

# Designing a Disruptive Life Sciences Cold Chain Logistics Platform



## Summary

Base2 believes technology can smash boundaries by creating innovative products. For example, supply chain logistics and cold chain shipping methods for biologistics have remained static for decades. Now, thanks in part to the Internet of Things (IoT), advances are being made in every space, including transportation - from drone deliveries to computerized containers. Base2 recently used software product development best practices to develop a groundbreaking cold chain SaaS application for a leading life sciences company.

### Results

BioLife and SAVSU's cold chain management platform was the first product designed to meet the logistics needs of the life sciences industry. Customers now have a fully integrated system developed specifically for the movement of live cells used in precision medicine applications.

BioLife Solutions (NASDAQ:BLFS) is the leading supplier of biopreservation media products for cell and gene therapies. They needed help developing a cloud-based app for customers to use in managing cold chain shipments of high-value, time and temperature sensitive personalized medicines. The app integrates with smart, precision thermal shipping containers that have embedded GPS, cellular communications and payload monitoring technologies. BioLife turned to Base2 to help develop this vision of a holistic, real-time live cell visibility platform. The system is now marketed by SAVSU Technologies, a private life science tools provider, 44% owned by BioLife.

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## Partnering with Industry Leaders

In 2015, BioLife formed a partnership with SAVSU, a leading designer and manufacturer of innovative storage and transport containers for temperature sensitive biologics and pharmaceuticals. Their joint idea

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was to develop a fully-functioning, cloud-based cold chain logistics management platform and application. Cells, tissues and other biologics need temperature-controlled environments in order to remain viable—making transportation a big challenge. The joint-venture planned to deliver a revolutionary solution that would give drug therapy developers, shippers, and customers complete visibility throughout the supply chain as to a shipment’s status, including its location, condition, position (tilt), shelf life, and integrity.

“To move forward, we had a buy versus build decision. We had the vision, but thought we needed to leverage outside expertise in order to execute on it in time to match the market window,” explained Mike Rice, CEO of BioLife. “To meet our timeline, we needed to find a development partner that had experience in regulated environments...and, based on its past work with Boeing and other similar customers, we turned to Base2.”

BioLife also wanted its potential partner to match its commitment to work culture. “We contacted Base2 because it was one of the businesses on Seattle Business Magazine’s Best Places to work, as were we,” Rice said. “We knew from the start that we’d be complementary.”

## Creating the Tools for Cold Chain 2.0

For the cold chain management system, now called *evo.is*, the vision was to create a smart shipping container that would monitor internal environment conditions in real-time through an onboard multi-sensor system. The GPS geofencing technology provides realtime chain-of-custody visibility. The system’s cloud-based app would deliver excursion alerts and delivery notification to recipients via SMS and/or email. It also implemented a patent-pending shelf-life timer solution—a cutting-edge product for supply chains handling timesensitive shipments.

BioLife and SAVSU already had the container in place, but the radio supplier’s existing cloud-based application could not be customized for extension to other solutions. Since it was proprietary technology, this presented Base2 with its first challenge: to develop a robust application that could ride on top of an existing supplier data stream. In fact, to be successful, a number of parties needed to integrate with the new platform, and all had disparate systems. Integration quickly became Base2’s primary development hurdle.

### BASE2 IMPLEMENTED KEY INTEGRATIONS WITH EVO.IS APP

- > The wireless device and its multiple iterations and releases of firmware
- > Twilio for email and SMS alerts across international boundaries
- > AWS for the cloud-based infrastructure, including virtualized containers, systems logging, etc.
- > Google Maps for visualized tracking
- > A postal system interface for packing, labeling, shipping and tracking notifications

## Creating User-Friendly Features

A second objective was to create a dashboard and user interface for the app that was intuitive and simple—matching the experience level of everyone from scientists to package handlers.

Base2's team of experts drew from their experience and industry best practices to overcome significant challenges throughout the design process, including:

- > Base2 made a deliberate decision to work in modern JavaScript frameworks using REST interfaces single page app environment in order to stay current with today's user expectations. This meant additional challenges around screen rendering times, but the team was able to resolve this too.
- > To make the app more user-friendly, the designers wanted lots of graphs based on important data points such as temperature, pressure, location and light. While this seemed simple on the surface, rendering and filtering the images and data was a significant UX challenge.
- > It was relatively easy to show a few customer names or boxes in a scroll-down menu, but when the customers/boxes numbered in the hundreds and thousands, the UI became unwieldy. Base2 created an elegant solution to work around this problem.

Base2 also had to figure out a way to integrate with Google Maps to show the location of packages in transit. Conceptually, this was easy, but the team quickly ran up against the Google Maps usage limit. The team figured out how to work around the costs and the number of required API calls.

## It's all About the Process

“One of the things I appreciated about working with Base2 was that they are process-driven,” said Todd Berard, BioLife's vice president of marketing. “Their methodology matched ours, which was especially important since hitting our timelines was critical to the project's success.”

*“The emerging reimbursement paradigm is based on therapeutic efficacy and patient response. That's why solving the logistics problem is so important—it's imperative for drug developers to ensure that the viability of the cells or the therapy is maintained, from the lab to the patient.”*

To foster and maintain tight project control, Base2 leveraged its DevOps expertise and best practices. The team used Docker's container platform and swarm technology to quickly push the app project from development to QA to pre-production and production within the same environment. In tandem, Base2 and BioLife had three week sprint cadences aligned with frequent program and design reviews. This allowed the team to course-correct as needed. Team meetings with the customer experts were also held 1-2 times per week to review progress and answer any questions that may have occurred.

## Hitting The Market

BioLife and SAVSU's cold chain management platform was the first product designed to meet the logistics needs of the life sciences industry. Previously, novel drug developers and shippers used outdated packing solutions that were designed for the food and flower industries. With evo, customers have a fully integrated system developed specifically for the movement of live cells used in precision medicine applications. And, since novel therapeutic developers are data driven, the app created with assistance from Base2 delivers real-time monitoring and recording. This helps mitigate the risk of cells being damaged prior to delivery due to environmental conditions.

"Cell and gene therapies are expensive to create and administer," Rice said. "The emerging reimbursement paradigm is based on therapeutic efficacy and patient response. That's why solving the logistics problem is so important—it's imperative for drug developers to ensure that the viability of the cells or the therapy is maintained, from the lab to the patient. Dead cells don't cure cancer."

## Going Forward

Specialty logistics couriers are already using evo. And, while the partnership with Base2 has ended, BioLife continues to add improvements to the cold chain management platform.

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"One of the things we liked about Base2 was that it understood our long-range plan," explained Berard. "Everyone knew our vision was to take the project in-house when the time was right, and Base2 facilitated that process. It was a true business partnership."

## BIOLIFE

Biolife solutions is the leading developer, manufacturer, and supplier of proprietary clinical

grade cell and tissue hypothermic storage and cryo-preservation freeze media for cells and tissues. Our proprietary HypoThermosol<sup>®</sup> and CryoStor<sup>®</sup> platform of solutions are highly valued in the regenerative medicine, biobanking and drug discovery markets. Our biopreservation media products are serum-free and protein-free, fully defined, and are formulated to reduce preservation-induced cell damage and death; offering commercial companies and clinical researchers significant improvement in shelf life and post-preservation viability and function. For more information please visit [www.biolifesolutions.com](http://www.biolifesolutions.com) and follow BioLife on twitter.



Base2 delivers the expertise needed by companies struggling with the process and practice of making

internal data actionable, helping to quickly unlock that data from complex interconnected systems for new insights and better opportunities. The company's disciplined systems engineering, DevOps and information security practices complement internal resources to allow organizations to efficiently operationalize and productize data, especially across heavily regulated industries such as aerospace, transportation and healthcare. To learn more about how Base2 helps realize the promise of data-driven enterprises, please visit [www.base2s.com](http://www.base2s.com).