



CENTER OF DIAGNOSTICS
AND TELEMEDICINE

INTEGRATION GUIDELINES FOR AI SERVICE PROVIDERS

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GLOSSARY

Table 0. Terms and definitions

Term/abbreviation	Definition
UMIAS ("EMIAS")	United Medical Information and Analytical System of Moscow. Unified Medical Information System (MIS) for all medical facilities of Moscow Department of Health.
URIS ("ERIS")	Unified Radiological Information Service. UMIAS subsystem.
MMP	Model Management Product. URIS subsystem. This subsystem is the "entry point" for AI solutions.
UNSEC	Unified Notification System for External Collaboration. UMIAS subsystem, designed for interaction and information exchange among UMIAS subsystems. Built on Apache Kafka.
HSTC	Hardware-software test complex. URIS testing environment.
HSPC	Hardware-software productive complex. URIS productive environment.
Apache Kafka API	Programming interface allowing to process data stored in Apache Kafka.
Apache Kafka	Distributing software message broker
DICOM Node	A device or system supporting DICOM protocol
DICOM	Digital Imaging and Communications in Medicine — Healthcare standard for creating, storing, transmitting and visualizing digital medical images and documents of examined patients
DICOM SR	DICOM Structured Report
DICOM SC	DICOM Secondary Capture — modality that includes images obtained by secondary processing of existing medical images
DICOM GSPS	DICOM Grayscale Softcopy Presentation State — DICOM protocol class allowing to apply grayscale markup on top of DICOM images
DICOM CSPS	DICOM Color Softcopy Presentation State — DICOM protocol class allowing to apply color markup on top of DICOM images
SCU	Service Class User — DICOM network consumer
SOP UID	DICOM Service-Object Pair UID — A number of DICOM protocol SOP class identifying data in DICOM file.
DICOM over SSL	DICOM protocol working via SSL encrypted transport mechanisms.
SW	Software.
Full Name	Last Name/First Name

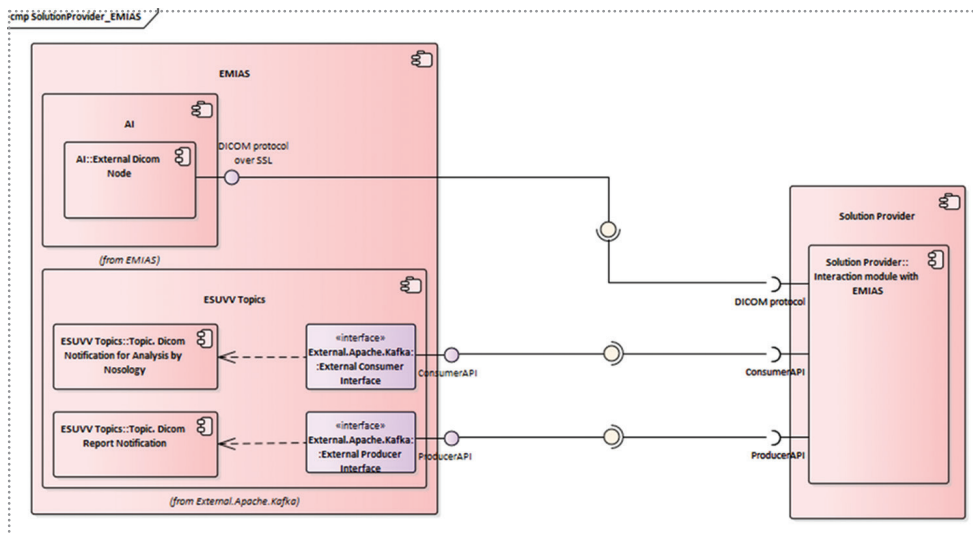
PREREQUISITES FOR AI SOLUTION:

- Temporary storage of DICOM files in the infrastructure for sharing studies and their results with URIS.UMIAS
- Static external IP address
- Availability for applications' development in order to work with DICOM protocol
- Availability for applications' development interacting with Apache Kafka

CONCEPTUAL MODEL OF INTERACTION BETWEEN SOLUTION PROVIDERS OF STUDY ANALYSIS AND URIS.UMIAS

Solution provider should ensure:

1. Interaction with URIS.UMIAS via:
 - a. UNSEC (Apache Kafka API)
 - I. As a subscriber – to receive a notification of study's availability for analysis
 - II. As a producer – to send a notification about completed study analysis and information on the report
 - b. DICOM Node (DICOM protocol 3.0 implementation – works as SCU) – DICOM over SSL is required
 - I. Study receiving
 - II. Reports' publication
2. Studies' analysis
 - a. Analysis report



Operation logic

Product pre-configuration is required:

1. Get a certificate (Table 2)
2. Add DICOM Node to the trusted ones using the certificate as a consumer:
 - to receive studies and provide their analysis reports
3. Get a provider identifier registered in the «Model Management Product»
4. Configuration of settings for work with UNSEC
 - configuration of connection settings for Producer and Consumer roles
 - indicate the identifier obtained in step 3 as a parameter that initiates getting studies

Basic process initialization*

1. When you receive DICOM Notification message for analysis, please check if AI identifier matches the one obtained earlier in the step 3 of the preparation phase
 - a. If the model ID in the message matches the previously issued provider identifier, then move on to the step 2
 - b. If one of the parameters does not match, the message processing is terminated without further actions
2. Receive (DICOM protocol (SCU)) a study for analysis
3. Perform study analysis
4. Generates a report
5. Publish a report (DICOM protocol (SCU)) on the study analysis
6. Send notification to the DICOM Report Notification section

1. CONNECTION TO THE SERVICE

1.1 Connection to HSTC URIS

1. Get access to Wiki UMIAS documentation (wiki.emias.mos.ru) by writing an email to sd@mosmedzdrav.ru

Table 1. Required information for email in order to get access to Wiki UMIAS

Required information	Example
Organization	Company name
Full name of an employee who requires access	Ivanov Ivan
Employee's work email address	ivanov@example.ru
Link to the wiki page (no need to modify)	https://wiki.emias.mos.ru/pages/viewpage.action?pagelid=71668596

2. Send information about the organization to the email address ai@vlmed.ru to start a process of receiving access certificates to UNSEC and HSTC.

Table 2. Required information for email in order to get the access certificates to UNSEC and HSTC

Required information	Example
Product name	Example AI
Contact person's full name, email, phone number	Ivanov Ivan, ivanov@example.ru , 8-999-999-99-99
Static external IP addresses	182.182.200.58, 205.15.195.6
DICOM transfer ports	11110, 11115-11119

After processing the application, two access certificates to UNSEC and HSTC, respectively, will be sent.

1.2 Connection to HSPC URIS

1. Connection to HSPC happens after successful completion of all phases of testing by HSTC.
2. Send information about the organization to the email address ai@vlmed.ru to start a process of receiving access certificates to UNSEC and HSPC. Email should contain the following information:

Table 3. Required information for email in order to get the access certificates to UNSEC and HSPC

Required information	Example
Product name	Example AI
Contact person's full name, email, phone number	Ivanov Ivan, ivanov@example.ru , 8-999-999-99-99
Static external IP addresses	182.182.200.58, 205.15.195.6
DICOM transfer ports	11110, 11115-11119

After processing the application, two access certificates to UNSEC and HSPC, respectively, will be sent.

2. RESULTS

Table 4. Study analysis results' formats

Component results	Format
Numeric and textual data	DICOM SR
Visual representation	DICOM GSPS, CSPS or SC
Accompanying, statistical, signaling information	Apache Kafka

2.1 Numeric and textual data

DICOM SR result format

Valid SOP UID:

- Enhanced SR 1.2.840.10008.5.1.4.1.1.88.22
- Comprehensive SR 1.2.840.10008.5.1.4.1.1.88.33

Table 5. List of data and it's sequence

Item	Item description	DICOM Tag	Tag description	Example
Serial number	Series number formation rule OriginalSeriesUID}. {modelId}. {addId}	0020,000E	Series Instance UID	1.3.6.1.4.1.30071.8.109684790920 2.6401921133906377.1001.1
Inventory number	The value to be taken from the original study	0008,0050	Accession Number	AGFA005290000529
Patient number	The value to be taken from the original study	0010,0020	Patient ID	AG00124568
Issuer of patient ID	The value to be taken from the original study	0010,0021	Issuer of Patient ID	URIS_MSK
Order number	The value to be taken from the original study	0040,2017	Filler Order Number / Imaging Service Request	AGFA031005840016
Report header				
Modality		0008,0060	Modality	SR
Age group		0010,1010	Patient Age	078Y
Study date		0008,0020	Study Date	20191028
Report		0040,A730	Content Sequence	
Service name		0040,A160	Text Value	Example Company
Warning	It is required to confirm that service data is used only for research purposes.	0040,A160	Text Value	ONLY FOR RESEARCH PURPOSES
Software version		0040,A160	Text Value	1.20.9
Date and time of analysis		0040,A160	Text Value	2019-11-28 15:48
Purpose of the service		0040,A160	Text Value	Modality: CT Anatomical region: chest Patients: adult population Purpose: search for signs of pulmonary malignancy Image requirements: slice thickness is no more than 5 mm

Quickstart guide	Information about the interpretation of findings' highlight and AI service results should be contained.	0040,A160	Text Value	Findings are marked with yellow rectangles; probability of lesions' malignancy is in the caption for each lesion; the service does not notify if the study is performed technically incorrect.
Conclusion	Service's general conclusion of the entire study that a radiologist can use in the report.	0040,A160	Text Value	Probability of malignancy in this study is XX%.
List of findings and their probability	It has details of analysis' results that a radiologist can use in the report description.	0040,A160	Text Value	The following information should be provided on each finding: 1. Probability (%) of malignancy of the detected finding 2. Confidence interval 3. X,Y,Z coordinates of the center of mass, slice location (0020;1041). 4. Finding size (mm) 5. Tumor type classification (solid/non-solid) 6. Tumor classification according to Lung-RADS/BTS/Fleishner recommendations

[Recommendation for DICOM SR.docx tags SR.dcm example](#)

2.2 VISUAL REPRESENTATION

2.2.1 DICOM SC result format

Valid SOP UID - Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7

Table 6. List and sequence of data in the presence of findings

Item	Item description	DICOM Tag	Tag description	Example
Serial number	Series number formation rule {OriginalSeriesUID}. {modelId}. {addId}	0020,000E	Series Instance UID	1.3.6.1.4.1.30071.8.1096847909202.6401921133906377.1001.1
Inventory number	The value to be taken from the original study	0008,0050	Accession Number	AGFA005290000529
Patient number	The value to be taken from the original study	0010,0020	Patient ID	AG00124568
Issuer of patient ID	The value to be taken from the original study	0010,0021	Issuer of Patient ID	ERIS_MSK

Order number	The value to be taken from the original study	0040,2017	Filler Order Number / Imaging Service Request	AGFA031005840016
Series name		0008,103E	Series Description	AI_Example
Service name		0008,0080	Institution Name	Example company
Software version		0008,1040	Institutional Department Name	1.20.9
Date of analysis		0008,0022	Acquisition Date	20191128 / YYYYMMDD
Time of analysis		0008,0032	Acquisition Time	154800 / HHMMSS
Probability of pathological changes		0008,1070	Operators' Name	0.66
Warning		0008,1080	Admitting Diagnoses Description	ONLY FOR RESEARCH PURPOSES
Heat map and/or the findings' highlight				

Table 7. List and sequence of data in the absence of findings

Item	Item description	DICOM Tag	Tag description	Example
Serial number	Series number formation rule {OriginalSeriesUID}. {modelId}. {addId}	0020,000E	Series Instance UID	1.3.6.1.4.1.30071.8.1096847909202.6401921133906377.1001.1
Inventory number	The value to be taken from the original study	0008,0050	Accession Number	AGFA005290000529
Patient number	The value to be taken from the original study	0010,0020	Patient ID	AG00124568
Issuer of patient ID	The value to be taken from the original study	0010,0021	Issuer of Patient ID	ERIS_MSK
Order number	The value to be taken from the original study	0040,2017	Filler Order Number / Imaging Service Request	AGFA031005840016
Series name		0008,103E	Series Description	AI Example
Service name		0008,0080	Institution Name	Example company

Software version		0008,1040	Institutional Department Name	1.20.9
Date of analysis		0008,0022	Acquisition Date	20191128 / YYYYMMDD
Time of analysis		0008,0032	Acquisition Time	154800 / HHMMSS
Warning		0008,1080	Admitting Diagnoses Description	ONLY FOR RESEARCH PURPOSES
Information about the absence of pathological changes		0008,1070	Operators' Name	No pathological signs detected

2.2.2 DICOM GSPS and CSPS data format

Valid SOP UID:

- Grayscale Softcopy Presentation State Storage SOP Class 1.2.840.10008.5.1.4.1.1.11.1
- Color Softcopy Presentation State Storage SOP Class 1.2.840.10008.5.1.4.1.1.11.2

Table 8. List and sequence of data in the presence of findings

Item	DICOM Tag	Location	Example
Service name	60xx,xxxx	Top left of the image	Example company
Software version	60xx,xxxx	Top left of the image	1.20.9
Date and time of analysis	60xx,xxxx	Top right of the image	2019-11-28 15:48
Warning	60xx,xxxx	Top right of the image	ONLY FOR RESEARCH PURPOSES
Probability of pathological changes	60xx,xxxx	Top right of the image	0.66
Heat map and/or the findings' highlight	60xx,xxxx		

Table 9. List and sequence of data in the absence of findings

Item	DICOM Tag	Location	Example
Service name	60xx,xxxx	Top left of the image	Example company
Software version	60xx,xxxx	Top left of the image	1.20.9

Date and time of analysis	60xx,xxxx	Top right of the image	2019-11-28 15:48
Warning	60xx,xxxx	Top right of the image	ONLY FOR RESEARCH PURPOSES
Information about the absence of pathological changes	60xx,xxxx	Top right of the image	No pathological signs detected

2.3 Accompanying, statistical, signaling information

Format of results in accordance with Apache Kafka requirements.

[Topic. Notification on DU report \(DicomReportNotify\) / Topic. Notification on DICOM report](#)

3. DICOM CONFORMANCE STATEMENT HSTC AND HSPC

[Enterprise Imaging 8.1.x DICOM Conformance Statement.pdf](#)