



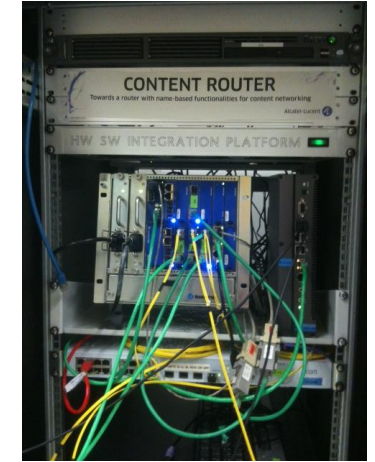
## HIGH SPEED SOFTWARE PROTOTYPE OF NAMED-DATA NETWORKING

Lorenzo Saino (UCL), Massimo Gallo, Diego Perino (Bell Labs, Alcatel-Lucent)

September, 29<sup>th</sup> - NDN community meeting

# NAME BASED ROUTER - TOWARD COMMODITY HARDWARE

- **Specialized solution for high-speed**
  - ATCA/ AMC or proprietary platform
  - Equipped with specialized or proprietary NPU(s)
- **Commodity hardware prototypes**
  - NDN prototype



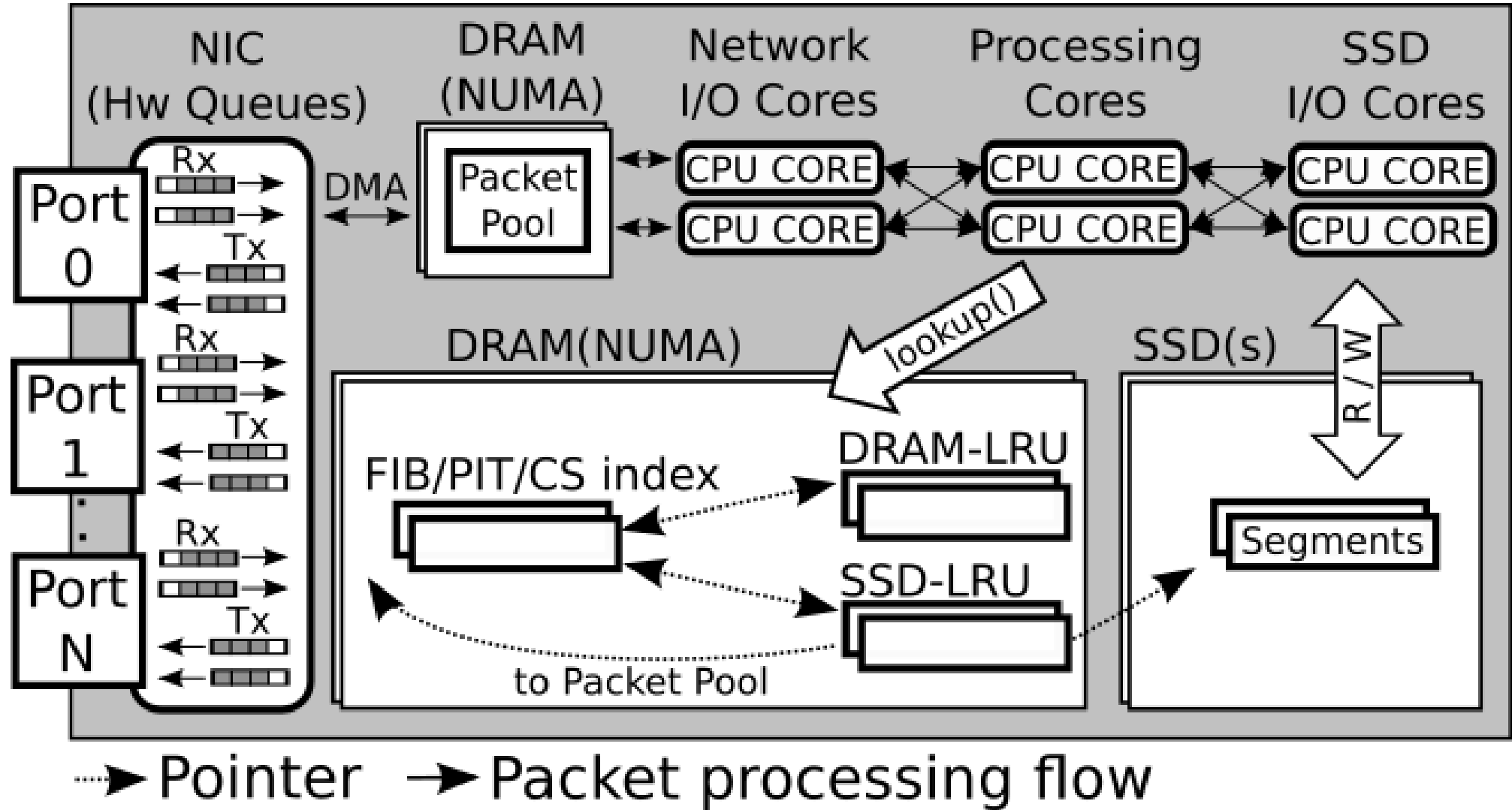
## HIGH SPEED SOFTWARE PROTOTYPE RUNNING ON COMMODITY HW FOR PROGRAMMABLE/VIRTUALIZED NETWORKS

- Facilitate innovation
- Fast time to market
- Multi-version, multi-tenancy functions
- Reduced costs, operational efficiency

# MAIN DESIGN CHALLENGES AND PRINCIPLES

1. **Efficient CPU-NIC, CPU-SSD, CPU-HW accelerator communication**
  - Kernel bypass through zero copy techniques such as Direct Memory Access
2. **Saturation of communication pipelines (i.e., CPU-NIC SSD-CPU)**
  - Exploit batching techniques to fulfill the PCI-Express bus
  - Define a batch identifier as chunk\_id/batch size
3. **Correct management of Multi-threading techniques**
  - CORE(s) have reserved memory Lock-free locations and
  - Non Uniform Memory Access aware operations.

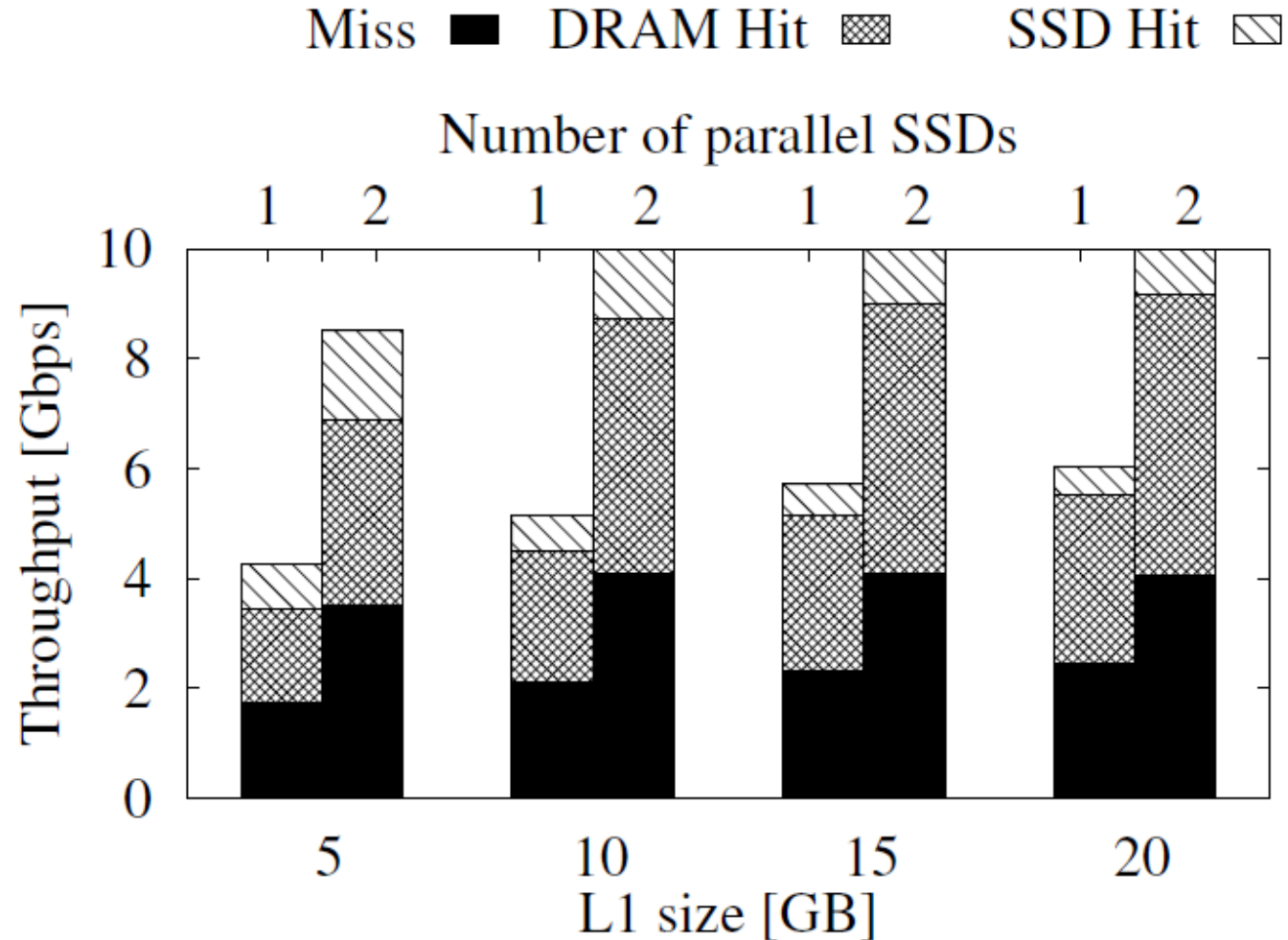
# AUGUSTUS PROTOTYPE: HIGH-LEVEL DESIGN



# AUGUSTUS: GLIMPSE ON PERFORMANCE

- HTTP requests to Wikipedia website (~zipf with alpha = 0.8)
- L1 DRAM cache=5-20 GB, L2 SSD cache=100 GB
- Batch and queue size = 16 packets
- Line rate when 2 SSD used and  $|L1| / |L2|$  ratio is 1/10
- Average latency = 96 usec

Label	Param	Value
Hardware	CPU	(2 ×) Intel Xeon E5540, 2.53 GHz
	NUMA	2 nodes, 4 cores/node
	RAM	32GB - 1.3GHz (0.8 ns)
	SSD	(2 ×) 200 GB HP enterprise SAS
	NIC	Dual-port 10GbE Intel 82599EB
Software	OS	Ubuntu 12.04 LTS
Workload	Catalog size	1.3M items
	Item size	10 MB
	Chunk size	8 KB
	Zipf skew	1



# CONCLUSIONS AND FUTURE WORK

- We built a High Speed NDN router on general purpose machines called Augustus
- Our prototype sustains line rate and large two layer caches



- We plan to release the code
  - Augustus
  - Traffic Generator
- Currently working on the integration of the design on programmable/virtualized framework

