Smart Open Services for European Patients

Open eHealth initiative for a European large scale pilot of

Patient Summary and electronic Prescription

D3.9.2 - Testing Methodology, Test Plan and Tools

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ABSTRACT

"**D3.9.2 - Testing Methodology, Test Plan and Tools**" provides the information related to the Testing Streamline within WP3.9. The other WP3.9 streamlines (Proof of Concept implementation and Semantic Services) are described in D3.9.1.

In order to test a system, a test strategy has to be defined that describes the strategic approach and goals of the organisation conducting or managing the test. The test strategy forms the normative basis from which all other test activities are dependant on.

This document describes the test approach to be adopted during the construction of the epSOS Architecture and ICT Infrastructure required for the implementation of the epSOS Large Scale Pilot (LSP). It establishes normative standards, a foundation for the test planning, the test techniques and methods, the processes required to support the test effort, the definition of the test environments as well as the test execution and evaluation for the respective tests.

The discussion and content of this document start from some standard test concepts, ideas and recommendations from the members of the epSOS Work Package 3.9.

This document is normative for epSOS and its partners during the development and construction of the ICT Infrastructure. Parts of this document are normative for Member States (MS), as it defines criterion that are to be adhered to for those entering their systems into Test Phases that are operated

and managed by epSOS. Specifically this concerns the test phases:

- Conformance Test (CCT)
- Service Interoperability Test (SIT)
- Pre-Pilot Test (PPT)

The following Test Phases are not normative for MS and are only intended to provide MS guidelines:

- Component Unit Test (CUT)
- Component System Test (CST)
- Component Integration Test (CIT)

The Test Plan and Testing tools, developed to verify epSOS systems interoperability are defined and described in this document.

The criteria to define test data are provided in this document as input to WP3.10.

Goals, Prerequisites, organisational aspects of Projectathon, the epSOS event to verify system interoperability, are described. Test generation and the implementation of Projectathon will be a key task of WP3.10.

Change History

Version	Date	Status Changes	From	Details	Review
V0.0.1	16/11/2009	Draft	Gematik S.Sampson	First draft Testing Strategy	WP3.9
V0.0.6	10/08/2010	Draft	Gematik S.Sampson+ WP3.9 WG A	Final version of Testing Strategy, the basis for this document	WP3.9
V0.1	10/08/2010	Draft	Gematik S.Sampson	First full draft of D3.9.2	
V0.2	18/08/2010	Draft	M.Melgara	Structure of the document reworked	
V0.3	01/09/2010	Draft	S.Sampson	Comments and input from ANDA.	
V0.4	01/09/2010	Draft	M.Šimegh	Add questions and open issues for PAT	
V0.5	02/09/2010	Draft	S.Sampson	Corrections and input from F2F in Paris 24/25 August. Conclusion added #9 and further additions in respect to Test Data Generation in #3.8.	

V0.6	06/09/2010	Draft	M.Melgara	Formatting and alignment to D3.9.1	WP3.9
V0.7	23/09/2010	Draft	S.Sampson	Comments from the CRS	WP3.9
V0.8	24/09/2010	Draft	M.Melgara	Version for the External Review	WP3.9
V0.9	06/10/2010	Draft	M.Melgara S.Sampson	Version for the PEB Approval, including external review comments. Additional section 2.6.	WP3.9
V1.0	15/10/2010	Final	J. Artmann	Removed line numbering, updated doc status	WP5.3

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1 Introduction

The following is taken from Annex I.

Information and communication technologies (ICT) are deployed on a broad scale in healthcare by most member states (MSs). In view of its key priorities of citizen mobility and borderless healthcare, the approach outlined by the European Commission in the eHealth Action Plan is to help ensure the seamless pan-European flow of information between interoperable national systems for the benefit of patients.

In view of the complexity and diversity of national eHealth applications and the tremendous work invested, only little attention has been given so far to international interoperability. The strategic approach of the European Commission is to focus on the core applications of electronic prescription and Patient Summary to serve as “gate-openers” to achieve interoperability on a European scale.

The overarching goal of epSOS (Smart Open Services for European Patients) is to develop a practical epSOS Architecture and ICT infrastructure that will enable secure access to patient health information, particularly with respect to a basic patient summary and ePrescription[1], between European healthcare systems.

The large scale pilots’ main approach is to implement a small set of agreed use cases and an analysis of both existing and foreseeable national solutions. They will be used to design pilot systems that are based on the principle of interconnecting the respective national solutions.

A National Contact Point (NCP) has to be established by each participating country, acting as a bidirectional way of interfacing between the existing different national functions provided by the national IT infrastructures and those provided by the common European infrastructure, created in epSOS. The National Contact Point takes care of external and internal national communication and functions in epSOS and the semantic mapping (if necessary) between information on either side.

The NCP also acts as a kind of mediator as far as the legal and regulatory aspects are concerned. The NCP creates the conditions (by supporting trust, data protection and privacy) for a trusted relationship with other countries’ NCP’s. [AnnexI]

Taking into account the above from Annex I, the goals of WP3.10 are:

- To provide a robust implementation of the NCP
- To assure Member States that their NCP can integrate and be interoperable with other NCP’s from other Member States

[1] Since Annex I was published the eDispensation service has been identified as a requirement.

- To provide clear testing guidelines for all that wish to participate in the Large Scale Pilot (LSP).
- That many key interoperability issues that would possibly be a problem for WP4.2 are eliminated prior to the LSP.
- To provide a safe and secure interoperable epSOS Infrastructure that protects the HCP's and Patients interests.

It is not within the responsibility of epSOS to set the Member States goals and success criteria. However, member states can employ any of the test phases described in this document and the contained success criteria.

epSOS sets the goals and success criteria for the test phases that lie within their responsibility, which are described in this document.

1.1 Background

1.1.1 epSOS Scope

The following is taken from Annex I.

epSOS scope is to investigate, build and evaluate a service infrastructure to enable cross border interoperability of ePrescription and Patient Summary services, to facilitate patients' mobility, according to the European Commission's recommendation.

The service infrastructure will demonstrate the interoperability between two or more Electronic Health Record Systems, allowing the exchange of computer interpretable data and human understandable knowledge.

epSOS will identify means of interoperability which will allow connectivity of services and architectures that are potentially different in every Member State (MS), and to provide Patient Summary (PS) and ePrescription (eP) cross-border services.

epSOS will define, develop and test services to allow a patient from country A while being in country B, to exploit eP and PS services available in country A. [AnnexI]

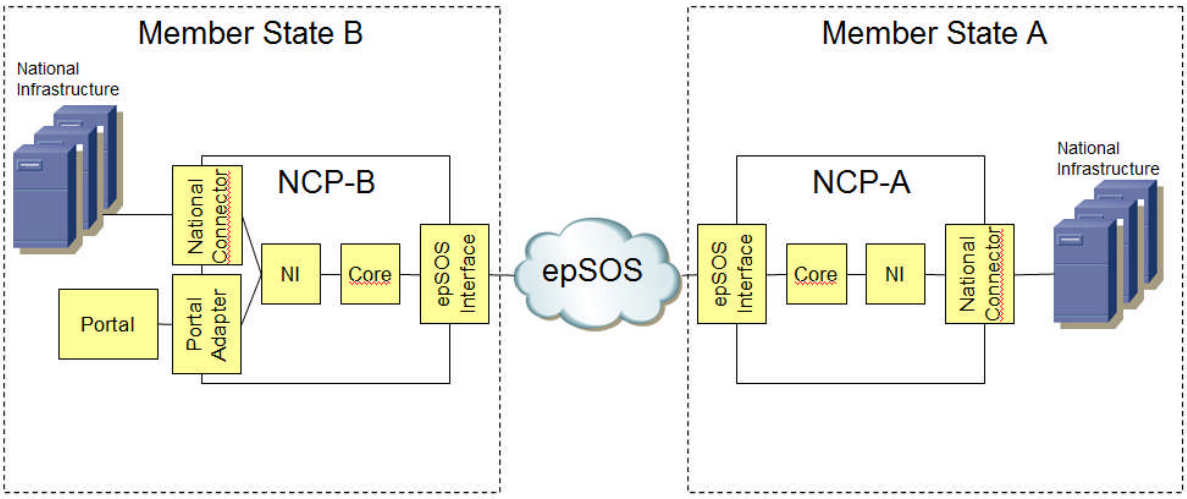


Figure 1 - Basic Architecture

epSOS has specified precisely the interoperability standards and profiles for communication between NCP's from different MS. These interoperability specifications have been defined by the output of WP 3.3 Architecture, WP3.4 Common specification components, WP3.5, Semantic Services, WP3.6 Identity Management, WP3.7 Security and Privacy. Together, these specifications along with some refinements specified in **[D3.9.1]**, form the detailed specification that NCP's have to comply with when sending and receiving information to / from other NCP's. These specifications establish the foundation against which, testing of NCP implementations will need to be tested in order to ensure interoperability of NCP's with each other, irrespective of their location and detailed software design.

According to PEB decision on 04/05/2010 in accordance to previous indications of PEB and PSB to define and develop as many common software components as is necessary, epSOS will develop the service software modules, conforming to the WP3.8/3.9 High Level Design Document that can be integrated into a MS NCP to facilitate implementation by MS NCP's in the epSOS Infrastructure.

epSOS will provide Member States with an NCP-in-a-Transparent-Box solution, a set of software components intended to facilitate a seamless integration of their National Infrastructure to the epSOS Infrastructure. The NCP-in-a-Transparent-Box offers a common application interface (National Interface) allowing the MS to develop a bridge to their National Infrastructure. This may require that Member States adapt their own National Infrastructure or the common software components to achieve their integration in the epSOS environment.

In addition epSOS will make a Web Portal (Portal) available to the Member States providing them a simple interface to be used by Country B for retrieving Patient Summaries (PS), ePrescriptions (eP) as well as for issuing eDispensations (eD).

epSOS will verify that an NCP developed by a MS, whereby the NCP-in-a-Transparent-Box solution is not used as a basis, can be integrated into the epSOS Infrastructure, and that the NCP is Interoperable with NCP's of other MS's.

epSOS will provide a reference test environment as part of the building of the epSOS Infrastructure, a tool that will enable the MS to verify with a high degree of certainty that their NCP implementation conforms to the epSOS Interoperability Specifications. A number of System Integration Test Phases will be conducted with original anonymous data retrieved from the electronic Prescription and Patient Summary services of Country A.

epSOS will provide a reference NCP as part of the building of the epSOS Infrastructure.

The System Integration Test Phase will be conducted with original anonymous data retrieved from the electronic Prescription and Patient Summary services of Country A.

1.1.2 epSOS Non Scope

epSOS will not integrate the service modules into the MS's NCP. The integration of the service modules into the MS's NCP will be done by MS in the epSOS framework under their own responsibility.

epSOS will not verify that an NCP of a Member State can be integrated or is interoperable with their own National Infrastructure. However, the testing strategy will cover the steps for Member States to perform to verify the integration of their NCP's in the epSOS Infrastructure.

In the event that a Member State defines and develops their own National Connector as part of their NCP, and it is no longer compatible with the epSOS definition, then the National Interface will not be tested by epSOS.

1.1.3 WP3.9 Methodologies Followed

Within this section, a summary of the methodological approaches adopted in WP3.9 will be summarised.

WP3.9 activities can be grouped under three main streamlines:

- Proof of Concept implementation
- Semantic interoperability
- Test strategy definition and test tool development

All the three streamlines have been addressed according to three phases, not necessarily fully sequential, but heavily overlapped:

- **Strategy definition**: is performed by identified core-teams, composed by specific experts, other WP Leaders, the Technical Project Manager, and the Project Co-ordinator, with the goal to build strategic approach, identify pros/cons, to present it to the TPM, PEB, and PSB. The approved strategy is activated, to allow the execution of the subsequent phases. The phase, in some cases, has included the definition of specific contracts with Suppliers or activity/funding assignment to beneficiaries.
- **Specification**: is performed by an enlarged team of experts, generally from many of the WP Beneficiaries. The goal is to provide MS developers and MS suppliers with the required specifications for the implementation. The draft specifications are submitted to the whole WP for approval, following the consolidated epSOS methodologies and tools.
- **Implementation**: is performed by either all of or specific beneficiaries or by selected Industry Team Members. The goal is to make available data, components, tools for the epSOS Proof of Concept creation and testing.
  The implementation phase, in all the three streamlines, has included the definition and the technical monitoring of the activities performed either by specific beneficiaries or external suppliers, regulated by agreements or by contracts assigned by the PSB, ratified by the epSOS Co-ordinating Beneficiary.

Information on "*Proof of Concept implementation streamline*" and on "*Semantic interoperability streamline*" can be found in D3.9.1 #1.2 "WP3.9 Methodological approach".

In the following section can be found a short summary of the major actions performed in the "*Test strategy definition and test tool development streamline*"

1.1.3.1 Test strategy definition and test tool development streamline

The epSOS Annex I to the Contract: "Description of Work" has reorganised WP3.9 and WP3.10 Testing activities, in order to avoid potential duplications, reducing overhead and increasing synergies.

Test strategy and testing tool development was consolidated in WP3.9 and is documented in this document.

Test data generation and testing execution were assigned to WP3.10.

We provide here a summary, in order to give a full picture of WP3.9 related activities.

Strategy definition: Definition of the overall Testing Strategy: the goal of the activity is to agree on the global methodology to be applied to perform the interoperability testing of the NCP implemented

by the MS. Alternatives were submitted to PEB/PSB whereby every MS develops and performs its tests, and test tools and data are generated by the Project. A further proposal was that the epSOS Beneficiaries developed tests, or a specialised expert entity would perform most of the activities. The core team defining the overall testing strategy was managed by ELGA, in strict co-operation with IHE Europe:

- PEB/PSB decided in favour of the Project developing the test tools.
- IHE Europe, an epSOS Beneficiary, was assigned the task to define and develop the testing tools and simulators, given that the majority of profiles to be tested are existing IHE profiles. IHE Europe testing activities were assigned to WP3.9/3.10 for their technical management. Within the definition of the overall Testing Strategy, it was analysed the way in which interoperability testing has to be performed:
    - NCP Interoperability testing will be performed in an individual Connectathon, organised and managed by IHE Europe, and called Projectathon. The Projectathon will not be limited to epSOS MS, but open to industries and other entities wanting to qualify their products and systems against epSOS specifications. It is planned to organise two Projectathons; in Slovakia during November 2010 and during April 2011 (location is undecided but will probably be in Pisa, Italy, and run in conjunction with the European Connectathon). This will allow the gradual inclusion of MSs and services in the epSOS LSP.

Specification: Definition of testing methodology (also called “epSOS Testing Strategy”), identifying test phases, test targets, responsibilities, in line with the overall Testing Strategy. The testing methodology also includes guidelines to MS on how to perform integration, testing and post-deployment testing. The test strategy activity was managed by Gematik GmbH

Definition of test tools and simulator: the activity aims to optimise the development of testing tools, by identifying the re-usability of already existing tools developed by IHE. Gap analysis between standard IHE Profiles and epSOS defined profiles in WP3.3, 3.4, 3.5, 3.6, 3.7 was performed, trying to minimise the delta. The activity was performed by IHE Europe and the aforementioned WP Leaders.

- The decision to use Gazelle, the testing environment developed by IHE Europe was taken by epSOS. It will also be used as a remote reference testing environment.
- Definition of Test Plan: Test scenarios and profiles to be tested were described and inserted in the Gazelle system, an overview of which can be found in this document. IHE and ELGA were responsible for this activity.

Implementation: Implementation is an ongoing activity. It is planned that all testing tools, simulators and the workflow manager be gradually released up until the end of September 2010. This is in

accordance to a release plan agreed with Fraunhofer ISST and Elga Team (F.E.T.) and in line with the MS development and testing plan. This activity is lead by IHE Europe, with relevant contributions from epSOS experts, in particular the Semantic Group for the development of the Schematron to test the epSOS documents based on the CDA.

1.2 Scope of this Document

1.2.1 Goals

The goal of this document is to communicate the test approach that will be followed within epSOS. It defines:

- the standards to be employed and adhered to
- the test levels and phases to be supported
- the test environments to be created
- the test methods and techniques to employ
- the statistics defined to measure progress
- the processes to be implemented to support the test effort
- the Test Plan definition strategy
- the Test Data definition Strategy
- the testing activities to be conducted based on the selected implementation activities
- the guidelines for the logistical organisation of the Projectathon[2]
- the testing approaches to be followed at the Projectathon (PAT), including criteria to participate to the first and maybe to the second Projectathon

1.2.2 Targeted Audience

The test strategy is aimed at all those involved in the conception of tests for components directly related to and defined within the scope of the epSOS Architecture and ICT infrastructure. Furthermore it clarifies for all involved the epSOS test strategy, including epSOS project members, member states, suppliers and vendors.

It is expected that the reader has an understanding of testing vocabulary and concepts.

[2] For an overview of the Projectathon see chapters 8.

1.2.3 Scope

This document provides prerequisites and guidelines for the test planning, test design, test implementation, test execution and test evaluation processes.

It is currently restricted to the testing conducted during the construction of the epSOS Architecture and ICT infrastructure. This covers testing activities up to and during the LSP. It does not cover testing beyond the LSP and for migrations to new releases after the LSP, although it should be used as a basis for the continued work.

It is applicable for the development of systems undertaken by epSOS, and to the organisation that assumes the responsibility for its implementation and test.

It does not provide a test strategy for the Component Unit, Component System and Component Integration Testing phases of components or systems defined by Member States or the Industry[3].

1.2.4 Document Structure

The document has eight further Chapters and an Annex:

- **General Conditions** where terminology, standards and the testable services are described.
- **epSOS Testing Methodology** lists the features of the system that are to be tested, **describes** the test levels, phases, and environments. In addition it characterises the test infrastructure, defines the test methods and design techniques, defines approval and signoff and what and to whom status and statistical information is to be sent, and lists the supporting processes.
- **Test Specification and Test Data Definition Strategy** defines the approach for identifying, recording and distributing the Test Cases and the Associated Test Data.
- **epSOS Integration / Interoperability Testing Approach** describes a possible approach for the epSOS testing phases SIT and PPT.
- **epSOS Test Plan Definition** describes the test plan with respect to the specifications of the WP3.X and the Test Strategy already defined in WP3.9.
- **Testing Tools** lists the tools that are to be made available to implementers prior to (CCT) and during the Projectathon (SIT).

[3] The term “Industry” does not apply to epSOS or the Fraunhofer ISST and Elga Team common components development partnership.

- **epSOS Projectathon** provides a brief overview of the Projectathon and the logistical steps that are taken prior to, during and after the Projectathon.
- **Conclusion** summarising the outcome of this document.
- **Annex** lists References, a Glossary and Open Points and Issues. In addition it provides where necessary further detailed information to the Chapters "*epSOS Test Plan Definition***"** and "*Testing Tools*".

2 General Conditions for Test Strategy Definition

2.1 Terminology

All terminology unless otherwise specified here is taken from the “ISTQB Glossary of Software Testing Terms” **[ISTQB]**.

2.2 Mandatory and Optional Standards

Mandatory

- IEEE Std. 829-2008 Standard for Software and System Test Documentation. Abstract: Test processes determine whether the development products of a given activity conform to the requirements of that activity and whether the system and/or software satisfy its intended use and user needs. Testing process tasks are specified for different integrity levels. These process tasks determine the appropriate breadth and depth of test documentation. The documentation elements for each type of test documentation can then be selected. The scope of testing encompasses software-based systems, computer software, hardware, and their interfaces. This standard applies to software-based systems being developed, maintained, or reused (legacy, commercial off-the-shelf, Non-Developmental Items). The term "software" also includes firmware, microcode, and documentation. Test processes can include inspection, analysis, demonstration, verification, and validation of software and software-based system products.
- IEEE Std. 1012-2004 Standard for Software Verification and Validation Abstract: Software verification and validation (V&V) processes determine whether the development products of a given activity conform to the requirements of that activity and whether the software satisfies its intended use and user needs. Software V&V life cycle process requirements are specified for different software integrity levels. The scope of V&V processes encompasses software-based systems, computer software, hardware, and interfaces. This standard applies to software being developed, maintained, or reused [legacy, commercial off-the-shelf (COTS), non-developmental items]. The term software also includes firmware, microcode, and documentation. Software V&V processes includes analysis, evaluation, review, inspection, assessment, and testing of software products.
- ISTQB Glossary of Software Testing Terms **[ISTQB]** **http://www.istqb.org/ISTQB Glossary of Testing Terms** Abstract: Much time and effort is wasted both within and between industry, commerce, government and professional and academic institutions when ambiguities arise as a result of

the inability to differentiate adequately between such terms as ‘statement coverage’ and ‘decision coverage’; ‘test suite’, ‘test specification’ and ‘test plan’ and similar terms which form an interface between various sectors of society. Moreover, the professional or technical use of these terms is often at variance with different meanings attributed to them.

- An exception here is the use of the term “Test Plan”. As this term already has a strong usage within epSOS it will be retained, but is used interchangeably and synonymously with the term “Test Specification”. The term “Test Concept” replaces the ISTQB term “Test Plan” but retains its meaning.

2.3 Services

2.3.1 National Contact Point

“A National Contact Point (NCP) acts as a legal entity which creates a secure link between the epSOS trust domain and the national trust domain. It is the only component that has an identity in both domains.” **[D3.3.2]**

2.3.2 epSOS Support Services

“There are a number of information sources which are relevant for every NCP and must be in the same state for every NCP. Examples for this are common taxonomies, schemas, and WSE addresses of NCP’s. This shared data is centrally managed in order to avoid inconsistencies and version conflicts in a generalisation process of epSOS.

Services are implemented within an NCP by using a static configuration table. It is the responsibility of each NCP to keep the configuration up to date from centrally managed data storage. ” **[D3.3.2]**

All of the support services are covered by the Configuration Manager that is described from a high level design perspective in #5.3 of D3.9.1 and the implementation details can be found in Appendix A of the same document.

2.4 Projectathon

epSOS will organise and manage Interoperability Testing events, to check the compliance of the MS and Vendors’ implemented systems to the epSOS Interoperability Profiles.

To prevent confusion with the IHE Connectathon, epSOS has renamed it to Projectathon. While the approach is the same, the actors and profiles have been adapted to the requirements of epSOS.

A more detailed description of the epSOS Projectathon is provided in # 8 epSOS Projectathon.

2.5 Pre-Requisites

2.5.1 Reference NCP Implementation

It is a pre-requisite that epSOS provides a reference NCP-in-a-Transparent-Box implementation for the following reasons:

1. To prove that all defined concepts and requirements as described in the various specifications (WP 3.1 through WP 3.7) can be implemented and tested.
2. To ensure that specification, design, implementation and test issues are identified as early as possible preventing unnecessary delay and extra costs through problems that are identified too late in the implementation or test process.
3. To allow MS to test their own country specific NCP implementations against an epSOS internally (epSOS / F.E.T. a Consortium including Vendors) tested[4] reference implementation. This ensures that MS own interoperability issues are identified and remedied earlier.
4. To allow MS to integrate their National Infrastructure against an epSOS internally (epSOS / F.E.T.) tested reference implementation. This is in the event that a MS chooses to adopt the NCP-in-a-box solution.

As epSOS / F.E.T. are planning to develop reusable modules that can be included in a proprietary MS NCP, epSOS / F.E.T. must build their own reference NCP around these reusable modules. The reference NCP, and / or the availability of part functionality, and / or the availability of reusable modules must be available before the MS begin developing and testing their respective parts of their NCP.

The operation of the reference NCP-in-a-box implementation lies within the responsibility of epSOS; F.E.T. is in no way obligated to operate it. The PEB/PSB has to decide how the Reference NCP-in-a-Box implementation will be operated and by whom.

[4] The NCP installation will be first approved at the epSOS Projectathon.

2.6 Member State, F.E.T. and Industry Responsibility

The following provides the Member States, F.E.T. and Industry a list of their responsibilities in relation to this document. Each item is followed by a reference within this document where further information can be found.

- It is the Member States, F.E.T. and Industry responsibility to test their solutions in order to achieve a suitable robustness before entering the Conformance and System Integration (Projectathon) Test Phases. As a guideline the following testing phases can be utilised:
    - Component Unit Test # 3.1.8.1
    - Component System Test # 3.1.8.2
    - Component Integration Test # 3.1.8.3

    The decision as to which test methods or test design techniques are to be used for these test phases is at the discretion of the Member States, F.E.T. and Industry.
- PAT registration # 8.2.3.1
- PAT / Gazelle education # 8.2.3.1
- Familiarisation with the Conformance and System Integration Test Tools and Simulators # 7 (and all sub-chapters).
- Familiarisation with the Conformance and System Integration Test Plan # 6 (and all sub-chapters) that provide an overview of the:
    - Roles
    - Test Cases
    - Workflows
    - Supporting Information
- Familiarisation with the Projectathon # 8.1and the Member State Activities # 8.2.3 (and all sub-chapters).
- Establish a Laboratory Test Environment # 3.3.1
- Import the Test Data # 3.8.1 (information pertaining to definition) # 3.8.4 (location of data)
- Conduct the Conformance Test # 3.1.8.4 & # 8.2.3.1
- Conduct the System Integration Test # 3.1.8.5
- Conduct the Pre-Pilot Test # 3.1.8.6

3 epSOS Testing Methodology

3.1 Test Levels, Types and Phases

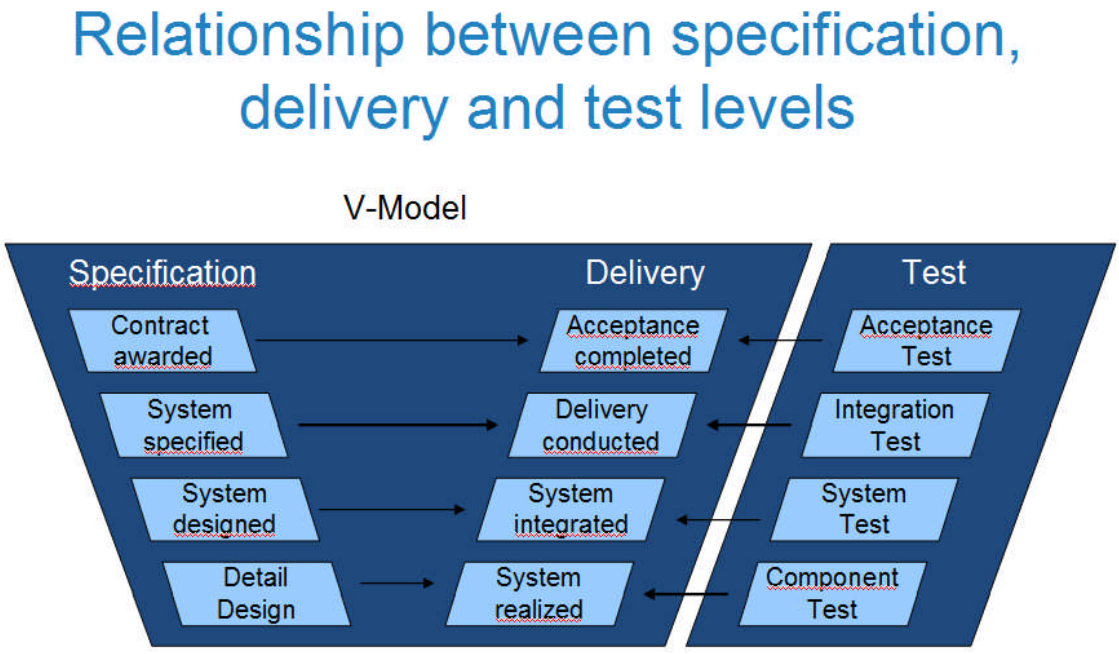
3.1.1 Test Levels

Test Levels are a group of test activities that are organized and managed together. A test level is linked to the responsibilities in a project. Examples of test levels are component test, system test, integration test and acceptance test.

This strategy defines four levels of test:

- Component
- System
- Integration
- Acceptance

The following figure shows the relationship between the levels and their respective specification and delivery levels. The two left hand columns are taken directly from the V Model. The right hand column is the mapping of the test levels onto the V-Model.



The following sections describe The Test Levels in more detail.

3.1.2 Component Test

Component test is the testing of individual software components.

The goal of the component test is to assess in a laboratory test environment, whether the test object has implemented accordingly the functions and interfaces and has fulfilled the non functional requirements as specified. Only parts of the integration and interoperability requirements can be examined during the component test:

- Integration between components as a single system.
- Integration between systems which groups components / sub-systems.

Those remaining must be tested in the System or at latest in the Integration test levels.

A Component for the purpose of epSOS can be a discrete software module or a sub-system. In relation to the NCP it can be the specific classes defined that make up a component or a complete component (transformation manager, configuration manager etc.). During this test phase the components that make up a system (e.g. NCP) must be integration tested with each other.

3.1.3 System Test

System test is the process of testing the integrated components as a complete system in a laboratory test environment whose goal is to verify that it meets accordingly the specified requirements of the epSOS project.

A System for the purpose of epSOS is a complete software system such as an NCP-A or NCP-B.

3.1.4 Integration Test

Integration Testing can be broken down into two categories:

Component integration testing: Testing performed to expose defects in the interfaces and interaction between components. This type of integration test is carried out within the Component or System Test level.

System integration testing: Testing performed to expose defects in the interfaces and interaction between systems; exercising those external interfaces (e.g. Electronic Data Interchange, Internet and OCSP Responder etc.).

With respect to epSOS this test concerns itself with the integration of the NCP-A and NCP-B, the Portal, and the other central services.

3.1.5 Acceptance Test

Acceptance Testing is the formal testing conducted in a production or production type environment with respect to user needs, requirements, and business processes. It is carried out to determine whether or not a system satisfies the acceptance criteria and to enable the epSOS project or other authorised entity to determine whether or not to accept the system into an operational environment.

3.1.6 Test Types

The building of an epSOS Architecture and ICT infrastructure cannot be regarded as a classical development project where at the end a single component or system is delivered. It requires the development of multiple components and systems from differing Member States and epSOS, with each undertaking their own internal development and test process. Components and systems that are submitted to epSOS will be verified during a Projectathon[5] as being able to integrate with other components or systems.

The test phases are logically categorised to a Test Type to help distinguish the test focus. For the purpose of this test strategy the following types have been defined:

- Component
- Service
- Pilot

The following sections expand upon the Test Types describing the purpose, responsibility, entry and exit criteria.

3.1.6.1 Component Type

The Component Type concerns the testing of a component or system in the Component and System Test Levels, covering such phases of testing as Component Unit Test, Component System Test, Component Integration Test and Component Conformance Test.

The goal of the Component Type test is a component or system that is verified as fully integrated and ready to be deployed as a service for further interoperability and pilot tests.

3.1.6.2 Service Type

The Service Type concerns the testing of an integrated component or system with other such systems, covering such phases of testing as Interoperability. While the focus of the component type

[5] For an overview of the Projectathon see chapter 8.

tests is local, the service type tests are global focusing ultimately on verifying interoperability with systems outside of its local infrastructure boundary.

The goal of the Service Type test is a component or system that is verified as interoperable with other integrated components or systems.

3.1.6.3 Pilot Type

The Pilot Type concerns the testing of an integrated and interoperable component or system covering such phases of testing as Pre-Pilot.

The goal of the Pre-Pilot Type test is a component or system that is verified as interoperable with other integrated components or systems and is ready to be operationally deployed.

3.1.7 Test Approach

3.1.7.1 Test Steps

The test approach is broken down into five distinct steps.

- **Test Planning** is the activity of establishing or updating a test concept.
- **Test Design** is the process of transforming general testing objectives into tangible test conditions and test cases.
- **Test Implementation** is the process of developing and prioritising test procedures, creating test data and, optionally, preparing test harnesses and writing automated test scripts.
- **Test Execution and Comparison** is the process of running a test on the component or system under test, and producing the actual result(s). Furthermore it involves the identification of the differences between the actual results produced by the component or system under test and the expected results for a test.
- **Test Evaluation** is the process of summarising all test activities and results. It also contains an evaluation of the test process and lessons learned.

3.1.7.2 Test Artefacts

Many test artefacts are created during the test steps, of which some can be file based as well as some tool based. It must be possible for the purpose of communication to generate some or all of the tool based artefacts into file based versions.

The following summarise those artefacts:

- **Test Plan** is the document describing the scope, approach, resources and schedule of intended test activities. It identifies amongst others test items, the features to be tested, the

testing tasks, who will do each task, degree of tester independence, the test environment, test design techniques and entry and exit criteria to be used, and the rationale for their choice, and any risks requiring contingency planning. It is a record of the test planning process.

- **Test Condition** is an item or event of a component or system that could be verified by one or more test cases, e.g. a function, transaction, feature, quality attribute, or structural element.
- **Test Design Specification** is a document specifying the test conditions (coverage items) for a test item, the detailed test approach and identifies the associated high level tests cases. When test conditions are tool based, this document must be generated direct from the tool.
- **Test Case** is a set of input values, execution preconditions, expected results and execution post conditions, developed for a particular objective or test condition, such as to exercise a particular program path or to verify compliance with a specific requirement. Test Cases can be captured in a tool, when not they are captured directly in a Test Specification.
- **Test Case Specification** is a document specifying a set of test cases for a test item. When test cases are tool based, this document must be generated from the tool.
- **Test Data Specification** is a document that describes the test data for test cases. This is an optional document that is created when the test data definition is maintained separately from the test case.
- **Test Script** is the term commonly used to refer to a test procedure specification, especially an automated one.
- **Test Suite** (Workflow Test (IHE Terminology)) is a set of several test cases for a component or system under test, where the post condition of one test is often used as the precondition for the next one.
- **Test Data** is data that exists before a test is executed, and that affects or is affected by the component under test. It refers to the actual test data as defined in the test data specification. Test Data should exist as an external entity in the form of a database or file, or non preferable is the definition directly in a test script.
- **Test Log** is a chronological record of relevant details about the execution of tests. These can be file or tool based.
- **Defect Report** is a document reporting on any flaw in a component or system that can cause the component or system to fail to perform its required function. These can be file or tool based.

- **Test Summary Report** is a document summarising the testing activities and results. It also contains an evaluation of the corresponding test items against exit criteria. These are file-based taking some of their data direct from tools.

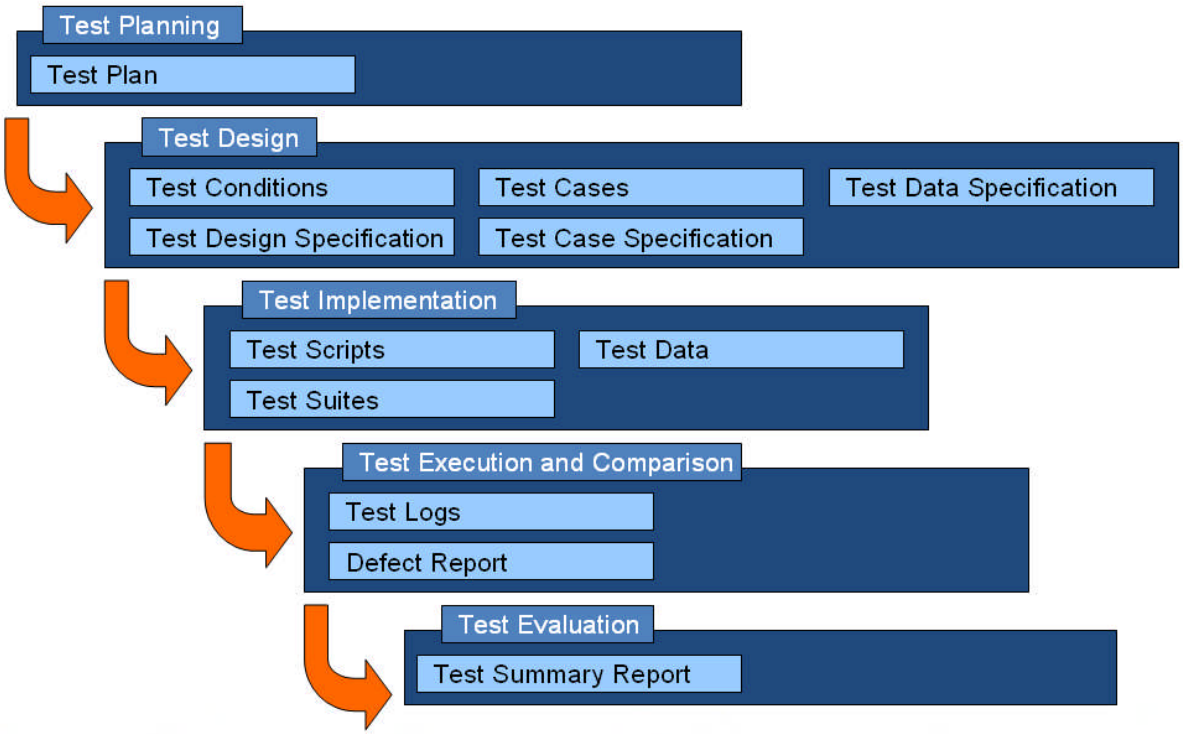


Figure 2 - Actions and Artefacts

The following figure positions the artefacts within their respective steps:

3.1.8 Test Phases

Test phases are a distinct set of test activities collected into a manageable group.

The term "phase" may suggest a strict chronological order. However, this is only partly correct, in principle:

- Component level tests precede the System, Integration level tests.
- The Component Test Phases precede the Service Test Phases which themselves precede the pre-Pilot test.

However, tests in a following phase can be conducted so long as the entry criteria for this phase have been met and where applicable dependant tests have been conducted. This requires that a Test Concept define the Test Phases with their own entry and exit criteria superseding that of this

Test Strategy. While this has the advantage of speeding up the test it requires additional effort and analysis in defining the Test Concepts.

This test strategy supports the following Test Phases:

- Component Unit Test (CUT)
- Component System Test (CST)
- Component Integration Test (CIT)
- Conformance Test (CCT)
- Service Interoperability Test (SIT) (Projectathon)
- Pre-Pilot Test (PPT)

The following figure shows the relationship between the test levels and phases:

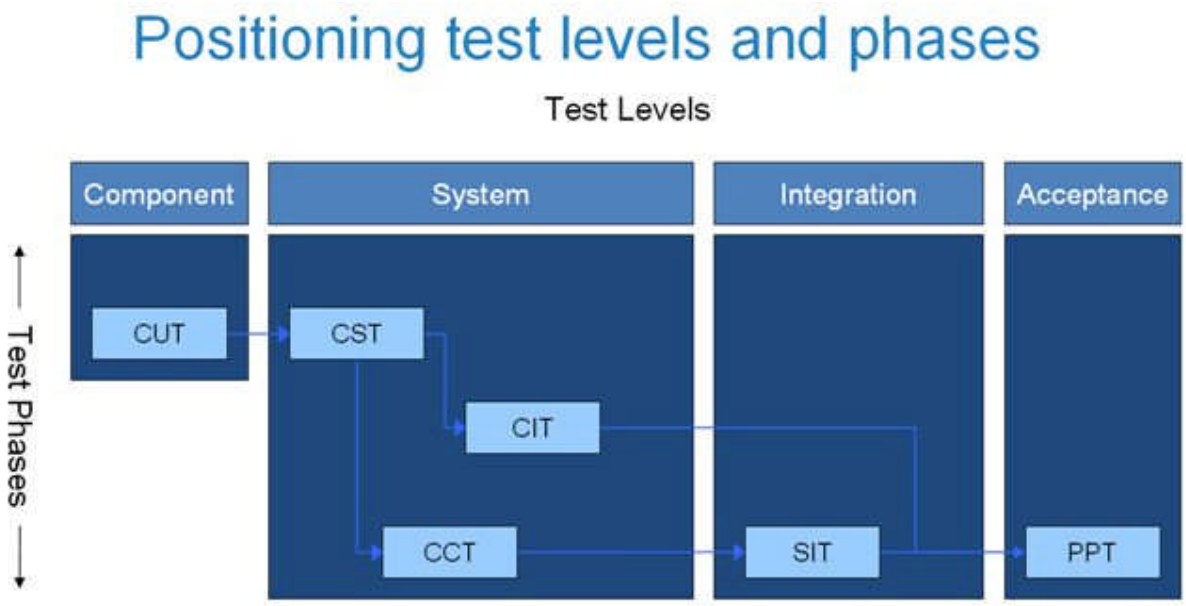


Figure 3 - Levels and Phases

The following sections expand upon the Test Phases describing the purpose, responsibility, entry and exit criteria.

3.1.8.1 Component Unit Test

Purpose

The Component Unit Test is the phase foreseen to test the software components (SWC). Its objective is to expose defects in the internal behaviour of the software component under test. The

components are treated as white boxes and as such should be tested using appropriate white box techniques.

During this phase the components that make up the NCP, Portal and or any other external services developed by epSOS or its subcontractors will be tested. The goal is a fully tested component that is ready for the integration into a complete system.

Responsibility

Task / Organisation	epSOS / IHE	Member State (Own development)	F.E.T. (NCP-in-a-box)	Industry (Components)
Test Planning		X	X	X
Test Design		X	X	X
Test Implementation		X	X	X
Test Execution		X	X	X
Test Evaluation		X	X	X

epSOS and F.E.T.

Where epSOS undertakes the development of a component, the accountability falls ultimately under epSOS but the responsibility for its execution can be assumed by epSOS or its sub-contractors / beneficiaries. In the case of the NCP-in-a-box, the responsibility falls under F.E.T.

Where possible, epSOS[6] will provide Member States with Test Stubs, Drivers, Simulators and Validators to support the testing of the epSOS trust domain interface. See # 7.2 for a list of available simulators and validators.

Member States and Industry

The Member States and the Industry are responsible for their component unit testing. This Test Strategy places no constraints or requirements on their test process.

Entry Criteria

The organisation tasked with the development of the component is to define their entry criteria. Due to the informality of this test phase epSOS places no constraints on its definition.

Exit Criteria

The following must be met and formally documented in order for the component to enter into the next test phase:

[6] F.E.T. will not provide any simulators.

- Requirement to modules coverage matrix showing implementation of all requirements with a priority of high and medium.
- Internal testing coverage of all paths, branches, and conditions showing coverage:

For epSOS LSP	Code Coverage	Use of code-metrics / bug detection software
Gateway / high-severity SW	>80%	Yes / Yes
Support tools	>60%	Yes / Yes
GUI	-	No / Yes

- No open problems of severity 1 and 2 as defined in this document in # 3.6.3.1 Defect Classification.
- No open problems of severity 3 as defined in this document without a functioning workaround.
- Component under Configuration Management, versioned and base lined.
- Workarounds are documented in the release notes.

When the defined exit criteria have not been met the Test Report must list the deviations and their estimated risk. In this case epSOS must decide if the component can take part in the next test phase.

Deliverables

The following are the expected deliverables:

A Test Report whose content is defined by the organisation conducting the tests, incorporating the results of the test; including as a minimum the information listed in the exit criteria; as verification that the tests have been completed.

3.1.8.2 Component System Test

Purpose

The Component System Test is the phase foreseen to functionally and non-functionally system test a software component. Its objective is to expose defects in the functional and non-functional behaviour of the software system under test. The systems are treated as black boxes and as such should be tested using appropriate black box techniques.

During this phase the system (NCP, Portal, or external services developed by epSOS) that is made up of the components tested during the component unit test phase will be tested. The goal is a fully tested system that is ready for integration testing.

Responsibility

Task / Organisation	epSOS / IHE	Member State (Own development)	F.E.T. (NCP-in-a-T-box)	Industry (Components)
Test Planning		X	X	X
Test Design		X	X	X
Test Implementation		X	X	X
Test Execution		X	X	X
Test Evaluation		X	X	X

epSOS and F.E.T.

Where epSOS undertakes the development of a system, the accountability falls ultimately under epSOS but the responsibility for its execution can be assumed by epSOS or its subcontractors.

In the case of the NCP-in-a-Transparent-Box, the responsibility falls under F.E.T.

Where applicable, epSOS will provide Member States with Test Stubs, Drivers, Simulators and Validators to support the testing of the epSOS trust domain interface. See # 7.2 for a list of available simulators and validators.

Member States and Industry

The Member States and the Industry are responsible for their component system testing. This strategy places no constraints or requirements on their test process.

Entry Criteria

The following defines the entry criteria for admission to the Component System Test phase:

- The exit criterion for the Component Unit Test phase has been met.
- Availability of all component documentation including but not restricted to release notes, installation and configuration handbook, and user guide.
- Availability of Workarounds

Exit Criteria

The following must be met and formally documented in order for the component to enter into the next test phase:

- Requirement to test case coverage matrix showing 100 percent coverage of all functional, non-functional and non integrative testing requirements.
- All Test Cases with a priority of 1 or 2 as defined in # 3.6.2.1 Test Case Priority, have the test result Pass.
- 70% of all test cases with a priority of 3 have been executed
- All problems of severity 1 and 2 as defined in # 3.6.3.1 Defect Classification, are closed
- All open problems of severity 3 have a functioning workaround and are described in the Test Report.
- All Test Artefacts are under Configuration Management and Base lined.
- System under Configuration Management, versioned and base lined.
- System is available as an installable packet (MSI, TAR, etc.)

When the defined exit criteria have not been met the Test Report must list the deviations and their estimated risk. In this case epSOS must decide if the system can take part in the next test phase.

Deliverables

The following are the expected deliverables:

A Test Report incorporating the results of the test; including as a minimum the information listed in the exit criteria; as verification that the tests have been completed.

The system must be provided in the form of an installable CD or downloadable packet (MSI, TAR, etc).

3.1.8.3 Component Integration Test

Purpose

The Component Integration Test is the phase foreseen to test the interaction between two systems, which have previously been system tested. Its objective is to expose defects in the interfaces and the interaction with other previously tested systems and verify that they are interoperable with one another.

This phase can only take place when a software producer develops a system that is required to be integrated with another system (actual or reference).

In the case that a software provider only develops a single system, they will have to wait until the Service Interoperability Test phase (Projectathon) before being able to integration test their systems with those developed by other software producers.

Responsibility

Task / Organisation	epSOS / IHE	Member State (Own development)	F.E.T. (NCP-in-a-T-box)	Industry (Components)
Test Planning		X	X	X
Test Design		X	X	X
Test Implementation		X	X	X
Test Execution		X	X	X
Test Evaluation		X	X	X

epSOS and F.E.T.

Where epSOS undertakes the development of a system, the accountability falls ultimately under epSOS but the responsibility for its execution can be assumed by epSOS or its subcontractors. In the case of the NCP-in-a-Transparent-Box, the responsibility falls under F.E.T.

Where applicable, epSOS will provide Test Stubs, Drivers, Simulators and Validators to support the integrative testing of the epSOS trust domain interface. See # 7.2 for a list of available simulators and validators.

Member States and Industry

The Member States and the Industry are responsible for their component integration testing. This Test Strategy places no constraints or requirements on their test process.

Entry Criteria

The following defines the entry criteria for admission to the Component Integration Test phase:

- The exit criterion for the Component System Test phase has been met.
- Availability of updated component documentation including but not restricted to release notes, installation and configuration handbook, and user guide.
- Availability of workarounds.

Exit Criteria

The following must be met and formally documented in order for the component to enter into the next test phase:

- Requirement to test case coverage matrix showing 100 percent coverage of all integrative testing requirements.
- All Test Cases with a priority of 1 or 2 as defined in # 3.6.2.1 have the test result Pass.
- 70% of all test cases with a priority of 3 have been executed

- All problems of severity 1 and 2 as defined in # 3.6.3.1 Defect Classification are closed
- All open problems of severity 3 have a functioning workaround and are described in the Test Report.
- All Test Artefacts are under Configuration Management and Base lined.
- Component base lined.

When the defined exit criteria have not been met the Test Report must list the deviations and their estimated risk. In this case epSOS must decide if the system can take part in the next test phase.

Deliverables

The following are the expected deliverables:

A Test Report incorporating the results of the test; including as a minimum the information listed in the exit criteria; as verification that the tests have been completed.

System is available as an installable packet (installable CD, MSI, TAR, etc.).

3.1.8.4 Conformance Test

Purpose

The Conformance Test is the phase foreseen to test the pre-defined epSOS test cases against the component or system as the pre-requisite for entry into the Service Interoperability Test (Projectathon). Its goal is to verify that all pre-defined test cases pass when executed against the component or system under test.

Responsibility

Task / Organisation	epSOS / IHE	Member State (Own development)	F.E.T. (NCP-in-a-T-Box)	Industry (Components)
Test Planning		X	X	X
Test Design	X			
Test Implementation	X	X	X	X
Test Execution		X	X	X
Test Evaluation	X			

epSOS and F.E.T.

Where epSOS undertakes the development of a system, the accountability falls ultimately under epSOS but the responsibility for its execution can be assumed by epSOS or its sub-contractors / Beneficiaries. In the case of the NCP-in-a-Transparent-Box, the responsibility falls under F.E.T.

As certain decisions pertaining to the division of work have already been taken these are reflected here.

- Test Design is assumed by the beneficiary IHE.
- Test Implementation is assumed by epSOS and the beneficiary IHE.
- Test evaluation is assumed by the beneficiary IHE.

Where applicable, epSOS will provide Member States all necessary Test Stubs, Drivers, Simulators and Validators to support the conformance testing. See # 7.2 for a list of available simulators and validators.

Member States and Industry

- Test Planning will be assumed by Member States, F.E.T. or the Industry.
- It is not ruled out that the Member States, F.E.T. or the Industry have anything to implement.
- Test Execution will be assumed by the Member States, F.E.T. or the Industry.

Entry Criteria

There is no formal entry criterion for admission into this phase.

Exit Criteria

As the entry into the Service Interoperability Test (SIT) is dependant on the results of the Conformance Test, and the responsibility for SIT lies within epSOS, the following exit criterion applies to all software producers' epSOS, MS, vendors and software producers alike:

- All Test Cases executed and have the test result Pass.

Deliverables

All who are to participate in the Service Interoperability Test are to provide epSOS with their Test Results. The structure and method of communication will be defined by epSOS.

Following the audit of test results, epSOS will provide the submitter with a confirmation of participation.

3.1.8.5 Service Interoperability Test

Purpose

The Service Interoperability Test or Projectathon is the phase foreseen to test the pre-defined test cases as defined by epSOS. The SIT has a Workshop characteristic and is conducted in a pre-determined location, within a pre-defined duration in which the test cases are executed. Participants register their interest and providing they meet the entry criteria can take part.

Its objective is to verify that all pre-defined functional, non-functional and integrative test cases pass when executed against:

- A standalone component or system
- A component that is integrated with other standalone components or systems

The goal is to verify the interaction of integrated components during the execution of end to end business processes.

Responsibility

Task / Organisation	epSOS / IHE	Member State (Own development)	F.E.T. (NCP-in-a-T-Box)	Industry (Components)
Test Planning	X			
Test Design	X			
Test Implementation	X	X	X	X
Test Execution		X	X	X
Test Evaluation	X			

epSOS

Where epSOS undertakes the development of a system, the accountability falls ultimately under epSOS but the responsibility for its execution can be assumed by epSOS or its sub-contractors / Beneficiaries. In the case of the NCP-in-a-Transparent-Box, the responsibility falls under F.E.T.

As certain decisions pertaining to the division of work have already been taken these are reflected here.

- Test Design is assumed by the beneficiary IHE.
- Test Implementation is assumed by epSOS and the beneficiary IHE.
- Test evaluation is assumed by the beneficiary IHE.

Where applicable, epSOS will provide Member States all necessary Test Stubs, Drivers, Simulators and Validators to support the conformance testing. See # 7.2 for a list of available simulators and validators.

Member States F.E.T., and Industry

- Test Planning will be assumed by Member States, F.E.T. or the Industry.
- It is not ruled out that the Member States, F.E.T. or the Industry have anything to implement.
- Test Execution will be assumed by the Member States, F.E.T. or the Industry.

In addition, participating Member States, F.E.T. and the industry are responsible for the delivery, installation, configuration and management of their systems during the Projectathon. Additionally they will be responsible for the execution of test cases and the delivery of all results to the officiating monitors. Furthermore they are responsible for the analysis of problems arising through the execution of test cases against or in combination with their systems.

The MS should ensure that Health Care Professionals are part of the team responsible for executing tests or at least for evaluating the test results.

Entry Criteria

The following entry criterion applies to all participants of the SIT:

- The exit criterion for the Conformance Test phase has been met.

Exit Criteria

The purpose of the exit criterion is to determine when testing can be halted, but as the duration defines the end of the test there is no need to define a formal exit criterion. At the end of the tests, the results are collected and a final summary report is created and communicated to all participants.

Deliverables

- Test Results entered by the Member State into the Gazelle system (requirement for the Test Evaluation)
- A Test Report to be provided by epSOS for each participating MS or organisation indicating whether or not they have passed the Projectathon and can participate in the Pre-Pilot tests.

3.1.8.6 Pre-Pilot Test

Purpose

The Pre-Pilot Test (also called LSP-Testing) is the phase foreseen to regression test the installed components in their target Pilot environment firstly as a standalone component and secondly with other standalone components or systems. Finally Services are tested in the complete Large Scale Pilot testing infrastructure, separated from the LSP-Operational Infrastructure for safety and security reasons.

Its goal is to ensure that there are no problems or issues with the setup and configuration of the epSOS Infrastructure and the components connected to it. Tests are executed using dummy data, or real patient data that has been anonymised (decision is up to the Member State). A Member State may decide to use real Patient data or real Patients, who require to be informed that they are participating in a pre-pilot trial. Extensive and possibly exhaustive end-to-end testing will be performed, involving HCP from Country B, to ensure the level of safety in the document semantic

transformation to achieve functional interoperability and get statistically significant data for the Evaluation performed by WP1.2.

Additionally a clinical risk assessment is to be conducted against the original data sent from Country A and the data received by Country B to ensure that during the transformation of data no adverse risk is apparent to the patient.

The level of testing during LSP-Testing will be determined according to:

- Quality Level achieved by F.E.T. NCP-in-a-Transparent-Box (demonstrated during its acceptance performed by WP3.10)
- Results of MS NCP testing pre and post Projectathon
- Size of the statistically significant sample

Once a MS has passed this phase and their Pilot fulfils the entry criteria for the LSP Operation, it is able to enter the Trust Domain of epSOS and will be interoperable with all other Pilots that have the same status.

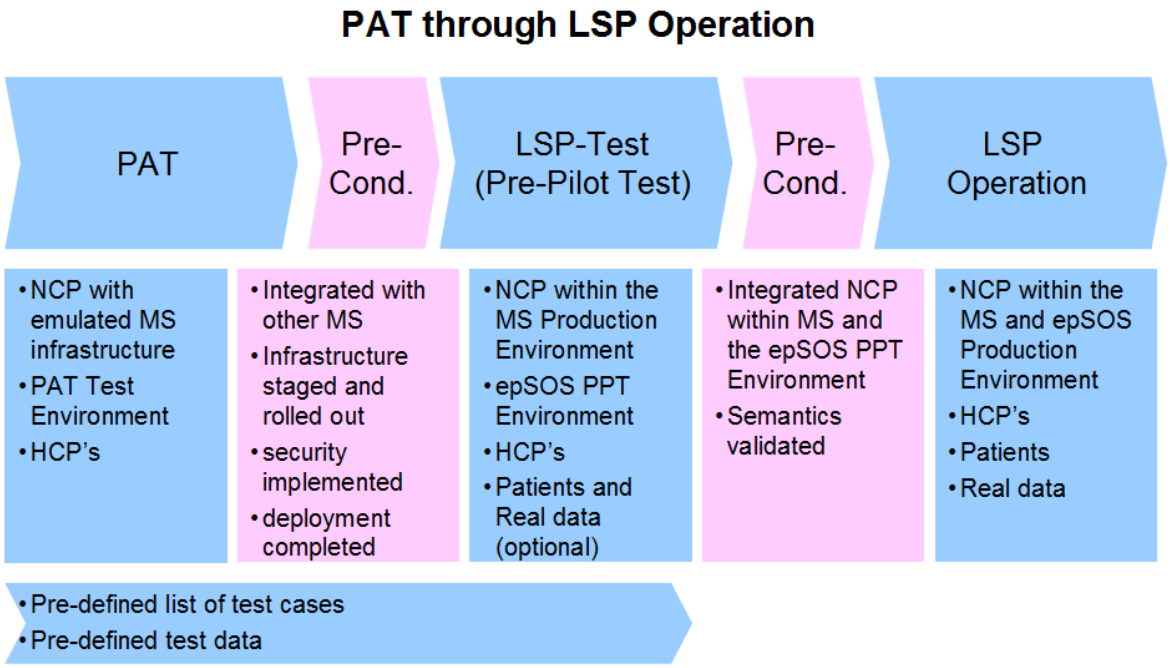


Figure 4 - PAT through LSP Operation

Independent of this epSOS driven test phase, it is possible and expected that a MS execute a local pre-pilot test to ensure the integration and interoperability of their national infrastructure.

Responsibility

Task / Organisation	epSOS / IHE	Member State (own Development)	F.E.T. (NCP-in-a-T-Box)	Industry (Components)
Test Planning	X	X		
Test Design	X	X		
Test Implementation	X	X		
Test Execution	X	X		
Test Evaluation	X	X		

epSOS

The responsibility for the preparation, organisation, evaluation of results, and reporting of this test phase with respect to the NCP lies wholly within epSOS. The end to end tests from the Portal or Member State B National Infrastructure through to the Member State A National Infrastructure will indirectly test all components in the process chain.

For the complete duration of this Test Phase a functioning pre-pilot test environment must be made available. epSOS assumes the responsibility to source this test environment via one of the following:

- One country alone or a group of countries provide as a service to the project a Pre-Pilot Test Environment supporting all scenarios for Member State A and B. This would allow another Member State to Pre-Pilot test their system at any time.
- During the Pre-Pilot tests pilot sites are grouped together to form an end to end environment. This would only allow a Member State to Pre-Pilot test their system when an opposing Member State is at the same time available.

Member States

Member States are responsible for the delivery, installation, configuration and management of their systems during the Pre-Pilot Test phase. Additionally they will be responsible for the execution of test cases and the delivery of all results to epSOS. Furthermore they are responsible for the analysis of problems arising through the execution of test cases against or in combination with their systems.

The MS should ensure that Health Care Professionals are part of the team responsible for executing tests or at least for evaluating the test results.

Entry Criteria

- Test Report from the Service Interoperability Test indicating that the Projectathon has been passed.

Exit Criteria

- All Test Cases related to standalone tests have been executed and have the test result Pass.
- All Test Cases related to interoperability tests have been executed and have the test result Pass.
- The Clinical Risk Assessment presents no adverse risk to patients.

When the defined exit criteria have not been met the Test Report must list the deviations and their estimated risk.

Deliverables

- Clinical Risk Assessment.
- Test Results entered by the Member State into the Gazelle system (requirement for the Test Evaluation)
- A Test Report to be provided by epSOS for each participating MS indicating whether or not they have passed the Pre-Pilot Test and are able to switch to live operation and enter the Trust Domain of epSOS. The Test Report is to be produced by WP3.10.

3.2 Test Items

The following lists those features found in input specifications that need to be or cannot be tested. In the case that requirements cannot be tested the justification is described.

The features to be tested are restricted to the NCP and Portal. Requirements relating to the national Infrastructures cannot be tested by epSOS, but such testing is a pre-requisite for each MS.

Functional (FR) and Non-Functional (NFR) requirements will be analysed.

3.2.1 Features to be tested

The following features are to be tested and can be located in the functional service requirements of **[D3.1.2]** and **[D3.2.2]** accordingly. Please refer to these documents for detailed information pertaining individual requirements.

The features to be tested are divided into two categories:

1. Covers the features to be tested during the development of the NCP and Portal.
2. Covers the features to be tested during the Projectathon.

3.2.1.1 Development of NCP and Portal

The NCP and Portal are being developed by the F.E.T. They are responsible for the Unit, System and Integration Tests of the NCP in both their A and B flavours, along with the Portal.

FR02 – Trust between countries – restricted to the interface NCP-B to NCP-A. Trust will be given or not between two countries NCP's. Trust will be established mutually between the two countries NCP's, with the technical implementation for epSOS to decide. The HCP does not play a role in the establishment of the trust relationship, but is affected by its outcome, for example a patient from a country whereby no trust relationship exists. The NCP-B in this case must be prepared for such a scenario.

FR03 – Patient Identification – NCP-B will send a Patient identification request to the NCP-A, which in turn will forward the request to the National Infrastructure of MS A. The NCP-A will receive the Patient Identification data from the MS A National Infrastructure and forward it to the NCP-B. Testing is restricted to validating according to epSOS requirements, that a patient can be identified through the Portal or the National Connector of the NCP-B, and the epSOS interface of the NCP-A.

FR04 – Patient consent to access data – NCP-B will send a Patient Consent request to the NCP-A, which in turn will forward the request to the National Infrastructure of MS A. The NCP-A will receive the Patient Consent answer provided / not provided from the MS A National Infrastructure and forward it to the NCP-B. Testing is restricted to validating according to epSOS requirements, that consent to access patient data can be granted through the Portal or the National Connector of the NCP-B, and the epSOS interface of the NCP-A. It will be possible to conduct the test from the connector side of the NCP-B via the NCP and the Portal.

FR05 – Structured Information – Verify that the information passed between two NCP's is structured / converted according to the requirements of epSOS. This has to be verified between the NCP's and further verified on the Portal.

FR09 – Prescription presentation – see FR05.

FR10 – 'Available' (and thus, valid) prescription – Verify that only prescriptions that are valid are displayed.

FR12 – Original Prescription – see FR05.

FR15 – Dispensed medicine information sent to country A – Verify that information passed between two NCP's is structured / converted according to the requirements of epSOS. This has to be verified between the NCP'S and further verified on the Portal.

FR19 - Patient summary of Country A available – see FR05.

FR20 – Information Traceability – the requirement does not provide enough information about which systems are responsible for auditing data. Therefore it is assumed that all systems are responsible for auditing data (NCP-A, NCP-B, and HCP-B). However, only the NCP's will be verified by epSOS according to epSOS requirements.

NFR02 – Communication – secure communication between NCP's will be verified during interoperability testing.

NFR03 – Response Time – the response time of a NCP and the response time between NCP's are within the defined parameters that will be verified. This will be restricted to proving that the roundtrip time between the Portal, NCP-B and NCP-A is not excessively slow. The response time of the MS National Infrastructure will not be measured.

NFR04 – It is assumed that an unauthorised party is anyone other than the HCP. It will be verified that patient data cannot be obtained through malicious or non-malicious methods within the NCP.

NFR05 – epSOS will verify that the NCP is not accessible via any of its interfaces to anyone other than authorised persons.

NFR06 – epSOS will verify that all access or attempted access to medical data via the NCP is audited. This is restricted to the NCP-A and NCP-B.

NFR07 – Integrity – epSOS will verify that the NCP A and B has not damaged, reduced or altered the data in anyway.

NFR08 – non repudiation – Can only be tested between the NCP's.

There are no specific Patient Summary features to be tested as all requirements are covered by the general requirements above.

3.2.1.2 epSOS NCP features to be tested at Projectathon

Although there will be no Test Cases created with the intention of specifically testing the Portal during the Projectathon, it will be used to initiate certain workflows and to view subsequent results. Therefore the Portal will be implicitly tested.

FR01 – HCP Identification and Authentication – despite being a national implementation it belongs to the processes Electronic Prescribing, Electronic Dispensing and Patient Summary and can be visually validated at the HCP-B.

FR02 – Trust between countries – restricted to the interface NCP-B to NCP-A. Trust will be given or not between two countries. Trust will be established mutually between two countries, with the technical implementation for epSOS to decide. The HCP does not play a role in the establishment of the trust relationship, but is affected by its outcome, for example a patient from a country whereby no trust relationship exists. The NCP-B in this case must be prepared for such a scenario.

FR03 – Patient Identification – this can be tested along the entire process path ending with a visual validation at the HCP-B.

FR04 – Patient consent to access data – this can be tested along the entire process path ending with a visual validation at the HCP-B.

FR05 – Structured Information – this can be tested along the entire process path ending with a visual validation at the HCP-B.

FR06 – Equivalent Information – It has to be tested the initial information in Country A and the received info in Country B, are equivalent along the entire process, path ending with a visual validation at the HCP-B. This test and the following one are performed by HCPs, both during interoperability testing and pre-production testing (see 3.8.2.4.2 for more details).

FR07 – Information understandable – this can be tested along the entire process path ending with a visual validation at the HCP-B.

FR08 – Information selection – deals with the display and selection of prescriptions to the Dispenser and although it cannot be verified by epSOS, it must be verified by a MS Health Care Professional.

FR09 – Prescription presentation – this can be visually validated at the HCP-B.

FR10 – 'Available' (and thus, valid) prescription – Verify that only prescriptions that are valid are displayed.

FR12 – Original prescription – this can be visually validated at the HCP-B.

FR13 – Identification of the medicinal product – this can be visually validated at the HCP-B.

FR15 – Dispensed medicine information sent to country A.

FR16 – Identification of original prescription and medicinal product dispensed – Verify that the data returned to MS A in the eD contains the Prescription Id from the original eP.

FR17 – Original dispensed medicine – Verify that the data returned to MS A in the eD contains the brand name of the Medicinal Product dispensed plus the active ingredient and quantity.

FR19 – Patient summary of Country A available – this can be tested along the entire process path ending with a visual validation at the HCP-B.

FR20 – Information Traceability – restricted to the NCP's.

NFR07 – Integrity – epSOS will verify that the NCP A and B has not damaged, reduced or altered the data in anyway.

NFR08 – non repudiation – Can only be tested between the NCP's.

3.2.2 Features not to be tested

The following features have a functional aspect that do not relate to the functionality between two NCP's but the NCP and its respective national infrastructure or the NCP and the HCP. As epSOS

does not test the interfaces within the national infrastructures it is regarded as outside of the scope of this test strategy.

FR11 – Access to Medication Summary by dispenser - No centralised test tool will be provided by epSOS, since this is a requirement that is implemented on a voluntary basis. Responsibility to test it is left to the MS piloting it (see D3.1.2).

FR14 – Substitution – this cannot be tested as it relates solely to a process related to the Dispenser. If a medicine is subsequently substituted the information must be sent back to Country-A, which is covered in FR15.

FR20 – Information Traceability – epSOS will not verify the traceability of information stored on systems other than the NCP.

NFR01 – Service Availability – The description relates to operational requirements, the result of which would be the definition of SLA's, and the setting up of a Command Centre responsible for monitoring all systems that are connected directly to the epSOS Infrastructure. It is assumed that epSOS will not create a command centre but allow the MS to regulate themselves.

NFR03 – Response Time – does not cover the response time of any Country B system other than the NCP, or any other Country A system other than the NCP. However, end-to-end response time will be measured for service evaluation purposes.

NFR04 – Confidentiality – epSOS will not verify that patient data in systems other than the NCP can be obtained through malicious or non-malicious methods.

NFR05 – the description does not refer specifically to the NCP but generally as Systems. This requirement therefore encompasses all systems in the end to end process. It is not possible for epSOS to verify systems other than the NCP.

NFR06 – No other epSOS LSP Services other than an NCP are defined that will receive or have access to medical data.

NFR09 – Trust - This requirement concerns itself with the non-functional aspect of trust between countries, specifically those policies defined by epSOS and to be implemented by the Member States. The implementation of those policies will be verified through Audits during and post rollout. As the rollout is not scope of this test strategy it should be addressed by WP4.3. TPM is evaluating a proposal to assign technical tasks to WP3.10 during the LSP testing phase.

NFR10 – Guaranteed delivery – epSOS cannot verify that the HCP-B confirms that the data is properly received.

NFR11 – This is a requirement of a MS. This type of functionality must be restricted to the MS national infrastructure and not the NCP. It must already be standard within a MS national infrastructure as this problem could already occur within their borders.

NFR12 – Supervision services – are operational services and as such are out of scope of epSOS. These services cover the creation of SLA's and probes, the monitoring of real time performance and services. It is the responsibility of the operational organisations to verify these requirements. This is also coupled with NFR01 – Service Availability.

3.3 Test Environments and Infrastructure

3.3.1 Test Environments

This test strategy defines the following test environments:

- Unit Test Environment (UTE)
- Laboratory Test Environment (LTE)
- Reference Test Environment (RTE)
- Projectathon Test Environment (CTE)
- Pre-Pilot Test Environment (PTE)

The Unit Test Environment UTE is a test environment where the developers from epSOS, Member States, suppliers or vendors unit test their components and each of whom is responsible for its acquisition and management. The test environment is typically made up of developers' machines with supporting testing software. It is not possible to describe the architecture of such a test environment as it can vary from organisation to organisation. The test phase Component Unit Test would use such a test environment.

The Laboratory Test Environment LTE is a test environment where testers from epSOS, Member States, suppliers or vendors perform functional, integration and conformance tests of their components or systems, each of whom is responsible for its acquisition and management. The test environment is typically made up of virtual or actual test systems, with supporting test software. It is not possible to describe the architecture of such a test environment as it can vary from organisation to organisation.

The Reference Test Environment (RTE) is a test environment where developers and testers of Member States, suppliers or vendors have the possibility to connect and integrate their components and systems by applying well-defined test plans, tools and processes. The epSOS project is responsible for the establishment of the RTE and its management.

The Projectathon Test Environment CTE is a test environment where Member States, suppliers and vendors can interoperability test their components and systems against other Member States, suppliers and vendors components and systems. The epSOS project is responsible for the definition of the CTE; epSOS will setup and manage systems and services required to connect MS Solutions with one another; the MS are responsible for the setup and management of their systems within this environment.

The Pre-Pilot Test Environment PTE is a conglomeration of Pilot Systems from Member States. Following the pre-pilot tests, the PTE will be handed over to the respective operations management groups to be run as a Pilot System. If the Pilot System contains live data they can no longer be accessible to test teams. epSOS assumes the responsibility to source this test environment via one of the following:

- One country alone or a group of countries provide as a service to the project a Pre-Pilot Test Environment supporting all scenarios for Member State A and B. This would allow another Member State to Pre-Pilot test their system at any time.
- During the Pre-Pilot tests pilot sites are grouped together to form an end to end environment. This would only allow a Member State to Pre-Pilot test their system when an opposing Member State is at the same time available.

3.3.2 Test Infrastructure

3.3.2.1 Document Management

Projectplace is the chosen application for document management. All documents when not managed under Projectplace must be uploaded to Projectplace when they are finalised.

An exception is the Test Plan (Test Cases) which is maintained in the Gazelle® test management tool. See #7.1 Gazelle® Management Tool for more Information.

3.3.2.2 Test management

Due to the structure of the project a Test Management Process / Tool is only required for the Component Conformance Test (CCT), System Integration Test (SIT) and Pre-Pilot Test (PPT) phases. It is foreseen that the Test Process and Tools of IHE will be employed for these Phases.

Gazelle® management tool from IHE will be used to manage Test Cases. See #7.1 Gazelle® Management Tool for more Information.

3.3.2.3 Problem Management

Due to the structure of the project a Problem Management Process / Tool is only required for the System Integration Test (SIT) and Pre-Pilot Test (PPT) phases. It is foreseen that the Problem Management Process and Tools of IHE will be employed for these Phases.

Gazelle® management tool from IHE will be used to manage Problems detected during the respective test phases. See #7.1 Gazelle® Management Tool for more Information.

3.4 Test Methods and Design Techniques

3.4.1 Test Methods

A Test method is a test process that can be employed to test a component or system in a particular way. The methods can be used in isolation or together, or in some cases they are implicitly related i.e. black box testing encompasses functional and non functional testing.

It is the decision of the Industry Partners, beneficiaries, member states, their suppliers or vendors as to which testing methods they employ during the testing of their components or systems that make up the epSOS Architecture and ICT infrastructure. The following is not an exhaustive list of test methods but a guideline as to those that could be employed:

Method	Description
Black Box Testing	Testing, either functional or non-functional, without reference to the internal structure of the component or system.
Component Integration Testing	Testing performed to expose defects in the interfaces and interaction between integrated components.
Projectathon	Testing the interoperability of a system with a complementary system using pre-defined tests based on profiles defined by the industry / hosting organisation.
Dynamic Testing	Testing that involves the execution of the software of a component or system.
Functional Testing	Testing based on an analysis of the specification of the functionality of a component or system.
Non Functional Testing	Testing the attributes of a component or system that do not relate to functionality, e.g. reliability, efficiency, usability, maintainability and portability.

Installation Testing	The process of testing the installability of a software product.
Integration Testing	Testing performed to expose defects in the interfaces and in the interactions between integrated components or systems.
Interoperability Testing	Testing performed to determine the capability of the software product to interact with one or more specific components or systems.
Operational Testing	Testing conducted to evaluate a component or system in its operational environment.
Performance Testing	The process of testing to determine the performance of a software product. Performance Testing can be distinguished further by three techniques: • Stress testing: A type of performance testing conducted to evaluate a system or component at or beyond the limits of its anticipated or specified work loads, or with reduced availability of resources such as access to memory or servers. • Load Testing: A type of performance testing conducted to evaluate the behaviour of a component or system with increasing load, e.g. numbers of parallel users and/or numbers of transactions, to determine what load can be handled by the component or system. • Volume testing: Testing where the system is subjected to large volumes of data.
Regression Testing	Testing of a previously tested program following modification to ensure that defects have not been introduced or uncovered in unchanged areas of the software, as a result of the changes made. It is performed when the software or the environment is changed.
Reviews	An evaluation of a product or project status to ascertain discrepancies from planned results and to recommend improvements. Examples include technical, formal and Informal reviews.
Risk Based Testing	An approach to testing to reduce the level of product risks and inform stakeholders on their status, starting in the initial stages of a project. It involves the identification of product risks and their use in guiding the test process.
Security Testing	Testing to determine the security of the software product.

Smoke Testing	A subset of all defined/planned test cases that cover the main functionality of a component or system, to ascertain that the most crucial functions of a program work, but not bothering with finer details. A daily build and smoke test is among industry best practices.
Static Testing	Testing of a component or system at specification or implementation level without execution of that software, e.g. reviews.
System Integration Testing	Testing the integration of systems and packages; testing interfaces to external organisations.

This test strategy assumes that the components / systems will be developed by Industry Partners, beneficiaries, member states, their suppliers or vendors as defined in **[D3.3.2]** #6.3.

3.4.2 Test Design Techniques

A test design technique is a procedure used to derive and/or select test cases.

During the preparation of the test concept and following the analysis of the input requirements, the test design techniques must be identified that will be used later during the test design process. This section defines and describes the test design techniques[7] that can be defined in the test concept to support the identification and justification of test cases.

The following Test Design Techniques must be considered:

Technique	Description
Boundary Value Analysis	A black box test design technique in which test cases are designed based on boundary values.
Cause Effect Graphing	A black box test design technique in which test cases are designed from cause effect graphs.
Classification Tree Method	A black box test design technique in which test cases, described by means of a classification tree, are designed to execute combinations of representatives of input and/or output domains.
Decision Table Testing	A black box technique in which test cases are designed to execute the combinations of inputs and/or stimuli (causes) shown in a decision table.
Equivalence	A black box test design technique in which test cases are designed to

[7] If further test design techniques are identified during the test planning process they must be added to this test strategy.

Technique	Description
Partitioning	execute representatives from equivalence partitions. In principal test cases are designed to cover each partition at least once.
Pair wise Testing	A black box test design technique in which test cases are designed to execute all possible discrete combinations of each pair of input parameters.
State Transition Testing	A black box testing technique in which test cases are designed to execute valid and invalid state transitions.
Use Case Testing	A black box test design technique in which test cases are designed to execute user scenarios.

3.5 Controlling and Reporting

3.5.1 Reporting

There is a requirement from WP 4.2 / 4.3 to receive status information from WP 3.9 / 3.10 pertaining to Test at varying stages of the test process. The following lists their requirements:

- Post the Conformance Test and prior to the System Integration Test (Projectathon) to receive status information as to which Member States are participating in the Projectathon and for which Profiles / Actors.
- Post Projectathon to receive status information as to which Member States have passed / failed which Profiles and Actors.

3.5.2 Statistics

- WP3.10 has to generate reports on Test Results, provided by F.E.T, and by MS before the Projectathon.
- Projectathon Test results will be managed according to the normal procedures defined and operated by IHE for Connectathon.
- Pre-Pilot / LSP-Testing results have to be carefully collected by MSs and provided to WP3.10, in accordance with the forms and the methodologies WP3.10 will define. WP3.10 will provide the full data collected during LSP-Testing to WP1.2 to allow the application of the Evaluation methodologies and plans defined by WP1.2

3.5.3 Approval and Signoff

The delivery and acceptance of the F.E.T. solution must be approved and signed off. The criteria for approval and those persons required to signoff the delivery need to be defined in the Agreement between epSOS and F.E.T. and approved by TPM.[8]

WP3.10 will describe and perform the deliverable acceptance activities assigned to the WP by TPM.

Signoff will be performed by epSOS Project Management team and by F.E.T.

Approval and signoff of Member State solutions will not take place.

The Member State receives only a notification that they have passed the Projectathon which does not constitute an approval of their solution but only a confirmation that they are able to integrate with other NCP's.

Further testing during the Pre Pilot Test will confirm that the Member State solution has passed the required Tests prior to being allowed to enter the Large Scale Pilot, but again is not a formal Approval and Signoff.

WP3.10 will define technical quality gates whereas WP4.3 will define organisational ones. These quality gates will form in addition to the test cases to be executed the criteria that allows a Member State to pass from the Pre-Pilot Test to the Large Scale Pilot.

3.6 Supporting Processes

The following describe the processes that are required to support the test effort. These processes are also required to support the Specification and Development effort as they provide and guarantee the traceability between the requirements, test artefacts and the components or systems to be tested.

As the systems to be implemented have very strong legal implications in terms of member state specific data protection laws, it is necessary to ensure a high level of traceability between what is to be tested, the given requirements and test specifications. epSOS must be able to verify in the case of a dispute that the NCP component or system in terms of its interface to the epSOS trust domain is implemented according to the specification.

epSOS cannot verify or guarantee that a member state has implemented their NCP component or system in terms of its national facing interface according to epSOS specifications. However, it is possible for epSOS to define test specifications based on epSOS specifications and enforce the

[8] See Open Point I-3

member state to implement these and provide epSOS with the results. The results must be audited by epSOS and would become part of the entry criteria into later test phases.

epSOS cannot specify, verify or guarantee how a member state manages or treats the patient data from another member state within their own national infrastructure. This should be regulated through agreements between member states.

3.6.1 Requirements Management

A requirement is a capability to which a project outcome (product or service) should conform.

Requirements management is the process of eliciting, documenting, analyzing, tracing, categorising and agreeing on these capabilities, controlling their change and communicating them to relevant stakeholders.

Requirements Management Process is defined and operated by the TPM Discipline “Requirement Management”. TPM has defined and is applying formal procedures. No specific SW Tool is foreseen.

3.6.2 Test Management

Test Management is the activity of managing the test process. A large number of test artefacts are created or generated during a test process, from a single Test Strategy to possibly hundreds of Test Cases and Test Scripts, to furthermore thousands of Test Logs. Without a suitable test management tool the process of managing these artefacts will become too overwhelming.

A professional Test Management tool enables the Tester to:

- Structure their tests accordingly
- Trace test artefacts with one another
- Report on the progress of test
- Integrate with a Requirements Management tool to ensure traceability.

Due to the structure of the project a Test Management Process / Tool is only required for the Component Conformance Test, System Integration Test and Pre-Pilot Test phases. It is foreseen that the Test Process and Tools of IHE will be employed for these Phases.

Gazelle® management tool from IHE will be used to manage Test Cases. See #7.1 Gazelle® Management Tool for more Information.

3.6.2.1 Test Case Priority

Testing is the process of reducing risk. To enable the tester to focus on the highest risks they need to know which tests to execute first. The assignment of a test case priority enables them to identify which tests have to be executed first.

The process of determining test case priority can be simplified or obtained through analysis of differing factors and the use of complicated formulas. The following table attempts to provide a simplified approach using the implication a resulting defect might have on the system to determine the priority.

The Test Case Priority can be classified into three categories:

Classification	Test	Implication[9]
1.	A Test Case that must be executed. The non execution must be justified and approved by the Project Manager.	The non execution could: – impair the system in such a way that it becomes unavailable, – result in human injury or loss of life – lead to the corruption or loss of critical data – constitute a severe security breach – lead to a severe usability / performance issue
2.	A Test Case that should be executed. The non-execution must be justified and approved by the Project Manager.	The non execution could: – result in a defect that impairs the system in such a way that a key feature becomes unavailable – lead to the corruption or loss of non critical data – constitute a security breach – lead to a usability / performance issue
3.	A Test Case that could be executed.	The non execution could:

[9] This does not constitute an exhaustive list of implications for the purpose of assigning test case priority, but is only meant to provide some guidelines.

Classification	Test	Implication[9]
	The non-execution does not have to be justified and approved by the Project Manager.	– result in a defect that impairs a system in such a way that a feature does not function without some kind of manual intervention or workaround – results in a cosmetic defect – lead to a minor usability / performance issue

3.6.3 Problem Management

A problem or defect is a product anomaly or flaw, which is a variance from the specification.

Problem management is the process of identifying, analyzing, recording, categorising and agreeing on problems, controlling them and communicating them to the relevant parties.

Due to the structure of the project a Problem Management Process / Tool is only required for the System Integration Test and Pre-Pilot Test phases. It is foreseen that the Problem Management Process and Tools of IHE will be employed for these Phases.

3.6.3.1 Defect Classification

Defect Severity is the operational impact a defect has on the system. Defect Classification is a sub process of the Problem Management process and describes how identified software defects are to be classified and assigned a formal defect severity. The following Defect Classification will be implemented for all test phases other than the CCT and SIT (Projectathon):

The impact of Defect Severity can be classified into four categories:

Classification	Test	Implication
1. Fatal	Functional A defect resulting in the failure of the complete software system, of an essential subsystem or subsystem functionality whereby a workaround is not available. Non-Functional A defect resulting in a security breach with restricted or unrestricted access to sensitive data, severely restricted	The test object cannot be released.

Classification	Test	Implication
	system or essential function performance[10], corruption of system or application critical or sensitive data, or risk to human life.	
2. Major	Functional A defect resulting in the failure of a complete software system or of essential subsystem functionality whereby a workaround is available. Non Functional A defect resulting in a security breach with restricted / unrestricted access to non critical or non sensitive data, restricted system or essential performance, corruption of system or application non critical data.	The test object should not be released.
3. Normal	A defect resulting in the failure of non essential subsystem functionality whereby a workaround is or is not available.	The test object may be released with restricted usability.
4. Minor	A defect resulting in the non failure of the system or subsystem that has no effect on its functionality or usability. It concerns itself mainly with spelling mistakes and cosmetic failures.	The test object can be released.

During the SIT (Projectathon) problems are recorded but are not classified by IHE as to their severity. Problems must be classified by the Projectathon participants, who are responsible for the solution, and following re-tests.

3.6.4 Software Configuration Management

The traditional software configuration management (SCM) process is the process of handling change in a software project. It identifies the functional and physical attributes of software at various points in time, and performs systematic control of changes to the identified attributes for the purpose of maintaining software integrity and traceability throughout the software development life cycle.

[10] Performance Testing is directly related to the performance requirements. Severely restricted would be outside of the given requirements, whereby restricted would be within the upper limit but outside of the mean.

The SCM process further defines the need to trace changes, and the ability to verify that the final delivered software has all of the planned requirements that are supposed to be included in the release. It identifies four procedures that must be defined for each software project to ensure that an SCM process is implemented. They are:

- Configuration identification
- Configuration control
- Configuration status accounting
- Configuration audits

TPM is currently evaluating the set up of a Software Configuration Management Process / Tool.

3.7 Test Specification and Test Data Definition Methodology

This section defines the approach for identifying, recording and distributing the Test Cases and the Associated Test Data.

3.7.1 Test Specification Definition Methodology

A Test Specification describes the test cases that have been identified through an informal direct analysis of the requirements, or the result of a formal test design process. It describes the case to test from a functional or non functional perspective without describing the technical implementation, which follows in the Test Procedure or Test Script.

A Test Specification can be created for a Product (NCP / Portal) or a specific phase (System Integration Test). As the development and testing within epSOS occurs mostly through third parties it is expected that these organisations create their Test Specifications:

- NCP / Portal development – the Software Producer (F.E.T., Member States etc.) need to create Test Specifications for the test phases CUT, CST, and CIT.
- CCT and Projectathon (SIT / PAT) – IHE is responsible for creating the Test Specification with the support of WP3.9 and communicating it to all Member States who have registered their interest to take part.
- Pre-Pilot Test (PPT) – epSOS is responsible for creating the Test Specification and communicating it to all Member States that are taking part in the LSP.

As a guideline the Test Specification according to IEEE 829 should contain the following information:

- Test items (references to requirements, or other documents)
- Input specifications (non technical; it can define a data type but should specify its actual content unless it's necessary to constrain the test procedure or test script.)

- Output specifications (expected intermediate and end results)
- Environmental needs (special non-standard Hardware, Software, or other needs)
- Special procedural requirements (special constraints)
- Intercase dependencies (test cases that must be executed prior to this one)

The following sections describe the steps necessary to create a Test Specification.

3.7.1.1 Identify Test Cases

Identify input material

- Provides the basis for test (Specifications, Test Strategy, and Test Concept etc.)

Analyse input material

- Formally identify all requirements (when not already)
- Analyse requirements ensuring they are understandable, unambiguous, and Testable

Identify Cases

- Formal Test Design process
- Establish and Design Test Cases

3.7.1.2 Describe Test Cases

- Input and Output Specifications
- Environmental needs
- Dependencies
- Describe test data (structure and not content, see Test Data Definition Strategy)

3.7.1.3 Review Test Specification

- Formal review to verify scope and correctness.

3.8 Test Data Definition Methodology

For successful and efficient testing it is necessary to have test data produced by an independent authority. In the best case by the authority that will validate the tests performed during the testing sessions, namely the Projectathon. In epSOS, the Work Package 3.9 WG A is responsible for providing the test strategy and testing tools in order to validate, approve, or reject the software under test. The Work Package 3.10 is responsible for providing clean and correct test data to be used during testing phases.

3.8.1 Defining Test Data

The Test Data Definition is derived from specifications. During the analysis of specifications test data types are identified. The test data for epSOS can be divided into several sub groups of data types:

1. Patient, HCP, HCO identification data
2. Document data
3. Technical data

3.8.1.1 Patient, HCP, HCO identification data

It is necessary to provide multiple patient and HCP/HCO data sets for Member States participating in epSOS, or at least participating in the Projectathon. These data sets, although created by epSOS to a structure firstly defined by them, have to be imported by the Member State and stored according to the structure and the format used by them.

During specific workflow tests, these data sets might be updated or new data sets created which following evaluation and approval of a yet to be defined epSOS evaluation team led by IHE, can be used by all participants.

3.8.1.2 Document data

In epSOS there are 7 different document types used, namely the Patient Summary in the CDA Level 3 (fully structured) and CDA Level 1 (*.pdf embedded in the CDA envelop), the ePrescription document in CDA Level 3 and CDA Level 1, the eDispensation document in CDA Level 3 and CDA Level 1, and the Patient Consent document in CDA Level 1 (*.pdf embedded in the CDA envelop).

Several versions of each document type must be generated by epSOS as defined in the epSOS Pivot Format, as specified by WP 3.5 – Semantic Services. Each Member State will need to import these documents, translate them to their native language and store them according to their structure and format. The participants of the Projectathon use the different types of documents, depending on which role they adopt, either as information creator in Country A or as a developer / implementer of a specific NCP solution or as an information consumer in Country B.

During special workflow tests (specific test scenarios) the participants will create new documents of particular type, which following validation and approval of the epSOS evaluation team can be used in the same way as other documents.

3.8.1.3 Technical data

The technical data are for example the MVC and MTC, the XML Schema and Schematron of the epSOS documents, certain security tokens and / or certificates, or any other non patient / document data used for testing.

3.8.2 Generating Test Data

The test data used in the Projectathon can be either “dummy data” (artificial data, generated by members of the epSOS testing team or from i.e. national authorities) or it can be real data, which is made anonymous by the epSOS testing team or a national representative.

It was agreed that all the test data to be used before and during the Projectathon has to be provided by October 15th 2010.

If real data is used, it must be verified that the data cannot be linked to any living or dead persons (metadata of the documents, header entries, local and global Patient Ids, etc. must be anonymised prior to its usage or loading into the National Infrastructure).

The epSOS testing team does not have any preferences. Either solution or a mixture of both is possible.

3.8.2.1 Patient, HCP, HCO identification data

The data sets shall contain all the relevant patient and HCP/HCO Information that is required to be used within each epSOS Pilot Member State. The structure of the information, the character sets, the syntax of the information (i.e. patient address: AT: Musterstrasse 1, 1234 Demostadt vs. FR: 23, Rue de Test, 12345 La Testing) has to be the same as in the “real world scenario”.

3.8.2.2 Document data

Medical documents, used within the epSOS pilots are stored for testing purposes within the test environment. For sufficient testing epSOS needs several different documents of each type (structured and pdf – embedded), as they are used in the different Member States, as well as several pivot documents. The epSOS team will produce the pivot documents, whereas the national documents are provided by the different Member States.

The following approach is to be followed for the generation of Document data:

- F.E.T. Solution / National Connector validation
    - epSOS to create a set of PS, eP and eD documents that are as close as possible to the real medical documents
    - MS to transform them to their own CDA document format and language

- Test Data for End-to-End Validation
    - epSOS to create through a team of physicians appointed by the MS, a set of well-formed and not well-formed[11] PS, eP and eD documents in the English language based upon the epSOS Schema and MVC.
    - MS to transform them to their own CDA document format and language

The advantages of this approach are pre-defined data sets that are common to all MS and results that are predictable and easier to analyse in the event of failure.

3.8.2.3 Technical data

As the scope of the technical data is largely unknown it is not possible to define how the data will be generated or distributed. However, it is safe to say that most of the data will be generated by epSOS. Certificates where required will be created from a Certification Authority (can be epSOS or can be a third party). XML Schema and Schematron will all be generated by epSOS based upon epSOS specifications.

The generation of technical data will be included as soon as the definition of the data is available.

3.8.2.4 Data Sets

Two data sets have been identified:

- Model Test Data – is created manually to cover the widest extent of the underlying standard / profile. While a system may create suchlike data, much of the data serves the purpose of ensuring the robustness of the system under test and supporting the development and validation of test tools.
- Representative Test Data – occurs in actual implementations and attempts to be representative of typical data generated by such systems. It can be generated by a HCP, or derived from existing documents anonymising the patient sensitive data.

The following characterises these test data sets.

3.8.2.4.1 Model Test Data

Within the context of epSOS, Model Test Data is to be developed in parallel with the test case and tool development. Model Test Data can be developed by a team independent of the MS but requires

[11] Not well-formed documents are medical documents containing values that are not specified in the MVC or cannot be translated.

a solid knowledge of the underlying specifications and standards. Only one set of Model Test Data is required to be created.

Model Test Data cannot be used to test the Country A National Connector. To test the National Connector A the test data must be designed to Country A formats.

Model Test Data can be used to test NCP-in-a-Transparent-Box and Country B Front-end, but there might be constraints related to Terminology and Coding system translation/transcoding. Country A coding systems should be applied: a Model Test Data per MS has to be generated.

3.8.2.4.2 Representative Test Data

Within the context of epSOS, the Representative Test Data will be used as reference data for documents generated by a specific MS. They will form the basis test data for the functional end-to-end testing at the Projectathon.

The test data has to be produced by the MS in the course of their NCP implementation and integration and serves three purposes:

- Support the testing of systems receiving the test data
- Support the senders of test data in the detection of data errors leading to improved robustness of the data.
- Help identify gaps in the testing tools. There is a need for as many sets as there are sources of date. Each MS alone is a data source.

In the case of Documents (eP / eD, PS) Representative Test Data has to be provided in three formats:

- epSOS CDA 2 L3 document
- PDF of the Original Country A, embedded in CDA L1 document
- Human readable version of the original document in English, to be used by HCP from Country B during testing validation

The following lists the constraints that apply to the use of the representative test data sets:

- NCP-in-a-Transparent-Box, Country A National Connector, MTC-A, Country B Front-End must be able to handle these tests.
- Representative Test Data must be transformed at every interface.
- MS Support, specifically the HCP's of MS A are required during testing phases such as PAT and PPT to verify the data received by MS B.

Combining the Model and Reference Test Data concepts, with the types of test data, the following tables are derived, to express the applicability and the test generation approach that might be followed by **WP3.10: Proof of Concept Testing**.

Data Type / Set	Model Test Data	Representative Test Data
Personal Data	Lower priority	Required
Document Data	Required	Required
Technical Data	Lower priority	Lower Priority, but very complex

The following table depicts requirements on the generation of test data:

Data Type / Set	Model Test Data	Representative Test Data
Personal Data	No stringent needs other than adherence to requirements and standards.	MS specific name and ID formats.
Document Data	The correctness of this test data must be strictly controlled to assure test data quality	The correctness of this test data must be strictly controlled to assure test data quality
Technical Data	No stringent requirements.	Must represent real configuration data.

3.8.3 Storing Test Data

After analyzing all possibilities, it seems more cost and time beneficial to adopt an existing tool for the storage of data than to develop a new tool. The Gazelle® tool, provided by IHE Europe, is such a tool and is already proven and approved for use at the Connectathon. For epSOS testing, the tool will be configured to provide a separate epSOS Domain, where the test data will be stored in a download section where in addition the subsequent epSOS test results are stored and validated.

3.8.4 Distributing Test Data

The Gazelle® tool will be used as the testing platform during the Projectathon as well as during the CCT or PPT, in order to qualify a software component / solution for the Projectathon.

The test data used during the CCT and Projectathon are stored in an epSOS domain within the Gazelle® tool, where the participants are able to access the relevant data in the “download” section.

4 epSOS Integration / Interoperability Testing approach

This section describes a possible approach for the epSOS testing phases SIT and PPT described in # 3.1.6 Test Types providing a validation and verification during these phases of the epSOS NCP-in-a-Transparent-Box. It also encompasses some of the concepts defined in the ISO/IEC 9126 keeping within the ISO/IEC 25000 family. The use of these concepts is complementary to those concepts already listed elsewhere in this document.

The ISO/IEC 9126 standard identifies three main viewpoints over which the evaluation should be performed, enabling a layered approach for quality improvement.

1. QI V&V "Quality in use" gives a non-technical, functional end-user perspective verifying business and end-to-end processes.
2. EQ V&V "External Quality" is mostly technical, verifying functional and non-functional aspects of a system with a view to its external interfaces.
3. IQ V&V "Internal quality" is technical and verifies the internal functional and non-functional aspect of the system. [12]

4.1 epSOS Architecture

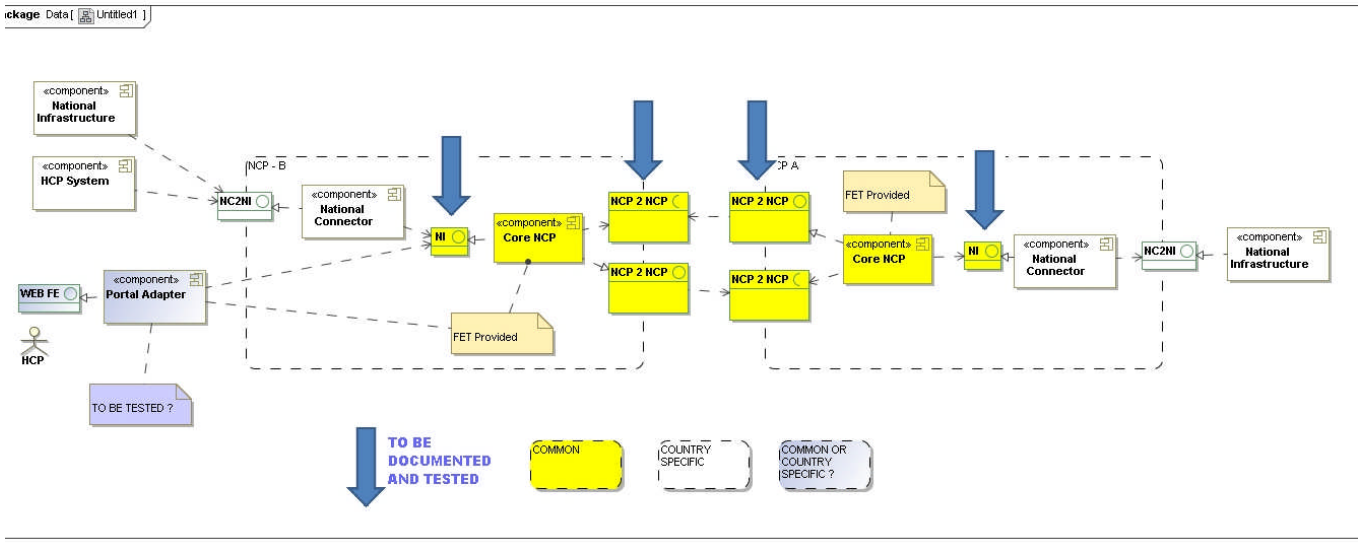


Figure 5 Architecture Blocks

Before describing the approach to be followed for implementing the Integration/Interoperability Strategy it is worth first looking at the epSOS Architecture to understand the architectural Blocks.

[12] IQ V&V is not to be considered as epSOS has no such testing responsibility.

Although a basic sketch of the architecture it is possible to see the main blocks that are to be considered during the test phases:

- NCP-A (Core)
- NCP-B (Core)
- National Connector
- National Infrastructure
- epSOS Portal (Portal Adapter / Country-B Front-end Portal)

4.2 epSOS Testing Approach

The following describes the strategic approach of the three valid viewpoints listed in #4 epSOS Integration / Interoperability Testing approach .

4.2.1 Internal Quality V&V

As mentioned previously, this is not within the scope of epSOS as we do not have the responsibility to carry out such tests. This is restricted to F.E.T., the Member States and Industry.

However, epSOS has the responsibility to Audit and Verify the Test Cases and the Test Results of F.E.T. and based upon the outcome; approve the NCP-in-a-Transparent-Box solution for distribution to the Member States.

4.2.2 External Quality V&V

This viewpoint describes the strategic approach of testing a component from the perspective of its external interfaces, which are those interfaces that are openly accessible and can be connected to from other systems or services. This testing focuses on the following quality attributes:

- Functionality
- Security
- Interoperability
- Performance (very basic)

There is a list of other quality related attributes that are relevant but that will not be tested of including:

- Suitability
- Accuracy

- Reliability Compliance
- Usability Compliance
- Performance (in its entirety)
- Resource Utilisation
- Maintainability Compliance
- Portability Compliance

Reasons they are not covered can be attributed amongst others to project timescales, responsibility, and need. For example it is not possible for epSOS to execute Performance Tests in their entirety due to the complexity of creating a test environment that encompasses the NCP plus their respective Member State national infrastructures. Therefore the responsibility for performance testing lies firmly in the hands of the Member States, industry and F.E.T.

This approach is directly associated to the Test Phases System Integration Test. It is executed by first verifying systems in their native standalone state, and then through successive integration of neighbouring components the integration of the complete Infrastructure is verified.

The following describes those systems that are to be verified as standalone and the combinations to be verified during the integration / interoperability stages.

To ensure system functionality, security and performance the following systems are to be tested via their respective interfaces as defined in WP3.4:

- MS B Solution including NCP-B and Portal Adapter / National Infrastructure. A Simulator developed by IHE will play the role of the NCP-A. The transaction is initiated through manual input in the MS B National Infrastructure PoC System or through a test driver interacting with the Portal Adapter. Results are evaluated in the Simulator and the test driver or PoC System.
- MS A Solution including NCP-A and National Infrastructure. A Test Driver developed by IHE will play the role of the NCP-B to initiate the transaction. The results are evaluated in test driver.

The F.E.T. NCP-in-a-Transparent-Box solution (including the Portal) will not be rigorously tested as this will already have been conducted by F.E.T. and the results verified by epSOS. The NCP-in-a-Transparent-Box solution will only be regression tested at this stage to ensure the basic functionality is warranted.

To ensure system interoperability, the following system combinations need to be tested with the support of simulators to ensure interoperability:

- MS B Solution to MS A Solution (End to End Tests). The transaction is initiated through manual input in the MS B National Infrastructure PoC System. The results are evaluated in the National Infrastructure of MS B PoC System.

For the combinations Portal to NCP-B, and NCP to NCP, the F.E.T. NCP-in-a-Transparent-Box solution will not be rigorously tested as this will already have been conducted and the results verified by epSOS. The NCP-in-a-Transparent-Box solution will only be regression tested at this stage to ensure interoperability is warranted.

The end result is an integrated and interoperable NCP with their respective Portals or National Infrastructures that are ready to be deployed in the Large Scale Pilot.

4.2.2.1 Quality in Use

This viewpoint describes the strategic approach of testing a system or combination of systems from the end users perspective, which is the end-user validation. This testing focuses on the following quality attributes:

- Functionality
- Usability
- Performance (very basic)
- Security

This approach is directly associated to the Test Phases Pre-Pilot Test. A Member State NCP will have passed the Projectathon and be ready for connection to the epSOS Infrastructure. There are the following incremental test targets:

- MS A Solution (NCP-A to National Infrastructure with NCP-B Test Driver)
- MS B Solution (Portal / National Infrastructure to NCP-B with NCP-A Simulator)
- MS B Solution to MS A Solution (End to End Tests).

The Member States will already have integration tested their NCP with their National Infrastructures.

It is necessary to ensure that selected tests executed during the Projectathon are repeated as a regression test to ensure that there have been no changes to the NCP (A & B), and that the configuration is correct before allowing it to actively join the epSOS Infrastructure.

In addition to the regression tests, other tests are required that focus on the clinical risk to patients. The goal of the tests are to verify that the medical information received by a HCP in country B is semantically correct in relation to the information sent from country A, and presents no risk to the patient.

Once it is allowed to join the epSOS Infrastructure, it will be necessary to run further end to end regression tests with an already approved Member State to ensure that there are no new interoperability issues.

The end result is an interoperable epSOS Infrastructure including NCP A's and B's, Portals and National Infrastructures that are ready for inter Member State patient data exchange in the scope of a Large Scale Pilot.

5 epSOS Test Plan Definition

This section describes the test plan with respect to the specifications of the WP3.X and the Test Strategy already defined in WP3.9. The test plan guide describes:

- the concepts used
- the assumptions and open issues
- the tests cases
- the workflow tests

5.1 Definition of the concepts used to define the epSOS test plan/cases

5.1.1 Profiles:

IHE Integration Profiles describe the solution to a specific integration problem, and document the system roles (Actors), standards and design details for implementers to develop systems that cooperate to address that problem. For example, the eDispensation service is based on the IHE-XDR profile (ITI-41) using transactions.

5.1.2 Roles/actors:

IHE Actors are responsible for producing, managing and/or acting on information in the context of an IHE Profile. For each test case, the roles played by the system are described in order to test their conformance to the actor responsible in the providing information. For example, in the test case defined to verify Patient service profile between the NCP-A and NCP-B, two roles are defined: NCP_A_Patient_Service and NCP_B_Patient_Service.

5.1.3 epSOS test case:

A test case describes in the detail the actors, their interactions, and the attend results (conformance tests). Several types of test cases are defined:

- Peer to peer test - where two actors exchange messages (request/ respond)
- No peer test - where a content of a document is checked. Example: the ePrescription document in CDA format is analyzed and validated.

- Displayed test - where a monitor will directly check the display result on the screen. For example, a Patient Summary is displayed on the application and the GP can read directly the document.

5.1.4 Test steps

A test case is described with one or several steps, where each corresponds to one functional test. For example, a test to obtain one particular fault condition is considered as a step.

5.1.5 Workflow test

The workflow test (interoperability test) will test a complete use case and will combine several epSOS services. For the epSOS Projectathon, generic workflows are defined and cover the most common use cases and take into account the different roles played by the HCP's (Doctor, Nurse and Pharmacist) as well as the patient as his/her own healthcare manager, as the patient can give/revoke consent and therefore allows/denies access to the own medical data.

5.2 Test Plan Assumptions

The definition of the test cases is based on the following assumptions. The following list of documents was used to specify the test cases and workflow tests:

[D3.1.2]	epSOS D3.1.2 Final definition of functional service requirements – ePrescription, Version 1.1, 27.10.2009
[D3.2.2]	epSOS D3.2.2 Final definition of functional service requirements – Patient Summary, Version 0.4, 11.12.2009
[D3.3.1]	epSOS D3.3.1 Draft epSOS System Technical Specification, Version 0.3QR, 16.10.2009
[D3.4.2]	Common Components Specifications Version 1.00
[D3.5.2]	Whole document, but in particular Appendix C, Pivot document specifications V0.0.6
[D3.6.2]	Identity Management
[D3.7.2]	Security Services documents

5.2.1 Security aspects

- Audit Trail: only the content of the audit log message is tested. Transport is not tested, since it is in the responsibility of each Member State and was not specified within the epSOS LSP.

- Two assertions are covered by the epSOS LSP: the identity assertion and the TRC (Treatment Relationship Confirmation) assertion. Identity assertion relates to a principal that is already identified at the NCP. When a patient searches for a treatment, a new, optional, assertion is requested, the TRC. This assertion contains the patient id, the purpose of use and a reference to the identity assertion used for the communication. Before issuing this assertion, the patient id is discovered, by sending a message to the patient identification service containing the identity assertion. When the patient identifier is resolved, the TRC assertion is issued. All subsequent messages will contain the identity assertion and (optional) TRC assertion. On the receiving side, SAML assertions will be scrutinised and the relation between the TRC and the identity assertion will be verified.
- Establishing the VPN connection is independent from the system conformance and as such we have not taken the VPN aspects into consideration in the provided test plans.
- IHE will provide all certificates for the epSOS trust domain, with MS, F.E.T. or the Industry providing certificates for their National Infrastructures.
- The process in the test context to access the revocation list must be defined by WP3.9.

6 Test Plan structure

6.1 Roles

The following roles are defined for the epSOS tests cases:

epSOS Roles
epSOS_AuditTrail_Creator
epSOS_Content_Creator
epSOS_National_Infrastructure_A_Order_service
epSOS_National_Infrastructure_A_Patient_service
epSOS_National_Infrastructure_A_Dispensation_service
epSOS_NCP_A_Authentication
epSOS_NCP_A_Consent_Service
epSOS_NCP_A_eDispensation_Service
epSOS_NCP_A_Identification_Service
epSOS_NCP_A_Identification_Service_With_Assertion
epSOS_NCP_A_Order_Service
epSOS_NCP_A_Patient_Service
epSOS_NCP_B_Authentication
epSOS_NCP_B_Consent_Service
epSOS_NCP_B_eDispensation_Service
epSOS_NCP_B_Identification_Service
epSOS_NCP_B_Order_Service
epSOS_NCP_B_Patient_Service

6.2 epSOS Test Cases

The Test Cases are registered directly in the Gazelle® test management tool in the Gazelle Master Model. See #7.1 Gazelle® Management Tool for more Information.

The following are the list of epSOS test cases as of the 16th September 2010:

	Test	Description	Steps
1	epSOS_AuditTrails_Event	The object of this test is to check the conformance of the AuditTrail events sent by NCPs when epSOS services are used	1
2	epSOS_Autorisation	This test shows the role based access to epSOS documents, according the role description in epSOS Specification	9
3	epSOS_Consent_Service_FC	The epSOS Consent Service is used to send an identified patient's eConsent data from the country of care (Country B) to the patient's country of affiliation (Country A). Both countries are represented by their respective NCPs. The fault condistions are checked in this test	1
4	epSOS_Consent_Service_NC	The epSOS Consent Service is used to send an identified patient's eConsent data from the country of care (Country B) to the patient's country of affiliation (Country A). Both countries are represented by their respective NCPs. The normal conditions is checked in this test	1
5	epSOS_eDispensation_Service_FC	The epSOS Dispensation Service provides an operation for notifying the patient's country of affili-ation on the dispensation of a previously retrieved ePrescription. The fault conditions are checked in this test	6
6	epSOS_eDispensation_Service_NC	The epSOS Dispensation Service provides an operation for notifying the patient's country of affili-ation on the dispensation of a previously retrieved ePrescription. The normal case is checked in this test	1
7	epSOS_Order_Service_FC	The epSOS Order Service (operation list()) is used to share an identified patient's ePrescriptions between the patient's country of affiliation and the country of care. Both countries are represented by their respective NCPs. The fault conditions are checked in this test	5
8	epSOS_Order_Service_NC	The epSOS Order Service (operation list()) is used to share an identified patient's ePrescriptions between the patient's country of affiliation and the country of care. Both countries are represented by their respective NCPs. The normal case is checked in this test	1
9	epSOS_Pat_identification_Service_FC	The purpose of this test is to test the core business (ITI-55 transaction) part of the Patient Identification Service. The fault conditions are checked in this test	5
10	epSOS_Pat_identification_Service_NC	The purpose of this test is to test the core business (ITI-55 transaction) part of the Patient Identification Service. The normal case is checked in this test	1
11	epSOS-Identification_Service_with_Assert	the purpose of this test is to test the Patient identification service using the HCP identity assertion	1
12	epSOS_ePresc_CountryB_pdf	Prove that Content Consumer actors in country B are able to correctly display the eP documents in the PDF format (XDS-SD). If not mentioned in a different way, you shall use only the pdf document of the epSOS ePrescription in this test	1
13	epSOS_ePresc_CountryB_Pivot	Prove that Content Consumer actors in country B are able to correctly display (and consume) the eP documents in national language (B) translated by NCP-B.If not mentioned in a different way, you shall use only the structured document of the epSOS ePrescription.	1
14	epSOS_ePS_CountryB_pdf	Prove that Content Consumer actors in country B are able to correctly display (and consume) the ePS documents in national language (B) translated by NCP-B.If not mentioned in a different way, you shall use only the structured document of the epSOS ePS.	1
15	epSOS_ePS_CountryB_Pivot	Prove that Content Consumer actors in country B are able to correctly display (and consume) the ePS documents in national language (B) translated by NCP-B. If not mentioned in a different way, you shall use only the structured document of the epSOS ePS.	1
16	epSOS_eDisp_CountryA_pdf	Prove that Content Consumer actors in country A are able to correctly display (and consume) the eDisp documents in national language (A) translated by NCP-A.If not mentioned in a different way, you shall use only the structured document of the epSOS eDisp.	1
17	epSOS_eDisp_CountryA_Pivot	Prove that Content Consumer actors in country A are able to correctly display (and consume) the ePS documents in national language (A) translated by NCP-A. If not mentioned in a different way, you shall use only the structured document of the epSOS eDisp.	1
18	epSOS_HCP_Authentication	The purpose of this test is to check the content of the identity assertions (HCP authentication and TRC assertion) provided by the HCP.	2
19	epSOS_Scrutiny_eDispensation	In this test the structure and validity of your epSOS eDispensation is verfied.	1
20	epSOS_Scrutiny_eDispensation_pdf	In this test the structure and validity of your epSOS eDispensation is verfied.	1
21	epSOS_Scrutiny_ePrescription	In this test the structure and validity of your epSOS ePrescription is verfied.	1
22	epSOS_Scrutiny_ePrescription_pdf	In this test the structure and validity of your epSOS ePrescription is verfied.	1
24	epSOS_Scrutiny_ePS	In this test the structure and validity of your epSOS ePS is verfied.	1
25	epSOS_Scrutiny_ePS_pdf	In this test the structure and validity of your epSOS ePS is verfied.	1
26	epSOS_Expired_Certificate	This test will verify if the secure node actor is able to verify the expired certificate	1
27	epSOS_Revoked_Certificate	This test will verify if the secure node actor is able to verify the revoked certificate	1
		TOTAL	48

6.3 Workflow tests

The workflow tests are generic and can be fitted for several business cases described in the document D3.2.2. They are presented in the following table:

	Test	Scenario	Steps
1	**epSOS_WF_Consent_Update**	Pat. XY comes to see the Dr. YZ in Country B (whatever B might be). Patient declares his consent to the usage of the epSOS cross border services.	Step 1:The doctor is authenticated at the NCP B.He is performing a query for the ID to the country of affiliation of the patient (Country A). The patient identity traits are sent to country A and the correct demographics, including national unique identifier are returned. An AuditTrail Event is sent to the ARR of NCP B.
			Step 2:The Doctor requests the Patient Summary from country A (translated Pivot document and the original document). No results are returned, due to the consent, containing a "ALL-DENY" policy, of the patient, given in Country A. An AuditTrail Event is sent to the ARR of NCP B.The Doctor requests the Patient Summary from country A (translated Pivot document and the original document). No results are returned, due to the consent, containing a "ALL-DENY" policy, of the patient, given in Country A. An AuditTrail Event is sent to the ARR of NCP B.
			Step 3:The Doctor, on patient's request, executes the modification of patient's consent in national infrastructure in Country A (national repository in Country A). An AuditTrail Event is sent to both the ARR of NCP B and of NCP A
			Step 4:The Doctor, on patient's request, executes the modification of patient's consent in national infrastructure in Country A (national repository in Country A). An AuditTrail Event is sent to both the ARR of NCP B and of NCP A.The Doctor requests the Patient Summary from country A (translated Pivot document and the original document) again. Now results are returned, due to the updated consent. An AuditTrail Event is sent to the ARR of NCP B.
2	**epSOS_WF_ePresc_eDispens**	Pat. XY comes to see the Pharmacist YZ in Country B (whatever B might be). Patient declares his consent to the usage of the epSOS cross border services.	Step 1:The Pharmacist is authenticated at the NCP B..He is performing a query for the ID to the country of affiliation of the patient (Country A). The patient identity traits are sent to country A and the correct demographics, including national unique identifier are returned.
			Step 2:He requests the available and valid ePrescriptions from country A (translated Pivot documents and the original documents).
			Step 3:After analysis of the ePrescriptions (in terms of indication, possible substitution, adverse reactions and interactions, ...), he dispenses medications available in country B according to the ePrescriptions. eDispensation documents are sent to country A (one eD doc for each dispensed Prescription Item).
2	**epSOS_WF_ePS_ePresc**	Pat. XY comes to see the Dr. YZ in Country B (whatever B might be). Patient declares his consent to the usage of the epSOS cross border services.	Step 1:The Nurse is authenticated at the NCP B..She is performing a query for the ID to the country of affiliation of the patient (Country A). The Patient gets registered by the Nurse at the Registrtaion counter. The patient identity traits are sent to country A and the correct demographics, including national unique identifier are returned.
			Step 2:She is performing a query for the ID to the country of affiliation of the patient (Country A). The Patient gets registered by the Nurse at the Registrtaion counter. The patient identity traits are sent to country A and the correct demographics, including national unique identifier are returned. The Patient sees the doctor. The doctor is authenticated at the NCP B. Then he requests the Patient Summary from country A (translated Pivot document and the original document).
			Step 3:After examination, Doctor requests to see the current ePrescriptions registered in Country A and receives all available ePrescriptions (in the Pivot and the original format).

These workflow tests along with the test cases listed in the previous section are registered in the Gazelle® management tool. They will be orchestrated, and their instantiation into participant work list will be used during the test against simulators (pre-Projectathon) or against another participant's system during the Projectathon.

6.4 Test Methodology

In this section, the reader will find some examples of how the test plan was built according the assumptions made during the meeting which was held in Rennes, France from July, 26th – 30th, 2010 and where the specifications of the test cases were defined and registered in the Gazelle tool.

6.4.1 epSOS document assumptions

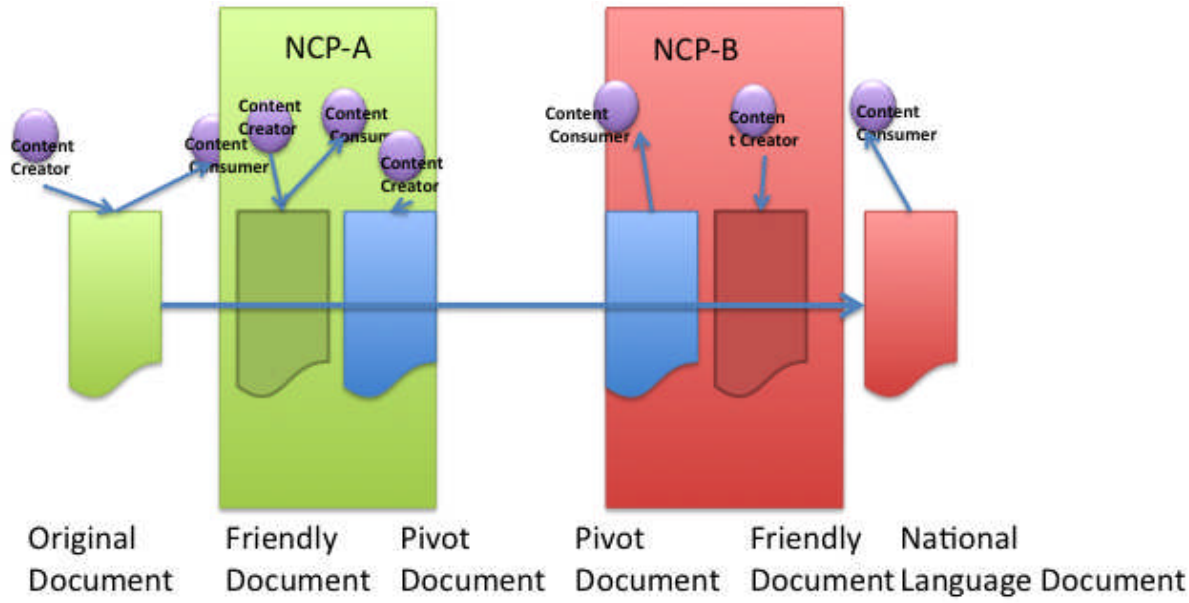
- The original documents are XDS-SD CDA documents embedding a PDF of the original print-out document.
- Projectathon participants will have to initialise their databases with provided set of patients and HCP (5 per roles). They will need to create CDA samples documents for eP, eD, ePS and consent documents for those patients. (*epSOS Friendly documents*). The original documents for these samples need also to be available as XDS-SD documents (PDF embedded in a CDA). Participants need to have configured Roles (GPs, nurses and pharmacists).
- Pivot documents will be created by NCP's during the Projectathon or during the pre-Projectathon phase for testing purposes.
- Only transactions between NCP-A and NCP-B are tested. Transactions from the National Infrastructure to the NCP's are not tested, since they are out of scope of epSOS. Only the content of documents is tested (eP, eD, ePS, Audit Messages, embedded documents) for exchanges that take place between the National Infrastructure and the NCP. (Content testing)
- Three generic workflow tests have been defined that covers several use cases defined in D3.1.2 and D3.2.2.

6.4.2 epSOS Document testing

The lifetime of the epSOS document is the following:

- V1: the National Infrastructure (NI) sends an original document (NI) into the NCP via an interface. This document has to be an "epSOS Friendly document". This version is provided by the CONTENT_CREATOR actor.
- V2: The NCP transforms the "epSOS Friendly document" into the pivot document. As such it acts as a "CONTENT_CREATOR". NCP acts as a CONTENT_CONSUMER of epSOS "Friendly documents".

- V3: NCP consumes the Pivot document and therefore acts as a CONTENT_CONSUMER. It translates epSOS Pivot document into the national language. As such it acts as a "CONTENT_CREATOR".



The Test Cases are defined as the following:

- Roles:

- NCP is a consumer of the CONTENT_CREATOR epSOS Friendly documents
- NCP is a consumer of epSOS pivot documents
- CONTENT_CONSUMER is a consumer of NCP epSOS translated documents.

- Test cases:
  - Scrutiny test for CONTENT_CREATOR epSOS Friendly documents
  - Scrutiny test for NCP epSOS pivot documents
  - Scrutiny test for NCP epSOS translated documents

Each kind of document (eP, eD, ePS) will be tested within the same methodology.

XDS-SD profile, used to communicate *.pdf documents, needs a scrutiny test and a CONTENT_CREATOR to CONTENT_CONSUMER test (for correct rendering). We will not test that the document is not transformed by the NCP's (Fault Case test).

6.4.3 Authorisation test

IHE_Europe will provide the participants a set of XACML policies that will be tested during the Projectathon. These policies are encoded as XACML2.0 policies. The participant needs to prove (by meanings of log files) that an authorisation procedure effectively took place.

The following policies will be provided:

ALL-PERMIT.xml - for all subjects, for all actions, for all resources, the authorisation decision is "Permit". This policy allows the access to all documents for all roles.

ALL-DENY.xml - for all subjects, for all actions, for all resources, the authorisation decision is "Deny". This policy denies the access to all documents for all roles.

FILTERED.xml - given a document, this document is not shown because the requesting role (HCP roles) has wrong permissions.

6.4.4 HCP Authentication with Identity

This test verifies that the HCP identity assertion, created by an identity provider (part of national infrastructure); is validated by the NCP. A SOAP Fault is thrown if the assertion is wrong.

6.4.5 ATNA Expired Certificate List

This test can be performed with any communication. It needs to be executed with an expired certificate.

7 Testing Tools

The list of the testing tools needed for the pre Projectathon and the Projectathon was defined after reviewing the epSOS specifications and the test plan definition.

Four types of tools have been selected:

- Gazelle® management tool: Gazelle is a more advanced set of tools that better integrates existing tools on a common platform, provides new functions and a single user interface. Gazelle is designed to support on demand interoperability testing of a single application or network as well as to enhance face to face testing of multiple systems in a Connectathon setting.
- Simulators: the simulators are tools that act as a connection partner in order to test a SUT's behaviour. Simulators emulate the behaviour of an SUT implementing a specific combination of actor/profile.
- External Validation Services (EVS): this tool allows the validation of messages or documents produced by the SUT.
- Data servers : this tool provides testing data such as demographic data or certificates (from a testing PKI)

These tools are the responsibility of IHE-Europe.

7.1 Gazelle® Management Tool

The Gazelle® Management Tool is already used for the IHE-Europe Connectathon. A specific instance of Gazelle® will be created for epSOS in order to manage the necessary testing processes and results. Its major functionalities include:

- Participant registration
- User management (participants and testers)
- SUT management
- Test management
- Simulator management
- Test engine
- Configuration management
- Samples sharing management

- Pre Projectathon test management (including the test grading)
- Connectathon test management (including the test grading)

For more information see: **http://gazelle.ihe.net/GazelleMasterModel/**. To access the Gazelle® Management Tool a login is required. It is possible over the following link to register oneself and obtain a login: **http://gazelle.ihe.net/GMM/users/login/login.seam**. Click on the hyperlink "Create an account" and complete the required fields selecting epSOS as the Company name.

7.2 Test Simulators and External Services

To support the testing of individual components or systems, simulators and external validators will be made available. The following lists those simulators and external validators with their intended purpose:

Simulators

Simulators	Purpose	Responsible Organisation
eDispensation Service	actors from IHE-XDR profile extended to be simulated	IHE
Patient Service	actors from IHE-XCA profile extended to be simulated	IHE
Identification Service	actors from IHE-XCPD profile extended to be simulated	IHE
Consent Service[13]	actors from IHE-XDR profile extended to be simulated	IHE

Simulators are accessible via URL's. The following example URL allows the user to access the XCPDINIT Simulator:

http://gazelle.ihe.net/XCPDINITSimulator/home.seam

External validation services

Documents and messages	EVS	Responsible Organisation
Medical Documents: ePS, eP,	CDA Schematrons	IHE

[13] Is based on the BPPC Profile.

eD		
Consent Document, pdf documents	Consent Document, pdf documents	IHE
Medical Documents: ePS, eP, eD	Schematrons (SD)	IHE
Consent Document , pdf documents	Schematrons (SD)	IHE
epSOS profiles using HL7 V3 messages	HL7 v3 evaluator	IHE
Audit Trail Events	Event evaluator	IHE
XAML Assertions	XAML evaluator	IHE

External Validators are accessible via URL's. The following example URL allows the user to access the CDA Validation:

http://gazelle.ihe.net/EVSClient/cda/validator.seam

Schematrons check both syntax and codes of the documents, verifying the adoption of the epSOS Coding Systems. The currently used Master Value Set Catalogue (MVC) can be accessed at URL:

http://gazelle.ihe.net/epSOS/codes/epSOS-pivot.xml

7.3 Other Testing Tools

The data servers will provide dummy data during the test execution. Two types of data servers are available:

- Demographic data service will provide demographic data from each European country to the SUT's. The demographic data service is accessible via the following URL: **http://gazelle.ihe.net/DDS/home.seam**
- PKI server will provide certificate, CRL, and other services linked to a PKI environment. The PKI service is accessible via the following URL: **http://sumo.irisa.fr/cgi-bin/pki/pub/pki?cmd=getStaticPage&name=homePage**

8 epSOS Projectathon

8.1 Projectathon Overview

To prevent confusion with the IHE Connectathon, epSOS has renamed it to Projectathon. While the approach is the same, the actors and profiles have been adapted to the requirements of epSOS.

The IHE Connectathon is the healthcare IT industry's only large-scale interoperability testing event. Connectathon's are held annually in Asia, Europe and North America. During the Connectathon systems exchange information with complementary systems from multiple vendors, performing all of the transactions required for the roles they have selected, called IHE Actors, in support of defined clinical use cases, called IHE Profiles. Thousands of vendor-to-vendor connections have been tested overall, and tens of thousands of transactions passed among the systems tested. The sponsoring organisations publish the results of this testing for public review (see below).

The Connectathon provides detailed validation of the participants' interoperability and compliance with IHE profiles. Participating companies prepare for the event using testing software—the MESA test tools—developed for this purpose. It offers vendors a unique opportunity for connectivity testing—removing barriers to integration that would otherwise have to be dealt with on site, at the customer's expense. Companies taking part have responded overwhelmingly that the IHE process addresses important issues in their product development plans.[14]

During the Bordeaux 2010 Connectathon, the MESA tools were substituted by the GAZELLE tools. epSOS will adopt the GAZELLE tools for future Projectathons.

The following figure shows the process employed by a Projectathon:

[14] Copyright © 2010 IHE International

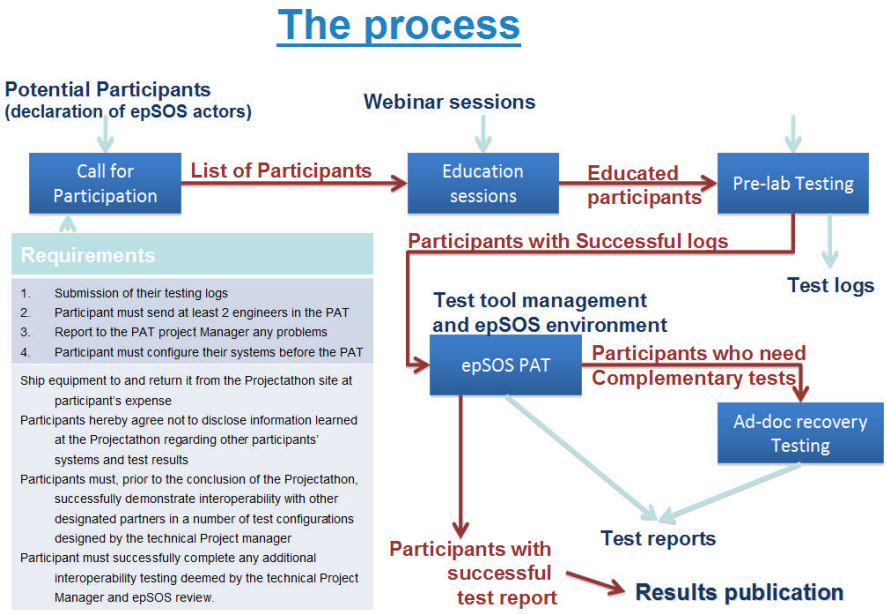


Figure 6 - Projectathon Process

8.2 Logistical Organisation of the Projectathon

In order to support the Projectathon, the epSOS project has to launch logistical organisational activities.

8.2.1 Description of the requirements

8.2.1.1 Duration

The length of the Projectathon will be defined by the number of participants, profiles and systems to be tested during the testing event. For the first PAT, the duration is set at 5 days including the time required to connect the systems and prepare them for the test.

8.2.1.2 Facilities

The PAT must be hosted by a vendor-neutral organisation / institution including the organisation team. This team must have sufficient technical background in order to follow the technical requirements of the PAT such as the establishment of the network. All the technical requirements will be delivered by the IHE technical Project Manager.

The facilities will include but are not restricted to the following items:

- Room with video projector and microphone(s)

- Room to stock the system packaging
- Small Room for organisation team
- Tables and chairs (one table (at least 1,40 X 0,80 m) and two chairs per system)
- Power
- Network
- Catering (water availability, break morning and afternoon and lunch) for the participants (note: vegetarian meals must be included)
- Signals (to sign the table/systems, room, restrooms…)
- Registration services and Badges for participants
- Security and insurances
- Other

The exact requirements will only be known after the call for participants has been closed.

8.2.1.3 Check list for the preparation of Projectathon 2010

This chapter contains questions regarding the organisation of Projectathon 2010 (PAT) and open issues which will need to be solved during the preparation period. The list is reported as guidelines for the organisation of future similar events.

- How many rooms should be available and what is the expected capacity of each room? The following structure of the available rooms is expected:
    - 1 room for testers – capacity for 40 people
    - 1 smaller room dedicated for paper boxes and technical aiding
    - 1 smaller room dedicated for the team of organizers
    - 1 small capacity room for meetings for 15 people
    - 1 large meeting room for 35 people
    - Are there any needs for other rooms to be available during PAT?
- Who manages the registration process for PAT and other required activities that are to be conducted?
  An organisation must take responsibility for the registration process. For PAT 1 IHE will assume responsibility. A self registration process will be made available through Gazelle.

- How many countries will take part in testing?
  The manager of the registration process needs to inform us about the number of the PAT participants. The task was started by TPM, continued with MS Pilot Single point of Contact (SPOC) in WP4.2
- Which Work Package leaders or other persons wish to organise meetings at the location of the PAT.
  Local organisers assume responsibility for organising meetings at the PAT Location. Work package leaders or other relevant people must inform us of their planned meetings, including the time, number of expected participants and special requirements (Flipchart, Beamer etc.). The meeting planning activity is performed.
- Is there a detailed time schedule for testing activities? IHE to define the planning.
- Is there a detailed schedule for other activities that will be conducted parallel to PAT? PC, WPLs are handling the planned meeting agendas and time-plan.
- Are any Member States planning to send political representation to PAT? If yes, we need to be informed. Local organisers need information such as special requirements of political representation (protocol), what will be the level of the representation, how many people will attend, the expected program of the representation during the PAT and who will be the contact person of the representation.
- What are the security requirements?
  It is considered that the room dedicated for testing will be secured by security service people.
- Should the security service be available for other political representations or for other activities parallel to PAT?
- Should there be a camera based security monitoring system in the room dedicated for testing?
- Should all individuals (participants, press, political representation etc.) requiring entry to the premises of PAT be issued with identification in the form of a plastic business card or identification wristlet?
- Will the press be present?
- Are there other security requirements?
- There is the requirement to offer the Gazelle server as a testing environment.

- It is needed to know exactly from what date the testing environment will be available (is it really sufficient for it to be available only 1 month before the due date of PAT.
- It is needed the technical specification of the testing environment (Servers, Routers Firewalls, etc.)?
- It is needed to know the contact person who will be responsible for the preparation of the testing environment.

- The following is a list of technical details, the list of technical parts we have to provide. Are they all necessary, or are any missing?
  - Wi-Fi connection
  - Secured and isolated LAN for testing.
  - Guaranteed connection of the testing LAN to the Internet on the 16 Mb level.
  - Should the speed of the link be controlled at the port (download, upload)? If yes, could you specify the speed capacity?
  - Static IP addresses
  - The network of electric sockets
  - How many LAN connection sockets are expected?
  - Should there be a data projector, screen and flipchart in every room?
  - Every participating Member State should specify their special requirements and a contact person.
- Catering (water availability, break morning and afternoon and lunch) for the participants, the lunch will include vegetarian meals. Are there any other special catering requirements?
- Other services.
  - We expect to offer 2+2 hostesses speaking English during the PAT depending on the real needs.
  - All materials will be available in the English language.
  - Is there any need for translators, if yes, for which languages?
  - Who will be the test lead?

8.2.2 Description of the tasks before the PAT

The following tasks must be completed prior to the PAT:

- Call for the participants: this call must open six months and closed 4 months before the PAT is scheduled to begin. The number of participants is the first element needed in order to determine the size of the facilities.
    - PAT Closure dates known at the time of publishing:
        - PAT 1 – Registration: Closure 11/10/2010
        - PAT 2 – 07.01.2011
- Detailed description of the required facilities and RFP if needed (size of the room, number of tables/chairs, all the catering for the number of participants including the testing management (Project Manager, monitors, …)
- Detailed description of the technical infrastructure (power and network) and all the support needed during the PAT and RFP if needed
- Selection of the location, and all providers in order to satisfy the requirements
- Selection of the security provider and insurance

8.2.2.1 Tasks prior to and during the PAT

The following are the list of task that takes part immediately before and during the PAT:

On the day before the PAT, the environment is built according to the requirements of the different logistical aspects the network is build.

During the PAT, the organisation team must follow all the logistical aspects of the PAT including the support of the network and all other requirements.

An online questionnaire can be provided by the organisation team to participants in order to evaluate the facilities of the PAT.

8.2.2.2 Tasks post PAT - Feedback and report

The organisation team will provide a report to the epSOS project by compiling the questionnaires completed by the participants, adding their own feedback and comments.

8.2.3 Member States Activities

The MS who want to test their systems (NCP and part of the national infrastructure) at a Projectathon have to prepare themselves by taking into account the following:

- epSOS specifications
- the instructions given by IHE

- the education session organised by IHE
- Pre-.Projectathon test

8.2.3.1 Prior to the PAT

The first MS task is to register their candidature along with their team members to the epSOS Projectathon. A call for candidates is launched 3 months before the Projectathon. This first epSOS Projectathon to be conducted in November 2010 was announced at the end of August 2010. Each MS can register in the Gazelle® management tool their system and the role (Country A or B) that they wish to assume in the Projectathon.

Following the registration of the MS and their team members, they can participate in an IHE-Europe organised education session. The education session will present to the MS the test environment, the tools and the test plans, and provide the information needed to prepare for the Pre-Projectathon tests. IHE-Europe gives the access rights to the tools and a specific space where they can upload their own results.

Following the education session, the MS can access the test plans and test data together with the test tools they need to familiarise themselves with the Gazelle® management tool and test their NCP in their own lab.

According to the MS role, they execute their lab tests accordingly by executing the test plans and uploading their test logs to the Gazelle® management tool. During the lab test, interactions between IHE-Europe and the MS are encouraged and facilitate an understanding of the test environment and prepare the MS for the actual Projectathon.

Following the lab test, IHE-Europe will verify the results of the MS uploaded test logs and given that the MS has passed the required tests will be provided authorisation to participate in the Projectathon.

The MS test team is ready to go to the epSOS Projectathon.

8.2.3.2 During and Post the PAT

The Projectathon is closed and secure, and access is granted only against prior registration. The MS participants must be registered in the Gazelle® management tool which is the responsibility of the MS. Participants need to present themselves at the Projectathon reception in order for them to receive their identification that authorises them to enter the secure areas of the Projectathon.

A specific area will be designated to each MS. The MS bring their NCP and Infrastructure to the Projectathon and build it in the designated area. For logistical reasons the MS has to declare if a part of their system is to be connected to the internet.

As per the Pre-Projectathon tests the MS executes the test plans and load their results to the Gazelle® management tool. IHE-Europe will verify those test results.

Following the Projectathon, MS who failed tests are provided the possibility to re-execute them during an ad hoc recovery session. This ad hoc recovery session will take place few weeks after the Projectathon and will be executed on line as per the Pre-Projectathon tests. The test results are recorded in the Gazelle® management tool and the results will be verified by the IHE test team.

9 Conclusion

WP3.9 Proof of Concept development has represented the link between the functional and technical specification performed in WP3.1 – 3.7 and the implementation at epSOS and MS level.

D3.9.2, this deliverable has additionally added from the testing perspective the link to the F.E.T. and Member States. It clearly provides the division of tasks between epSOS, Member States and F.E.T. defining for each their roles and responsibilities for:

- Delivering the components to epSOS (F.E.T.)
- Taking part in the Projectathon (Member States); the pre-requisite for joining the Large Scale Pilot

The activities carried out according to D3.9.2 will ensure:

- F.E.T. provide a robust implementation of the NCP
- Member States are assured their NCP can integrate and be interoperable with other NCP's from other Member States
- WP3.10 have clear testing guidelines
- That many key interoperability issues that would possibly be a problem for WP4.2 are eliminated prior to the large scale project.

It is now the task of WP3.10 to implement the testing strategies, to define the test data, to organise the Projectathon events and to monitor the test results.

WP3.10 will have to perform the validation of the NCP proof of concept, implemented by F.E.T. .

WP3.10 will also have to define the quality gates to allow MS created services and systems to pass from the pre-production phase to the operational phase.

Annex

A1 References

[AnnexI] Annex I – "Description of Work", Version unknown, 24.06.2008

[D3.3.2] epSOS D3.3.2 epSOS System Technical Specification, Version 1.4, 30.04.2010

[D3.1.2] epSOS D3.1.2 Final definition of functional service requirements – ePrescription, Version 1.1, 27.10.2009

[D3.2.2] epSOS D3.2.2 Final definition of functional service requirements – Patient Summary, Version 0.4, 11.12.2009

[D3.9.1] D3.9.1: epSOS Pilot System Components Specifications – Version 0.49, 10.08.2010

[ISTQB] International Software Testing Qualification Board, Standard glossary of terms used in Software Testing, Version 2.1, 01.04.2010:

http://www.istqb.org/download/attachments/2326555/ISTQB%20Glossary%20of%20Testing%20Terms%202%201.pdf

A2 Glossary

The general epSOS Glossary will not be exhaustively explained in this document, because it is accessible on the Projectplace. This section is focused on specific terms related to WP3.9.

Term	Description
Common Software Components	Software components of the NCP-in-a-Transparent-Box
Component	For the purpose of epSOS it can be a discrete software module or a sub-system
Component Integration Test (CIT)	It is the phase foreseen to test the interaction between two tested systems. Its objective is to expose defects in the interfaces and the interaction with other previously tested systems and verify that they are interoperable with one another. This phase can only take place when a software producer develops a component that is required to be integrated with another system (actual or reference).
Component System Test (CST)	It is the phase foreseen to functionally and non-functionally test a software component. Its objective is to expose defects in the functional and non-functional behaviour of the software system under test. The systems are treated as black boxes and as such should be tested using appropriate black box techniques.
Component Unit Test (CUT)	It is the phase foreseen to test the software components. Its objective is to expose defects in the internal behaviour of the software component under test. The components are treated as white boxes and as such should be tested using appropriate white box techniques.

Term	Description
Conformance Test (CCT)	It is the phase foreseen to test the pre-defined epSOS test cases against the component or system as the pre-requisite for entry into the Service Interoperability Test (Projectathon). Its goal is to verify that all pre-defined test cases pass successfully when executed against the component or system under test.
Connectathon	It is the healthcare IT industry's only large-scale interoperability testing event organised and managed by IHE. It provides detailed validation of the participants' interoperability and compliance with IHE profiles
epSOS Interoperability Profiles	Subset of IHE profiles adapted to the epSOS project use cases.
epSOS Portal	Web portal providing a simple interface to be used by Country B for retrieving Patient Summaries (PS), ePrescriptions (eP) as well as for issuing eDispensations (eD).
Gazelle	Test tools provided by IHE to prepare the Connectathon events where validation of the participants' interoperability and compliance with IHE profiles is performed.
IHE profiles	Workflow models of the various business processes that take place in healthcare on a daily basis. These profiles describe “actors” and “transactions.” IHE actors are systems or parts of systems that create or process data. Actors interact and share data by means of IHE transactions.
Laboratory Test Environment (LTE)	Test environment where the testers from epSOS, Member States, suppliers or vendors functional, integration and conformance test their components or systems and each of whom is responsible for its acquisition and management. The test environment is typically made up of virtual or actual test systems, with supporting test software.
MESA	Test tools formerly provided by IHE to prepare the

Term	Description
	Connectathon events where validation of the participants' interoperability and compliance with IHE profiles is performed. These test tools have been substituted by Gazelle tools.
National Connector	Entity that encapsulates the Nation-Specific NCP Components. The National Connector is implemented as a black box having its subcomponents hidden from the NCP.
National Contact Point (NCP)	Entity in each participating country to act as a bidirectional technical, organisational and legal interface between the existing different national functions and infrastructures. The NCP is legally competent to contract with other organisations on its territory in order to provide the necessary services which are needed to fulfil the business use cases and support services and processes. The epSOS NCP is identifiable in both the epSOS domain and in its national domain and acts as a communication gateway and establishes trust in the Trusted Domain. As such a NCP is an active part of the epSOS environment if and only if it is compliant to normative epSOS interfaces in terms of structure, behaviour and security policies. The epSOS NCP also acts as a mediator as far as the legal and regulatory aspects are concerned.
National infrastructure	It represents all entities where patient or HCP or Health Care records are managed in member states.
NCP-in-a-Transparent-Box	A modular set of software components (Common Software Components) intended to facilitate a NCP implementation that can be used completely or partly by any MS to fulfil NCP obligations. This implementation is not mandatory.
Portal Adapter	Adapter located in the NCP for enabling the communication between the NCP and the epSOS Portal without using the unknown National Connector (specific for each country).
Pre-Pilot Test (PPT)	It is the phase foreseen to regression test the installed components in their target Pilot environment firstly as a

Term	Description
	standalone component and secondly with other standalone components or systems. Its goal is to ensure that there are no problems or issues with the setup and configuration of the epSOS Infrastructure and the components connected to it.
Pre-Pilot Test Environment (PTE)	It is a conglomeration of pilot systems from Member States where Pre-Pilot Tests are performed to validate the systems before the pilot operation phase.
Projectathon (PAT)	Similar to Connectathon, Projectathon is an interoperability testing event organised and managed by the epSOS Project in cooperation with IHE, to check the compliance of the MS implemented systems to the epSOS Interoperability Profiles.
Projectathon Test Environment (CTE)	Test environment used in the Projectathon, where Member States, suppliers and vendors can test the interoperability of their components and systems against other Member States, suppliers and vendors components and systems.
Reference Test Environment (RTE)	Test environment where developers and testers of Member States, suppliers or vendors have the possibility to connect and integrate their components and systems by applying well-defined test plans, tools and processes.
Service Interoperability Test (SIT)	It is the phase foreseen to test the pre-defined test cases as defined by epSOS. The SIT is conducted in the Projectathon.
Unit Test Environment (UTE)	Is a test environment where the developers from epSOS, Member States, suppliers or vendors unit test their components and each of whom is responsible for its acquisition and management. The test environment is typically made up of developers' machines with supporting testing software. The test phase Component Unit Test would use such a test environment.

A3 Abbreviations

Abbreviation	Description
ATNA	Audit Trail and Node Authentication
CA	Certificate Authority
CCT	Conformance Test
CDA	Clinical Document Architecture
CIT	Component Integration Test
COTS	Commercial off-the-shelf
CRL	Certificate Revocation List
CST	Component System Test
CTE	Projectathon Test Environment
CUT	Component Unit Test
eD	eDispensation
eP	ePrescription
ePS	Electronic Patient Summary
EQ	External Quality
EVS	External Validation Services
F.E.T.	Fraunhofer ISST / Elga Team
FR	Functional Requirement
GP	General Practitioner
GUI	Graphical User Interface

Abbreviation	Description
HCP	Health Care Professional
HLDD	High Level Design Document
ICT	Information and Communication Technologies
ID	Identifier
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IHE	Integrating the Health Care Enterprise – Europe
IQ	Internal Quality
ISO	International Organisation for Standardisation/
ISTQB	International Software Testing Qualification Board
IT	Information Technologies
LSP	Large Scale Pilot
LTE	Laboratory Test Environment
MS	Member State
MSI	Microsoft Installer
MTC	epSOS Master Translation/Transcoding Catalogue
MVC	epSOS Master Value Sets Catalogue
NCP	National Contact Point
NCP-A	National Contact Point of Country A
NCP-B	National Contact Point of Country B
NFR	Non Functional Requirement

Abbreviation	Description
NI	National Infrastructure
OCSP	Online Certificate Status Protocol
PAT	Projectathon
PDF	Portable Document Format
PEB	Project Executive Board
PKI	Public Key Infrastructure
PoC	Point of Care
PPT	Pre-Pilot Test
PS	Patient Summary
PSB	Project Steering Board
PTE	Pre-Pilot Test Environment
QI	Quality in Use
RTE	Reference Test Environment
SAML	Security Assertion Markup Language
SCM	Software Configuration Management
SIT	Service Interoperability Test
SLA	Service Level Agreement
SOAP	Simple Object Access Protocol
TAR	Tape Archive
TPM	Technical Project Manager
TRC	Treatment Relationship Confirmation

Abbreviation	Description
URL	Uniform Resource Locator (world wide web address)
UTE	Unit Test Environment
V&V	Verification and Validation
VPN	Virtual Private Network
WG	Working Group
WP	Work Package
WSE	Web Service Enhancement
XACML	eXtensible Access Control Markup Language
XDS-SD	Cross-enterprise Scanned Document Sharing
XML	eXtensible Markup Language

A4 Open Points and Issues

Number	Priority	Description
I-1	High	Are epSOS to provide a fully integrated reference system making it possible for member states to conduct integration / interoperability testing at this level leading to fewer issues during the System Integration Test phase? • F.E.T. has made available a test system to be used for development and System Integration Test
I-2	High	IHE to provide the Entry and Exit Criteria for Conformance Test and Service Interoperability Test. In addition the “Deliverables” must be defined. • To be addressed in WP3.10.1.
I-3	High	Approval and Signoff criterion for the F.E.T. solution must be defined. • Task assigned to WP3.10 by TPM.
I-4	High	The exit criteria for the Pre-Pilot Test and entry criteria for LSP-Operation are to be defined. • Proposal has been made to the PEB from the TPM, and is expected to be assigned to WP3.10.