



Case Study

# Freescale and BAM Labs® Enable Nonintrusive Health Monitoring

**Touch-Free Life Care™ (TLC) System tracks biosignals without keeping patients tethered to bedside monitors**

## Say Yes to Health Monitoring with No Wires, No Straps, No Patches

Continuous health monitoring can help improve healthcare for everyone from patients in hospitals or other care facilities, to people living or recovering in the comfort of their own homes. The problem is that traditional continuous health monitoring can be intrusive, to say the least. It requires saddling people with wires, straps, patches or other physical means of connecting them to bedside monitoring equipment. And it can be cost prohibitive to monitor someone's health this way over the long term.

But what if monitoring required no more effort than just lying down? BAM Labs' TLC System makes it that simple. This solution consists of a thin, medical-grade air mat equipped with a biometric sensor that's placed under an ordinary mattress, where it can collect health data with no intrusion on the person being monitored, no effort on the part of the caregiver and at a far lower cost than conventional monitoring.

## BAM Labs' TLC System Makes Any Bed a Smart Bed

Simply placing the TLC System sensor mat under the mattress transforms a conventional bed or hospital bed into a powerful data collection and analysis platform. A Freescale pressure sensor is integrated into the mat to collect a variety of types of biosignal information, including heart and breathing rate trends, sleep behaviors and motion, and transmit it to BAM Labs' HIPAA-compliant biometric cloud monitoring environment for analysis. The results are communicated wirelessly to caregivers through user-friendly applications accessible from any Internet connected device. The system removes the traditional barriers to continuous health monitoring, with no need for complex, costly physical connections to monitoring devices at the point of care.

Web services provide a platform for supporting multiple applications through a single Freescale sensor integrated into the mat. These applications can provide information to help reduce a number of healthcare risks.

- Position Change application provides information to help reduce the risk of pressure ulcers in people who are confined to bed over long periods of time.
- Bed Exit application reduces the risk of falls by sending alerts to caregivers when a monitored person is out of bed, so they can provide assistance.

## Challenge:

Remove the physical barriers to data acquisition and access that have traditionally made continuous health monitoring costly and challenging for patients and caregivers alike.

## Solution:

Freescale pressure sensor, MCU and applications processor work together to provide comprehensive hardware support for data collection, networking and communications in BAM Labs' health monitoring solution.

## Benefit:

With the TLC System, a simple sensor mat placed under any mattress is all that's required to continuously monitor key health indicators, including heart and breathing rate trends, sleep behaviors and motion. It dramatically simplifies health data collection for both patients and caregivers.



- Sleep Analysis application measures sleep quality and tracks the impact of medications, exercise and other factors on sleep.
- Heart Rate and Breathing Rate Trend Reporting applications report on daily rates and trends over time.

Caregivers can monitor one person or a group of people while performing their daily duties and receive notifications on their desktop or laptop, or on a mobile device like a smart phone or tablet.

“BAM Labs developed the TLC System to improve the quality of life for people in healthcare environments ranging from hospitals to home care,” said Steve Young, CTO of BAM Labs. “It delivers actionable data that turns every bed into a point of connected care, and it does it without imposing unreasonable demands on either the monitored person or the caregiver.”

### BAM Labs Makes It Possible. Freescale Makes it Work

The TLC System uses a dual MCU and processor topology to build out its networking and communications capabilities.



### Freescale Technology in BAM Labs' TLC System

- MPXV2010 pressure sensor
- MC9S08JM16 MCU
- i.MX 6 applications processor

Full integration of Freescale MC9S08JM16 MCU and i.MX 6 applications processors enables the system to encapsulate a very sophisticated feature set in a very small space, allowing it to operate as a comprehensive solution when reading data from the MPXV2010 pressure sensor.

Providing hardware platform support is important, but that's just part of what Freescale delivers. Software enablement is equally important to the solution's success, and comes in the form of our internally developed Linux® OS software platform. The Linux Target Image Builder is a comprehensive package that includes everything needed for development (compilers, linkers and debuggers), accelerating the product development process.

“Freescale is truly a one-stop technology resource for us, with the hardware support we need for data collection and communications, as well as the right software platform for our product development team,” said Young.

### Freescale: Medical Expertise for the Long Term

Semiconductor technology plays a critical role in the development of new technologies to assist with patient monitoring, diagnostics, therapy and imaging. Medical device designers need to balance processing requirements with power consumption, help to ensure a fast time to market and navigate the regulatory environment. Freescale is a trusted provider of MCUs, MPUs, analog and sensor components, RF amplifiers and wireless technology to meet the unique needs of medical designs. These vital technologies, along with Freescale enablement tools, expertise and alliances, help enable customers to develop breakthrough medical systems and life-critical applications. Freescale also offers a formal product longevity program for the medical segment, ensuring that a broad range of program devices will be available for a minimum of 15 years\*.

### How the BAM Labs TLC Technology Works



- The TLC sensor mat is placed under the mattress of any type of bed.



- Person rests on the bed with nothing attached to them.



- Caregivers receive timely information on their PC or mobile device to improve efficiency of care.

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### BAM Labs: The Innovator in Touch-Free Connected Care

BAM Labs, Inc., a Silicon Valley company founded in 2006 by Apple veterans, is the leading innovator in biometric smart bed technology. Smart beds expand the realm of informed health management and connected healthcare applications to the bed—the place where people spend one-third of their lives. The BAM Labs TLC smart bed sensor and HIPAA-compliant cloud monitoring platform transform any bed into a smart bed. The FDA-registered TLC smart bed system provides touch-free monitoring

of vital sign trends and motion through a biometric sensor placed under any mattress. BAM Labs’ proprietary cloud computing platform enables healthcare professionals and caregivers to monitor essential health information wirelessly anytime and from anywhere. Benefits include reduced hospital readmissions, significant reduction in pressure ulcers, fall prevention, medication compliance and early indication of sleep disorders. The TLC smart bed system is available through authorized distribution partners in the United States and Canada.

\*For Terms and Conditions and to obtain a list of available products included in our product longevity program, visit [freescale.com/productlongevity](http://freescale.com/productlongevity).

For more information on Freescale healthcare and medical solutions, visit [freescale.com/medical](http://freescale.com/medical)

To learn more about how BAM Labs’ TLC System is powered by Freescale technology, visit [freescale.com/BAMLabs](http://freescale.com/BAMLabs)