

OPTIMIZING SECURITY FOR VIRTUAL MACHINE APPLICATIONS

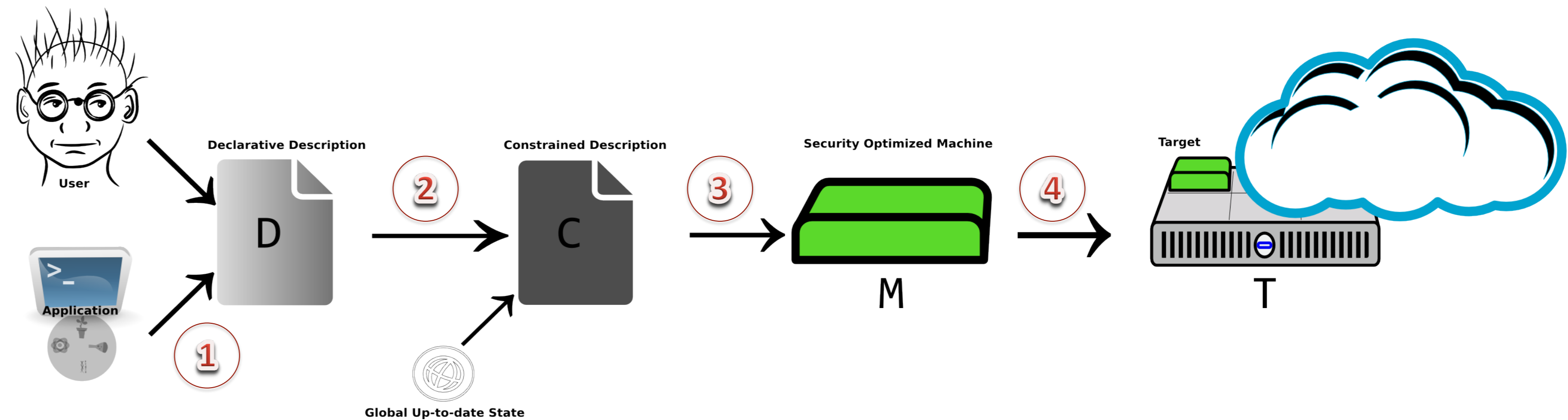
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Introduction:

- ✧ Primary Goal: secure virtual execution environment tailored for a specific application
- ✧ Application-specific trusted computing base (TCB) size minimization in a virtualized environment is possible
- ✧ VM size and composition matters: **security** (TCB, attack surface) and **performance** (storage, memory, CPU)

Approach:

- ✧ From declarative *descriptions* to *systems* deployed as VMs.

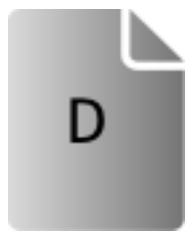


DESCRIPTIONS

1. Capture user and application requirements in the form of a declarative description **D**

Approach:

Gather user/application requirements as a declarative description (D). D describes an execution environment and other requirements such as trust domains and storage issues. Steps 2-4 focus on the execution environment.



Challenges:
Language Design, Profiling Techniques

2. Analyze D to give a system constraint described as **C**

Approach:

Consult the 'Global Up-to-date State' – GUS (patches, updates, versions, standards as models...) to create a more precise description of an execution environment for the application.



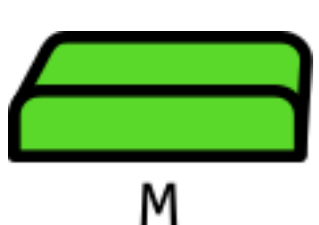
Challenges:
GUS Representation, Semantic Reasoning

SYSTEMS

3. Create a *security optimized* machine **M** based on C

Approach:

Use constraints in C to configure an OS, creating a minimal 'Trusted Computing Base' in the application's execution environment M – e.g. include only relevant drivers or libraries.

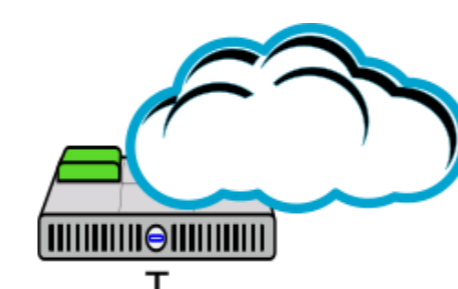


Challenges:
Constraint Satisfaction/Optimization Approaches, Implementations

4. Deploy M as a target **T**

Approach:

Pack and deploy M on different target cloud/HPC platforms .



Challenges:
Performance Issues, Predictability, Scalability, Interoperability

ADVANTAGES

Flexibility. Reusability. Portability. Ease of Use.

WORK IN PROGRESS

Model refinement and description techniques.

