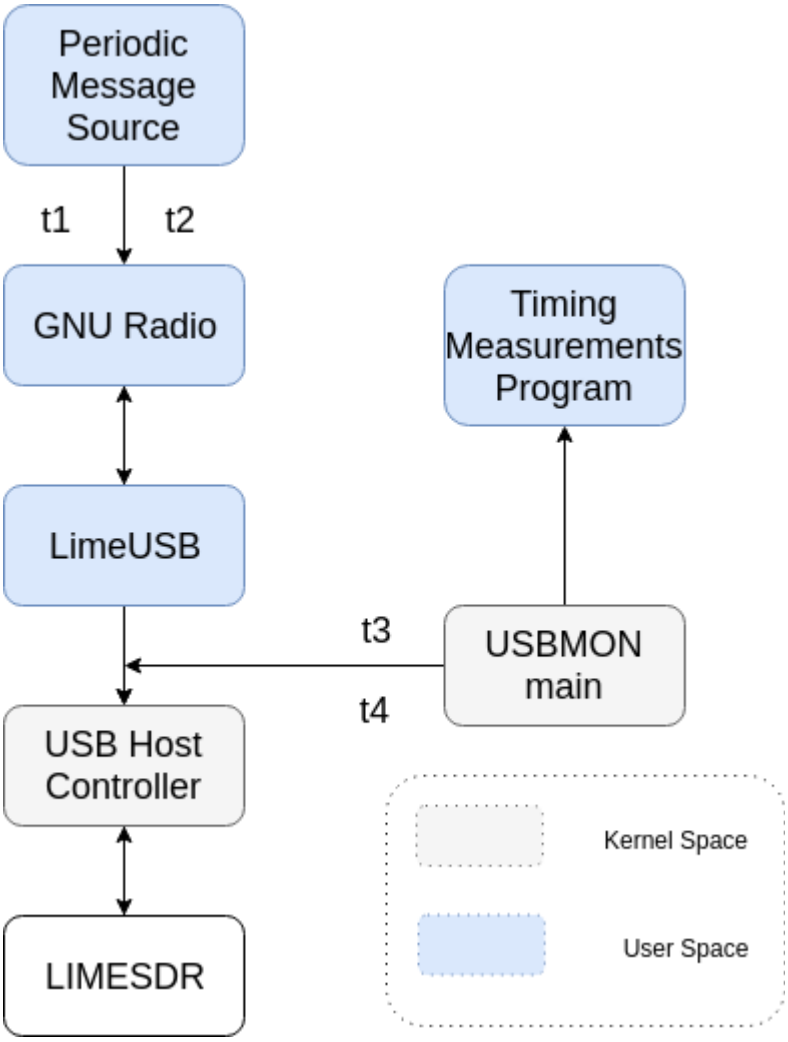
Timing Delay Measurement(Update)

Measurement Setup:



Measurement Setup

T1: The time instant the message is sent from the periodic message source.
T2: The time instant the message is received by the periodic message source.
T3: The time instant when usbmon main is notified of a urb_submit request.
T4: The time instant when usbmon main is notified of a urb_receive request.

Results:

The interpretation of the various measurements:
T2 - T1: *Total round trip delay.*
T4 - T3: *Kernel round trip delay.*
T3 - T1: *TX software chain delay.*
T2 - T4: *RX software chain delay.*

Sampling Rate	T2-T1 Mean	T2-T1 Std Deviation	T4-T3 Mean	T4-T3 Std Deviation	T3-T1 Mean	T3-T1 Std. Deviation	T2-T4 Mean	T2-T4 Standard Deviation
5MHz	5360	326	4113	1201	470	60	1100	472
10MHz	3606	472	1937	330	675	1165	1122	1764
15MHz	3065	262	1354	232	831	186	871	262
20MHz	4485	1273	762	298	1586	860	1769	1036

* All the reported values are in µs.
** The values for the 20MHz are highly unstable, I captured 610 packets of which I would correlate the timings for only 160 packets.

Analysis:

- We see a monotonic drop in the kernel USB timings with increase in sampling rate and monotonic increase for TX and RX delay (Exception: 15 MHz). This indicates with increase in sampling rate, the buffers are getting overloaded and hence an increase in processing delay compared to bus communication delay.
- Another thing that I noticed was at high sampling rates the round trip time increases with time, again pointing to buffer delay on the RX chain.