MODEL-BASED AUTOMATION FOR HARDWARE PROVISIONING

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1. BACKGROUND

Existing model-based provisioning techniques can generate a desired software system effectively from the simple system definition, which describes hardware components and the system behavior. However, the market trends show significant demands for hardware provisioning.

2. CHALLENGES

Problems in current hardware provisioning:
- Substantial labor-intensive effort, such as...
  - Designing system & planning tasks
  - Describing operational procedures
  - Ordering components & assigning workers
  - Performing the tasks actually
  - Managing progress of the tasks
- Diversity in the work items makes automation harder
- Complicated operational procedures
  - Manually produced operational procedure includes...
    - Conditional sections
    - References, like “See also...”, to other documents
  - It reduces maintainability and readability

We solve the above problems by applying model-based scheme to hardware provisioning.

Two Key Research Challenges
1. How to define the modeling specification? (which describes systems including hardware components)
2. How to generate the operational procedure? (which supports human workers to enhance their productivity)

3. CONCEPT OF MODEL-BASED HARDWARE PROVISIONING

System Generator
- Desired system

Model repository
- Model-based scheme to hardware provisioning

- Modeler: His work is almost automated. He only needs selecting and customizing pre-defined models
- Workers: He only needs selecting and customizing pre-defined models

System Definition
- Component (Primitive, Composite)
  - A primary unit to define a system. Primitive component is related to an actual product and composite component defines a pattern of component combination. Composite will be extracted into primitives.
- Part, State, StateShift
  - Each part has a state. Parts shows a variable piece of primitive. Each part has a state.
- Wire, WirePort, WireInterface
  - Wire shows a physical connection between components. WirePort shows a connection port and wireInterface defines its type.
- Task
  - A piece of operational procedure. Execution of each task changes a state. It is included in wires or stateShifts.
- Dependency
  - Dependency suggests an order to perform tasks properly.

4. MODEL SPECIFICATIONS

Operational procedures
- Insert server1 into rack
- Insert server2 into rack
- Insert switch into rack
- Connect cable between

Workers are assisted by advanced operational procedures
- Modeler: His work is almost automated. He only needs selecting and customizing pre-defined models
- Workers: He only needs selecting and customizing pre-defined models

5. EXPERIMENTAL VALIDATION

Generate an operational procedure from a system definition, which describes a private cloud hardware platform provisioning workflow with variability in component selection.

6. FUTURE WORK

We will support features such as multi-worker, task ordering for human operational efficiency, dynamic state change and flexible task re-calculation.

Practical experiments
We will perform practical experiments involving actual actions to deploy the system and evaluation of time and efficiency. To do this, we need to develop fundamental functions like client interfaces.

Exploring other application areas and domains
We expect that many other application domains can leverage this scheme, e.g., construction, healthcare, warehousing. We are looking for collaborators and industry partners.