IT Infrastructure: Internet of Things (IoT)

Carl Lochstampfor Jr.

Department of Cybersecurity, Old Dominion University,

IT 315 – Introduction to Networking and Security, Professor Shawn D. Altman

September 6, 2025

Instructions

Pick a topic related to IT Infrastructure and describe your topic in detail.

For your topic at a minimum, you should at least answer all of the following:

- The pros and cons?
- Advantages and disadvantages?
- Costs, what it is used for?
- How it is used?
- When it is used?
- Why it is used?
- Which companies and people are using it?
- How does it improve IT infrastructure?
- How has it changed over time?
- Which companies produce it?
- What is the future prospects of it?
- Give a timeline (when it was created all the way up to present day)?
- How does it affect you and your IT habits?
- Sales for your topic?

You should not only answer the above questions, but you should also add more material as well. Remember the more detailed you are the better your grade will be.

IT Infrastructure: Internet of Things (IoT)

What is the Internet of Things (IoT)?

Kim & Solomon (2021, Chapter 2) refer to the Internet of Things (IoT) as an interconnection of physical and virtual objects, sensors, control systems, and information technology (IT) networks, creating a shared platform through the internet that collects, manages, and transfers data. Its chief purpose is to monitor and automate tasks without constant human interaction. IoT devices can range from household appliances and home security systems to industrial machinery, including smart grids and remote asset management devices (Polat, 2019; Fortinet, 2024). IoT is also widely used in manufacturing, healthcare, and logistics industries to improve operations, reduce costs, protect assets and personnel, and improve customer service.

Advantages and Opportunities of IoT

Key advantages of IoT include automation, accessibility, and enhanced effectiveness (Polat, 2019; Kim & Solomon, 2021, Chapter 2).

- **Efficiency and Automation:** IoT devices automate basic tasks, such as a smart thermostat learning a user's schedule to conserve energy, or a smart assistant controlling lights and appliances with voice commands. In business, IoT enhances productivity by monitoring manufacturing processes, tracking real-time inventory, and managing vehicle fleets for companies like Ford and Tesla.
- **Data-driven Insights:** By collecting real-time data from the physical world, organizations can gain valuable insights to predict market changes and strategically adapt, thereby avoiding losses and improving customer experience.
- **Improved IT Infrastructure:** IoT acts as a bridge between the digital network and the physical world. For example, it can make a factory "smart" by using sensors on machines to track performance and predict breakdowns before they happen. In logistics, IoT provides real-time tracking of goods in the supply chain.

Disadvantages and Challenges of IoT

Despite its benefits, IoT has significant drawbacks related to security, compatibility, and dependency (Polat, 2019; Pratt, 2025).

- **Security and Privacy Risks:** The Internet of Things creates a massive "attack vector" for cyber threats, making devices with lax security "easy prey" for hackers. Attackers can utilize tools such as malware or Denial-of-Service (DoS) attacks to compromise IoT endpoints.
- **Lack of Standards:** The IoT market lacks a single, clear security standard, and products from different companies can often be incompatible. That leads to fragmented ecosystems and limited consumer choices.

- **Increased Dependency:** As society becomes more reliant on IoT for daily tasks, a loss of internet connectivity or a device malfunction can be highly disruptive. A smart system failure could affect everything from home security to critical industrial operations.

Companies and People Using IoT

The IoT market is highly fragmented, with many different players (Asia Growth Partners, 2025; Sruthy, 2025). Major technology companies include the following:

- **Amazon (AWS)**, **Microsoft**, and **Google** provide the cloud infrastructure that underpins most IoT ecosystems.
- Hardware manufacturers such as **Intel**, **Qualcomm**, and **ARM** produce processors and chips for the devices themselves. Consumer-facing companies like
- **Amazon (Alexa)**, **Google (Nest)**, and **Samsung (SmartThings)** create smart home products for daily use.
- For enterprise and industrial applications, companies like **Cisco**, **Siemens**, and **IBM** deliver solutions for smart factories, cities, and logistics.

The Evolution and Future of IoT

The idea of connected "things" is not new (Kim & Solomon, 2021, Chapter 2).

- A Coca-Cola vending machine at Carnegie Mellon University in the **1980s** was an early networked device, but it was not internet-connected in the modern sense (IBM 2018).
- The term "Internet of Things" was coined in **1999** by British technologist Kevin Ashton, who envisioned a network where objects would be connected directly to the internet using RFID tags (Ashton, 2009).
- IoT technologies began to take off in the **2000s**, driven by the widespread adoption of Wi-Fi, cloud computing, and smartphones, which led to the number of connected devices surpassing the human population for the first time.
- The **2010s** saw a boom in consumer devices like fitness trackers and smart thermostats, and major tech companies like Amazon and Microsoft launched their own IoT platforms.

Today, the development of IoT is accelerating with the rollout of the **5G network**, which offers high-speed communication with minimal latency between devices. The future of IoT is about making devices smarter, more secure, and more efficient (Polat, 2019; Georgiou, 2023).

- **AI Integration:** AI and IoT are converging to allow devices to not only gather information but also learn from it and take independent action.
- **Enhanced Security:** As the market matures, there will be a greater emphasis on "security by design," meaning security features will be built into devices from the beginning to prevent vulnerabilities.
- **Edge Computing:** This technology enables data to be processed closer to its source, reducing latency and conserving energy.

References

Ashton, K. (2009, June). That 'Internet of Things' thing. RFID Journal. Retrieved on September 5, 2025, from https://www.rfidjournal.com/expert-views/that-internet-of-things-thing/73881/

Asia Growth Partners. (2025, January). 2025 top 100 industrial IoT companies. Retrieved September 5, 2025, from https://asiagrowthpartners.com/iotone100

Fortinet. (2024, August). ICS/SCADA security: A comprehensive guide. CyberGlossary. Retrieved September 2, 2025, from https://www.fortinet.com/resources/cyberglossary/ics-scada

Georgiou, Michael. (2023, February). IoT development trends & predictions. Imaginovation Blog. Retrieved on September 5, 2025, from https://imaginovation.net/blog/iot-development-trends-predictions/

IBM. (2018, February). The first Internet of Things device: The story of the Coca-Cola machine. IBM Think. Retrieved on September 5, 2025, from https://www.ibm.com/think/topics/iot-first-device

Kim, D., & Solomon, M. G. (2021). Fundamentals of information systems security (4th ed.). Jones & Bartlett Learning.

Polat, G. (2019, January). Security issues in IoT: Challenges and countermeasures. ISACA Journal, 1. https://www.isaca.org/resources/isaca-journal/issues/2019/volume-1/security-issues-in-iot-challenges-and-countermeasures

Pratt, M. K. (2025, July). Top 15 IoT security threats and risks to prioritize. IoT Agenda. https://www.techtarget.com/iotagenda/tip/5-IoT-security-threats-to-prioritize

Sruthy. (2025, April). The top 11 Internet of Things (IoT) companies to watch in 2025. Software Testing Help. https://www.softwaretestinghelp.com/top-iot-companies/