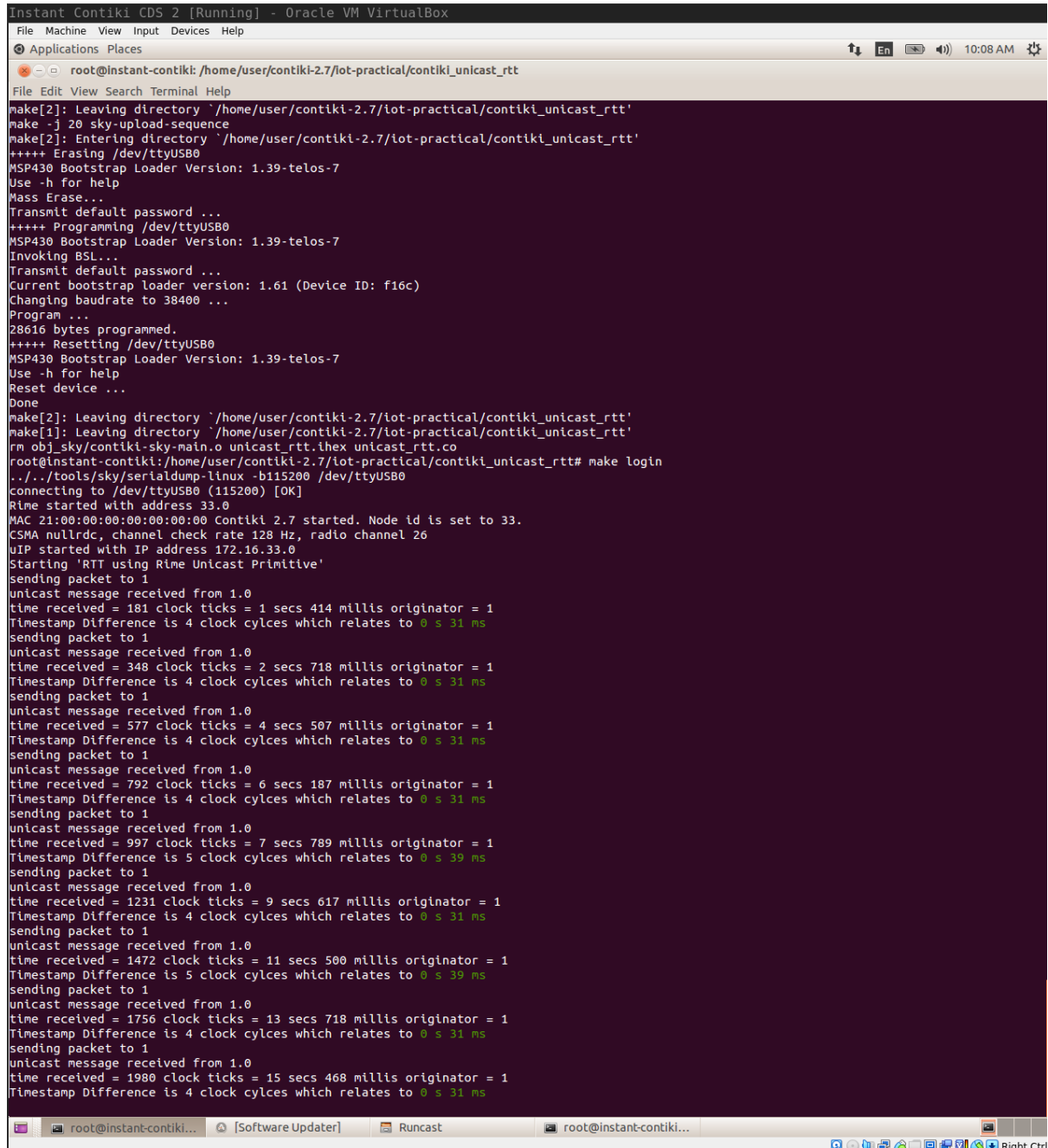


Q1 Unicasting and RTT measurement.

Your task: alter the program above such that the node where the USER button is pressed sends a packet with its timestamp (is already done above) and THEN gets back a unicast packet with the timestamp it has initially written into the first packet. Based on this packet, compute the Route-trip time at the node initiating the packet exchange and print it to the serial interface.



```
Instant Contiki CDS 2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places
root@instant-contiki: /home/user/contiki-2.7/iot-practical/contiki_unicast_rtt
File Edit View Search Terminal Help
make[2]: Leaving directory `/home/user/contiki-2.7/iot-practical/contiki_unicast_rtt'
make -j 20 sky-upload-sequence
make[2]: Entering directory `/home/user/contiki-2.7/iot-practical/contiki_unicast_rtt'
++++ Erasing /dev/ttyUSB0
MSP430 Bootstrap Loader Version: 1.39-telos-7
Use -h for help
Mass Erase...
Transmit default password ...
++++ Programming /dev/ttyUSB0
MSP430 Bootstrap Loader Version: 1.39-telos-7
Invoking BSL...
Transmit default password ...
Current bootstrap loader version: 1.61 (Device ID: f16c)
Changing baudrate to 38400 ...
Program ...
28616 bytes programmed.
++++ Resetting /dev/ttyUSB0
MSP430 Bootstrap Loader Version: 1.39-telos-7
Use -h for help
Reset device ...
Done
make[2]: Leaving directory `/home/user/contiki-2.7/iot-practical/contiki_unicast_rtt'
make[1]: Leaving directory `/home/user/contiki-2.7/iot-practical/contiki_unicast_rtt'
rm obj_sky/contiki-sky-main.o unicast_rtt.hex unicast_rtt.co
root@instant-contiki: /home/user/contiki-2.7/iot-practical/contiki_unicast_rtt# make login
../tools/sky/serialdump-linux -b115200 /dev/ttyUSB0
connecting to /dev/ttyUSB0 (115200) [OK]
Rime started with address 33.0
MAC 21:00:00:00:00:00:00:00 Contiki 2.7 started. Node id is set to 33.
CSMA nullrdc, channel check rate 128 Hz, radio channel 26
UIP started with IP address 172.16.33.0
Starting 'RTT using Rime Unicast Primitive'
sending packet to 1
unicast message received from 1.0
time received = 181 clock ticks = 1 secs 414 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
sending packet to 1
unicast message received from 1.0
time received = 348 clock ticks = 2 secs 718 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
sending packet to 1
unicast message received from 1.0
time received = 577 clock ticks = 4 secs 507 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
sending packet to 1
unicast message received from 1.0
time received = 792 clock ticks = 6 secs 187 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
sending packet to 1
unicast message received from 1.0
time received = 997 clock ticks = 7 secs 789 millis originator = 1
Timestamp Difference is 5 clock cycles which relates to 0 s 39 ms
sending packet to 1
unicast message received from 1.0
time received = 1231 clock ticks = 9 secs 617 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
sending packet to 1
unicast message received from 1.0
time received = 1472 clock ticks = 11 secs 500 millis originator = 1
Timestamp Difference is 5 clock cycles which relates to 0 s 39 ms
sending packet to 1
unicast message received from 1.0
time received = 1756 clock ticks = 13 secs 718 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
sending packet to 1
unicast message received from 1.0
time received = 1980 clock ticks = 15 secs 468 millis originator = 1
Timestamp Difference is 4 clock cycles which relates to 0 s 31 ms
```

As one can take from the picture above, the roundtrip usually takes 4 or 5 ticks which results in a time of **31 or 39 ms**