




Smart Open Services for European Patients

Open eHealth initiative for a European large scale pilot of
Patient Summary and electronic Prescription

D3.C.1 - Proof of Concept Testing Strategy

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COVER AND CONTROL PAGE OF DOCUMENT

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ABSTRACT

“**D3.C.1 - Proof of Concept Testing Strategy**” is a revision and major update of “**D3.9.2 - Testing Methodology, Test Plan and Tools**” from epSOS Phase 1. It revises the epSOS testing strategy as defined in D3.9.2, in order to comply with the latest requirements and information in epSOS Phase 2.

The core of the revised epSOS Testing Strategy is presented in this document; while its appendix (D3.C.1 Appendix-B - Proof of Concept Testing Strategy Details) provides further details for the testing concepts and assets as they are utilized in epSOS.

Change History					
Version	Date	Status Changes	From	Details	Review
V0.0.1	16/11/2009	Draft	S.Sampson	First draft Testing Strategy	WP3.9
V0.0.6	10/08/2010	Draft	S.Sampson+ WP3.9 WG A	Final version of Testing Strategy	WP3.9
V0.1	10/08/2010	Draft	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.	

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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 and further additions in respect to Test Data Generation	
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 Ext. 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
V1.1	17/08/2012	Draft	M.Yuksel	Renamed the document title to "D3.C.1 - Proof of Concept Testing Strategy" from "D3.9.2 - Testing Methodology, Test Plan and Tools" and updated the overall content by complying with the latest information from the epSOS Project in 2012.	WP3.C, TPML, PC
V1.2	22/08/2012	Draft	K. Bourquard, M. Yuksel	Karima provided comments and updates from IHE-Europe's perspective. Mustafa went over them to produce the next version.	WP3.C, TPML, PC
V1.3	15/10/2012	Draft	TPML, M.Melgara, M. Yuksel	Marcello and TPML provided comments updates. These are applied by Mustafa. Conformance gates are slightly updated with the observations from the latest PPT-slot. Finally, the document is restructured to address reviewer comments.	TPM, NEPCs (PD4)
V1.4	2/11/2012	Draft	CAB, M. Yuksel	Testing strategy updated with change management process. Comments from M. Melgara and M. Ruzicka are integrated	TPML, NEPCs, ChM, WP3.C
V1.5	21/12/2012	Final	J. Thorp, M. Yuksel	Updated according to the final quality review	All



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1 Introduction


This document and its appendices describe 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). They establish normative standards, a foundation for the test planning, the test techniques and methods, the details and interaction among the epSOS test phases, 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.

Together with its Appendix-B, this document is a revision and major update of D3.9.2 - Testing Methodology, Test Plan and Tools from epSOS Phase 1. Taking into account the comments of reviewers, a single document that contains all the information related with the testing strategy is now composed into one main document presenting the core (i.e. this document), and an appendix (i.e. D3.C.1 Appendix-B - Proof of Concept Testing Strategy Details) providing further details.

The core that is provided in the next section is entitled **epSOS Testing Strategy and Approach**. It first describes the details of the epSOS Testing Strategy, which gathers the criteria to participate to test phases that are under the responsibility of epSOS, namely Pre-Projectathon (pre-PAT), Projectathon (PAT) and Pre-Pilot Testing (PPT). It also encompasses some concepts defined in the ISO/IEC 9126 Software engineering - Product Quality for better explaining the epSOS testing approach.

The details that are provided in D3.C.1 Appendix-B are composed of **General Conditions** where terminology, standards and the testable services are described; **epSOS Testing Methodology** describing the test levels, phases, and environments; **epSOS Test Plan Definition** describing the test plan with respect to the specifications of the WP3.X and the Test Strategy already defined in WP3.9 / WP3.C; **Testing Tools** listing the tools that are made available to testers prior to and during epSOS test phases; **Testing Plan Structure** presenting the actors and the test cases that are defined for epSOS test phases; **epSOS Projectathon** providing a brief overview of the Projectathon and the logistical steps that are taken prior to, during and after a Projectathon; and finally an **Annex** listing References, Glossary and Abbreviations.

This document is supported with another appendix, namely D3.C.1 Appendix-A - Revised Requirements of epSOS Testing Environment, which has revised the requirements of testing in epSOS, by concentrating mostly on the technical capabilities of the testing environment.

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2 epSOS Testing Strategy and Approach

This section first describes the details of the epSOS Testing Strategy, which gathers the criteria to participate in test phases that are under the responsibility of epSOS, namely Conformance Test (CCT) (pre-Projectathon), Service Interoperability Test (SIT) (Projectathon), and Pre-Pilot Test (PPT); and the flow between these test phases.

In the second part, this section also encompasses some of the concepts defined in the ISO/IEC 9126 Software engineering - Product Quality keeping within the ISO/IEC 25000 family for better explaining the epSOS testing approach. The use of these concepts is complementary to those concepts already listed elsewhere in this document.

2.1 epSOS Testing Strategy

epSOS is specified and implemented as a set of interacting National Contact Points (NCPs). epSOS technical specifications define common communication and data exchange interfaces only for NCP to NCP interactions. There is no common specification by epSOS for NCP to National Connector or National Connector to National Infrastructure interactions. The building blocks of epSOS, which for now cover the epSOS Phase 1 services, are presented in Figure 1. Please note that presenting the details of these components is not within the scope of this deliverable.

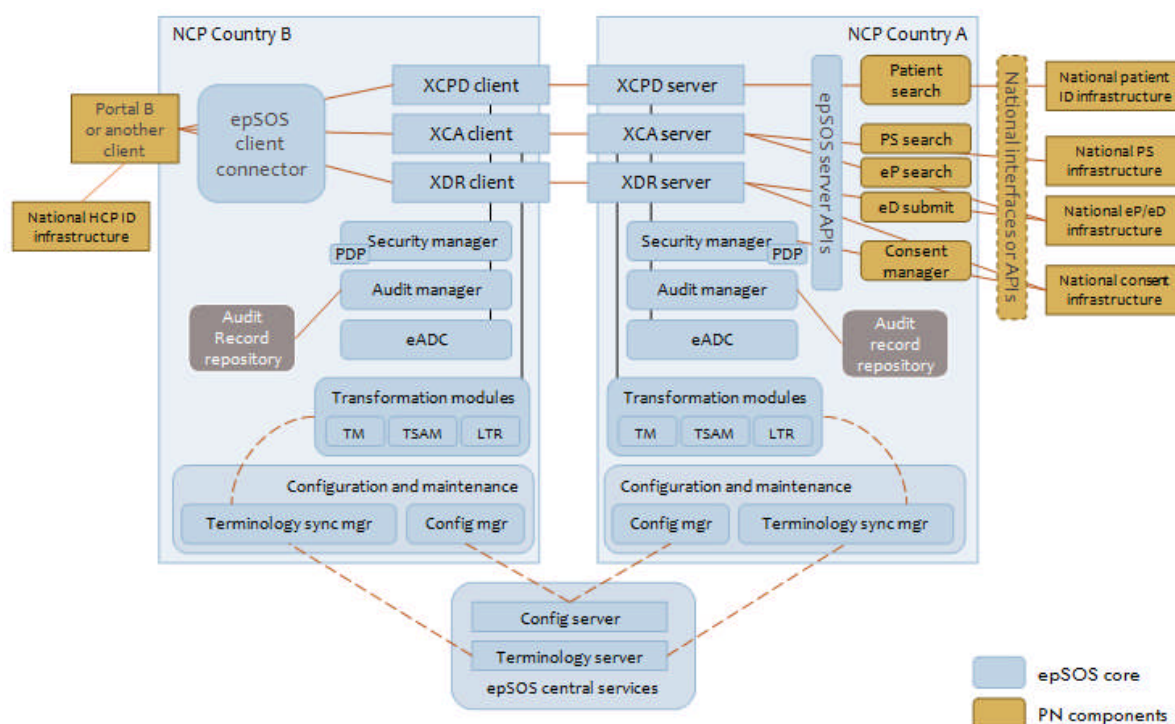



Figure 1 epSOS Building Blocks [Courtesy of OpenNCP]

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Therefore, the epSOS Testing Strategy focuses on cross-border data exchange, i.e. the NCP to NCP communication. In addition to testing of technical communication between the NCPs, epSOS testing includes end-to-end functional testing, semantic and document validation, and existence and formal compliance testing of audit trails / security provision as well. On the other hand, although NCP-to-NCP testing (including end-to-end testing) might reveal issues related with NCP to National Infrastructure communication on one side, or on both sides, this is not the main objective of epSOS testing.

The main blocks that are to be considered during epSOS test phases are as follows:


- NCP-A
- NCP-B
- Portal-B (Country-B Front-end Portal)

2.1.1 The Interactions among the epSOS Test Phases

The test phases that are within the scope of PNs and epSOS are already defined in D3.C.1 Appendix-B #3.1.8. In this part, these phases will not be defined again, but the relationships among them will be explained together with acceptance and pass criteria for the PNs.

Below, we briefly go over the test phases that are within the scope of epSOS:

- **Pre-Projectathon (pre-PAT):** Conformance testing to be allowed to go to the Projectathon, performed from the participant systems towards the simulators and validators provided by IHE-Europe. It is initiated by registration to Gazelle® Management tool for PAT, and continues until the PAT. IHE-Europe checks and validates pre-PAT tests latest 2 weeks before the PAT.
- **Projectathon (PAT):** IHE Connectathon like face-to-face event to perform conformance and interoperability testing. It also includes end-to-end functional testing involving health professionals (HPs). It is not mandatory for the PNs to participate with their actual national infrastructures to a PAT; a simulation of the national environment is accepted as well; of course this holds for the pre-PAT too. PAT allows to enter in the Pre-Pilot Testing.
 - **PAT Grace Period:** Immediately after the PAT, when they are back home the participants are allowed to complete unfinished test cases and provide logs remotely for 1 or 2 weeks. The duration is determined according to the observations during the Projectathon. The tests that are completed during this grace period are also taken into account in the PAT reports.
- **Pre-Pilot Testing (PPT):** Conformance, interoperability and end-to-end functional testing with real national infrastructure and virtual data (Representative and Critical Test Data). Its


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goal is to ensure that there are no problems or issues with the setup and configuration of the pilot environment of a PN. The initiation of the PPT environment should immediately start after passing a PAT. PPT is a continuous process and the PNs need to operate their testing environments even after starting real operation.

- **pre-PPT-slot:** For participation in a PPT-slot, the PNs have to provide evidence to KT3.C.4 leader and WP3.C leader that they are ready for the PPT-slot through links to validation results in the test simulators and validators provided by Gazelle. Furthermore, they have to exchange PS and/or eP/eD documents with all possible counterpart PNs available in the PPT environment and the other PNs who will participate to the same PPT-slot. This pre-PPT-slot phase is not a formal process managed through Gazelle or IHE-Europe, but it is still mandatory for making sure that the PNs are actually capable of achieving a PPT-slot.
- **PPT-slot:** According to the needs and statuses of the PNs, two weeks long PPT-slots are organized a few times in a year for repeating all tests within the scope of pre-PAT and PAT (i.e. conformance, interoperability and end-to-end functional testing) with real national infrastructure and virtual data. PPT-slot is a conformance gate to go into real operation. It is a remote testing activity managed through Gazelle by IHE-Europe and KT3.C.4 PPT leader. Registration through Gazelle® Management tool is necessary as in the case of PAT. It should be noted that the overall PPT phase can be used for debugging and configuration management; however PPT-slot is restricted to testing formally according to the test plan and test cases; it is not for debugging. A PPT-slot is a formal process that leads to accept a PN for the next step (i.e. to go to the real operation).

It should be noted that, testing by the PNs shall not be limited to these test phases. In addition to Component Unit Test (CUT), Component System Test (CST) and Component Integration Test (CIT) phases that are advised to the PNs, they are encouraged to use the simulators and validation services of IHE-Europe even during their development process. These simulators and validators are used normally during pre-PAT and PPT, but they are in fact available online almost 7/24.

The interactions among the epSOS test phases is depicted in the following figure.

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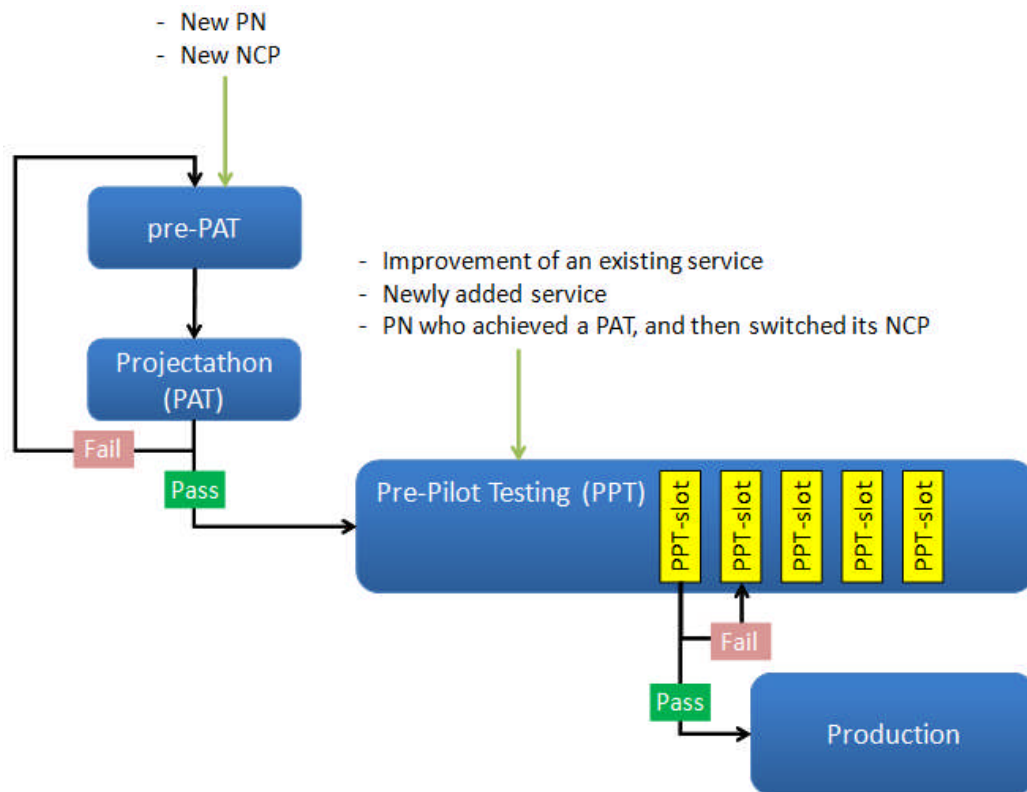



Figure 2 epSOS Testing Strategy: Interactions among Test Phases

According to epSOS Testing Strategy, the **main participation rules** for these test phases is as follows:

1. A participant (PN or vendor) who has never achieved a PAT previously **MUST** start from pre-PAT and PAT.
 - a. This rule has an exception. Due to time constraints, if a new PN who has never achieved a PAT before shows very good progress with implementation and testing, then it **MAY** be allowed to start from PPT and PPT-slot instead of PAT. This exception can only be applied if the next PAT is several months ahead. This decision is evaluated individually for each requestor, and **MUST** be approved by KT3.C.4 leader, WP3.C leader, PD4 leader, the TPML and the PC. Even if this exception is approved, the corresponding PN **MUST** still participate to the next possible PAT.
2. If a participant is not able to achieve any progress during pre-PAT, then it is asked to de-register from the upcoming PAT.
3. The participants that achieved a PAT **MUST** proceed with PPT.
4. If the PNs who already achieved a PAT i) improve an existing service, ii) implement a new service, or iii) switch their NCP completely (e.g. from NCP-in-a-box to OpenNCP), then they

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are permitted to proceed with PPT and PPT-slot. It is NOT REQUIRED to start from PAT again.

5. The PNs MUST operate their PPT environments and participate in PPT activities starting from the end of a successful PAT and continuing as long as they remain in the epSOS network.
6. In order to proceed to pilot operation, a PN MUST achieve at least one PPT-slot. A PN who failed for a PPT-slot MUST participate to a new PPT-slot, if it is willing to be part of operation.
7. The PNs MUST NOT shut down their PPT environments and stop PPT activities after being accepted in operation.
8. A participant MAY participate to PATs and PPT-slots as many times as they want, even after becoming successful.

It should be noted that these are only the main rules. The details of the participation criteria are provided in the following section.

2.1.2 Detailed Participation Criteria for the Test Phases (Conformance Gates)

WP3.9, WP3.10, WP4.3 in epSOS Phase 1 and WP3.C, KT1.4.10, WP4.C in Phase 2 have defined several technical / semantic detailed participation criteria for the epSOS test phases. These are also known as Conformance Gates. There are three Conformance Gates, and they are incremental; i.e. each one is built upon the previous one, and further extends the previous.


The Conformance Gates are formally released in the PN_Report Check List (managed by PD4, specifically WP4.C). NEPCs are requested to provide the updated status of their check list fulfilment every two weeks.

In this part, the Technical and Semantic Conformance Gates that are relevant for testing are provided. For the formal and complete list of Conformance Gates, please refer to the PN_Report Check List.


2.1.2.1 Conformance Gate 0 (CG0)

A participant has to pass Conformance Gate 0 (CG0) to be allowed to participate to a pre-PAT and PAT. CG0 criteria are as follows:

1. Participants MUST create and formally approve the Master Translation and Transcoding Catalogue (MTC), verifying all the agreements / contracts with the relevant Standard Development Organizations (SDOs) are fulfilled.

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2. The participants that use Transformation Manager (including Terminology Service Access Manager [TSAM], TSAM Synchronizer and Local Terminology Repository [LTR]) for transcoding / translation MUST upload their MTC to eCRTS (at present HealthTerm) and MUST synchronize their Local Terminology Repository (LTR) with eCRTS. In case a participant is not using Transformation Manager for transcoding / translation, but using its own solution, then this participant MUST prove to the epSOS semantic experts during and after PAT that this solution is technically correct and terminology validation procedures are in place to prevent clinical safety risks.
3. Participants MUST integrate their NCP at least with a virtual National Infrastructure (i.e. a simulated NI), and if possible with the real National Infrastructure with virtual data.
4. Participants MUST create the Critical Test Data (CTD) and OPTIONALLY Representative Test Data (RTD) and load them in their virtual National Infrastructures; i.e. CTD is a MUST, and RTD is RECOMMENDED.
5. Participants MUST provide the credentials for the CTD and RTD.
6. Participants MUST run scrutiny tests on these CTD and RTD.
7. If acting as Country B, participants SHOULD translate Portal-B in Country-B language.
8. Participants MUST request and install certificates. They are allowed to participate with self-signed certificates, which MUST be still compliant with epSOS specifications in terms of content.
9. Participants MUST use central services (i.e. TSL Editor, SyncApp) to create and upload their configuration files to the epSOS central config area. The config area that is used for both PPT and PAT MUST be used.
10. Participants MUST enable TSL synchronizer in their NCP setup.
11. Participants MUST establish VPN communication as used in the PPT environment.
12. Participants SHOULD successfully exchange at least one document (i.e. complete a workflow of PS and/or eP/eD according to the services that they implement) with each possible counterpart PN available in the PPT environment, and also with the PNs who will be in the same PPT session. The participants MUST inform WP3.C leader about the results.
13. Participants MUST prepare their HPs for end-to-end functional testing to take place during PAT. HPs MUST register themselves for the electronic questionnaire that is available at <http://gazelle.ihe.net/content/epsos-cda-evaluation-form> and MUST study the questionnaire before PAT.
14. Participants MUST complete their registration in Gazelle on time, based on the epSOS services they implement.
15. Participants MUST participate to the Gazelle education teleconference organized by IHE-Europe prior to a PAT.

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16. Participants **MUST** be able to easily locate and manipulate the application logs of their NCPs, which will be necessary during testing in PAT.


2.1.2.2 Conformance Gate 1 (CG1)

A participant has to pass Conformance Gate 1 (CG1) to be allowed to participate to a PPT-slot. CG1 criteria are presented below, but before that, there are also some basic criteria to be part of PPT (be careful, not PPT-slot) in general for performing experiments with other PNs in the PPT area for debugging, configuration management, quality improvement, etc. These basic criteria can be termed as pre-CG1, and are listed below:

1. Participants **MUST** have passed CG0.
2. Participants **SHOULD** have passed a PAT. If not, they **MUST** have completed all the related pre-PAT tests (i.e. Conformance tests epSOS-1 to epSOS-11).
3. NCP **SHOULD** be connected to the real National Infrastructure with virtual data.

The CG1 criteria that must be fully met to be admitted to a PPT-slot are as follows:

1. Participants **MUST** have passed a PAT successfully, which means that no Severity 1 or 2 defect (D3.C.1 Appendix-B, # 3.6.3.1) was reported as a result of the PAT.
2. Participants **MUST** have resolved any issues that were detected in their implementation in previous test phases.
3. NCP **MUST** be connected to the real National Infrastructure with virtual data.
4. Participants **MUST** create both CTD and RTD, and make them available in their National Infrastructures.
5. If acting as Country-B, participants **MUST** translate and validate Portal-B in Country-B language.
6. Participants **MUST** request and install certificates that are totally compliant to epSOS specifications. Self-signed certificates are not accepted.
7. Participants **MUST** provide evidence to KT3.C.4 leader and WP3.C leader that they are ready for the PPT-slot through links to validation results in the test simulators and validators provided by Gazelle® Management tool. These tests will be identical to the pre-PAT tests (i.e. Conformance tests epSOS-1 to epSOS-11). Please note that this pre-PPT-slot phase is not a formal process managed through Gazelle® Management tool or IHE-Europe, but it is still mandatory for making sure that the PNs are actually capable of achieving a PPT-slot.
8. Participants **MUST** successfully exchange at least one document (i.e. complete a workflow of PS and/or eP/eD according to the services that they implement) with each possible counterpart PN available in the PPT environment, and also with the PNs who will be in the

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same PPT-slot. The participants MUST inform KT3.C.4 leader and WP3.C leader about the results, again within the scope of pre-PPT-slot activities.

9. Participants MUST complete their registration in Gazelle® Management tool on time, based on the epSOS services they implement, this time for the PPT-slot.
10. Organizational aspects MUST be established.
11. Basic legal requirements MUST be fulfilled.

2.1.2.3 Conformance Gate 2 (CG2)

A participant has to pass Conformance Gate 2 (CG2) to be allowed to enter into operation. CG2 criteria are as follows:

1. Participants MUST have passed a PPT-slot successfully, which means that no Severity 1 or 2 defect (D3.C.1 Appendix-B, # 3.6.3.1) was reported as a result of the PPT-slot.
2. Legal, security and organizational requirements MUST be fulfilled.

Once a PN has passed successfully PPT-slot tests and fulfils all entry criteria for the operation environment (CG2), PSB is asked to admit the national pilot to Operation (OP). The pilot then enters LSP OP, i.e. the Trust Domain of epSOS, and is interoperable with all other national pilots.


2.1.3 Change Management

During the lifetime of the epSOS Project, some changes in the PN implementations might be required for many reasons. These changes might also affect testing; e.g. they might lead to development and execution of new tests against the updated PN implementations, or only re-execution of existing tests. This depends on the type and scope of the change, which can be a new patch for bug fixing, MVC/MTC update or a brand new service implementation.


The overall objective of the epSOS Project to ensure that standardized methods and procedures are used for efficient and prompt handling of all changes belongs to the epSOS Change Manager (ChM) and the supporting Change Advisory Board (CAB), in which the WP3.C Leader is an active participant. ChM and CAB together manage the change management operation, elaborate on details of change and take decisions with respect to a particular change.

In this section, some further details of change management from the testing strategy point of view are presented:

1. If there are new specifications to be implemented, as in the case of new and extended services that are introduced within the scope of epSOS Phase 2, then this will lead to either update of existing test assets or brand new development of test assets, followed by execution of these tests by the PNs and/or vendors. The strategy to be followed is as follows:

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- a. When the technical details of the new specifications are provided by WP3.A or by other responsables such as the Security Expert Group (SEG) (e.g. through EED Design deliverable), WP3.C and testing contractor (i.e. IHE-Europe) MUST analyze the new design specifications. The implementation decisions of WP3.B MUST be taken into account as well.
 - b. According to analyses, WP3.C and IHE-Europe MUST decide on whether the new requirements should be covered by new test asset development, update of existing test assets or total re-use of existing test assets.
 - c. WP3.C and IHE-Europe MUST do the testing implementation planning accordingly.
 - d. IHE-Europe MUST do the implementation and assure the correctness of the implementation through internal testing, according to the agreed planning.
 - e. WP3.C, together with the necessary experts such as from SEG or Semantic Task Force Group (TFG), MUST validate the updated and/or new test asset implementation.
 - f. IHE-Europe MUST include the updated and/or new test assets into the corresponding epSOS test phases.
 - g. In line with the main participation rules presented above, the PNs who have already achieved a PAT previously (including those in operation) and are subject to these newly implemented specifications, MUST proceed with PPT and PPT-slot testing to complete successfully the updated and/or new test assets against their PPT environments.
 - l. If the PN is already in operation, after it becomes successful with these updated and/or new test assets, it MUST apply the updates done in its PPT environment to its operation environment. The rest is beyond the scope of WP3.C, but it is RECOMMENDED by WP3.C to repeat the same tests in operation environment as well.
 - h. If the PN has not achieved a PAT yet, then it MUST proceed with its preparations for the next possible PAT, taking into account the updated and/or new test assets.
2. If the change is limited with a configuration change in the NCP, new patch for bug fixing or MVC/MTC update, then it is almost guaranteed that there will be no need for brand new test asset development (in case it turns the opposite way, proceed with bullet 1 above). Such changes will lead to either slight update of the existing test assets or re-use of the existing test assets. The strategy to be followed is as follows:
 - a. When the change is a new patch for bug fixing or a configuration change in the NCP, WP3.B MUST provide the details and implementation planning of the change to WP3.C. When the change is MVC/MTC update, Semantic TFG must provide this information to WP3.C.


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- b. WP3.C and IHE-Europe, in cooperation with the involved experts such as from WP3.B or Semantic TFG, MUST do the analysis and make the relevant updates to the existing test assets if found necessary, in a similar way it is explained in bullet 1 above (b-f).
- c. WPL3.C MUST inform the PNs who are already operating a PPT environment, about the test process to be followed. Depending on the details of change, this can be re-execution of some updated tests, or re-execution of existing tests only. The identified tests MUST be performed in the PPT environments of the PNs who are affected by the change. Note that this is an ad-hoc process that has to be realized for each change individually; i.e. it is not possible to fix the set of tests to be repeated in advance.
 - I. If the PN is already in operation, after it becomes successful with these updated and/or existing test assets, it MUST apply the updates done in its PPT environment to its operation environment. The rest is beyond the scope of WP3.C, but it is RECOMMENDED by WP3.C to repeat the same tests in operation environment as well.
3. A third case would appear when a PN from Phase 1 (might be already in operation) decides not to implement any of the Phase 2 services.
 - a. In case the new design is totally backwards compatible (D3.A.3 - EED Design is planned to be backwards compatible), it is expected that a PN who will not implement any Phase 2 service SHALL NOT be REQUIRED to re-execute the tests. However, for example, if there is a change in content of an existing service (e.g. modification of the patient summary template), then the validators for the PS will be updated, and the old PN MUST re-execute according to these updated validators, first in the PPT environment, and then in the operation environment. Hence, this case becomes identical with bullet 2 above.
 - b. In case backwards compatibility is not possible with the updated service (e.g. modification of the transactions), then after updating the implementation of the service, the PN MUST proceed with PPT and PPT-slot testing. Hence, this case becomes identical with bullet 1 above.

2.2 epSOS Testing Approach

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

1. IQ verification and validation (V&V) "Internal quality" is technical and verifies the internal functional and non-functional aspect of the system.

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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. QI V&V “Quality in use” gives a non-technical, functional end-user perspective verifying business and end-to-end processes.

In the following sub-sections, these viewpoints are discussed from the epSOS point of view.

2.2.1 Internal Quality V&V

This is not within the scope of epSOS, as we do not have the responsibility to carry out such tests. This is restricted to the implementing bodies themselves, such as the Participating Nations or the Vendors.

However, in Phase 1, epSOS had 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 Participating Nations.

Similarly, in Phase 2, this time epSOS has a similar responsibility to confirm with the OpenNCP mini-project teams that internal quality of the developed components is established.


2.2.2 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

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- 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 PN national infrastructures. Therefore the responsibility for performance testing lies firmly in the hands of the Participating Nations.

External Quality approach is directly associated to all three test phases that are under the responsibility of epSOS, i.e. pre-Projectathon, Projectathon and Pre-Pilot Test. It is executed by first verifying systems in their native standalone state, and then through successive integration of neighbouring components until 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 / WP3.A:

- PN B Solution including NCP-B and Portal-B. A set of simulators (e.g. XCPD responding gateway simulator) developed by IHE-Europe play the role of the NCP-A. The transactions are initiated through manual input in the PN B National Infrastructure PoC System (Portal-B). Results are evaluated in the simulators. Additionally, it is suggested that the application logs are cross-checked from Portal-B and NCP-B.
- PN A Solution including NCP-A. A set of simulators developed by IHE (e.g. XCA initiating gateway simulator) play the role of the NCP-B / Portal-B to initiate the transactions. The results are evaluated in the simulators. Additionally, it is suggested that the application logs are cross-checked from NCP-A.

To ensure system interoperability, the following system combinations need to be tested with the support of simulators and validators provided by IHE-Europe to ensure interoperability:

- PN B Solution to PN A Solution (End to End Tests). The transactions are initiated through manual input in the PN B National Infrastructure PoC System (i.e. Portal-B), which are then forwarded to NCP-B and then to NCP-A; the responses follow the same route back. The results are first evaluated manually in the Portal-B. Then, transactions and the corresponding audit logs are validated in the validators provided by IHE-Europe. This validation process is still manually initiated by the PNs as of October 2012 by extracting WS messages from the application logs of NCP-A and NCP-B. It is planned to use Gazelle Proxy at least during the Projectathons to automatically capture and validate these transactions.

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

2.2.3 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 (partially) Projectathon and (mainly) the Pre-Pilot Test phases. A Participating Nation NCP will have passed the Projectathon and be ready for connection to the epSOS Infrastructure. There are the following incremental test targets:

- PN A Solution including NCP-A
- PN B Solution including NCP-B
- PN B Solution to PN A Solution (End to End Tests)

While progressing from the end of Projectathon to PPT, 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) during the switch from the emulated national infrastructure to the real national infrastructure, and that the configuration is correct before allowing it to actively join the epSOS Infrastructure. For this reason, a PPT-slot is composed of all the test steps that are involved in pre-Projectathon and Projectathon.

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 HP in country B is semantically correct in relation to the information sent from country A, and presents no risk to the patient. This is known as **end-to-end functional testing**, and it is carried out with participation of HPs and/or semantic experts from the participating PNs. After doing several patient data exchanges, these experts are asked to fill in electronic questionnaires¹ that are prepared by epSOS and hosted by IHE-Europe. Then, these questionnaires are evaluated by the semantic experts of epSOS. end-to-end functional testing is done during both PAT and PPT. The details of end-to-end functional

¹ <http://gazelle.ihe.net/content/epsos-cda-evaluation-form>

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testing is presented in D3.10.1 Appendix 8 - epSOS end-to-end Functional Testing for Projectathon and Pre Pilot Testing: Guidelines for HPs and PNs.

Once a Participating Nation is allowed to join the epSOS Infrastructure, it is necessary to run further **end to end regression tests** with already approved PNs to ensure that there are no new interoperability issues. Technically, the regression testing in the operational environment is identical with the end-to-end functional testing, and it is encouraged that these tests are repeated periodically to assure the operation is flawless. It should be noted that WP3.C deals with the testing process till the operation; therefore the management of regression testing in operation belongs to PD4.

After successful application of these test procedures, the end result is an interoperable epSOS Infrastructure including NCP-As, NCP-Bs, Portals and operational National Infrastructures that are ready for cross-border real patient data exchange in the scope of a Large Scale Pilot.