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HULK-V: a Heterogeneous Ultra-low-power Linux capable RISC-V SoC

Luca Valente, Yvan Tortorella, Mattia Sinigaglia, Giuseppe Tagliavini, Alessandro Capotondi, Luca Benini, Davide Rossi

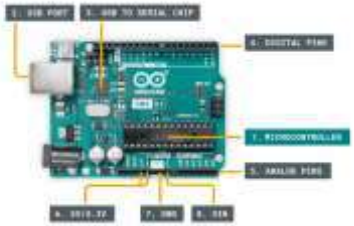
PULP
Parallel Ultra Low Power

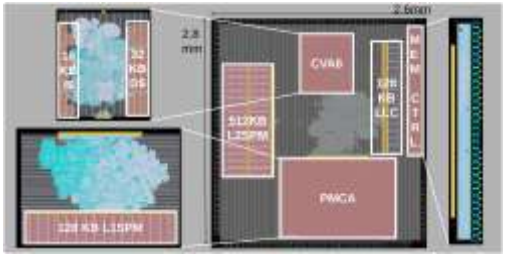
TII Technology Innovation Institute

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

ETH zürich

IoT End-Nodes classification





Low-power devices:

- Hundreds kB of SRAM
- Bare-metal runtime
- Energy efficient accelerators

Single Board Computers:

- Powerful (CortexA53 like Linux-capable) CPU
- High perf & power DDR memories
- Watts of power consumption

HULK-V (22nmFDSOI):

- Linux-capable (CPU and enough mem)
- Energy efficient accelerator
- 250mW power envelope

How?

1) Leverage heterogeneity

- **Combine different kinds of processors**

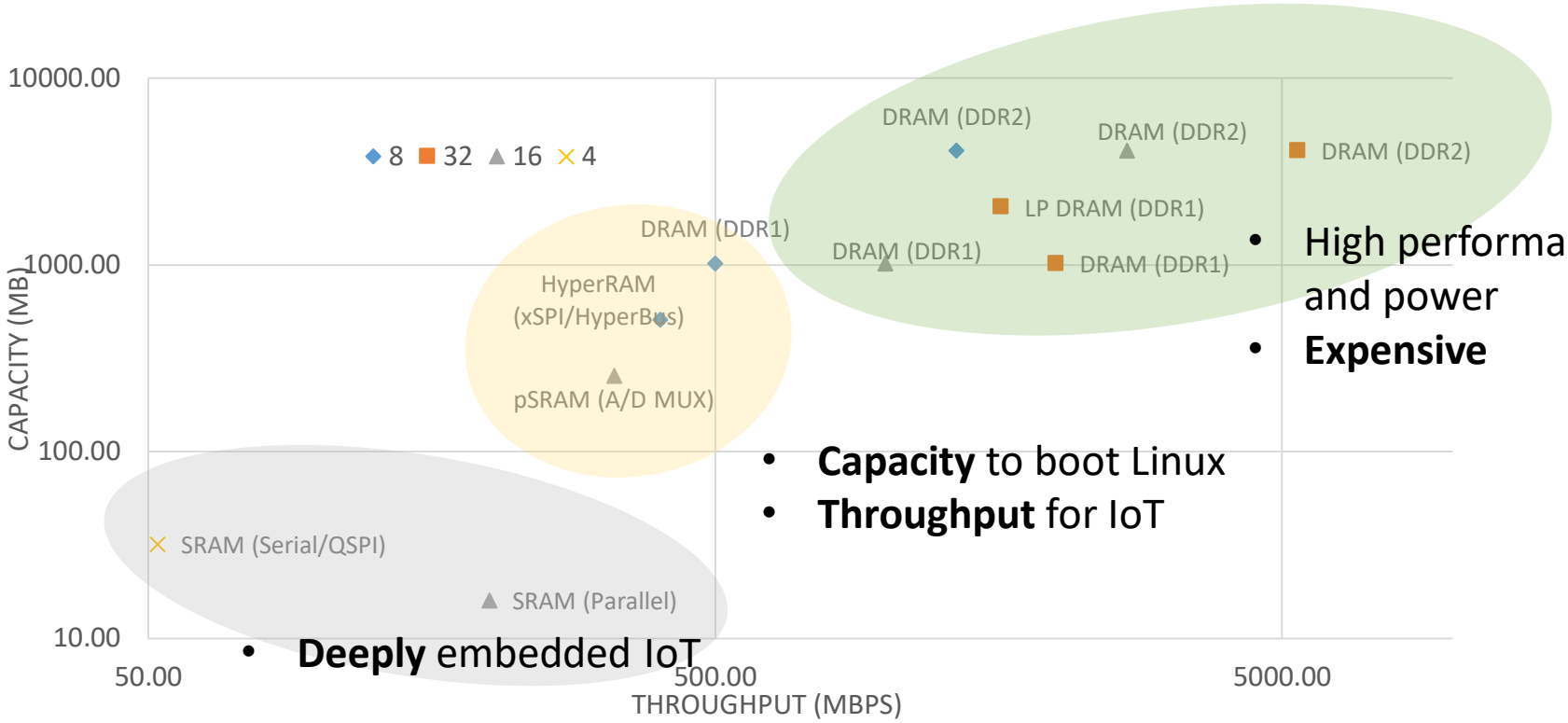
Host core

- Decide: modulate flow of **instructions**
- **Linux support**

Accelerator cores:

- Compute: modulate flow of **data**
- **Energy efficient**
- DSP and ML extension

2) Choose the right memory

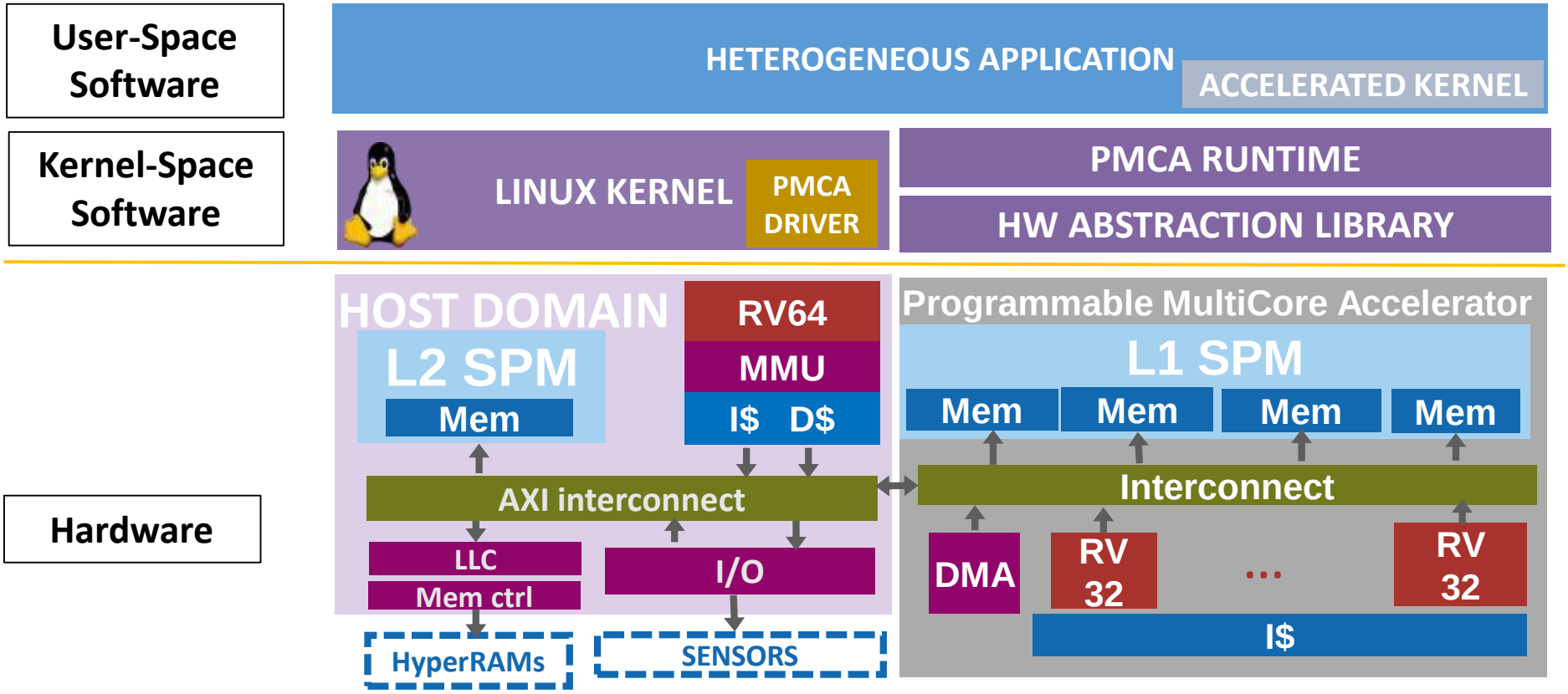


- High performance and power
- **Expensive**

- **Capacity** to boot Linux
- **Throughput** for IoT

- **Deeply** embedded IoT

HW-SW infrastrucure: HULK-V



Comparison with SoA

	OS	CPU mem.	Technology	CPU	Accelerator	Peak power
GAP10 (Greenwaves)	RTOS	512kB SRAM	ASIC	RI5CY 200MHz	8-core cluster	100mW
Sapphire	RTOS	4MB-3GB HYPER/DDR	FPGA	VEX RISC 400MHz	-	Few W
i.MX RT (NXP)	RTOS	1.5MB SRAM	ASIC	CORTEXM7 1GHz	MIPI	100mW
Raspberry Pi0	Linux	512MB LPDDR2	ASIC	4-Core CortexA53 1GHz	-	3W
SiFive Unmatched	Linux	16GB DDR4	ASIC	U74 1GHz	-	3W
HULK-V	**Linux**	**512MB HYPER**	**ASIC**	**CVA6 900MHz**	**8-core cluster**	**250mW**

Question? Poster session!