UBIQUITOUS PROMISES:
Internet of Things

Human civilization over time devised various ways to communicate and interact with one another through the means of postal/telephonic/Internet based communication. Present world is enjoying all time connected phenomena, riding on the successful implementation of Internet and Internet based technology. On the same pattern, the machine to machine communication is progressing very fast in such a fashion that voluminous information generated can be used in improving the standards of living and taking decisions in real time. This communication and information availability can be used for reduction in product/service cost, effective pricing and enforcing competition which will help the enterprises of tomorrow to offer tailored products of quality which are requirement based.

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The ongoing development of various sensors and actuators is opening new vistas of development. Together with advancements in the field of barcodes and RFID, the advancement in machine to machine communication is making a rapid stride which is riding successfully on the adoption of IPv6 and successful implementation of cloud based architecture. This phenomenon, IoT - Internet of Things, started in 2009 and is taking definite shape along with new promises.

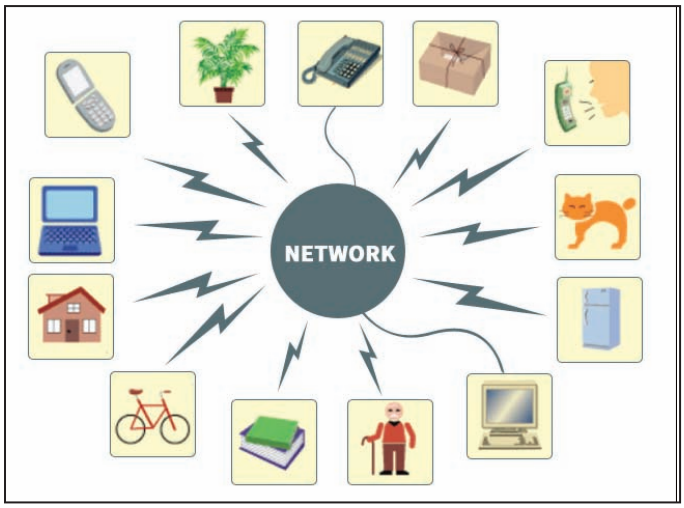
In physics, chemistry and biology, the idea of self-organization is well documented. Applied to the IoT, self-organizing networks have come to mean the temporary formation of a network in order to collect specific information or measure a specific phenomenon. Various companies and technical experts are expecting that by 2020 around 15 to 50 billion devices will be interconnected, which means that each and every individual will be connected to six devices on an average. With so much inter connectivity among various devices doing machine to machine communication, Internet will become central nervous system of our modern world.

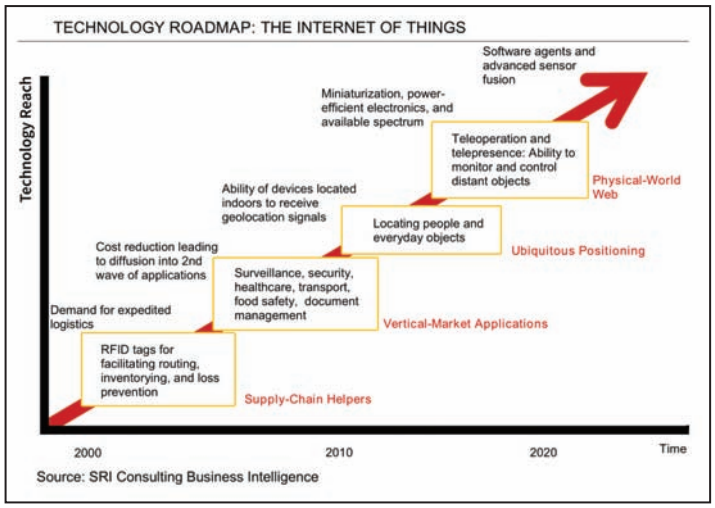
The widespread espousal of the Internet of Things will take time, but the time line is advancing, due to perfection in essential technologies. Advancements in wireless networking technology and the greater standardization of communication protocols have enabled data collection from these sensors almost anywhere, at any time. Ever-smaller silicon chips for this purpose are gaining new capabilities, while costs, following the pattern of Moore's Law, are falling. Huge increases in storage and computing power, some of it available via cloud computing, make number crunching possible at very large scale and at plummeting cost.

Studies, experiments and parallel implementation has been started in various areas successfully and areas like transport, medical, time management, pollution management(carbon emission), oil and natural gas exploration etc. are main areas where this new idea is penetrating largely.

According to Mckinsky, the IoT developments can be categorized in two broad categories viz. (i) Information and Analysis (ii) Automation and Control. Applications related to Information and Analysis, Enhanced Situational awareness, Sensor driven Decision Analytics areas are sub-categorised under category one and under category two will be Process Optimization, Optimized Resource Consumption and Complex Autonomous System. Given below are few instances/areas related to this categorization which are under experiment/use or are in the process of development and further research:

- Researchers are be able to map carbon emissions at street level in real





time in cities around the globe so as to find most offending sources of carbon in order to plug these holes and slow down the pace of climate change.

- The companies would be in better position to deliver goods and services according to the exact needs of the tailored product to a specific consumer segment, that too at lower cost with more features.
- Not only optimization of our planet's scarce resources but also prevention of the depletion of these resources will be possible. This optimization will not only for be natural resources or systems, but also for man-made ones as well.
- The real time information will result in adding value to highly distributed and loosely connected supply chains of today's massive organizations running operations across the globe.
- The GPS trackers could be applied as tags or stickers to everything be it cell phones, wallets, car keys etc. which would let everything to be tracked and found easily when lost. Each person would have their own sphere of objects they could track and find instantly.
- Most people have a hard time keeping track of all the food they have in their house at any given time. If the food industry started adding smart tags to all their packaging, simple apps could be created that monitor freshness, inventory, recommend possible meals, and creates grocery lists for the next time someone goes shopping.
- Experiments in Dairy sector in Norway on cows have led the owners to ascertain the condition of cows in their dairy farms, whether she is ill/pregnant and help the dairy owners to take the remedial measures accordingly.
- Precision farming equipments with wireless links to data collected from remote satellites and ground sensors can take into account crop conditions and adjust the way each individual part of a field is farmed–for instance, by spreading extra fertilizer on areas that need more nutrients.
- Billboards of tomorrow will peer back at passersby, assessing how they fit consumer profiles, and instantly change displayed messages based on those assessments.

Though above presented ideas may seem to open many powerful vistas which IoT will offer but there are challenges and issues which need to be taken into account.

- With numbers of inter-connected heterogeneous devices and communication among these, there will be need of highly sophisticated and well tuned cloud based network, which could handle at times the ebbs and high data. There will be also issues in creating address space for all the connected devices as huge data inflow will cause strain on networking infrastructures.
- The heterogeneity of the entire system further complicates security concerns, as certain devices may require a higher degree of encryption than others.
- Privacy needs to be maintained in human-device interaction and the confidentiality of shared organisational data must be protected. Though the idea of IoT will be appealing to many but there are others who see this as infringement of their privacy.

However, whenever new idea takes place, concerns are obvious to come to fore but at the same time there should be enough confidence in the hard work of scientists/technologists who are engaged in these developments and encourage them to clear all obstacles in the way for the betterment of all.

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