An Efficient Joint Analytical and Simulation-based Design Space Exploration Flow for Predictable Multi-Core Systems

**Goal:**
Faster and More Efficient design of Time Critical and Mixed-Criticality Systems

**Challenge:**
Huge design space, critical time constrains and optimization goals

**Results:**

- **Significantly Faster Design Time**
  - Simulation-based exploration would take weeks!
  - 90% Cut of Original Design Space through the Analytical DSE in minutes
  - It would still take 14h!
  - ARS heuristic enables saving 80% of the simulations with a negligible impact in the search of the Pareto Set

- **More efficient Designs**
  - New solutions revealed after JAS-DSE vs A-DSE (>30%, conf1: 11 out of 32, conf2: 14 out of 36)
  - Thousands of solutions disappear as optimum ones

- **Worst-case analysis prevents accurate decisions for average optimization**
  - Avg. Cycle <50μs ⇒ 3PES, and not 4 PES, are required

**Solution:**

**Adaptive Random Sampling**
Enables heuristic search both in Analytical and Simulation-based DSE

**Implementation for Predictable MPSoC Design**

- **Application to a Voice Activity Detection (VAD) system** (Part of GSM vocoder)
- **Application**
- **Platform**
  - Up to 6 Processing Elements
  - 2 TDMA bus configurations with up to 8/20 slots
- **Constraints**
- **Goals**
  - Throughput, Avg. Load, #PEs

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