NetSoler: Scalable Constraint-based Virtual Data Center (VDC) Allocation

Motivation
- Applications need cloud SLAs for predictable service
- Tenants can express their job/placement requirements as a VDC
- DC operators want to maximize their resource utilization

Existing approaches
- State-of-the-art: fast but incomplete heuristic algorithms [1]
- These heuristics fail to find a VDC allocation even if one exists
- Existing constraint-based approaches do not scale

Our contribution: NetSoler
- Constraint-based VDC placement tool that uses MonoSAT, an SMT solver with fast graph theories [3]
- CPU and memory are encoded as integer constraints
- Multi-path e2e bandwidth encoded as max-flow constraints
- Given a formula, MonoSAT computes a graph and a valid flow assignment that satisfies the formula

Extensions

VDC allocation with affinity and global constraints

Evaluation
NetSoler achieves higher DC utilization than competing approaches

VDC allocation on data center with 2000 servers

NF chain allocation on data center with 1200 servers


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