

Future and Challenges of Internet of things

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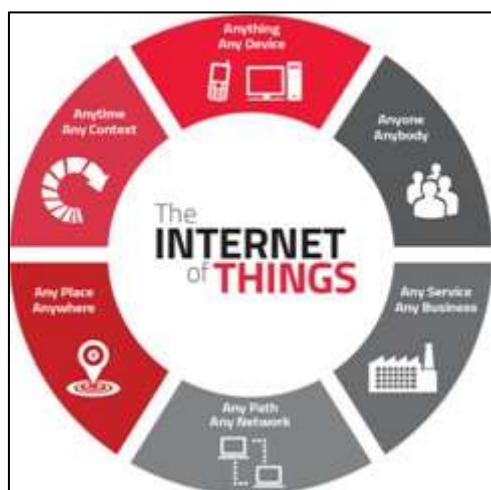
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Abstract— The world is moving at a fast pace, and the credit goes to ever growing technology. One such concept is INTERNET OF THINGS (Internet of things) with which automation is no longer a virtual reality. INTERNET OF THINGS connects various non-living objects through the internet and enables them to share information with their community network to automate processes for humans and makes their lives easier. The paper presents the future challenges of Internet Of Things , such as the technical (connectivity , compatibility and longevity , standards , intelligent analysis and actions , security), business (investment , modest revenue model etc.), societal ,changing demands , new devices, expense, customer confidence and legal challenges (laws, regulations, procedures, policies etc.). A section also discusses the various myths that might hamper the progress of INTERNET OF THINGS, security of data being the most critical factor of all. An optimistic approach to people in adopting the unfolding changes brought by INTERNET OF THINGS will also help in its growth.

Keywords: Internet of Things, Security, Sensor

I. INTRODUCTION

The Internet of Things (Internet Of Things) is a synonym for the fully interconnected world [1]. It joins all the things with technology and makes a whole new separate scopes for them to interact with each other with the help of internet. INTERNET OF THINGS is not just a concept but can prove to be a revolutionary in advancing technology to change the lifestyles of humans altogether [2].



INTERNET OF THINGS is something that will not leave any physical or theoretical concept unaffected. As it demands inter communication between objects, everyone should be able to fetch content from any device at any point in time from everyone located anywhere and who is a part of any businesses or services, through any path or network. Constructively, 'availability' is a

critical factor that affects the performance of INTERNET OF THINGS [3].

Let us assume this scenario of driving to a train. There is a network to which all the things like AC, alarms, cars, coffee maker, maps, fuel, calendar, indicator etc. are connected. Now consider your meetings got delayed and will start 45 minutes. Later in the morning than scheduled, the system will notify that you might want to sleep 45 minutes. Late because of the change. The system also indicates the change in train schedules and fuel levels.



Fig. 2: General Example of Internet of Things

The traffic indications by maps can help avoid you delays and change routes before engaging in accident scenes, to reach on time. While all this is happening, it is communicated to things like alarm which automatically snoozes for 5 minutes or more, the car melts the ice that gathered overnight, and the coffee maker makes coffee after starting up. [4].

According to a survey done in 2014 – 2015 [5], there was a grand movement in the understanding and prioritization of INTERNET OF THINGS among people in just one year. When asked about their interest in INTERNET OF THINGS and their engagement with it, some awareness parameters seemed to have almost doubled their percentage values from the last year.

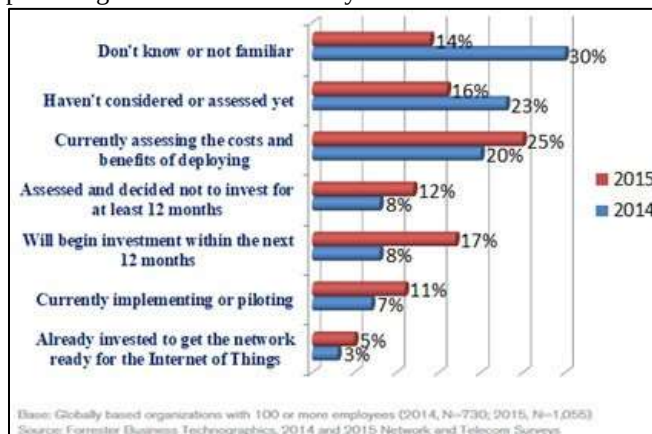


Fig. 3. Survey of understanding and prioritisation of IOT Technology

II. GROWTH OF INTERNET OF THINGS OVER LAST FEW YEARS

The graph below depicts the growth of Internet Of Things over the years. In 1992, only 1,00,000 people were using INTERNET OF THINGS as a technology. Till 2003, the number grew to half a billion people. While 2009 marked the INTERNET OF THINGS inception, 2012 witnessed a sudden increase in the usage of INTERNET OF THINGS where the people using INTERNET OF THINGS reached 8.7 billion, and there was no looking back. The number of users has grown exponentially over the years reaching 32 billion in 2018. It is expected that the number will broaden to 50.1 billion by 2020. [6]

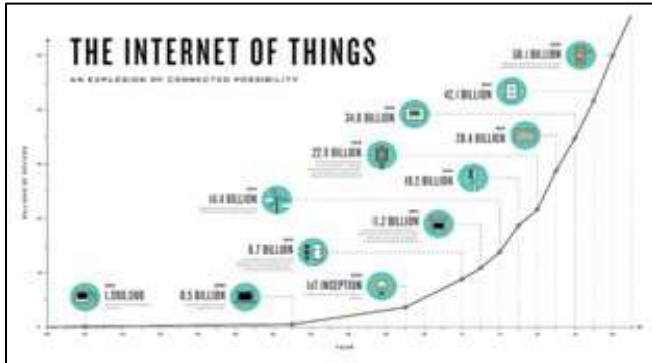


Fig. 4: Survey of Growth of Internet of Things over past years

III. FUTURE OF INTERNET OF THINGS

The business risk and uncertainty is always present in any new technology. In case of Internet Of Things, it is observed that many of the dangers are physically not present somewhat they are distorted or misstated. While it will take time to develop the Internet Of Things vision fully, the building blocks to start the process are ready to be used.

The major requirements are hardware and software assets that are either available in a small quantity or some are under in development; it is also a fact that, the security and confidentiality concerns of Internet Of Things devices are not properly addressed over past decade. It is a whole and sole responsibility of stakeholders to collaborate and carry out the open standards to make Internet Of Things reliable, secure and interoperable. Therefore, allowing secured services to be delivered seamlessly.

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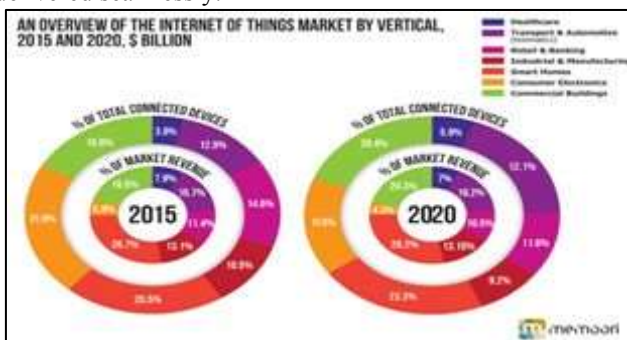


Fig. 5: Future of IoT in the year 2015 and 2020

Over the next few years IOT is expected to make over \$21 trillion [8]. However, the problem associated with this : these 'things' have myths surrounding them, some of which are impacting how organizations develop the apps to support them.

An overview of the Internet Of Things Market in 2015 and 2020 is shown. The comparison of the percentage of total connected devices and the percent of market revenue of several verticals like Healthcare, Transport & Automotive, Retail & Banking, and Industrial & Manufacturing.

However, there are some myths [10] that hover around the certain future of INTERNET OF THINGS. Let us talk about each of them one by one.

IV. CHALLENGES OF INTERNET OF THINGS

Behind every story there is hidden chain of problems that needed to be solved. Same is the case of INTERNET OF THINGS. According to banafa A. et. al. It experiences three major challenges [15]:

- Technological challenges
- Business challenges
- Societal problems

V. TECHNOLOGY

Internet Of Things components are implemented using divergent protocols and technologies. As a result, these components have intricate configurations and poor design. Technological challenges can be a reflection of five parameters [15].

- Security: Internet Of Things has happened to cause major security issues that have grabbed the attention of various public and private sector companies of the world. Adding massive number of new hubs to the systems and the web will provide attackers with a larger platform to invade the systems, particularly as many experience the ill effects of security holes. Indications suggested that the malware captured infinite number of Internet Of Things gadgets that are being used in basic applications like smart-home devices and closed-circuit cameras and deployed them against their own servers. A further critical move in security will develop from the way Internet Of Things turns out to be involved in our lives Cameras connected to the internet contributes 30% to security concerns. Others are being 15% on doors, 12% on car cameras, 11% on TVs, 7% due to iron, 7% on heating systems, 8% on smoke systems, 5% and 5% on oven and lightning each.

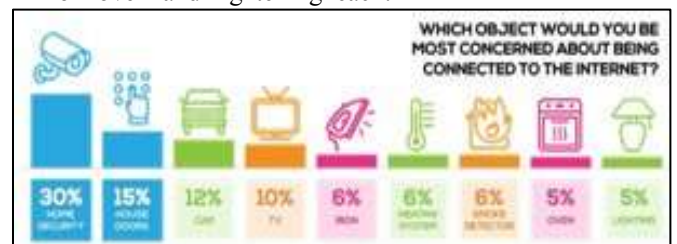


Fig. 6: Concerns of IoT

- 1) Connectivity: The most significant challenges of the future of Internet Of Things would be to connect several devices, this communication will end up resisting the currently existing structure and the technologies associated with it.
- 2) Compatibility and Longevity: Unavailability of standardized M2M protocols, Non-unified cloud services, and varieties in firmware and operating systems among Internet Of Things devices are some of the other compatibility issues.
- 3) Intelligent Analysis & Actions: The final step in the implementation of Internet Of Things is the revelation about the data for analysis. There are certain parameters that cause intelligent actions to be incorporated in INTERNET OF THINGS, some of them being lesser device cost, enhanced device functionality, the machine "influencing" human actions deep learning tools, machine actions in unusual scenarios, information security and device interoperability and privacy [18].

VI. CONCLUSION

The paper goes through the various aspects of what future of INTERNET OF THINGS looks like. While using data collected from sensors wisely, dependency of INTERNET OF THINGS on mobile networks, significance of the data generated from different devices, importance of networks alongside data centers, need of a secured infrastructure with remote controls, evolution of interoperability, heterogeneity and openness are some of the issues that need to be addressed, security and privacy of data will play a major role in how the picture of Internet Of Things will look like in the coming decades. Every aspect including technology, business, society and law resist the success rate of INTERNET OF THINGS. Acceptance of technology by people is also essential as people who are not fond of using gadgets, smart devices and do not feel comfortable dealing with technology will have a difficult time working with the complexity functionality INTERNET OF THINGS will engage them with. It's high time to deal with the factors that might significantly bring down the mighty future of INTERNET OF THINGS.

REFERENCES

- [1] Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (Internet Of Things): A vision, architectural elements, and future directions. *Future generation computer systems*, 29(7), 1645-1660.
- [2] Li, S., Da Xu, L., & Zhao, S. (2015). The internet of things: a survey. *Information Systems Frontiers*, 17(2), 243-259.
- [3] Guo, B., Zhang, D., Wang, Z., Yu, Z., & Zhou, X. (2013). Opportunistic Internet Of Things: Exploring the harmonious interaction between human and the internet of things. *Journal of Network and Computer Applications*, 36(6), 1531-1539.
- [4] Banafa, A. (2014). Internet Of Things Standardization and Implementation Challenges. *IEEE. org Newsletter*.
- [5] Banafa, A. (2015). „What is next for Internet Of Things and IInternet Of Things”. *Enterprise Mobility Summit*.
- [6] Coetzee, L., & Eksteen, J. (2011, May). The Internet of Things-promise for the future? An introduction. In *IST-Africa Conference Proceedings*, 2011 (pp. 1-9). *IEEE*.
- [7] Cai, H., Da Xu, L., Xu, B., Xie, C., Qin, S., & Jiang, L. (2014). Internet Of Things-based configurable information service platform for product lifecycle management. *IEEE Transactions on Industrial Informatics*, 10(2), 1558-1567.
- [8] Khan, R., Khan, S. U., Zaheer, R., & Khan, S. (2012, December). Future internet: the internet of things architecture, possible applications and key challenges. In *Frontiers of Information Technology (FIT), 2012 10th International Conference on* (pp. 257-260). *IEEE*.
- [9] Liu, Y., & Zhou, G. (2012, January). Key technologies and applications of internet of things. In *Intelligent Computation Technology and Automation (ICICTA), 2012 Fifth International Conference on* (pp. 197-200). *IEEE*.
- [10] Sadeghi, A. R., Wachsmann, C., & Waidner, M. (2015, June). Security and privacy challenges in industrial internet of things. In *Proceedings of the 52nd annual design automation conference* (p. 54). *ACM*.
- [11] Banafa, A. (2014). Internet Of Things and Blockchain Convergence: Benefits and Challenges. *IEEE Internet of Things*.
- [12] Marjani, M., Nasaruddin, F., Gani, A., Karim, A., Hashem, I. A. T., Siddiqua, A., & Yaqoob, I. (2017). Big Internet Of Things data analytics: Architecture, opportunities, and open research challenges. *IEEE Access*, 5, 5247-5261.
- [13] Desai, P., Sheth, A., & Anantharam, P. (2015, June). Semantic gateway as a service architecture for Internet Of Things interoperability. In *Mobile Services (MS), 2015 IEEE International Conference on* (pp. 313-319). *IEEE*.
- [14] Koivu, A., Koivunen, L., Hosseinzadeh, S., Laurén, S., Hyrynsalmi, S., Rauti, S., & Leppänen, V. (2016, December). Software Security Considerations for Internet Of Things. In *Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData), 2016 IEEE International Conference on* (pp. 392-397). *IEEE*.
- [15] Sundmaeker, H., Guillemin, P., Friess, P., & Woelfflé, S. (2010). Vision and challenges for realising the Internet of Things. *Cluster of European Research Projects on the Internet of Things, European Commission*, 3(3), 34-36.
- [16] Vermesan, O., Friess, P., Guillemin, P., Gusmeroli, S., Sundmaeker, H., Bassi, A., ... & Doody, P. (2011). Internet of things strategic research roadmap. *Internet of Things-Global Technological and Societal Trends*, 1(2011), 9-52.
- [17] Sheng, Z., Yang, S., Yu, Y., Vasilakos, A., Mccann, J., & Leung, K. (2013). A survey on the ietf protocol suite for the internet of things: Standards, challenges, and opportunities. *IEEE Wireless Communications*, 20(6), 91-98.

- [18]Theoleyre, F., & Pang, A. C. (Eds.). (2013). Internet of Things and M2M Communications. River Publishers.
- [19]Coetzee, L., & Eksteen, J. (2011, May). The Internet of Things-promise for the future? An introduction. In IST-Africa Conference Proceedings, 2011 (pp. 1-9). IEEE.
- [20]Ji, Z., & Anwen, Q. (2010, November). The application of internet of things (INTERNET OF THINGS) in emergency management system in China. In Technologies for Homeland Security (HST), 2010 IEEE International Conference on (pp. 139-142). IEEE.
- [21]James Kirkland, "Internet of Things: insights from Red Hat", Website: <https://developers.redhat.com/blog/2015/03/31/internet-of-things-insights-from-red-hat/> , Accesed : 2nd February 2018

