

Software Implementation vs. Hardware Implementation: The Avionic Test System Case-Study

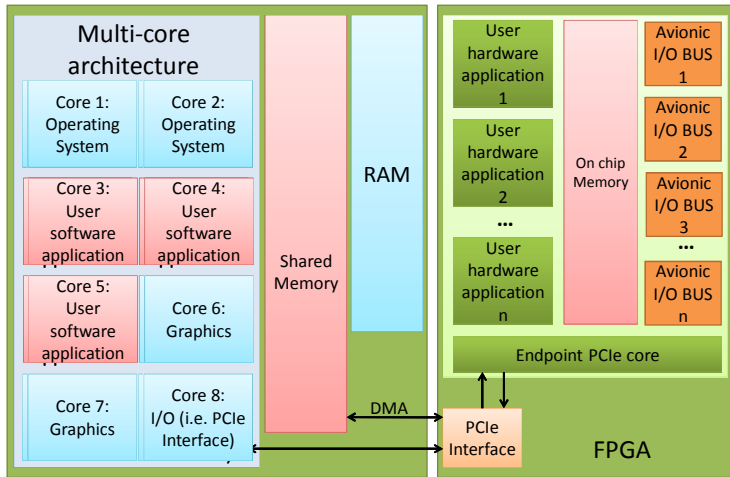
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Context :

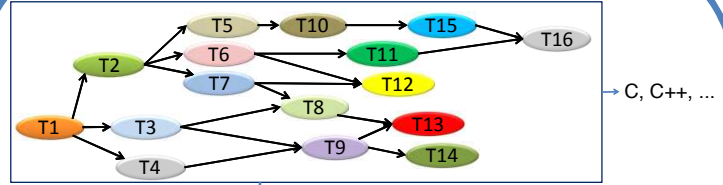
- Growing computation rates of avionic test systems and avionic heavy Models.
- Dedicated test systems on each embedded part of the helicopter.
- Development complexity of hybrid CPU/FPGA architectures.

Objectives :

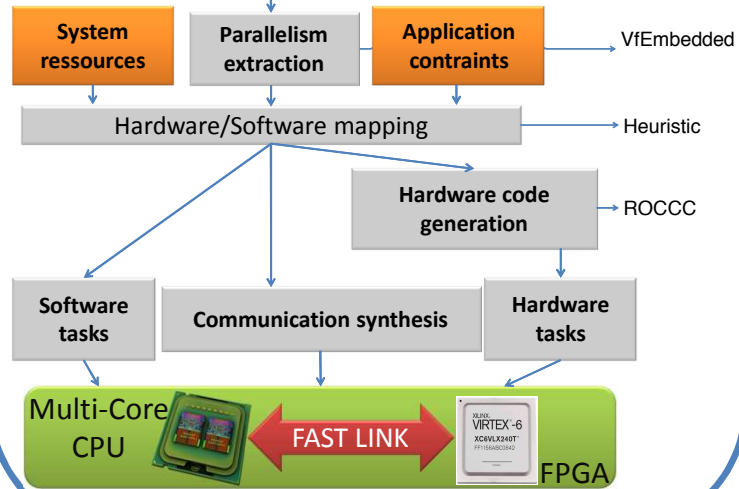
- Using hybrid architectures (CPU/FPGA) to design innovative avionic test systems.
- Using FPGA reconfigurability capabilities to design new generic and adaptive test systems.
- Defining a runtime supervisor for reconfigurable Test & Simulation architectures.
- Finding the best trade-off between different software and hardware implementation.



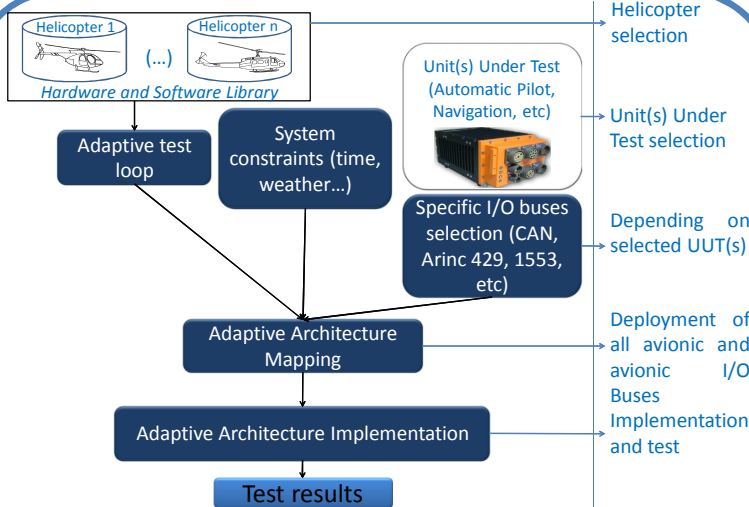
Future avionic Test & Simulation architecture



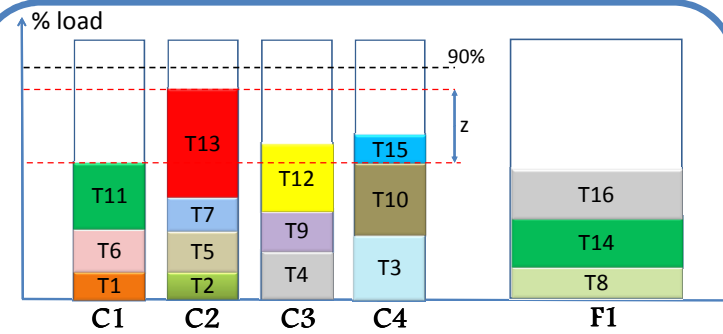
C, C++, ...



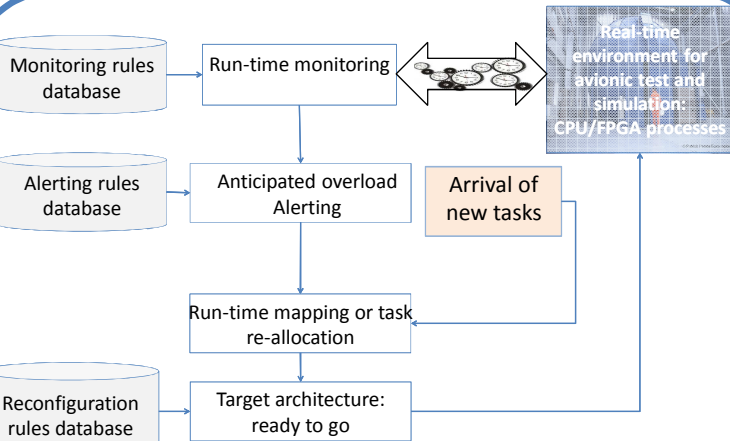
Design methodology for efficient task mapping



Design methodology for adaptive avionic test system



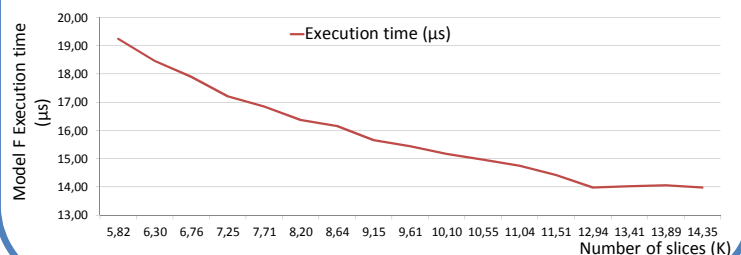
Task mapping through all available computing nodes



Run-time monitoring of the CPU/FPGA system

Results	Speed-up	Max. of useful threads	Synchronization overhead (%)
Model A	1.2	2	1
Model B	0	1	0
Model C	2.4	3	0
Model D	3.5	6	39
Model E	3	4	29
Model F	486.7	10000	95

Avionic software model analysis



Model F hardware implementation