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# Abstract

This document provides a survey on Indian Government activities related to Internet of Things. Most of the Indian Government activities related to Internet of Things focus mainly on e-applications, mobile alert system, GPS monitoring system and creation of advanced metering infrastructure for smart grid applications. This document is organized based on the application verticals in which IoT (also sometimes referred as M2M) is used.

# IoT/M2M India specific applications

## Transport application

### Automatic Vehicle Location (AVL) System

The GPS enabled AVL allows real-time tracking of bus movement and provides information on its location. This information is then used along with other details such as the speed of the bus, the route followed etc to provide the passengers waiting at the bus stops with the expected arrival time of their bus. This information is displayed on LED boards installed at the bus stops as well as inside the buses.



Figure 1 AVL system

The system consists of the following major components

1. The bus mounted GPS devices, with GPRS connectivity
2. The back-end application which includes the following

i. Various master data residing in the database

ii. Module for assimilating real-time data from GPS devices

iii. Application layer for processing and analyzing real-time operation data for:

1. Real-time prognosis purposes

2. Data storage for MIS purposes

i. Operation data (stored in the database)

ii. Web based user interface for maintenance of data and for view and downloading of MIS

iii. Web and SMS based public interfaces for dissemination of prognosis data

1. The LED Display boards located at various BQS

This project has been successful in Delhi state capital, and pilot implementation phase started in Rajasthan and Gujarat state.

## E-Health application

This e-Health project is implemented by the Department of Health & Family Welfare, Government of Kerala with the help of DeitY, Government of India to capture the demographic data, automate hospital processes and bring all information into a centralized State Health Information system through the network to ensure continuity in health care



Figure 2 Block diagram of e-health Solution

The objective of this project is to have a Universal healthcare system. This cannot be achieved without having a robust IT enabled management and monitoring system. The envisaged e-health project is an integrated solution covering the entire health sector of Kerala including all the public healthcare institutions and at a later stage to include private healthcare institutes also. The data collected at all levels of interaction with the system to be captured and linked together to form the State Health Information System database in the State Data Centre.

## Supply chain management application

### Water Tanker Distribution Management System - Delhi

The project involves access based control for water dispensing at the filling stations, monitoring the movement of fleet of water tanker vehicles, geo-fencing of designated delivery locations and real time water level monitoring in tankers to ensure an end-to-end audit of the entire delivery system.

 To make available relevant information to the citizens, the project envisages setting up a Call Centre and Central Control Station (CCS) based in Delhi Jal Board (DJB ) central office and call center/help desk function to register and monitor complaints and request.

Coverage: The project Water Tanker Distribution Management System will cover 42 filling point locations, 800 water tanker and about 18000 fixed delivery points in Delhi.

 The WTDMS system from the citizens’ perspective will allow booking of complaint / request online or through call center and check status of delivery or resolution of complaint online, call center or through SMS. Delhi Jal Board will be able to efficiently utilize water at filling point locations, increase efficiency in water delivery services by tracking vehicles in real-time, track and monitor the movement of tankers and drivers in real time basis to optimize operations, improve fleet utilization, schedules, and vehicle availability with accurate information to ensure optimum and effective utilization of water, avoidance in water wastages, better control of the tanker movements.

## Smart Grid Projects

Fourteen smart grid pilot projects in different distribution companies have received funding from India’s Ministry of Power, on the recommendations of the India Smart Grid Task Force. The following are the list of approved pilot smart grid project with the short summary on the each projects.

* CESC (Karnataka) – AMI, outage management, peak load management, microgrid and distributed generation with an initial 21,800 consumers in the Mysore Additional City area
* Andhra Pradesh CPDCL – AMI, outage management, peak load management and power quality management with 11,900 consumers in the Jeedimetla suburb of Hyderabad
* Assam PDCL – AMI, outage management, peak load management, power quality management and distributed generation with 15,000 consumers in the Guwahati area
* Gujarat VCL – AMI, outage management, peak load management and power quality management with 39,400 consumers in Naroda and Deesa
* Maharashtra SEDCL – AMI and outage management with 25,600 consumers in Baramati in the Pune district
* Haryana BVN – AMI and peak load management with 30,500 consumers in Panipat City
* Tripura SECL – AMI and peak load management with 46,000 consumers in Agartala
* Himachal Pradesh SEB – AMI, outage management, peak load management and power quality management with 650 industrial consumers in Nahan
* Puducherry electricity department – AMI with 87,000 consumers
* JVVNL (Rajasthan) – AMI and peak load management with 2,600 consumers in Jaipur
* Chattisgarh SPDCL – AMI with 500 industrial consumers in Siltara
* Punjab SPCL – outage management with 9,000 consumers in Amritsar
* Kerala SEB –AMI with 25,000 industrial consumers
* West Bengal SEDCL – AMI and peak load management with 4,400 consumers in Siliguri town in the Darjeeling district.

# Government Research Lab proposal on IoT framework

## CDAC- Pune : Prototype of IoT Based Navigation Solution



Figure 3 CDAC - Proposed IoT framework

The proposed Internet of Things framework shown below in Fig. 3 will have the following components:

a. Application Service Layer – This is an independent layer that interoperates with the IoT framework to provide domain specific and application oriented services.

b. IoT Framework comprises the following layers :

Utility Layer – This layer comprises of utilities that can be used by various applications in application service layer. The possible utilities for applications like navigation, tracking, location services.

IoT Service Layer – This layer provides various services for interoperability among entities in targeted IoT environment. This includes various services like device communication service, device management service, mediator service, security service, location service, data service and external interface service etc.

c. IoT environment represents the network of the physical entities or things in the Internet of Things.

## CDAC-Noida Projects

### Real-Time Monitoring of Harmful Gases

This system provides a means for monitoring the leakage of combustible gases (LPG, CNG etc) . The system is economical to manufacture, and may be readily installed in service stations, pressure gas storage tank environments, gas yards, utility areas like kitchen, and gas powered vehicles. The nodes are compact in size 98 X 98X 43mm, wall mountable and have less than 700mW continuous operation power consumption. The nodes employ pre-calibrated sensors (10% LEL) which avoid hassles of sensor calibration during production. Wireless Sensor Network system is for detection of a gas leak in utility areas like an apartment house. The sensor nodes are deployed in kitchen of each apartment and few relay node at each floor with stable power supply. Each sensor node relays to the control station/ master node the safety status of nodes location. The network master node/coordinator collects information from the nodes through Wireless Network. The Master node is connected with control system installed in security room. The control station display will indicate the location of gas leakage. Master node also monitors the health of deployed nodes. Each sensor node also has independent audio/visual alarms at to alert gas leakage to occupants. These nodes are also equipped with onboard batteries with more than 6hrs backup power supply.

### Acoustic Eavesdropping Device

The system is capable to sense presence of human activity in the vicinity of the sensor network from the acoustic signals picked up by the sensors. It picks up the acoustic signals, compress it into packets and send it to the control station over the wireless medium. Here, the packets are processed, stored in database, decompressed, played back, tagged and appropriate actions are taken by security personal. The relevant data are made available to the security personnel around the area on their TETRA handheld unit or mobile device in an attempt to give them an early warning of the human activities in the area under surveillance. It also monitors the health of deployed nodes. It consists of:

A set of independent nodes (WASN Array) forming a wire-less sensor network in the area under surveillance,

A master communication node (MWASN) that acts as a link to a vehicle mounted base station,

The vehicle mounted control station consists of Laptops, MWASN and TETRA base station. The TETRA antenna is carried in packed form on the top of the vehicle. It is mounted on ground and connected to the vehicle on reaching the location of operation. The vehicle is pre-fitted with all equipments in such a fashion that four personnel can comfortably travel inside it. During operation, the vehicle is stationary. During this time, the equipments are powered using gen-sets that forms part of equipments in vehicle mounted system.

Tetra hand-held units for use by the security personnel around the area.

### Device for Health Monitoring of Environment Sensitive objects in Transit

Sensitive items like medicines, blood bag, food items, etc., often get damaged during transit leading to wastage of the efforts, cost, and time. Physical quantities, such as, humidity, temperature, pressure, vibration, light intensity, radiation etc., can be measured during transit and logged onto a device that accompanies the item. An alarm may be generated when measurements are out of range upon which corrective measures can be taken to protect the item from getting damaged. The device developed can continuously monitor and log the intended environmental parameters and also it can generate different indication in different stage of its own and environmental condition based on certain user configuration. When the items reach at the remote destination, the logged data can be analyzed to confirm the quality and condition of the items.

# Proposal

Since the major demand in India for IoT applications were mainly focusing on monitoring and information gathering application, and in some cases it is used for providing advance alert to the people regarding particular instance over mobile phone. We propose the GISFI Light weight IoT architecture should consider the above application Indian government initiative and requirements, while making specification for Lightweight IoT architecture. We request the members, to discuss and approve this study report as an input document for IoT architecture document.

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