An Elastic Layers Pattern Approach with Dynamically Added Layers

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Motivation

- Monitoring of applications in ExplorViz [3]
- Different filter and analyzing steps for probed data
- Resulting architecture is a (parallel) layered architecture [2]
- Existing scaling operations (in this architecture) not sufficient
Parallel Layers Pattern [2] (Foundation)
Height: Fixed by system design/architecture

Width: Scalable at runtime
Our Dynamic Height Approach for the Parallel Layers Pattern
Height: Scalable at runtime. Accumulator defined at design time

Width: (Still) Scalable at runtime
Implementation in ExplorViz
Evaluation
Evaluation Setup

- Private cloud running OpenStack containing seven servers
- 224 VCPU cores (112 real cores) and 896 GB of RAM
- Object system: web application JPetStore
- Flavor used for every dynamically started instance
  (Master, Worker, and JPetStore nodes): 1 VCPU, 3 GB of RAM
- First presented at ESOCC, 2015 [1]
Fig. 1: Employed workload curve [1]
Fig. 2: JPetStore instance count and average CPU utilization of Master node

[1]
Conclusion and Outlook

- Extension to an existing Parallel Layers Pattern [2]
- Increased level of scalability
- Successful integration and evaluation in ExplorViz¹
  - Fluctuating workloads are handled dynamically
  - Open source and replication package provided

¹ www.explorviz.net
References


Threats to Validity

- Only one environment and one application
- Only two worker levels (due to only 216 possible instances)
- Similar traces generated by JPetStore
Fig. 3: Analysis nodes and number of instances in each level [1]
Related Work

● Architectural Approaches:
  ○ Microservices [5]
  ○ Mapreduce [6]

● Self-Adapting Techniques like [4].