COSMOS

Cultivate resilient smart Objects for Sustainable city applicatiOnS

Grant Agreement Nº 609043

D3.2.1 End-to-end Security and Privacy: Software prototype (Initial)

WP3 End-to-End Security and Privacy

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www.iot-cosmos.eu

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Annexes:

Nº	File Name	Title

Table of Contents

1 Introduction

1.1 About this deliverable

The present deliverable describes the first modules of the COSMOS platform demonstrator. It provides technical details with respect to the implemented modules, their usage and the requirements needed.

1.2 Document structure

The document is structured as according to work package 3 structure. Each task has a dedicated section which details the results of the activities performed. The present document covers the individual activities which are going to converge into a unified demonstrator over the course of the next month.

2 Hardware Coded Security

2.1 Implementation

2.1.1. Functional description

The Hardware Coded Security component of COSMOS provides the necessary link between the physical world and the actual COSMOS platform. The hardware security board implements the necessary security mechanisms to support the functionality described in D3.1.1 End-to-End Security and Privacy.

The hardware security board provides security primitives, implemented in hardware, for the software applications. Therefore the hardware coded security components help build up the chain of trust, based on high performance cryptographic applications.

The security components in place allow for seamless operation and are not an optional component, selectable by the user, but are by-default enabled for each communication between the hardware security board and the COSMOS platform.

The main advantages of the hardware coded security components are the high speed and reliability as compared to software implementations. Also the structure and architectural model in place have been developed to enable on the fly cryptographic operation without user interaction. This is provided by a mixture of hardware and software design.

The delivered prototype is the first step in enabling the seamless enrollment and authentication of hardware based security components in the COSMOS platform. Currently it provides hardware components which integrate seamlessly with an ARM CPU sub-system and with a modern Linux based operating system. The provided components implement the cryptographic accelerator and the basic Linux drivers for the hardware security board.

2.1.2. Fitting into overall COSMOS solution

As depicted in Figure 1 the COSMOS platform receives data from VEs. These VE's can be of three types (as presented in D3.1.1 – End-to-End Security and Privacy):

- Highly secured,
- Low secured,
- Unsecured.

The presented activities are focusing on a hardware embedded solution which provides the platform for the highly secure VEs – the Hardware Security Board. The Hardware Security Board consists of a physical hardware device which provides the link between sensors (data generators) and the COSMOS environment/platform. The Hardware Security Board can be either attached to one sensor or can be a hub for an entire collection of sensors (e.g. temperature, pressure, humidity, surveillance cameras, etc.).

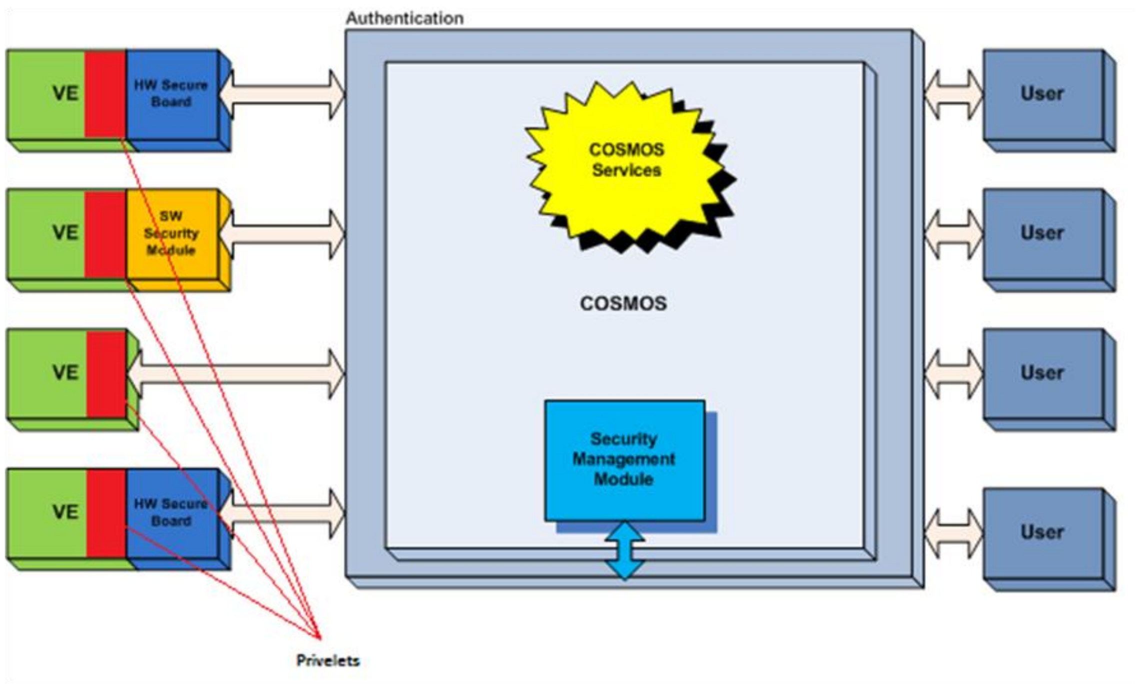


Figure 1. COSMOS high level view

2.1.2.1. Technical description

The hardware coded security components are implemented inside the Xilinx Zynq platform FPGA.

2.1.2.2. Prototype architecture

The Hardware Coded Security diagram is presented below:

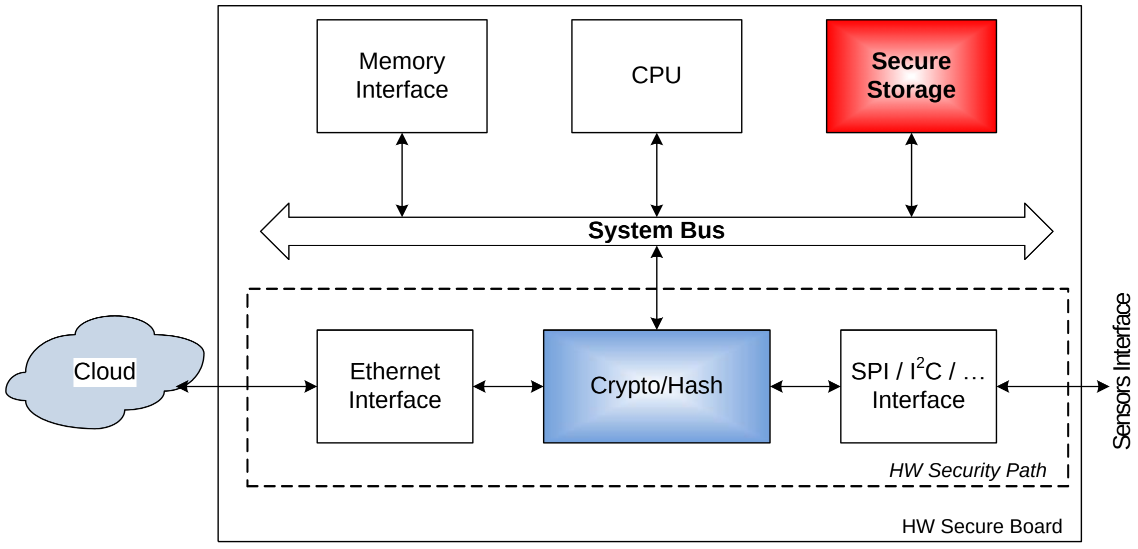


Figure 2: Hardware Coded Security

For the system to be secure, the following items are needed:

- Secure boot – this allows the system to “start” in a pre-defined state, where the security level is high and uncompromised;
- Secure storage – this allows for the safe storage of secret information (e.g. configuration data, encryption keys);
- Hardware cryptographic modules – runs partially autonomously and uses the secret information to provide the basic building blocks in order to raise the security level.
- Secure execution environment – allows for the security critical applications to run in a safe and secure compartment which safe-guards the critical information.

2.1.2.3. Components description

Figure 3 illustrates the functional blocks of the Zynq-7000 AP SoC.

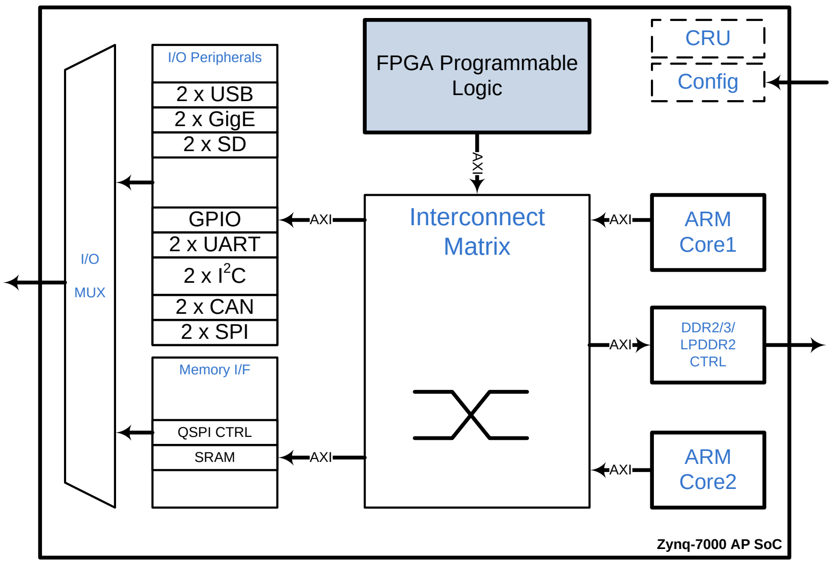


Figure 3: Zynq-7000 AP SoC Overview

The hardware security board uses the ARM subsystem and the provided peripherals (hard macros) as depicted in Figure 3. The security component, that is the cryptographic accelerator, is implemented in the FPGA fabric. The connection between the FPGA Programmable Logic and the ARM subsystem is implemented using an AXI bus interface.

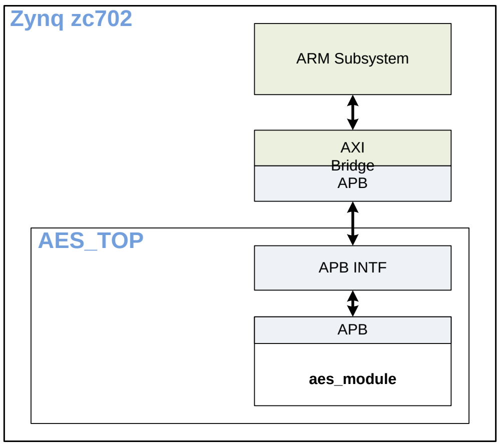


Figure 4: AES Module Instantiation

The implemented AES cryptographic accelerator is implemented using an APB bus system. In order to connect the APB to the AXI bus, a so-called bridge is needed. The used bridge is provided by the platform FPGA manufacturer (Xilinx) and is freely available in the toll-chain the demonstrator board was delivered with.

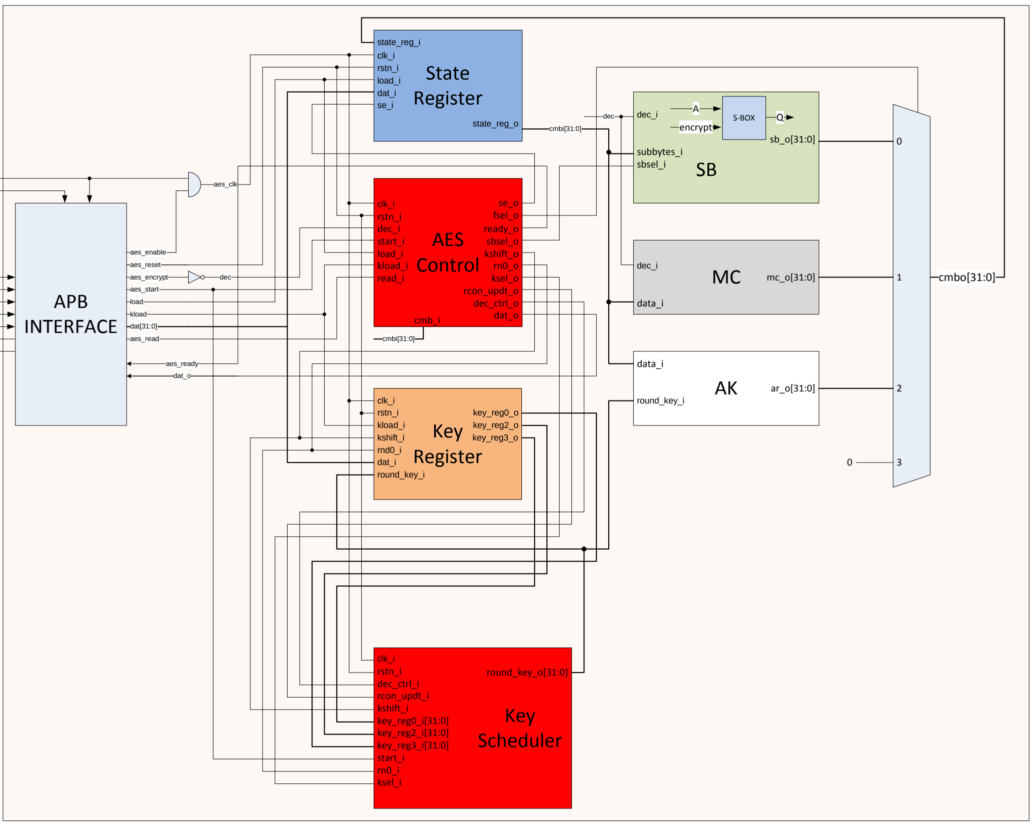
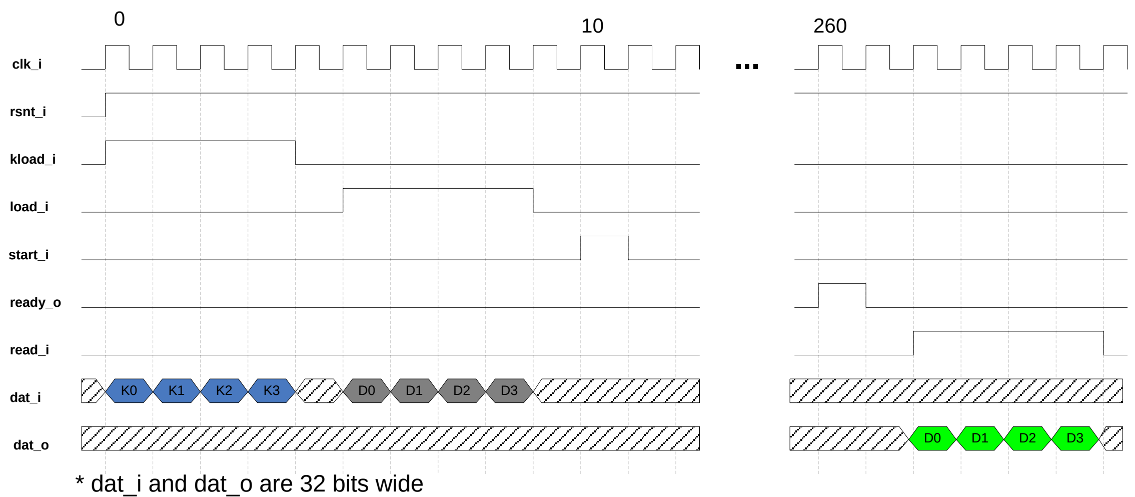


Figure 5. AES Module Internal Structure

The AES module is implemented according to the fips-197 standard and hard the internal structure as depicted in **Error! Reference source not found.**. The module implements the basic building blocks the AES computing rounds rely on. The AES Control sub-module implements a state machine which controls the AES computation. The module implements both encryption and decryption according to the AES standard.



* dat_i and dat_o are 32 bits wide

** an encryption or decryption(without key expansion) takes 240clk

Figure 6: AES Timing Diagram

The timing diagram of the AES cryptographic accelerator is depicted in Figure 6. As the diagram shows the data and key are loaded over a 32bit bus and therefore need 4 clock cycles to load.

2.1.2.4. AES Functionality Description

Certain steps must be followed in order to encrypt/decrypt data correctly with the AES module described in this chapter (see Figure 7). After the chip Power On, the software has to enable the AES module – set bit [1] (*aes_enable*) of the **AES_CTRL** register. This bit gates the module's input clock. After the clock enable, a software reset must be provided by writing bit [0] (*aes_reset*) of the same control register. In this phase, the AES is initialized and enters the IDLE state, waiting for an encryption/decryption operation.

In case of an encryption, **AES_CTRL** bit [3] (*aes_encrypt*) must be set, and then 128 bits of data have to be first loaded into the **LOAD_DATA1…4** registers followed by writing 128 bits of key into the **LOAD_KEY1…4** registers. The encryption operation starts when bit [4] (*aes_start*) of **AES_CTRL** is set. This register bit is automatically cleared by hardware. Having the encryption started, the SW must poll bit [5] of **AES_CTRL** register (*aes_ready*) in order to detect the operation end. This bit is set by hardware and automatically cleared (by hardware) when 128 bits of result are read out from **READ_DATA1…4** registers.

In case of a decryption, **AES_CTRL** bit [3] (*aes_encrypt*) must be cleared, and then 128 bits of data have to be first loaded into the **LOAD_DATA1…4** registers followed by writing 128 bits of key into the **LOAD_KEY1…4** registers if the decryption keys are not the same with the encryption keys. The decryption operation starts when bit [4] (*aes_start*) of **AES_CTRL** is set. This register bit is automatically cleared by hardware. Having the decryption started, the SW must poll bit [5] of **AES_CTRL** register (*aes_ready*) in order to detect the operation end. This bit is set by hardware and automatically cleared (by hardware) when 128 bits of result are read out from **READ_DATA1…4** registers.

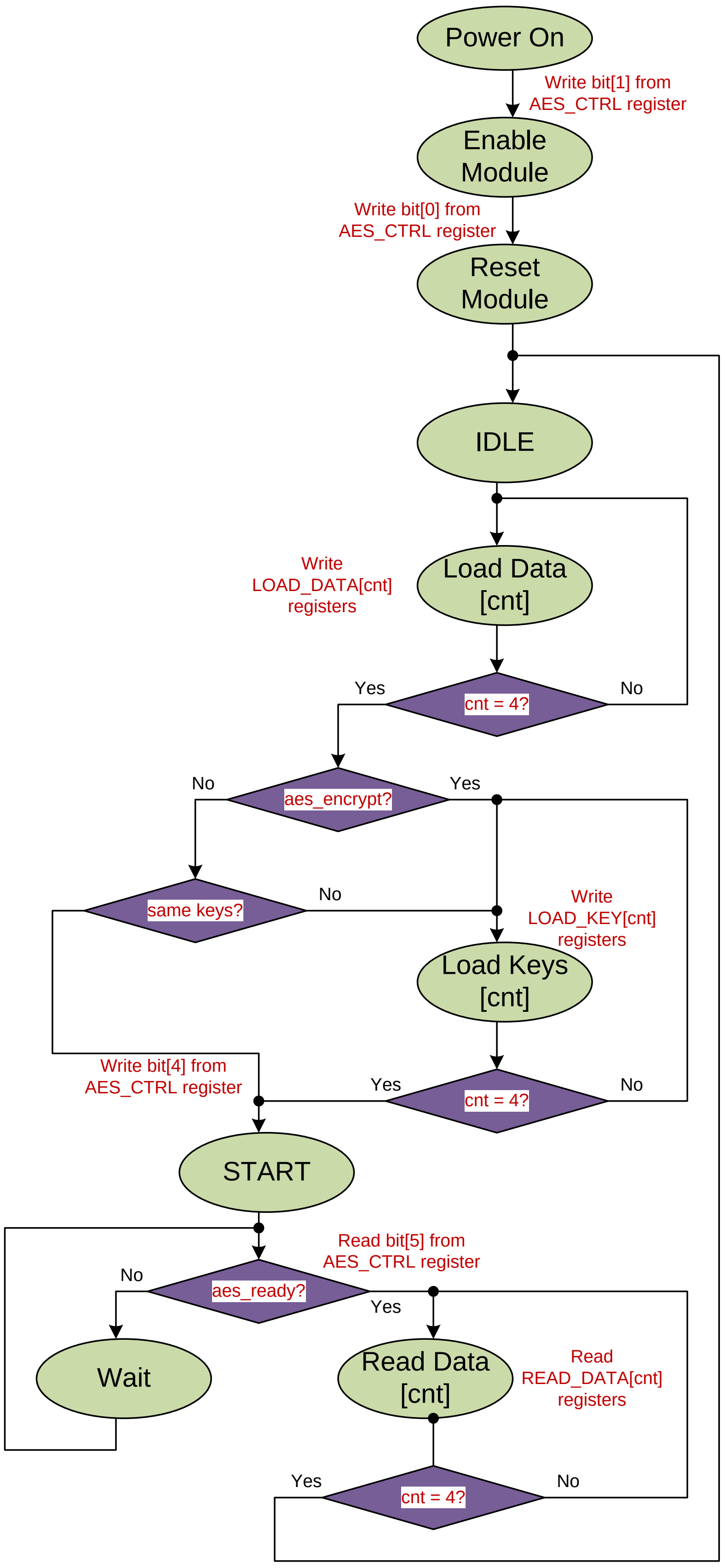

Power On
Write bit[1] from AES_CTRL register
Enable Module
Write bit[0] from AES_CTRL register
Reset Module
IDLE
Write LOAD_DATA[cnt] registers
Load Data [cnt]
Yes
cnt = 4?
No
No
aes_encrypt?
Yes
same keys?
No
Write LOAD_KEY[cnt] registers
Load Keys [cnt]
Write bit[4] from AES_CTRL register
Yes
cnt = 4?
No
START
Read bit[5] from AES_CTRL register
No
aes_ready?
Yes
Wait
Read Data [cnt]
Read READ_DATA[cnt] registers
Yes
cnt = 4?
No

Figure 7: AES Module Functionality Chart

2.1.2.5. AES Address Space

The AES address space has been designed to allow further improvements. The data and control registers are directly addressable, by the CPU, using the implemented APB bus.

Start-Address	End-Address	Module/Memory-Name
0h	90h	AES

Module	Register/Memory	Read	Write	Address
/AES				
	LOAD_DATA1		w	0h
	LOAD_DATA2		w	4h
	LOAD_DATA3		w	8h
	LOAD_DATA4		w	Ch
	LOAD_KEY1		w	10h
	LOAD_KEY2		w	14h
	LOAD_KEY3		w	18h
	LOAD_KEY4		w	1Ch
	READ_DATA1		w	20h
	READ_DATA2		w	24h
	READ_DATA3		w	28h
	READ_DATA4		w	2Ch
	AES_CTRL	(r)(h)	(w)	90h

2.1.2.6. AES Register Description

In order to address the AES peripheral using software, the following register map has been implemented.

Register:	LOAD_DATA1			Address:	0h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the data to be encrypted.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_DATA1	00000000h		w	Load register for the data to be encrypted	

Register:	LOAD_DATA2			Address:	4h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the data to be encrypted.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_DATA2	00000000h		w	Load register for the data to be encrypted	

Register:	LOAD_DATA3	Address:	8h

Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the data to be encrypted.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_DATA3	00000000h		w	Load register for the data to be encrypted	

Register:	LOAD_DATA4			Address:	Ch	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the data to be encrypted.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_DATA4	00000000h		w	Load register for the data to be encrypted	

Register:	LOAD_KEY1			Address:	10h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the encryption key.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_KEY1	00000000h		w	Load register for the encryption key	

Register:	LOAD_KEY2			Address:	14h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the encryption key.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_KEY2	00000000h		w	Load register for the encryption key	

Register:	LOAD_KEY3			Address:	18h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the encryption key.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_KEY3	00000000h		w	Load register for the encryption key	

Register:	LOAD_KEY4	Address:	1Ch

Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Load the encryption key.					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	LOAD_KEY4	00000000h		w	Load register for the encryption key	

Register:	READ_DATA1			Address:	20h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Read decrypted data					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	READ_DATA1	00000000h		w	Read register for the decrypted data.	

Register:	READ_DATA2			Address:	24h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Read decrypted data					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	READ_DATA2	00000000h		w	Read register for the decrypted data.	

Register:	READ_DATA3			Address:	28h	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Read decrypted data					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	READ_DATA3	00000000h		w	Read register for the decrypted data.	

Register:	READ_DATA4			Address:	2Ch	
Bits:	31dt0	Reset value:	0h	Attributes:		w
Description:	Read decrypted data					
Bit	Identifier	Reset	Attr.		Function / Description	
31dt0	READ_DATA4	00000000h		w	Read register for the decrypted data.	

Register:	AES_CTRL	Address:	90h

Bits:	31dt0	Reset value:	0h	Attributes:	(r)(h)	(w)
Description:	AES Control register					
Bit	Identifier	Reset	Attr.		Function / Description	
0	AES_RESET	0h	r	w	AES module Reset bit '0' - Reset is asserted	
1	AES_ENABLE	0h	r	w	AES module Enable '1' - AES module enabled	
2	reserved	0h				
3	AES_ENCRYPT	0h	r	w	Select between encryption/decryption operation '1' - encryption '0' - decryption	
4	AES_START	0h		w	AES operation start (pulse, always read '0') '1' - start the encryption/decryption opeartion '0' - idle/operation in progress	
5	AES_READY	0h	rh		AES operation ready, set by HW, reset by SW when reading from address 0x2X	
31dt6	reserved	0000000h				

2.1.3. Technical specifications

The AES module is coded entirely in the **Verilog** hardware description language. The rest of the HW subsystem is instantiated from the XILINX standard libraries which require no other licenses.

The software components are written in C/C++. The main component is the Linux driver which enabled user-level (level 5) access to the cryptographic accelerators inside the FPGA fabric. The driver is developed in ANSI C. The test application as well as all other software components is developed in C++. There are no other software components in use except for the Linux operating system stock libraries. The custom libraries which are used to access Xilinx's own proprietary hardware components inside the Zynq Platform FPGA device are freely available and usable from directly the tool-chain IDE.

Tools used:

- Xilinx ISE 14.6;
- GCC;
- Linux 3.6 based operating system (ARM branch).

2.2 Delivery and usage

2.2.1. Package information

An SD card image is provided with the following structure:

- */boot.bin* – contains also the bitstream file with the hardware set-up and the custom hardware AES cryptographic accelerator;
- */image.ub* – is the bootloader;
- */AES/test vectors* – contains the test vectors according to fips-197;
- */AES/aes_app_drv.elf* – contains the application using the custom AES hardware;
- */AES/aes_driver_amp.ko* – contains the custom AES driver;
- */AES/load_aes_driver_amp.sh* – is the script used to load the driver.

2.2.2. Installation instructions

In order to start the application, the following steps are necessary:

1. Copy the content of AES Linux App Image Folder on the root of the SD card:
   - AES directory:
     - test_vectors directory
     - aes_app_drv.elf
     - aes_driver_amp.ko
     - load_aes_driver_amp.sh
   - boot.bin
   - image.ub

2. Set board for booting from SD card, using the SW16 switch from the Zynq ZC702 board.

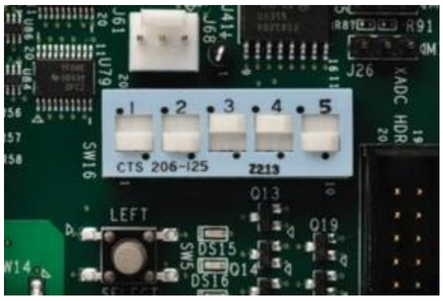


Figure 8. Zynq ZC702 boot switch configuration

3. Place SD card in the MMC slot and power ON the board.

4. Start a terminal application (e.g. PuTTY) with the following serial settings:

   - baudrate: 115200;
   - data bits: 8;
   - stop bits: 1;
   - parity: none;
   - flow control: none.

5. After board initialization, the DS16 and DS17 LEDs are blinking to indicate the system's activity.

6. In order to boot from SD card, enter the following commands:
   - *fatload mmc 0:1*
   - *bootm*

7. Linux is booting up; login with user = root, password = root.

8. Mount the SD card using the following commands:
   - cd /
   - mkdir sdcard
   - mount dev/mmcblk0p1 sdcard/

9. Load the kernel driver using the following commands:
   - cd sdcard/AES/
   - ls
   - source ./load_aes_driver_amp.sh

10. Run application using the following command:
    - ./aes_app_drv.elf

2.2.3. User Manual

Once the steps above have been executed the cryptographic module can be accessed from the user level. This enables the usage of cryptographic primitives from the application level, such as OpenSSL.

The provided components enable a standard Linux usage model for the custom hardware cryptographic components. This mechanism will be further extended in order to enable the COSMOS platform to fully use the capabilities of the provided hardware platform (as stated in D3.1.1 – encryption, authentication and privacy).

2.2.4. Licensing information

The provided files are as-is and are provided to the COSMOS consortium partners for demonstration purposes. Redistribution and/or modification of the files are prohibited without notifying Siemens SRL.

All used components are available under the same license as the Xilinx ISE tool chain.

2.2.5. Download

The bitstream file and compiled software images will be available in the COSMOS SVN repository.

3 Privacy

3.1 Implementation

3.1.1. Functional description

Privelets is an essential part of the COSMOS chain. Virtual Entities are able to contact with each other as much as with the external platform also exposing and trading information connected to the VE's user and his environment. It is easily understood that this behaviour leaves the user exposed and vulnerable to any use of his information sharing. In this way of information exchange there is high possibility that the user shares information that violate his privacy in an unwanted way.

Our goal is to ensure that the user shares information that he wants only and leaves out all other that he considers as private and believes that may affect his privacy.

The design and implementation of Privelets follow an iterative approach. As a first step, messages about to be exported from a VE are analyzed and specific fields are filtered based on users' input.

In this section we will try to provide a diagram of the Privelets and how the work. Firstly we will have to make some assumptions about the incoming and outgoing information regarding the Privelets. In order to keep Privelets generic and in order to avoid making a specific Privelet according to each device we consider the incoming and outgoing information from and to each device to follow a specific pattern. Data will be exchanged though JSON files. The format that each JSON file should have in order to be processed by a Privelet must follow this way without duplicates:

```
[
{"tag":"some_tag","information":"some_information"},
.
.
.
{"tag":"some_tag","information":"some_information"}
]
```

A Privelet has a certain space in each VE, where it can store a configuration file, in order to load it on each start up. This configuration file, can be updated, edited or even deleted, during the VE's operation. This configuration file contains only the private tags, the tags that a VE doesn't want to share to the public. By now, in the source code already developed, the specified path where this configuration file can be found is C:\\jsonFile.json. As said before, the template is also specific. So the configuration file is presented in this way again without duplicates:

```
[
{"tag":"some_tag"},
.
.
.
{"tag":"some_tag"}
```

]

By this time, the filtering procedure is human oriented, so the user parameterizes what to share and what to keep private.

Every incoming and outgoing file transfer a.k.a data exchange is made with JSON files as already said. JSON files are transferred through RESTful services.

As far as RESTful services are concerned there are (until now) four basic services running.

insertData: When choosing this @POST service, we have to load a JSON file, containing the tags and information to be exchanged. This is what the VE is exporting and has to be filtered. So this service takes each piece of information coming out from the VE and enters them into the Privelet for further filtering.

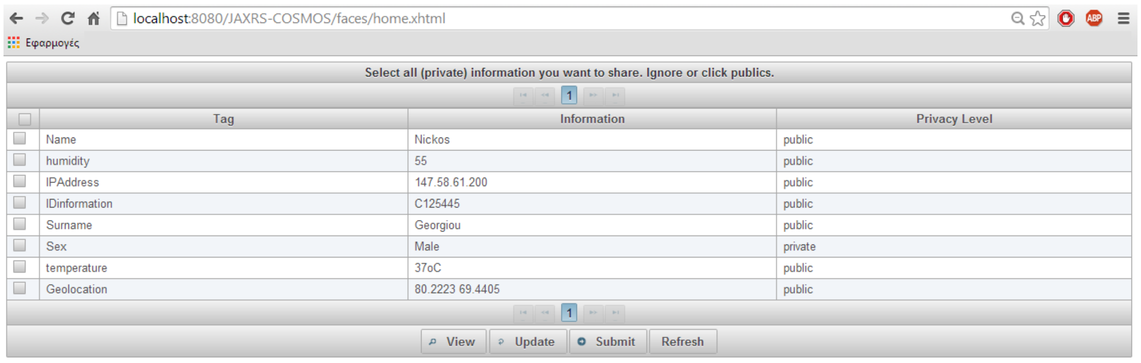
getPublicJasonFileTags: When calling this @GET service, the VE responds to us, giving out the filtered information. So the response contains a JSON file with all the public tags after the filtering procedure. All the private tags are kept inside the VE and get discarded just the after the moment the next @POST insertData service is called. This service is called by another VE, or by the main platform that requests to gather information.

retrieveExistingConfigurationFile: This service has to do with the stored configuration file we mentioned before on the root directory of each device. It's a @GET service. With this call, we can see, in any time, the state of the configuration file that is read by the source code and by which the filtering procedure is taking place. This service is called by the user in order to check the status of the VE's file. The response of this service, gives us a JSON file with the tags considered as private only.

updateExistingConfigurationFile: This service also has to do with the stored configuration file. A @POST service, through which the user can alter the configuration file by adding a JSON file to the payload of the service's call. The user has to enter only the private tags on this file, the tags that he wants to keep safe and not share with the other VEs or the platform. The changes take place just after the next "insertData" service is called, in the next interval. Changes do not affect the already running information to be shared.

By the time the VE starts operating, the source code starts scanning the root registry for a configuration file that describes the private values. If the configuration file contains no value, the VE shares everything with the rest of the world. The filtered information sharing procedure starts by the time a configuration file has at least one value in it.

There is also a UI for the managing of the configurations. If the device has a screen, the user can make changes regarding the configurations through a user interface. To build the UI, we used Java Server Faces and the PrimeFaces extension.



Select all (private) information you want to share. Ignore or click publics.

Tag	Information	Privacy Level
Name	Nickos	public
humidity	55	public
IPAddress	147.58.61.200	public
IDinformation	C125445	public
Surname	Georgiou	public
Sex	Male	private
temperature	37oC	public
Geolocation	80.2223 69.4405	public

Figure 9. Privelets

The user can see the tags existing that moment in the VE, and can alter the privacy level by selecting one or multiple and pressing the update button. By the time the submit button is pressed, every change is written down to the configuration file. The refresh button is used if and when the next “insertData” service is called in order to view the new values to be exchanged. The view button is of no general use. It just shows on a pop up window the tag name and the information provided through this tag.

3.1.2. Fitting into overall COSMOS solution

A VE, which participates on COSMOS platform, generates information that sends on other VEs and COSMOS. Information generated is stored in a JSON file. The JSON file stores all the information on separated tags in a specific pattern. With the use of an existing preloaded configuration file, or by some user input that can configure the privacy level of some tags, a privelet (as expected) lets all the public tags to be exchanged and it keeps safe or discards all the private ones by generating a new JSON file which looks like the one received by the VE before the filtering process, but without the private tags.

In other words, data generated from the device must pass through that filter and then be exported to another VE or our COSMOS platform. That’s a Privelet’s action. We assume that the VE generates data with a certain interval update and wants to share it through our platform or between other VEs. It generates a JSON file where all those data pass through this mechanism called privelet. Each tag of the JSON file generated contains information and the user is called to configure the privelet by setting privacy level values to the data exchanged and thus a configuration file is stored in the privelet. After that any data exchanged from the VE, will have the same configuration regarding the privacy level of each tag in order to decide what data to send to the platform and what to keep. The privelet will not change each tag’s privacy level unless the user calls it again and re-configures it. After this configuration the data exchanged will be filtered and exported with the Privelet’s configuration.

By now, we consider that a Privelet is embedded on the VE and relates with other VEs or the COSMOS platform. So it’s a standalone component that (by now) acts as a filter and we choose to embed it on the VE. So, a Privelet, is related with the VE, and any other component that will ask the VE for information exchange.

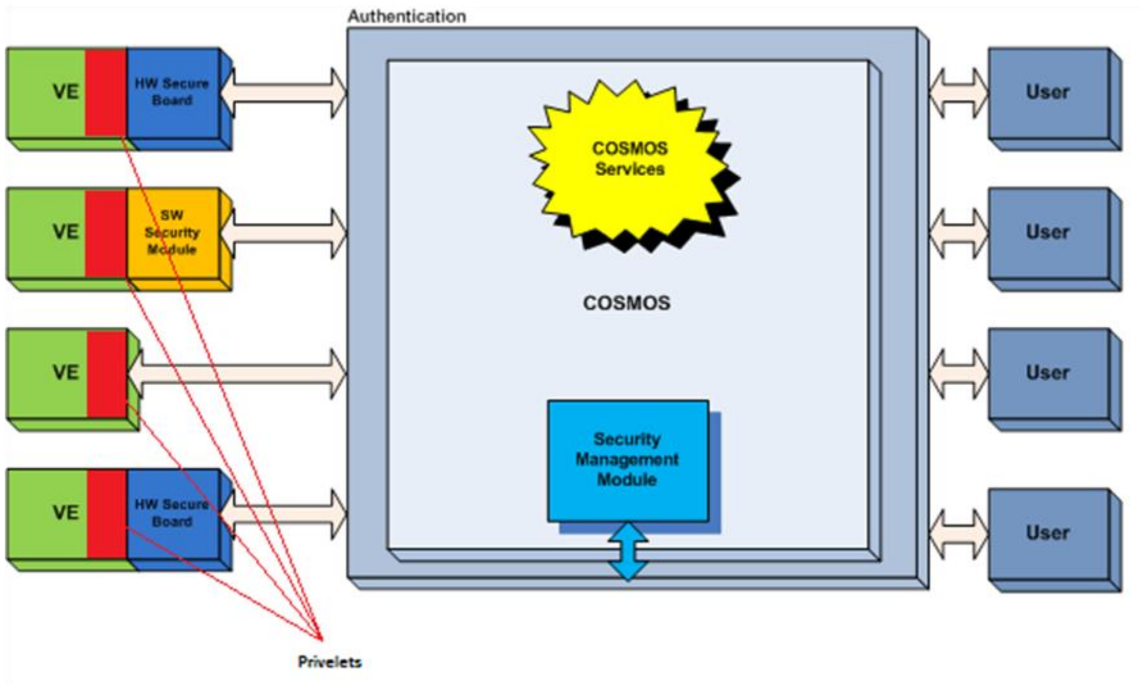


Figure 10. COSMOS high level view

3.1.2.1. *Technical description*

The Privelets component is developed on Eclipse Java EE IDE for Web Developers, version: Kepler Service Release 2. We used Tomcat v7.0 Server to handle all the request and responses from and to the source code. We made use of Jersey Restful web services, and Java Server Faces. Finally, the project is being built with Maven.

3.1.2.2. *Prototype architecture*

A draft diagram of how a Privelet works is shown below. By now as we can see the mechanism is fully user driven.

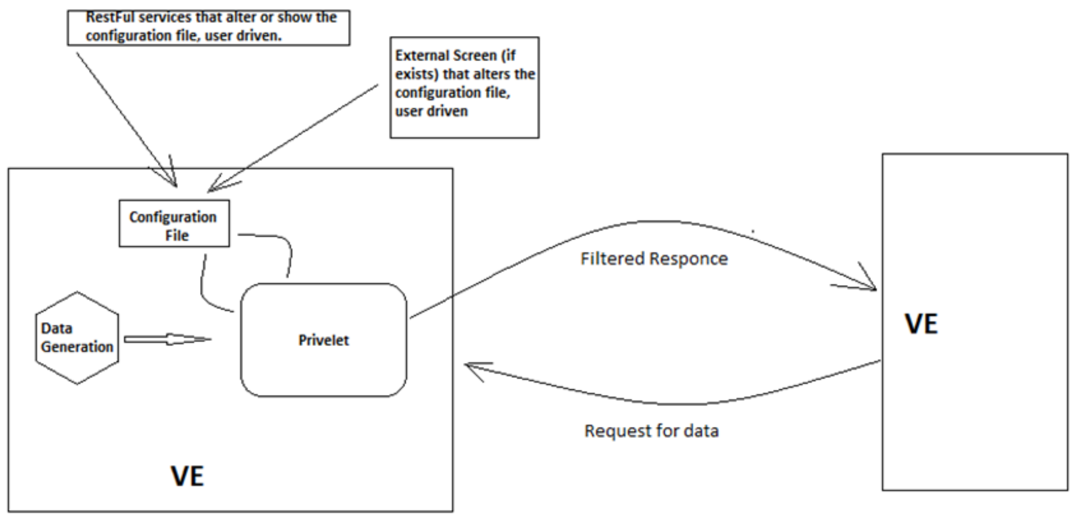

RestFul services that alter or show the configuration file, user driven.
External Screen (if exists) that alters the configuration file, user driven
Configuration File
Data Generation
Privelet
VE
Filtered Responce
Request for data
VE

Figure 11. Prototype architecture

3.1.3. Technical specifications

The Privelets component is coded entirely in the Java programming language, with the use of Apache Tomcat v7.0 Server. We used Eclipse in Windows 7 environment. We used HTML GET and POST methods for communication purposes. Apart from the Java's JDK 1.7 and the JRE's 7 existing stock libraries, we made use of external existing libraries to develop functions and operations that are open source and freely available online.

3.2 Delivery and usage

3.2.1. Package information

The source code is structured in two individual packages. The first is called "com.cosmos.rest.jersey" which is responsible for the main operations and services offered and the second one is called "persistence" with main target to keep temporary storage and use of it on the main services.

The first package contains three Java classes.

- JsonData (Definition of the Json data to be filtered and exchanged)
- JsonDataConfiguration (Definition of the data that have to do with the configuration file)
- Privelets (The main class with most of the services offered)

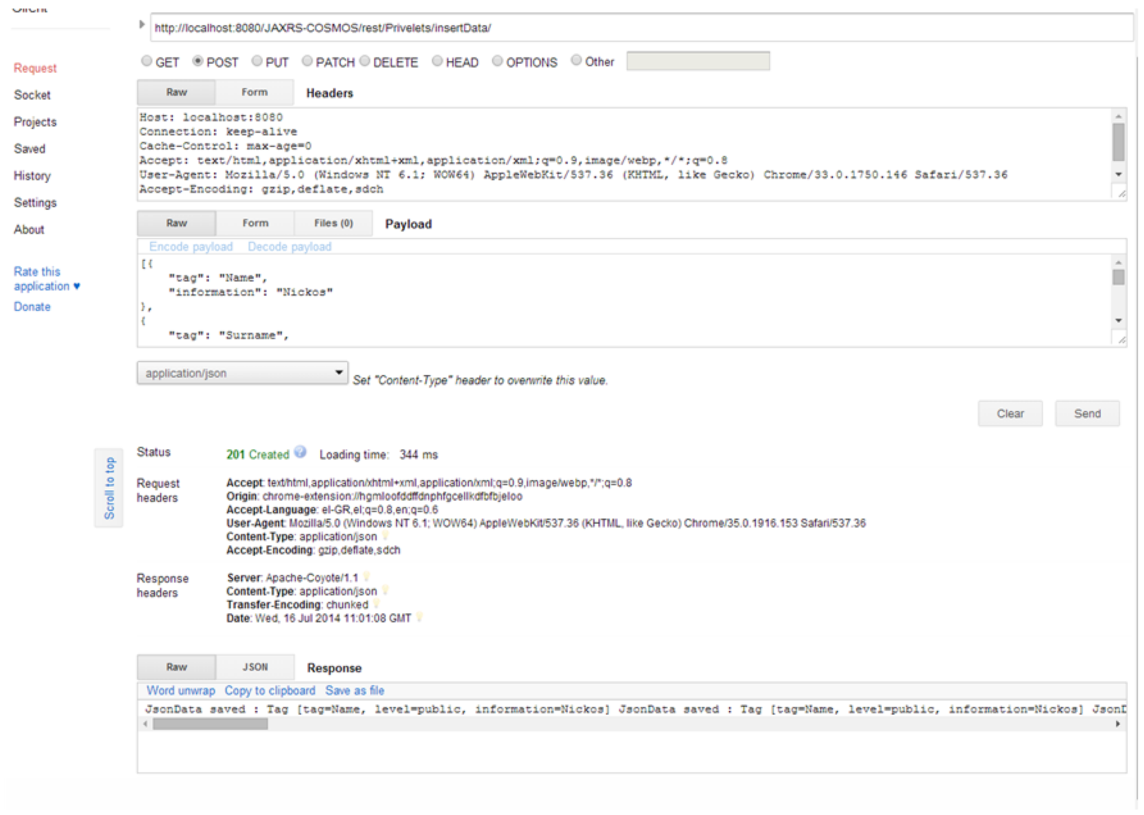
The second package contains five Java classes.

- ConfigurationJsonObject (temporary storage and mapping of configuration data)
- JSFcontrollerBean (A bean responsible for the projection of data to the UI)
- JsonDataTable (Creation of a data table to be projected)
- PublicJsonObjectsToExport (class that categorizes the public data to be exported)
- StoredJsonObjects (Data temporary stored to be filtered and edited)

3.2.2. Installation instructions

Firstly we have to generate a Json file on the root directory of our device "C:\\" and call it "jsonFile.json". So the final path will look like "C:\\jsonFile.json" This will be our configuration file. We can pre-complete some tags on it considered as private, or we can leave it empty. What we really care about is that this file exists. After, we need to take the source code's package and import is on Eclipse or Netbeans. As soon as the project is built with maven, we let Maven find the libraries and build the project. As soon as the project is built, we just need to run it as a java application and switch to the REST client and the JSF component (UI webpage).

In order to test our source code, and as soon as it's a standalone component by now and not embedded in any other structure, we had to download and install Google Chrome browser and in order to take advantage of its add-on called "Advanced REST Client". Through this application/add-on, we were able to communicate with our application running on the server and exchange messages. This add-on fully supports JSON files so it was exactly what we needed.



http://localhost:8080/JAXRS-COSMOS/rest/Privelets/insertData/

[✓ POST]

Headers

```
Host: localhost:8080
Connection: keep-alive
Cache-Control: max-age=0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/33.0.1750.146 Safari/537.36
Accept-Encoding: gzip,deflate,sdch
```

Payload

```
[{
    "tag": "Name",
    "information": "Nickos"
},
{
    "tag": "Surname",
```

application/json *Set "Content-Type" header to overwrite this value.*

```
Status            201 Created   Loading time:   344 ms

Request           Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
headers           Origin: chrome-extension://hgmloofddffdnphfgcellkdfbfbjeloo
                  Accept-Language: el-GR,el;q=0.8,en;q=0.6
                  User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/35.0.1916.153 Safari/537.36
                  Content-Type: application/json
                  Accept-Encoding: gzip,deflate,sdch

Response          Server: Apache-Coyote/1.1
headers           Content-Type: application/json
                  Transfer-Encoding: chunked
                  Date: Wed, 16 Jul 2014 11:01:08 GMT
```

Response

```
JsonData saved : Tag [tag=Name, level=public, information=Nickos] JsonData saved : Tag [tag=Name, level=public, information=Nickos] JsonD
```

Figure 12. Privelet add-on

3.2.3. User Manual

In order for the prototype to be usable, as said before, we need the Google Chrome's add on called advanced REST client. In this way we can simulate the VE's behavior.

Assuming we have a configuration file on the root directory by the time we will run the application, the source code will scan for it and load (if any) the private tags to be kept. After that, we can do some testing by performing some @POST insertData services with groups of tags on the call's payload and right after some @GET getPublicJasonFileTags services. In this way, we will see what the VE is sending out to the other VEs or the platform. The insertData service, is the data generated by the VE to be exported before the filtering procedure, while the getPublicJasonFileTags service, is the call on the VE (by another VE) to share information. Afterwards we can check about the existing configuration file by calling the @GET service called retrieveExistingConfigurationFile. This will give us every tag stored on the configuration file. In other words, every private tag that will not be exchanged with the platform.

We can update the existing configuration file, and add or remove tags considered as private by calling the @POST service, updateExistingConfigurationFile and giving in the payload a Json file, as described in the previous parts.

We can see (while the code is running) on the link http://localhost:8080/JAXRS-COSMOS/faces/home.xhtml, the UI of that has to do with the instance of the data to be exchanged, from there we can alter the configuration file with some specific moves described above, and see the next instance (after an insertData service use) by clicking refresh.

3.2.4. Licensing information

For the component license, we chose Apache License v2.0 (http://www.apache.org/licenses/LICENSE-2.0.html) and Common Development And Distribution License (CDDL) plus GPL (http://glassfish.java.net/nonav/public/CDDL+GPL.html). The reason for this choice is that they are the most neutral license models that can be combined with proprietary and/or other restrictive open source licenses (e.g. GPL-like models).

3.2.5. Download

The source code will be available in the COSMOS SVN repository.

4 Cloud Storage Security

The Cloud Storage Security components are described in *D4.2.1 Information and Data Lifecycle Management: Software Prototype (Initial)*, as stated in the DoW. Please refer to section 7 – *Cloud Storage Security and Privacy* of the deliverable for technical details.

5 Conclusions

This document describes the prototypes for the End-to-End Security and Privacy work-package. Each individual component implemented independently during the past year will be integrated over the course of year 2 and 3 of the COSMOS project into a common demonstrator.