

filter output `conv_valid_out` = `convolve(ringbuffer signal in, filter tap array, mode='valid')`
`rb` stands for ring buffer

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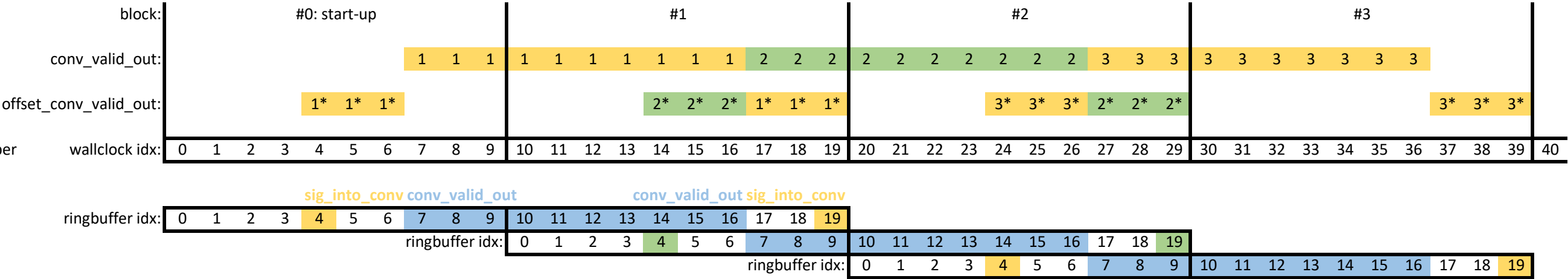
Test scenario 1:

Perform convolve every incoming block, ring buffer is 2x BLOCK_SIZE
Not optimal

BLOCK_SIZE	10	samples
N_blocks	2	int
rb_capacity	20	samples
N_taps	7	samples
N_sig_into_conv	16	samples
offset_sig_into_conv	4	samples
N_conv_valid_out	10	samples
offset_conv_valid_out	3	samples
idx_rb_valid_start	7	samples

== must be odd number

== BLOCK_SIZE



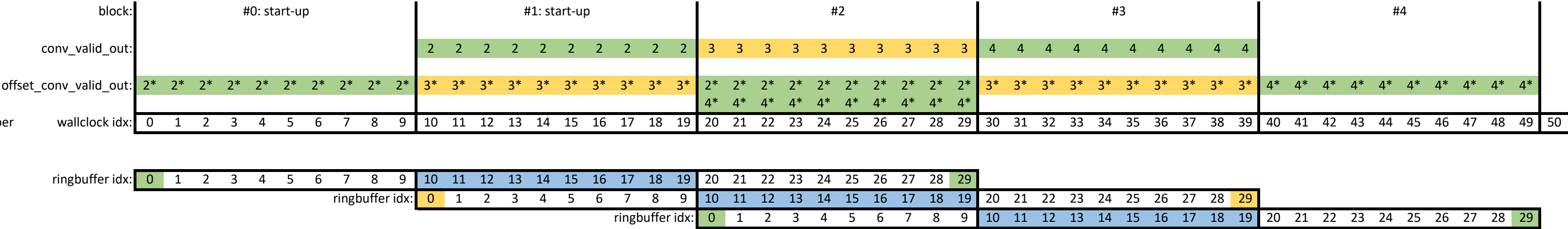
Test scenario 2:

Perform convolve every incoming block, ring buffer is 3x BLOCK_SIZE
Maximized N_taps given N_blocks

BLOCK_SIZE	10	samples
N_blocks	3	int
rb_capacity	30	samples
N_taps	21	samples
N_sig_into_conv	30	samples
offset_sig_into_conv	0	samples
N_conv_valid_out	10	samples
offset_conv_valid_out	10	samples
idx_rb_valid_start	10	samples

== must be odd number

== BLOCK_SIZE



Optimal scenario:
Perform convolve every incoming block, maximize N_taps given N_blocks

Fs	20000	Hz
BLOCK_SIZE	2000	samples
N_blocks	21	int

rb_capacity	42000	samples	= BLOCK_SIZE * N_blocks
N_taps	40001	samples	= BLOCK_SIZE * (N_blocks - 1) + 1 == max that fits using rb_capacity

Fred Harris' approximation		Multirate Signal Processing for Communication Systems, Fredric J. Harris, 2004, page 216, equation (8.16)
f_pass	49	Hz
f_stop	50	Hz
filter attenuation	44.00	dB

= N_taps * 22 * ((f_stop - f_pass) / Fs)

N_sig_into_conv	42000	samples	= BLOCK_SIZE + N_taps - 1 == rb_capacity by optimal design
offset_sig_into_conv	0	samples	= rb_capacity - N_sig_into_conv == 0 by optimal design
N_conv_valid_out	2000	samples	= rb_capacity - N_taps + 1 == BLOCK_SIZE by optimal design
offset_conv_valid_out	20000	samples	= INT((N_taps - 1) / 2)
idx_rb_valid_start	20000	samples	= offset_conv_valid_out + offset_sig_into_conv == offset_conv_valid_out by optimal design
T_valid_start	1.00	s	= idx_rb_valid_start / Fs
T_settle_filter	2.00	s	= (N_blocks - 1) * BLOCK_SIZE / Fs

i.e. Starting index within the input-signal ring buffer corresponding to the time stamps of the computed valid filter output
i.e. When the filter starts outputting (not to be confused with the filter theoretical response time to an impulse)