Musard Balliu (PostDoc at Chalmers University of Technology)

Title: All Your Tiers Are Belong to Us: Building Secure Applications with JSLINQ

Modern web and mobile applications are complex entities
amalgamating different languages, components, and platforms.
The rich features spread across the application tiers
and components, some from third parties, require substantial
efforts to ensure that the insecurity of a single component
does not render the entire system insecure. As of today,
the majority of the known approaches fall short of ensuring
security across tiers.

This work proposes a framework for end-to-end security,
by tracking information flow through the client, server,
and underlying database. The framework utilizes homogeneous
meta-programming to provide a uniform language for programming
different components. We leverage .NET meta-programming capabilities
from the F# language, thus enabling language-integrated queries
on databases and interoperable heterogeneous execution on the
client and the server.
We develop a core of our security enforcement in the form of
a security type system for a functional language with mutable
store and prove it sound. Based on the core, we develop JSLINQ,
an extension of the WebSharper library to track information flow.
We demonstrate the capabilities of JSLINQ on the case studies of
a password meter, two location-based services, a movie rental database,
and a friend finder app. Our experiments indicate that JSLINQ is practical
for implementing high-assurance web and mobile applications.

This is joint work with Benjamin Liebe, Daniel Schoepe and Andrei Sabelfeld.