



Hack - a - tune

using micro:bits to explore
the links between **music**,
networking, **cyber security**
and **code**

11:40 – 12:15

What's your favourite
quote to inspire a
positive learning
environment?

**FESTIVAL OF
COMPUTING**



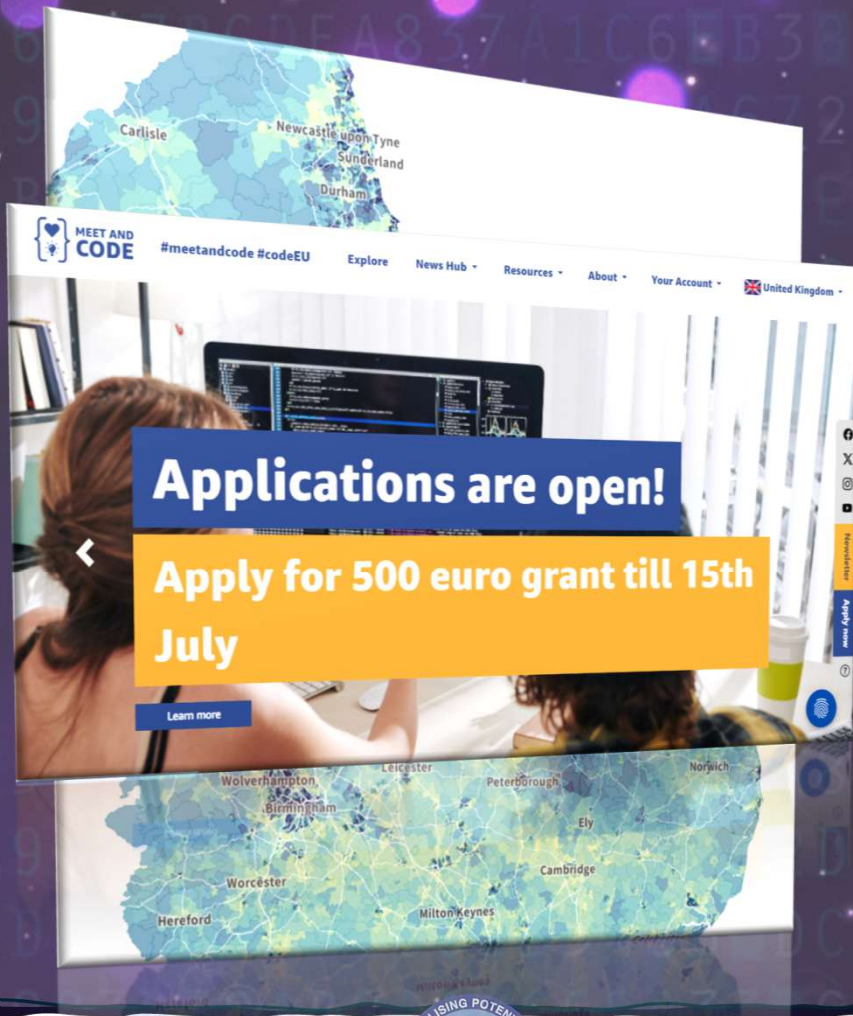
Hack-a-Tune

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The plan





Context

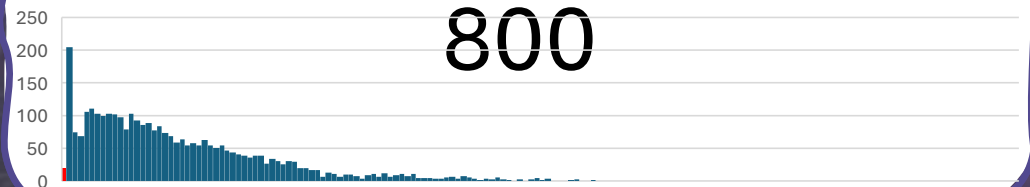
20

1853

8.9

6465

800



```
1 # Imports go at the top
2 from microbit import *
3
4
5 # Code in a 'while True:' loop repeats forever
6 while True:
7     display.show(Image.HEART)
8     sleep(1000)
9     display.scroll('Hello')
10
```



“python microbit editor”

Task 1: Replace ‘Hello’ with your inspiring quote

```
# Imports go at the top
from microbit import *

# Code in a 'while True:' loop repeats forever
while True:
    display.show(Image.HEART)

    # show a play icon if you press button A
    if button_a.was_pressed():
        display.show(Image("09000:09900:09090:09900:09000"))

    sleep(500)
```

Challenges

- # 1) Fill in the dot in the middle of the play icon
- # 2) Make a different image appear when you press the B button
- # 3) Animate the play icon so it moves across the screen

Task 2:

Respond to button presses with an image or animation

```
# Imports go at the top
from microbit import *
import radio
radio.on()

# Code in a 'while True:' loop repeats forever
while True:
    display.clear()

    # show a play icon if you press button A
    if button_a.was_pressed():
        display.show(Image("09000:09900:09090:09900:09000"))
        radio.send("You are worth infinitely more than your exam results")
        sleep(500)

# Challenges
# 1) Send a different message when you press the B button
# 2) Change the play icon to a radio icon
# 3) Animate the radio icon so it looks like it's sending
```

Task 3:

Send your inspirational message using the radio

```
# Imports go at the top
from microbit import *
import radio
radio.on()

# Code in a 'while True:' loop repeats forever
while True:
    # Show a line at the bottom of the screen to show it's listening
    display.show(Image("00000:00000:00000:00000:99999"))

    # message will be None if nothing has been received
    message = radio.receive()

    # display any received data on the REPL
    if message != None:
        print(message)
        display.show(Image("00900:99999:09990:00900:99999"))
    sleep(50)
```

Task 4 (Teacher only):

Display any received
messages

```
# Imports go at the top
from microbit import *
import radio
radio.on()

# Code in a 'while True:' loop repeats forever
while True:
    display.clear()

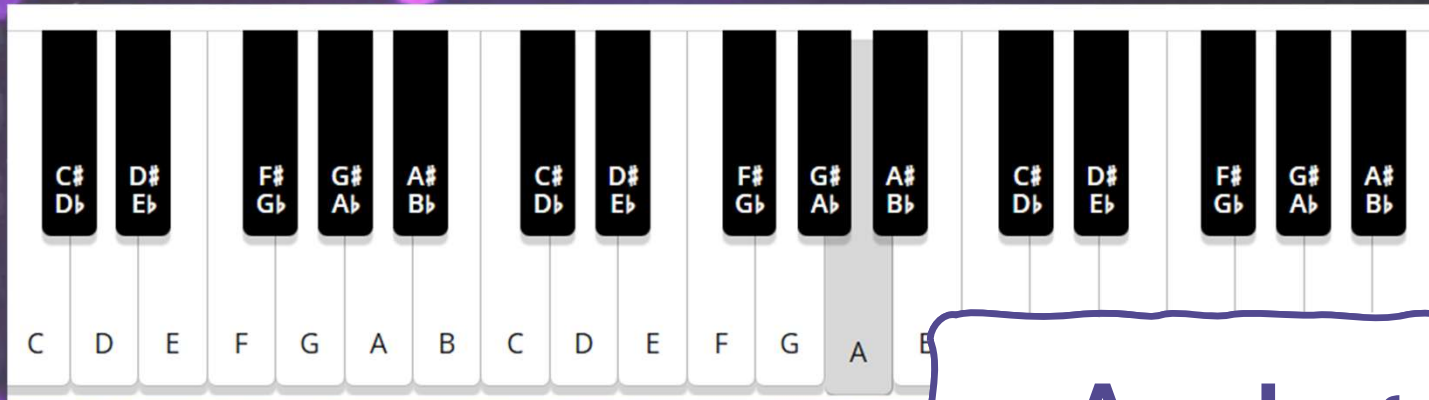
    # Send the number 76 if you press the A button
    if button_a.was_pressed():
        display.show(Image("09000:09900:09090:09900:09000"))
        radio.send("76")

    # Send the number 75 if you press the B button
    if button_b.was_pressed():
        display.show(Image("09000:09900:09090:09900:09000"))
        radio.send("75")

    sleep(500)
```

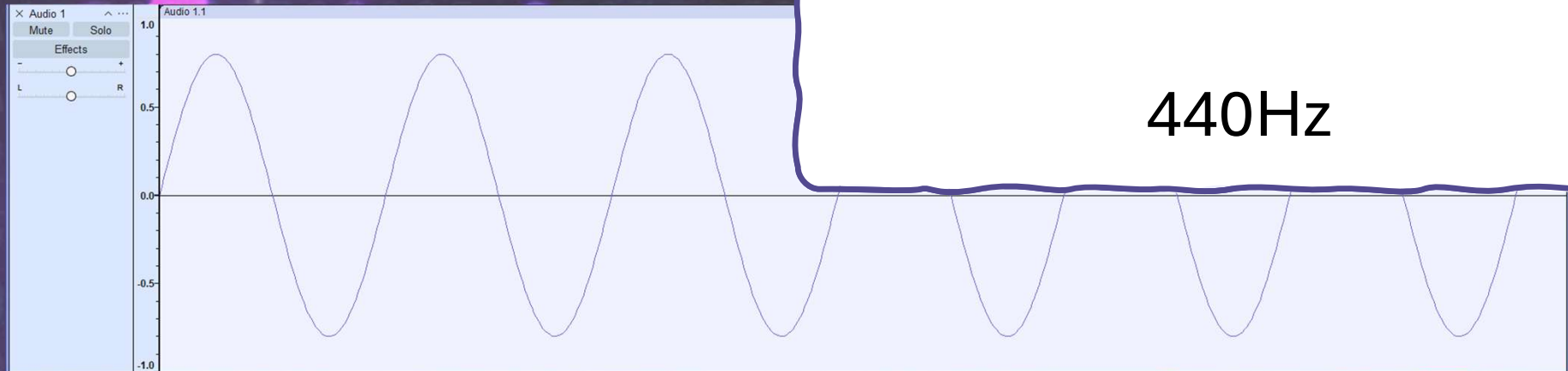
Task 5

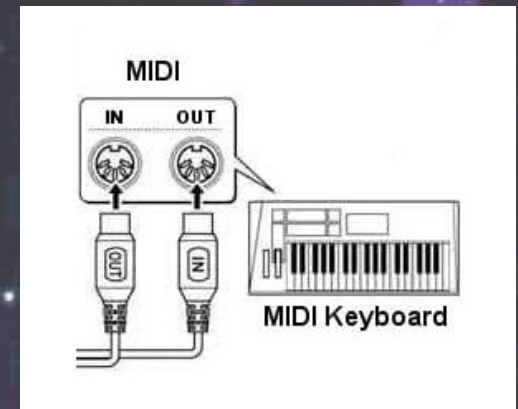
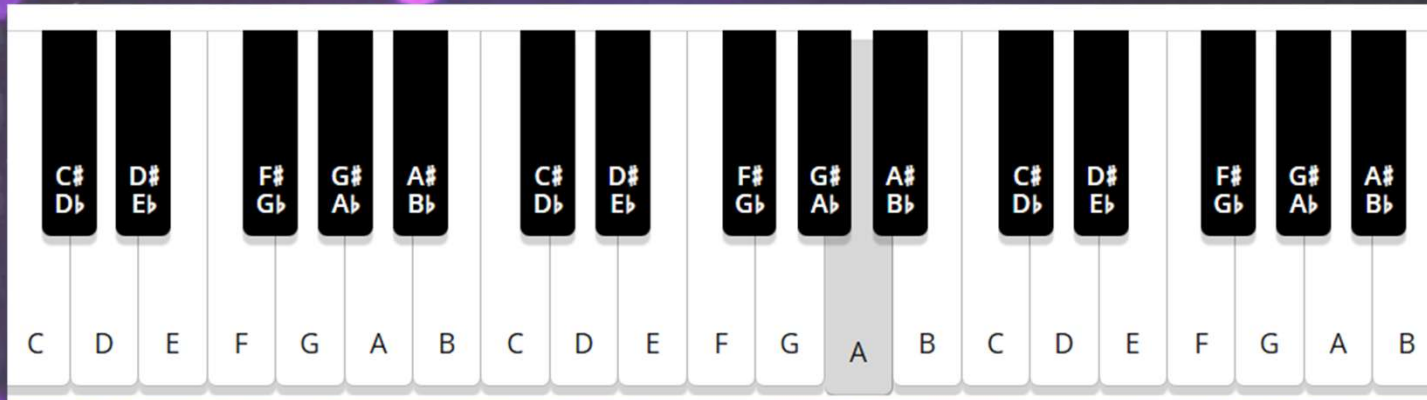
Send MIDI note numbers



Analogue Audio

440Hz



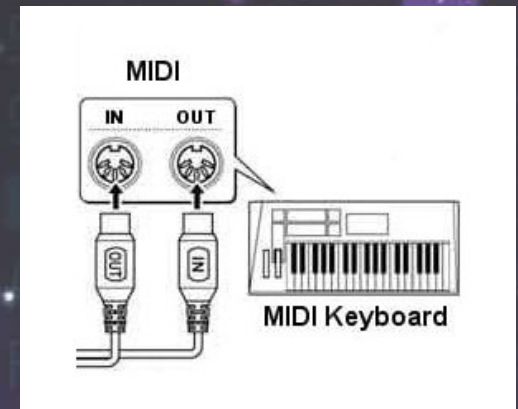
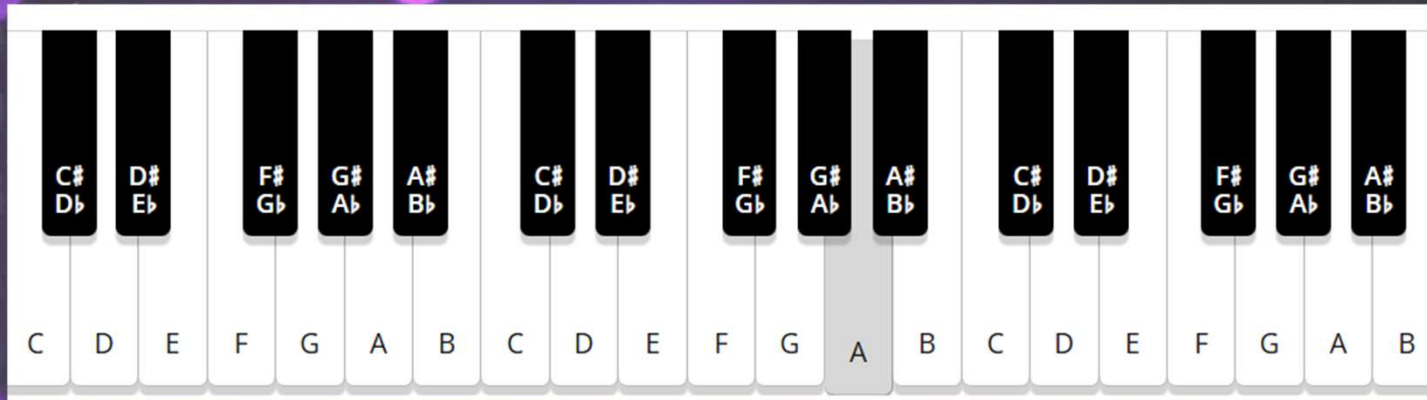


Hex	9	0
Binary	1001	0000
Description	Note on	Channel 1

MIDI Note On

Hex: **90** 45 7F

1001nnnn	0kkkkkkk	Note On event. This message is sent when a note is depressed (start). (kkkkkkk) is the key (note) number. (vvvvvvv) is the velocity.
	0vvvvvvv	

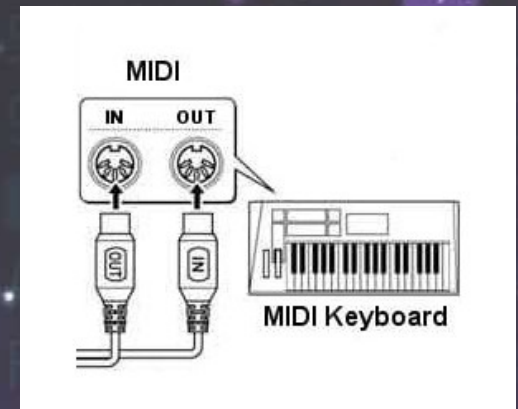
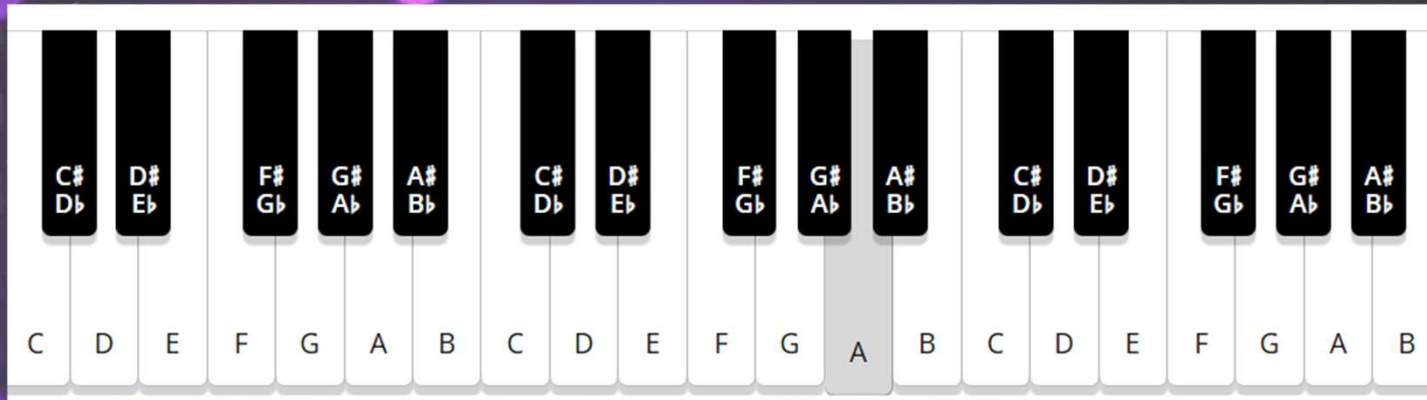


Hex	4	5
Binary	0100	0101
Description	Note 69 (A above middle C)	

MIDI Note On

Hex: 90 45 7F

1001nnnn	0kkkkkkk Ovvvvvvv	Note On event. This message is sent when a note is depressed (start). (kkkkkkk) is the key (note) number. (vvvvvvv) is the velocity.
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Hex	7	F
Binary	0111	1111
Description	Maximum volume (127)	

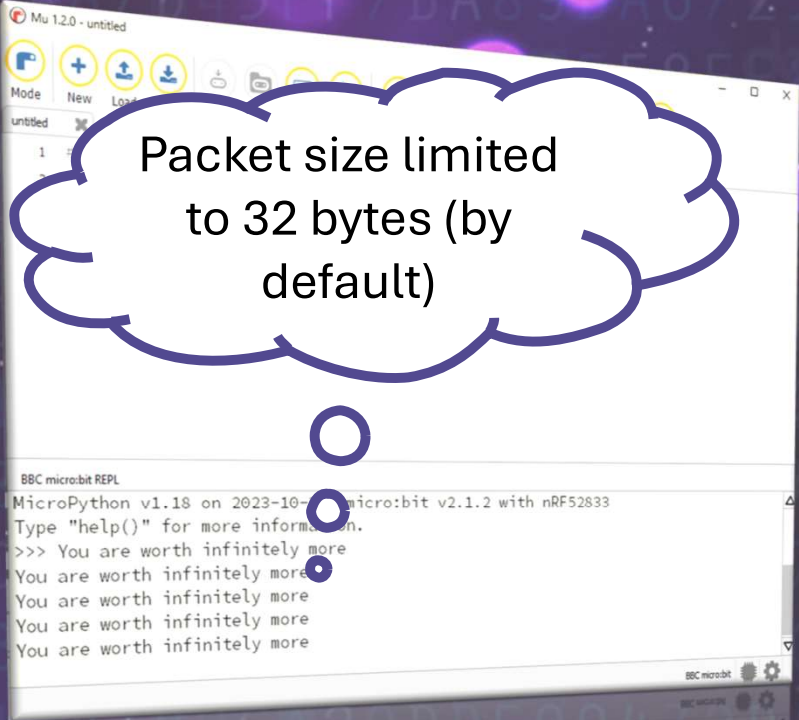
MIDI Note On

Hex: 90 45 **7F**

1001nnnn	0kkkkkkk 0vvvvvvv	Note On event. This message is sent when a note is depressed (start). (kkkkkkk) is the key (note) number. (vvvvvvv) is the velocity.
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Concepts / next steps:

- **Packet size**
- Protocols
- DoS / DDoS
- Encryption
- Firewall
- Robotics



Packet size limited to 32 bytes (by default)

```
1 # Imports go
2 from micro
3 import m
4 radio
5
6 # C
7 while
8
9
10 # Play the snare if you press the A button
11 if button_a.was_pressed():
12     display.show("H")
13     radio.send("42 10")
14
15 # Play the snare if you press the B button
16 if button_b.was_pressed():
17     display.show("S")
18     radio.send("40 10")
19     sleep(100)
20
21
22 # Challenges:
23 # 1) Replace the numbers with your own percussive instrument
24 # https://musescore.org/sites/musescore.org/files/General%20
25
```

Note number
followed by
channel
(10 is percussion)

Concepts / next steps:

- Packet size
- **Protocols**
- DoS / DDoS
- Encryption
- Firewall
- Robotics

How could you prevent this?!

```
1 # Import
2 from microbit import
3 import radio
4 radio.on()
5
6 # Code in a 'while True:' loop repeats forever
7 while True:
8     radio.send("!!!DoS!!!")
9
10     sleep(100)
11 |
```

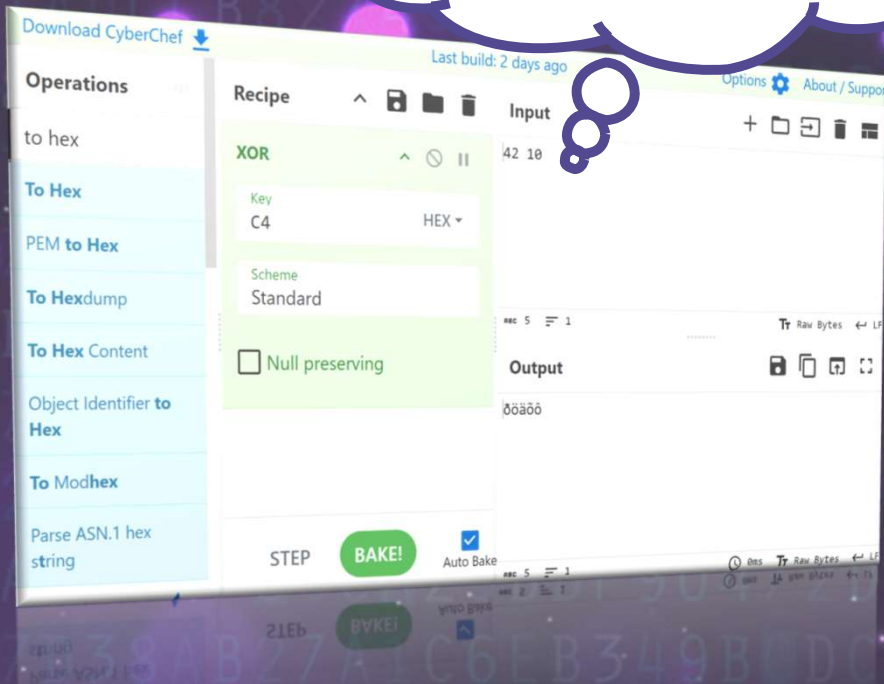
Concepts / next steps:

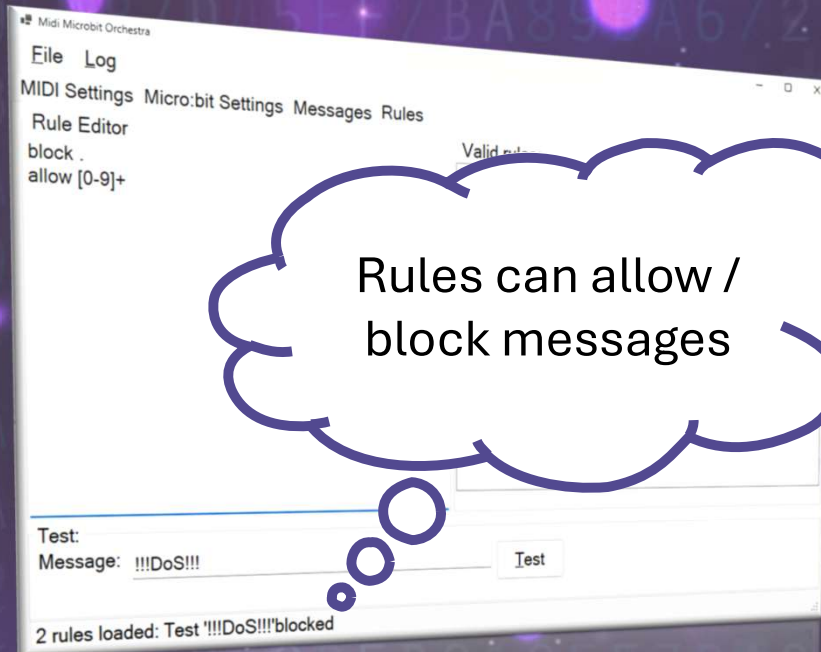
- Packet size
- Protocols
- **DoS / DDoS**
- Encryption
- Firewall
- Robotics

CyberChef

Concepts / next steps:

- Packet size
- Protocols
- DoS / DDoS
- **Encryption**
- Firewall
- Robotics





Rules can allow /
block messages

Concepts / next steps:

- Packet size
- Protocols
- DoS / DDoS
- Encryption
- **Firewall**
- Robotics



Concepts / next steps:

- Packet size
- Protocols
- DoS / DDoS
- Encryption
- Firewall
- **Robotics**



Thank you

Any questions?