IoT Policy Document

I. BACKGROUND

The digital space has witnessed major transformations in the last couple of years and as per industry experts would continue to evolve itself. The latest entrant to the digital space is the Internet of Things (IoT). IoT can also be defined as interplay for software, telecom and electronic hardware industry and promises to offer tremendous opportunities for many industries.

With the advent of the Internet of Things (IoT), fed by sensors soon to number in the trillions, working with intelligent systems in the billions, and involving millions of applications, the Internet of Things will drive new consumer and business behavior that will demand increasingly intelligent industry solutions, which, in turn, will drive trillions of dollars in opportunity for IT industry and even more for the companies that take advantage of the IoT.

The number of Internet-connected devices (12.5 billion) surpassed the number of human beings (7 billion) on the planet in 2011, and by 2020, Internet-connected devices are expected to number between 26 billion and 50 billion globally.

The Indian Government's plan of developing 100 smart cities in the country, for which Rs. 7,060 crores has been allocated in the current budget could lead to a massive and quick expansion of IoT in the country. Also, the launch of the Digital India Program of the Government, which aims at transforming India into digital empowered society and knowledge economy will provide the required impetus for development of the IoT industry in the country. The various initiatives proposed to be taken under the Smart City concept and the Digital India Program to setup Digital Infrastructure in the country would help boost the IoT industry. IoT will be critical in making these cities smarter. Some of the key aspects of a smart city will be:

- ″ Smart parking.
- ″ Intelligent transport system.
- ″ Tele-care.
- ″ Woman Safety
- ″ Smart grids.
- ″ Smart urban lighting.
- ″ Waste management.
- ″ Smart city maintenance.
- ″ Digital-signage.
- ″ Water Management

Among other things, IoT can help automate solutions to problems faced by various industries like agriculture, health services, energy, security, disaster management etc. through remotely connected devices.

IoT offers avenues for telecom operators & system integrators to significantly boost their revenues and this has resulted in their taking lead in adoption of IoT applications and services being offered by the technology. Apart from direct IoT applications, the IT industry also has an opportunity to provide services, analytics and applications related to IoT.

Internet of Things involves three distinct stages:
1. the sensors which collect data (including identification and addressing the sensor/device),
2. an application which collects and analyzes this data for further consolidation and,
3. Decision making and the transmission of data to the decision-making server. Analytical engines and Big data may be used for the decision making process.

Several countries like US, South Korea, China among others, have taken lead in their preparedness for taking advantage for IoT.

The key stakeholders in the Internet of things initiatives would be the citizens, the government and the industry. Participation and collaboration of each of the stakeholder at an appropriate stage is essential. At this juncture, we require policies for promotion of IoT and selection of e essential domains and then emphasize on building answers for 'what Data will Service the Citizens' Internet of Things should clearly strategize with a simple goal of 'Value Up' and 'Cost Down' models.

With industry collaboration, experiences from global forums, learnings from other countries who are leaders in IoT, active participation of global partners will help us induce more innovation driven approach. Key to success of Internet of Things would be in building open platforms for ease of use and low cost, building scalable models and using citizens as sensors. Data needs to be openly collected and shared between cross functions to bring out maximum benefits. Participation of start-ups at

this stage will help us devise some innovative methods/ concepts which could be cornerstones for the upcoming overall "smart concept"

II. DEFINITION

"IoT is a seamless connected network of embedded objects/ devices, with identifiers, in which M2M communication without any human intervention is possible using standard and interoperable communication protocols." - Phones, Tablets and PCs are not included as part of IoT.

III. VISION

"To develop connected and smart IoT based system for our country's Economy, Society, Environment and global needs. "

IV. OBJECTIVES

1. To create an IoT industry in India of USD 15 billion by 2020. This will also lead to increase in the connected devices from around 200 million to over 2.7 billion by 2020. As per Gartner Report the total revenue generated from IoT industry would be USD 300 billion and the connected devices would be 27 billion by 2020 globally. It has been assumed that India would have a share of 5-6% of global IoT industry

2. To undertake capacity development (Human & Technology) for IoT specific skill-sets for domestic and international markets.

3. To undertake Research & development for all the assisting technologies.

4. To develop IoT products specific to Indian needs in the domains of agriculture, health, water quality, natural disasters, transportation, security, automobile, supply chain management, smart cities, Automated metering and monitoring of utilities, waste management, Oil & Gas) etc**.**

V. PILLARS OF IOT
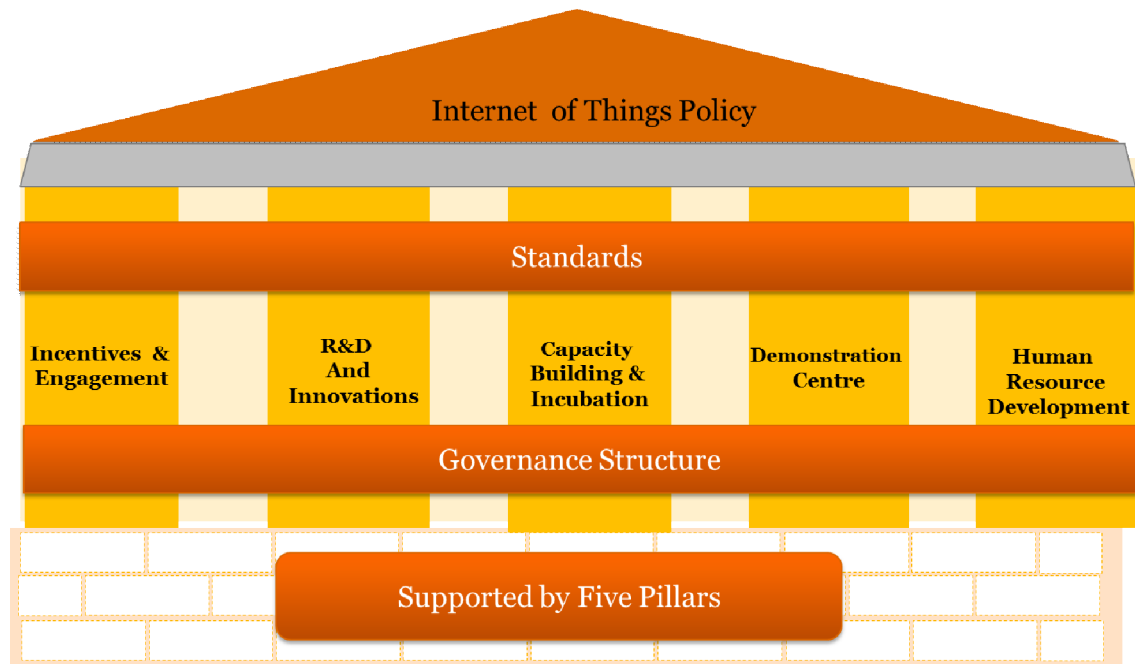
The Policy framework of the IoT Policy has been proposed to be implemented via a multi-pillar approach. The approach comprises of five vertical pillars (Demonstration Centres, Capacity Building & Incubation, R&D and Innovation, Incentives and Engagements, Human Resource Development) and 2 horizontal supports (Standards & Governance structure).

A. DEMONSTRATION CENTRES

a. To develop domain specific strategies for IoT including green building, smart grid, industrial monitoring, agriculture, smart cities, healthcare, connected homes, telematics and supply chain, safety and security, forest and wild life, automotive, natural disasters, etc.

b. To Identify domain specific applications/ prototypes which are of highest priority and inclusive in benefits. To allocate Rs. 125 Crores on PPP mode as 50% funding for atleast 5 projects each will be from different categories as mentioned below or similar IoT applications/projects over a period of 3 years.

i. **SMART CITY :**

I. To set-up a Smart-city model which would include deployment and display of IoT concepts to be used in development of Smart City. The model should cover the concepts like, Smart Lighting, Smart traffic management, Smart building, Smart parking, Wi-Fi Internet access & City Surveillance, Solid Waste Management, Smart Metering, Water Quality, water clogging management in cities, etc.

II. To develop tools to enable accessibility for persons with disabilities.

ii. **SMART WATER :**

I. To setup Potable water monitoring tools to monitor the quality of tap water in all government owned education institutes and public places.

II. To setup project to detect real-time leakages and wastes of factories in rivers and other natural water bodies.

III. To setup project for monitoring of water level variations in rivers, dams and reservoirs, for proactive disaster management.

iii. **SMART ENVIRONMENT**

I. To setup project for alarm and control of CO_2 emissions of factories, pollution emitted by cars and toxic gases generated.

II. To setup projects to create alarms based on distributed control in specific places like buildings, bridges, of tremors in the country and establish a National Advance Seismic System.

iv. **SMART HEALTH (Remote)**

I. To setup projects for monitoring various vital parameters of patients like subtle changes in pulse, respiration, heart condition, temperature and preventive warning on early onset of pneumonia (in small children) or other life-threatening problems ,inside hospitals and at remote patient location including old people's home and ambulance.

II. To setup projects for supporting dementia and other mentally unhealthy patients from getting lost

III. To setup projects to detect & provide support to old age persons in case of fall.

v. SMART WASTE MANAGEMENT

To assist the 'SWACH BHARAT' initiative, we may setup projects to create products which are solar-powered trash receptacle and trash compactor that alerts sanitation crews of municipal authorities, when it is full.

vi. SMART AGRICULTURE

I. To setup project for precision farming which uses data analysis to customize operations. The project may include monitoring of soil moisture, vibrations, earth density and pests to detect dangerous patterns in land conditions and create an online update mechanism for farmers.

II. To setup a project to allow farmers to monitor online, the temperature of grain bins and receive an alert if the temperature rises outside of an acceptable range to help them preserve grains in storage areas. This also can be extended to alerts for pest controls requirements.

vii. SMART SAFETY

I. To setup a project to build a wearable device for women, child and old people safety in public.

viii. SMART SUPPLY CHAIN & LOGISTICS

I. To setup a project for enabling universal ambulance service at any place using any kind of device.

II. To enable logistics chain managed by government for essential food items to ensuring need-based re-filling and reduction in wastage of food items.

Objective	Minimum number of projects	Mode	Duration (in years)	Extent of Govt. funding	Budget (Rs. in crores)
IoT projects on selected application domains	5	PPP	3	50%	125
Total					**125**

B.   CAPACITY BUILDING & INCUBATION

a. To promote Institutional capacity building with ERNET as the nodal agency and 15 academic/ institutional partners. Under this program government will fund to create Resource Centers & Test-beds as a common experimental facility supporting heterogeneity in Internet of Things (IoT) domain to help the community to experiment IoT devices and applications by combining various IoT technologies with an allocation of Rs. 18 Crores as 100% fund with Rs 1 Crores for each partner and Rs. 3 Crores for nodal agency over a period of 5 years.

Objectives

I.   Implementing IoT test-bed comprising heterogeneous legacy and possible new types of devices

II.   Support IoT experiments to benefit academic and research community in improving the knowledge of IoT hardware and software infrastructure

III.   Semantic technologies and ontology development to the benefit IoT community

IV.   Help scientific community in enhancing their knowledge about IoT and its relevance to their application domain

V.   Facilitate IoT innovation enhancing its impacts and define necessary standards for IoT

VI.   Use IoT to the benefit of the citizens & society.

VII.   Awareness programs related to IoT which will encourage individual students and others to jump into research and development of this technology .This will be done through workshops, demonstrations etc.

Expected Outcomes

I.   The 3 tiered IoT test-bed architecture.
   - Plug & Play enabler
   - Middleware Layer and
   - Application Layer.

II.   Project technical documents on hardware/software design and any documents published (journal/ conference/ standards).

III.   Manpower trained
   - Moderate to highly technical level of training.

- At least 4 technical work- shops on IoT will be organized by each project partner institution with approximately 50 participants for each workshop.

b. To set up an Incubation centres (National Centre of Excellence) under PPP mode with NASSCOM and other industry associations for supporting IoT industry.

    I.   The Centre of Excellence (CoE) for Internet of Things (CoE-IoT) will host IoT incubation infrastructure to support start-ups, SMEs, students and other innovators based on membership and support from design to prototype in productizing their ideas. The CoE-IoT will be set up in major cities for Internet of Things innovation housing hardware design tools, wireless development kits, application sensors, software tools, training on specific technologies, industry interface etc. that otherwise would be difficult to afford for the start-ups, democratizing the innovation process. The industry liaisoning will be the responsibility of an industry partner NASSCOM, while ERNET will provide the academic interfacing.

    II.   The application for incubation will be evaluated by a steering committee with members representing government, industry and academic members.

    III.   Creating eco-system for transfer of knowledge amongst start-ups and from industry, technology to start-ups and academia. The framework will help the start-ups from idea to prototype to product and necessary industry interface.

    IV.   The expected cost to execute a 40 seater COE for 5 years would be Rs. 35 Crores. Total 5 centres should be aimed which should include labs, office infrastructure and other necessities.

    V.   Government would provide Rs. 100 Crores of funds. The rest of the funding would be sourced through industry by NASSCOM or any other appointed association.

Objective	Nodal Agency	No. of Centers	No. of Seats	No. of Partners	Funding Mode	Period (In Years)	Funding %age	Budget (Rs. In Crores)
Institutional Capacity Building	ERNET	15	10	15	Govt.	5	100	18
National Center Of Excellence	ERNET	5	40	1 or 2	PPP	5	50	100
TOTAL								118

C. STANDARDS

a. To facilitate global and national participation of industry and research bodies for promoting standards around IoT technologies developed in the country. To appoint relevant nodal organization for driving and formalizing standards relating to technology, process, interoperability and services like:-

    I. IoT standardization

    II. Spectrum energy communication protocols standards

    III. Standards for communication within and outside the cloud.

    IV. International quality/integrity standards for data creation, data traceability.

    V. Standards for Energy consumption

    VI. Safety standards (for example, if devices/sensors are used on humans)

    VII. Privacy and Security Standards.

b. To create national expert committee for developing and adopting IoT standards in the country. The expert committee should comprise of industry experts/organizations in following areas:

    I. Identification Technology· Development of Open framework for.IoT.

    II. Architecture Technology- IoT architecture, platform interoperability.

    III. Communication Technology· Ultra low power chipsets, On chip antennas, Ultra low power single chip radios, ultra low power system on chip.

    IV. Network Technology- Self aware and Self organizing networks, storage and power networks, hybrid networking technologies

    V. Software and Algorithms· Next generation IoT based social software, enterprise applications.

VI. Hardware· Multi protocol/standard readers, sensors, actuators etc.

VII. Data & Signal processing technology

VIII. Power and Energy storage technologies· Energy harvesting and conversion, long range wireless power.

IX. Security and Privacy technologies

X. Material Technology . Silicon, semiconductor manufacturing etc.

XI. Participation in Standards Committees of ITU, IEEE and other relevant global forums for standards making in IoT.

D. R&D AND INNOVATION

a. To fund R&D in IoT for specific applications of common good through call for proposals.

I. To identify core members of R&D in each field of technology which enables IoT.

II. To initiate cloud based open source projects for incessant and collaborative R&D.

III. To create test labs for hardware to hardware (H to H) and hardware to software (H to S) integration.

b. In order to stimulate private sector's investment in IoT related R&D and to undertake IoT related R&D projects with international partners, an innovative project named %International IoT Research Collaboration scheme (IIRC)+to be initiated by DeitY, Government of India in support with an aligned association/supporting organization with following objectives:

I. Under IIRC scheme, government will collaborate and initiate treaties with other countries to generate joint projects for R&D in IoT on 50% contribution basis.

II. IIRC scheme will disburse fund to IoT industry in the form of loan, grant & equity for approved projects after analyzing the capabilities of the bidder.

III. Under IIRC scheme, the appointed organization will handle the whole process from Call for Proposal to project closures.

A detailed program will be formulated on the above broad guidelines.

E. INCENTIVES & ENGAGEMENTS

Incentives

a. To promote Venture Funds of Electronic Development Fund specifically directed to support companies in IoT related domains like Memory, Processor, Sensors, Low power devices and solar electronics. This will be in the form of low/ Zero cost funding of eligible projects.

b. To launch a program to be driven by an existing/ new society through promotion of exports from the IoT products and services by facilitating space requirement and strengthening the communication infrastructure at a subsidized rate for setting up IoT development Centers in the country. This program would aim at providing the following benefits:

   I. IoT developmental Centre can be set-up anywhere in India.
   II. Imports of capital goods/ raw materials required for manufacturing IoT products imported with a duty benefit of up-to 100%.
   III. Capital goods/ raw materials purchased from domestic market will be entitled for reimbursements of excise duty and CST.
   IV. For developing IoT centers, space & Internet would be made available at subsidized rates

c. To support participation in leading international global trade fairs to show case Indian industriesqcapabilities in IoT, to check the progress and global trends in IoT and identify global IoT leaders who can be included in high level advisory committee for IoT. In order to support this initiative:

   I. Government will fund exhibition space cost (up-to 80% funding) to 1000 Indian SMEs (Small and Micro Enterprises) who are well credit rated by National Small Industries Corporation/ MSME and, are contributing to IoT industry of India and need international exposure to promote their products at international exhibitions and for study tours, subject to a maximum of Rs.6 lakhs per Enterprise per year.
   II. Government will also fund (up-to 100%) IoT specific study tours by Industry Associations and supporting government organizations.

We recommend that government should support the above mentioned initiatives through programs owned by Ministry of MSME.

d. Govt. of India is already providing incentives on IoT products in its M-SIPS policy, which will continue as an independent initiative over and above this policy.

Engagements

a) To be on the Steering committee of IEEE world Forum on IoT or similar forums to take part in formation of standards and security parameters.

b) High level advisory committee would help interface with various IoT attached industries and track the progress of IoT in the country. The same should be show-cased in International forums.

c) To create methods to generate incessant awareness of this new wave and help industry commercialize with ease in all business verticals.

F.   HUMAN RESOURCE DEVELOPMENT

a. To create an IoT Education and Awareness program in DeitY for developing skill sets for IoT at all levels. Objectives of this program would be :

I.   Introduction of IoT Curriculum at M.Tech & B.Tech level and Research Activity/PhD.

II.   Certificate Course in IoT, 6-weeks/ 2-weeks training program. To setup norms for accreditation of all such courses relating to IoT.

III.   Awareness Program: Under this activity, IoT information will be widely propagated in a planned manner-.

i.   Publish articles etc. in leading journals.

ii.   Develop Audio & Video material for awareness through social media.

iii.   Participation in conferences for industry /educational Institutions.

iv.   Promoting workshops for working level executives from industry & faculty form academic institutions.

IV.   Introduce cross country pacts for IoT education exchange Programs.

i.   Organize trainings by inviting experts from other countries for training scientists / engineers / officers of DeitY, including

those of Societies and attached offices of DeitY, and from other Ministries / Departments as Master Trainers.

ii. To introduce Bilateral Cooperation programs between Indian premier institutes and institutes of other countries.

iii. Faculty of Academic Institutions, Experts and other Professionals working in the area of IoT to be sponsored for Presenting Papers, attending - Conferences, Short-term courses, tutorials etc. both at the National as well as International level.

V. To support faculty and students for participation in global academic conferences for presenting papers on IoT.

VI. To create fellowship M-Tech level specialization programs within IITs in next 2 year timeframe. The fellowship program should sponsor 150 students every year.

VII. Creation of Young faculty chairs. Young faculty chairs (posts) should be created in academic institutions. These young faculties become the bridge between academia and industry and identify the areas in which IoT skills need to be created after regular consultation with industry. These young faculties can also take up research in IoT sector. To fund 5 Young faculty chairs in each IIT with an allocated fund of Rs. 4.5 Crores for a period of 5 years.

VIII. Creation of a body including Academia, industry and associations to set up test beds / labs for IoT design, development and testing. This will help academia to share specific knowledge to industry and also the academia will get more conversant with the recent developments in industry relating to IoT.

IX. To draw together and form a panel of experts from academia, govt. and industry for research and projects related to IoT.

Objective	No. of IITs	Young faculty funded per IIT	Per faculty per month (Rs.)	Period (In Years)	Funding %age	Budget (Rs. In Crores)
Young Faculty Chairs	15	5	10,000	5	100	4.5
TOTAL						4.5

G. **G**OVERNANCE **S**TRUCTURE

a. **Advisory Committee.** To set up a High Level Advisory Committee (AC) including representatives from Government, industry and academia for providing ongoing guidance in the emerging area of IoT. Committee should comprise of :

I. Govt.

    a. Organizations dealing with ITU, IEEE, IETF for standards.

    b. Bureau of Indian Standards

    c. Technology organizations

    d. Network organizations.

    e. R&D and academicians.

II. Domain ministry members.

III. Industry experts on:

    a. Devices (IoT), semiconductors and Nano-electronics

    b. Software dealing with device to device communication and integration

    c. Networking

    d. Sensor Technologies

    e. Cloud and application security

b. **Governance Committee**. To set up a High powered Governance Committee (GC) driven by Secretary, DeitY including representatives from Government for governing all IoT initiatives, projects and their progress against planned timelines.

c. **Program Management Unit**. A Program Management Unit (PMU) will be established led by Director (IoT Operations & Smart City support). The role of the PMU would be, but not limited to,

- Provide ongoing support in identification of various initiatives for operationalization of the IoT Policy.

- Provide ongoing implementation support to various initiatives within the IoT policy

- Track the performance of IoT initiatives vis-à-vis planned timelines and highlight issues (if any), suggest corrective actions to the Advisory Committee/ Governance Committee.

- Periodic reviews of the above mentioned policies would be undertaken with respect to changes proposed by the advisory or governing committee.