

A Framework for Reasoning about the Temporal Behavior of Scientific Applications

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Problem

Qualitative Assessment of Behavior and Contracts in Virtual Grids

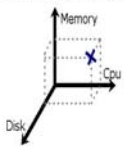
Approach

Qualitative Behavioral Classifications and Temporal Reasoning

Classification of Temporal Behaviors

AXIS 1: Metric Space Characterization:

Cpu, Memory, Disk, Network



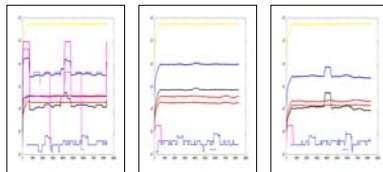
AXIS 2: Pattern Characterization:

Steady, Oscillatory, Random



Clustering: hierarchical, kmeans
Classification: Nearest-neighbor
Result: Database of Common Behaviors

Example: WRF Behavioral Classes



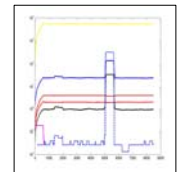
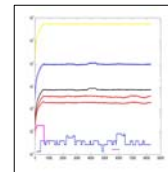
Temporal Performance Validation

Resource Overlaps: Network, Storage, . . .

Example: WRF Network Contention

No Network Contention

Network Contention



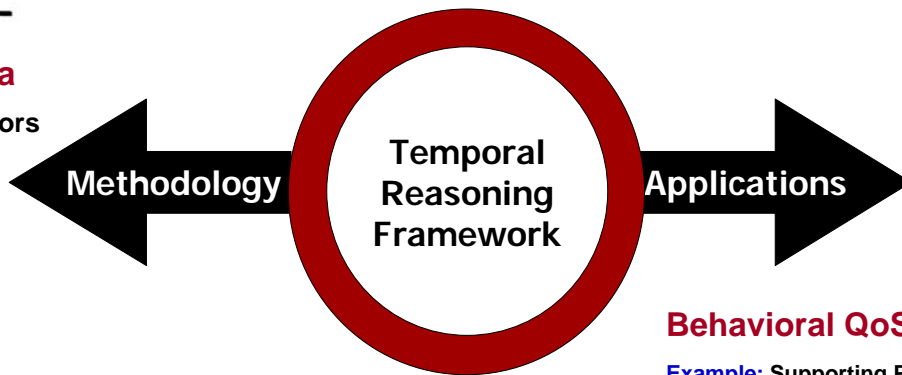
Temporal Algebra

1. Ordering Operators

- A **Before** B
- A **Meets** B
- A **Overlaps** B
- A **During** B
- A **Starts** B
- A **Finishes** B
- A **Equals** B

2. Resource Interaction Operators

- A **Interacts** B, or A + B



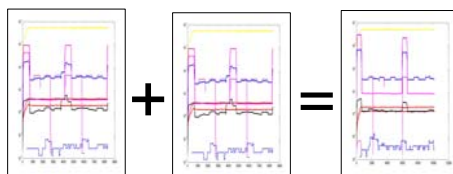
Behavioral Interactions

Behavior Interaction Table

	—	⌋	⌋
—	90%
⌋	10%
⌋	...	50%	...
⌋	⌋

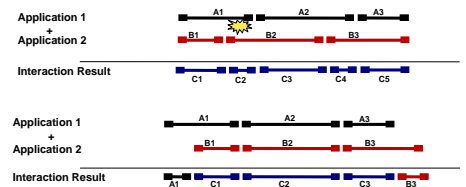
Record All Behavioral Interactions Observed
Integrate with Statistical Uncertainty Framework

Example: WRF Behavioral Interactions

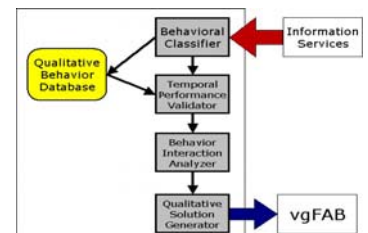


Behavioral QoS Management

Example: Supporting Policy Decision;
Look-a-head Scheduling



VGrADS
Integration



Summary: Ability to Manage Behavioral Quality of Service Intuitively
Challenges & Goals: Resource Selection, Behavioral Validation