The Kernel

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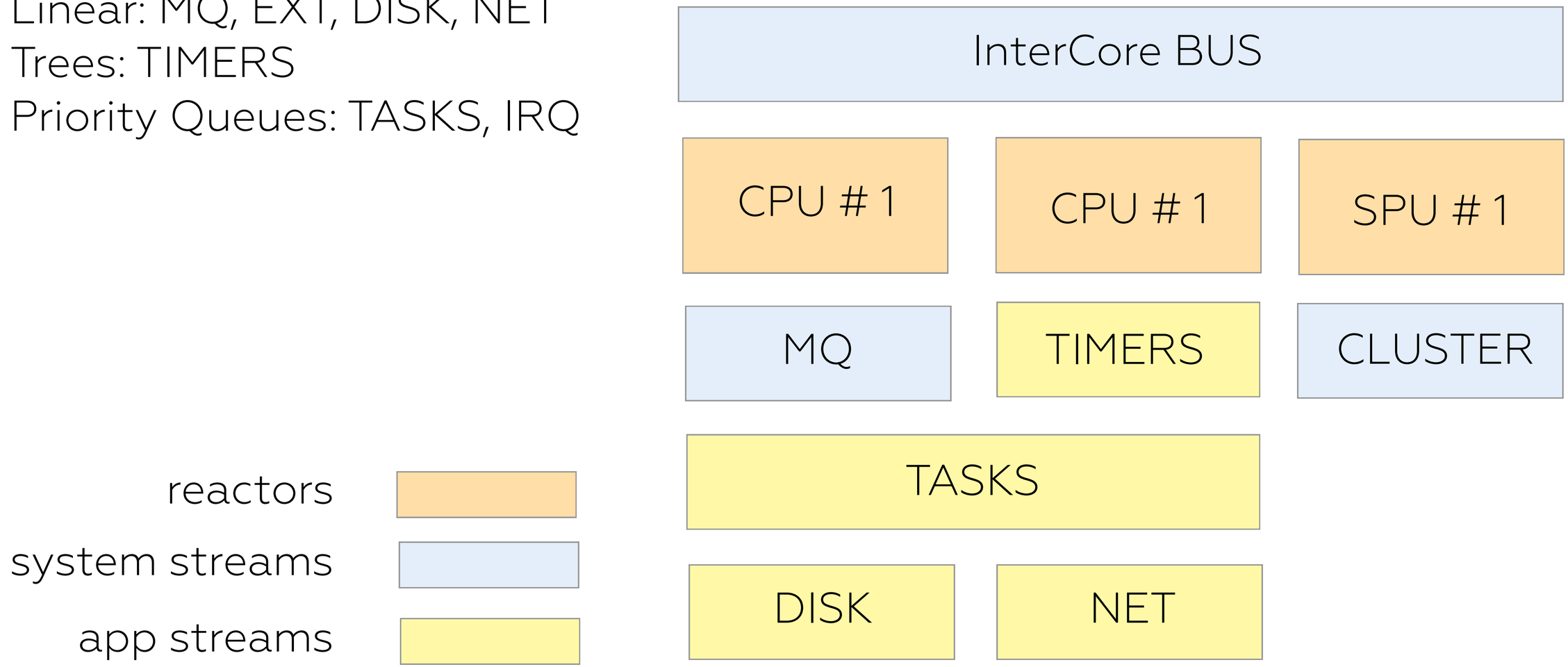
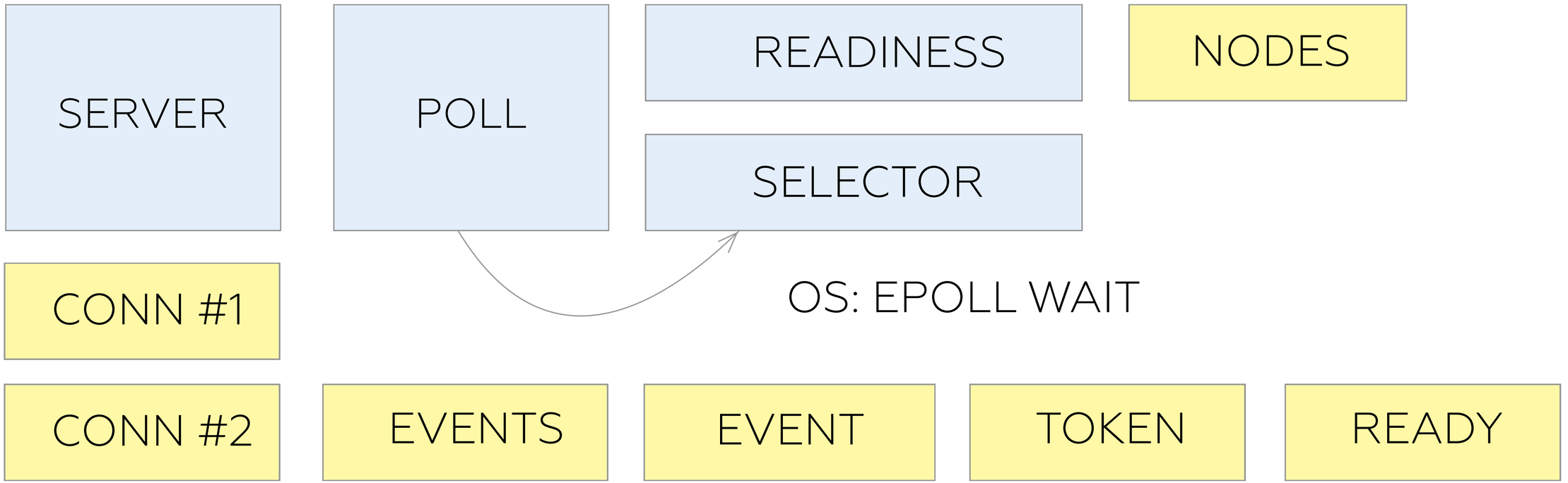
Scheduler: Round-Robin, Priority Queues, Tree Flavours
Scheduler Actors: Features, Timers, Async I/O
Streams Backends: Zero-copy, Message Passing
Linear Backends: Async I/O Disk Streams, Network Streams
Indexed Backends: Timers, Actors
Backpressured Message Bus/Buffers: Arc/Vec prealloc
Class: Low Latency, Real Time

Linear: MQ, EXT, DISK, NET
Trees: TIMERS
Priority Queues: TASKS, IRQ



IO

MIO compatible polling loop based on Readiness Queue



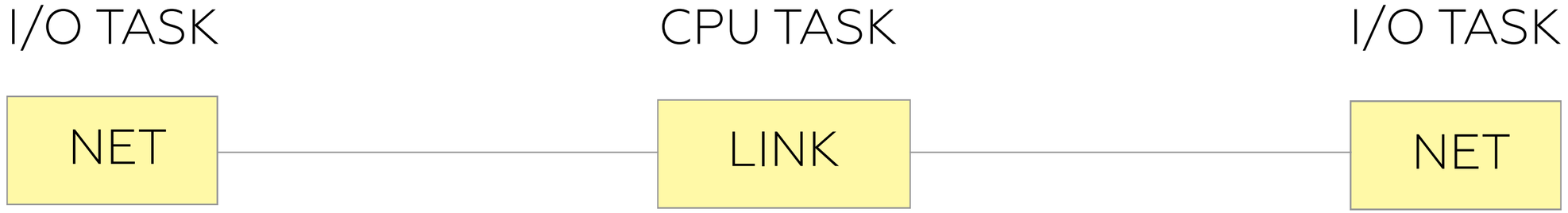
MQ

Queue Types

SPSC/LINK	4-10ns Lowest Latency Possible
MPSC/SUB	10-40ns Reducer or Subscribe Polling
SPMC/PUB	10-40ns Publisher Multicursor

FAST DELIVERY CASE

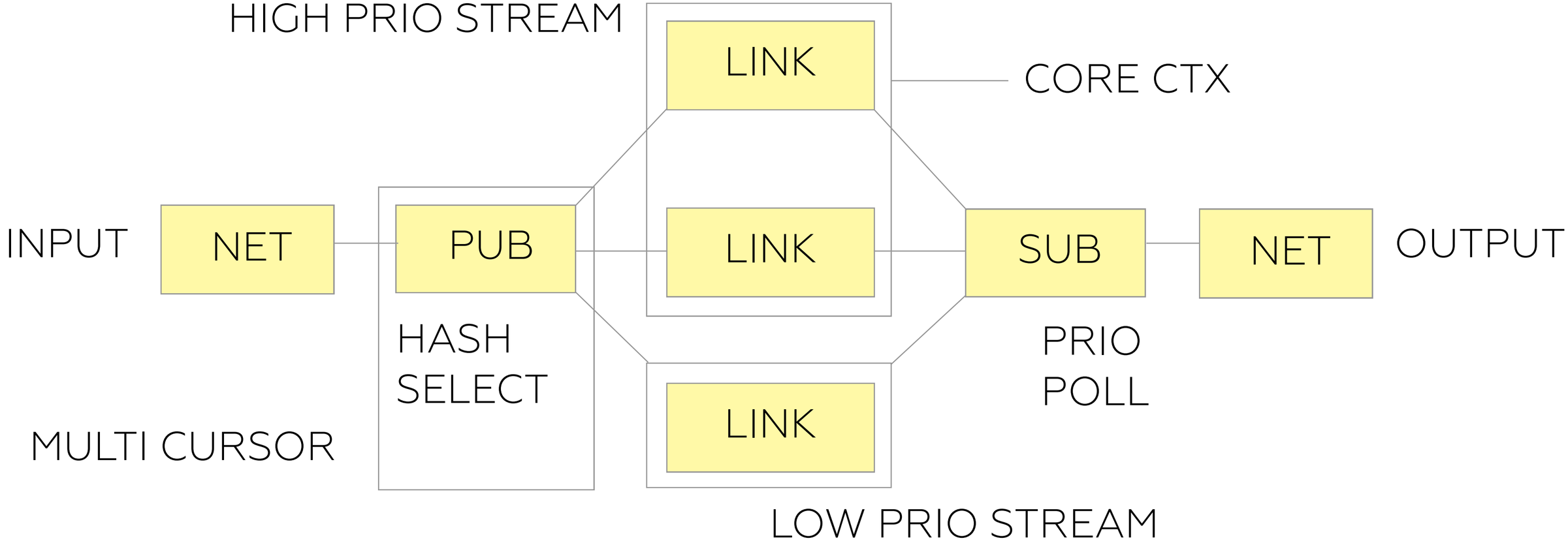
Single Threaded Task Configuration
to be compared as reference



You can use inplace message modifying and reduce copies to unpack and pack.

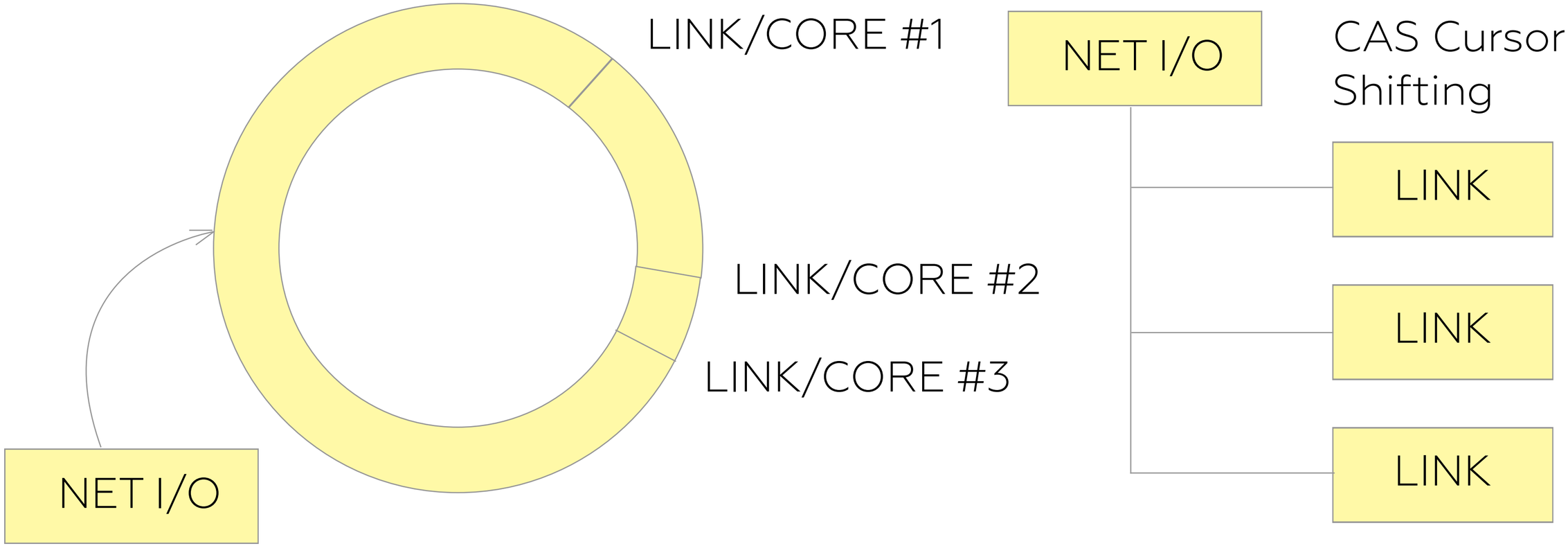
LOAD BALANCING CASE

Load Balancing
of Priority Streams per Core
Buckets



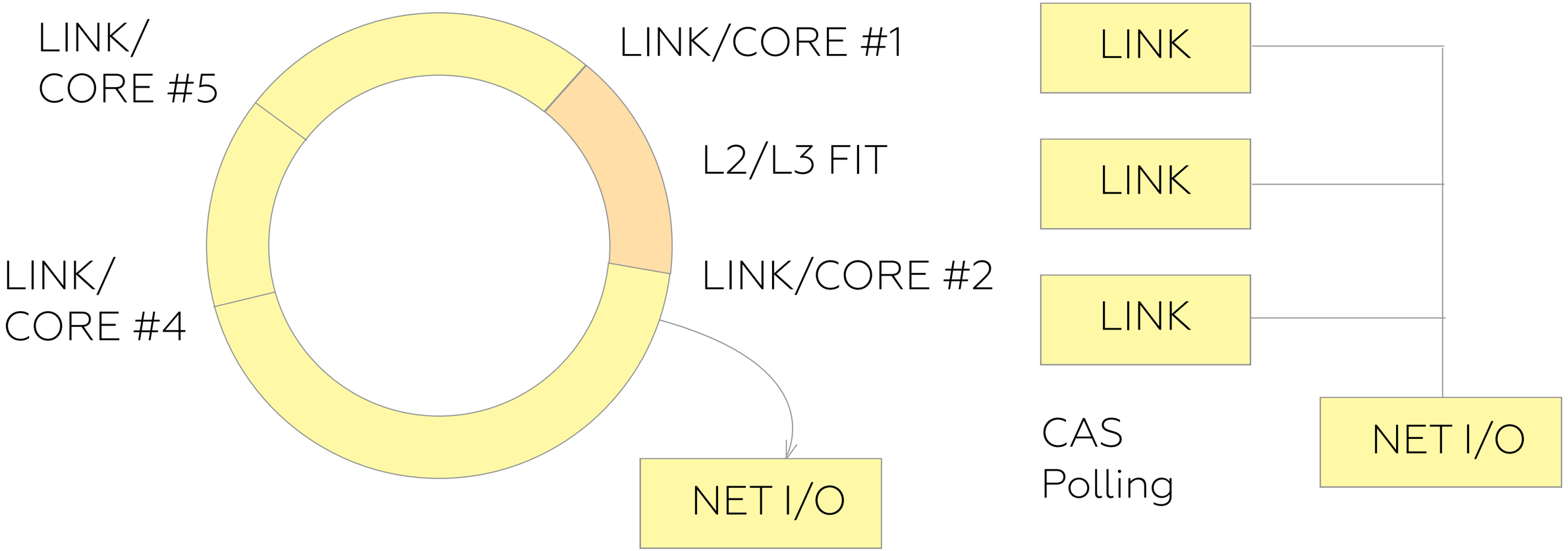
PUBLISHER CASE

PUB Implementation for Zero-Copy Multiple Consumer Publishing (SPMC)



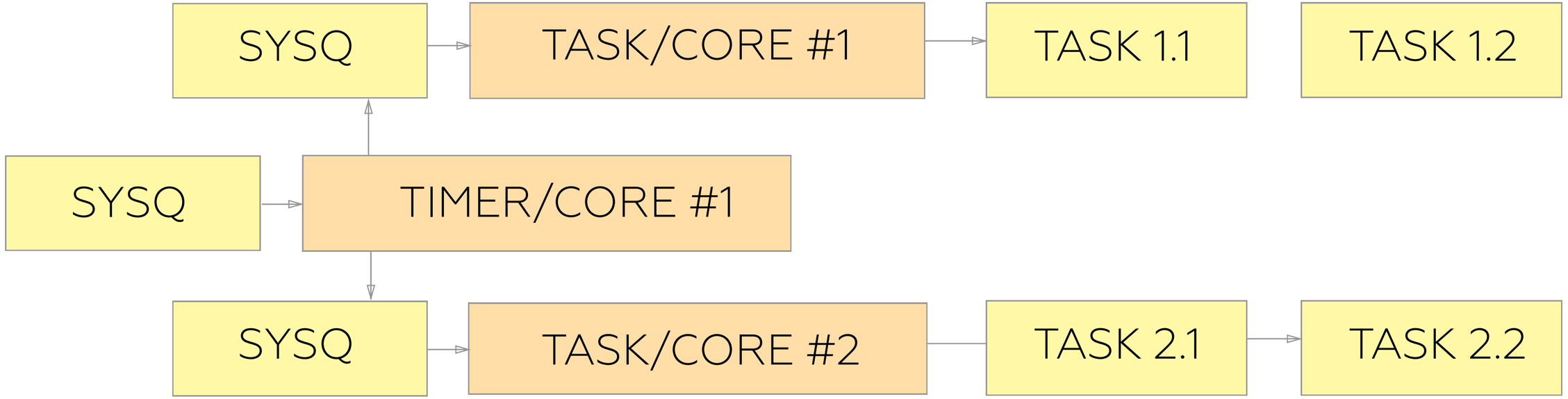
SUBSCRIBER CASE

Multicursor Implementation of SUB (MPSC) for InterCore Queue Migrations and Cache Locality

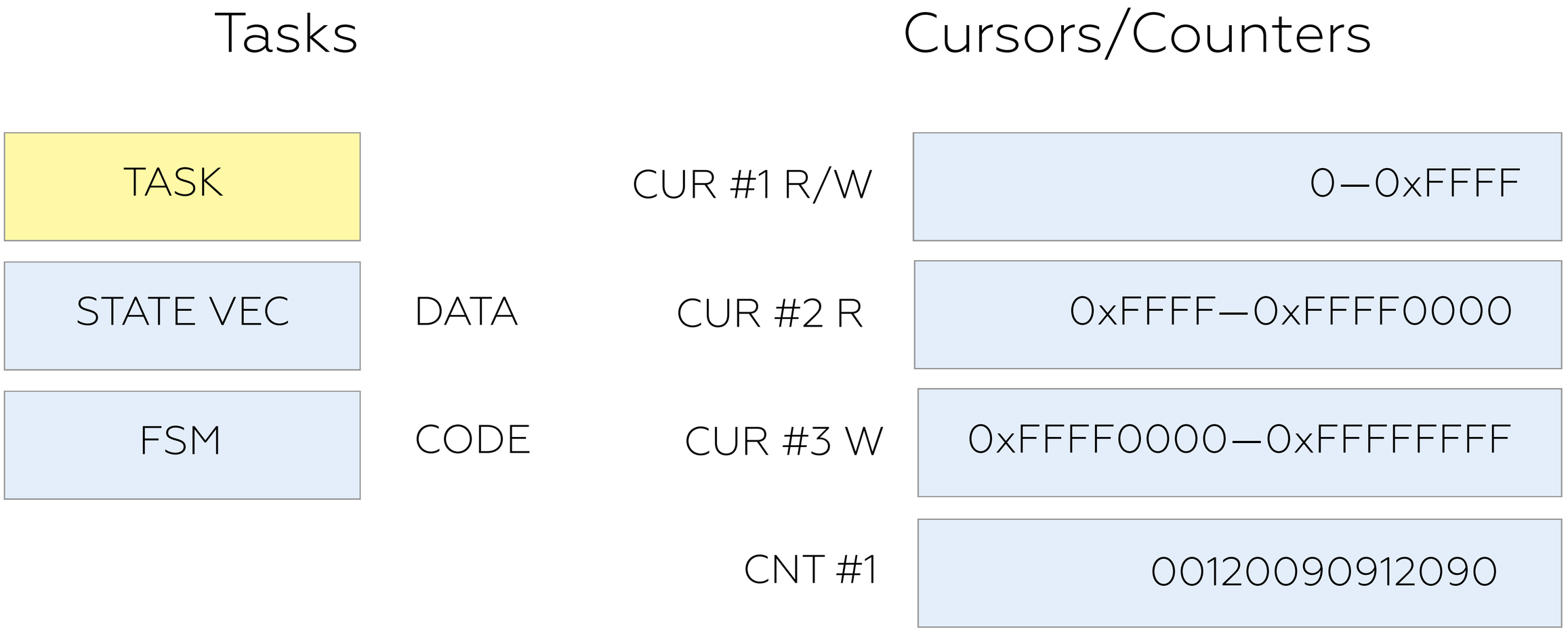


TIMERS

Scheduler Reactors can communicate throught InterCore transport for Timers.



Timer uses Linear Firing Round Robin.


Tasks
Cursors/Counters
TASK
STATE VEC
FSM
DATA
CODE
CUR #1 R/W
0—0xFFFF
CUR #2 R
0xFFFF—0xFFFF0000
CUR #3 W
0xFFFF0000—0xFFFFFFFF
CNT #1
00120090912090

ITERATORS

```
+/{x*y}[(1;3;4;5;6);
        (2;6;2;1;3)]

+/{x*y}[vec1;vec2]

vec1.iter().zip(vec2
.iter()).map(|(i, j)|
i * j).sum()
```

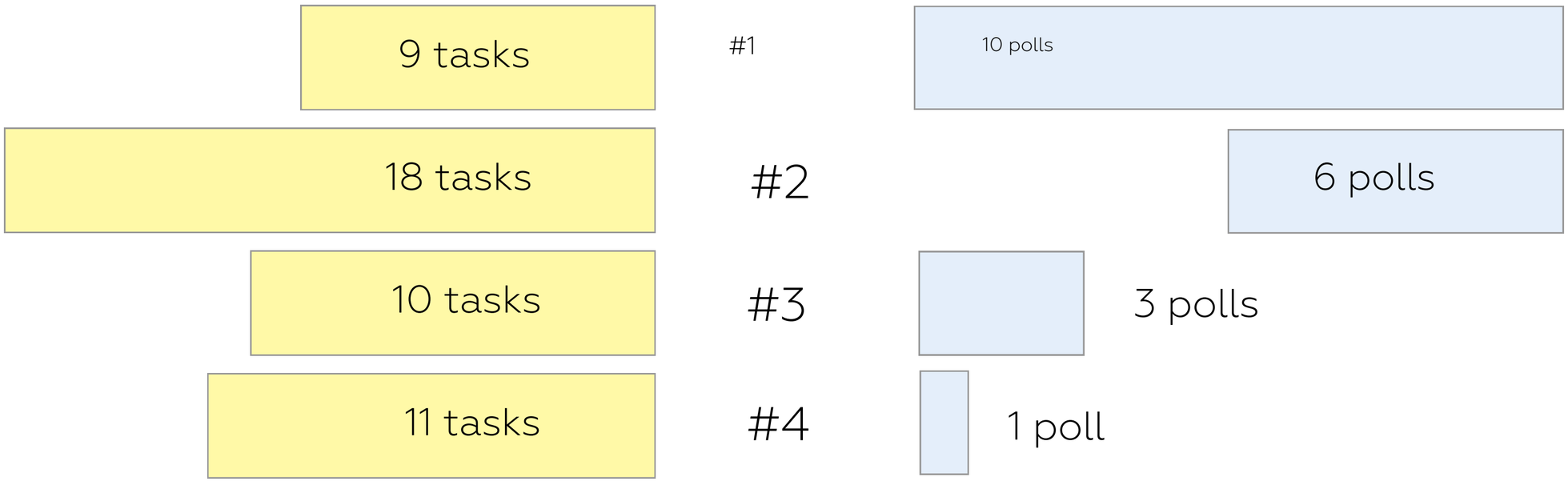
```
.LBB0_7: testq %r8, %r8
         je .LBB0_9
         movdqu 16(%rdx,%rax,4), %xmm2
         movdqu 16(%rdi,%rax,4), %xmm3
         pshufd $245, %xmm2, %xmm4
         pmuludq %xmm3, %xmm2
         pshufd $232, %xmm2, %xmm2
         pshufd $245, %xmm3, %xmm3
         pmuludq %xmm4, %xmm3
         pshufd $232, %xmm3, %xmm3
         punpckldq %xmm3, %xmm2
         paddd %xmm2, %xmm1
         movdqu (%rdx,%rax,4), %xmm2
         movdqu (%rdi,%rax,4), %xmm3
         pshufd $245, %xmm2, %xmm4
         pmuludq %xmm3, %xmm2
         pshufd $232, %xmm2, %xmm2
         pshufd $245, %xmm3, %xmm3
         pmuludq %xmm4, %xmm3
         pshufd $232, %xmm3, %xmm3
         punpckldq %xmm3, %xmm2
         paddd %xmm2, %xmm0
```

Capacity: 239 Time: 20

Workload: 48 Total: 400

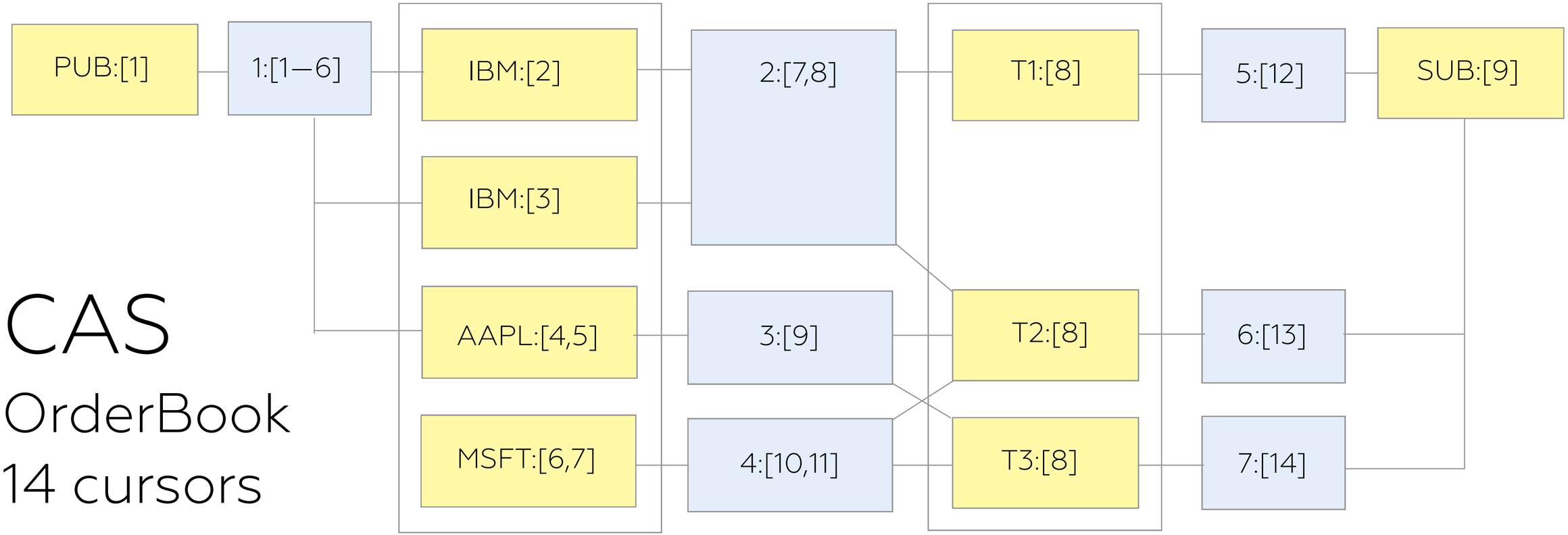
Avg Task Consumtion
Accumulated in the Task Stream

Σ AvgTime * Tasks * Polls = Capacity



prios: [10,6,3,1]

12x CPU Cores: In: [1] Order Books: [2,3,4,5,6,7] Traders: [8] Out: [9]



CAS

OrderBook

14 cursors

8x32K MEM Regions: Input Queue: [1] Reducing Queues: [2,3,4,5,6,7]

```
Console is listening...
>
ring[reader;mem[0;16]];
ring[writer;mem[0;16]];
cursor[1;writer;1];
split[1;2;50];
split[2;3;50];
split[1;4;50];
cursor[5;reader;1];
split[5;6;50];
split[5;7;overlapped];
reactor[aux;0;mod[console;network]];
reactor[timercore;1;mod[timer]];
reactor[core1;2;mod[task]];
reactor[core2;3;mod[task]];
spawn[1;80;AAPL;trader1;core1];
spawn[2;80;EEM-SPY-GDX;trader1;core1];
spawn[3;20;AMI;trader1;core1];
spawn[5;80;GOOG;trader2;core2];
spawn[4;80;FB-NFLX-AMZN;trader2;core2];
timer[timer1;core1;SPY;rule1;t1;notify];
list[reactors];
list[rings];
list[cursors;writer];
list[core1];
list[timercore];
send[1;message1];
send[1;message2];
dump[1;mem[0;100]];
show[recv;1];
```

io	seq	ring
register	spawn	join
send	cursor	split
sync	reactor	timer