

# Model-based Security Engineering with UML: The Last Decade and Towards the Future (Keynote)

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## 1. Model-based Security Engineering

The current state of the art in developing security-critical software and systems in practice is far from satisfactory: New security vulnerabilities are discovered on an almost daily basis. To address this problem, there has been a significant amount of work over the last 10 years on providing model-based development approaches based on the Unified Modeling Language which aim to raise the trustworthiness of security-critical systems (see Fig. 1 for a visualization of the main ideas and [6, 7, 2, 10, 8, 5, 1, 3, 4, 9] for some examples and overviews). Recently, model-based security has even managed to gain entry into Gartner's "hype cycle".

This keynote talk gives an overview over some developments in this field over the last 10 years, discusses the current state of affairs with respect to foundations, tool-support and industrial applications, and considers what might be particularly promising current and future developments.

One such current development is that of supporting evolution: Although approaches like those mentioned above do improve the trustworthiness of systems, they usually have a significant cost associated with their use. Also, most of these approaches focus on ensuring that security properties will be enforced during the initial development of the system. However, software systems are becoming increasingly long-living and undergo evolution throughout their lifetime. In order to enforce that the system remains secure despite its later evolution (which is bound to happen with most practical systems), one would usually have to apply the secure software development methodology from scratch. With ongoing evolution cycles, this will create costs that are in most cases unrealistic to meet. We therefore need a secure software development approach that supports maintaining the needed levels of security even through later software evolution. There exist some initiatives towards this goal (for example the EU project "Secure Change"), of which some results will be presented.

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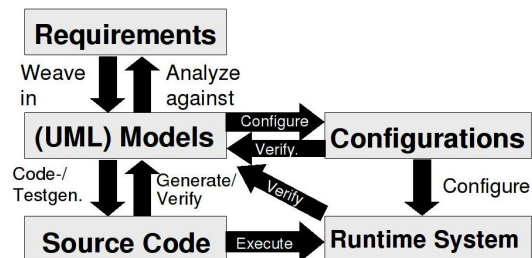


Figure 1. Model-based Security Engineering  
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