



Hardening of SAP[®] HTTP- and Webservices



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(Slides shamelessly stolen from by
colleague Frederik Weidemann)
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Hardening of SAP® HTTP- and Webservices

■ Introduction

- ▶ History
- ▶ Network Landscape Overview

■ Secure Configuration SAP NW ABAP

- ▶ Services
- ▶ What can be configured, what is programmed
- ▶ Logging
- ▶ Pitfalls

■ SAP Web Services with ABAP

- ▶ Overview

OWASP Top 10 – 2010

A1	Injection
A2	Cross-Site Scripting (XSS)
A3	Broken Authentication and Session Management
A4	Insecure Direct Object References
A5	Cross-Site Request Forgery (CSRF)
A6	Security Misconfiguration
A7	Insecure Cryptographic Storage
A8	Failure to Restrict URL Access
A9	Insufficient Transport Layer Protection
A10	Unvalidated Redirects and Forwards

History of SAP Web App Technology

ITS

- Release R/3, 4.6b+

SAP Web AS

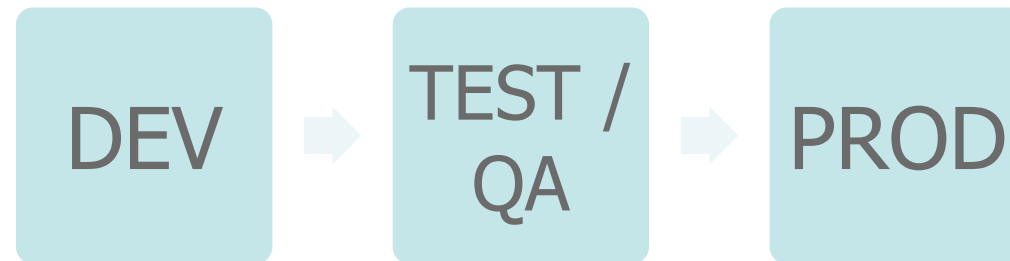
- ICM
- Release 6.10

SAP NW AS ABAP

- Replaces Web AS

Introduction SAP Landscape Setup

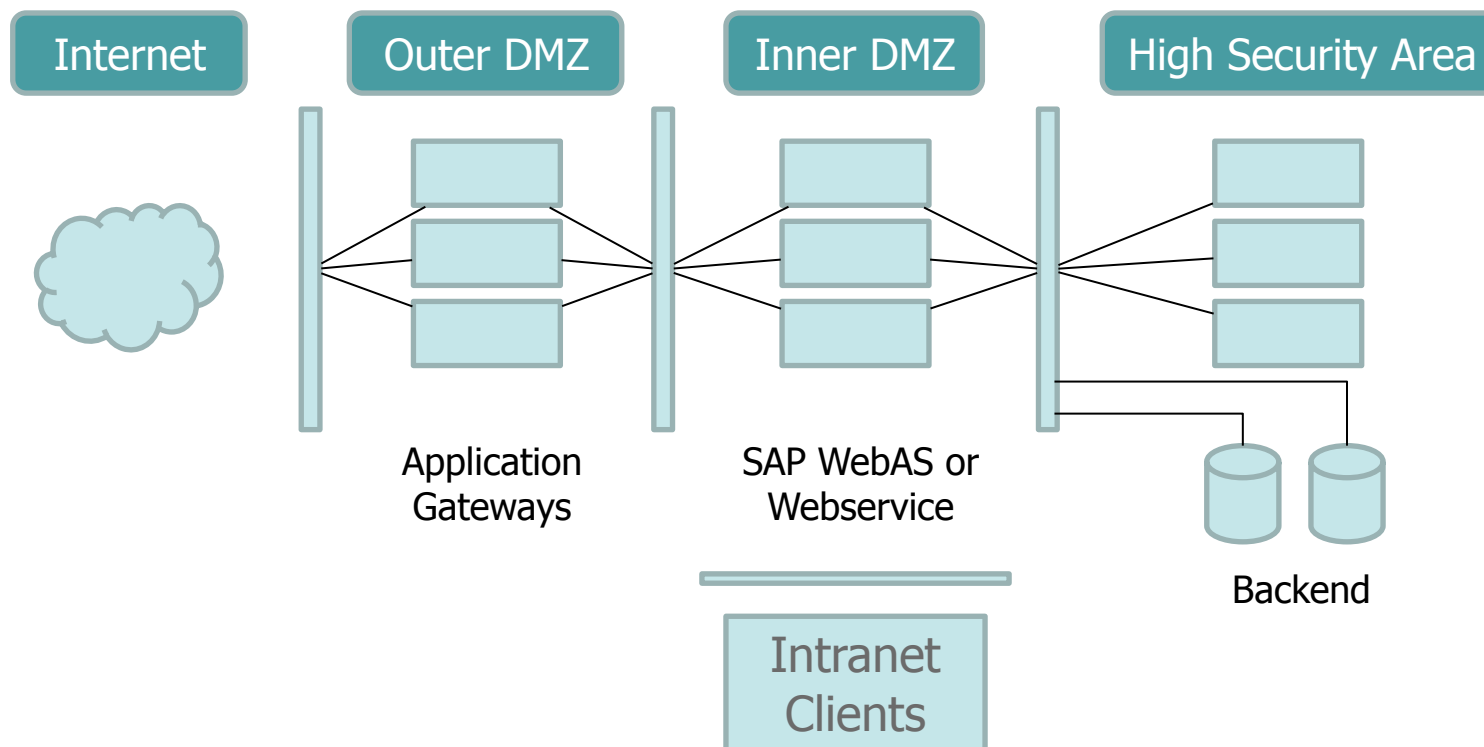
- Landscape should consist of at least 3 systems



- In the field: often only PROD or DEV+PROD
- But: sometimes also 4 systems (D→T→Q→P)

Introduction - Network

- Network Landscapes as described in the NW Security Guide



Protection on Network Layer (Web)

■ WebDispatcher

- ▶ Load Balancer
- ▶ SSL Termination
- ▶ URL Path whitelisting
- ▶ Limit URL size (`wdisp/max_permitted_uri_len`)
- ▶ Limit URL characters in range (`wdisp/permitted_uri_char_range`)

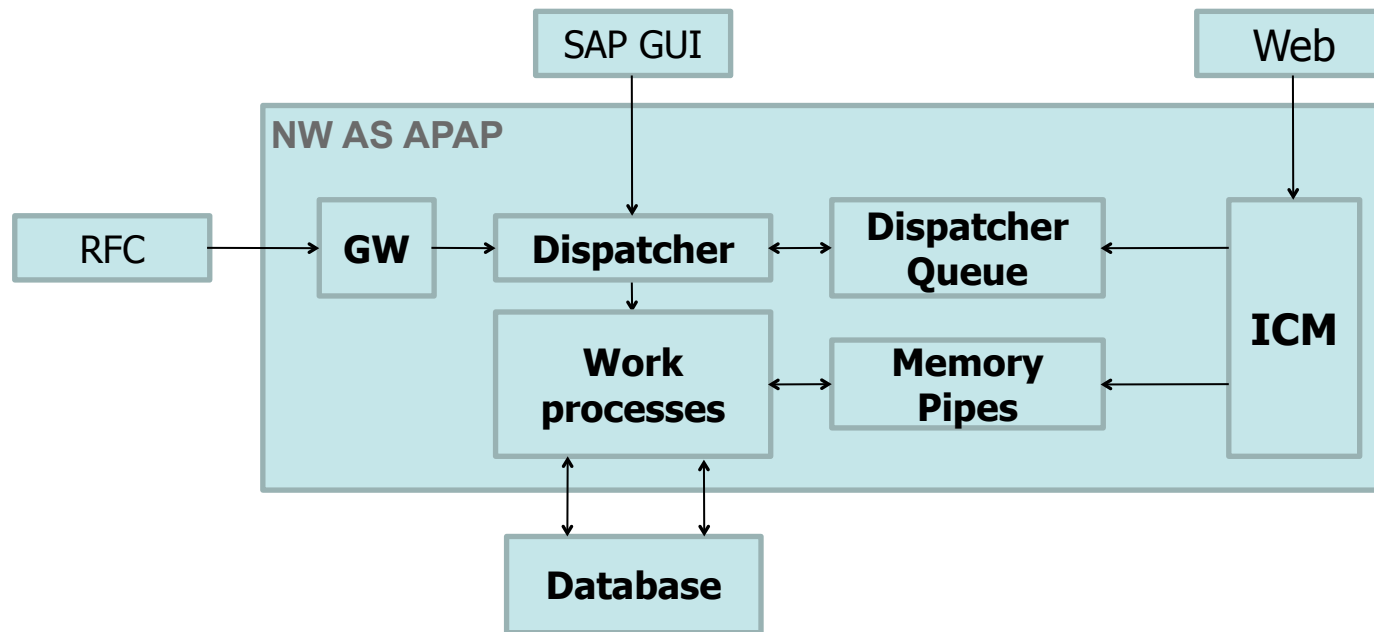
```
# Permissions
P    /sap/bc/
P    /sap/owasp/
D    *
```

■ Other Reverse Proxies

- ▶ Often seen: Apache `mod_security`, `mod_proxy`
- ▶ Other commercial vendors ...

■ Recommendation: Reverse proxy is a must have

Architecture SAP NetWeaver AS ABAP



- Architecture since release 6.10
- Integration of ICM (process) into the SAP Kernel
- ICM supports HTTP, HTTPS, SMTP, SOAP, WebDav

Secure Configuration SAP NW ABAP

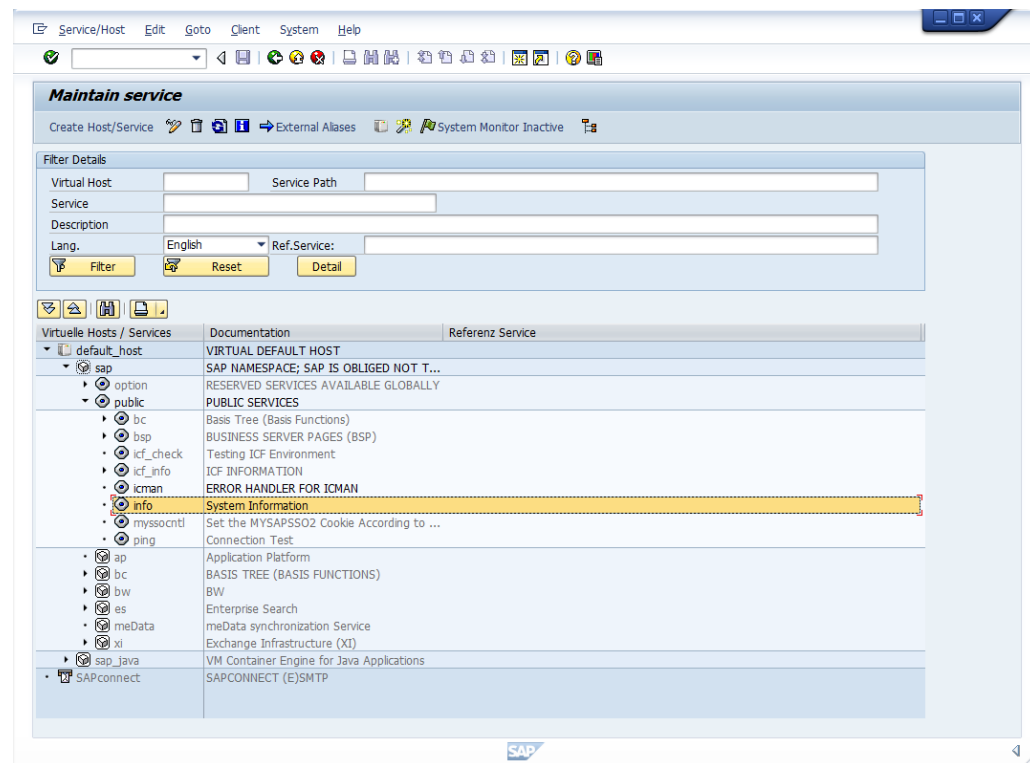
■ Overview

- ▶ HTTP Standard Services
- ▶ Authentication Methods
- ▶ Protection by configuration

- ▶ Logging
- ▶ Security Audit Log

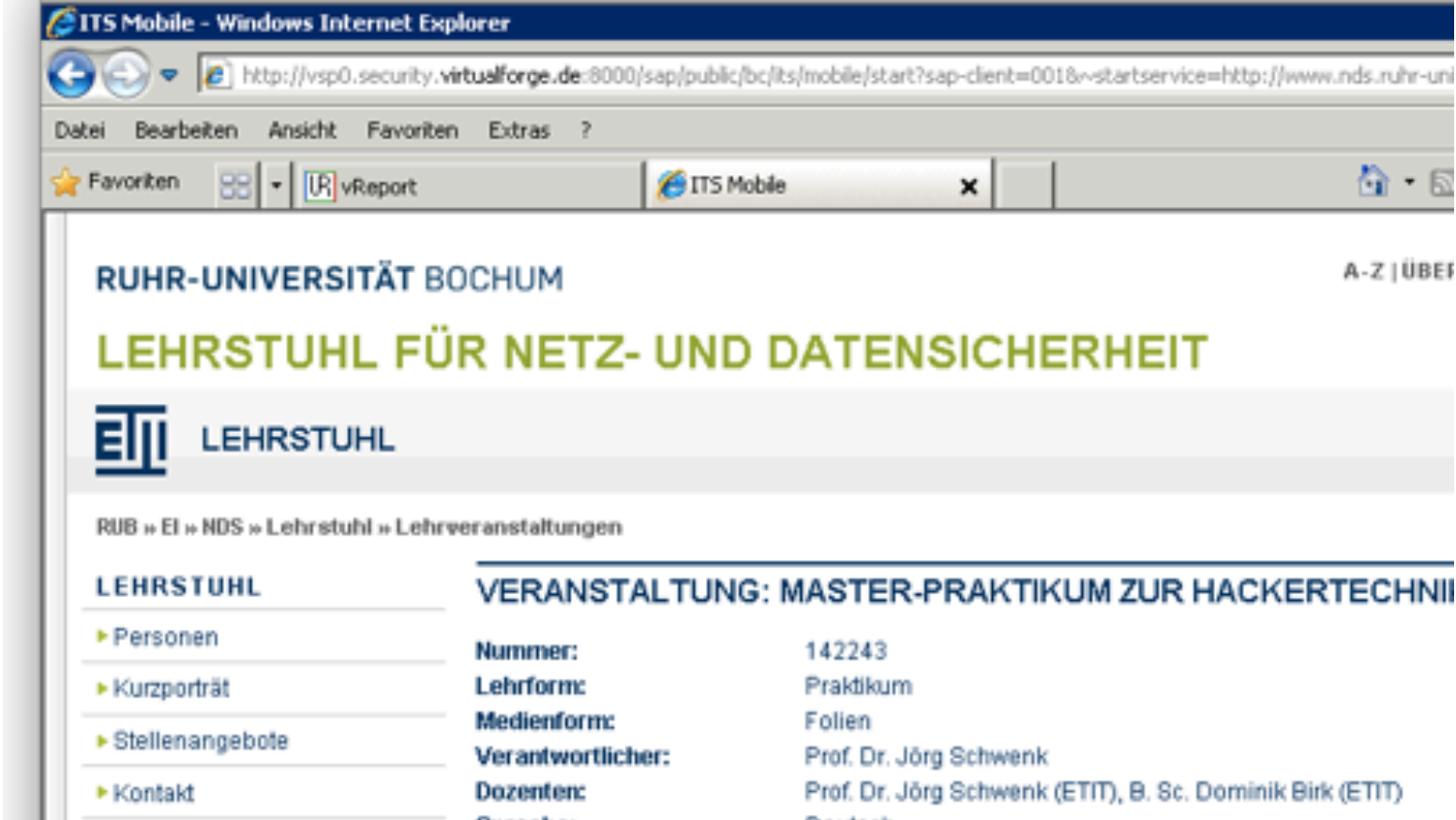
Secure Configuration SAP NW ABAP HTTP Standard Services

- Maintenance via Transaction (Tr.) SICF
- Release NW 7.01 EhP1 is delivered with deactivated services
- Older releases may need manual maintenance
 - ▶ Best practice: Deactivate ALL services and activate them individually as required
 - ▶ Avoid inherited activations
- (!) /sap/bc/soap/rfc



Secure Configuration SAP NW ABAP HTTP Standard Services

■ Phishing:



The screenshot shows a browser window titled "ITS Mobile - Windows Internet Explorer". The address bar contains the URL: `http://vsp0.security.virtualforge.de:8000/sap/public/bc/its/mobile/start?sap-client=0018~startservice=http://www.nds.ruhr-uni`. The browser's menu bar includes "Datei", "Bearbeiten", "Ansicht", "Favoriten", and "Extras". The address bar shows "vReport" and "ITS Mobile" tabs. The main content area displays the logo for "RUHR-UNIVERSITÄT BOCHUM" and "LEHRSTUHL FÜR NETZ- UND DATENSICHERHEIT". Below this, there is a navigation menu with "LEHRSTUHL" and "VERANSTALTUNG: MASTER-PRAKTIKUM ZUR HACKERTECHNIK". The "LEHRSTUHL" menu is expanded, showing options like "Personen", "Kurzporträt", "Stellenangebote", and "Kontakt". The "VERANSTALTUNG" section lists details such as "Nummer: 142243", "Lehrform: Praktikum", "Medienform: Folien", "Verantwortlicher: Prof. Dr. Jörg Schwenk", and "Dozent: Prof. Dr. Jörg Schwenk (ETIT), B. Sc. Dominik Birk (ETIT)".

ITS Mobile - Windows Internet Explorer

http://vsp0.security.virtualforge.de:8000/sap/public/bc/its/mobile/start?sap-client=0018~startservice=http://www.nds.ruhr-uni

Datei Bearbeiten Ansicht Favoriten Extras ?

Favoriten vReport ITS Mobile

RUHR-UNIVERSITÄT BOCHUM A-Z | ÜBER

LEHRSTUHL FÜR NETZ- UND DATENSICHERHEIT

ETIT LEHRSTUHL

RUB » EI » NDS » Lehrstuhl » Lehrveranstaltungen

LEHRSTUHL

- ▶ Personen
- ▶ Kurzporträt
- ▶ Stellenangebote
- ▶ Kontakt

VERANSTALTUNG: MASTER-PRAKTIKUM ZUR HACKERTECHNIK

Nummer:	142243
Lehrform:	Praktikum
Medienform:	Folien
Verantwortlicher:	Prof. Dr. Jörg Schwenk
Dozent:	Prof. Dr. Jörg Schwenk (ETIT), B. Sc. Dominik Birk (ETIT)
Sprache:	Deutsch

Secure Configuration SAP NW ABAP Authentication Methods

- Individual methods configurable for each ICF node
 - ▶ SSO
 - ▶ Basic Authentication
 - ▶ X.509 Client Certificates
 - ▶ Session based (only for stateful applications)
 - ▶ Anonymous logon via authentication on behalf of a hard coded user (configured by admin)
- Custom Development:
Use the secure standards provided by SAP
- Additional check configurable against authority object S_ICF
(Tab Service Data → SAP Authoriz.)

Secure Configuration SAP NW ABAP Profile Parameters

- ABAP Stack / profile parameter
- Accessed on OS level (/usr/sap/<SID>/SYS/profile) or
via Transactions RZ10/RZ11
- Maintain password parameters
- Check SSL setup
- SSO Configuration

Secure Configuration SAP NW ABAP

Example Parameters

■ Password

- ▶ login/min_password_lng
- ▶ login/min_password_digits
- ▶ login/min_password_letters
- ▶ login/min_password_specials
- ▶ login/password_charset
- ▶ login/min_password_diff
- ▶ login/password_expiration_time
- ▶ login/password_change_for_SSO
- ▶ login/disable_password_logon
- ▶ login/password_logon_usergroup
- ▶ ...

■ Others

- ▶ is/HTTP/show_detailed_errors
- ▶ icm/HTTPS/verify_client
- ▶ icm/security_log
- ▶ ..., e.g. */HTTP/*, icm/*

- ▶ auth/rfc_authority_check

■ Logon

- ▶ login/fails_to_session_end
- ▶ login/fails_to_user_lock
- ▶ login/failed_user_auto_unlock
- ▶ login/no_automatic_user_sapstar
- ▶ ...

■ Validity

- ▶ login/min_password_digits
- ▶ login/password_max_new_valid
- ▶ login/password_max_reset_valid

■ SSO

- ▶ login/accept_sso2_ticket
- ▶ login/create_sso2_ticket
- ▶ login/ticket_expiration_time
- ▶ login/ticket_only_by_https
- ▶ login/ticket_only_to_host

Secure Configuration SAP NW ABAP

Working with Redirects

- Example SAP URL Parameter: `sap-exiturl`
Used upon exiting a stateful BSP
- Table `HTTP_WHITELIST` to maintain allowed redirect destinations (Maintenance via Tr. SE16)
- Empty table == no checks
- Example entry:
`protocol=https, host=mysite.owasp.org, port=23443, url=/sap/redirects/*` (wildcard * is allowed)
- Development with ABAP:
`CL_HTTP_UTILITY=>CHECK_HTTP_WHITELIST`

Secure Configuration SAP NW ABAP

Logging of ICM

- Tr. SMICM (Goto → HTTP Log → HTTP Server / Client)
- Deactivated by default
- Log format is equal to mod_log_config of Apache
- Log format can be customized
- Anonymizes certain parameters/header fields with dots:
e.g. MYSAPSSO2 Cookie, jsessionid ...
- Recommendation:
 - ▶ Use reverse proxy logs → easier analysis
 - ▶ If required, add SAPs ICM logging
(Remember: `x-forwarded-for` header, parameter `wdisp/add_xforwardedfor_header = TRUE` for Web Dispatcher)

Secure Configuration SAP NW ABAP

Security Audit Log

- Inactive by default
- Enabled by `rsau/enable = 1`
- Maintained with Tr. SM20
- Logging of:
 - ▶ Dialog logon attempts
 - ▶ RFC logon attempts
 - ▶ RFC calls to function modules
 - ▶ Transaction starts
 - ▶ Report starts
 - ▶ Changes to the user master records
 - ▶ Changes to the audit configuration
- Caveat: Possible violation of data protection laws!

Secure Configuration SAP NW ABAP

Lessons Learned

■ Lessons learned:

- ▶ Log inactive by default
- ▶ Huge number of configuration possibilities
 - Complexity in Audits
(Who maintains several hundred pages of documentation and who reads it???)
- ▶ SAP already offers a lot of functionality → Problem: you have to know about it
- ▶ SSL must be separately installed (SAPCRYPTOLIB) and activated

SAP Web Services with ABAP

■ Server

- ▶ Inside-Out
(RFC-enabled function modules are used as a basis for generation)
- ▶ Outside-In
(Service Interface in ES Repository is used to generate the skeleton)

■ Client

■ UDDI compliant registry with NW 7.1 (called ES Repository)

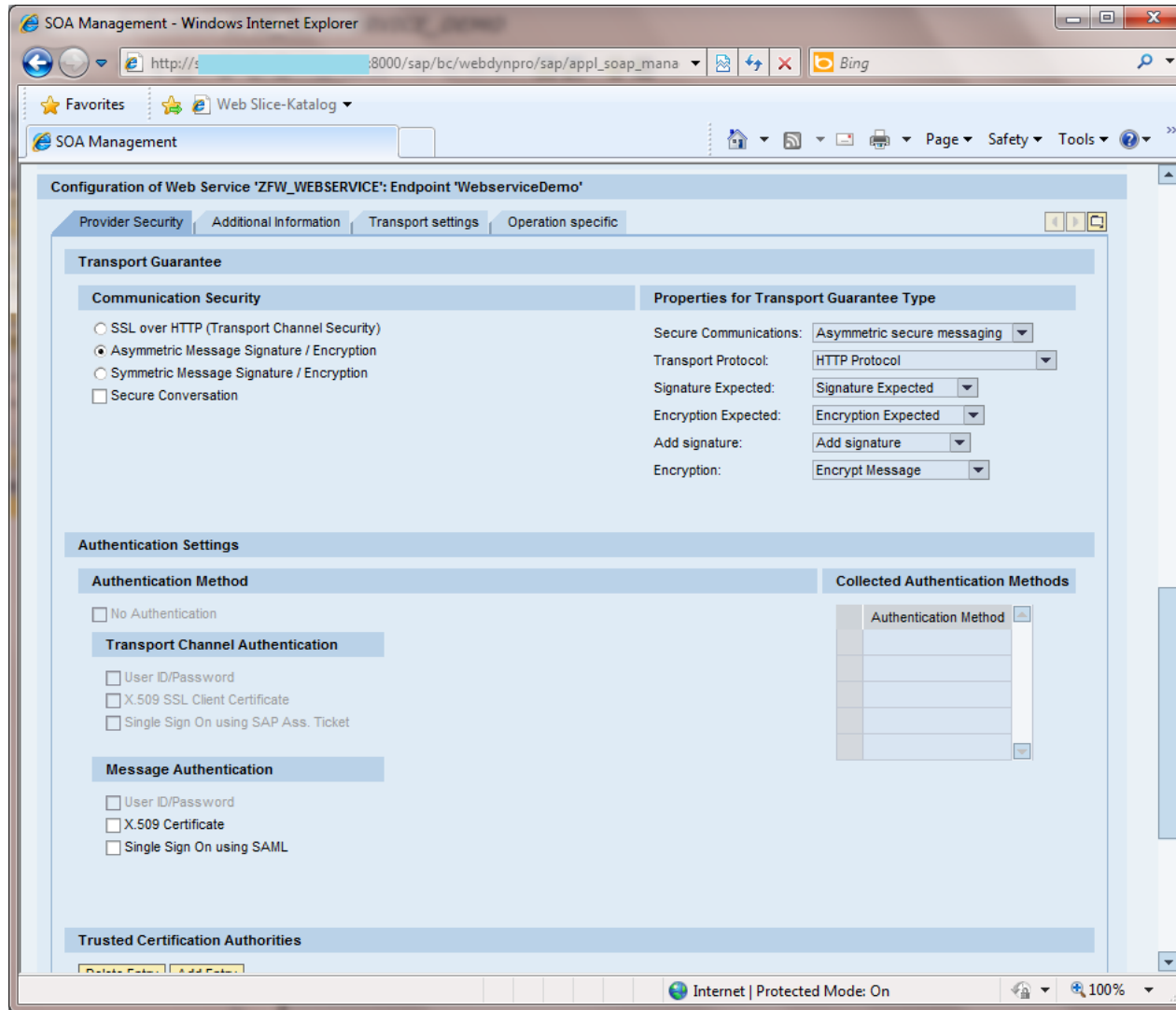
■ Maintenance:

formerly Tr. WSCONFIG + WSADMIN

since NW 2004s SP14 Tr. SOAMANAGER

- ▶ Redirects to WebDynpro ABAP App → Must be enabled previously

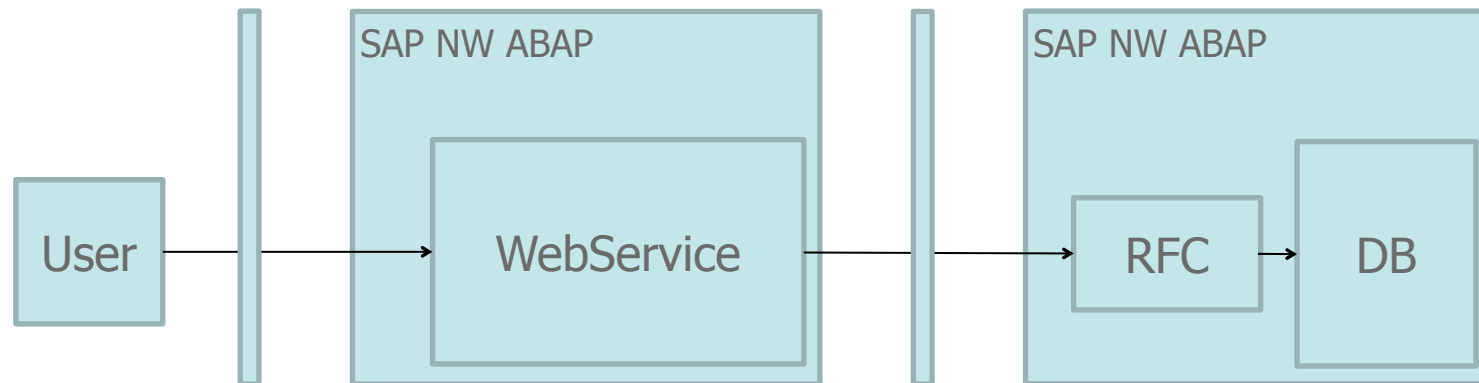
SAP Web Services with ABAP - SOAMANAGER



SAP Web Services with Custom ABAP Development - Top 3 problems

■ Typical Scenario

- ▶ User calls Webservice
- ▶ Webservice calls a RFC in the backend



SAP Web Services with Custom ABAP Development - Top 3 problems

■ Most common problems

- ▶ Insufficient validation and authentication between frontend user and backend data
 - Usually backend calls are made with preconfigured high privilege accounts
 - Thus, iterating through parameters results in disclosure of data
 - → A4 - Insecure Direct Object References
- ▶ Missing encryption
 - → A6 - Security Misconfiguration
 - → A9 - Insufficient Transport Layer Protection
- ▶ Missing input validation in custom ABAP
 - → A1 - Injection

Results

- Network topology is complex
- Reverse Proxy required
- Configuration possibilities are great
- Configuration complexity is our enemy
 - ▶ Think about a lot of ICF nodes in combination with individual authority objects
 - ▶ Developers != Administrators
 - ▶ Administrators != Role Administrators
- Logging deactivated by default
- Custom Web Services are also affected by Owasp Top 10

OWASP Top 10 – 2010

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OWASP Top 10 – 2010

A1	Injection	
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A4	Insecure Direct Object References	<input checked="" type="checkbox"/>
A5	Cross-Site Request Forgery (CSRF)	
A6	Security Misconfiguration	<input checked="" type="checkbox"/>
A7	Insecure Cryptographic Storage	
A8	Failure to Restrict URL Access	<input checked="" type="checkbox"/> (partly)
A9	Insufficient Transport Layer Protection	<input checked="" type="checkbox"/>
A10	Unvalidated Redirects and Forwards	<input checked="" type="checkbox"/>

Questions ...

■ Thank you for your attention

... ????

Literature

- SAP NetWeaver Security Guide ([click](#))
- Sichere ABAP Programmierung,
Wiegenstein, Schumacher, Schinzel, Weidemann, Galileo Press
<http://www.sap-press.de/2037>
- The Developer's Guide to SAP NetWeaver Security, Martin Raeppe, Galileo Press
- ABAP Cookbook, James Wood, Galileo Press
- SAP Security and Authorizations, Mario Linkies, Frank Off, Galileo Press
- ABAP Security Scanner <http://www.codeprofilers.com>
- DSAG ERP Security Guide

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