

WORK REPORT OF NAVDEEP GARG, SCI/ ENG 'SC', MISD-PPEG, MISA
FOR THE PERIOD 24TH MAY 2016 – TILL DATE

I'm working in MISD of PPEG, MISA since 24th May 2016, which is responsible for the implementation of Management Information Systems(MIS) requirements for administrative and management related activities. Following are major activities carried out by me during the period:

1. Requirement elicitation, Planning, Designing, Development, Implementation, Testing, Operationalization and Maintenance of ISRO/DOS PFMS Web Services Interface System (IPWS).
2. Value Addition, Innovation and Maintenance in SANDESH system
3. Published a paper on 'e-Governance Initiative in URSC - Automation of various Government-to-Employee (G2E) Services'
4. Prototype model of Integrated MIS system
5. Operationalization & Maintenance of COINS-PFMS Interface Software
6. DMR of MISD for ISO implementation

Following are the details of above activities accomplished during the period:

1) Requirement elicitation, Planning, Designing, Development, Implementation, Testing, Operationalization and Maintenance of ISRO/DOS PFMS Web Services Interface System (IPWS).

Introduction of IPWS:

PFMS software which is formulated by Office of the Controller General of Accounts (**CGA**), Ministry of Finance (**MoF**) in **two** different models. First model provides a simple approach where a Government organization can directly pass their bills using PFMS portal, whereas **Second** model is an interface model, developed to cater the data confidentiality requirement for those organizations where scope of work is in area of research and development activities.

Indian Space Research Organisation (**ISRO**) being a R&D organization has adopted the **second** model and developed ISRO/DOS PFMS Web Services Interface System (**IPWS**) to process the input requests and handle output responses between COINS and PFMS.

Following is the conceptual diagram of IPWS

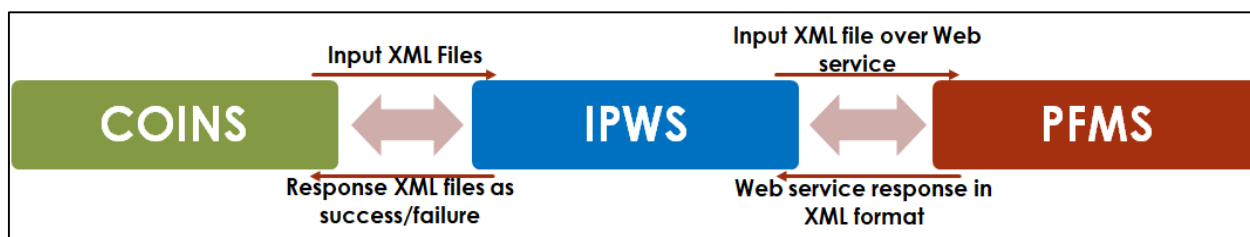


Fig 1: Conceptual Diagram of IPWS

Following are the major responsibilities and tasks carried out for IPWS

- a) Responsible for **requirement analysis** and coordination with ITD-PFMS and National Informatics Centre (NIC) teams to gather the detailed knowledge of interface model.
- b) Analyzed interface **model** implemented by NIC team for integrating with COINS. The following web services of PFMS have been utilized for expenditure related transactions and tracking their status.
 1. Vendor Registration Web Service
 2. Sanction Details & Status Web Service
 3. Transfer entry /Permanent Cancellation Web Service
 4. Challan Web Service
- c) Designed the IPWS system in accordance with the requirement specifications and constructed structural UML Class diagram for realization of this system.

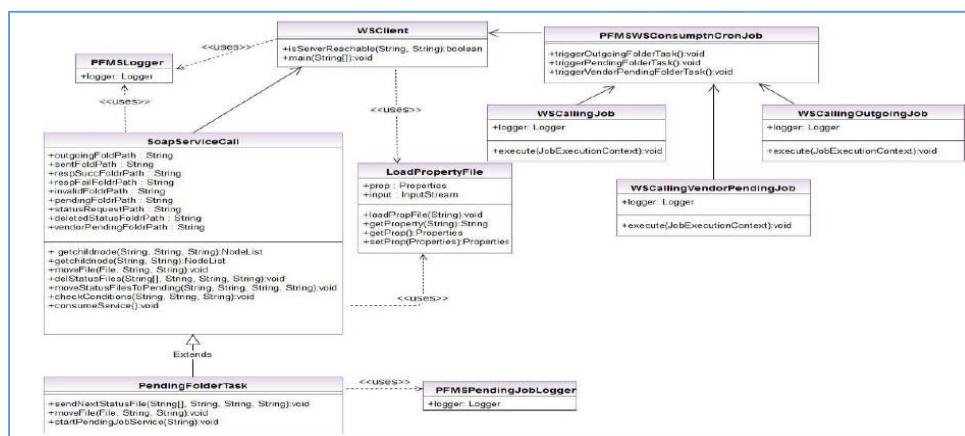


Fig 2:Class diagram -IPWS

d) Development of IPWS:

Responsible for **end-to-end development** of this system which is developed using **Java 2 Platform Enterprise Edition (J2EE)** platform with required APIs related to networking, XML formatting, **Jasypt**(Java Simplified Encryption) for adding encryption capabilities, log4j for logging of events and quartz scheduler for Cron Jobs Scheduling.

Based on ISRO security advisory committee recommendations, this application is configured on the file system instead of any RDBMS. The system is designed in such a way that execution of tasks will be **guided** by format of Input XML file name to invokes the sequence of operations.

S	H	1	S	2	0	1	8	0	0	0	0	0	1	A	0	0	0
Centre Code		PAO code and Service		Year			Running Number							Service Operation		No of times service sent	

e) Configuration of server hosting IPWS application

This system is interacting both with intranet and internet, hence it becomes mandatory to have a robust security mechanism for avoiding possible vulnerability and cyber

threats. Thus, to strengthen the security following recommendations of ISRO/DOS Cyber Security (**CSMD**) team have been implemented:

- **Mandatory Configuration Recommendations**
 - ✓ Allowing only required TCP/80 and TCP/443 ports in the firewall on Internet side.
 - ✓ Only rsync protocol to be allowed in the firewall on intranet side.
 - ✓ Minimal installation of latest CentOS/RHEL Operating System (OS) version without any GUI/application software.
 - ✓ Hardening of intermediate server to be carried out.
- **Recommended Configuration**
 - ✓ SSL/TLS certificate deployed at pfms.nic.in is not trusted; hence need to import this certificate and handle accordingly in jre.
 - ✓ Selinux based mandatory access control should be enabled and enforced.
 - ✓ Strong password for root & other users.
 - ✓ Usual protections like No direct login to root account, no remote login to any account, locking of account on 3 unsuccessful attempts, etc need to be implemented.
 - ✓ No IP-Forwarding.
 - ✓ The listening port of OpenSSH should be changed to a non-standard port.
- **Git version control system** has put in place to track the changes made in software.

Development of file transfer module

Responsible for development of shell scripts using rsync utility to simplify the **two-way** communication, **file transfer and synchronization** over the networked connection between COINS and IPWS servers.

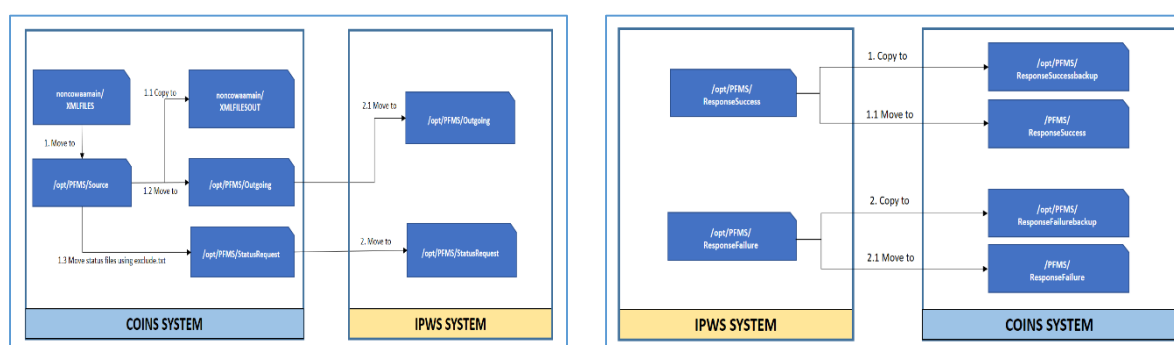


Fig 3 putXML.sh and getXML.sh flow diagram

Deployment of IPWS

Developed a customised **Linux service** using 'systemd' for deploying the IPWS application in a Java Archive (**JAR**) format in Linux environment. 'systemd' service manager ensures the continuous running of script, be restarted in case of a failure (unexpected exit), and even survive server restarts.

f) **Major enhancements and documentation**

- Responsible for fixing of bugs and implementing enhancements on priority basis to ensure system stability.
- Implemented mechanism for obtaining **Failure After Success (FAS)** responses which shall make in use to maintain the latest updates of transactions.
- Preparation & distribution of all design documents and manuals across all ISRO centres to share the latest updates & understanding of the system.

Presently IPWS is serving its objective satisfactorily across all ISRO centres/units.

2) **Value Addition, Innovation and Maintenance in SANDESH system**

As a team member of SANDESH-MIS developer team, used Java 2 Enterprise Edition (J2EE) framework and jQuery technology to contribute following to the system.

- **Foreign Tour Allowance(FTA)**
Developed a new module for Foreign Tour Allowance (FTA), in which account personal can add Travelling Allowance advance and settlement details through online mode for employees who travelled on foreign official tours.
- **Digitization of TRAVEL Agents transactions**
 - a) Developed a module for **digitization of records** related to payment details and air-travel booking details that made by TRAVEL Agents like 'Balmer Lawrie'. This module is responsible for enabling the registration of new bills, editing of previous bills, obligatory online approvals from Account Officer for payments disbursement and generate online reports.
 - b) Implemented the **inclusion** of the air fare payment incurred on **ISRO Guests** and other Centre's employees who travelled on behalf of URSC.
 - c) Developed an **INCENTIVE MANAGEMENT MODULE**, by which cost of tickets can be adjusted against Incentives received to travel agent from airlines companies for accomplished tours. In addition to this, corresponding **reports** is generated in PDF format as well to keep the **track of expenses**.
- Developed a software module to automate payment acknowledgements through SMS and email alerts to vendors. This module is meant to enforce **e-Governance initiatives** at URSC which shall send automated alerts to respective vendors whenever a payment gets credited in their bank accounts.
- Implemented the concept of **CONNECTION POOLING** in all major SANDESH software modules. This concept provides a cache of database connection objects that reduces new connection objects creation **overhead** and **promotes connection object reuse**. This in effect has reduced the load on database server and enhance the performance of the application in use.

- Introduced and implemented the **open source version control system GIT** and **hold the responsibility** to ensure versioning and keeping track of all changes made in source code of SANDESH application. This in turns helps in sharing of secured source code and **provide seamless collaboration amongst developers**.

Implementing these modules minimised the manual interventions, improve efficiency, minimized human errors, processes becomes more effective and encourages paper less practise in daily operational activities.

- 3) As an author of technical paper on ‘**e-Governance Initiative in URSC - Automation of various Government-to-Employee (G2E) Services**’ got invite for **oral presentation** at ISRO Propulsion Complex (IPRC), Mahendragiri. This paper was **published** in ‘ISRO Seminar on Computer and Information Technology (ISCIT) – 2018’.

4) Prototype model of Integrated MIS system

Designed, developed and demonstrated a prototype model to retrieve data from multiple databases over the network on real time basis. This model is developed using **SPRING-BOOT, Hibernate and bootstrap technologies**, that provides efficient & effective methodologies to access different centres ‘available databases and consolidate results at a **common server**.’



This technology can make the data retrieval process quite efficient in extracting the desired **outcome, which shall aid the management in decision making processes**.

5) Operationalization & Maintenance of COINS-PFMS Interface Software

- Provided support for configuring the COINS-PFMS interface software across all ISRO centres. The system is working and serving its objective since 01-Jan-2019.
- As a member of ‘COINS-PFMS Interface /software review Committee’ team submitted detailed **codewalk** through report. This report covered all major issues related to business logic, bugs and short coming in functionality in various modules, performance related issues, recommendations for possible code optimization, improving exceptions handling and implementing modularity in the code.
- Responsible for operation and maintenance of the finance, accounts and stores related modules of COINS at URSC. In addition to these activities ensured availability of Computerized Working in Administrative Areas (COWAA), COINS and Sandesh systems and suggested improvements/enhancements.

6) Additional Responsibilities

- As Division Level Management Representatives (**DMR**) of MISD for ISO program, responsible for maintaining required ISO documents for the division which are essential in maintaining ISO standard activities.
- On behalf of URSC, attended 'One-Day Workshop on HINDI KNOWLEDGE MANAGEMENT APPLICATION' held at SAC. This application is developed to **digitalize** the various operational activities of respective centres' Hindi Cell. After making centre specific changes, this application is configured successfully on the test server for URSC-Hindi Cell and made available for the Functional testing.

Navdeep Garg