Speedy Goods Freight

Tracking the location of items in real-time is a requirement of many industries, from logistics firms to manufacturers to hospitals. The expanding IOT marketplace will only increase the demand for capturing and analyzing streams of location-dependent information in real-time

This project demonstrates how Pravega can be applied to solve a real-world problem that businesses experience today. The project uses Pravega in a business internal application platform to improve profitability and customer satisfaction.

SGF is a parcel delivery service that prides itself on fast delivery with a money-back guarantee for late or lost packages. To provide the fastest service possible they run the package conveyor system at their sorting centers at high speed. Sometimes packages fly off the conveyor and are lost. These lost or delayed packages decrease company profits because they must refund the shipping cost, and sometimes the actual value of the package, to the customer.

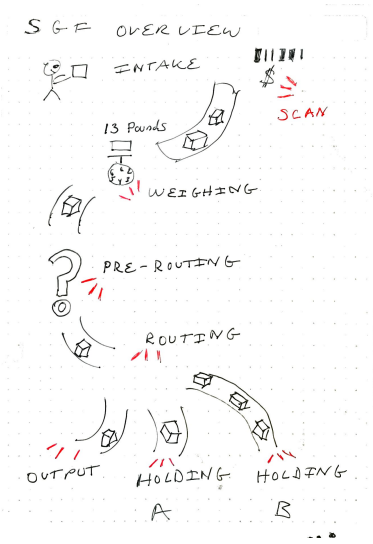
The IT department at SGF has been assigned the task of finding a way to alert sorting-center workers to missing packages before they become excessively delayed or completely lost. Additionally, C-suite executives want to see real-time package handling metrics, including a running account of lost packages, late deliveries and a report on locations within sorting centers where delays tend to occur.

When customers drop their packages off at any of the four SGF sorting centers they declare the value of their packages. SGF applies a barcode and the package is scanned by an intake scanner. The package travels to a weighing station, where it is weighed and scanned again. After weighing, the package travels through other scanners and trucks before it is delivered to the destination.

These scanners provide the data necessary to detect problems with package flow.

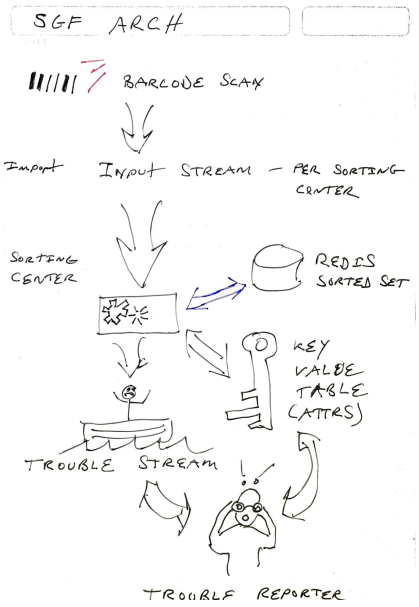
Barcode scanners distributed through the sorting facility capture the identifier of each package that passes by. This identifier, a timestamp, the timestamp and identity of the scanner the package is heading towards is written to a per-sorting-center Pravega stream.

A sorting-center process tails the stream, using its information to store package details in a key-value-table as well as noting the expected arrival time at the next barcode scanner. The expected package arrival time is stored in a sorted set in redis so that ‘late’ packages can be quickly identified.



When an anomalous condition is detected, an event is written to a central ‘trouble-stream’.

A management process “trouble reporter” tails the trouble stream. It hydrates trouble events with additional information from the package attribute key-value table before passing the trouble event on to users.



Pravega is an important component to the solution architecture because it provides a combination of features that typically could only be obtained by combining multiple solutions:

- Exactly once delivery semantics - used by this application to ensure no scans are missed
- Reliable messaging over lan and wan connections - used by this application to allow distributed sorting-centers to merge data in a shared central system
- Synchronized updates from multiple writers - key-value-table test and update inhibits overwrites
- Long-term storage of data - facility maintenance priorities can be guided by historical performance (what sections are losing the most packages?)
- Ability to remove outdated data from storage - unneeded events can be purged without shutting down the system

This project can continue to grow by:

- Using additional streams to quantify daily sorting-center metrics
- Analyzing popularity of routes between sorting-centers to schedule staffing
- Determining average and median value of goods on trucks to avoid over-insuring
- Collect tracking details from printable-wireless labels and NFC tags