**5. PUBLIC TRANSPORT OPTIMIZATION**

**What is the Internet of Things?**

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as [a pill](https://www.zdnet.com/article/how-sensors-enabled-eli-lilly-to-improve-the-patient-experience/)to something as big as [an aeroplane](https://www.zdnet.com/article/ten-examples-of-iot-and-big-data-working-well-together/), into a part of the IoT. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being. The Internet of Things is making the fabric of the world around us more smarter and more responsive, merging the digital and physical universes.

**What is an example of an Internet of Things device?**

Pretty much any physical object can be transformed into an IoT device if it can be connected to the internet to be controlled or communicate information.

[A lightbulb](https://www.zdnet.com/article/building-my-own-internet-of-things-ambient-experience-one-step-at-a-time/) that can be switched on using a smartphone app is an IoT device, as is a motion sensor or a [smart thermostat](https://www.zdnet.com/article/johnson-controls-cortana-powered-thermostat-is-up-for-preorder-in-march/) in your office or a connected streetlight. An IoT device could be as fluffy as [a child's toy](https://www.zdnet.com/article/fbi-to-parents-beware-your-kids-smart-toy-could-be-a-security-risk/) or as serious as [a driverless truck](https://www.zdnet.com/article/driverless-trucks-are-coming-but-for-now-adoption-is-in-the-slow-lane/). Some larger objects may themselves be filled with many smaller IoT components, such as a jet engine that's now filled with thousands of sensors collecting and transmitting data back to make sure it is operating efficiently. At an even bigger scale, [smart cities projects are filling entire regions with sensors](https://www.zdnet.com/article/las-vegas-announces-smart-city-plans-with-cisco/) to help us understand and control the environment.

**What are the benefits of the Internet of Things for business?**

The benefits of the IoT for business depend on the particular implementation; agility and efficiency are usually top considerations. The idea is that enterprises should have access to more data about their own products and their own internal systems, and a greater ability to make changes as a result.

Manufacturers are adding sensors to the components of their products so that they can transmit data back about how they are performing. This can help companies spot when a component is likely to fail and to swap it out before it causes damage. Companies can also use the data generated by these sensors to make their systems and their supply chains more efficient, because they will have much more accurate data about what's really going on.

**What about Internet of Things security?**

Security is one the biggest issues with the IoT. These sensors are collecting in many cases extremely sensitive data -- [what you say and do in your own home](https://www.zdnet.com/article/how-to-keep-your-smart-tv-from-spying-on-you/), for example. Keeping that secure is vital to consumer trust, but so far the IoT's security track record has been extremely poor. Too many IoT devices give little thought to the basics of security, like encrypting data in transit and at rest.

Flaws in software -- even old and well-used code -- are discovered on a regular basis, but many IoT devices lack the capability to be patched, which means they are permanently at risk. Hackers are now actively targeting IoT devices such as routers and webcams because their inherent lack of security makes them easy to compromise and [roll up into giant botnets](https://www.zdnet.com/article/satori-malware-code-given-away-for-christmas/).

**DESIGN THINKING**

* **REAL TIME TRANSIT INFORMATION PLATFORM**: When applied to the design of an IoT (Internet of Things) platform for real-time information transmission, it can lead to more user-friendly and effective solutions. Here's how you can apply design thinking principles to the design of such a platform:  
    
  **1. “Empathize (Understand the Users): “**   - Identify the key stakeholders and users of the IoT platform. This may include transportation operators, passengers, maintenance personnel, and other relevant parties.  
     - Conduct user research to understand their needs, pain points, and expectations regarding real-time information transmission.  
     - Create user personas to represent different user groups and their unique requirements.  
    
  **2. “Define (Frame the Problem): “**  
     - Clearly define the problem you are solving with the IoT platform. For example, it could be improving passenger information, optimizing transportation operations, or enhancing safety.  
     - Develop a problem statement that guides the design process, such as "How might we provide real-time information that improves the passenger experience on public transportation?"  
    
  **3. “Ideate (Generate Ideas): “**  
     - Brainstorm potential IoT solutions that address the defined problem. Encourage creativity and diverse perspectives from your design team.  
     - Consider various IoT sensors, data sources, and communication technologies that can be used to transmit real-time information.  
     - Explore different ways to visualize and present information to users, such as mobile apps, digital signage, or in-vehicle displays.  
    
  **4. “Prototype (Create Solutions): “**  
     - Build low-fidelity prototypes of the IoT platform to test and refine ideas quickly.  
     - Experiment with different hardware and software components, including IoT sensors, data processing algorithms, and user interfaces.  
     - Gather feedback from users and stakeholders as you iterate on your prototypes.
* **INTEGRATION APPROACH:**  This method ensures that the integration is user-centered, addresses real problems, and results in effective solutions. Here's how to apply design thinking to the integration of IoT into transportation optimization:

**1. “Test (Gather Feedback): “**  
   - Conduct usability testing and gather feedback on the integration prototypes. Engage with stakeholders to understand how the proposed solutions meet their needs and expectations.  
   - Identify any usability issues, technical challenges, or potential roadblocks that may arise during implementation.  
  
**2.** **“Implement (Develop and Deploy the Integration): “**  
   - Based on feedback and insights from testing, proceed with the development of the IoT integration solutions. This may involve creating custom software, deploying IoT sensors, and setting up data analytics infrastructure.  
   - Ensure that the integration aligns with the goals of transportation optimization and that it can be scaled for broader use.  
  
**3.** **“Iterate (Continuous Improvement): “**  
   - The design thinking process is iterative, so continue to gather feedback and make improvements to the IoT integration as it is deployed and used.  
   - Stay open to evolving user needs, technological advancements, and changes in transportation trends.  
  
**4.** **“Scale and Deploy (Rollout): “**  
   - Once the IoT integration has been refined and tested, scale it for wider deployment across the transportation system.  
   - Provide training and support to transportation staff and operators who will use the integrated solutions.  
  
**5.** **“Monitor and Maintain (Ongoing Operations): “**  
   - Continuously monitor the performance of the IoT integration, collect data, and measure its impact on transportation optimization goals.  
   - Regularly maintain and update the integration to ensure it remains effective and aligned with changing needs.