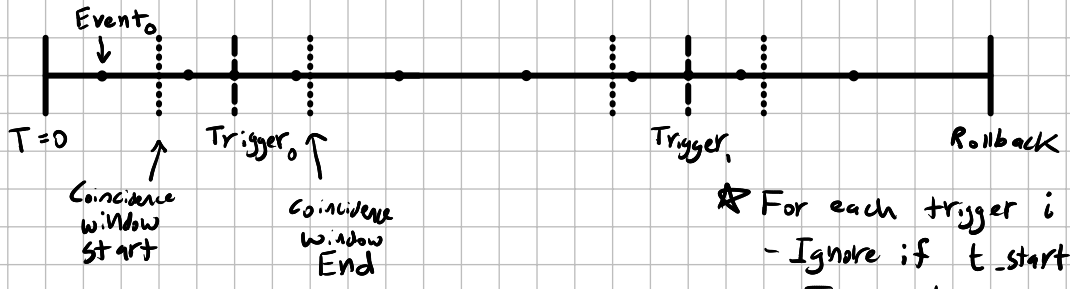


$t\_trg \equiv$ Trigger timetag

$t\_start \equiv$ Coincidence window Start timetag

$t\_end \equiv$ Coincidence window End timetag

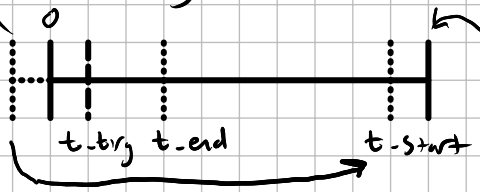
$t\_rollback \equiv$ Timetag rollback (INT_MAX)

☆ For each trigger i:
- Ignore if $t\_start_i \leq t\_end_{i-1}$
- Iterate backwards through each event until t_start.
- Iterate forwards through each event until t_end.

Taking rollback into Account:

1.) $t\_start = t\_trg - \frac{window}{2}$ (without rollback)

(If t_trg is within $0 \leq t\_trg < \frac{window}{2}$, take into account rollback)



if $(t\_start < 0)$ {

$t\_start = t\_rollback - \left(\frac{window}{2} - t\_trg\right)$

~~$t\_rollback = t\_start + (t\_end - t\_trg)$~~

}

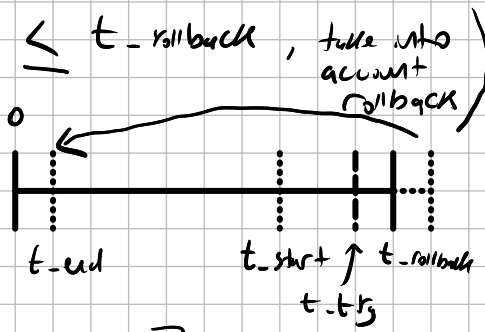
2.) $t\_end = t\_trg + \frac{window}{2}$ (without rollback)

(If t_trg is within $t\_rollback - \frac{window}{2} < t\_trg \leq t\_rollback$, take into account rollback)

if $(t\_end > t\_rollback)$ {

$t\_end = t\_trg + \frac{window}{2} - t\_rollback$

~~$t\_rollback = t\_end + t\_trg$~~

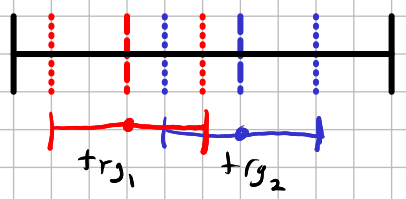


[Keep in mind that $t\_rollback \equiv$ INT_MAX, so t_end would initially be > INT_MAX. Must use uint32_t, so we can go beyond INT_MAX]

Checking if triggers are too close

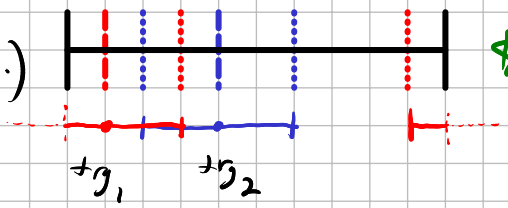
{ • Earlier trigger
• Later trigger

1.)



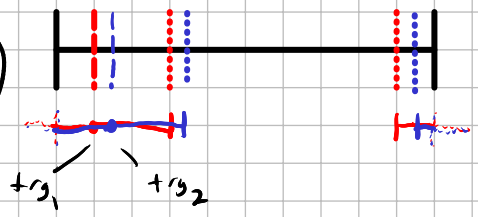
No rollback
No rollback

2.)



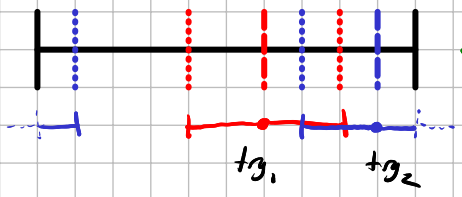
Below 0
No rollback

3.)



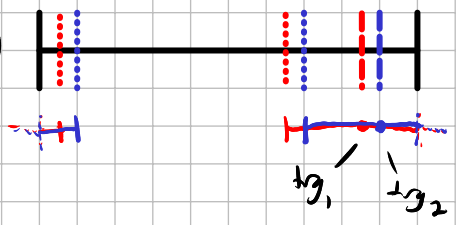
Below 0
Below 0

4.)



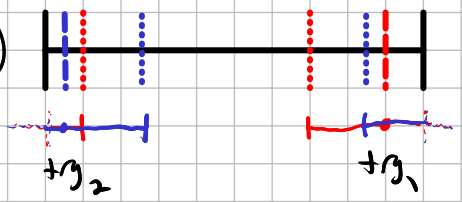
No rollback
Rollback

5.)



Rollback
Rollback

6.)



Rollback
Below 0

★ if $(t_{start_2} \leq t_{end_1})$
- ignore trigger$_2$

★ if $(t_{start_2} \geq t_{end_1})$
- ignore trigger$_2$

Between No rollback, below 0, and rollback, there are $3^2 = 9$ combinations for 2 triggers, but 1 must come before the other. So the remaining 3 combinations are forbidden:

{ No rollback, Below 0 | { Below 0, Rollback | { Rollback, No rollback

Observations:
- Only need to consider rollback if <u>both</u> triggers extend beyond either 0 or t_rollback.
- This can be checked with rollback bool.

★ if $(rollback_1$ && $rollback_2$ && $t_{start_2} \geq t_{end_1})$
- ignore trigger 2

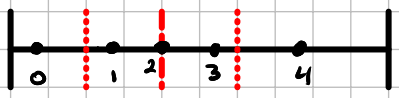
★ if $(!(rollback_1$ && $rollback_2)$ && $t_{start_2} \leq t_{end_1})$
- ignore trigger 2

```
t_end_prev = 0;
extended_prev = true;

① if (t_start ≤ t_end_prev && !(extended && extended_prev)) {
        continue;
② }
  else if (t_start ≥ t_end_prev && !extended && !extended_prev) {
        continue;
  }
```

Check if events are within window, taking into account rollback

1.) Not extended beyond 0 or rollback:



Events 1 and 3 are within window

- checking below trigger timetag:

```
if (t ≥ t_start && t ≤ t_trg) {
    // Increment histograms, etc.
}
```

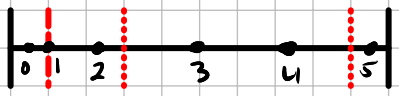
- checking above trigger timetag:

```
if (t < t_end && t > t_trg) {
    // Increment histograms, etc.
}
```

Not including t_end in case 2 adjacent triggers overlap perfectly with the start and end of their windows. In that case, the later trigger collects an event that is at the overlap.

If t == t_trg, the "below" check will cover it in order to avoid double counting.

2.) Extends below 0:



Events 0, 2, 5 within window

- checking below trigger:

```
if (t ≥ t_start || t ≤ t_trg) {
    // ...
}
```

- checking above trigger:

```
if (t < t_end && t > t_trg) {
    // ...
}
```

3.) Extends above t_rollback:

Events 0, 3, 5 within window

- checking below trigger:

```
if ( t ≥ t_start && t ≤ t_trg) {
  // ...
}
```

- checking above trigger:

```
if ( t < t_end || t > t_trg) {
  // ...
}
```