Supporting the Comprehension of System Behaviour Under Load

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How To Understand ULS Systems?

Ultra-large-scale (ULS) systems dominate the fields of e-commerce and telecommunications.

! Highly concurrent and highly distributed.

! Complex architectures built on complex sub-architectures

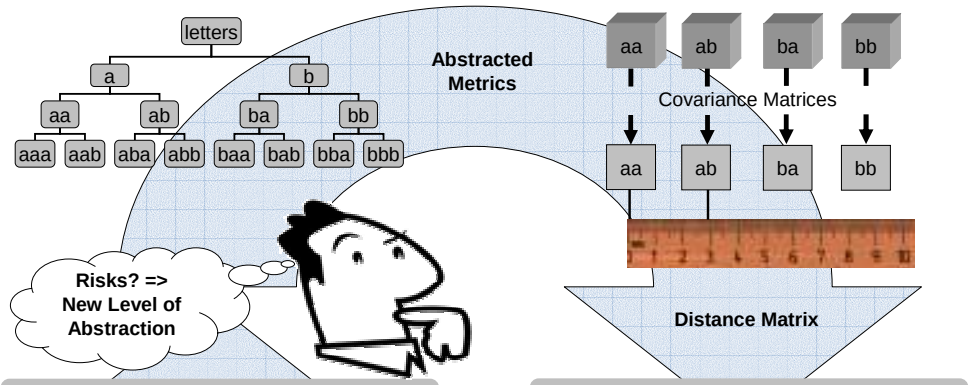
Behaviour is hard to understand!

We propose:

- an iterative methodology
- for automatically identifying and ranking deviating behaviour
- based on the level of dissimilarity between the resource usage metrics of threads.

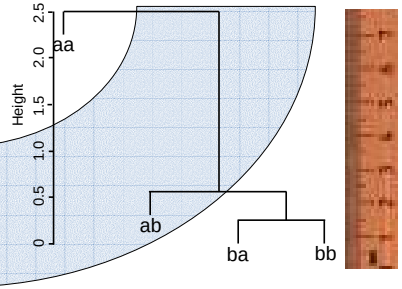
Iterative Methodology

1. Metric Abstraction

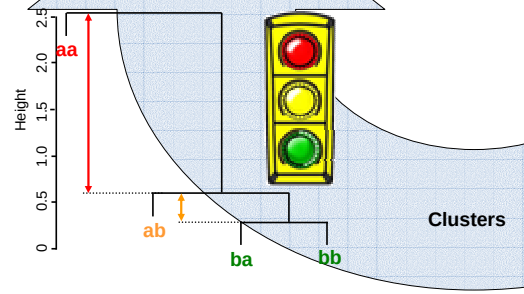


2. Distance Calculation

3. Hierarchical Clustering



4. Ranking



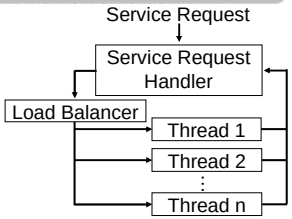
Case Study: Thread Pools

Threads pools face a variety of challenges:

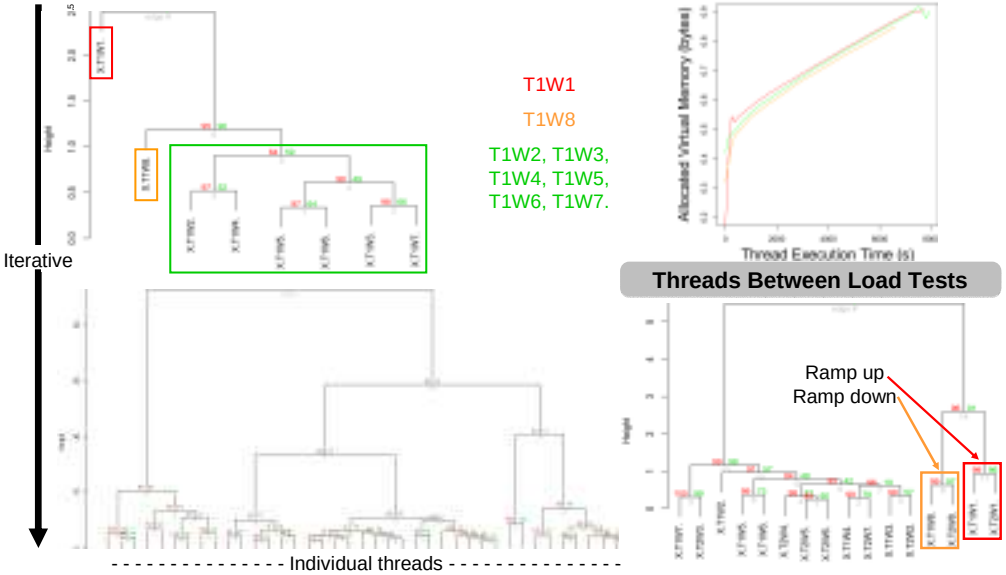
- Synchronization errors
- Deadlock
- Resource thrashing
- Thread leakage

Thorough understanding of the system is needed to address these challenges

The subject system in our case study was a commercial ULS system that implemented the typical thread pool architecture.



Threads Within A Load Test



Threads Between Load Tests

Conclusions and Future Work

Our methodology has enabled us:

- Develop a better understanding of the subject system
- Identify and rank similar and deviating behaviour
- Tackle different problems where resource usage metrics are collected

Future work:

- More systems
- More design patterns and architectural styles
- Improved ranking algorithm (e.g. load testing)