Towards a Context-Aware Information Model to Support Virtualization

Yeongrak Choi¹, Jian Li², Yoonseon Han¹, John Strassner¹, and James Won-Ki Hong¹,²

¹ Division of IT Convergence Engineering, POSTECH, Pohang, Korea
² Department of Computer Science and Engineering, POSTECH, Pohang, Korea

Introduction

• More Complex Services with Resources
  – Increasing necessity for new, innovative and personalized services
  – Contention among those services for the same set of shared resources
  – Difficulties in management: a mix of services with shared resources

• Benefits of Virtualization
  – Isolate different machines and applications that have different requirements
  – Decouple hardware, operating system, and application dependencies
  – Provide different availability, reliability, and backup policies simultaneously

Research Goal

• Model Virtual Resources and Corresponding Services
  – Build an unified information model to support both virtual and non-virtual resources
  – Model behaviors of virtual resources by defining a set of classes and corresponding associations
  – Support context-aware policies to govern services and resources offered by the system being managed

• Extension of the DEN-ng Resource Domain: with Virtualization
  – Creating a set of classes required to run Virtualization
    • VirtualResource and its subclasses
      • VRInstalledIntoVS: how a VirtualResource is installed into a VirtualSystem
    – Placing VirtualResource into hierarchy with NonVirtualResource
      – Contention among those services for the same set of shared resources
    – NonVirtualResource: Resource in the original DEN-ng
      • Definition of VirtualResource: an abstraction that decouples the physical manifestation of a Resource from its logical operation
      • Definition of Resource: a set of entities that are of interest to the managed environment

Virtualization

• Hardware Virtualization
  – A virtualization of computers or operating systems
  – Decouple the software environment from its underlying hardware infra.

• Virtual Infrastructure
  – Share physical resource of multiple machines across the entire infra.
  – Virtual resources are shared across multiple Virtual Systems

• Virtual System
  – A tightly isolated software container that can run its own operating systems and applications as if it was a physical computer

Top-level Resource Model

Context-Aware Policies for VR

• Use of Context-Aware Policies for Managing VirtualResource
  – ContextData: different aspects of context (e.g. the set of resources that each virtual device provides)
  – Context: a complete aggregate of context aspects (e.g. the virtual service)
  – Use Context and ContextData to select the appropriate set of policy rules to realize the set of governance operations for managing VirtualResource

Concluding Remarks

• Conclusion
  – Extended DEN-ng information model to support virtualization
  – Modeled virtual resources with non-virtual resources to apply context-aware policies

• Future Research
  – Convert the model to OWL ontology and apply first-order logic to decrease the management complexity for virtualization
  – Validate the model using a set of detailed scenarios and a simulator