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Transparent Dataflow Programming Paradigm for Multicores Inspired by Philosophical Ideas of Emergence and Synergy

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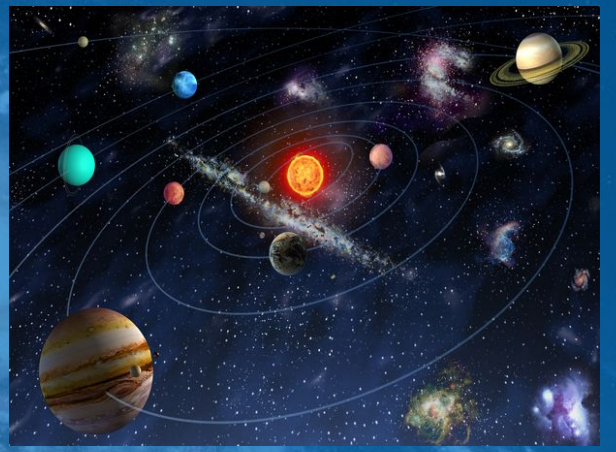
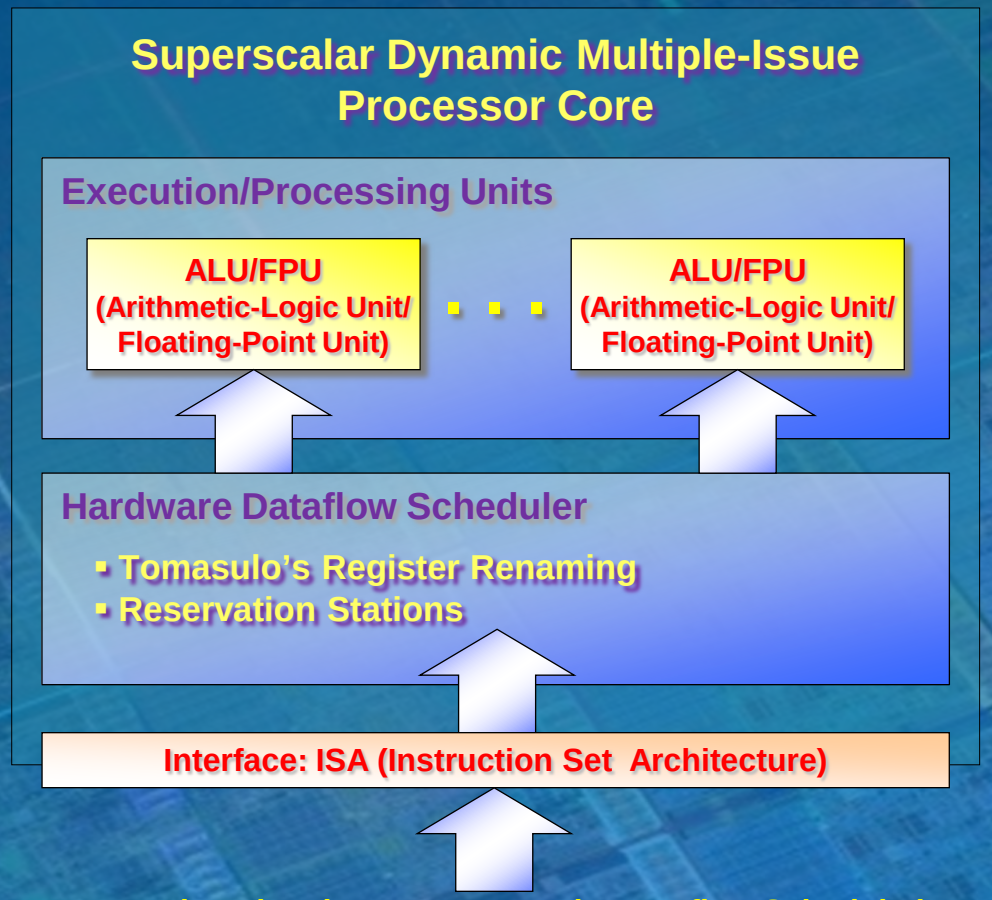
Emergence and Synergy

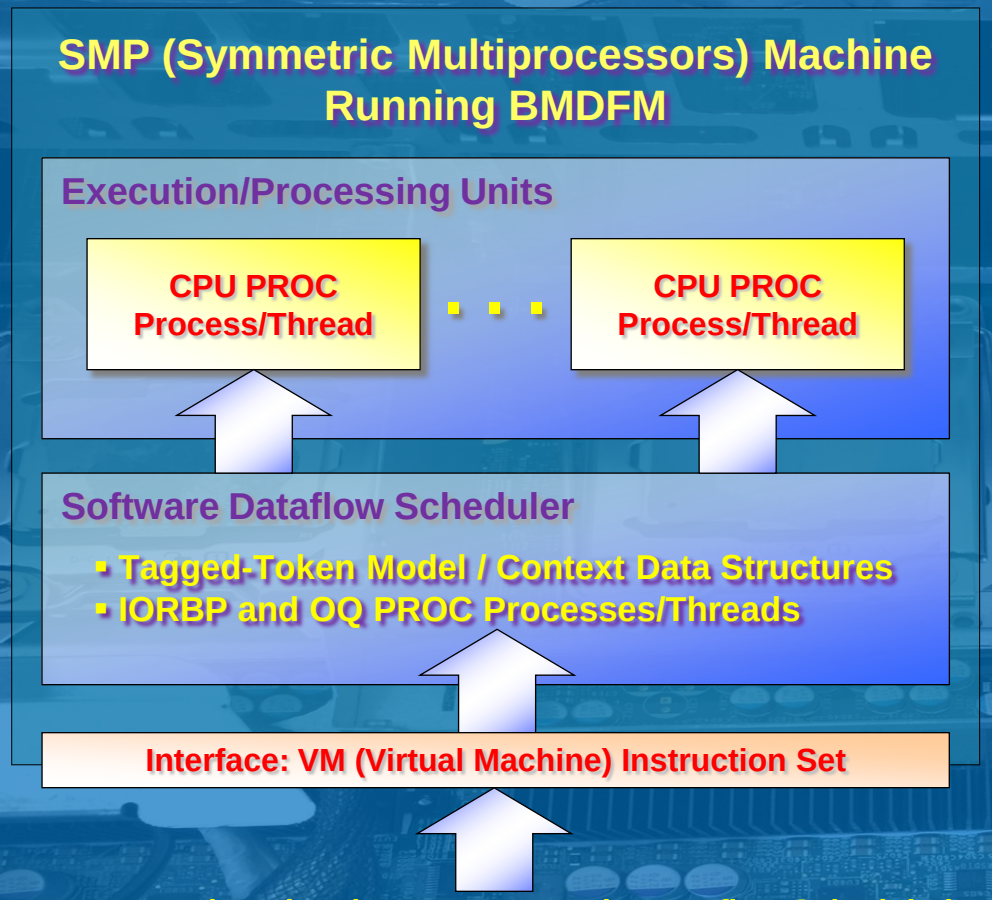
- Definition: in philosophy, systems theory, science and art, emergence is a process whereby larger entities, patterns, and regularities arise through interactions among smaller or simpler entities that themselves do not exhibit such properties.

- Definition: synergy is the creation of a whole that is greater than the simple sum of its parts.



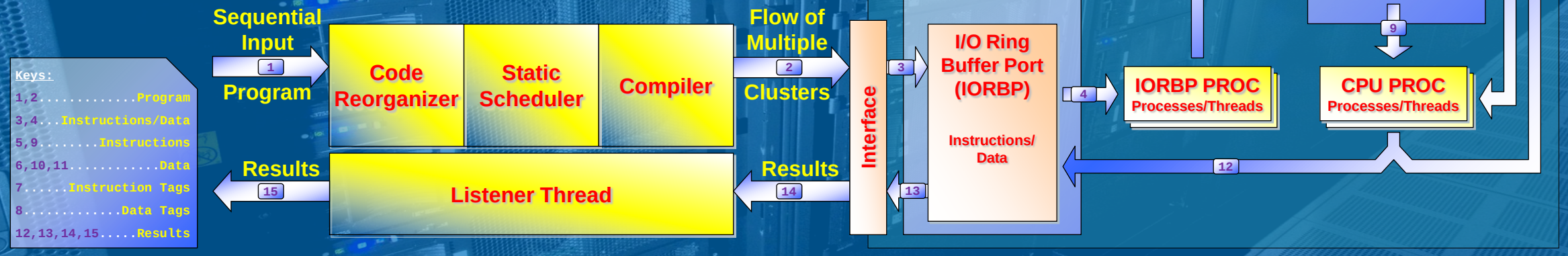


- Dataflow is local within one processor core. Execution units are the processing elements of ALU/FPU.
- Hardware dataflow machine uses Tomasulo's algorithm to exploit instruction-level parallelism.
- Tomasulo's approach defines the reservation stations for all execution units enabling register renaming.



- Dataflow is global within one multicore SMP machine. Execution units are the processor cores themselves.
- Software dataflow machine uses tagged-token model to exploit function-thread-level parallelism of VM instructions.
- BMDFM defines context data structures for each instance of variable using principles that are similar to register renaming.

- Running on SMP OS the processes/threads will occupy all available processor cores.
- Due to transparent dataflow semantics on top, BMDFM is a natural parallelization technique and an excellent parallel programming technology for multicore/many-core SMP machines.



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