

[instruction]CPU Core Allocation Guide for BenderServer HFT Infrastructure

: CPU
: 2024

1.1.

- 1.
 2. [CPU Mapper Tool](#)
 - 3.
 4. [L3 Cache Partitioning](#)
 5. [Multi-Socket Topology](#)
 - 6.
 - 7.
-

1.2. 1.

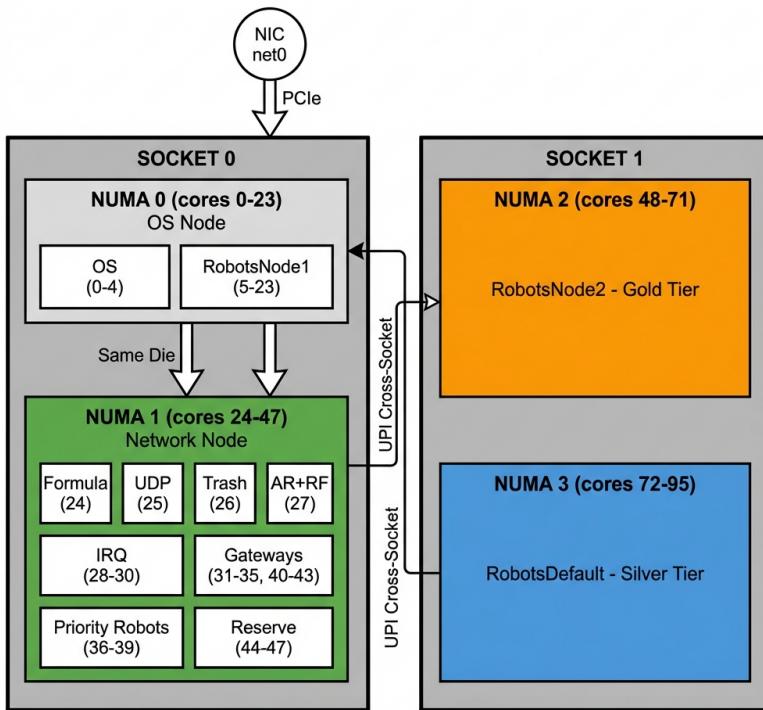
CPU latency HFT .

1.2.1.

NUMA Locality	NUMA-
L3 Isolation	"" "" cache eviction
Cross-NUMA Avoidance	
Jitter Reduction	IRQ

1.2.2.

Dual-Socket Server Topology (96 Cores)



. 1: dual-socket NUMA

1.3. 2. CPU Mapper Tool

1.3.1.

[HFT CPU Mapper](#)

1.3.2.

Topology Visualization	, NUMA , L3
Role Painting	
Config Export	YAML Ansible (<code>bs_instances</code>)
Compare View	
Auto-Optimize	

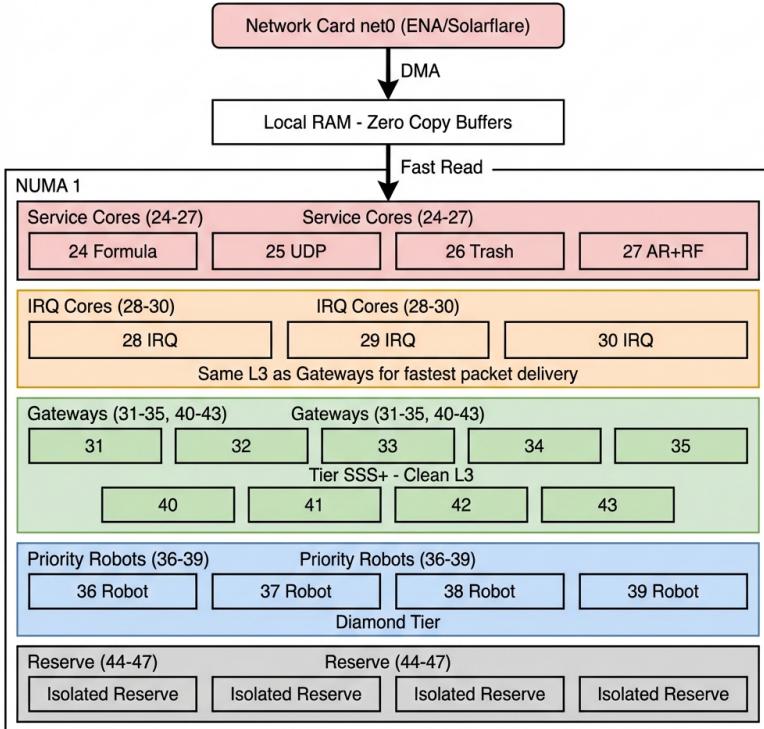
1.3.3.

1. `cpu-map.sh <hostname> duty.virt.qb.loc`
2. CPU Mapper
3. Build Map
4. Auto-Optimize
- 5.

1.4. 3.

1.4.1. Network NUMA

NUMA 1 - Network Node Detail (cores 24-47)



. 2: NUMA (Service, IRQ, Gateways, Robots)

1.4.2. 3.1. OS / Housekeeping

: , kernel, housekeeping

- (0 N)	
0-5 0-8 AVG	
~20% (mpstat, htop)	

:

- 0 N (,)
- NUMA —
- 100+ : 4-5
- ~12 : 1

1.4.3. 3.2. Network Stack / IRQ

:

NUMA-	
2-6	

- (Queues)
 - RX TX affinity (XPS)
 - Gateways/Robots
 - IRQ L3 Gateways latency
-

1.4.4. 3.3. Gateways

:

	NUMA-
	Dedicated Core ()
	~20% AVG
Tier	SSS+ (L3)

- L3 locality
 - L3 Trash/ClickHouse
 - : Tier 2 (L3)
-

1.4.5. 3.4. AR + RF + Formula

: AllRobots Thread, RemoteFormula, Formula

AR (AllRobots)	, Trash
RF (RemoteFormula)	AR Trash
Formula	AR

:

AR + Formula Trash

1.4.6. 3.5. Trash + ClickHouse

: ,

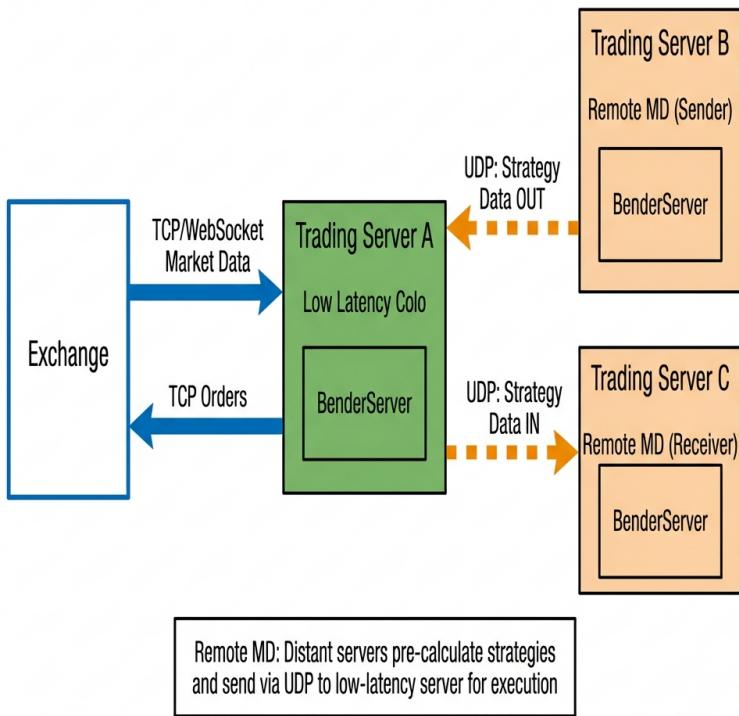
	NUMA- (UDP)
	Trash + RF + ClickHouse

- NUMA-
 - "" L3
 - trading-critical
 - UDP (UDP)
-

1.4.7. 3.6. UDP Handler

|

: UDP -



. 3: *Remote MD — - UDP*

	10+ . pps
	sar -n UDP 1
	1

UDP Remote MD:

- ()
- UDP low-latency
- Low-latency TCP/WebSocket

:

- NUMA-
- Remote MDR —
- Trash (UDP)

1.4.8. 3.7. Robots

Tier		
Diamond	L3, Gateways	
Gold/Silver	NUMA	
Bronze	Cross-socket (UPI/QPI)	

:

-
- Robot Pools
 - Dedicated Core
 - : ~20% AVG

1.5. 4. L3 Cache Partitioning

1.5.1.

- "" : Gateways, Robots L3
- "" : Trash, ClickHouse, RF L3()

1.5.2. 16 (2 L3 8)

L3 Pool		
1-8	Trash, UDP, IRQ, AR+RF, Gateways Tier A	
9-16	Gateways SSS+, Robots	

1.5.3. L3

1	Trash + RF + ClickHouse	
2	UDP	
3-4	IRQ	
5	AR + Formula	Trash!
6-8	Gateways Tier A	L3

1.6. 5. Multi-Socket Topology

1.6.1. NUMA- (Tier List)

: Network Node 2

Tier	NUMA Node	Latency	
Tier 1	Node 2 (Network)		Gateways, IRQ, Robots
Tier 2	Node 1 (Same Socket)		Robots Pool 1, Gateways
Tier 3	Node 3, 4 (Cross-Socket)		Robots Pool 2,

1.6.2. Tier 3

- Cross-socket UPI/QPI latency
 - Robots Pool 3, Pool 4
-

1.7. 6.

```
# CPU topology
sudo bender-cpuinfo
bender-cpuinfo -o net    #

# NUMA topology
numactl -H

# CPU topology
lscpu -e

#      (softirq, sys, usr)
mpstat -A 15 1

# UDP ( UDP )
sar -n UDP 15 1
```

1.8. 7.

CPU Mapper Tool	https://asciimrk-commits.github.io/goffy_cpu/
Performance Guide	https://github.com/alexkachanov/performance
HFT Analytics Dashboard	Grafana Dashboard