Scheduling Operating System Services

PhD Planner

Research Area: Operating Systems, Distributed Systems

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What is this about?

- System calls are executed at arbitrary locations and thereby pollute caches and block shared data structures.
- This limits performance of applications since they have to wait for system calls.
- System calls can be executed remotely and asynchronously in, e.g., Microkernels.
- CPU cores can be dedicated to run system calls. This reduces cache pollution and improves application speed.
System Calls

• Interaction Between OS and Application
• Remote Execution in Microkernels
• Advantage:
  • Fewer Locking
  • Lower Cache Pollution
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OS Services

• Specific System Call
• Offered by One or Multiple Cores
• Replication:
  • Improves Locality
  • Synchronisation & Consistency
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Scope

- Multi-Node, Multi-Application System
- HPC Applications
  - High Concurrency
  - Recurring Tasks
  - No User Interaction
  - Non-Preemptible Execution
Approach

• Monitor System Calls
• Extract Affinities of Tasks to Services
• Cost Model
  • Communication to Services
  • Replication of Services
    • Synchronisation & Consistency
  • Location of Input Data
  • Resource Utilisation
• Hierarchical Scheduler for Tasks
• Co-Schedule System Services
Research Questions

• How does OS service placement affect application performance?
• How do scheduling of application tasks and OS services influence each other?
• What is the optimal placement strategy for OS services to achieve maximum application performance?
• What is the reconfiguration cost for different OS services?
Questions?