

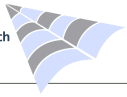
Self-adaptive Security at Application Level: a Proposal

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Outline

Security and
Self-adaptive
Systems

Related Work

Self-adaptive
Security

Conclusions and
Future Work

Security and Self-adaptive Systems

Related Work

Self-adaptive Security

Conclusions and Future Work

Self Adaptive Systems

Security and
Self-adaptive
Systems

Self Adaptive
Systems

Security

Related Work

Self-adaptive
Security

Conclusions and
Future Work

- ✓ React to changes in the external environment;
- ✓ react to changes in the internal operational conditions;
- ✓ change their behavior;
- ✓ change their hw/sw configuration.

Security

Security and
Self-adaptive
Systems

Self Adaptive
Systems

Security

Related Work

Self-adaptive
Security

Conclusions and
Future Work

- ✓ Changes in the system behavior may require changes in the security mechanisms;
- ✓ a unique security configuration may not be enough for the different operating conditions.

Related Work

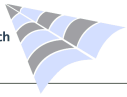
- ✓ Adaptation mostly focused on a single security aspect:
 - ✗ Adaptive Cryptographic Engine;
 - ✗ adaptation of cryptographic algorithm parameters.

Security and Self-adaptive Systems

Related Work

Self-adaptive Security

Conclusions and Future Work



Security and
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Systems

Related Work

Self-adaptive
Security

Security Policies and
Costs

Application
Requirements

General Architecture

Analysis Module

Reconfiguration
Module

Conclusions and
Future Work

We propose a framework for security self-adaptation

Security Policies and Costs

Security and
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Systems

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Module

Conclusions and
Future Work

- ✓ Different sets of security policies are enforced at different instants of time;
- ✓ each policy has a cost associated:
 - ✗ $P_{x,cost} = P_{x,fix_cost} + P_{x,usage_cost}$
- ✓ *cost threshold*: the maximum cost for the current system status.

Application Requirements

Security and
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Conclusions and
Future Work

- ✓ Each application has its own requirements;
- ✓ *hard* or *soft*;
- ✓ *critical applications* have precedence over non critical ones.

General Architecture

Security and Self-adaptive Systems

Related Work

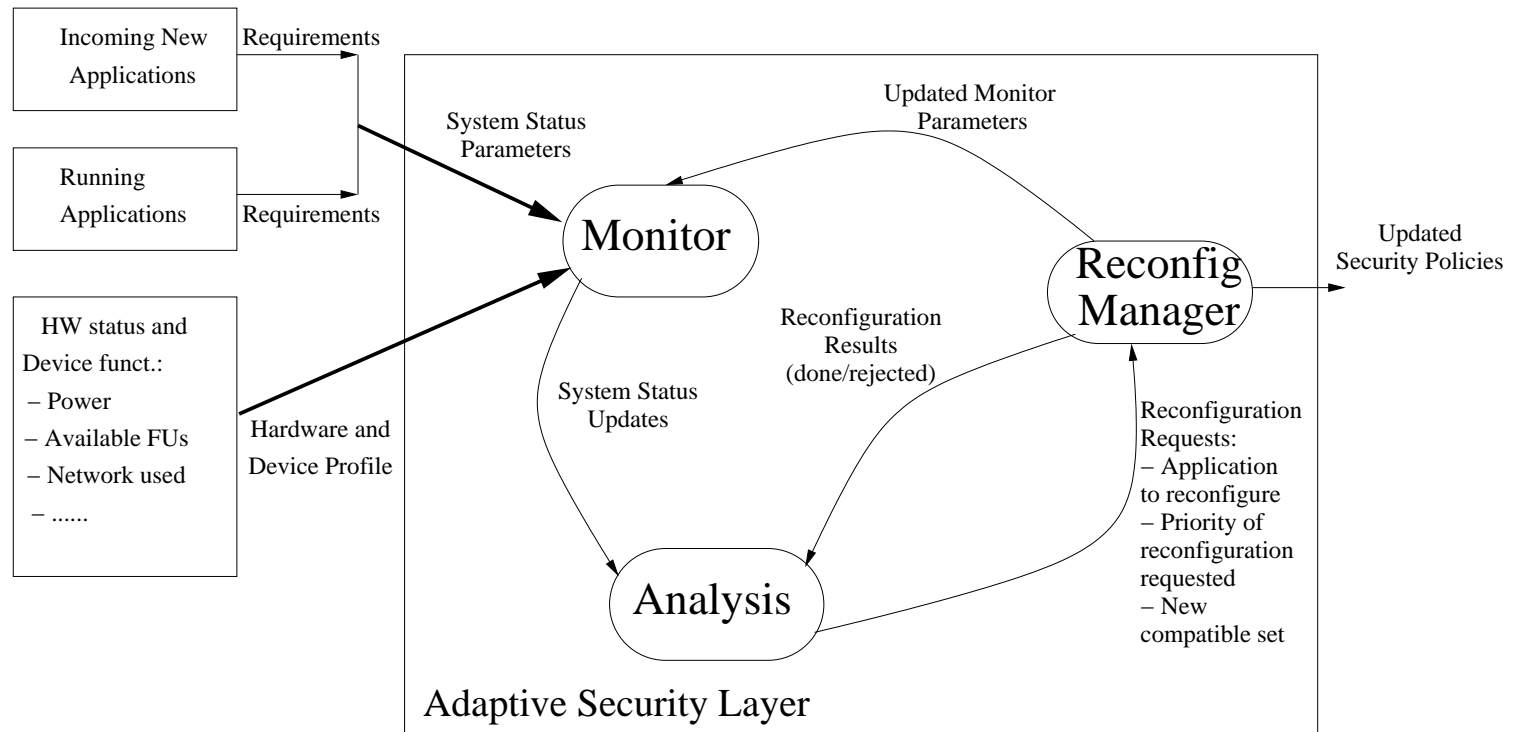
Self-adaptive Security

Security Policies and Costs Application Requirements

General Architecture

Analysis Module
Reconfiguration Module

Conclusions and Future Work



Analysis Module (1/2)

Security and
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Systems

Related Work

Self-adaptive
Security

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Module

Conclusions and
Future Work

- ✓ Receives notifications from the *Monitor*;
- ✓ finds the *applicable* policies;
- ✓ matches applicable policies
with application requirements:
 - ✗ essential;
 - ✗ desirable;

Analysis Module (2/2)

- Security and Self-adaptive Systems

- Related Work

- Self-adaptive Security

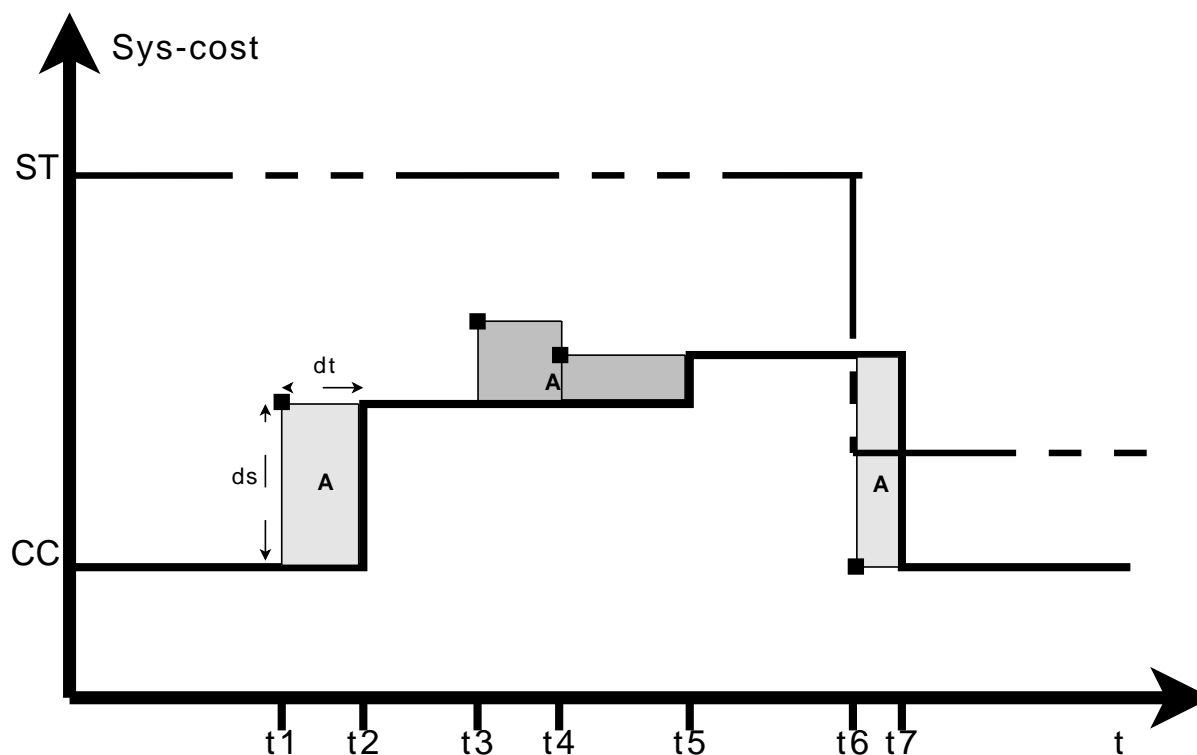
- Security Policies and Costs
- Application Requirements
- General Architecture
- Analysis Module**
- Reconfiguration Module

- Conclusions and Future Work

- ✓ searches a cost sub-minimal solution in:
 - ✗ *desirable* \cup *intermediate* set;
 - ✗ *desirable* \cup *intermediate* \cup *essential* set;
- ✓ by means of:
 - ✗ Quine-McCluskey table of coverage;
 - ✗ branch and bound;
- ✓ cost below the system threshold.

Reconfiguration Module

- ✓ Receives reconfiguration requests:
- ✗ strong / weak.



- Security and Self-adaptive Systems
- Related Work
- Self-adaptive Security
- Security Policies and Costs
- Application Requirements
- General Architecture
- Analysis Module
- Reconfiguration Module**
- Conclusions and Future Work

Conclusions

Security and
Self-adaptive
Systems

Related Work

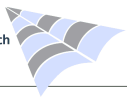
Self-adaptive
Security

Conclusions and
Future Work

Conclusions

Future Work

- ✓ We proposed a framework for self-adaptive security;
- ✓ it aims to solve the security problems of self-adaptive systems.



Future Work

Security and
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Systems

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Security

Conclusions and
Future Work

Conclusions

Future Work

- ✓ Extend and complete the proposal;
- ✓ provide a complete study of security policy costs;
- ✓ simulate the proposal.