BBC Micro:bit
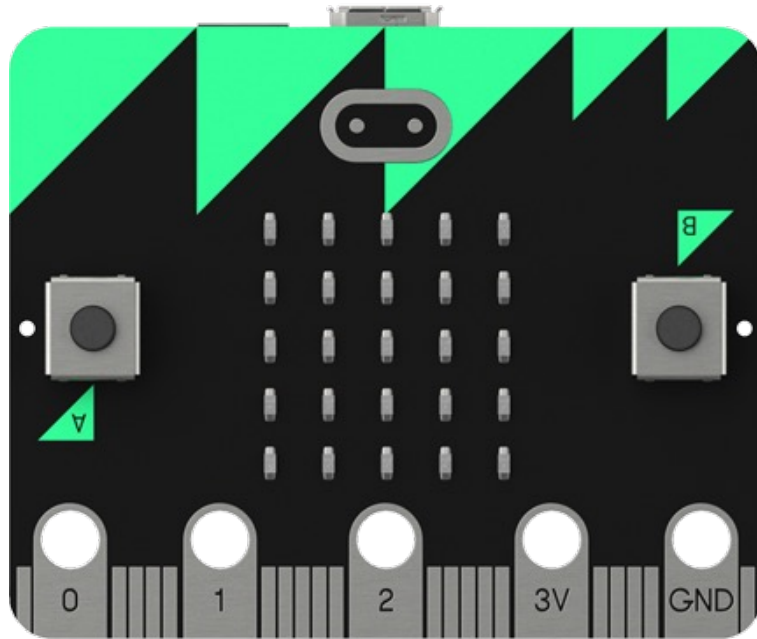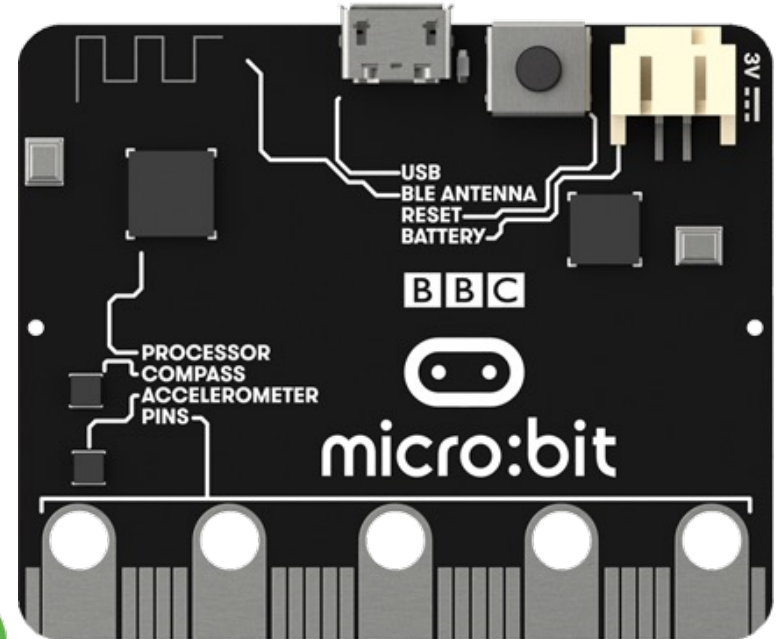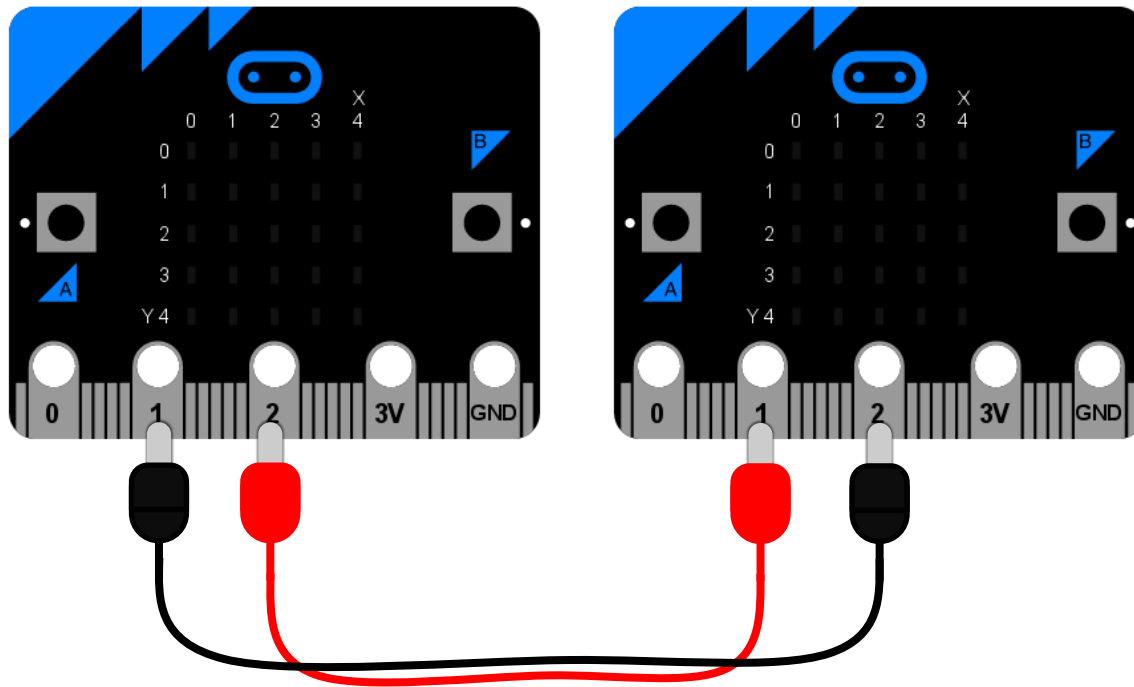
Lesson 6
Networking

Networking

Digital devices can be networked together to exchange data. You are going to create a very simple network using two micro:bits.

Connect the two micro:bits with crocodile clips as shown.

Protocols

Devices need to follow a set of rules to communicate over a network, each device on the same network must follow the same set of rules. This set of rules is known as a protocol.

Here is the protocol we are going to use on our micro:bit network:

Transmit a 0 by sending a signal through pin 1 for 200 milliseconds
Transmit a 1 by sending a signal through pin 1 for 400 milliseconds
If a signal is detected on pin 1 for 200 milliseconds interpret it as a 0
If a signal is detected on pin 1 for 400 milliseconds interpret it as a 1

Activity 6.1

Below is a list of common protocols, use internet research to help you to complete the table.

Protocol	Description
TCP/IP	
HTTP	
HTTPS	
SMTP	
POP3	
FTP	

Writing the Protocol

This program creates the protocol that will allow the micro:bits to communicate.

If button A is pressed a signal will be sent through pin 1 for 200 milliseconds and the other micro:bit will display a 0 on the screen.

If button B is pressed a signal will be sent through pin 2 for 400 milliseconds and the other micro:bit will display a 1 on the screen.

Note: this program works best if both micro:bits are plugged into a USB port.

```python
from microbit import *

while True:
    display.show("-")

    if button_a.is_pressed():
        pin1.write_digital(1)
        display.show("0")
        sleep(200)
        pin1.write_digital(0)
        sleep(200)
    elif button_b.is_pressed():
        pin1.write_digital(1)
        display.show("1")
        sleep(400)
        pin1.write_digital(0)
    sleep(100)

    if pin2.read_digital():
        sleep(300)
        if pin2.read_digital():
            display.show("1")
        else:
            display.show("0")
        sleep(200)
```

Activity 6.2

Implement the protocol
program shown on the
previous slide and test it.
Comment the code
explaining what each part
does.

Place a screenshot of your code here.

Representing Characters

We can now send sequences of binary digits between our micro:bits but how can we turn these into characters?

Computers use coding systems to represent characters using binary numbers, one of these systems is ASCII (American Standard Code for Information Interchange).

This table shows some of the binary codes used to represent characters using ASCII.

100000	SPACE	1001101	M
101110	.	1001110	N
1000001	A	1001111	O
1000010	B	1010000	P
1000011	C	1010001	Q
1000100	D	1010010	R
1000101	E	1010011	S
1000110	F	1010100	T
1000111	G	1010101	U
1001000	H	1010110	V
1001001	I	1010111	W
1001010	J	1011000	X
1001011	K	1011001	Y

Activity 6.3

Write a short message, convert it into ASCII codes and send it to your learning partner using your micro:bit network.

Character	Character Code

Automatic Conversion

We can change the program so that it automatically converts the binary code into a character.

Each time the micro:bit receives 1 bit it adds it to the character variable until there are 7 bits.

When there are 7 bits they will be converted into a character and displayed.

Update your program, the code you need to change/add is highlighted.

```python
from microbit import *

character=""

while True:
    display.show("-")

    if button_a.is_pressed():
        pin1.write_digital(1)
        display.show("0")
        sleep(200)
        pin1.write_digital(0)
        sleep(200)
    elif button_b.is_pressed():
        pin1.write_digital(1)
        display.show("1")
        sleep(400)
        pin1.write_digital(0)
sleep(100)

    if pin2.read_digital():
        sleep(300)
        if pin2.read_digital():
            display.show("1")
            character=character+str("1")
        else:
            display.show("0")
            character=character+str("0")
sleep(200)

if len(character)>6:
    display.show(chr(int(character,2)))
    sleep(500)
    character=""
```

Activity 6.4

Update your protocol program as shown on the previous slide. Comment the code to explain what each part does.

Place a screenshot of your code here.

Extension

Improve your protocol program to make it play one sound when a 0 is received and another sound when a 1 is received.

Place a screenshot of your code here.