Bridging Research and Innovation at SAP Security Research

Volkmar Lotz, SAP Security Research, Mougins, France
Who we are

An industrial research strategy for security

From research to innovation: an example

Collaboration

Lessons learned
SAP Security Research Facts 2018

24 Researchers
6 PhDs students
20+ Master Students
10+ Nationalities

Sophia Antipolis / Mougins
Karlsruhe
Walldorf

20+ Scientific publications
1 Distinguished Paper Award
1 Smart Security Week Award
7 IDFs
20 Patents
4th Professor in 4 years

7 Collaborative projects (PFP)
60+ Partners
800+ k€ Funding (est.)
Our Mission at SAP Security Research

Research Objective
Constantly challenge given security assumptions!

Mission
Bridging Scientific Research and SAP® Product Development

The SAP Security Research organization serves as a security thought leader at SAP, constantly transforming SAP by improving security. We are thinking ahead and preparing the way for product security at SAP.
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Lessons learned
## SAP Security Research

### Scientific Research
- Theoretical research, basic principles, new theories, new fundamental methods, etc.

### Applied Research
- Refinement of methods (performance, etc.) and application of methods to validate applicability in SW industry

### Prototyping
- Build prototypes to proof applicability; blueprint for productization

### Product Development
- Develop product and ship (OnPrem) or operate (cloud service)

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### Universities

<table>
<thead>
<tr>
<th>Identify New Concepts</th>
<th>SAP Security Research</th>
<th>Transfer</th>
<th>Consultation</th>
</tr>
</thead>
</table>

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1) Technology readiness levels (TRL) according to EU definition (Horizon 2020)

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SAP Security Research Strategy 2020

Security as Business Enabler
Use security to enable new business and support the transition into a digital world.

Zero Vulnerability
Minimize vulnerabilities to ensure maximum protection.

Defendable Application
Identify and prevent attacks from within the application.

Zero Knowledge
Ability to store data encrypted in the cloud and protect it from outside control.

Future Technology
Get into concepts and technologies which will change security of the future.

Anonymization
Secure IoT
Open Source Analysis
Software Security Analysis
Deceptive Application
Applied Cryptography
Quantum Technology
Blockchain

Machine Learning
Enabler for next generation of security

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Research and innovations: From security now toward security tomorrow

**Open Source Security**
**Relevance:** Now

**Trend**
Market research companies estimate that more than 80% of the codebase of a typical Java application is open source.

**SAP Security Research**
SAP Vulnerability Discovery tool for open Source, VULAS, is contributed as Open source to accelerate open source security.

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**Built-in Security**
**Relevance:** Now to 3 years

**Trend**
Huawei plans to spend at least US$2 billion for a secure software redesign (bloomberg.com, Dec 07, 2018).

**SAP Security Research**
Built-in security to harden the security of existing and future software. Tainting approach in SAP Cloud Platform as beta version available, deceptive application as research in close collaboration with first applications.

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**Privacy enables an Intelligent Enterprise**
**Relevance:** 1 to 3 years

**Trend**
Customer experience (CX) is at the top of the CEO agenda (Gartner, 2018).

**SAP Security Research**
Works on automated text anonymization for text mining that preserves the possibility of performing automated content and sentiment analysis but avoids authorship attribution; a prerequisite for experience management in an intelligent enterprise.

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**Artificial Intelligence and Machine Learning**
**Relevance:** Now to 10 years

**Trend**
An intelligent enterprise brings together machine and human intelligence (SAP’s product strategy, 2018).

**SAP Security Research**
Research road map for an intelligent security is available with first solutions using ML to discover vulnerabilities in open source and to detect security threats from the dark Web.

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**Quantum Technology**
**Relevance:** 5 to 15 years

**Trend**
Quantum Computing is one of the top 10 IT Trends for CIOs (Forrester, Dec. 2018).

**SAP Security Research**
Within the EU project “QIA – Quantum Internet Alliance”, Quantum Technology is used for secure communication by physics, a preparation for the next generation of the Internet.
Chronos and Kairos – Strategy and Opportunities

Strategy

Opportunities & Exploration

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Emerging Topics at SAP Security Research

- Product/Tool maturity of results
- Innovation & Research
- Explore
- Monitor

Scientific maturity:
- High investment
- Low investment

New
Innovation
Research

- VULAS
- SVM
- ETD
- Blockchain Security
- SMASH
- Machine Learning
- Anonymization
- Applied Crypto
- Diff Privacy
- Log learning for ETD
- Software Security
- Open Source Security
- IoT Security
- Tainting
- Deceptive Application
- FaaS Security
- Social Engineering Attacks
- Blockchain Hacks
- Security of Bots
- IoT

Innovation by SAP Security Research
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Lessons learned
Trend – Past and new realities in the software stacks ¹)

1999

- >95% home grown code

90% from SAP

- SAP GUI

>98% from SAP

- SAP ERP

95% from SAP

- SAP NetWeaver Application Server

100% from vendor, contract

- Database

100% from vendor, contract

- Operating System

Trend – Past and new realities in the software stacks ¹)

<table>
<thead>
<tr>
<th>1999</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% from SAP</td>
<td>&gt;95% home grown code</td>
</tr>
<tr>
<td>Operating System</td>
<td>Browser, JavaScript</td>
</tr>
<tr>
<td>Database</td>
<td>Kubernetes, Docker, Cloud Foundry</td>
</tr>
<tr>
<td>SAP NetWeaver Application Server</td>
<td>Container Operating System</td>
</tr>
<tr>
<td>SAP GUI</td>
<td>Operating System</td>
</tr>
<tr>
<td>&gt;98% from SAP</td>
<td>¹00% “3rd party or Internet”</td>
</tr>
<tr>
<td>SAP ERP</td>
<td>90% “from the Internet”</td>
</tr>
<tr>
<td>95% from SAP</td>
<td>90-100% “from the Internet”</td>
</tr>
<tr>
<td>Application server (Tomcat, node, ..)</td>
<td>x times “from the Internet”</td>
</tr>
<tr>
<td>100% from vendor, contract</td>
<td>100% “from the Internet”</td>
</tr>
<tr>
<td>Operating System</td>
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Example VULAS: From research to a patented, productive and officially recommended security scan service

Vulas officially recommended at SAP to scan Java
(after comparison w/ 3rd party commercial tools)

Sirius/Security Hub integration

Vulas today:

v.3.0.9
760+ vulnerabilities
900+ projects
6800+ modules
540k+ scans since 2017

Go-live v.2.0
(Java micro services on Docker)

Metric-based update recommendations

SAP Security Experts Summit

DKOM

Posecco
2013-2015
EU funded research project

ICSME
2015
v.1.0
(based on SAP Hana XS1)

ESORICS
2016

RSA
2017

ICSME
Distinguished paper award

ESEM

Vulas officially recommended at SAP to scan Java
(after comparison w/ 3rd party commercial tools)

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(after comparison w/ 3rd party commercial tools)

Open Source Contribution

Vulas for Python

IRICE

VAMOSS
EU funded research project

EU funded research project
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Collaboration

Funded projects (H2020, EIT, EID, BMBF, ANR, …)

Currently: …

Bilateral research contracts

PhD program

Publications

Scientific community service (PC, conferences)

SAP Security Research Seminar
Collaborations (bilateral)
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Lessons Learned

Strategy alignment on all corporate levels needed
- Digital transformation requires secure systems
- Security as technology foundation and business enabler
- Build or buy
- Low footprint on processes: automation

Accept failure
- Can you risk to miss an opportunity?

Funding strategy determined by corporate strategy

Collaborate with strong partners: academia, research institutes, business

Key to successful proposals: clear problem statement and convincing solution idea
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