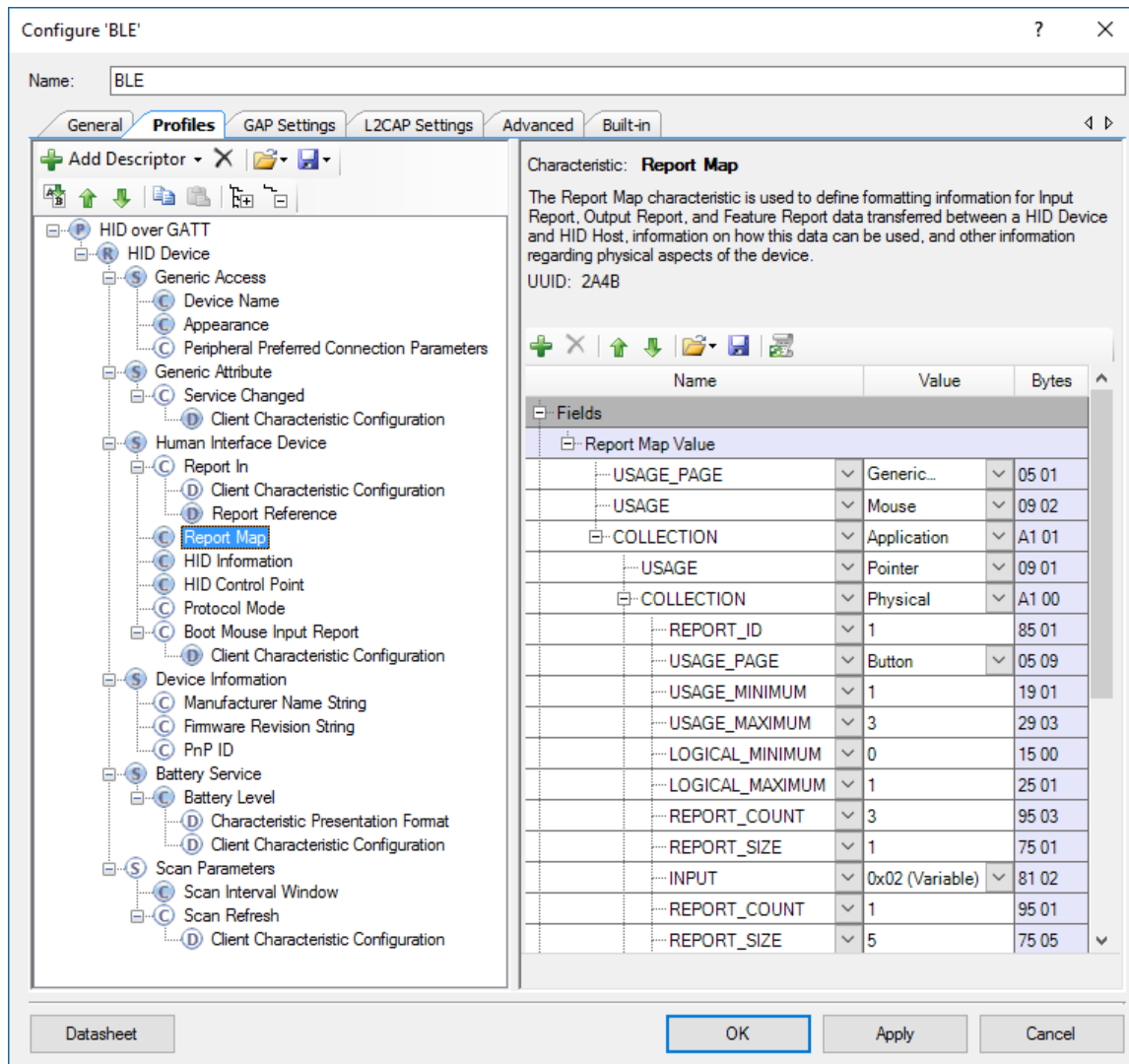


Figure 2. GATT settings

Configure 'BLE'

Name: BLE

General Profiles **GAP Settings** L2CAP Settings Advanced Built-in

General

- Peripheral role
  - Advertisement settings
  - Advertisement packet
  - Scan response packet
  - Peripheral preferred connection
  - Security

Device address

Public address (Company ID - Company assigned): 00A050-000009

☐ Silicon generated "Company assigned" part of device address

*You can use the user configuration section of the supervisory flash to store the public device address for mass production.*

Device name: BLE Mouse

Appearance: HID: Mouse

Attribute MTU size (bytes): 23

Link layer max TX payload size (bytes): 27

Link layer max RX payload size (bytes): 27

Adv/Scan TX power level (dBm): 0

Connection TX power level (dBm): 0

☐ Enable Link Layer Privacy

Restore Defaults

Datasheet OK Apply Cancel

Figure 3. GAP settings

Configure 'BLE'

Name: BLE

General Profiles **GAP Settings** L2CAP Settings Advanced Built-in

General

- Peripheral role
  - Advertisement settings**
  - Advertisement packet
  - Scan response packet
  - Peripheral preferred connection
  - Security

Discovery mode: Limited

Advertising type: Connectable undirected advertising

Filter policy: Scan request: Any | Connect request: Any

Advertising channel map: All channels

Advertising interval

Fast advertising interval:

Minimum (ms): 30

Maximum (ms): 30

☒ Timeout (s): 30

☒ Slow advertising interval:

Minimum (ms): 1000

Maximum (ms): 2500

☒ Timeout (s): 150

Restore Defaults

Datasheet OK Apply Cancel

Figure 4. GAP settings -&gt; Advertisement settings

Configure 'BLE'

Name: BLE

General Profiles **GAP Settings** L2CAP Settings Advanced Built-in

General

- Peripheral role
  - Advertisement settings
    - Advertisement packet**
    - Scan response packet
    - Peripheral preferred connection
  - Security

Advertisement data settings:

Name	Value
<input checked="" type="checkbox"/> Flags	
<input checked="" type="checkbox"/> Limited discoverable mode	
<input checked="" type="checkbox"/> BR/EDR not supported	
<input checked="" type="checkbox"/> Local Name	
Local name	Complete
<input type="checkbox"/> TX Power Level	
<input checked="" type="checkbox"/> Slave Connection Interval Range	
<input checked="" type="checkbox"/> Minimum	Value (ms) 7.5
<input checked="" type="checkbox"/> Maximum	Value (ms) 15
<input checked="" type="checkbox"/> Service UUID	
<input checked="" type="checkbox"/> Human Interface Device	
<input type="checkbox"/> Device Information	
<input checked="" type="checkbox"/> Battery Service	
<input type="checkbox"/> Scan Parameters	
<input type="checkbox"/> Service Solicitation	
<input type="checkbox"/> Service Data	
<input type="checkbox"/> Service Manager TK Value	
<input checked="" type="checkbox"/> Appearance	
Data	HID: Mouse
<input type="checkbox"/> Public Target Address	
<input type="checkbox"/> Random Target Address	
<input type="checkbox"/> Advertising Interval	
<input type="checkbox"/> LE Bluetooth Device Address	
<input type="checkbox"/> LE Role	
<input type="checkbox"/> URI	
<input type="checkbox"/> Manufacturer Specific Data	

Advertisement packet:

Description	Value	Index
AD Data 1: <<Flags>>		
Length	0x02	[0]
<<Flags>>	0x01	[1]
BR/EDR not supported   Limited discoverable mode	0x05	[2]
AD Data 2: <<Local Name>>		
Length	0x0A	[3]
<<Local Name>>	0x09	[4]
'B'	0x42	[5]
'L'	0x4C	[6]
'E'	0x45	[7]
''	0x20	[8]
'M'	0x4D	[9]
'o'	0x6F	[10]
'u'	0x75	[11]
's'	0x73	[12]
'e'	0x65	[13]
AD Data 3: <<Slave Connection Interval Range>>		
Length	0x05	[14]
<<Slave Connection Interval Range>>	0x12	[15]
Minimum : 7.5 ms		
[0]	0x06	[16]
[1]	0x00	[17]
Maximum : 15 ms		
[0]	0x0C	[18]
[1]	0x00	[19]
AD Data 4: <<More 16-bit UUIDs available>>		
Length	0x05	[20]
<<More 16-bit UUIDs available>>	0x02	[21]

Datasheet

OK Apply Cancel

Figure 5. GAP settings -&gt; Advertisement packet

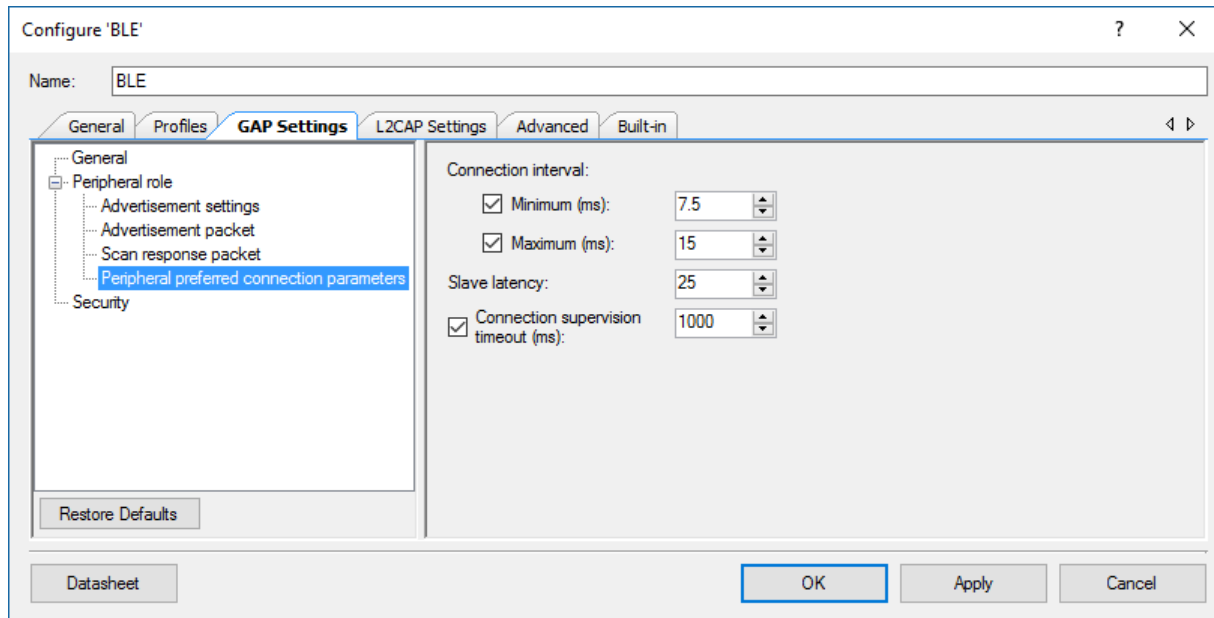


Figure 6. GAP Settings -&gt; Peripheral preferred connection parameters

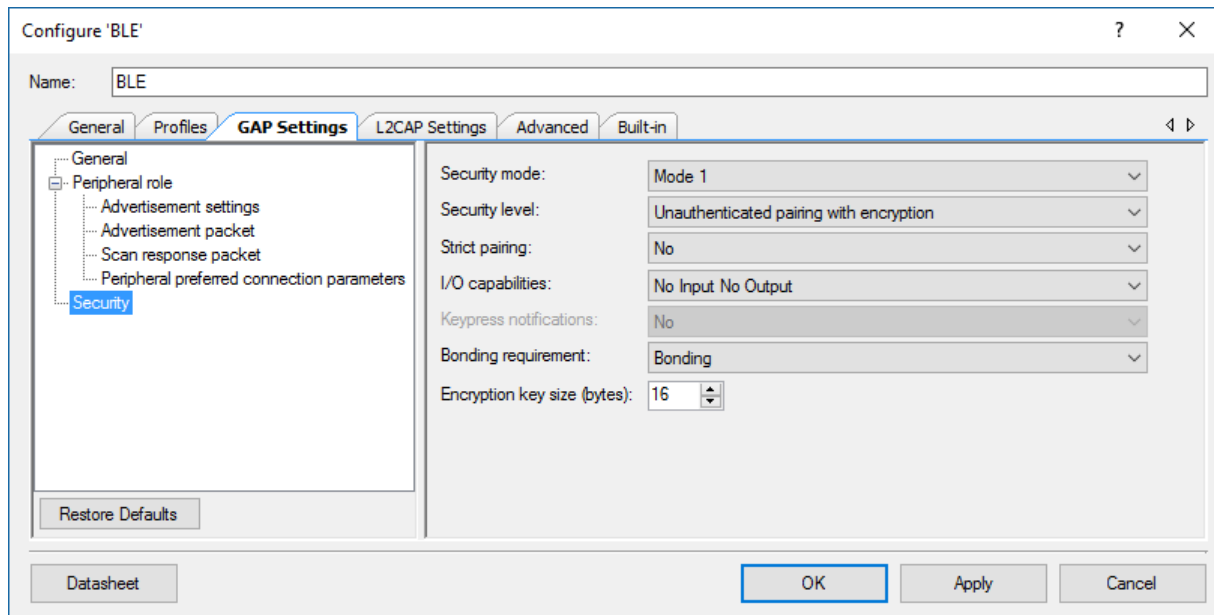


Figure 7. Security settings

## Project Description

The project demonstrates the core functionality of the BLE component configured as a HID Device.

Right after the device is started it performs the BLE component initialization as well as initialization of the UART components. Four callback functions are required in this project for BLE operation. One callback function (AppCallBack()) is required to receive generic events from BLE Stack and the others (HidsCallBack(), BasCallBack(), ScpsCallBack()) are required for receiving events from the services. The component has also buried a call to CyBle\_GappStartAdvertisement() on an execution of which the device will start advertising with the advertisement packet shown in **Figure 5**. On advertisement timeout, the system enters into the hibernate mode. Press the mechanical button on CY8CKIT-042 BLE (SW2) to wake up the system and start re-advertising. BLE subsystem and CPU enters into low power Deep-Sleep mode between connection and advertising intervals. BLE subsystem automatically wakes up to maintain connection and advertising data transfer.

To indicate that the device is advertising, the green LED is blinking. The red LED is turned on after disconnection to indicate that no Client is connected to the device. When a Client has connected successfully, both red and green LEDs are turned off. When a Client enables notifications, blinking of the blue LED indicates a simulated data transfer from the HID device to the Host.

You can connect the HID Device to Windows 8. Windows 7 and older OS don't have HOGP drivers. Make sure that a PC with Windows 8 has Bluetooth 4.0 installed. To connect to the HID Device, click on "Add a device" in the Devices and Printers window of the Control Panel. Select "BLE Mouse" device and click the Next button. Setup will automatically install the necessary files in the system and the mouse pointer will be moving in a square clockwise direction.

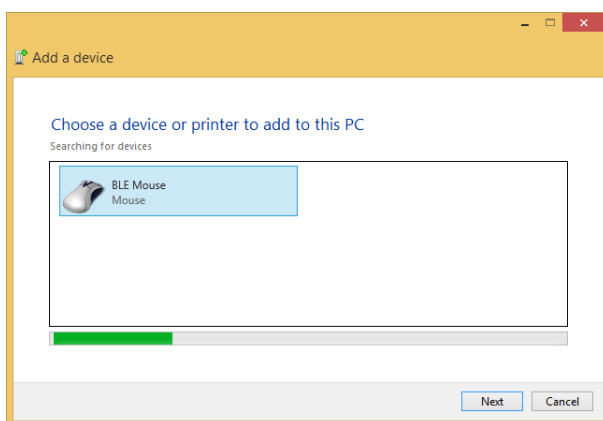


Figure 8. Windows 8 PC connecting to BLE Mouse

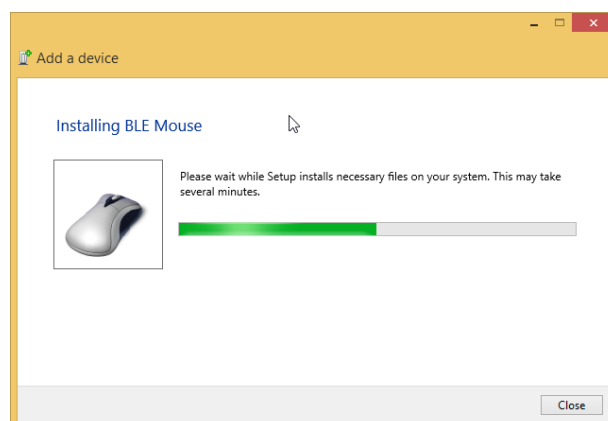


Figure 9. When device drivers are installed, mouse cursor starts moving

Also, you can connect the HID Device to the Android device with Bluetooth 4.0 support. To do this, go to your phone's Bluetooth settings and pair it with CY8CKIT-042 BLE device (it should be recognized as BLE Mouse).

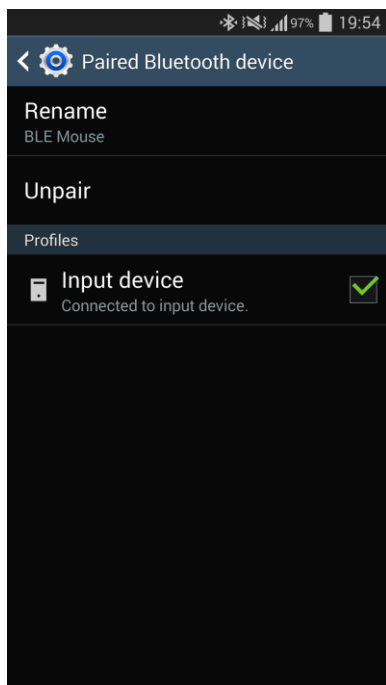


Figure 10. Android device recognizes BLE Mouse as input device

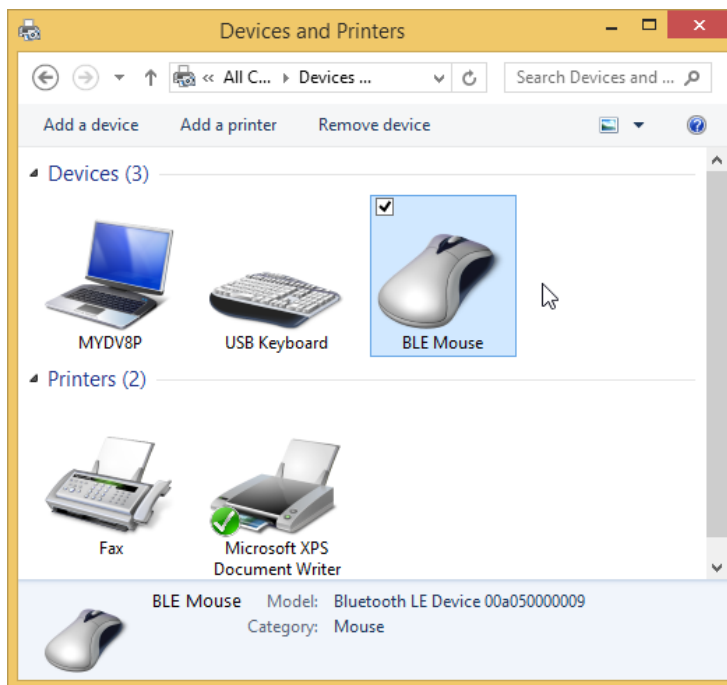


Figure 11. Windows 8 PC recognizes BLE mouse as input device

Additionally, this project implements Battery Level Service. By default, the battery level is simulated and is changed from 2 to 20 percent. To enable battery level measurement, set `BAS_MEASURE_ENABLE` to 1, `BAS_SIMULATE_ENABLE` to 0 and connect J2 pin P3[0] to J3 pin VREF. For instructions on how to use this service, refer to BLE\_Battery\_Level example project datasheet.

## Expected Results

After pairing with peer device (Windows 8 PC, Android phone or tablet), the mouse pointer will be moving in a square clockwise direction.



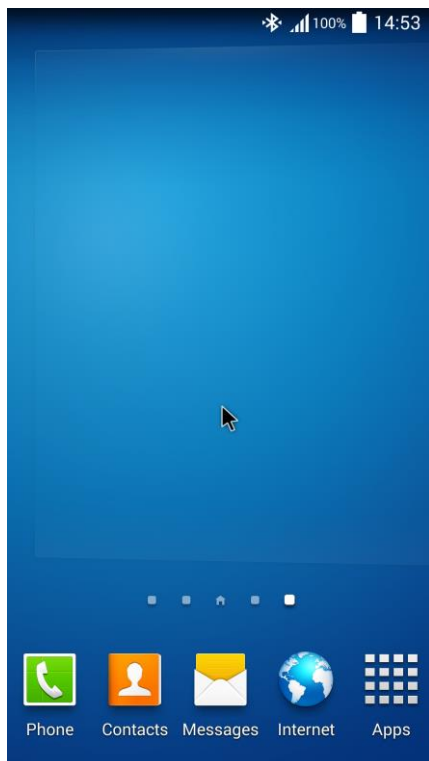


Figure 12. Initially, mouse cursor is placed at the center of the screen

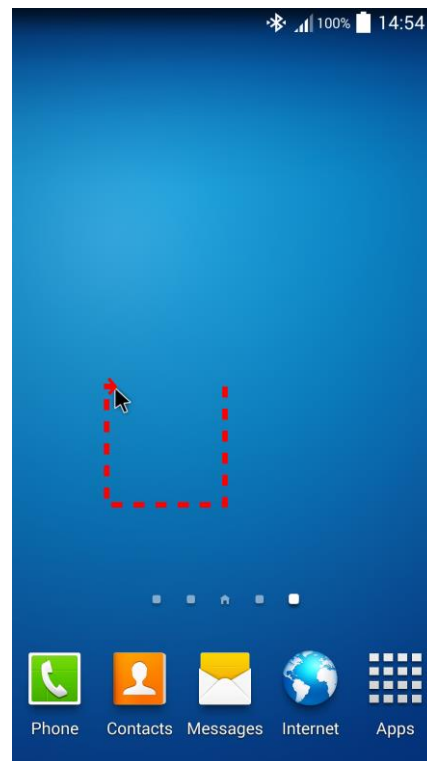


Figure 13. Mouse cursor is moving in a square clockwise direction

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