# Introduction

Remember childhood and wondering about the kitchen stove's magic? It seemed that a simple turned knob, an inexorable wait and a flipped pan could poof! runny batter into a hot pancake on our plates. The lucky among us discovered through observation the power of the stovetop's heat. Unfortunately for the rest of us, we took matters into our own hands, literally, and came away burned. Although we used different means, all of us gathered information and drew the conclusion, "Don't touch!"

We call that information **data** and it is all around us, driving our decisions and determining a venture's success. In technology, data also refers to quantities, characters or symbols stored and/or transmitted as electrical signals. They travel in bits between inputs (I) and outputs (O). These signals can be recorded, translated and interpreted.

Data falls into three categories of **Data at Rest**, **Data in Motion** and **Data in Use**. Improved hardware make collection and storage easier and more accurate. Cutting edge software, like innovated sensors and the **cloud**, improve analysis and data harnessing in real time.

# Data States

### Data at Rest

Data at rest is stored information, like knowledge. It provides the ability to predict an outcome, based on analysis such as trends and counting. The most progression in its use has come from storage expansion and processing speed.

Traditional storage methods include hard drives, USB sticks and servers. Personal forms in this stage include photos and documents. Industrial data at rest might be a log of users by location. Data often remains in this state for academics whose studies take place over years.

Owners primarily care that their stored data is safe, relying on several layers of encryption, firewalls and other privacy measures. However, every storage facility has drawbacks, ranging from hacking vulnerabilities to inconvenient access. Secure and uncorrupted information is essential for later use. Industry experts recognize this issue's importance and offer solutions and reassurance to users.

### Data in Motion

Data in motion are facts in real time, continuously describing the situation. Every output has an immediately available significance. Data here can prompt an action or go straight to storage.

Examples of this data include pressure gauges, temperature readings, speed measurements, air quality grades, and other environmental or non-constant factors.  These variables pertain to facilities management, military and scientific research, among other vertical markets.

Primary concerns about this data are security, environment, latency and consistency. Due to moving data's exposure, having a closed or nearly closed system is essential when handling sensitive material. Furthermore, using rugged hardware appropriate for the environment will be key to consistent, accurate gathering. Finally, an operation depends on a low latency factor, the delay between event, measurement and transmission. Data collected long after occurrence increases the likelihood of damage or irrelevancy.

# Data States

**Data in Use**

This is the stage of processing and interpretation of information. Operators know what the data is, what it means and what changes to prescribe.

Forms of this state include future adjustments, research reports that reference patterns in a database and photos being reviewed in a slide. These are the facts prompting new data creation.

Authentication and processing pose the biggest obstacles to appropriately optimizing data in use. Authentication begins with verifying the source and ends with every endpoint secured. Minimized vulnerability comes with minimized access.

# Tools

In all technology cases, hardware and software can be used individually or together to improve operations. The same holds true for data in all its states, but especially data in motion. Sensors and cloud technology offer the biggest gains in efficiency to industry.

Sensors have existed since the middle of the 20th century, progressing in ability, availability and construction since the early 2000s. Modern sensors are electrical input machines, taking measurements and communicating them to an output device, possibly with a display, such as a digital thermostat. Sensors can be customized to fit a situation, fitting all types of data collection needs.

The "cloud" sounds mysterious, but it is just a space created through a network, such as the internet, and does not have a physical location. The cloud creates an infinitely scalable system that can be used for storage, processing, monitoring and automation. Individuals primarily know the cloud for its storage capabilities, such as their operating system's cloud document file. Related to cloud networking is the "Internet of Things," which is the connection between devices and the internet. Popular use of it includes smart home utility control.

However, the cloud has progressed from Internet of Things to Industrial Internet of Things. This latter term means information from multiple inputs can be transmitted, monitored, and controlled from up close and afar on an industrial level. This large-scale management creates operational intelligence and improves systems.

# Case Study

Imagine summer vacation. You're driving to the beach and it is hot. As you're driving along, jamming to your favorite tunes, you pass a refrigeration truck. Carrying your favorite frozen product from a distributor to your beach's local treat stand, it is an important vehicle. This truck's journey generates useful data that can be utilized for present and future operation improvement.

Some data in motion in this scenario includes the temperature of the interior chilled compartment and the truck's GPS coordinates. This distribution company placed temperature sensors that can detect temperatures as high as 30 degrees C and as low as -10 degrees C in the interior compartment. A GPS system has been integrated into the truck's system as well. Connecting them is cloud software, which can be automated or monitored by dispatchers.

Programs in the software track the temperature through regularly measured data points, adjusting the cooling system's intensity as needed. If the data in motion indicates the temperature has risen too high, alarms can alert the driver and the dispatcher. If the driver cannot fix the problem, the GPS coordinates could trigger an automatic indication of the closest service center.

Data at rest would be logging and storing those temperatures throughout the duration of the trip. If the goods arrived melted, one could identify exactly when the systems failed or the temperature surpassed the limit. Alternatively, the company would have the data to prove their goods arrived intact. The GPS could also be correlated to the temperatures of the compartment. Any repeated issues in temperature at specific locations may signal that the route needs to change.

Finally, our data in use would be the information reviewed to adjust future trips. Logistics coordinators would know whether they should increase or decrease the load size, change the route of the truck, or update the cooling system to maintain the correct temperature.

# Conclusion

Data surrounds us and making use of it effectively saves time, money and frustration. Operations will be optimized through accurate, consistently collected data; additionally, systems will be condensed controlled through cloud IoT.

We at Sealevel hope you feel more confident understanding your unique data situation. If you think that you could benefit from new technology, contact us about solutions we can help create for and with you.