CASE STUDY

Smart Logistics
Connected Operations

Improving the logistics operation of a large home appliances company in India leveraging RFID and LoRaWAN® to implement an end-to-end vehicle tracking solution for their manufacturing facility.

Logistics

THE CHALLENGE

India's logistics industry supports almost 25% of India's overall workforce, the majority focused on the transportation of goods and freight. In the mid-1990s, with the expansion of India's road network and creation of multiple expressways, India's logistics sector saw an increase of freight being shipped via roads instead of railway or air. With a growing demand for trucks and drivers, the industry saw a boom in third party operators who began offering contracted fleet services.

Unfortunately, with the introduction of middlemen operators, the industry struggled to find ways to track, monitor, and exchange information transparently between suppliers, distributors, contractors, and buyers. The lack of transparency created a deficit in trust between all parties making it extremely difficult in keeping a well-balanced supply of drivers to match the demand. In addition to the lack of trust, the cost of contracted truck drivers increased, and manufacturers were charged a premium for every hour the drivers were on the job.

Like many other industries, companies began looking for ways to improve operational efficiencies to reduce their costs and increase productivity. Many focused on speeding up their logistics timelines from the moment the freight leaves the warehouse until the time it is delivered to the next point in the supply chain. Dealing with inconsistencies of drivers and contracted operators, companies looked at the operational activities which they had control over such as locating, packaging, loading, and unloading of containers at their warehouses.

WHY LoRaWAN®?

Smart solutions such as asset tracking, people tracking, equipment monitoring, temperature monitoring, vehicle tracking, and smart inventory management systems are rapidly being adopted in the Logistics industry to improve operational efficiencies. The Internet of Things (IoT), which include use of hardware, devices, and sensors to send information wirelessly, provide companies many flexible options to address their requirements. However, there are still some challenges which present itself when trying to determine which IoT technology is best suitable to meet their needs.

Many warehouse facilities are often located in remote areas extending over large plots of land and are unable to provide direct internet access through out their entire campus. This makes it challenging to implement smart solutions that depend on high numbers of LAN connection points.

Leveraging Wi-Fi could be an option but also has limitations with range which inherently reduces the number of devices that can be deployed per LAN connection. Although many cellular based solutions do provide longer range coverage, the availability of cellular networks are not often available in remote / rural areas where warehouse facilities can be located. Cellular solutions also present indoor coverage issues due to RF penetration limitations. LoRaWAN®, however is a great option when implementing solutions which do not require huge amounts of data to be transmitted wirelessly over long-rage distances. With minimal investment, LoRaWAN®' can provide the means for smart devices to send data to the internet over long-range without relying on many LAN connections to be available on the grounds. LoRaWAN® can also penetrate hard to reach indoor areas making it a perfect fit for such applications.

8 hectares of area was covered with one LoRaWAN® outdoor gateway

LoRaWAN® Gateway Installation Site
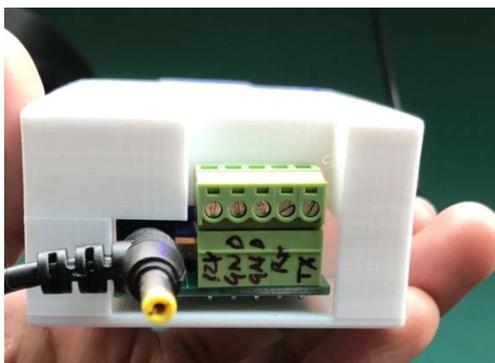
RS232 to LoRaWAN® Convertor

Integration with RFID Readers

LoRaWAN®
IMPLEMENTATION

A large home appliances company in India decided to implement a smart solution that would track the truck driver's activities while at their facilities, to include knowing when the truck drivers entered / existed their grounds, which warehouses they visited and at what time they arrived and departed from those locations. With this information, they planned to not only monitor how many hours each truck spent on the grounds but also to predict when truck drivers were scheduled to arrive at certain warehouses based on a planned pick-up route which was provided to the driver upon entry. The expected arrival time of the truck drivers would then be displayed at each warehouse on 40" LED display monitors.

Based on this, the company would then be able to have better response times so that the containers would be prepared for loading prior to the arrival of the truck which would then reduce the wait time of the truck driver at each location. With less time spent at each location, the overall time the truck drivers would spend on the grounds would also be reduced. This introduced an opportunity to monetize the revenue which was spent on third-party truck driver services.

Initially, the company decided to leverage a RFID solution which comprised of RFID tags that were given to the drivers at entry and RFID readers which were planned to be deployed at each pick-up point through out the facility. The company quickly realized that RFID readers relied on direct access to LAN in order to send the RFID tag data to the central server. Due to the unavailability of LAN connections, the company began to explore alternate back-haul options for their RFID readers which they had already invested in. During their research they identified LoRaWAN® to be a viable option which could address their needs.

The company contacted SenRa to see if they were able provide a solution that could allow their RFID readers to send the data over LoRaWAN®. After many months of solutioning and R&D, SenRa with collaboration from ecosystem partners, were able to develop a LoRaWAN® device which could be connected to the RFID reader via the RS232 serial port and transmit the RFID data over LoRaWAN®. After the device was ready for field trials, SenRa conducted an RF survey of the 8-hectare area and determined that only one outdoor LoRaWAN® gateway would be needed to provide coverage for the entire area.

The gateway was installed 40 meters off the ground at a tower located on their grounds. Field engineers then tested the signal of the gateway at all locations where the RS232 to LoRaWAN® devices would be installed to confirm signal strength was at desirable levels.

The RS232 to LoRaWAN convertors where then integrated via wire directly to the RFID readers at each pick-up point and were tested to ensure the RFID tag data was properly being sent to their central server and LED display monitors.
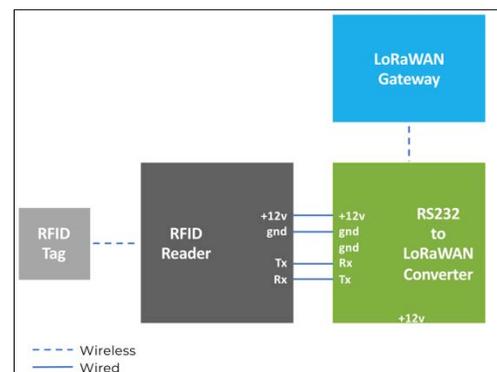
On average, 400 trucks enter the campus every day

Step 1: Locate the containers

Step 2: Prepare containers for loading

Step 3: Load containers on the trucks

LoRaWAN®

BENEFITS

After only one month of implementing the solution, the customer was able to see a reduction of truck drivers time spent on the grounds by 50%. The average time it took one truck to complete all pick-up activities was reduced from 3 days to 1.5 days.

The truck drivers use to take advantage of the lack of transparency by parking the truck for hours at a time in locations of the warehouse where no one would notice their presence costing the company Lakhs of rupees per day. With the smart solution, truck drivers were forced to stick to a tight schedule and were not able to sit idol for hours at a time.

On average, 400 truck drivers visit the warehouse facilities each day and there are over 80 different pick-up points where drivers could visit as part of their planned route. If you consider the truck driver's hourly rates plus the service / fuel charges and multiply it by the number of trucks which visit the facility each day, you can assume the company was able to save an estimated 3,00,000 Lakhs per day with this new smart solution.

The benefits of leveraging LoRaWAN® prove to have immediate return on investment.

The proven benefits of LoRaWAN® are:

❑ Provides Near-real time insight of sensor data

❑ Provides deep indoor penetration through dense materials (i.e., concrete or metal)

❑ Low-cost deployment options reduce number of infrastructure hardware needed to provide connectivity

❑ Can be integrated with other technologies reducing the need to invest in new equipment

❑ Devices do not need access to power due to extended long battery life

❑ The Long-range capabilities provide last mile connectivity in rural or hard to reach areas

❑ Return on investment is quickly achievable and can introduce new monetization opportunities

CONCLUSIONS

The logistics industry, like many others, have their challenges that can be addressed by well thought-out and well planned IoT solutions. Focusing energy on problems that are within your control, can be a good first start in successfully achieving the digitalization goals of the company. One technology is not always able to meet all the needs of a customer and exploring alternative / complementary options can be beneficial. LoRaWAN® demonstrates the ability to support a plethora of use cases and can even be used in hybrid projects such as this case study has demonstrated. With good planning, proper expertise, and the use of the right technologies' customers can have successful projects that save money and improve productivity.