



Nurse Call System

Business Transformed: Infinity develop a real time, high throughput Nurse Call System for ST Dynamics

“Infinity’s attention to processes, quality, reliability and responsiveness to deliver solutions quickly is noteworthy. This has facilitated quick turnaround and time-to-market needs of today’s competitive marketplace. In a short span of four months, Infinity had delivered a solution, integrated with our hardware, meeting the near real-time and high load requirements.”

- **Quek Joo Meng, Manager, Technology Department**

Singapore Technologies Dynamics

Customer Introduction

Singapore Technologies Dynamics Pte Ltd (ST Dynamics) specializes in the design, development, production integration and testing, prime contracting and selling of smart and guided weapons as well as unmanned systems.

Also known as FusionWorks to better reflect their new role as the Advanced Engineering Center of ST Engineering, it is set up to acquire budding technologies for incubation and development for future applications.

Business Situation

ST Dynamics had developed a cutting edge RFID based wrist pendant that can be worn by patients in a hospital environment. The pendants can be used to raise a distress signal by patients that will be displayed on a nurse call system. The system also provides a patient wandering and location system.

The Challenge

The major challenges were to provide a system with:

- 1. Real-time responses:** The primary aim of the system was providing the patients a means for alerting the nearest nurse station whenever they need help. This meant that once a patient pressed a distress button on the pendant, an alarm was raised at the nurse station within 2 seconds. This includes the hardware delay of relaying the message from the pendant to the nearest receiving server through an array of hardware-routers installed on the premises. The alarm included messages on the nurse station computer’s screen, LEDs connected to them and SMS and e-mail alerts to staff designated to each station.
- 2. Support for a high load:** Due to the need of tracking each patient, pendants signal out their positions every few seconds. These signals are picked up by several routers who relay the information to the nearest receivers. The software on the receiver then processes the messages and based on the signal strength of the messages from various routers, determines the location of the patient. Final installations were to support 5000 pendants for patients and a similar number of stationary pendants on bedsides and other locations.
- 3. A user-friendly application primarily for non-tech-savvy users:** In addition to distress call management, the system also provides for the hospital staff to maintain records of all the hardware (pendants/routers/receivers), patients and hospital staff. The system also lets the administrators define identifiable locations based on the routers. It supports monitoring of patients and alerts if patients wandered into certain designated locations. A comprehensive set of reports was needed for data on alarms generated and response times.

Case Profile

Hospital Nurse Call System for ST Dynamics

Duration:: 8 man months

Environment:: Windows

Technology used:: .NET Remoting, Serial communications

Services:: Product Design, Product development and performance engineering

Results:: Optimized architecture to run on low end PCs, distributed architecture with built in scalability

Imfinity's Solution

As with any product, Imfinity entered into detailed business requirement analysis for the system. Usage scenarios were analyzed and the best possible means of presenting the features ascertained.

Handling real-time responses & high load: A distributed architecture was used to allow the receivers to send messages to different servers for processing based on the load on each of them. Communication between machines supported both sockets and remoting. The former was used for critical operations while the latter for non-real-time functionalities.

Multi-threaded processes were implemented to handle incoming messages on the serial ports from the receivers. Concurrent operations were performed wherever possible.

Access to the database was reduced by caching data that isn't updated frequently. Queries were optimized and index-usage was maximized. Data was periodically purged and backed-up to limit the size of frequently used tables.

Pools were set up for database connections, socket connections and other objects that had high creation overhead. Objects were re-used to prevent over-reliance on the garbage collector and conserve memory.

A user-friendly application primarily for non-tech-savvy users: The system design was stripped to the basics to make it easy-to-operate for users who were not well-versed with computers. Complicated functionality was moved to technical administrators as much as possible. Smart defaults were provided so that the deployed version works in the most optimized way without user interference. Staff on the nurse stations saw the minimum possible number of features and even less data input.

Product Value adds

- Product installers with smart defaults for easy deployment
- Configuration tools for deploying and testing the hardware (routers/receivers) etc.
- Dynamic access control that is adjustable without modifying the application
- Modular design to de-couple application services, client-interaction processes, receivers and database access.
- Secure database access by allowing only application servers access to the database
- Better usability for non-IT users by keeping all irrelevant processes transparent to them

Results

- **Successful deployment:** The system has been successfully deployed and accepted by the client's first customer
- **Gaining traction:** Two new interested clients based on the demonstrations for the first deployment
- **Optimized architecture:** Allowed the client to meet its goals of running the software on low-end computers for smaller customers
- **Distributed architecture:** Provided them with options of scaling up by adding more hardware for larger installations

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Transforming businesses

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Balancing time to market pressures and superior quality is our forte at Imfinity, and that is the essence of the value we bring to our clients. We bring you the much needed technical expertise, outstanding people and quality processes to build great products, on time.

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