HandyTrac:
Taming the Sprawl of Legacy Code

Future-Proofing a 20-Year-Old Key Control System
With a Modern Rebuild

“I was quite impressed how quickly the 7Factor developers were able to get their heads around the problem.”

Lead In-house Developer, HandyTrac Key Control

OVERVIEW

For 26 years, Atlanta-based HandyTrac Systems has helped multifamily, military, and student housing managers control and monitor entry into 5 million units for 10,000 properties and 800 organizations nationwide. With an advanced security infrastructure of key boxes and kiosks, the HandyTrac Key Control system automates the otherwise cumbersome process of checking out keys and granting unit access to service, maintenance, and repair personnel.

The company invested early in custom software, developed in-house. They've since constantly innovated to lead their field while delivering better service to their customers.

Iterative improvements, although built on now-outdated software architecture, had nevertheless attracted and retained a robust customer base. But by 2018, there were signs that the company's key management software and web portal needed a total overhaul.

PROBLEM

Gnarly, Clunky, Massive...

Chris Garies, a developer at HandyTrac, searched for the right words to describe the condition of his company's code before a major rebuild project began more than a year ago. He landed on "sprawl." Serial and sometimes reactive extensions over time had gradually made their IT operations more complex, expensive, and vulnerable to system failure.

What convinced HandyTrac engineers to conquer the sprawl and rebuild their premier app from scratch? A disaster didn't prod them into action, but a grim thought experiment did.

Keeping a Valuable System Afloat

The HandyTrac Key Control system was originally built on a network of first-generation keypads that communicated with an in-house server via dialup communications.

The key management system was the brainchild of Tibor Szenti, a brilliant electrical engineer who co-invented and holds patents for much of the company's core technology. Szenti also developed the system's original software from scratch, using Perl.

For more than 20 years, Szenti maintained and extended the code as the company leveraged advances in available hardware and networking technology to enhance their security monitoring and control services.

Over the years, those improvements have included:

- **Touchscreen interfaces.**
- **Ethernet and WiFi connectivity.**
- **Biometric authentication.**
- **A web portal with real-time status reports and access control.**
- **Automated reporting of key-related events.**

HandyTrac's Perl-based software was innovative at the time of its original creation, effectively addressing the necessities of the moment. For two decades, as capabilities were added to maintain the company's competitive edge, it was a critical driver of the company's growth and success.

Szenti's tireless efforts had kept this valuable differentiator afloat. However, serial extensions made the system ever more complex and less stable. Gradually, the layer-by-layer add-ons created a long-term problem: ***sprawl***.

Contemplating the Business Impacts of the Proverbial Bus

In 2018, HandyTrac business leaders and company engineers decided to rebuild the Key Control system from the ground up, using modern frameworks and best practices.

Why such a radical rebuild, which was certain to be time-consuming and expensive? It was the answer to a troubling thought experiment: "What happens if Tibor gets hit by a bus?"

For a long time, the Szenti-centric development environment presented few problems. Szenti had no difficulty explaining the app to others: he developed it. All changes to the app made sense to him because he implemented them.

Szenti was a long-time, valued, loyal member of the HandyTrac team, but – whether by injury or illness, career change, or retirement – there was no telling when or how he might leave the company. The threat of losing Szenti's specialized and essential experience set off alarm bells among company business and technical leaders.

"If we had to bring in someone new to the team, there was little or no documentation for them to work with," says Garies. *"Tibor built the solution before we had any modern frameworks. We had Tibor and files and files of protocols, but that was it."*

What would happen if the company suddenly lost Szenti?

"We realized we could be in a lot of trouble," recalls Garies.

Reduced reliability.

Reliability topped their list of concerns. The HandyTrac business model was based on making it easy for customers to check out, use, and return keys quickly, simply, and securely, every time.

When anything went wrong with the Key Control system, Szenti always knew how to fix it. Downtime was rare but, when it happened, quickly resolved.

Without Szenti, the company might risk extended downtime, damaging customer goodwill and loyalty.

Compromised security.

Security is never a one-and-done proposition. Only dedicated engineering vigilance can keep systems ahead of emerging threats. This is important for any IT-enabled business, but it was doubly important for HandyTrac, which promised security both online and in the homes of millions of residents.

Without Szenti, who would monitor system integrity? How would they identify new vulnerabilities? How would they protect HandyTrac's customers against novel threats?

Inability to innovate.

HandyTrac attracts new customers and keeps their existing ones through continual innovation, maintaining their reputation for superior security and ease of use. Through the years, they've stayed ahead of their competition by introducing new kiosks with updated features such as biometric authentication.

Each new generation of kiosks required application extensions and custom integration to support the new devices. Before the rebuild, Szenti personally extended the app to support each new device and feature.

If HandyTrac ever found itself without Szenti and the essential information held in his memory, their engineers might struggle to improve their product. Innovation would grind to a halt, and competitors might pass them by. This was a depressing scenario.

Long development cycles.

At HandyTrac, it had always been company policy to develop all software in-house, exclusively for company use. Taking generic software off the shelf and adapting it to company requirements, as many companies do, was not an option.

HandyTrac recognized that rebuilding their software now, while they still had access to Szenti's knowledge and guidance, would be time-consuming. However, rebuilding the system without him would take much longer, at substantially greater cost.

SOLUTION

Modernizing the Monolith

A mutual connection recommended that HandyTrac CEO John D. Lie-Nielsen contact 7Factor CEO Jeremy Duvall and hire 7Factor for the modernization project.

The existing system, 7Factor soon learned, was a massive monolith of old code.

"HandyTrac came to us with a 20-plus-year-old system that they had been building off with pretty much one developer for forever," says Chelsea Green, the 7Factor engineering manager who Duvall tasked with leading the modernization team. *"This whole thing is Tibor's brainchild. He'd architected it in a way that works and that he understands, and then it worked for the next 20 years."*

But now it was time to modernize the monolith.

"They wanted it rebuilt into more modern technology, and to give their customers a new experience," says Green. *"They basically wanted us to redo everything."*

Asking a Lot of Questions

However, to rebuild the HandyTrac Key Control system, the 7Factor team first had to understand how it worked. This proved particularly challenging.

Szenti wasn't the only key leader who had been with HandyTrac for all or most of the company's history. Long loyalty and low turnover had left much of the company's institutional knowledge undocumented, held implicitly in the minds of veteran employees who lived it every day.

Before they wrote a single line of code, the 7Factor team spent long hours with HandyTrac, examining their existing systems and asking lots of questions.

"That's my favorite part of doing consulting work: teasing out what clients need and want," says Green. *"We spent a lot of time talking with [HandyTrac engineers], figuring out what their pain points are and making small changes to the workflow, so they can have an easier time when they do almost any task."*

"Someone at HandyTrac made a comment," says 7Factor engineer Kenneth Jorgensen, "that until we came along and started asking how they do everything so that we could implement it in software, they hadn't really thought about their business processes in that way."

As the 7Factor engineers asked more questions, they got a more complete and accurate understanding of how the legacy system actually worked... and better ideas of how they could rebuild it better.

"I was quite impressed how quickly the 7Factor developers were able to get their heads around [the problem]," says Garies. *"It's not something anyone is likely to have a lot of experience with. They picked up what the system's purpose was, how to get the scripts to communicate from our system to our servers, back to the systems, and finally to our website. They asked many questions. That was a good thing."*

A Modern Solution and an Engineering Process to Match

Once the 7Factor team had a solid understanding of the existing systems and, more broadly, of HandyTrac's processes, Green's team got to work rebuilding the app and web portal from scratch, using modern frameworks and best practices.

A new system architecture.

Redeveloping the new app and web portal involved a major modernization in approach to an API-based system built on AWS. The front end is built on Vue.js, a JavaScript framework, and the back end is written in Java with a SQL database. (The SQL database isn't new but was ported to AWS.)

Basing the solution design on API requests made system behavior more stable and predictable, and reduced the IT resources needed to keep everything running.

Automated deployment capabilities.

Much of the early rebuild work reduced the time and resources needed to deploy updates to the HandyTrac system. The new efficiency is the result of DevOps automation. As 7Factor engineer James Fidler explains, "Continuous integration and deployment are built into the system, and developers can easily roll back changes if anything breaks."

Advanced alerts and reporting features.

The rebuild updated existing communications functions into an online portal that displays all key control-related transactions using best practices of modern UI design. Property managers and HandyTrac admins can view the status of keys with up-to-the-minute data and summaries of all activity at the corporate, regional, or property level.

The new system also implements custom, automated email alerts that can be sent to property managers and residents.

Faster customer service.

The new efficiencies made customer service more efficient, too.

For example, Garies reports that the effort needed to onboard new HandyTrac customers dropped by more than half. The legacy system required admins to set up and click through five pages of forms to bring on new customers. Now, admins complete the same tasks with two pages of forms.

Quick Learning and True Grit

Throughout the rebuild process, HandyTrac and 7Factor engineers worked closely together. HandyTrac was impressed by what they saw.

"They knock out things one after the other, any time there's been any kind of issue," says Garies. *"Some of the old systems, like the original Ethernet-based ones are ancient. They're running a chip from the '80s, so they need this very specific formatting or they're just going to reject everything. And they just blew right through that and it stood up real quick."*

As everyone anticipated, the custom-work-only requirement increased development cycle time significantly. However, the project's initial stage is complete, and the new system is live.

With a modern, standards-based architecture in place, HandyTrac is now better positioned to innovate and enhance their systems. They continue to turn to 7Factor to further improve their applications.

RESULTS

Not a Revolution, Just Robust Software that Works

The 7Factor engineers are quick to acknowledge that the new solution is far from revolutionary. Its value lies in modernizing a hand-crafted, in-house, system that worked but was expensive to extend and maintain.

What was the return on HandyTrac's investment in modernization? Value-rich features, which include:

- **A clean, modern, easy-to-use design,** which translates into a better user experience in the web portal.

- **Improved workflow,** which helped HandyTrac admins and property owners spend less time and effort accomplishing routine tasks.

- **Modern infrastructure design,** which enables continuous system improvements and reduces the risk of breaking the system whenever developers add new features to the system.

A Secure, Stable, and Scalable System Stimulates Customer Interest

Rebuilding the HandyTrac Key Control system had another benefit, one that bodes well for the company's future.

For many years, HandyTrac has been a regular exhibitor at more than a dozen annual trade shows throughout the United States. Anticipating the Key Control system rollout, the company put together a marketing blitz that focused on the new system's capabilities. The rebuild has generated plenty of customer interest for the only reason that really matters. It provides HandyTrac customers with an affordable, easy-to-use solution that delivers tangible business value.

7Factor CEO Duvall, summarizes the real value of the new app saying, *"Rebuilding the Key Control software with modern tools, design, and best practices makes HandyTrac services much more efficient, secure, stable, and extensible. These are the qualities that HandyTrac customers have always shown their appreciation for with decades-long loyalty. I'm glad we could help HandyTrac continue to earn that loyalty."*

With the sprawl now fully tamed, we look forward to partnering further with HandyTrac as they innovate new ways to simplify the work of property managers while keeping their residents safe.

We build good things

Let us show you how