



## D8.2

### Integrated LIGHTest Software Components

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## 1. Executive Summary

This deliverable provides information about the LIGHTest software components. The deliverable also discusses the integration between the software components. We discuss the interoperability of the Automatic Trust Verifier with the Trust Scheme Publishing Authority, Trust Translation Authority and the Delegation Provider.

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## 2. Document Information

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### 2.2 History

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## 3.1 Table of Acronyms

Abbreviation	Meaning
ATV	Automatic Trust Verifier
DP	Delegation Provider
DNS	Domain Name System
TPAT	Trust Policy Authoring Tool
TSPA	Trust Scheme Publication Authority
TTA	Trust Translation Authority



## 4. Introduction

LIGHT<sup>est</sup> architecture is the base to support the trust in the decision process of users. Its design has been performed to cover the two main factors involved in the decision process: reliable information and trustworthy relationships.

Trust Scheme Publication Authority (TSPA), Trust Translation Authority (TTA) and Delegation Authority (DA) constitute the pillars of the infrastructure as they are offering a model to express trust information while providing the infrastructure of repositories and publishers of this information.

This information can be discovered through DNS servers which provide a universal access point to information. The project provides the Zone Manager service to manage pointers in DNS.

Although these components work separately, they become a valuable tool when combining all information. At this point, it is the Automated Trust Verifier (ATV) who works as the glue of all components providing single access of the LIGHT<sup>est</sup> infrastructure that allows the user to verify the validity of transactions according to trust constraints called as trust policies. Together with ATV, LIGHT<sup>est</sup> provides an interface to ease the task of defining trust policies, namely the Trust Policy Authoring Tool.

This document provides a brief description of each component and the URL of repositories where they can be found. A short description of the interoperability between the different components is provided.

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## 5. Software Components

### 5.1 Automatic Trust Verifier

#### 5.1.1 Description

Automatic Trust Verifier is a tool that takes an Electronic Transaction and Trust Policy [1] as input, outputs trustworthy [y/n], possibly with an explanation of its reasoning. It uses a pluggable parser for Electronic Transactions as sub-component

#### 5.1.2 Access to Code

The programming language for the ATV is Java 8 (it will be ported to the latest version of Java before production) and Maven [2] is used to build the source code. Maven retrieves dependencies; you need to give Maven access to artefacts hosted in the artefacts Maven repository located in the IAIK GitLab repository hosted at <https://extgit.iaik.tugraz.at>. This Setup can be done by creating a *personal access token* in GitLab and adding it to your maven *config.xml*.

A access token can be created in GitLab in *Profile* → *Settings* → *Access Tokens* → *Personal Access Tokens*

Maven's global settings.xml is located in `~/.m2/settings.xml` and needs to contain the following:

```
<?xml version="1.0" encoding="UTF-8"?>

<settings xmlns="http://maven.apache.org/SETTINGS/1.0.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/SETTINGS/1.0.0
    http://maven.apache.org/xsd/settings-1.0.0.xsd">

  <servers>

    <server>
      <id>gitlab-maven</id>
      <configuration>
        <httpHeaders>
          <property>
            <name>Private-Token</name>
            <value>YOUR_TOKEN_HERE</value>
          </property>
        </httpHeaders>
      </configuration>
    </server>

  </servers>
</settings>
```

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Note that only users that have access to the IAIK GitLab repository can create access tokens currently.

### 5.1.3 Relevant Artefacts

To build the ATV, the following dependency is needed and therefore access to its repositories needs to be configured:

**Component name:** TrustPolicyInterpreter

**GIT repository:** <https://extgit.iaik.tugraz.at/LIGHTest/trustpolicyinterpreter>

**Maven repository:** <https://extgit.iaik.tugraz.at/api/v4/projects/1050/packages/maven>

## 5.2 Trust Policy Authoring Tool

### 5.2.1 Description

The Trust Policy Authoring Tool provides a convenient interface for the creation of Trust policies.

A Trust Policy is a recipe, expressed in a Trust Policy Language that describes a series of rules that a particular electronic transaction must fulfil.

### 5.2.2 Access to Code

The process described at Section 5.1.2 should be performed if it has not been performed earlier otherwise it can be skipped. The code of the TPAT is available at:

**Component name:** TPAT

**GIT repository:** <https://extgit.iaik.tugraz.at/LIGHTest/TrustPolicyAuthoringTool>

## 5.3 Trust Scheme Publication Authority

### 5.3.1 Description

The Trust Scheme Publication Authority (TSPA) enables the discovery and verification of trust scheme memberships for automatic trust verification with the ATV. The TSPA also defines how Trust Schemes are published making use of the existing infrastructure and established global trust anchor of the Domain Name Systems DNS. For this purpose, the TSPA uses a standard DNS Name Server with DNSSEC extension, which is used for discovering the claim of Trust Scheme Association. Also, the TSPA consists of a Trust Scheme Provider, implemented as an HTTPS component, which provides this signed Trust List, which contains this required association and optionally also the requirements of the Trust Scheme in the form of tuples.

### 5.3.2 Access to Code

The source code for the TSPA can be obtained from the following GIT repository:

**Component name:** TrustSchemePublicationAuthority

**GIT repository:** <https://extgit.iaik.tugraz.at:LIGHTest/TrustSchemePublicationAuthority>

The project uses Maven as a build system.

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To run the TSPA, a Java servlet server like Apache Tomcat is required. For Apache Tomcat copy the target folder into

```
$CATALINA_BASE/webapps/
```

and restart the server.

## 5.4 Trust Translation Authority

### 5.4.1 Description

The Trust Translation Authority tool is the module within the LIGHTest architecture that models the trust translation relationship between Trust Schemes. At the time of writing this deliverable, it has been improved from previous releases by providing three different interfaces and more flexibility to build the files containing this information.

First, two primary interfaces are designed to interact and be integrated with ATV, one intended to manage (publishing and removal) trust translations declarations, and a second one to allow the user to retrieve them. The third and new interface provides access to the configuration of the module itself and should be used only by administrators.

Regarding the format of the Trust Translation declarations, they can be chosen now between to provide one file per translation declaration or one single file for all available translations of a Trust Scheme; either in XML or in TPL.

### 5.4.2 Access to Code

The code of the TTA is available at:

**Component name:** TTA

**GIT repository:** <https://extgit.iaik.tugraz.at/LIGHTest/TTA>

## 5.5 Delegation Publisher

### 5.5.1 Description

The purpose of the Delegation Provider is to publish, provide, and revoke delegations used by the LIGHTest architecture simply and effectively. It provides a RESTful API to the other components that allow them to publish, download, and revoke delegations. It further provides methods for a verifier to check and validate this information.

The implementation of the Delegation Provider has been provided as part of the LIGHTest project and has a fairly simple design. It is build using Java 9 (it will be ported to the latest version of Java before production) as a basis, together with Jersey [3] for the RESTful API. The Delegation Provider can either use a database or the file system to store content. As for the database we provide an implementation for a SQLite [4] database, but adoptions to other databases are relatively easy as Java provides a versatile architecture for databases connections. The component requires an application server like Apache Tomcat [5] to function.

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## 5.5.2 Access to Code

The code of the DP is available at:

**Component name:** DP

**GIT repository:** <https://extgit.iaik.tugraz.at/LIGHTest/DelegationProvider>

## 5.6 Zone Manager

### 5.6.1 Description

The purpose of the Zone Manager is to provide management of the DNS zone data used by the LIGHTest architecture simply and comprehensively. It provides a REST-like API towards the other components that allows them to add, alter, and remove information about the relationships expressed by LIGHTest. The Zone Manager translates this information in the own DNS resource records, adds, changes, or removes them from their zones. It also takes care of DNSSEC signing these zones.

The implementation of the Zone Manager that has been provided as part of the LIGHTest project is relatively simple. It has been built in Python, using the Falcon [6] and SQLAlchemy [7] frameworks for the Web services and database, respectively, and uses Idns [8] for creating and signing the DNS zones. A DNS authoritative server is not part of the zone manager. This part is done with NSD [9] for which Zone Manager provides the necessary configuration.

### 5.6.2 Access to Code

The code for the Zone Manager is available at:

**Component name:** Zone Manager

**GIT repository:** <https://extgit.iaik.tugraz.at/LIGHTest/ZoneManager>

An instance of the Zone Manager for use in testing is running on [lightest.nlnetlabs.nl](http://lightest.nlnetlabs.nl).

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## 6. Interaction between Components

### 6.1 Interoperability of the ATV with TTA, TSPA and DP

The TSPA server component provides trust scheme information (in XML) to the ATV while the TTA server components include information about trust translation in TPL format. The ATV discovers both TTA and TSPA through the DNS. The DNS provides the URI pointer to the HTTPS component of the TTA and TSPA.

The DP provides delegation information to the ATV. The DP server component is URI pointer is included in an electronic transaction. The ATV uses this pointer to confirm the validity and delegation status of a delegation.

### 6.2 Interoperability of the TTA, TSPA with Zone Manager

The Zone Manager offers a simple REST-like API to the TTA and TSPA that allows them to add, alter, and remove information through HTTP requests.

Authentication of the TTA and TSPA instances allowed to access a specific Zone Manager instance happens through simple bearer tokens that are exchanged out-of-band between the operators of the respective components.

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## 7. Conclusion

This document describes the software components in LIGHTest as well as the access to the code. The deliverable describes the interoperability between those components and the kind of information they provide.

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## 8. References

- [1] LIGHTest Consortium, "Requirements and Design of a Conceptual Framework for Trust Policies," LIGHTest Consortium, 2018.
- [2] Apache, "Apache Maven Project," [Online]. Available: <https://maven.apache.org/>. [Accessed 14 February 2019].
- [3] Glashfish, "Jersey," [www.glassfish.org](http://www.glassfish.org).
- [4] Xerial, "SQLite JDBC Connector," Xerial.
- [5] A. Foundation, "Apache Tomcat".
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- [7] Michael Bayer, "SQLAlchemy," [Online]. Available: <https://www.sqlalchemy.org/>. [Accessed 16 April 2019].
- [8] NLNET, "LDNS," [Online]. Available: <https://nlnetlabs.nl/projects/ldns/about/>. [Accessed 16 April 2019].
- [9] NLNET, "NSD," [Online]. Available: <https://nlnetlabs.nl/projects/nsd/about/>. [Accessed 16 April 2019].

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## 9. Project Description

### **LIGHTest project to build a global trust infrastructure that enables electronic transactions in a wide variety of applications**

An ever increasing number of transactions are conducted virtually over the Internet. How can you be sure that the person making the transaction is who they say they are? The EU-funded project LIGHTest addresses this issue by creating a global trust infrastructure. It will provide a solution that allows one to distinguish legitimate identities from frauds. This is key in being able to bring an efficiency of electronic transactions to a wide application field ranging from simple verification of electronic signatures, over eProcurement, eJustice, eHealth, and law enforcement, up to the verification of trust in sensors and devices in the Internet of Things.

Traditionally, we often knew our business partners personally, which meant that impersonation and fraud were uncommon. Whether regarding the single European market place or on a Global scale, there is an increasing amount of electronic transactions that are becoming a part of peoples everyday lives, where decisions on establishing who is on the other end of the transaction is important. Clearly, it is necessary to have assistance from authorities to certify trustworthy electronic identities. This has already been done. For example, the EC and Member States have legally binding electronic signatures. But how can we query such authorities in a secure manner? With the current lack of a worldwide standard for publishing and querying trust information, this would be a prohibitively complex leading to verifiers having to deal with a high number of formats and protocols.

The EU-funded LIGHTest project attempts to solve this problem by building a global trust infrastructure where arbitrary authorities can publish their trust information. Setting up a global infrastructure is an ambitious objective; however, given the already existing infrastructure, organization, governance and security standards of the Internet Domain Name System, it is with confidence that this is possible. The EC and Member States can use this to publish lists of qualified trust services, as business registrars and authorities can in health, law enforcement and justice. In the private sector, this can be used to establish trust in inter-banking, international trade, shipping, business reputation and credit rating. Companies, administrations, and citizens can then use LIGHTest open source software to easily query this trust information to verify trust in simple signed documents or multi-faceted complex transactions.

The three-year LIGHTest project starts on September 1st and has an estimated cost of almost 9 Million Euros. It is partially funded by the European Union's Horizon 2020 research and innovation programme under G.A. No. 700321. The LIGHTest consortium consists of 14 partners from 10 European countries and is coordinated by Fraunhofer-Gesellschaft. To reach out beyond Europe, LIGHTest attempts to build up a global community based on international standards and open source software.

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The partners are ATOS (ES), TimeLex (BE), Technische Universität Graz (AT), EEMA (BE), G+D (DE), Danmarks tekniske Universitet (DK), TUBITAK (TR), Universität Stuttgart (DE), Open Identity Exchange (GB), NLNet Labs (NL), CORREOS (ES), Ubisecure (FI), and University of Piraeus Research Center (GR). The Fraunhofer IAO provides the vision and architecture for the project and is responsible for both, its management and the technical coordination.

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