Andreas Wiegenstein and Xu Jia

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Ghost In The Shell

Troopers13, March 11th – 15th, Heidelberg

The researchers

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Andreas Wiegenstein

- SAP Security Researcher, active since 2003
  - Received Credits from SAP for more than 20 reported 0-day Vulnerabilities
- Speaker at international Conferences
  - **SAP TechEd** 2004 (USA & Europe) / 2005 (USA) / 2006 (USA), DSAG 2009
  - **BlackHat** 2011 (Europe), **Hack in the Box** 2011 (Europe)
  - **Troopers** 2011, 2012, 2013, **RSA** 2012 (USA), **IT Defense** 2013
- Co-Author of „Sichere ABAP Programmierung" (SAP Press)

Xu Jia

- SAP Security Researcher, active since 2006
  - Received Credits from SAP for more than 15 reported 0-day Vulnerabilities
- Speaker at SAP-focused Conferences
  - **Sicherheit und Prüfung von SAP Systemen** 2012

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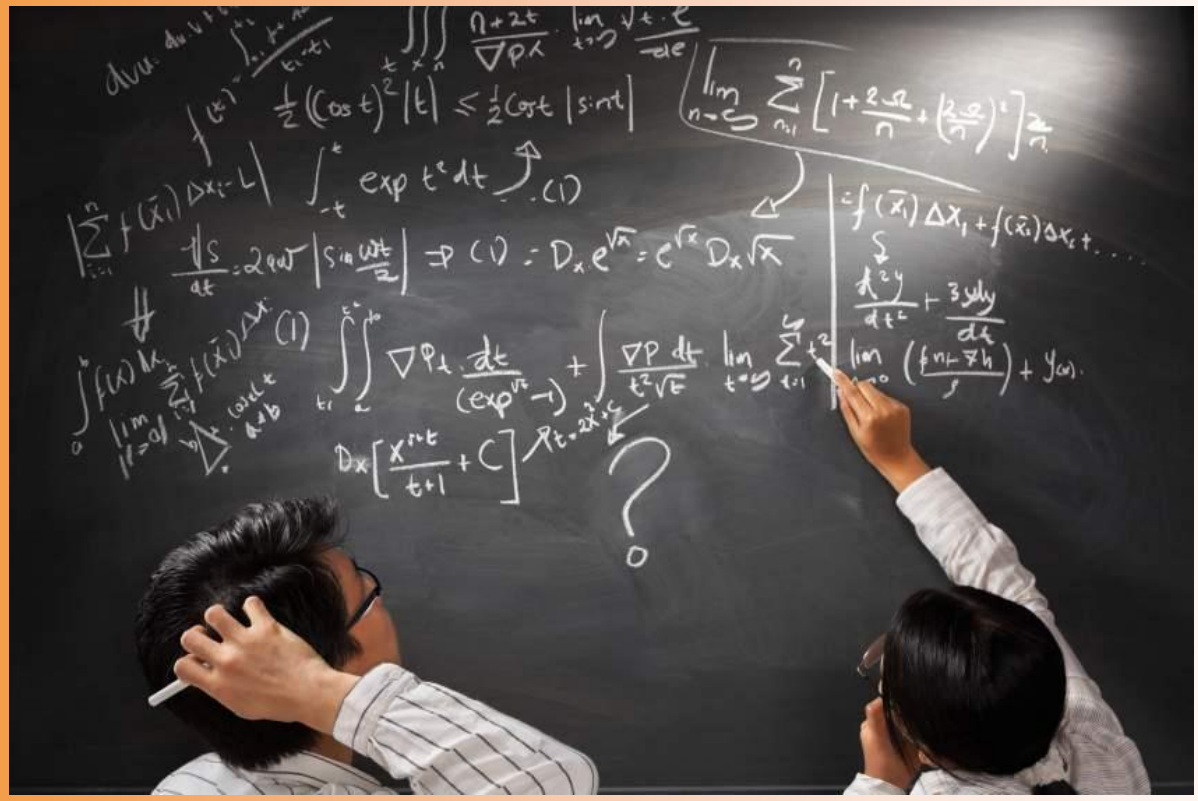
SAP Technology Basics



Source: http://www.productiveflourishing.com/wp-content/uploads/2011/03/Simplifying-Complexity.jpg

SAP in (Business) Numbers

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Why protect SAP Systems?

- More than 176,000 companies run SAP
- SAP customers…
  - Transport > 1.1 billion flight passengers per year
  - Produce > 65% of all TV's
  - Produce > 77,000 cars every day
  - Produce > 52% of all movies
- And…
  - 72% of the world-wide beer production depends on companies that run SAP !!!

Source: http://www.posters.at/the-simpsons--homer-bier_a34273.html

SAP in (Technical) Numbers

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How many … exist in Release … ?	Release	Answer
… DB tables	Basis 7.20	~ 81,000
*… SLOC**	Basis 7.20	~ 37.9 Mio
… Executable programs	Basis 7.20	~ 38,000
… DB tables	ECC 6.0	~ 384,000
*… SLOC**	ECC 6.0	~172.8 Mio
… Executable programs	ECC 6.0	~221,000

* SLOC = Source Lines of Code

Classic SAP Architecture

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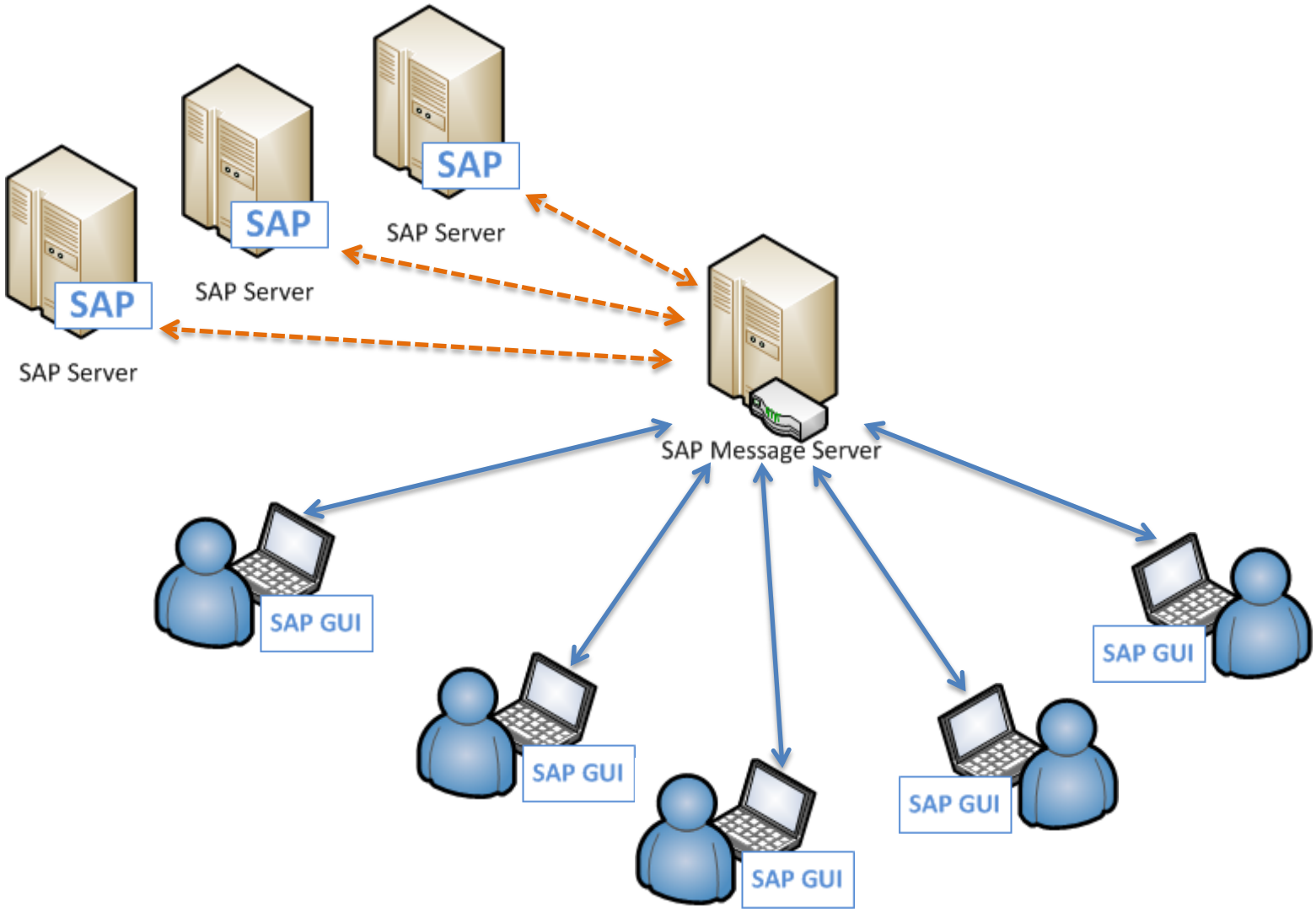

SAP GUI Users

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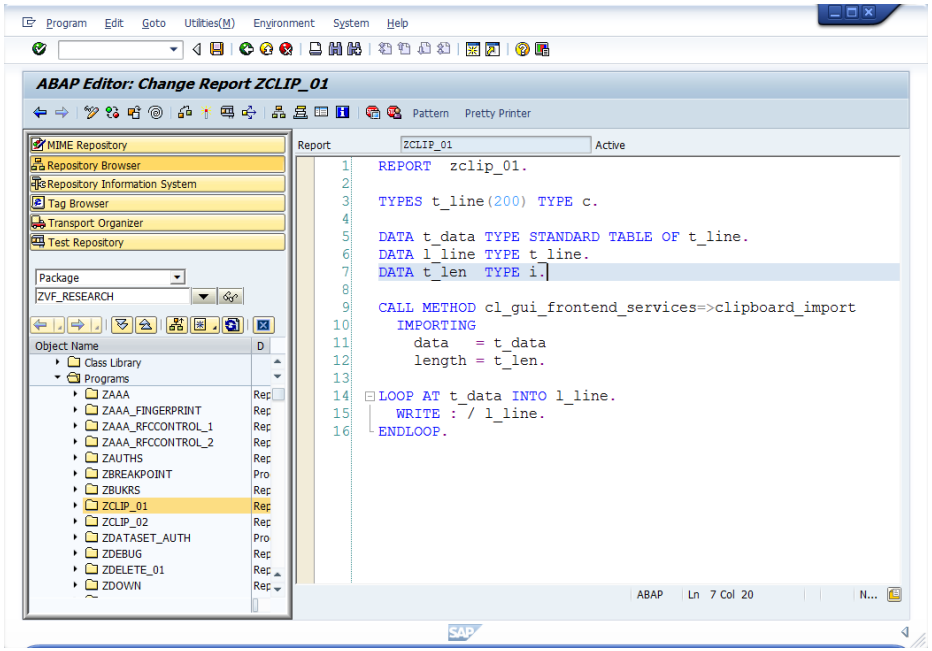
Who works with SAP GUI and why?

- Employees
  - Daily work

    (running multi-million $ Companies)
- Administrators
  - System Maintenance & Configuration
  - User Maintenance
- Developers
  - Write custom ABAP Code (extend standard Solutions)



In short:

- Users with a wide Range of Privileges work with SAP GUI.
- User Access to SAP Backend is still done via SAP GUI in 99% of the Cases

SAP GUI Application

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What is SAP GUI?

- Proprietary (Fat) Client
  - EXE Running on Windows (a Java Version is also available)
  - Access to Client OS (file system, shell, registry, clipboard, …)
  - Scriptable
- Proprietary Communication Protocol (DIAG)
  - Up- and download of files and data from screen elements
  - Data is transferred in a compressed format

Summary:

- SAP GUI is a powerful tool that manages data transfers between frontend and backend

SAP Security / Forensic Basics

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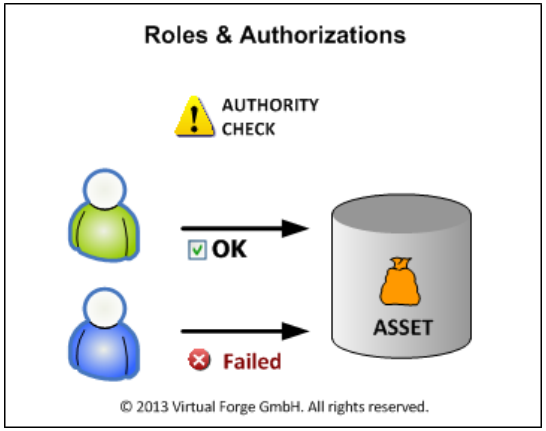
Roles and Authorizations

- Restrict User Access to Data and Business Logic

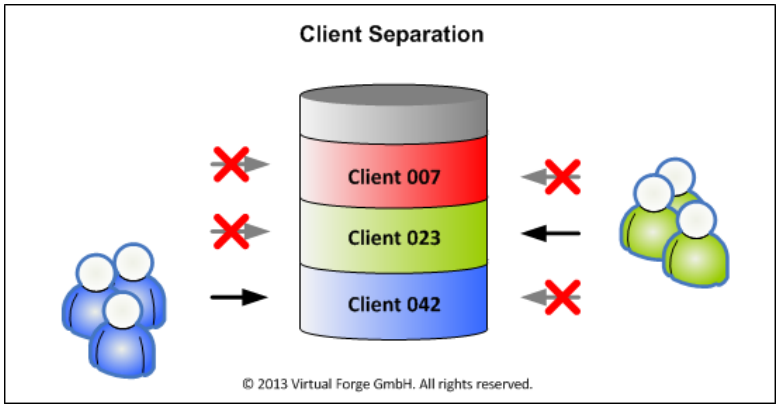


Accountability

- Log Changes to relevant Data
- Trace DB Access, Program Execution, …

Client Separation

- Protect Data of different Organizations on the same SAP System



Very few monitoring tasks are active all the time.

Audit Information System / Security Audit Log (should be active)

- (Failed) (Remote) Logon Events, Server Events
- Program execution, Debugging
- User maintenance
- …

System Trace (not active, due to high data volume)

- List of performed authorization checks and their results
- List of executed OSQL commands
- …

Ghost in The Shell

VF Advisory: **SAP-GHO-01**

SAP Note: 1529235

Advisory: 03.11.2010

Fix Date: 27.09.2011

CVSS Base Score: 6.0

CVSS Base Vector: AV:N/AC:M/AU:S/C:P/I:P/A:P

VF Advisories: **SAP-ZONE-01, SAP-ZONE-02**

SAP Note: 1560489

Advisory: 18.01.2011

Fix Date: 27.09.2011

CVSS Base Score: 6.0

CVSS Base Vector: AV:N/AC:M/AU:S/C:P/I:P/A:P

Mechanics of the Ghost

Passive Request Forgery (PRF)

- Attack User Session through Trap
- Examples:
  - Cross-Site Request Forgery
  - Cross-Application Request Forgery (Troopers 2011)

Active Request Forgery (ARF)

- Attack User Session immediately
- Examples:
  - Ghost in the Shell

PRF is asynchronous. Be patient.

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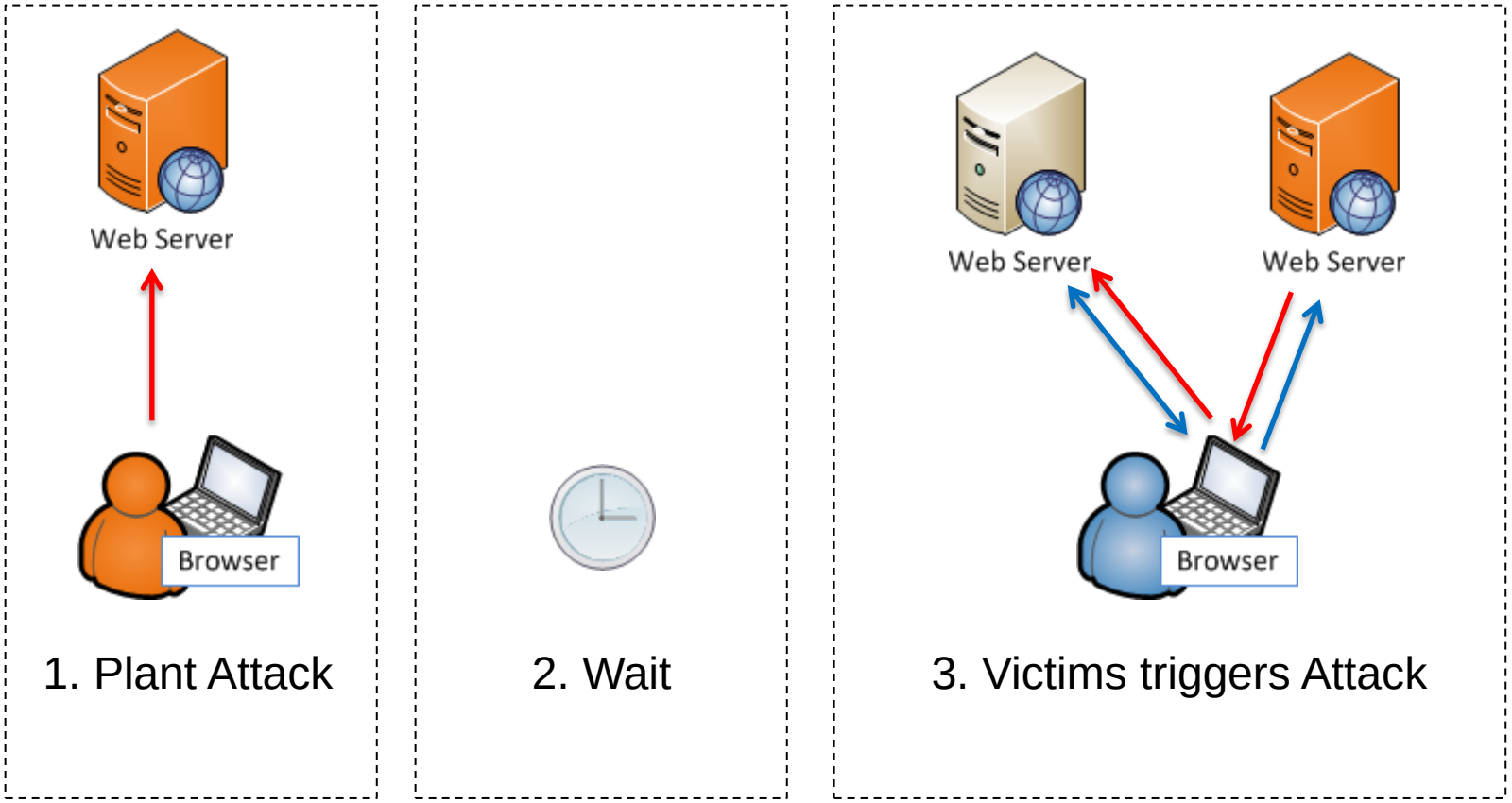

ARF is synchronous. Much better!

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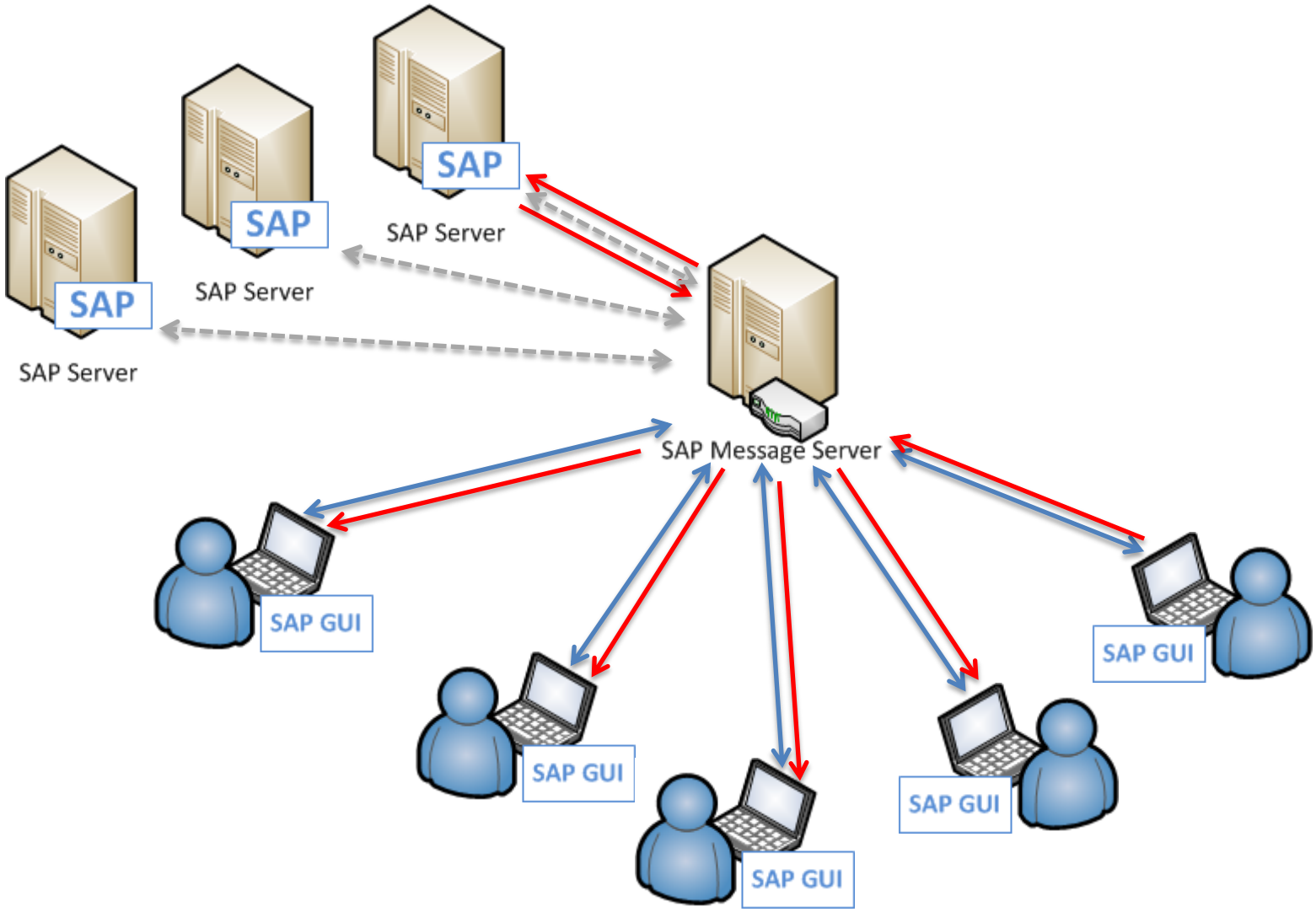

Summary

SAP Security Recommendations

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ABAP Security Resources

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Links

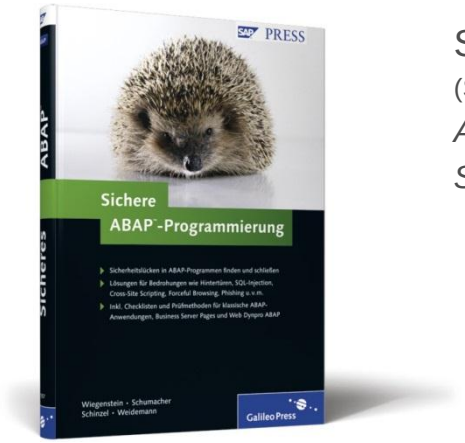
SAP Security Advisories researched by Virtual Forge
http://www.codeprofilers.com/index.php/advisories.html

Organizations

BIZEC
BUSINESS SECURITY

BIZEC – Business Security Initiative
http://www.bizec.org

Literature



Sichere ABAP-Programmierung
(SAP PRESS, 372 S., 2009)
Andreas Wiegenstein, Markus Schumacher, Sebastian Schinzel, Frederik Weidemann

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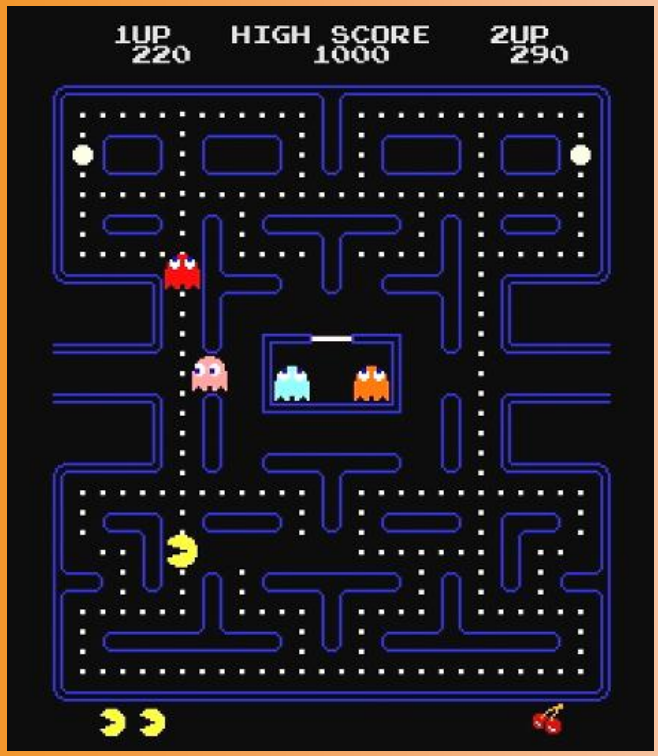
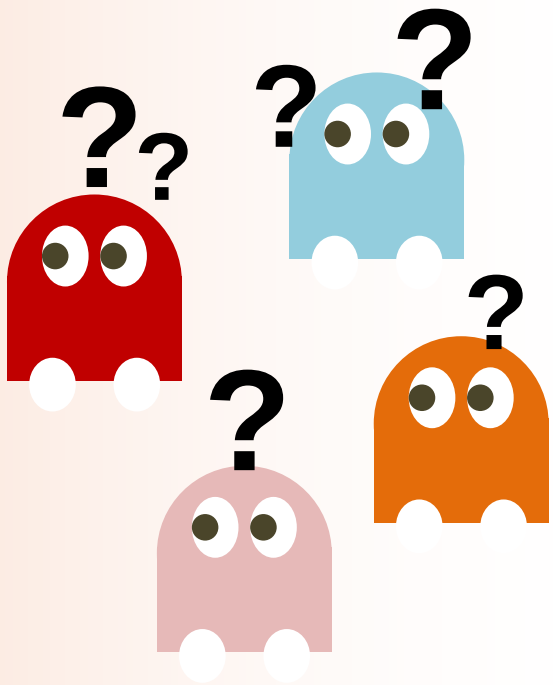
Questions?



Source http://ostatic.com/pacman/screenshot/1



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Contact Information

VIRTUALFORGE GmbH

contact@virtualforge.com

Web: http://virtualforge.com

Phone: + 49 (0) 6221 86 89 00

Twitter: @codeprofiler

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