

Chapter 2: Internet of Things (IoT) & Edge Computing

1. Setting the Stage

Activity 1: Comprehensive Terminology Matrix

Match each term in Column A with the correct definition in Column B.



Column A - Term	Column B - Definition
1. Edge Computing	A. A lightweight publish/subscribe messaging protocol designed for low-bandwidth and unreliable networks.
2. Internet of Things (IoT)	B. The ability of a system to handle increasing workloads by adding resources without degrading performance.
3. Latency	C. A decentralized computing paradigm in which data is processed near its source rather than in centralized servers.
4. MQTT Message Queuing Telemetry Transport	D. A distributed computing layer that extends cloud capabilities closer to end users and edge devices.
5. Fog Computing	E. The time delay between a data request and the corresponding system response.
6. Data Aggregation	F. The process of collecting and combining data from multiple sources into summarized information.
7. Actuator	G. A network of interconnected physical objects embedded with sensors, software, and communication capabilities.
8. Real-Time Processing	H. The capability of processing data immediately after it is generated, with minimal delay.

Column A - Term	Column B - Definition
9. Distributed Architecture	I. A computing model in which tasks are executed across multiple nodes simultaneously to improve efficiency and resilience.
10. Latency-Sensitive Workload	J. A structured sequence of stages through which data is collected, transmitted, processed, stored, and analyzed.
11. Distributed Processing	K. A system design in which computing components are located on multiple networked machines that coordinate via communication protocols.
12. Data Pipeline	L. task or application that requires immediate response to prevent performance degradation or safety risks.
13. Computational Constraints	M. Limitations in processing power, memory, storage, or energy availability within a system.
14. Scalability	N. A component that converts digital or electrical signals into physical action within a system.



2. Take a Listen



Activity 2: Understanding the Core Components of IoT

Activity to be done on Moodle

Activity 3: IoT Concept Sorting Challenge

After watching the video carefully, sort the terms below into the correct category:

Categories:

- Device / Hardware
- Data & Processing
- System Function / Application

The terms:

- A. Sensor
- B. Actuator

C. Smart Thermostat

D. Connectivity

E. Data Pipeline

F. Cloud Computing

G. Real-Time Data

H. Automation

I. Latency-Sensitive Workload

J. Embedded System

K. Wearable Device

L. Distributed Processing

M. IoT Platform

3. Read & Reflect

The Internet of Things (IoT) is a rapidly evolving ecosystem of interconnected devices that collect, exchange, and analyze data to enable smarter decisions and automation across industries and daily life.

The Internet of Things (IoT) has transformed the way devices, systems, and humans interact, creating a network of physical and digital entities that are capable of c



ommunicating and operating autonomously. At its core, IoT involves **sensors, actuators, software, and connectivity technologies** embedded in everyday objects—ranging from household appliances and wearable devices to industrial machinery and urban infrastructure.

Key Applications

IoT applications are diverse and span multiple sectors. In smart homes, devices such as thermostats, security cameras, and voice assistants provide convenience, energy efficiency, and security. In healthcare, IoT enables remote patient monitoring, wearable medical devices, and real-time health analytics, which improve patient outcomes and reduce costs. The industrial IoT (IIoT) enhances manufacturing and logistics through predictive maintenance, automation, and realtime supply chain management. Cities are also becoming smarter through IoT-enabled traffic management, environmental monitoring, and efficient energy systems.

Technological Components

Modern IoT systems rely on **Internet connectivity, cloud computing, edge computing, artificial intelligence (AI), and data analytics**. Edge computing is particularly important for reducing latency and processing data locally, which is critical for real-time applications such as autonomous vehicles and industrial automation. AI and machine learning are increasingly leveraged to extract actionable insights from the vast data generated by IoT devices, supporting predictive analytics, anomaly detection, and decision-making processes.

Security and Privacy Concerns

With millions of devices connected worldwide, **IoT security and privacy** have become major challenges. Cyberattacks targeting IoT devices, data breaches, and vulnerabilities in communication protocols can have significant consequences in industries such as healthcare and energy. Therefore, ensuring robust encryption, secure authentication, regular software updates, and adherence to industry standards is essential to maintain trust and resilience in IoT ecosystems.

Trends and Future Directions

IoT continues to evolve with the integration of **5G networks**, which allow higher bandwidth and lower latency, enabling more devices to communicate efficiently. The combination of IoT with AI, edge devices, blockchain technology, and digital twins is driving innovation across sectors. Sustainability is also an emerging focus, with IoT supporting energy-efficient operations, smart grids, and environmental monitoring. An

analysts expect pervasive IoT adoption across cities, healthcare, agriculture, and transportation, fundamentally reshaping business models and the way we live.

In summary, the Internet of Things represents a **dynamic convergence of connectivity, computing, and intelligence**, offering substantial benefits in efficiency, automation, and decisionmaking while also posing challenges in security and data privacy. As technology advances, IoT is set to become even more deeply integrated into our personal and professional lives, enabling smarter, more connected environments.

Activity 4: Critical Thinking & Fill-in-the-Blank

1. Read the IoT text carefully.
2. Complete the following sentences with the most appropriate word or phrase from the word bank.
3. Use each word only once.

Word Bank: IoT, sensors, actuators, edge computing, cloud computing, AI, latency, cybersecurity, wearable devices, industrial IoT, 5G network

1. The _____ is a network of interconnected devices that collect, exchange, and analyze data.
2. _____ detect physical changes like temperature or motion in IoT systems.
3. _____ perform physical actions based on processed data signals.
4. _____ processes data locally to reduce delays in real-time applications.
5. _____ stores and analyzes IoT data remotely over the internet.
6. _____ algorithms extract insights from IoT-generated data for predictive decision-making.
7. Minimizing _____ is critical for applications like autonomous vehicles.
8. Ensuring strong _____ sensors is essential to protect devices and sensitive data.
9. _____ monitor personal health and activity in real-time.
10. _____ enhances manufacturing and logistics through automation and predictive maintenance.

Activity 5: Challenging Your Understanding of the Internet of Things

Read each statement carefully and decide whether it is **True (T)** or **False (F)** according to the text.

If you think a statement is **False**, explain what makes it incorrect and correct it using information from the text.

Statements

1. The Internet of Things mainly refers to computers connected to the internet rather than everyday objects.
2. IoT systems typically involve sensors, actuators, software, and connectivity embedded in devices.
3. In healthcare, IoT devices can support remote patient monitoring and real-time health data analysis.
4. Industrial IoT (IIoT) mainly focuses on improving social media communication in manufacturing companies.
5. Smart cities use IoT technologies for traffic management, environmental monitoring, and energy efficiency.
6. Edge computing helps reduce latency by processing data closer to where it is generated.
7. Artificial intelligence is rarely used in IoT systems because IoT devices generate very little data.
8. Cyberattacks on IoT devices may have serious consequences in sectors such as healthcare and energy.
9. The expansion of IoT is expected to slow down because current internet networks cannot support it.
10. The integration of IoT with technologies such as AI, blockchain, and digital twins is driving innovation across industries.

4. Grammar in Action: Advanced Preference Structures



1. Would Rather

Subject + would rather + base verb

Example:

Engineers would rather process data locally than send all data to the cloud.

When the subject changes

When expressing preference about **another person's action**, the verb changes to the **past simple**.

Subject + would rather + subject + past simple

Example:

IoT engineers would rather devices operated with stronger encryption.

Meaning: they prefer that this happens.

2. Would Prefer

Subject + would prefer + to + verb

Example:

Many companies would prefer to implement edge computing to reduce latency.

When referring to another person:

would prefer + object + to + verb

Example:

Manufacturers would prefer technicians to monitor IoT systems remotely.

3. It's Time / It's High Time

This structure expresses that **something should happen now or is overdue**.

It's time + subject + past simple

Examples:

It's time IoT manufacturers improved device security.

It's high time governments regulated IoT data protection.

Although the verb is **past**, the meaning refers to the **present or future**.

4. I'd Sooner / I'd Just as Soon

These are advanced alternatives to **would rather**.

Subject + would sooner + base verb

Example:

*Network engineers would sooner **analyze data at the edge** than send everything to centralized servers.*

Activity 6: Expressing Preferences and Recommendations

Choose the correct form of the verb to complete each sentence.

1. IoT engineers would rather devices _____ stronger authentication protocols.

- a) use
- b) used
- c) using

2. Many hospitals would prefer _____ wearable IoT devices for remote patient monitoring.

- a) use
- b) to use
- c) used

3. It's high time IoT manufacturers _____ security vulnerabilities more seriously.

- a) take
- b) took
- c) taking

4. Many developers would rather _____ data locally instead of sending it to centralized cloud servers.

- a) process
- b) processed
- c) processing

5. Smart city planners would prefer traffic sensors _____ at all major intersections to improve traffic monitoring.

- a) install
- b) to install
- c) to be installed

Activity 7: Sentence Transformation

Rewrite each sentence using the **word(s) in parentheses** so that the meaning stays the same. Do **not change the given word(s)**.

1. Developers prefer processing data locally rather than sending it to the cloud.
(**would rather**)

2. Companies want their IoT devices to operate with stronger encryption.

(would prefer)

3. IoT manufacturers should address security vulnerabilities immediately.

(It's high time)

4. Engineers prefer implementing edge computing instead of relying entirely on centralized cloud systems.

(would sooner)

5. Urban planners want traffic sensors to be installed at major intersections.

(would prefer)

5. Speak & Debate

Activity 8: IoT Decision-Makers

1. Scenario:

"Your company is planning to implement an IoT-based smart home system. You must decide on policies regarding data collection, privacy, and automation levels."

2. Roles:

- **Pro-Innovation:** Advocates for maximum automation and convenience.
- **Pro-Privacy:** Advocates for strict data protection and cautious implementation.
- **Neutral Moderator/Advisor:** Suggests compromise strategies, asks questions.

3. Preparation

Writes 3-5 points supporting their position. You must include at least 2 advanced grammar structures per point:

- *We would rather...*
- *We would prefer...*
- *It's high time...*
- *If IoT devices were fully secure...*
- *Cities/hospitals/companies must...*

4. Debate Flow

- Each participant presents their points.
- Counter-arguments are presented respectfully.



- Students must reformulate at least one opponent's argument using advanced grammar structures to show comprehension and critical thinking.

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6. Write with Might



Write one paragraph (120-150 words) answering the following question:

How can IoT technology improve efficiency or safety in one field (healthcare, smart homes, transportation, or industry)?

Your paragraph should include:

1. A clear topic sentence introducing the main idea.
 2. Two or three supporting details explaining how IoT helps in this field.
 3. An example or real-life application of IoT devices.
 4. A concluding sentence summarizing the benefit of this technology.
- Try to include at least one advanced expression, such as:
- *It's high time...*
 - *Companies would rather...*
 - *Governments would prefer...*
 - *If IoT systems were fully integrated...*