

# e-Health Technical Committee Newsletter

September-October, 2017

On behalf of the e-Health Technical Committee (TC) of the IEEE Communications Society (ComSoc), we wish all our members a very instructive reading of this letter.

The contribution from this edition is coming from Cyprus and report on some ongoing activities of deployment of cross border ehealth services towards Connecting Europe Facility (CEF) (2017-2020) initiative.

Members of the e-Health community are invited to contact the author for further information or collaborations.

***We also welcome all our members to share their research activities and field experiences through this open newsletter and to open up new opportunities for discussions and collaborations.***

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## I. INTRODUCTION

Cyprus, aligned with the eHealth Action Plan 2012-2020 [1] interoperability requirements (both nationally and among the EU member countries), and in response to societal demands for cross border healthcare access, is currently working towards the establishment of a national interoperable hub for the exchange of secured medical data. In this context, the proposed eHealth services deployed under the Connecting European Facility (CEF) instrument of the European Union (EU), will accommodate functionalities for secure patient data exchange, exploiting an interoperable, secured, and trustworthy infrastructure.

More specifically, Cyprus is committed to deploy and provide a cross border eHealth service under the CEF 2015 eHealth time frame (2017-2020) [2]. The main objective of this project is to support Cyprus efforts to be part of a secure peer-to-peer network allowing the exchange of patient summaries (PS) [3] and/or electronic prescriptions (eP) [4]. The latter will pave the way towards the following distinct objectives: (a) Enabling seamless cross-border care and secure access to patient health information between European healthcare systems, particularly with respect to the exchange of PS and eP; (b) Contributing to patient safety by reducing the

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## DEPLOYMENT OF GENERIC CROSS BORDER EHEALTH SERVICES IN CYPRUS

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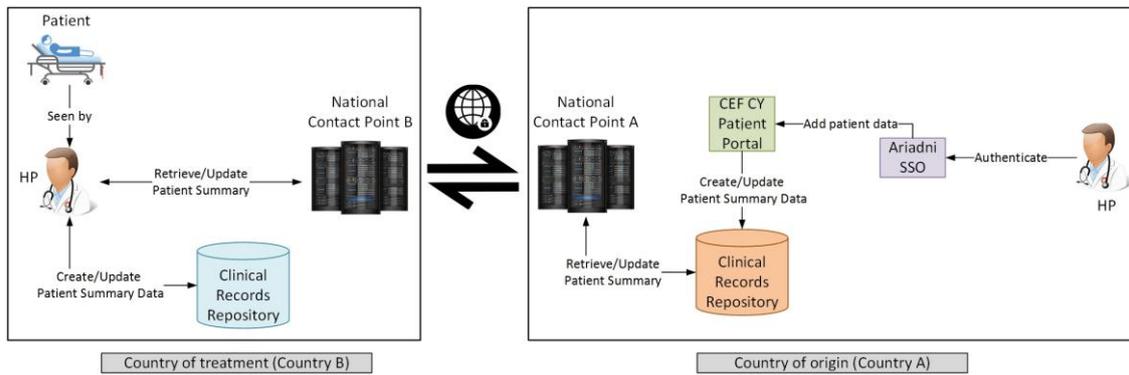


Figure 1: Use Case Scenarios Diagram

frequency of medical errors and by providing quick access to patient health information, as well as by increasing the accessibility of a patients' own prescriptions, also when abroad; (c) Providing medical personnel with potentially life-saving information in emergency situations while reducing the repetition of diagnostic procedures.

Cyprus's goal is to deliver high quality cross border healthcare for both its citizens living abroad as well as visiting citizens from other EU Member States. Being a tourist destination, it's reasonable to expect that the deployment of cross border services will further impact on Cyprus' economic growth. In the summer season, we can project that the usage of the services emanating from this project will be carried out on a daily basis. In addition to making the country safer and patient friendly, Cyprus is improving the daily quality of life (QoL) not only for its citizens, but most importantly, for EU citizens as a whole. In short, when a citizen makes an unplanned cross-border healthcare visit to a health provider within the EU, the health professional will have access to that person's patient summary as well as additional relevant electronic health record (EHR) information (see Section II).

From a technical perspective, the PS is generated in a twofold manner, namely in extensible markup language format (XML) and portable document format (PDF), so as to be user readable. Both formats are Health Level Seven International (HL7) Clinical Document Architecture (CDA) [5] documents that specify the encoding, structure, and semantics of clinical documents. The latter is based on the latest epSOS Master Value Set Catalogue (MVC), hence ensuring interoperability. The epSOS MVC contains all value sets used within the framework provided by the

CDA and used within the epSOS system. The value sets originate from the following well-established code systems: SNOMED CT [6], ICD-9, ICD-10 [7], LOINC [8], HL7 etc.

The complete array of the facilitated services further include eP and electronic Dispensation (eD) that ascertain that a patient being abroad can receive the equivalent medication treatment that s/he would receive in his/her home country. In other words, cross border medication dispensing based on prescription received at the country of visit. Exploiting exchange of medication data from the dispensing pharmacy in the country of temporary stay, the health services in the patient's home country can update the medication record of the patient, improving health care and making prescriptions safer.

The solution proposed by the current project aims at reaching the Technology Readiness Level 9 - Actual system proven in operational environment - namely by start providing operational eHealth cross border services (PS or eP) by 2018 and 2019 respectively. The following time plan is to be implemented: PS A and B corresponding to country of affiliation and country of treatment respectively will entrance in operation the first quarter of 2018. Next, eP and eD will entrance in operation on the first quarter of 2019.

The Cyprus' consortium consists of the eHealth Lab of the Department of Computer Science of the University of Cyprus and the Ministry of Health of the Republic of Cyprus. Moreover, GNOMON INFORMATICS is subcontracted to provide expertise and support on NCP component installation, connectivity and validation.

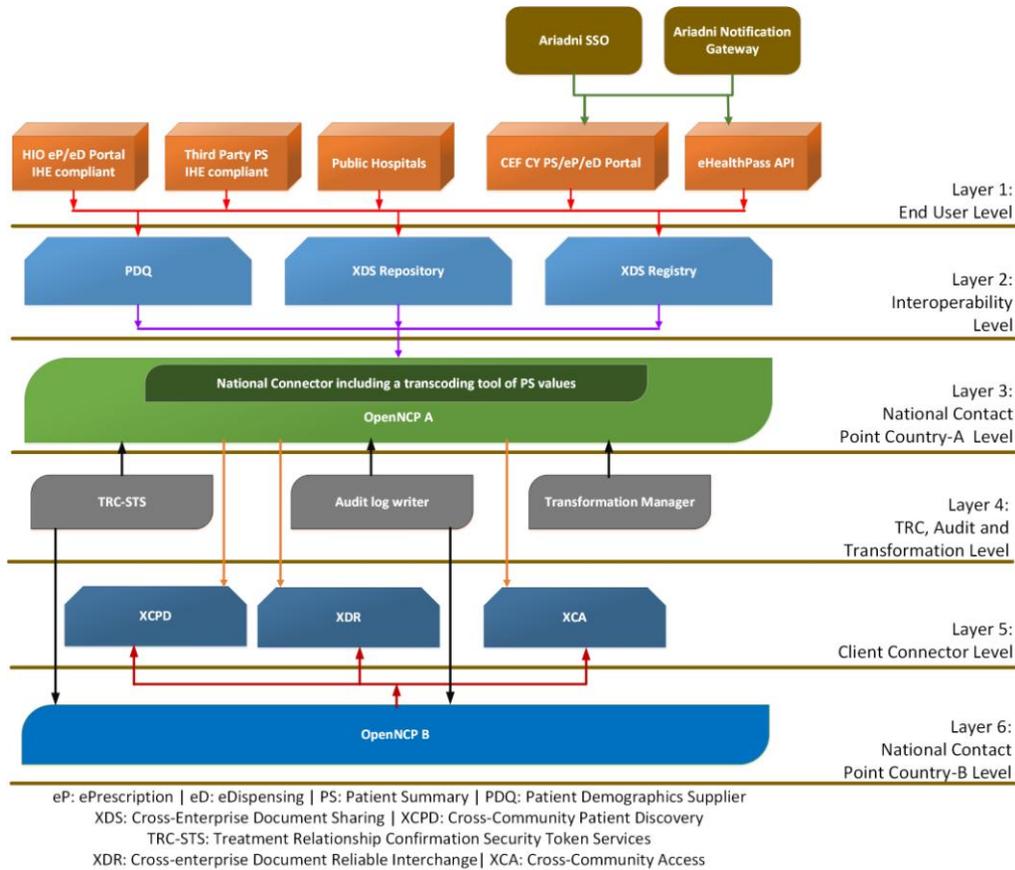


Figure 2: National Architecture of Generic Cross Border eHealth Services

Deploying countries on CEF eHealth digital service infrastructures (eHDSI) are in alphabetical order: Austria, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Malta, Portugal, Sweden and Switzerland.

In what follows, we provide more details with respect to the scenarios of usage in Section II, the Cyprus' national architecture in Section III, and the validation schemas in Section IV. Section V provides the concluding remarks

## II. USE CASE SCENARIOS

### A. Scenario A: Sharing PS in country of origin

The patient feels sick and seeks a healthcare professional (HP) in his/her country of origin (country A). The HP logs in to the CEF CY PS/eP/eD portal via Ariadni single-sign-on (SSO) as depicted in Figure 1. The system validates HP's role as doctor.

If this is the first visit of the patient to a hospital, the HP is required to fill in the patient's summary data. After the completion of all mandatory information, the data

are then stored in the hospital's repository. Next, the patient summary is extracted from this repository in two versions: (i) as XML and (ii) as PDF. Both versions are then stored in the national contact point NCP-A.

In the opposite case (the patient has been to a hospital before), the HP must retrieve the patient's PS from NCP-A. If the PS requires modification for any reason, a new version of PS needs to be created that will in turn update the previous ones in NCP-A. All HPs in Cyprus have the privilege to create, retrieve and update a patient's PS.

### B. Scenario B: Sharing PS on a Cross-Border Scale

The patient feels sick and seeks a HP in a country that is not his/her country of origin. The most frequent situation is that the HP has no prior clinical information about the patient and it's not expected that his/her visit will be repeated.

The HP asks from his/her country national contact point NCP-B for the patient's PS. NCP-B then asks the patient's PS from NCP-A. If the PS exists, the NCP-A will send the patient's PS to NCP-B so that the HP can retrieve it. If the PS's coding system is not the same as the

country B, a transcoding must be performed. In case the PS is updated for any reason, a new version is created. The updated version of the PS is then sent to NCP-A via NCP-B, so that NCP-A always has the latest version.

### III. NATIONAL ARCHITECTURE

The national architecture for the deployment of generic cross border eHealth services in Cyprus [9] consists of the following six layers, as depicted in Figure 2: (a) Layer 1: End User Level, (b) Layer 2: Interoperability Level, (c) Layer 3: National Contact Point Country-A Level, (d) Layer 4: TRC, Audit and Transformation Level, (e) Layer 5: Client Connector Level, and (f) Layer 6: National Contact Point Country-B Level.

#### A. Layer 1: End User Level

##### 1) Ariadni Single-sign-on

Ariadni is the government gateway portal that enables a citizen to make use of the electronic services (e-Services) provided by the government of Cyprus. Individuals, organizations, and agents need to register in order to gain access to Ariadni. SSO functionality of Ariadni's user authentication is adopted to CEF CY PS/eP/eD portal. This functionality is necessary to configure the CEF CY PS/eP/eD portal as a trusted relaying party. When the portal is configured as a trusted party, the government gateway will issue tokens. The portal will then consume this security assertion markup language (SAML) [10] tokens to perform all necessary authorization actions. Overall, Ariadni provides secure connections, encryption, and the use of digital certificates and user identifications.

##### 2) CEF CY PS/eP/eD Portal

The CEF CY PS/eP/eD portal will contain all required forms based on epSOS specifications and integrating the healthcare enterprise (IHE) interoperability protocols so as to create and exchange the PS, medication eP and eD. Only authenticated users signed in via Ariadni SSO will have access to the portal.

##### 3) EHR systems

All deployed EHR systems in Cyprus including the health insurance organization (HIO) eP/eD portal system, third party PS systems and public hospitals' systems will generate epSOS compliant documents supporting PS. HIO eHealth system will be responsible to monitor and process data with respect to patients' claims following a visit to a HP.

#### B. Layer 2: Interoperability Level

The interoperability level will be based on the IHE cross-enterprise document sharing (XDS) Registry and XDS repository.

##### 1) Patient demographics query (PDQ)

PDQ integration profile queries a PDQ supplier in order to retrieve patient demographics and encounter information. A document repository is responsible for storing documents in a transparent, secure, reliable and persistent manner and for responding to document retrieval requests.

#### C. Layer 3: National Contact Point Country-A Level

##### 1) National Connector

The national connector is the "isolation" component between the NCP-A and the national infrastructure. Its role is to (i) make the link between the "NCP world" and the "country specific world"; (ii) enforce national policies (authentication level, user profiles, search criteria, etc); (iii) enforce consent process; (iv) trigger the creation of the patient summary and (v) modify the content of the returned files (PS, eP) by performing mappings.

The national connector incorporates a transcoding tool that maps coding standards of the PS to PS MVC codings.

##### 2) OpenNCP-A

The epSOS architecture is based on the IHE profiles [11] which are implemented as web services. Communication between service consumer and service provider is always initiated by the consumer. Each participating nation (PN) provides these services through the NCP that acts as a service provider to other PN's and as a gateway for consumers. NCP can either act as NCP-B (country of treatment) and/or as NCP-A (patient's country of affiliation).

#### D. Layer 4: TRC, Audit and Transformation Level

##### 1) TRC-STs

Treatment relationship confirmation security token services (TRC-STs) is responsible to issue the TRC assertion after a patient has been discovered and the identity assertion has been issued. After a successful patient discovery, the health provider retrieves the associated documents.

##### 2) Audit log writer

The NCP must write an audit trail entry for the confirmation of a treatment relationship (e. g. after the

attesting signature has been applied to the TRC assertion).

### 3) *Transformation Manager*

Transformation manager (TM) is responsible for data transformation from a national language to the epSOS reference terminology and from the epSOS reference terminology to a national language. Main scenarios are (a) data transformation from a national language to the epSOS reference terminology (transcoding) and (b) data transformation from the epSOS reference terminology to a national language (translation).

#### *E. Layer 5: Client Connector Level*

##### 1) *Cross-Community Patient Discovery (XCPD)*

epSOS XCPD profile (Patient Identification): The epSOS patient identification and authentication service is used to discover a valid patient identifier from an ID assigning authority by providing given identifiers and/or demographic data that is sufficient for patient identification.

##### 2) *Cross-Enterprise Document Reliable Interchange (XDR)*

XDR provides document interchange using a reliable messaging system. This permits direct document interchange between EHRs, personal health records (PHR), and other healthcare IT systems in the absence of a document sharing infrastructure such as XDS Registry and Repositories.

##### 3) *Cross-Community Access (XCA)*

epSOS XCA Profile (Fetch and Retrieve Document): This service supports the means to query and retrieve patient relevant medical data held by other communities. A community is defined as a coupling of facilities/enterprises that have agreed to work together using a common set of policies for the purpose of sharing clinical information via an established mechanism.

#### *F. Layer 6: National Contact Point Country-B Level*

##### 1) *OpenNCP B*

NCP here refers to NCP-B, where country-B is the country the patient is visiting and in which information about this patient is needed, in the event that a patient seeks healthcare. In country-B, a mechanism to validate the identity of the patient and to handle patient consent against country-A will be available at the PS of the requested patient.

## IV. VALIDATION

Two 5-day online preparatory Projectathon test events were held in June and September of 2017, respectively. The test strategy defined a set of testing phases that eHealth DSI deploying countries should (optional) and had (mandatory) to undergo to prove by evidence the NCP for eHealth (NPCeH) technical gateway conformance with the eHealth DSI specifications. The testing scenarios involved participating countries connecting to each other and exchanging PS. Then, they validated the PS through online validators to ensure that all the codings and PS sections adhered to epSOS coding based on the latest MVC. CEF CY infrastructure passed all the tests successfully in both test events.

Similarly, 5-day preparatory Projectathon test events will be held in 2018 regarding eP and eD by exchanging valid prescription and dispensation documents.

Here, it's important to note that a training test always precedes an online preparatory Projectathon test event, to ensure that all functionalities of the participating deploying countries are working properly.

## V. CONCLUSION

eHealth services provision in Cyprus is identified as one of the high priority areas by the Ministry of Health towards achieving high-quality and sustainable health care and long-term care services. In this context, it is foreseen that the CEF eHealth services will considerably aid Cyprus towards achieving its healthcare priority policies and will play a decisive role in enhancing both the quality of care as well as the quality of life of its citizens.

The CEF funding will help carry out the initial tasks that are necessary to implement cross-border eHealth information services, such as testing, dissemination and training. By the time the services are placed on a steady basis, it is expected that they will be well-integrated into the nationally-funded structures that provide ongoing operation, support, dissemination, management and evaluation of information services, and therefore will no longer require special funding through the CEF.

## ACKNOWLEDGMENT

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number: INEA/CEF/ICT/A2015/11S1451, Action No: 2015-CY-IA-0095.

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### **Call for Officers Nominations for the eHealth TC : Chair, Vice Chair and Secretary**

eHealth TC N&E committee call the eHealth TC members to nominate for the eHealth Technical Committee Officers position: of Chair, Vice Chair and Secretary for the term 1 January 2018-31 December 2020.

Nominations must include the candidate name and contact information, the nominated position. If it is a self-nomination, it should also include a (max 1 page) biography with information about current TC, ComSoc, IEEE, or other Society volunteer activities and achievements.

Nominations must be sent no later than **November 19<sup>th</sup>, 2017** to [eHealthTC@gmail.com](mailto:eHealthTC@gmail.com)

- Following the nomination phase, the N&E committee will announce the slate of candidates.

- The N&E Committee will then make biographies and position statements of candidates available.

- The election will be organized during the eHealth TC meeting in GC 2017. Following the TC policy, only active members are eligible to vote.

- The complete TC Policy regarding the E&N procedure and details and duties of the officers' position can be found at the eHealth TC's website:

<http://ehealth.committees.comsoc.org/>



## Call for Proposals

### Workshops, Tutorials, Invited Sessions, Mini-Symposia and Special Sessions

Proposals for Workshops, Tutorials, Invited Sessions, Mini-Symposia and Special Sessions are invited. Submission opens on **September 1, 2017** and closes **November 15, 2017**. The activities are subdivided into pre-conference and during-conference. **Pre-conference activities will be held on Tuesday, July 16, 2018, from 8.00 AM – 5.00 PM.** <https://embc.embs.org/2018/>