MPSSDEGB
कौशल से रोजगार, समृद्धि अपार

FITT
Foundation For Innovation And Technology Transfer

SANKALP
Ministry of Skill Development & Entrepreneurship

Course Conclusion

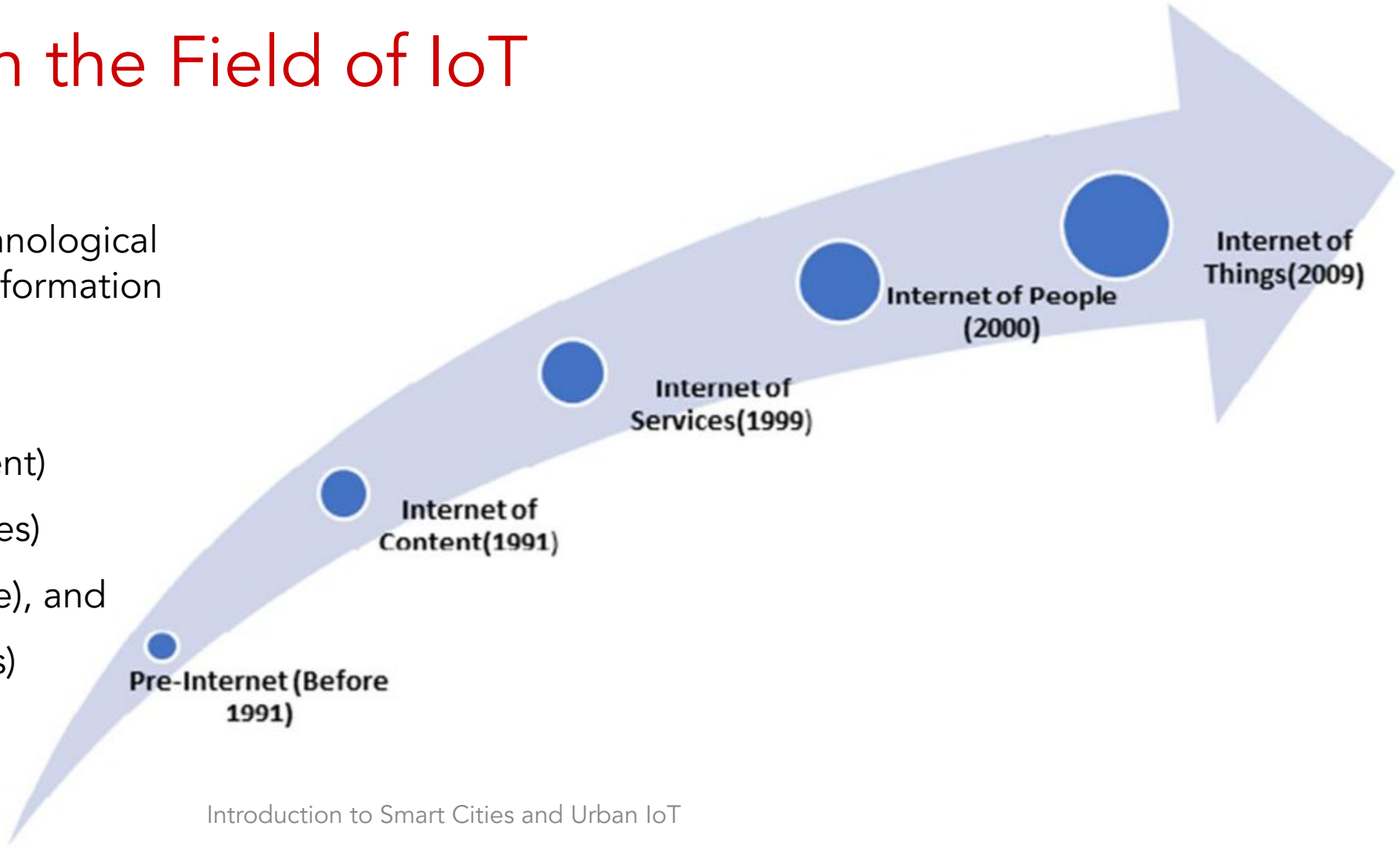
Agenda

- Course Overview
- Emerging Trends in IoT: Paradigms, Challenges and Future
- IoT Applications- Challenges & Future Scope
- IoT skills to boost your career
- Job Roles and Opportunities in India
- Discussion on Report Submission and Evaluation

Progression in the Field of IoT

There are five major technological changes in the field of information technology:

- Pre-Internet,
- IoC (Internet of Content)
- IoS (Internet of Services)
- IoP (Internet of People), and
- IoT (Internet of Things)

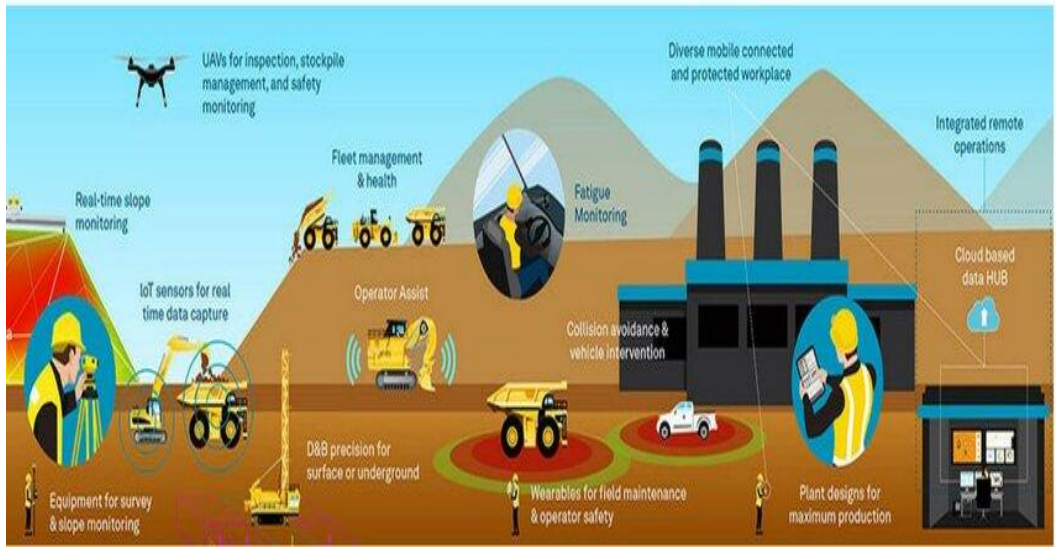


Progression in the Field of IoT

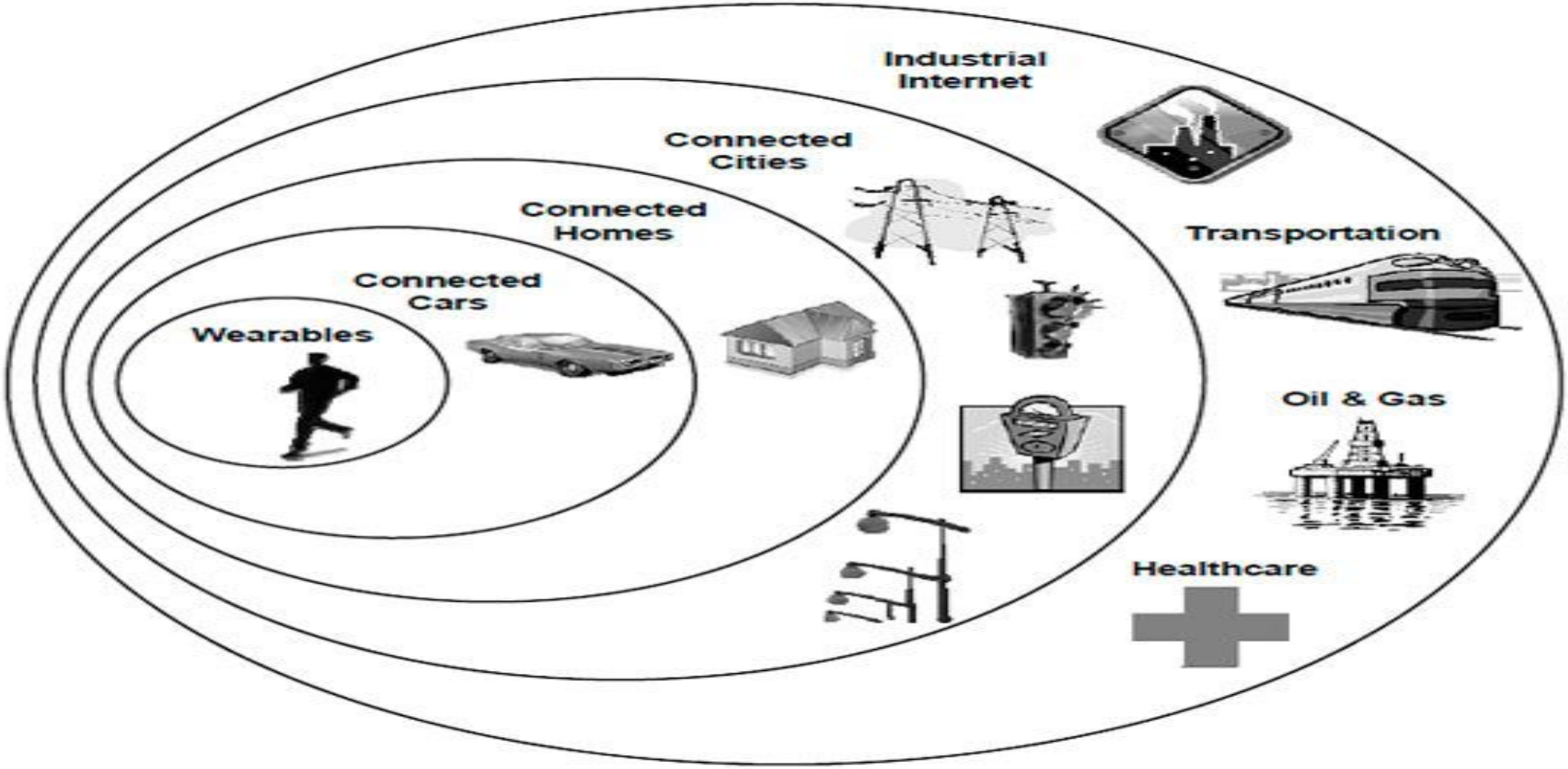
Pre-Internet	IoC (Internet of Content)	IoS (Internet of Services)	IoP (Internet of People)	IoT (Internet of Things)
Human connection using a dedicated line of communication . Paper to paper transfer of information or an audio call. Text messages or voice calls.	the era of the World Wide Web (www) Emails added to the communication stream	offering internet-enabled services to the users enabled two-way communication between the user and web service providers e-productivity and e-commerce	the term social media came into the picture developing applications of public interest rather caused by the growth in the phone industry	IoT is a combination of smart devices that are interconnected to each other via the Internet Gathered data is further transferred to cloud platforms. IoT is based on machine-to-machine interconnection and processing concepts

Emerging Trends in IoT: Paradigms, Challenges and Future

Various Applications of IoT



Industrial Internet



Source: Goldman Sachs Global Investment Research.

A number of significant technology changes have come together to enable the rise of the IoT. These include the following.

- ***Cheap sensors*** – Sensor prices have dropped to an average 60 cents from $1.30 in the past 10 years.
- ***Cheap bandwidth*** – The cost of bandwidth has also declined precipitously, by a factor of nearly 40X over the past 10 years.
- ***Cheap processing*** – Similarly, processing costs have declined by nearly 60X over the past 10 years, enabling more devices to be not just connected.
- ***Smartphones*** – Smartphones are now becoming the personal gateway to the IoT, serving as a remote control or hub for the connected home, connected car, or the health and fitness devices consumers are increasingly starting to wear.
- ***Ubiquitous wireless coverage*** – With Wi-Fi coverage now ubiquitous, wireless connectivity is available for free or at a very low cost, given Wi-Fi utilizes unlicensed spectrum and thus does not require monthly access fees to a carrier.

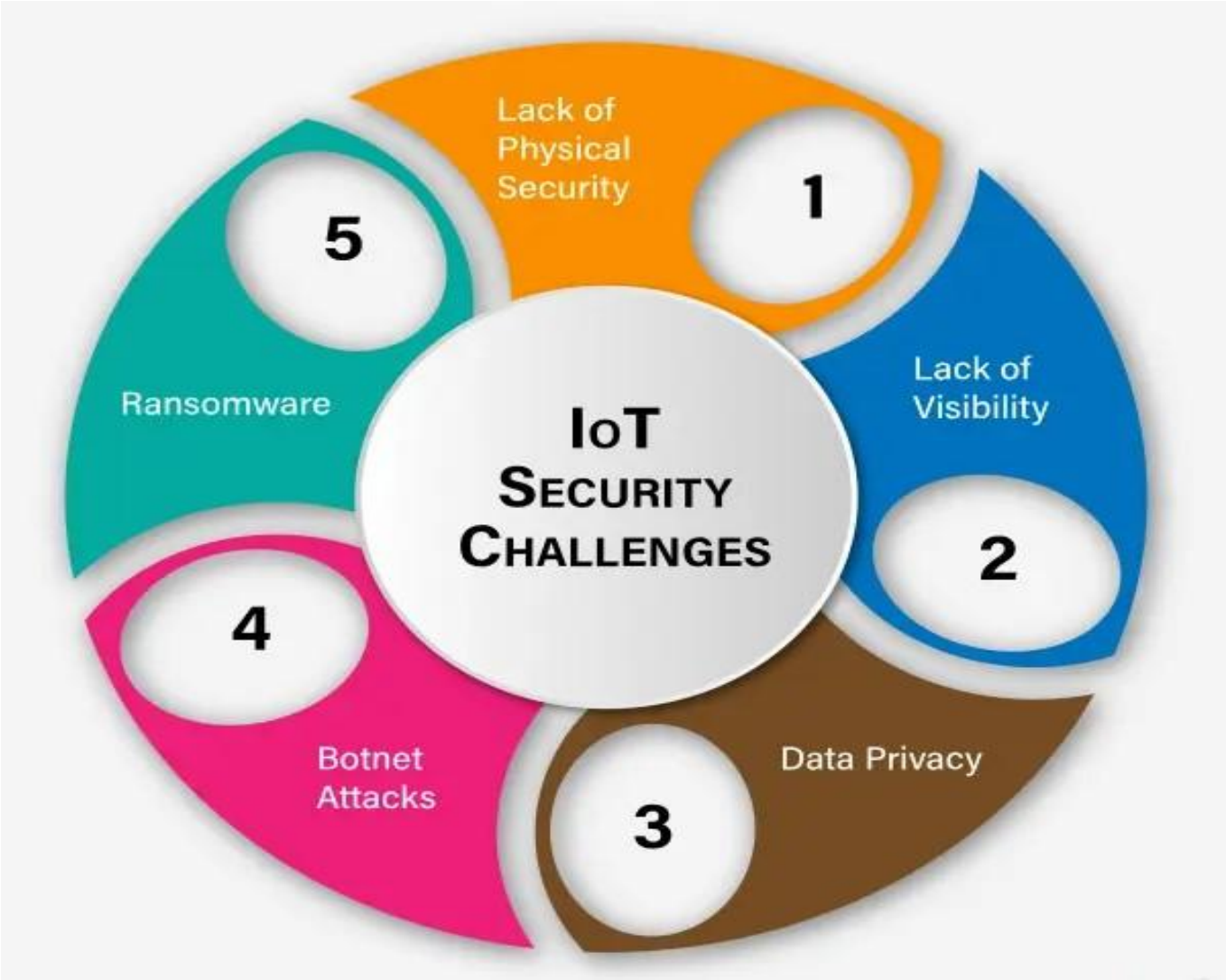
Challenges for IoT

- Security: Conventional methods of security do not provide the needed solutions encountered in the fast-paced development in the IoT.
- Computational Capacity: Most IoT devices have low end CPUs with low speed processors.
- Memory Limitations: Just like the processor speeds, these devices do not have enough memory space.
- Energy Limitations: IoT devices require constant source of power.
- Scalability: Solutions developed are not up to date for connecting exponentially increased devices to the network.
- Communication Media: Wireless network does not provide with protocols for connecting large number of devices being added to the network.

Challenges for IoT

- Multiplicity of devices and protocols standards: It is a challenge to create a protocol standard which can deal with the plethora of devices and networks.
- Environmental Challenges: As more and more devices are added it is creating problem of electronic waste.
- Localization Problem: Localizing vehicles becomes challenging as it is dependent on accuracy of GPS.
- Radio Propagation Modelling: Signal strength can get deteriorate in highly populated infrastructure.
- Interference and Attenuation: Electromagnetic signals are highly affected by interference.
- Multiple Data Sources: Difficulty in extrapolation of usable information from variety of data available.

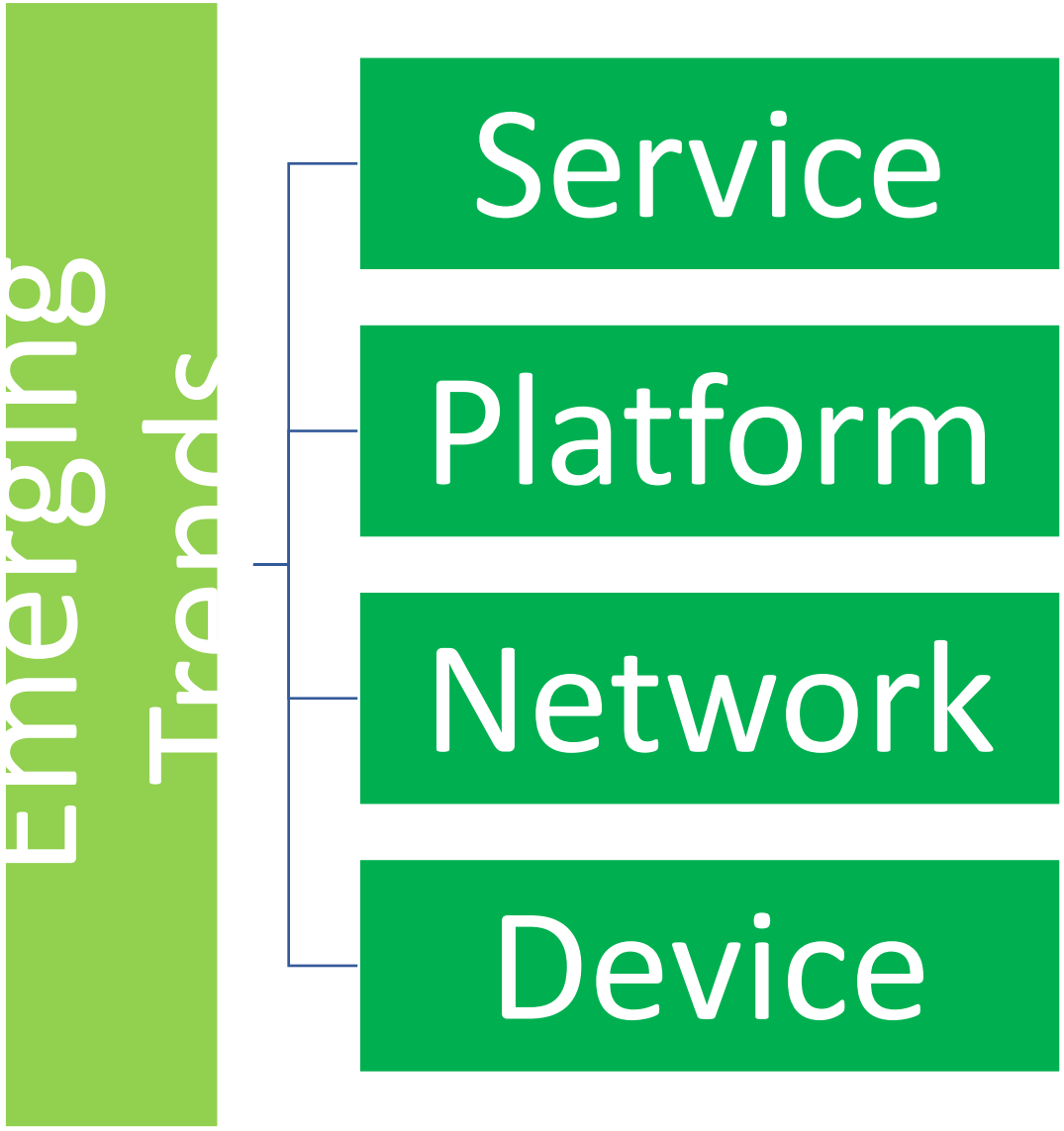
Challenges for IoT



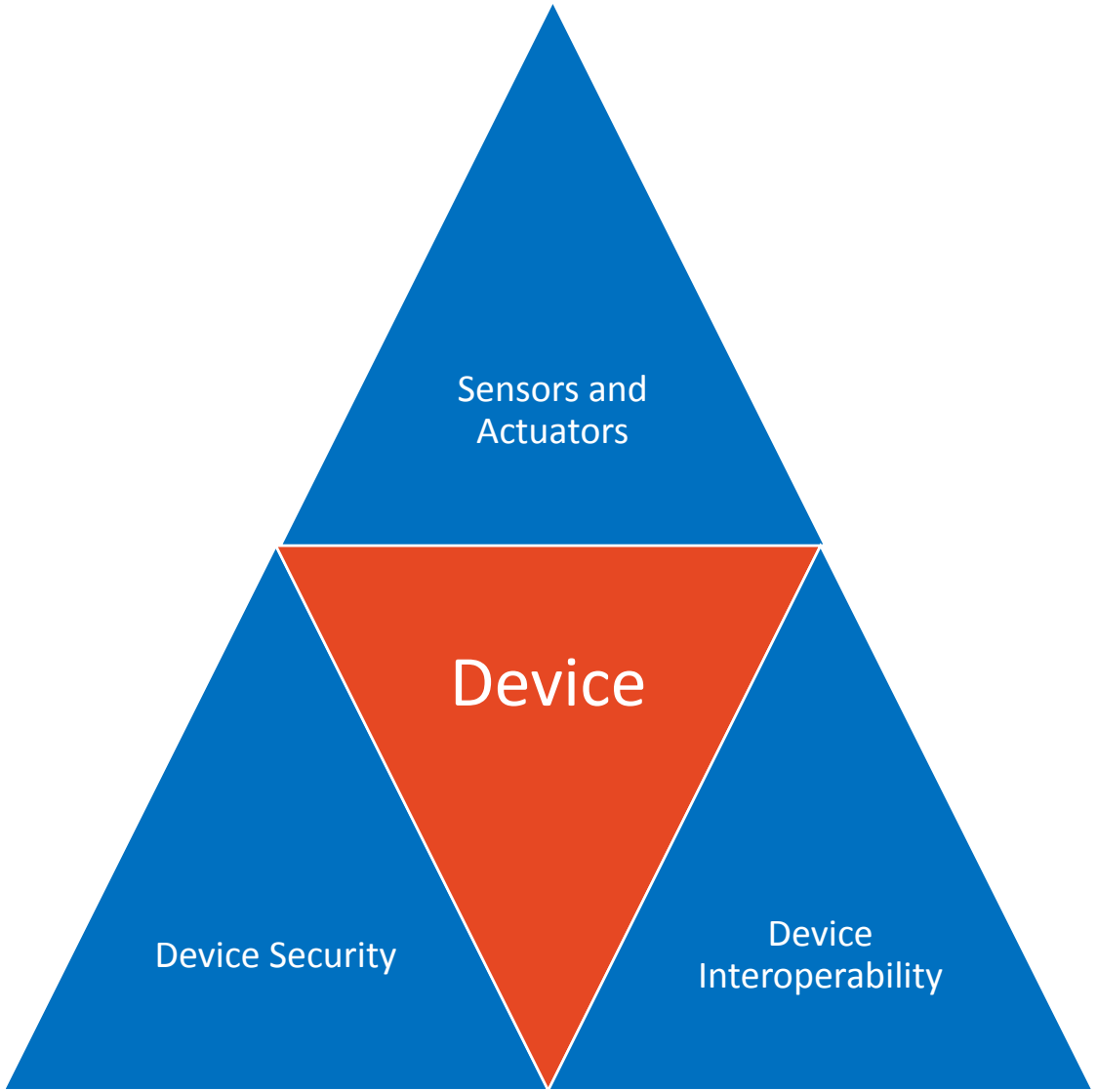
Future Trends in IoT

- Significant expansion in the scope of IoT.
- Impact on various business models and creation of new jobs.
- Data from connected devices and sensors being delivered in a timely manner.
- The emerging technologies defines new ways of access to information, emphasis given on data protection and privacy controls.
- Presenting high autonomy to devices making human life smarter, more comfortable.

Future Trends in IoT



Future Trends in IoT



Future Trends in Device Level

- Device level advances classified into further 3 categories
  1. Sensors and Actuators
  2. Device Security
  3. Device Interoperability
- Sensors and Actuators:
  1. Introduction of MEMS devices which are low power, low cost enable new hardware implementation.
  2. Examples are graphene FET sensors for gas sensing, smart dust for yield prediction as it comprises of micro-controller.
- Device Security:
  1. Future technology for device security which is highly recommended is block chain technology.
  2. Development of light-weight device security architectures to address low power IoT devices.
- Device Interoperability:
  1. Light weight Machine to Machine from Open Mobile Alliance device management protocols are gaining importance.
  2. However interoperability is difficult to achieve.

Future Trends in Network Level

- Network Scalability is the topmost priority of future IoT systems.
- Virtualization:
  1. It is a mechanism where software, hardware and network are abstracted into configured software called as virtual network
  2. The technology is adopted by cloud providers to reduce hardware costs
- Software Defined Network (SDN):
  1. Based on the concept of separating hardware and controllers that instruct the router switches about packet forwarding.
  2. There are 3 components of SDN:
     a. Infrastructure layer: Consists of hardware containing predefined set of commands.
     b. Control layer: Capable of acting upon instructions received from application layer.
     c. Application layer: Used to interact with the hardware and monitor them.
- Network Functions Virtualization (NFV)
  1. Separate various functions integrated with hardware thus giving more more flexibility in terms of scalability, cost reduction, energy savings.
  2. Any infrastructure can be enabled with networking components such as storage, network and computing.
  3. Examples of functions that are virtualized are called as virtualized network functions.
  4. These include firewalls, switching functions, intrusion detectors.

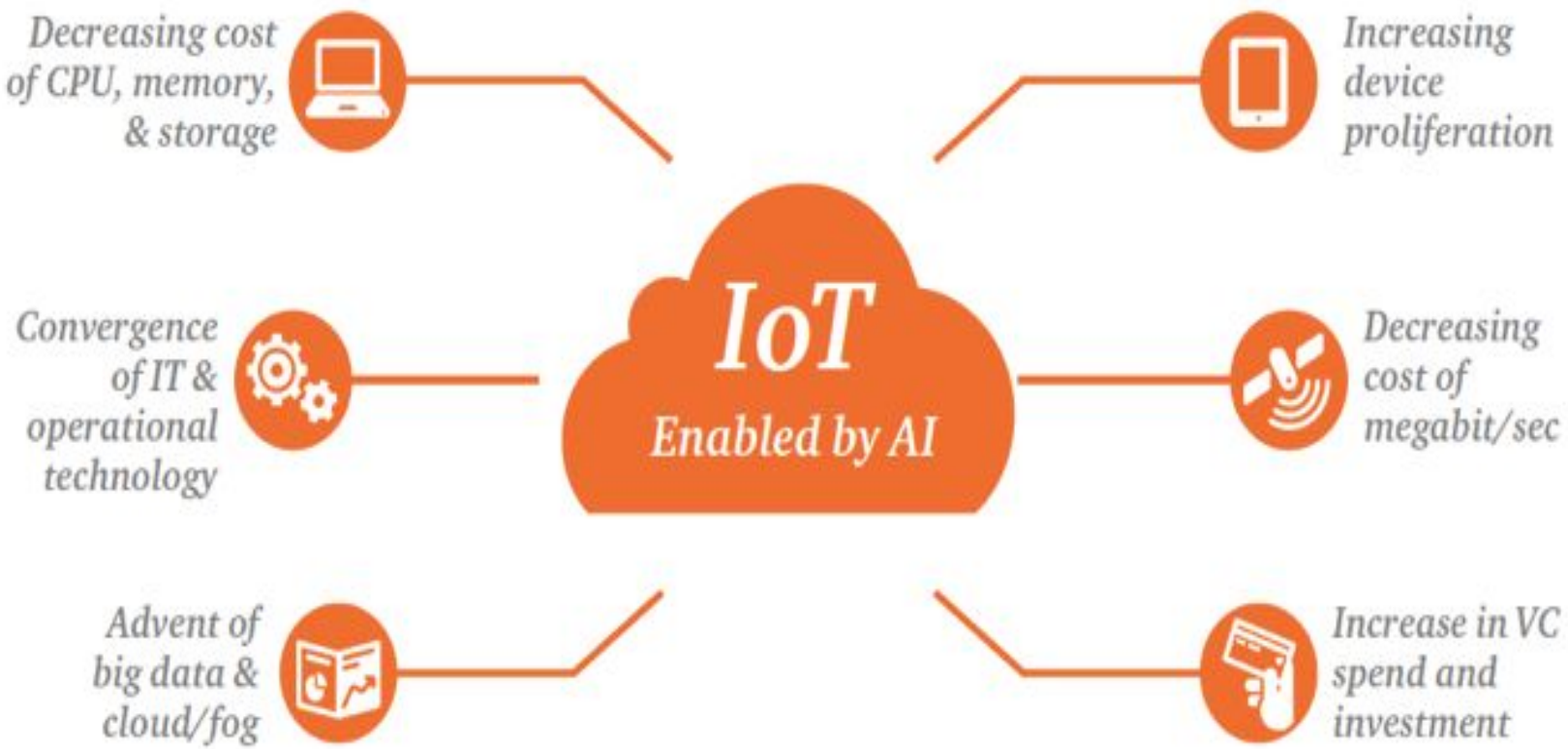
Future Trends in Platform Level

- IoT platform provides various management functions related to device, network connections and data.
- Enabling the user to focus on domain specific task.
- IoT platforms can make major contribution in terms of revenue generation.
- The platform will be core pillars of Industry 4.0
- Deep integration of AI and machine learning into cloud based IoT platforms can enable powerful analytics for business in real time.

Future Trends in Service Level

- Service are offered at edge and cloud level.
- IoT services at the edge are becoming increasingly sophisticated and processing huge of amount of data and providing intelligence at massive scale.
- Integration of services at edge and cloud level is known as orchestration.
- To avoid of complexity of data orchestration is required.
- The future IoT services are predicted to high level of orchestration capabilities.
- Distributed version of orchestration is known as choreography.
- Accessibility of data and other services are easy in choreography.
- Future IoT models will be hybrid model of orchestration and choreography

Expanded Opportunities For IoT



IoT Applications- Challenges & Future Scope

Challenges for VIoT

Challenges for IoT in vehicular:

1. Intruder intervention and cyber attacks.

2. Availability of large power and also continuous power is required.

3. Alternate source of energy like solar power, battery is required.

4. Complexity in exchanged data: If the information form one vehicle is not understood by other or if there is any error in the information send user may loose interest in using IoT enabled vehicles.

Future Scope for VIoT

- Vulnerable parts monitoring
- Sound pollution detection system
- Advance transport system design
- Energy efficient technology and alternate energy source
- Standby sensing devices
- Trusted data evaluation
- Overseas tracking system

Challenges in HIoT

- Data security and privacy
- Incorporating multiple devices and protocol
- Data overload and analysis
- Cost is relatively high

Future Scope in HIoT

- Blockchain: The inability to delete or change the information in the block makes the technology useful in health sector.

- Tactile Internet: The idea of Internet sensorial connectivity is called tactile Internet (TI). The role of TI in healthcare can be applied at tremor suppression in Parkinson's disease, remote surgeries, interactive medical training.

- Internet of Nano things: With the emergence of the Internet of nano things (IoNT), numerous applications can be recognized by IoNT for healthcare, including nanorobots for delivering drugs to special organs with great accuracy.

Challenges in Implementing Smart Cities

"The integration of various smart devices and systems facilitates IoT for a smart city. The interdependent and interwoven nature of smart cities puts notable legislative, socioeconomic, and technical challenges for integrators, organizations, and designers committed to administrating these novel entities." (Ketu and Mishra, 2022)

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IoT Job Roles and Opportunities in India

IoT Market

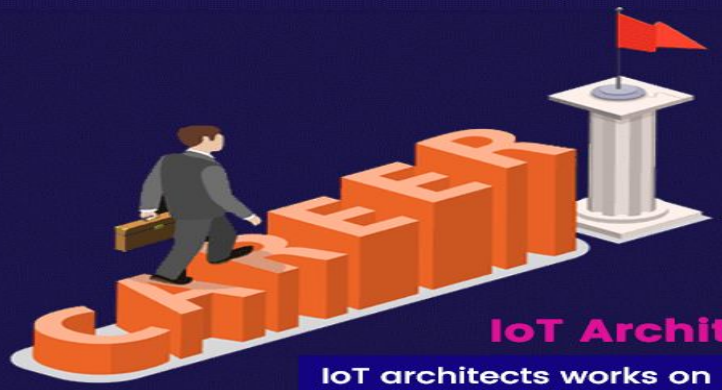
IoT development has huge potential and a well promising market. At the moment there are many companies that are involved in IoT —

- IBM,
- Intel,
- Microsoft,
- Oracle,
- SAP,
- Amazon,
- AT&T,
- Bosch,
- Cisco,
- Huawei etc.

IoT as a Career in India

- Career decisions require knowing the benefits and challenges of Technology. IoT is a technology that comprises electronic devices, users, and the Internet. Eying to the proceeding of India as a digital nation, IoT is receiving an equitable interest of popularity.
- The giant companies favour IoT technology because IoT promotes smarter and faster technological advancement. All thanks to the Internet of Things, companies collect data and analyze it to make better business decisions.

101 Blockchains | CAREER OPPORTUNITIES IN IOT



IoT Embedded System Engineer

IoT embedded system engineer works on Development and implementation of software required for embedded devices and systems in IoT networks.

IoT Architects

IoT architects works on Conversion of critical ideas into functional designs and application logic.

IoT Security Engineer

IoT security engineer works on security of IoT systems and software.

IoT Platform Developer

IoT platform developer works on development, management and monitoring of IoT systems and devices.

IoT Network Engineer

IoT network engineer works on the maintenance of IoT infrastructure.

IoT Data Analyst

IoT data analyst works on obtaining relevant insights from data collected through IoT devices

IoT UI Designer

IoT UI designer works on making an IoT system accessible to general users.

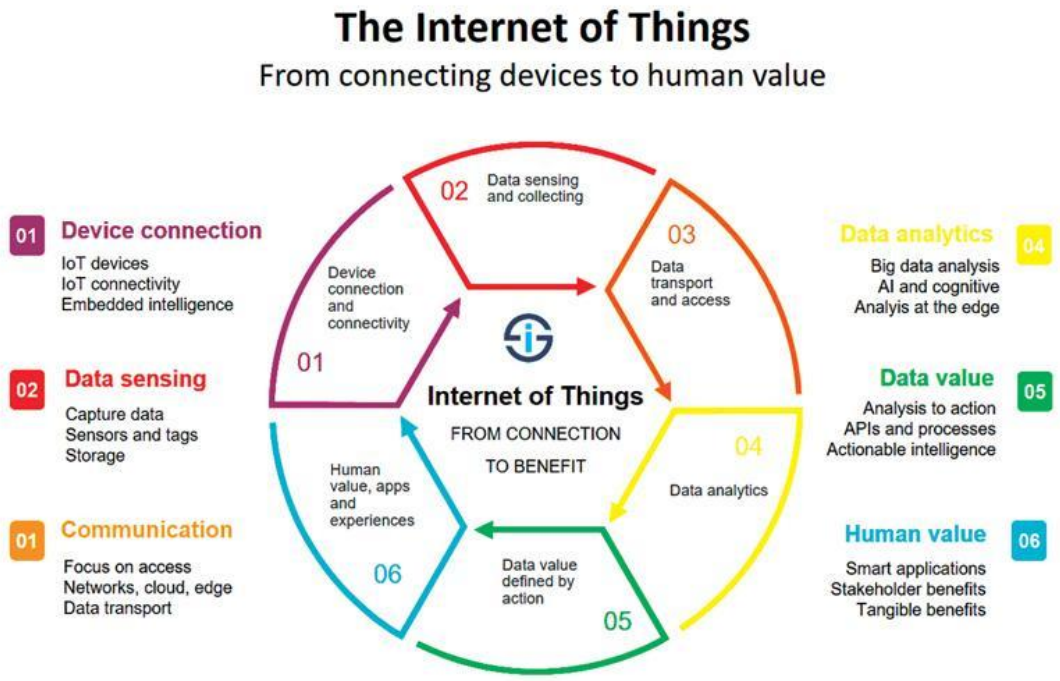
Created by 101blockchains.com

Companies Offering Jobs in IoT

Source: https://www.communicationstoday.co.in/india-readying-to-dominate-the-nb-iot-world/

Top Hard Skills For IoT Engineers

- Embedded System Design and Development.
- Wireless Communication Protocols (e.g., Zigbee, LoRaWAN, 5G).
- IoT Security and Privacy Measures.
- Edge Computing and Data Processing.
- Cloud Computing Platforms (e.g., AWS IoT, Azure IoT).
- Programming Languages (e.g., Python, C/C++, Java).
- Networking and System Integration.
- Sensor Technology and Data Acquisition.
- Machine Learning and AI for IoT.
- IoT Standards and Ecosystem Knowledge.



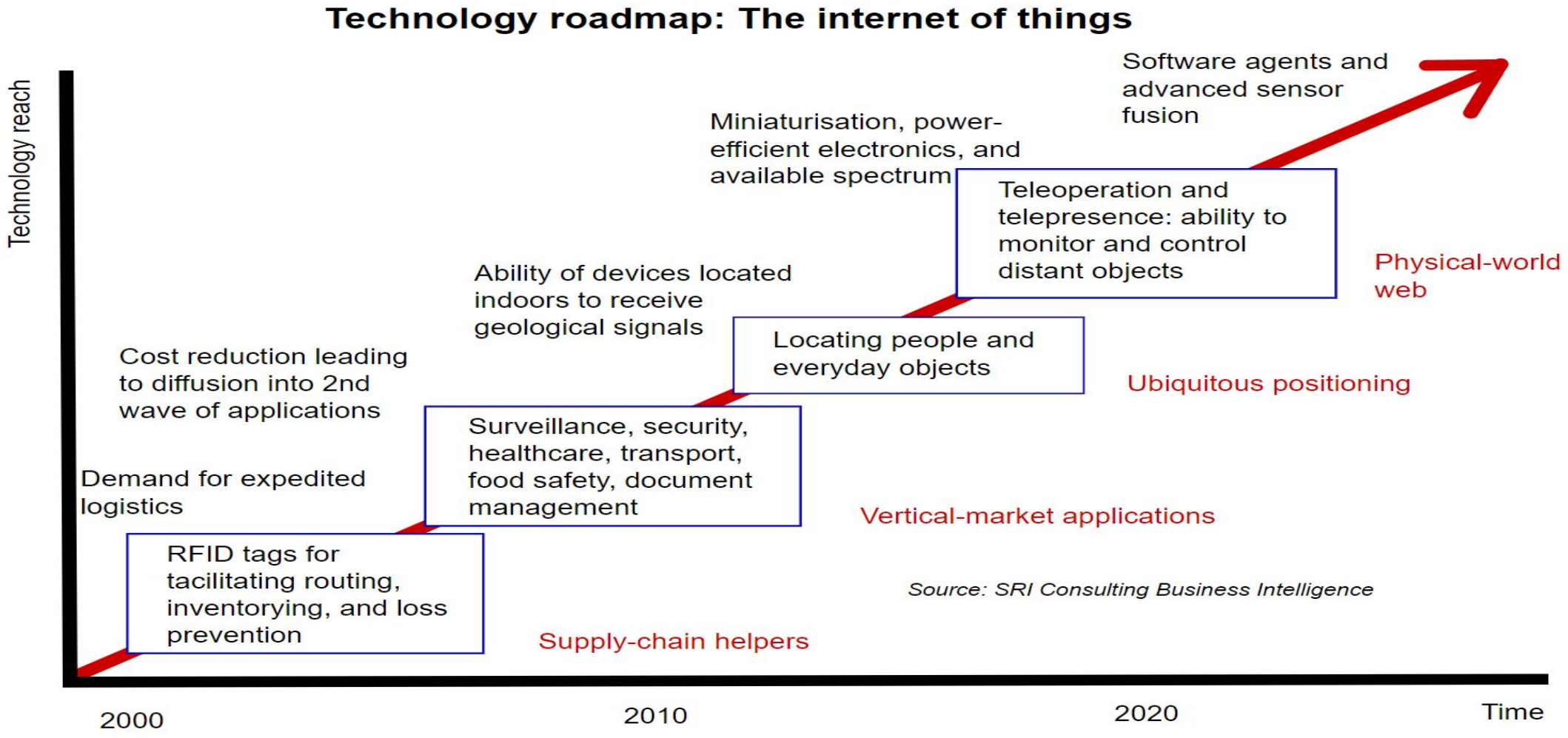
Top Soft Skills For IoT Engineers

- Problem-Solving and Critical Thinking.
- Adaptability and Flexibility.
- Cross-Disciplinary Collaboration.
- Effective Communication.
- Creativity and Innovation.
- Time Management and Prioritization.
- Continuous Learning and Technical Curiosity.
- Teamwork and Interpersonal Skills.
- Customer Centric Mindset.
- Emotional Intelligence and Empathy.

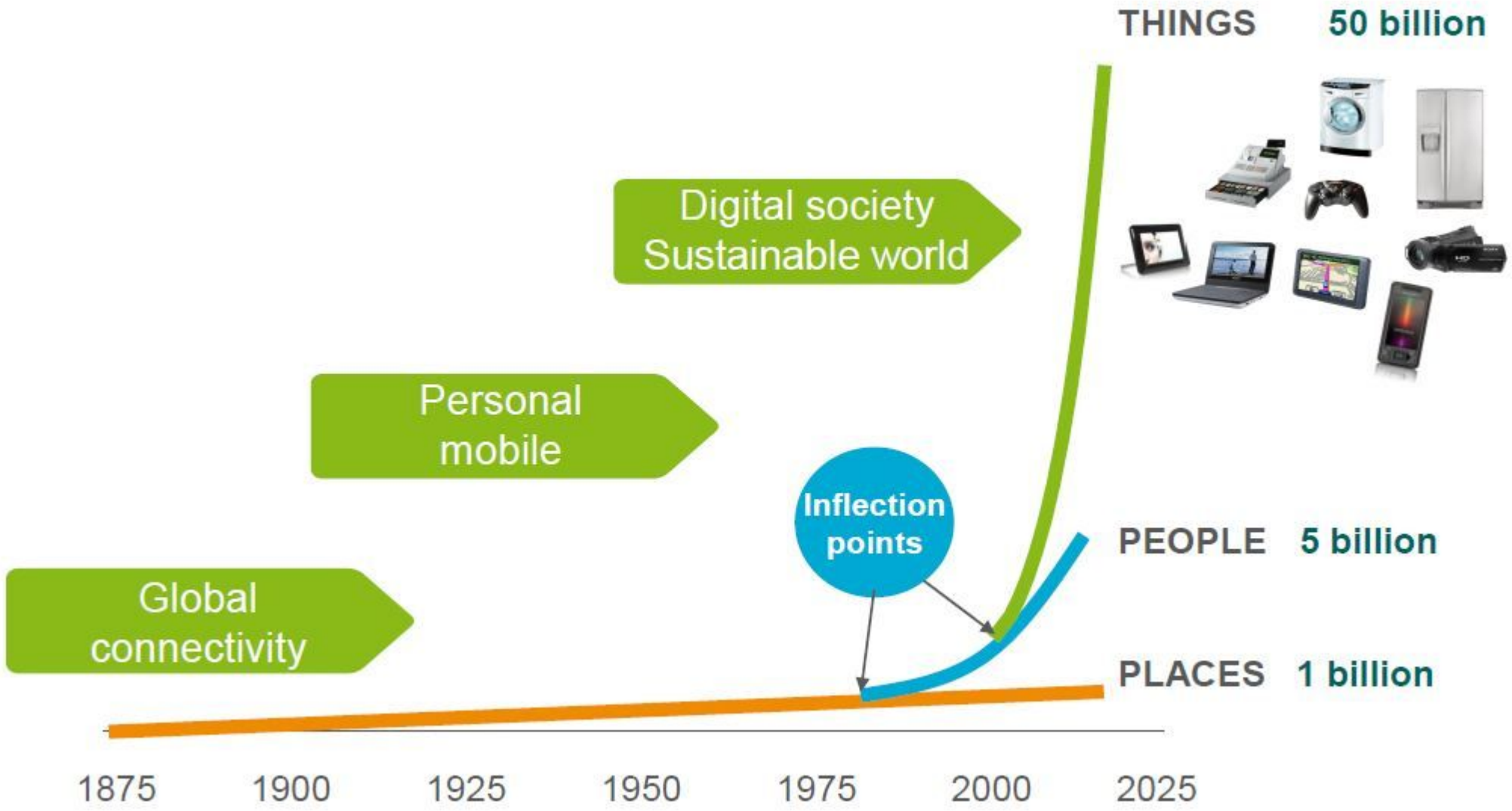
Most Important IoT Engineer Skills in 2024

- Systems Engineering and Integration.
- Security and Privacy Expertise.
- Machine Learning and Analytics.
- Wireless Communication Proficiency.
- Cloud and Edge Computing.
- Programming and Software Development.
- Resourcefulness and Continuous Learning Adaptability

Technology roadmap of IoT



Growth and connection The Internet Of Things



Source :
http://www.kurzweilai.net/images/ericssonthings.jpg

Report Submission Guideline and Evaluation Plan

- Submit report as per format available on LMS by Feb 24, 2024.

Marking Scheme:-

- Assessment 1 - 15%
- Assessment 2 - 20%
- Homework Assignment - 15%
- Capstone Project (PPT + Report)- 50%.

Thank You