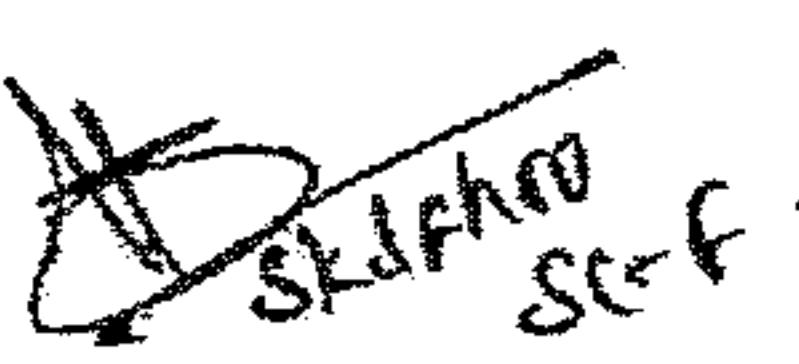


RFP for "Development of Integrated Command Intelligence Center(ICIC) Software"

1. Introduction

The RFP Development of Integrated Command Intelligence Center(ICIC) Software as given in the ensuing paragraphs.

- Section 1: Introduction**
- Section 2: Overview of ICIC**
- Section 3: Scope of Development of ICIC Software**
- Section 4: Architecture**
- Section 5: Technology Stack**
- Section 6: Deployment Setup**
- Section 7: DLRL & Industry Partner Responsibilities**
- Section 8: General Terms & Conditions**
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- Section 10: Warranty**
- Section 11: Termination**
- Section 12: Payment Terms**
- Section 13: SDLC Documents**
- Section 14: ATP**
- Section 15: Delivery**



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2. Overview of Integrated Command Intelligence Center(ICIC)

Integrated EW System consists of a set of diversified sensors configured in a multilevel hierarchical structure. It collects multi-sensor data viz. Radar interceptions, Com emitters, Mobile interceptions, Satellite interceptions & UAV interceptions. The vast amount of data collected can be classified as structured data stored in relational databases and unstructured data in terms of Audio, Image, Text & Video. The EW system carries out a set of analysis viz. ELINT, COMINT, SIGINT, EOB & COP at various levels.

Multiple EW Systems of different origin (viz. DRDO, Non-DRDO) which are of Legacy, Current & Future EW systems of different configuration (I.e Standalone, Integrated) are being used in Indian Army and generate a huge amount of operational data (Figure-1). There is a pertinent requirement of integrating the data sources and to bring to a centralized repository for data collation and analysis. The collated data can provide a better common operational picture and enhance the situational awareness. An AI aided analysis shall be carried out on the archived data. It not only enhances the performance of the system but also automates the features towards decision making.



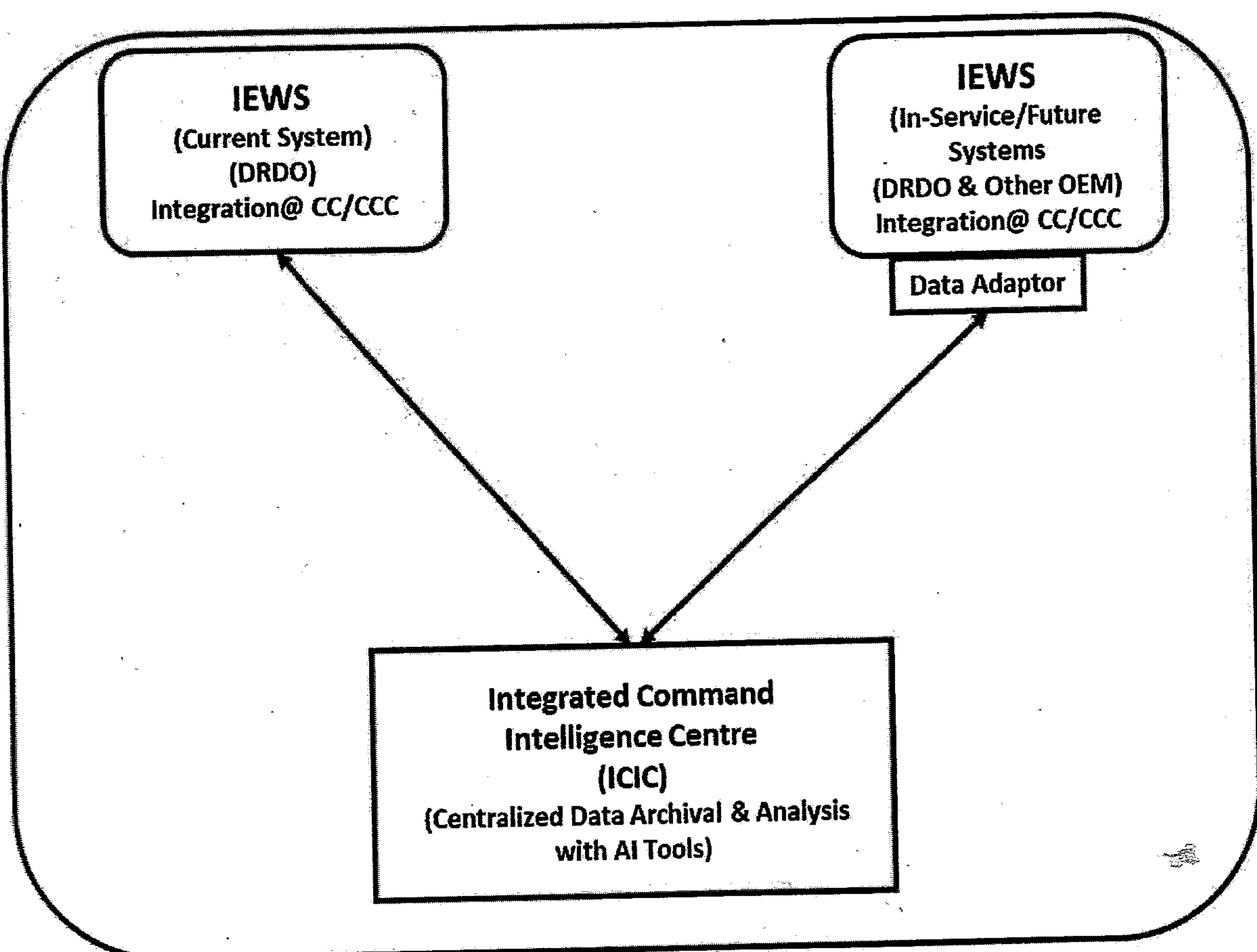


Figure:1- ICIC Configuration

3. Scope of Development of Integrated Command Intelligence Center(ICIC) Software

The ICIC Software suite consists of the following three software packages

- a. ICIC Analysis Software
- b. ICIC Interface Software
- c. ICIC Adaptor Software

The ICIC Analysis software shall be developed in a web based framework and shall be hosted on a webserver. The client shall connect to the server to carry out the required analysis on the data archived in the centralized data storage and the result of the analysis shall be displayed at the client in an integrated dashboard. The integrated dashboard shall present the result of analysis features in terms of charts,

reports, geo-spatial maps using BI tools. Appropriate ML models shall be used for meeting the analysis requirements of ICIC Analysis Software.

ICIC Interface Software shall provide the features of interfacing with various data sources viz. Adaptors, EW systems, Databases and folders containing the unstructured data. It shall use a data integration platform like Kafka for integration with multiple data sources, stores the data in terms of multiple topics and deliver the data into the data archival cluster. It shall also carry out the ELT process of the data received from multiple EW Sources.

ICIC Adaptor Software shall facilitate the interoperability between ICIC and external EW systems. It takes care of the interfacing between External EW system and ICIC as well as transformation of reports of the specific EW system to the report format that can be consumed by ICIC.

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3.1 Scope of Development of ICIC Analysis Software

The Integrated Command Intelligence Center(ICIC) Analysis software shall be developed on a web based framework. The application shall be distributed on multiple hardware nodes. The broad capabilities of ICIC Analysis Software shall be grouped into the following modules.

- a. Mission Management: The system shall host mission data received from multiple EW systems. The operator can view the mission data from multiple EW system and shall select the missions for analysis.
- b. Global data management: The global data shall be generated at ICIC and is maintained across the missions. There should be provision to import Global Data from external EW systems. It contains apriori known information of our own and adversary assets such as Vulnerable Assets (VA), Formation Headquarters (FmnHQ), Central RADAR Library, BTS Library, Satellite Spot Beams, Image Library, Threat Library and Communication Emitter Library.
- c. Mission Analysis includes selection of missions stored in database received from multiple EW systems. On selection of mission, Area of Operation (AOP), Forward Edge of Battle Area (FEBA) and entity locations shall be retrieved and shown on the map. There should be provision to define area of operation and missions falling fully or partially within the defined AOP shall be retrieved and shown on the map.
- d. EW Analysis: Operators will perform analysis of reports received from sensor entities. Appropriate ML models shall be integrated to augment the analysis features. The Analysis features planned at ICIC is grouped as follows:

COMINT: The COMINT analysis includes refinement of nets, cluster identification and pattern generation. It also includes analysis pertaining to specialized entities viz. content analysis, metadata analysis, traffic analysis and pattern generation.

ELINT: The ELINT analysis includes emitter fusion, radar net identification, cluster identification and pattern generation.

SIGINT: SIGINT analysis focuses on collation of COMINT and ELINT information and analysing the relationship between them. The SIGINT analysis shall be performed across COM and RADAR emitters falling in a common AOP and SIGINT reports shall be generated.

E-Orbat: Electronic Order of Battle (EOB) depicts the identified emitter along with their associated data compiled across the missions.

COP: COP represents combined visual representation of relevant operational information such as position of own troops, enemy troops and infrastructures. COP shall be generated for a mission and shall be disseminated to integrated EW systems.

Image/Video Analysis: The images/videos pertaining to different objects and geographical area are received pertaining to interception reports are processed using appropriate models towards object identification and change detection.

Voice Analysis: Various reports in the EW system is available with audio files. The system shall facilitate voice analysis features viz. Speech enhancement, language identification, speaker identification, machine translation and keyword spotting etc.

Text Analysis: Various reports in the EW system is available with text data. The system shall facilitate text analysis viz. keyword spotting, named entity extraction, document clustering etc.

- e. **Report Management:** Report Management feature set comprises of reports received from EW systems, analysis reports generated at ICIC and reports disseminated to EW systems integrated to ICIC.
- f. **UI & Charts:** An integrated chart based dashboard will display various charts generated using BI tool against user queries. Statistical Analysis shall be carried out which includes temporal, spectral and spatial analysis. GUIs shall be developed for visualization of the implemented features.
- g. **GIS Management:** The software shall facilitate various GIS operations for effective analysis and visualization of the intercepted data.
- h. **Maintenance & Support:** Support functionalities encompass administrative tasks viz. User management, session management and health management.
- i. **Database Management:** Database Management capability consists of centralized maintenance of data repository of operational data. Data shall be hosted on multiple databases. It also facilitates backup, restore and purging of the data.
- j. **Communication:** It facilitates the communication with external IEWS systems and data sources. ICIC shall be integrated with the external EW systems and data sources thru adaptor software.



3.1.1 Features of ICIC Analysis Software

The module wise detailed features to be implemented are stated as follows:

3.1.1.1 Mission Management

The system shall receive and archive mission data from multiple EW systems. The operator can view/Create/update/delete Mission.

3.1.1.1.1 Global Data Management

The global data shall be generated at ICIC and is maintained across the missions. There should be provision to view/add/modify/delete/import/export of Global Data. The following are the list of global data:

- Vulnerable Assets (VA)
- Formation Headquarters (FmnHQ)
- Central RADAR Library
- BTS Library
- Satellite foot print
- Communication Emitter library
- Threat Library
- Image Library

3.1.1.1.2 Mission Analysis

Mission Analysis includes selection of missions stored in database received from multiple EW systems. On selection of mission, Area of Operation (AOP), Forward Edge of Battle Area (FEBA) and entity locations shall be retrieved and shown on the map.

The ICIC shall create a mission by defining the area of operation and missions falling fully or partially within the defined AOP shall be retrieved and displayed on the map. Standard symbols shall be used to depict enemy assets/own assets/emitters on the map with pre-defined colours. The mission specific data pertaining to EW systems shall be selected the missions for analysis.

- Single Mission of an EW system
- Multiple missions of an EW system
- Mission across EW systems pertaining to a specific AOP & Time frame
- Identification of Frequency band, Sector of operation and Area of interest for future operations



3.1.1.2 EW Analysis

EW analysis aided by ML models shall be implemented for the following set of analysis.

a. ELINT Analysis

i. Emitter Fusion:

The fusion of emitters information intercepted by multiple sensors/EW systems in an overlapping area of operation shall be carried out aided by ML techniques.

ii. Prediction:

Prediction of emitter occurrences and emitter location using appropriate ML models trained on historical data.

iii. Cluster identification:

Cluster analysis shall be carried out by analyzing the volume of operation over a period of time and shall identify the clusters based on spatial, tempo-spatial & emitter parameters.

iv. Pattern Analysis:

Pattern analysis shall be carried out and system shall analyze the repository of intercepted data to depict various temporal, spectral & spatial patterns using BI tools.

v. Outlier Identification:

Technical & operational outliers shall be identified and presented.

b. COMINT Analysis

i. Net Building

Emitters/Nets received from multiple EW sources falling in overlapping operational area shall be subjected for Net merging. Net refinement in terms of Net merging or Net splitting process can be optimized by analyzing the change of technical and tactical parameters as well as spatial disposition of the emitters.

ii. Prediction:

Prediction of emitter occurrences and emitter location using appropriate ML models trained on historical data.

iii. Cluster Identification

Spatially dispersed communication nets with different net type, level, branch received from various EW sensors shall be processed at ICIC to derive various clusters. Cluster based algorithms shall be used in analyzing the volume of operation over a period of time.

iv. Pattern Analysis

ICIC shall receive the emitter/net information from various EW systems and shall congregate huge amount of emitter information over period of time pertaining to multiple missions. It shall facilitate the identification of pattern of operation in terms of time, set of frequencies as well as location to derive the intent of enemy operation. System shall throw alerts to the operator on indication of specific patterns. It shall also identify outliers using appropriate ML Models.

c. JAU Analysis

The interception reports from Jammer Anti-UAV (JAU) entities shall be subjected for analysis viz. pattern identification, outlier identification and image analysis.

d. JIM & JIS Analysis

Target reports from JIM entity and CDR reports from JIS entity shall be subjected for content analysis, metadata analysis, traffic analysis. It shall also carry out collation of JIM & JIS interceptions falling within overlapping area of operation. ICIC shall carry out the following set of analysis:

i. Content Analysis

As a part of content analysis, the intercepted cellular target reports as well as GMPCS & VSAT interception reports will be subjected for analysis to carry out the following broad features:

- a. Image Analysis**
- b. Text Analysis**
- c. Keyword Spotting**
- d. Voice Analysis**

Voice Analysis Software tool shall be integrated with ICIC for carry out the voice analysis of the audio files.

ii. Metadata Analysis

The following set of analysis shall be carried out on the metadata of interception reports

- a. Identification of calling pattern
- b. Emitter Clustering
- c. Alerts
- d. BTS Prioritisation on JIM data

iii. Traffic Analysis

The following set of traffic analysis is carried out on interception data.

- a. Frequent communication
- b. Chain of communication
- c. Link Analysis
- d. Visual calling pattern

Sentinel visualizer tool shall be integrated with ICIC to depict the calling pattern.

iv. Collated Analysis

In the event of associated operations of the targets intercepted by both JIOS and JIM entity, the related info is subjected for collation as follows:

- a. Common target (IMEI/IMSI/Phone No)
- b. Common Peer Number
- c. Common Operator comments
- d. Common Location of emitters
- e. Common SMS content
- f. Common voice sample

v. Pattern of Operation

The interception data pertaining to JIS & JIM shall be analysed for identification of various patterns of calls (i.e. link analysis) between calling and called party based on time of call, frequency of call and location of call. It shall also identify outliers using appropriate ML Models.

e. Voice Analysis

ICIC shall collect a large set audio clips associated with interception reports received from respective sensor entities. The audio component as a part of reports viz. intercepted reports, Cellular Target reports and satellite interceptions, Mobile handset shall be subjected for voice analysis. The tagging of audio files against the interception

reports and indexing of the audio files shall be done. The set of features to be realised related to voice analysis are as follows:

- i. Archiving of audio
- ii. Speech Pre-processing
- iii. Speech enhancement
- iv. Speech identification
- v. Speaker identification
- vi. Language identification
- vii. Machine Translation
- viii. Keyword Spotting

Voice Analysis Software tool shall be integrated with ICIC for carry out the above analysis against the audio files.

f. Text Analysis

Text based analysis shall be carried out on the repository of documents/ text content received from various sources. The text content as a part of reports viz intercepted reports, Cellular Target reports and satellite interceptions, Mobile handset shall be subjected for text analysis. The set of features to be realised related to text analysis are as follows:

- i. Named Entity Recognition
- ii. Document Clustering
- iii. Sentiment Analysis
- iv. Keyword Spotting

g. Image Analysis

Images and videos collected from different sensors are indexed at data archival and subjected for analysis. The images pertaining to different objects and geographical area are processed using AI based techniques for the following analysis.

i. Object Identification

EW platform houses a set of image sensors viz. EO/IR, CCD Camera, satellite imagery etc. The image and video collected from these sensors is subjected for image analysis. Various images/videos will be pre-processed and subjected for identification of military objects in the battlefield arena



ii. Change Detection

Change detection is one of the important features of image analysis where in a series of images/video streams acquired from image sensor systems pertaining to a specific battle area is subjected for analysis. It can identify the changes related to a set of objects over a period of time and identify new force built up or movement of forces with time. This info can be supplemented to the prime source of info regarding deployment or redeployment of assets.

h. SIGINT Analysis

Communication and Radar interceptions from multiple EW systems are analyzed to extract associated information between them. The intention is to collate communication emitters and tracks operating in a cooperative manner with a common cause and formation.

The degree of collation will be based on the extent of Spatial, Temporal, image based, keyword based co-relation. Outlier identification will be used to eliminate the non-collated emitters. Association of JIM & SIS interceptions along with COM & Radar interceptions based on available spatial info and common keyword shall be realized.

i. Electronic Order of Battle (EOB)

Emitter information (i.e COM, Radar, JIM,JAU,JIS) from EW systems along with the deployment of enemy assets shall be received at ICIC. The associated information shall be used to derive the Electronic Order of Battle (EOB). EOB shall depict the emitter deployment along with their associated data, which can be used to develop a tactical picture. It also derives deployment and hierarchy of enemy forces along with strengths and assets. This EOB will be incrementally built at ICIC.

j. Common Operational Picture (COP)

Based on the entity deployment and emitter details received from the EW systems, COP shall be generated at ICIC. Area of operation shall be used to filter COP concerned to the EW system and shall be shared with respective EW systems.

k. Statistical Analysis

ICIC shall carry out statistical analysis on the consolidated emitter information received from various EW systems. The Statistical analysis is broadly classified as Temporal, Spectral & Spatial analysis and shall be generated specific to EW system. The statistical charts shall be dynamically generated with user defined X-Y-Z parameters

in term of 2-D as well as 3-D graphs using the BI tool with associated reports. The charts shall enable the operator to identify & analyze volume of the activities pertaining to specific EW system.

3.1.1.3 GIS Management

The GIS management module at ICIC enable the user to carry out geo-spatial operations and analysis. It facilitates the operator for view of mission deployment and analysis of intercepted emitters. A server based GIS tool shall be used at ICIC realize the features.

The GIS features pertaining to ICIC are described as follows:

a. Map Management

Map management shall provide the facility to load different types of map data required in the application. The map management module supports the standard formats (OGC Compliant) to enable porting of Defence Series Maps of Indian Army. The map data comes in various scales and projection systems. GIS expects the maps to be available in a format that is compatible to the GIS software. Following file formats are supported.

Raster Maps: JPEG, TIFF, Geo TIFF, DSM

Vector Maps: DGN, Shape File, KML , KMZ

3D Data: DTED(.dt0, .dt1, .dt2) , DEM

b. Symbol Management

GIS software provides a general Symbol Library, which contains different Symbol set files where various types of symbols are stored. A set of pre-defined military symbols is pre-created to represent various kinds of emitters, towers, installations, vehicles, EW Resources, own forces, hostile nets, units, FmnHQs etc. These symbols are used for rendering different operational and geographic layers. In addition to the predefined symbols, ICIC shall also be able to create and customize new symbols as well as import pre-defined symbols to the library in standard format supported by GIS software. These symbols can be used to mark elements of interest on the map and create different operator layers.

c. Layer Management

GIS layers are created automatically while carrying out different kinds of operations and also manually by the operator. It will facilitate the display of deployment of own assets/forces and intercepted emitters in different geographical layers. The GIS layers are broadly classified into three categories:



- Geographic Layers
 - Operational Layers
 - Operator Layers
- d. Standard Measurements

This option enables the user to measure distance, angle or area on the map using GIS functionalities. This aids the operator for effective deployment of own resources. ICIC operator shall use GIS tools to carry out the following operations on the map:

Zoom-In/Zoom-Out/Zoom-In-Centre/Zoom-Out-Centre/Full View/Panning

e. Line of Sight

Line of Sight (LOS) is used to determine whether the target point can have been seen from the Observer Point. It helps in analyzing radio reachability by computing visibility among the entities and the result is displayed as visible/not visible along with a line drawn between observer and target location either in green or red color based on the visibility status.

f. Area Coverage

Coverage of an entity placed at a particular location indicates the area around the entity in which a signal transmitted by an emitter would be detected/ Jammed by the receiver / Jammer of the entity considering terrain conditions. This information may be used to deploy the entity such that, the optimal/maximum area is covered for interception / disruption of signals. The ICIC operator is facilitated to view entity coverage once the location of the sensors is specified.

g. Shortest Path

This feature enables the user to compute shortest path by road between two points on the map considering the geographical constraints. Road network layer is built from the available vector data pertaining to different kinds of roads. After selecting the two nodes, a route is drawn for the shortest path between the selected nodes and displayed on the map.

h. Flythrough

The DTED maps contain the terrain elevation data. The data pertaining to area of interest shall be mosaiced and a 3D profile of the area shall be built. The raster topo maps can be draped over it. The system shall depict the emitters (Com and RADAR)



on the 3D map. The operator shall have a provision to perform flythrough over the 3D view. Sensor deployment with 3D visibility/coverage shall be displayed.

i. Export/Import

The system shall provide import and export of GIS data in standard formats like shape files to facilitate inter-operability with other GIS software. The GIS layers that are generated can be exported as part of various reports generated at ICIC to integrated EW systems.

3.1.1.4 Report Management

Report Management feature set comprises of reports received from EW systems, analysis reports generated at ICIC and reports disseminated to EW systems integrated to ICIC. User defined reports shall be generated.

GUI based configurable forms shall be provided to enter parameters pertaining to different interception reports related to different EW systems. The input data shall be exported to .csv/json format which shall be read and exported into database. The respective unstructured data i.e image, audio, video & text shall be imported and tagged to the respective interception report.

3.1.1.5 Maintenance and Support

This encompasses all generic functionality required for carrying out operations by the ICIC and facilitates administrative tasks for effective functioning. The following support functionalities are provided at ICIC:

a. User management

User Management enables functional security for the application running on a work-post. Security for the application is achieved by defining the user groups. Following user groups shall be defined:

Operator: Operator is the default user group having permissions to perform report generation and analysis functionalities.

Commander: Commander performs all the functions related to data customization, Global data management, Analysis and Summary Report generation. This user is allowed to carry out all application level operations except administrative functions.



Administrator: Administrator can perform all kinds of administrative functions such as user management, IP management and database management activities related to the application software.

b. Monitor Health

Diagnostic check is performed to know the health status of Subsystems (Clients / Servers / Devices) of the ICIC. This check is performed while startup, periodically after startup and also on user initiation. It includes the following:

- Work-post / Server Health Check - Health status of all Work-posts / Servers
- GNSS Health Check

c. Log management

ICIC maintains a set of logs namely User log, Sent Message log, Receive Message log and System log. Operator can view and filter the data in the logs using filters-mission, time and entity. The administrator has got the privilege to purge the log details.

d. GNSS and Time Synchronization

The Global Positioning System is used to obtain the current position of the ICIC and the current local time information. The time received from GPS is used to synchronize the time of the posts at ICIC. If the GPS is down at the time of application start-up, facility is provided to get the time from the Database Server designated as Time Server. The location details can also be updated manually in ICIC application in the absence of GPS.

3.1.1.6 Database Management

Database Management capability consists of centralized maintenance of data repository of operational data received from external EW Entities and other sources. The data shall be hosted on a cluster of unstructured databases such as Cassandra, Elastic Search & HDFS file system.

Major functionalities in Database Management as follows:

- Database Backup
- Database Restore
- Purge Database
- Database Replication

3.2 Scope of Development of ICIC Adaptor Software

The ICIC Adaptor software shall take care of communication with the external systems and data sources. The Adaptor software shall be deployed on a dedicated hardware with the external EW system. The specification of ICIC Adaptor software is attached as **Appendix-A**.

3.3 Scope of Development of ICIC Interface Software

The Interface software shall host kafka based messaging framework to integrate multiple sources of data viz. ICIC Adaptor, Database, Local repository/Folder. It stores the fetched data in Kafka cluster in multiple topics and push the data to respective database of the data lake. The Kafka configuration and ELT process shall be facilitated by Interface module. The specification of Interface module is attached as **Appendix-B**.

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4. Architecture

The architecture envisaged for development of ICIC is a web based client server architecture (Figure-1). The server software packages/components of ICIC software shall be hosted on a cluster. The web framework will be used to develop and deploy web based components and provide an interface between client as well as the data processing engine. The application shall be distributed on multiple hardware nodes. It shall facilitate to access multiple data sources.

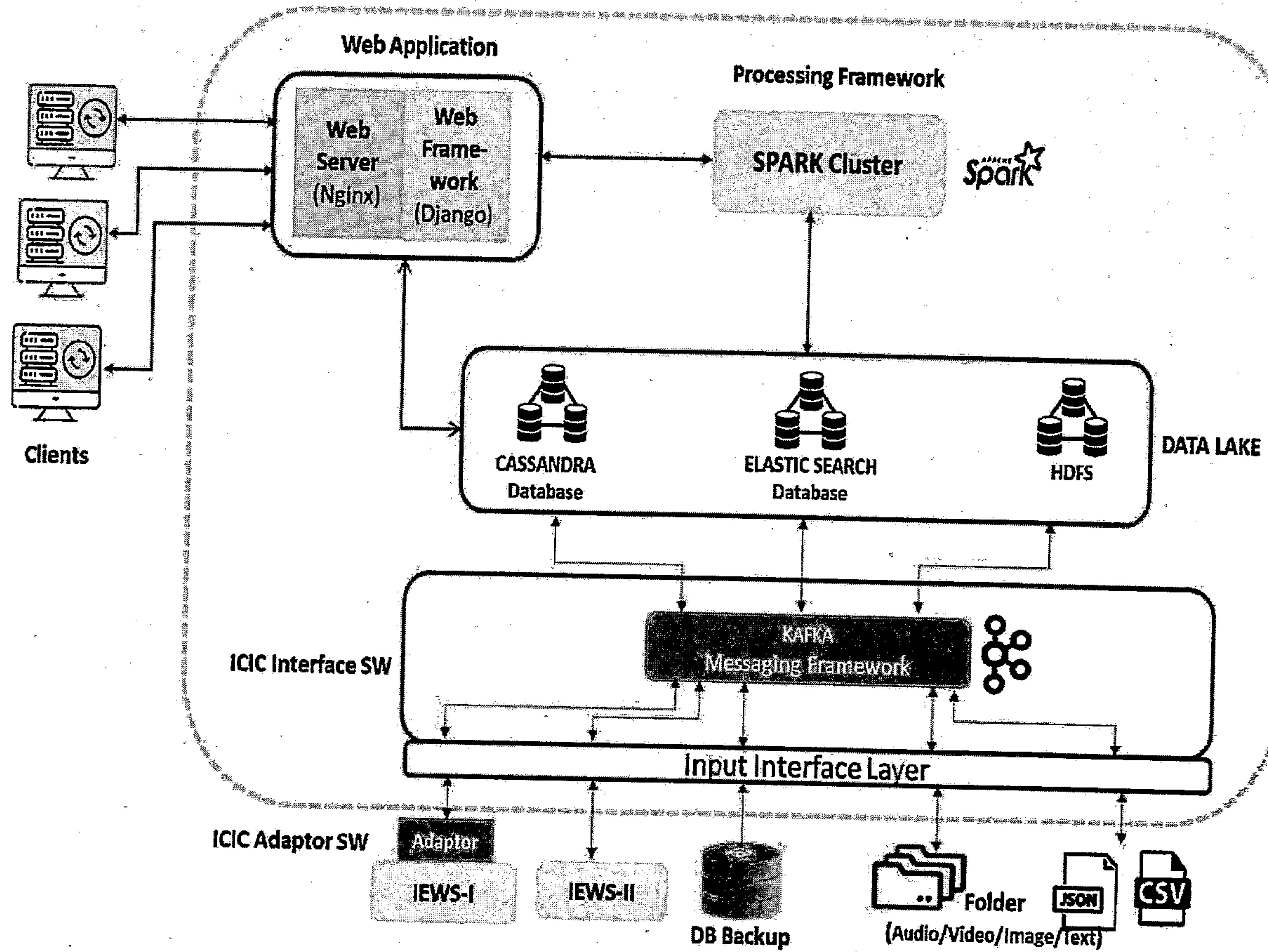


Figure 1: ICIC Architecture

5. Technology Stack

The technology stack for the development of ICIC Software as follows:

Software Item	Tools & Technology
Operating System	Linux & Windows
Language	Python & React JS
Data store	Cassandra, Elastic Search, HDFS
Web Server Framework	Django Web Framework
Data Processing Framework	Apache Spark
BI & Visualization	Oracle BI tool with Oracle Data Integrator
Data Integration/Middleware	Kafka
GIS	ArcGIS Server
Image Analysis	ENVI
IP Analysis, Voice Analysis & Link Analysis	Intelliworker Software suite
Link Visualizer	Sentinel Visualizer
AI/ML Models	Python based AI/ML Models

6. Deployment Setup

The Deployment setup consists of a set of hardware viz. Workstation, Data server and Laptop integrated with a dedicated network (Figure-2). The web application shall be hosted on two workstations as application server and web server. The three databases shall be hosted on three database clusters. The Interface software which shall host the Kafka messaging framework shall run on a dedicated hardware. The clients shall run on the laptops.



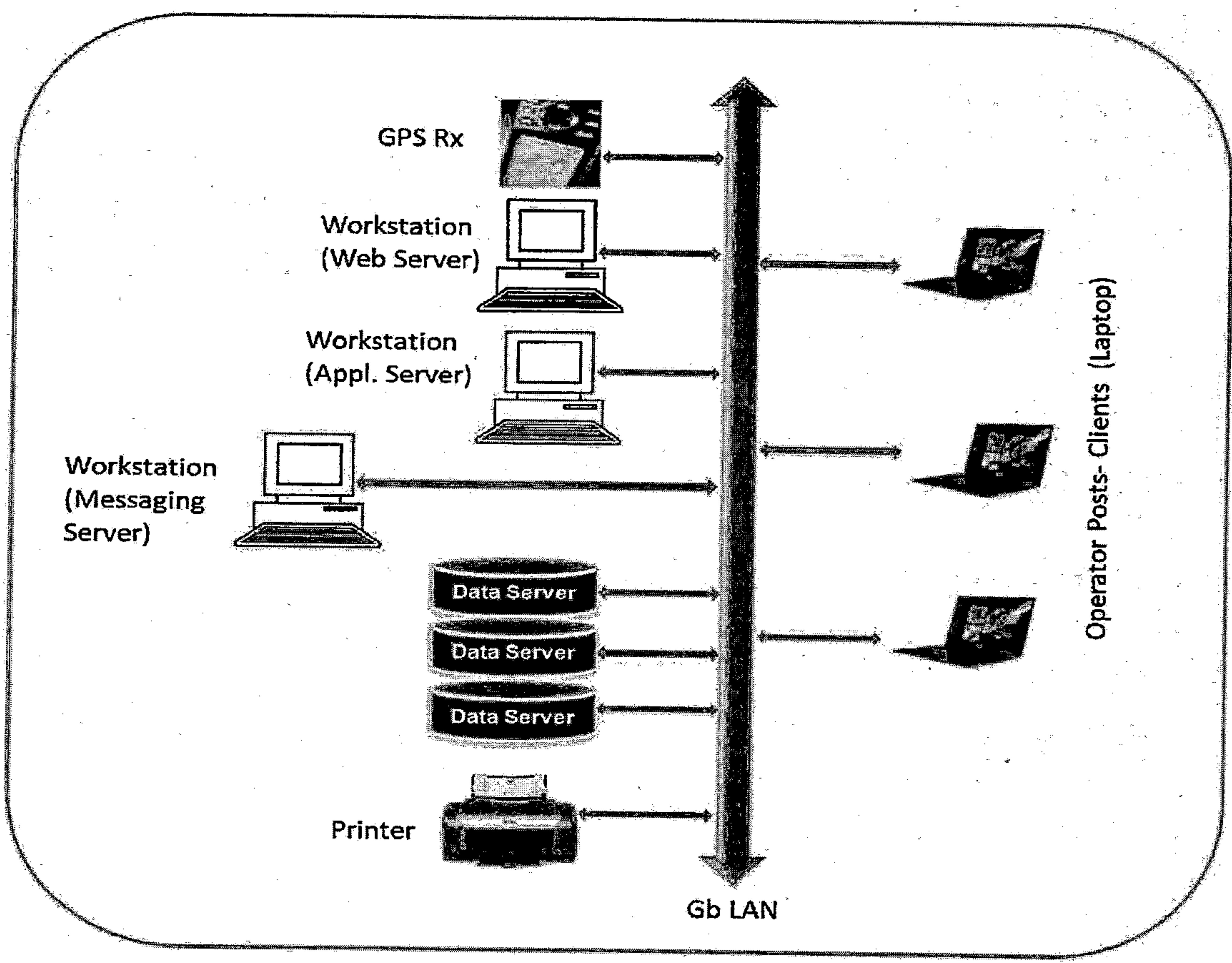


Figure-2: Deployment Setup

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7. DLRL and Industry Partner Responsibilities

a. DLRL Responsibilities

- i. DLRL shall provide the necessary IT hardware and networking infrastructure for development of web application.
- ii. DLRL shall be responsible for eliciting the requirements specified in the RFP for implementation.
- iii. DLRL shall augment data required for training the ML models and testing of the application.
- iv. DLRL shall verify the SDLC documents submitted by the Industry partner for acceptance of the documents.
- v. A TCEC committee constituted by the competent authority shall visit the firm if required and shall carry out onsite assessment of the related product and personnel with requisite expertise.
- vi. A committee appointed by competent authority shall carry out periodical reviews of the software development activity and recommend mile stone based payments.
- vii. A committee constituted by the competent authority shall evaluate the applications developed by the Industry Partner for delivery and acceptance towards payment.

b. Industry Partner Responsibilities

- i. The Industry Partner shall deploy engineers with requisite skill sets on the technology stack as mentioned in section 5 to carry out the envisaged activities.
- ii. The Industry Partner should have required manpower for deployment with necessary skillset and expertise on roll with minimum experience of 5 years in the technology stack as specified in Section 5 of RFP and experience certificate shall be submitted along with technical bid.
- iii. The Industry Partner shall establish the software development setup using the tools as mentioned in section 5 as well as additional tools required for development.
- iv. The Industry Partner shall have the expertise in software development using AI/ML tools/models/libraries pertaining to scope of DLRL. Industry Partner shall



- identify appropriate Machine learning models in discussion with DLRL team to implement the features.
- v. The Industry Partner shall submit a technical approach document towards providing a composite solution towards realizing the requirements specified in RFP.
 - vi. The Industry Partner shall designate an experienced person as a point of contact to interact with DLRL team for requirement capturing, design and development of software.
 - vii. The Industry partner shall deploy engineers to the tune of 550 Person Month during the development period of 25 months with requisite skill sets on the technology stack as mentioned in section 5 of the RFP.
 - viii. The Industry Partner shall have a fall back option for the members of the development team to ensure a smooth take over in case of attrition.
 - ix. If DLRL feels the deployed manpower is ineffective, suitable replacement shall be provided by the Industry Partner.
 - x. The Industry Partner shall bear the cost related to travel and logistic support for the team deployed at ELSEC towards carrying out the contract.
 - xi. The Industry Partner shall generate SDLC artefacts based on DRDO Guidelines for Software Development (DGSD) standard. The list of SDLC artefacts is attached as Appendix-C
 - xii. The Industry Partner shall accommodate the requirement changes to the tune of 15% during the course of development and warranty.

8. General Terms and Conditions

- i. The development work has to be carried out in ELSEC premises.
- ii. Secure coding principle shall be adhered to for the development of ICIC software.
- iii. The engineers shall execute the work at ELSEC as per the working days and working hours of ELSEC and extended hours as per the demand to complete the envisaged activities.
- iv. Attrition or deployment of assigned team to other assignments outside the scope of the contract shall not be acceptable.
- v. DLRL reserves the right to hold all Intellectual Properties (IP) during the course of execution of the envisaged activities.

- vi. The Industry Partner shall not keep or share any source code, algorithms, and formulae of any of the component/module of the developed software packages to any third party.
- vii. The Industry Partner shall follow DLRL rules, regulations and security restrictions during visits/interactions with DLRL personnel for carrying out the assigned activities.
- viii. Police verification and other security formalities pertaining to the team, working in ELSEC shall be ensured by the Industry Partner.
- ix. The Industry Partner personnel will be subjected to security checks and restrictions as applicable within the DLRL/ELSEC premises. They shall strictly adhere to the security norms of MOD/DLRL and shall abide by the "Official Secret Act".
- x. The cyber security policies laid down by DRDO shall be strictly complied by the deployed man power.
- xi. DLRL will not bear any responsibility for the injuries sustained if any by the personnel deputed in ELSEC during the execution of the contract.
- xii. DLRL shall handover the detailed Specification/RFP to Industry partner after the submission of duly signed NDA by the Industry partner.

9. Time Line

Delivery period is of Twenty-Five Months and the assigned work shall be completed within Twenty-Five Months from ARO.

10. Warranty

The Industry Partner shall support during the warranty period of 15 months after the delivery and acceptance towards update of software to the tune of 15% of changes of requirement.

11. Termination

Director DLRL shall have authority to terminate the contract at any time during the course of the contract.

- i. Without assigning any reason thereof.
- ii. In case of violation of any agreed terms and conditions.
- iii. In case of frequent failure in providing required service.

In the event of cancellation or termination of the contract, DLRL shall not be responsible for any compensation and PBG will be forfeited.



12. Payment Terms

The software shall be developed in two builds i.e- Build I & Build-II (Build wise features are attached as Appendix-D). The payment shall be released in three stages as per the following milestones:

SI No	Milestone	Deliverable	Timeline
1	Milestone-I	SRS(Build-I)	(T0 +4 months) - 20% of PO value including taxes against JCC by User
2	Milestone-II	Build-I	(T0 +16 months) - 40% of PO value including taxes against JCC by User
3	Milestone-III	Build-II	(T0 +25 months) - 40% of PO value including taxes against JCC by User

13. SDLC Documents

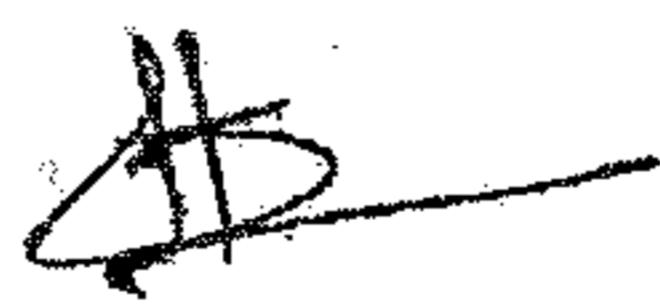
- a. SDLC artefacts shall be generated as per DGSD (DRDO Guidelines for Software Development) for all the three CSCI (ICIC Analysis Software, Adaptor Software and Interface Software) and list of documents is attached as Appendix-C.
- b. Development of three CSCI (ICIC Analysis Software, Adaptor Software and Interface Software) shall be realized in two builds. Each Build consists of source code along with required libraries, development stack, executables and internal test reports along with list of SDLC artefacts attached as Appendix-C.
- c. Reviews shall be as per SQAP.

14. Acceptance Test Procedure (ATP)

- a. ATP shall be carried out at ELSEC for each of the two builds of the three CSCIs (i.e ICIC Analysis Software, Adaptor Software and Interface Software) as per STD.
- b. The Industry Partner shall demonstrate the functionality as per the STD document at ELSEC. The Industry Partner shall generate the ATP Report.

15. Delivery

- i. The delivery of the software shall be done in three milestones. The Industry partner shall deliver SRS(Build-I) as Milestone-1 at T0+4 months. The software shall be realized in two builds. Build-I of the software shall be delivered as milestone-2 at T0+16 months and Build-II of the software shall be delivered as milestone-3 at T0+25 months.
- ii. Each Build consists of source code along with required libraries, development stack, executables, Internal test reports, along with SDLC artefacts based on DRDO Guidelines for Software Development (DGSD) standard as per Appendix-C.
- iii. The delivery of the CSCIs are subjected for VAPT (Vulnerability Assessment and Penetration Testing) by the Industry partner before acceptance of the Build.
- iv. The delivery shall be deemed to have been complete on delivery of goods/services, inspection, installation and acceptance by DLRL as per section 14 (ATP).
- v. In case of delay in delivery, liquidated damages shall be levied milestone wise on the Industry Partner at the rate of 0.5% per week up to a maximum of 10% of the basic value for each milestone payment.

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Specification for ICIC Adaptor Software

1. Introduction

ICIC Adaptor Software shall facilitate the interoperability between ICIC and external EW systems. It takes care of the interfacing between External EW systems and ICIC as well as transformation of reports of the specific EW system to the report format that can be consumed by ICIC.

The IEWS systems are heterogeneous in nature. Apart from architectural and platform choices the data representation techniques are to be standardized.

The adaptor shall get deployed at the source and get integrated with the source IEWS / database on a local network. A middleware like Kafka shall be used to connect the Adaptor to transmit the data to the database of ICIC.

A set of designated reports/mission specific data related to each source i.e IEWS shall be fetched by the Adaptor. The parameters of the designated reports exchanged between IEWS and ICIC shall be determined by the set of Interface Requirements Specification messages.

2. Configuration

The configuration of ICIC Interface Software is shown below:

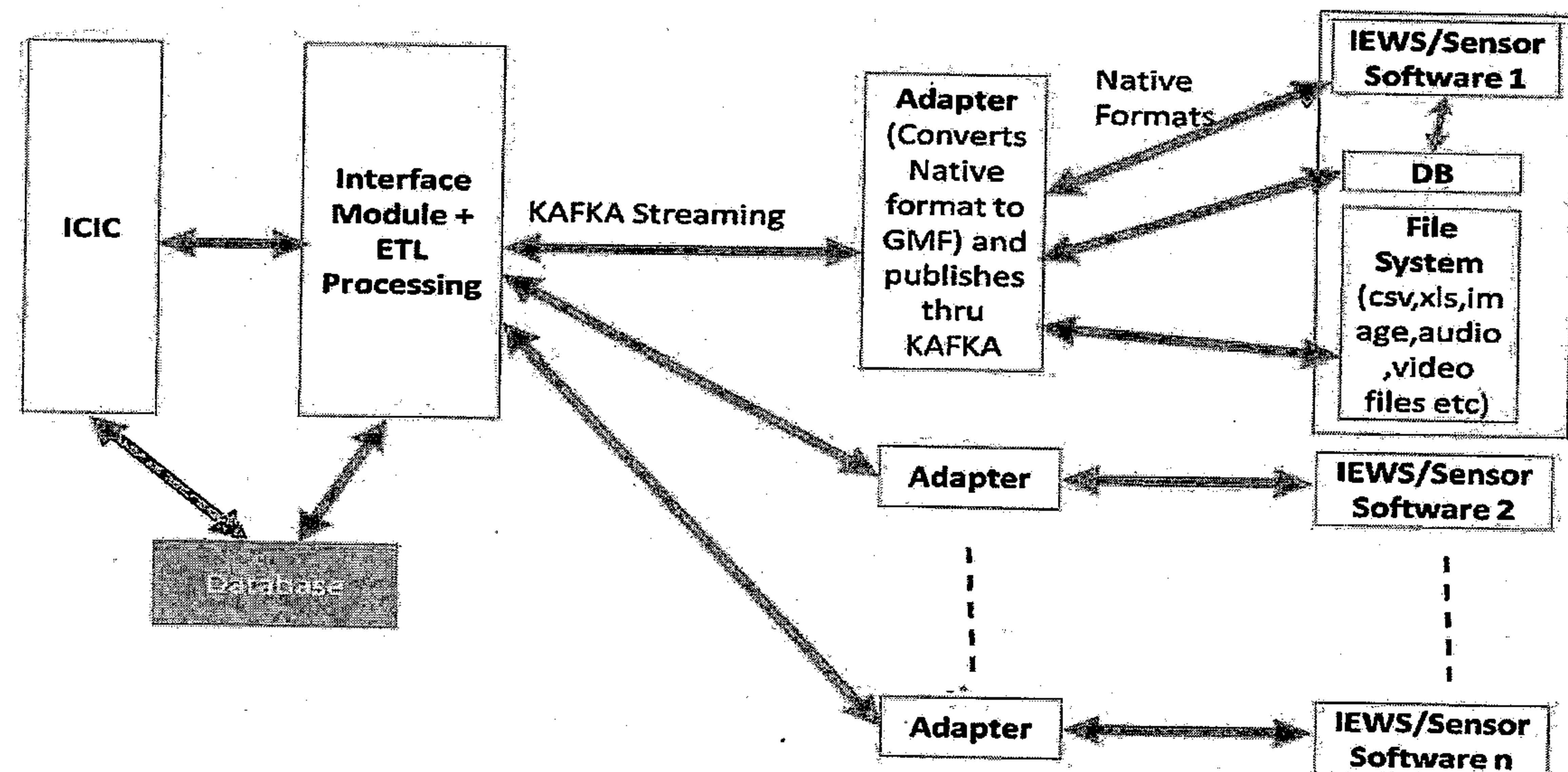


Fig 1: Adaptor Configuration

3. Specifications

- i. Adaptor software shall have provision to connect/disconnect with IEDS/ Database, fetch the designated data and send to ICIC through KAFKA.
- ii. Generation of standardized XML/JSON based Generic Message Format(GMF) for each interface message by transforming the native data format to standardized generic message format using adaptor.
- iii. Provision for data mapping from native format data (DB Columns, csv, xls etc) to ICIC compatible GMF formats.
- iv. Provision for access and sharing of files (Audio/Images/GIS Layers (kml & kmz) /Text files/Video) to ICIC through KAFKA.
- v. UI Layouts to shall be customized automatically with parameters of the selected reports.
- vi. Generic UI Layouts/ form to facilitate input of report parameters and associated unstructured data i.e- Audio, Image, text, video manually and exporting the data into .csv/JSON format.
- vii. Provision for Import of reports specified in csv, xls, json format in all the GUIs and send to ICIC.
- viii. Provision for Manual feeding of reports data in GMF format and send to ICIC.
- ix. Connectivity and health also to be displayed.
- x. Adaptor software shall be compatible for both Linux and Windows Platforms
- xi. Adaptor software shall use the libraries of KAFKA for sending and receiving of messages to ICIC Interface Software.
- xii. Adaptor shall asynchronous communication to transfer the data to ICIC.

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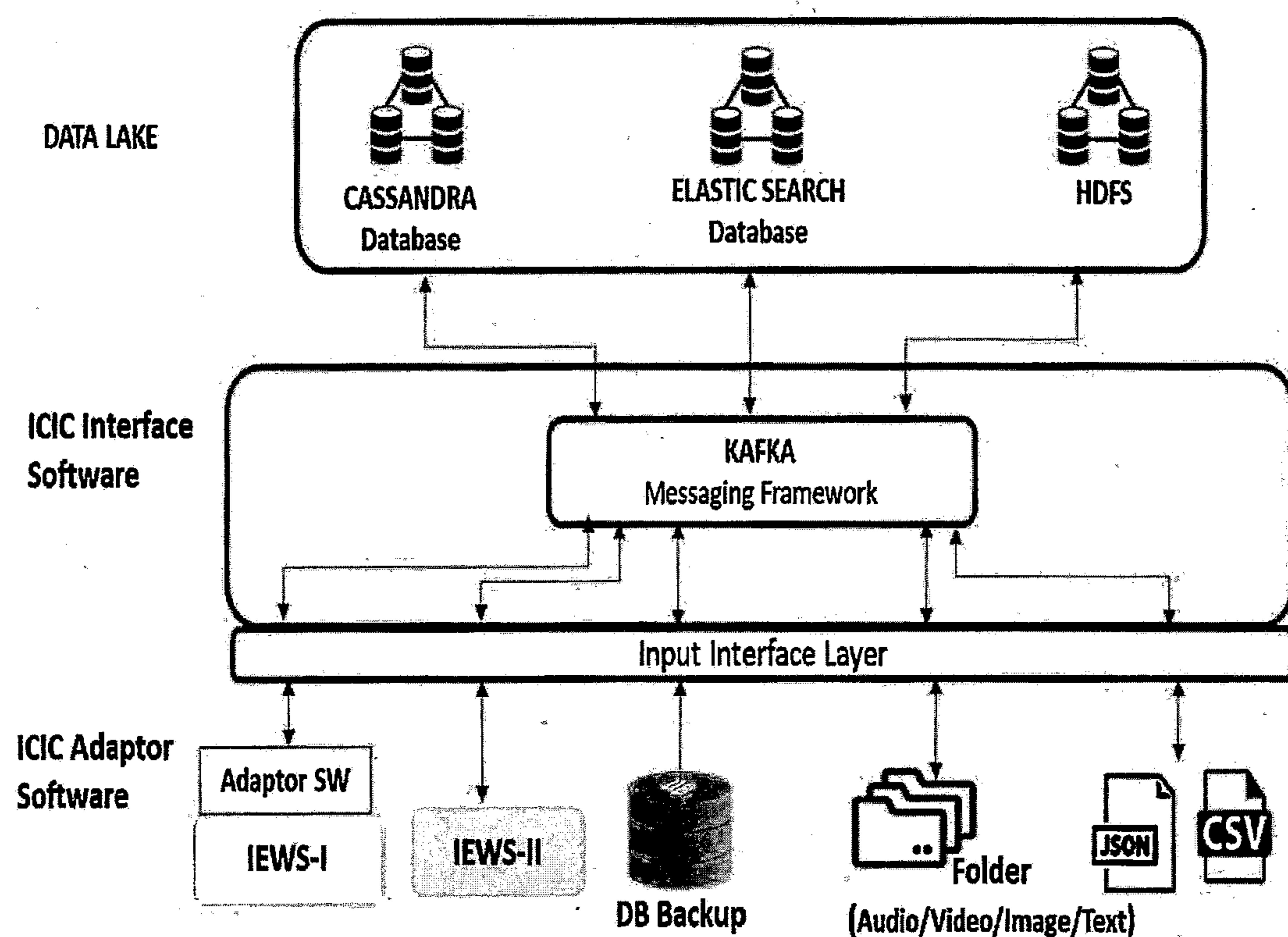
Specification for ICIC Interface Software

1. Introduction:

ICIC Interface Software shall provide the features of interfacing with various data sources viz. EW systems, Databases and folders containing the structured, semi-structured and unstructured data. It shall use a data integration platform like Kafka for integration with multiple data sources, stores the data in terms of multiple topics and deliver the data into the data archival cluster. It shall also carry out the ELT process on the data received from multiple EW sources and shall load into the central databases.

2. Configuration

The configuration of ICIC Interface Software is shown below:



3. Specification:

- a. The ICIC Interface software is Application software and shall facilitate modules such as Source Integration, Kafka Management, Destination Integration, Support Functionality, GUI management and Database Management.
- b. Source Integration module shall integrate IEWS applications through Adapter Software for Legacy & current IEWS systems. It shall also get integrated directly without Adaptor software for designated EW systems.
- c. The module shall integrate Databases through source Connectors available in Kafka message platform.
- d. The module shall integrate unstructured data in various forms and formats viz. Audio, video, Image, Text as apart of stream processing. The module shall transfer data files various format such as JSON, XML, CSV etc.
- e. The data retrieved from EW systems/ Databases/Folders shall be inserted into databases using sink connector.
- f. The ICIC Interface Software shall facilitate Extract Load Transform(ELT) processing.
- g. The software shall facilitate to fill the missing data if required for the designated reports as a part of data transformation in ELT process.
- h. GUI based framework shall facilitate the operator for selection of different sources, reports, fields of the reports and shall transform to designated common structure in ICIC native format with meta data & associated unstructured data before load to target databases.
- i. The ICIC Interface software shall store the transformed data in the ICIC databases viz. Cassandra, Elastic Search and HDFS.
- j. The Support functionality module of ICIC Interface Software shall facilitate features viz. User management, Log management, Health and Kafka management.
- k. User management feature shall envisage different roles for the user group viz. Admin roles and Operator role. The authentication based login shall be provided in the software.
- l. The Log management feature shall facilitate user logging, message log (Transmitted and Received) and Error log.
- m. ICIC Interface Software shall maintain health of Target Databases, Source Databases, Adaptor & Analysis software.

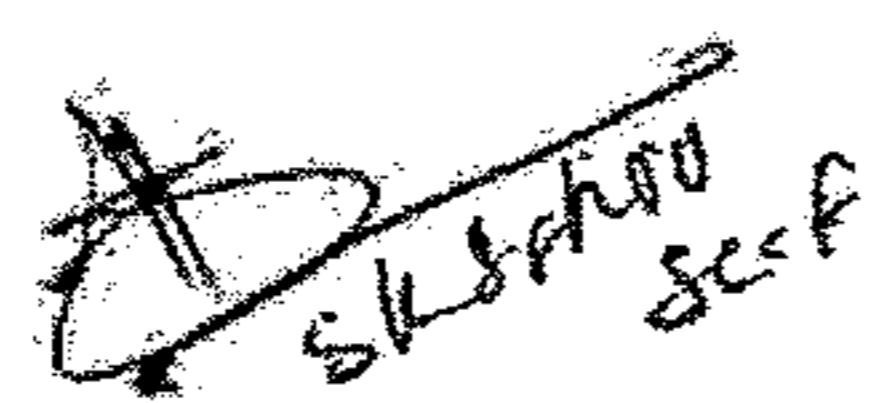


- n. The Kafka management module of ICIC Interface software shall support for configuration of Kafka topics, replication policy, Producers management, Consumer management, Connectors for Source and Sink.
- o. The ICIC Interface software shall support for batch & stream processing and on demand transfer of data from different data sources.

List SDLC Documents

The following list of SDLC documents shall be generated for two builds of the three CSCI (ICIC Analysis Software, Adaptor Software and Interface Software)

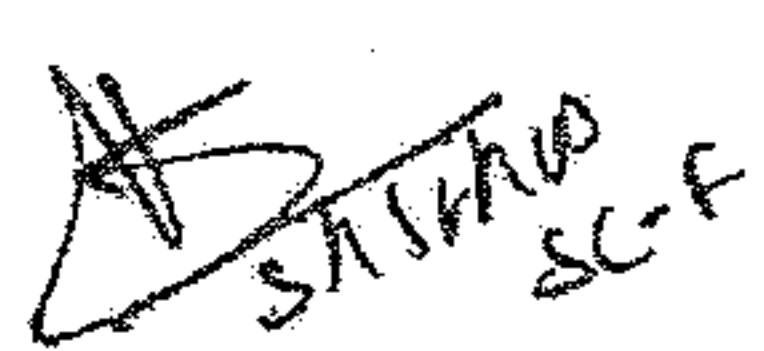
SNo	Phase	Document Name
1	Planning	Software Development Plan (SDP) Software Test Plan (STP) Software Configuration Management Plan (SCMP)
2	Requirement	Software Requirement Specification (SRS) Interface Requirement Specification (IRS)
3	Design	Software Design Document (SDD) Database Design Document (DBDD) Software Test Description (STD)
4	Testing	Software Test Report (STR) Software Installation Plan (SIP) Build and Checkout Release Notes
5	Deployment	Version Description Document (VDD) Software User Manual (SUM)



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Build wise Features- ICIC Software

A. ICIC Analysis Software	
Build-1	
SNo	Functionality
1.	Mission Management
2.	GD-Vulnerable Areas
3.	GD-Formation Head Quarters
4.	GD-Central Radar Library
5.	GD-BTS Library
6.	Mission Analysis(MA)- Single Mission
7.	Mission Analysis(MA)- Multiple Missions of EW System
8.	Mission Analysis(MA)- Multiple Missions of across EW Systems
9.	Mission Analysis(MA)- Guidelines for Future Operations
10.	ELINT Analysis- Emitter Fusion
11.	ELINT Analysis- Prediction
12.	ELINT Analysis- Cluster Identification
13.	ELINT Analysis- Pattern Analysis
14.	ELINT Analysis- Outline Identification
15.	COMINT Analysis- Net Building
16.	COMINT Analysis- Prediction
17.	COMINT Analysis- Cluster Identification
18.	COMINT Analysis- Pattern Analysis
19.	JAU Analysis
20.	JIM & JIS analysis
21.	Text Analysis: Document Clustering
22.	Text Analysis: Sentiment Analysis
23.	Text Analysis: Keyword Spotting
24.	Text Analysis: Named Entity Recognition
25.	Image Analysis: Object Identification
26.	Statistical Analysis
27.	GIS Management: Map Management
28.	GIS Management: Symbol Management
29.	GIS Management: Layer Management
30.	GIS Management: Standard Measurements
31.	GIS Management: Line of Sight
32.	GIS Management: Export/Import
33.	Report Management
34.	Maintenance and Support : User management
35.	Maintenance and Support : Monitor Health
36.	Maintenance and Support : Log management
37.	Maintenance and Support : GNSS and Time Synchronization
38.	Database Management :Database Backup
39.	Communication
Build-2	
1.	GD-Satellite Foot Prints
2.	GD-Communication Emitter Library



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3.	GD-Threat Library
4.	GD-Image Library
5.	GIS Management: Area Coverage
6.	GIS Management: Shortest Path
7.	GIS Management: Flythrough
8.	Mission Analysis(MA)- Multiple Missions of EW System
9.	Mission Analysis(MA)- Multiple Missions of across EW Systems
10.	Mission Analysis(MA)- Guidelines for Future Operations
11.	ELINT Analysis- Emitter Fusion
12.	ELINT Analysis- Pattern Analysis
13.	COMINT Analysis- Net Building
14.	COMINT Analysis- Pattern Analysis
15.	JAU Analysis
16.	JIM & JIS analysis
17.	SIGINT Analysis
18.	Electronic Order of Battle (EOB)
19.	Common Operational Picture (COP)
20.	Report Management
21.	Communication
22.	Content Analysis: Image Analysis
23.	Content Analysis: Text Analysis
24.	Content Analysis: Keyword Spotting
25.	Content Analysis: Voice Analysis
26.	Metadata Analysis : Identification of calling pattern
27.	Metadata Analysis : Emitter Clustering
28.	Metadata Analysis : Alerts
29.	Metadata Analysis : BTS Prioritization on JIM data
30.	Traffic Analysis : Frequent communication
31.	Traffic Analysis : Chain of communication
32.	Traffic Analysis : Link Analysis
33.	Traffic Analysis : Visual calling pattern
34.	Collated Analysis: Common target (IMEI/IMSI/Phone No)
35.	Collated Analysis: Common Peer Number
36.	Collated Analysis: Common Operator comments
37.	Collated Analysis: Common Location of emitters
38.	Collated Analysis: Common SMS content
39.	Collated Analysis: Common voice sample
40.	Pattern of Operation
41.	Image Analysis: Change Detection
42.	Voice Analysis: Archiving of audio
43.	Voice Analysis: Speech Pre-processing
44.	Voice Analysis: Speech enhancement
45.	Voice Analysis: Speech identification
46.	Voice Analysis: Speaker identification
47.	Voice Analysis: Language identification
48.	Voice Analysis: Machine Translation
49.	Voice Analysis: Keyword Spotting
50.	Database Management: Database Restore
51.	Database Management: Purge Database
52.	Database Management: Database Replication



B. ICIC Interface Software

Build-1

1. EW Source Integration through adaptor
2. EW Source Integration without adaptor
3. EW Database Integration
4. Integration with Unstructured Data
5. Integration with Destination Database/Data Repository
6. Kafka management
7. Source Connectors customization and integration
8. Sink Connectors customization and integration
9. ELT processing
10. Data Transformation
11. User Management
12. Log Management
13. GUI management

Build-2

1. EW Source Integration through adaptor
2. EW Source Integration without adaptor
3. EW Database Integration
4. ELT processing
5. Data Transformation
6. GUI management
7. Log management
8. Health management
9. Configuration management
10. Database management

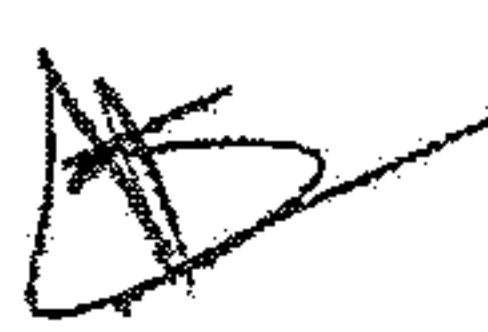
C. ICIC Adaptor Software

Build-1

1. Connectivity to EW Sources (Application, DB, Files in Folder)
2. Kafka Integration
3. Generation of standardized XML/JSON based Generic Message Format(GMF)
4. EW Source Data mapping to ICIC data format
5. Integration with shared folder containing files (Audio/Images//Text files/Video/GIS Layers through KAFKA).
6. Generic/Dynamic UI Layout
7. Import of reports
8. Kafka Configuration
9. GUI/Form for manual entering of report data in GMF format
10. Adaptor software shall be compatible for both Linux and Windows Platforms

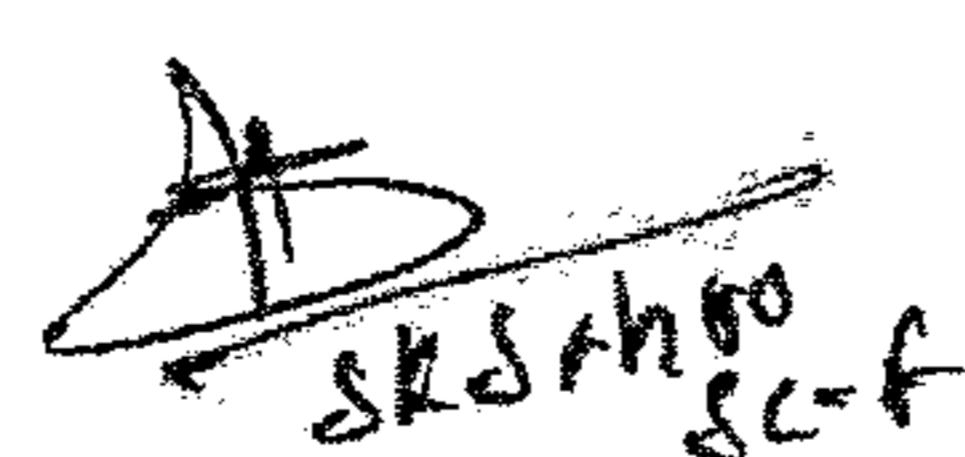
Build-2

1. Connectivity to EW Sources (Application, DB, Files in Folder)
2. Kafka Integration
3. Generation of standardized XML/JSON based Generic Message Format(GMF)
4. EW Source Data mapping to ICIC data format
5. GUI/Form for manual entering of report data in GMF format
6. Generic/Dynamic UI Layout
7. Adaptor software shall be compatible for both Linux and Windows Platforms



Industry Partner Qualification Criteria

- i. The Industry Partner should have executed software development using AI/ML models/techniques related to Image analysis, video Analysis, Text Analysis, Pattern generation, Outlier identification, Predictive Analysis, Network analysis on Call Data Record(CDR) data in any DRDO Lab/ Govt organizations/PSUs in the recent 3 years and the proof of the same to be provided in terms of SO along with brief technical description of the case/project.
- ii. Compliance of expertise to technology stack (mentioned in para 5) wrt projects executed/expertise/experience and proof for the same to be submitted.
- iii. The average annual turnover of the Industry Partner should be more than 4 Crore for past 3 years and proof for the shall be submitted.
- iv. The Industry Partner shall be CMMI L3 certified & ISO 9001:2015 certified and shall produce the documentary proof for the same.
- v. The TCEC constituted by the competent authority shall visit the office of the Industry partner and shall assess the claimed experiences practically in addition to the documentary evidence.
- vi. The Industry partner should have executed at least one Supply Order of Rupees 10 Cr or at least two Supply Orders of 6.5 Crore each or three Supply Order of 4 Crore each in past 5 years in the area of software development.



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