SIT314/SIT729 – Week 2 Group Activity  
Technologies for IoT Applications

short line

# Overview

# Now that we have a reasonable understanding of the options for IoT nodes and communications, we should explore what technologies we would use for specific application scenarios.

# Tasks

Consider the following applications and answer the questions about the most appropriate technologies to use.

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| 1. A smart home lighting system. | |
| What properties does your IoT node need? | Low power, responsive, support for wireless control, local scheduling. |
| What microcontroller would you use? | ESP32 (built-in Wi-Fi & Bluetooth). |
| What communications standard would you use? | Wi-Fi or Zigbee |
| What edge computing infrastructure would you use? | Smart home hub (e.g., Raspberry Pi running Home Assistant). |
| Would you use cloud computing? | Yes – for remote access, data logging, and smart automation. |

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| 1. A forest fire monitoring system. | |
| What properties does your IoT node need? | Long battery life, environmental sensors (temperature, humidity, gas), rugged casing. |
| What microcontroller would you use? | Arduino MKR WAN 1310. |
| What communications standard would you use? | LoRaWAN (long range, low power). |
| What edge computing infrastructure would you use? | Local LoRa gateway aggregating data. |
| Would you use cloud computing? | Yes – to monitor large-scale sensor data and trigger alerts. |

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| 1. A smart air-conditioning system for a large building. | |
| What properties does your IoT node need? | Real-time sensor readings (temperature, humidity, occupancy), reliable operation. |
| What microcontroller would you use? | STM32 or ESP32. |
| What communications standard would you use? | Wi-Fi or Ethernet (stable and fast). |
| What edge computing infrastructure would you use? | Local edge server for immediate processing and decision making. |
| Would you use cloud computing? | for remote control, analytics, and scheduling. |

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| 1. A river monitoring system for the remote Australian outback. | |
| What properties does your IoT node need? | Solar-powered, waterproof, low maintenance, long-range data transmission. |
| What microcontroller would you use? | Arduino MKR NB 1500 (NB-IoT/cellular support). |
| What communications standard would you use? | NB-IoT or satellite. |
| What edge computing infrastructure would you use? | Minimal – focus on low-power data acquisition. |
| Would you use cloud computing? | Yes – to visualize and analyze data over time. |

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| 1. A driver-less taxi system for a smart city. | |
| What properties does your IoT node need? | High processing power, real-time data processing, GPS, cameras, LIDAR. |
| What microcontroller would you use? | NVIDIA Jetson Xavier or Raspberry Pi 4 (as controller interface). |
| What communications standard would you use? | 5G or V2X (Vehicle-to-Everything). |
| What edge computing infrastructure would you use? | In-vehicle edge AI system. |
| Would you use cloud computing? | Yes – for fleet management, updates, and analytics. |

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| 1. A system for automatic robotic maintenance on Mars. | |
| What properties does your IoT node need? | Autonomous operation, extreme temperature resistance, radiation shielding. |
| What microcontroller would you use? | Radiation-hardened ARM processor or RAD750. |
| What communications standard would you use? | Direct-to-Earth relay or Mars orbiter (delayed). |
| What edge computing infrastructure would you use? | Onboard AI/ML for local decision making. |
| Would you use cloud computing? | Yes – once data is synced with Earth-based systems (delayed uplink). |