

CONNECTED HEALTHCARE

Multiple Devices. One Interface.

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Abstract

A myriad of exciting possibilities lie at the crossroads of healthcare and technology. Connected Care brings with it the promise of greater accountability, enhanced customer satisfaction and the means to monitor patients anytime, anywhere, on any device. However, limited adherence by medical device vendors to a unified communication protocol is posing a serious hindrance to realizing this “connected” dream. With each medical device OEM using its own proprietary communication channels to get devices to talk to each other, service providers have a major challenge in integrating vital data from multiple devices onto a single unified platform.

This paper talks about the requirements of building a communication framework that brings together multifarious medical devices on a unified platform. It also presents the possible ramifications and business benefits that such a unified framework would have for the entire healthcare ecosystem.

The Not-So-Connected Present

Daniel Hewitt, CEO of Newborn Hospital, was grappling with a multitude of issues that were giving him sleepless nights.¹

In the past six months, 20 patients had been incorrectly diagnosed and put through painful and expensive medical treatments for diseases that they never had. A host of lawsuits followed which threatened to jeopardize the reputation of the hospital. What alarmed Daniel the most was the underlying cause for the mess — a laborious, manual process of recording and entering patient data, which came with its own fair share of blunders. Having to take the brunt for these mishaps, the hospital physicians concluded that manual data entry could no longer be trusted. They petitioned to the management to automate the process of patient data collection.

Patient satisfaction levels were at an all-time low. Surveys and feedback forms strongly highlighted the need for greater personalized care from nurses. When confronted with the feedback, nurses revealed that they were perpetually occupied with the process of manually recording and feeding patient data into the hospital system.

One of the hospital's immediate requirements was to invest in advanced medical equipment to effectively treat critical ailments. However, the existing software applications at Newborn Hospital could not easily integrate with these new devices. Expensive IT infrastructure had to be procured just to get these new equipment connected to the hospital network.

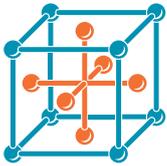
Daniel was disillusioned. He had a dream to provide his patients with the best of care and comfort; a dream in which doctors could be empowered with the best technology and devices to treat their patients; a dream in which all medical devices could seamlessly talk to one another without the need for any human intervention.

So what could he do to realize his “connected” dream?

Need of the Hour – A Connectivity Framework

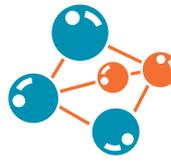
Daniel engaged with leading technology experts to understand the root cause of the problems the hospital was facing. These experts examined the entire hospital ecosystem and concluded that disconnected medical devices were one of the fundamental problems. The technology veterans were assigned with the challenging task of designing a connectivity framework that would be acceptable to the entire healthcare ecosystem.

Daniel articulated six key points that had to be kept in mind when building a unified connectivity framework.



» Making Use of Existing Infrastructure

For any typical healthcare service provider, the first and foremost aspect to be considered when designing a framework is the cost. Providers are unlikely to be in favor of making radical changes to their existing infrastructure set-up. Hence, a solution that could ensure re-usability of existing infrastructure and software licenses would be much more likely to gain mass acceptance among hospitals.



» Simultaneous Connection of Multiple Devices

To facilitate speed and efficiency, there is often a need to collect patient data from multiple devices simultaneously. The connectivity framework of the future must be capable of collecting patient data from multiple devices concurrently.



» Easily Scalable Solution

As technology and medical science evolve over time, newer and more advanced medical equipment are bound to be released in the market. A unified framework must have the flexibility to accommodate these newer devices, while still offering complete support and coverage to the legacy devices. The framework must be easily scalable, without affecting everyday operations of the hospital.



» Regulatory Viewpoint

Such an industry standard solution must adhere to the regulatory standard requirements i.e. ISO 13485/Part 820 - QMS standards, ISO 14971 - Risk Management Standard, IEC 80001-1 - Risk management for IT networks incorporating medical devices, HIPAA³ and also to any device - specific standards. It is advised to classify the framework to the highest class (class -C as per IEC 62304) to ensure connectivity support to the complete range of medical devices.



» Support for Standard and Proprietary Devices

The connectivity framework should be universal in that it must be capable of supporting all types of medical devices — both those that follow standard protocols² and those that follow proprietary protocols.



» Minimize Manual Intervention

Typical hospital software applications require nurses to manually enter patient data in the system. As data for multiple patients from multiple devices is entered into the system, human errors are all but apparent. Manual intervention must be minimized to ensure speed and accuracy.

The Approach to Unifying Healthcare Devices

Daniel's technology veterans thought long and hard on the simplest and most cost-effective approach to building a connected framework. The answer to the puzzle came in the form of the "Medical Data Aggregator."

This new building block (see Figure 1) would collect data from multiple devices in the healthcare ecosystem, each device being identified using a unique ID. The consolidated information would then be sent across to the hospital application interface, which would display this data in the manner most preferred by doctors and nurses.

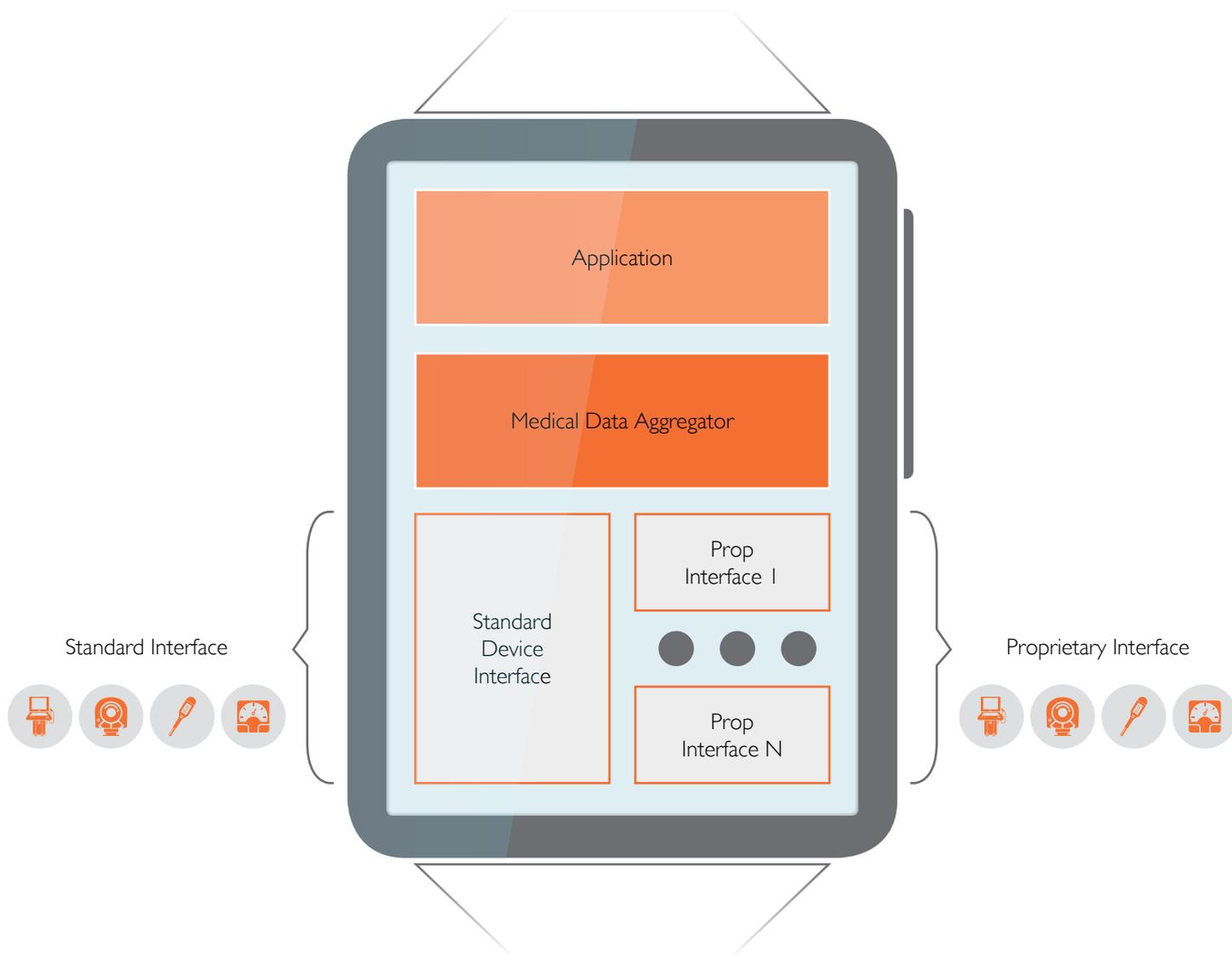


Figure 1 – Medical Data Aggregator for Connected Healthcare

The Medical Data Aggregator would be able to:

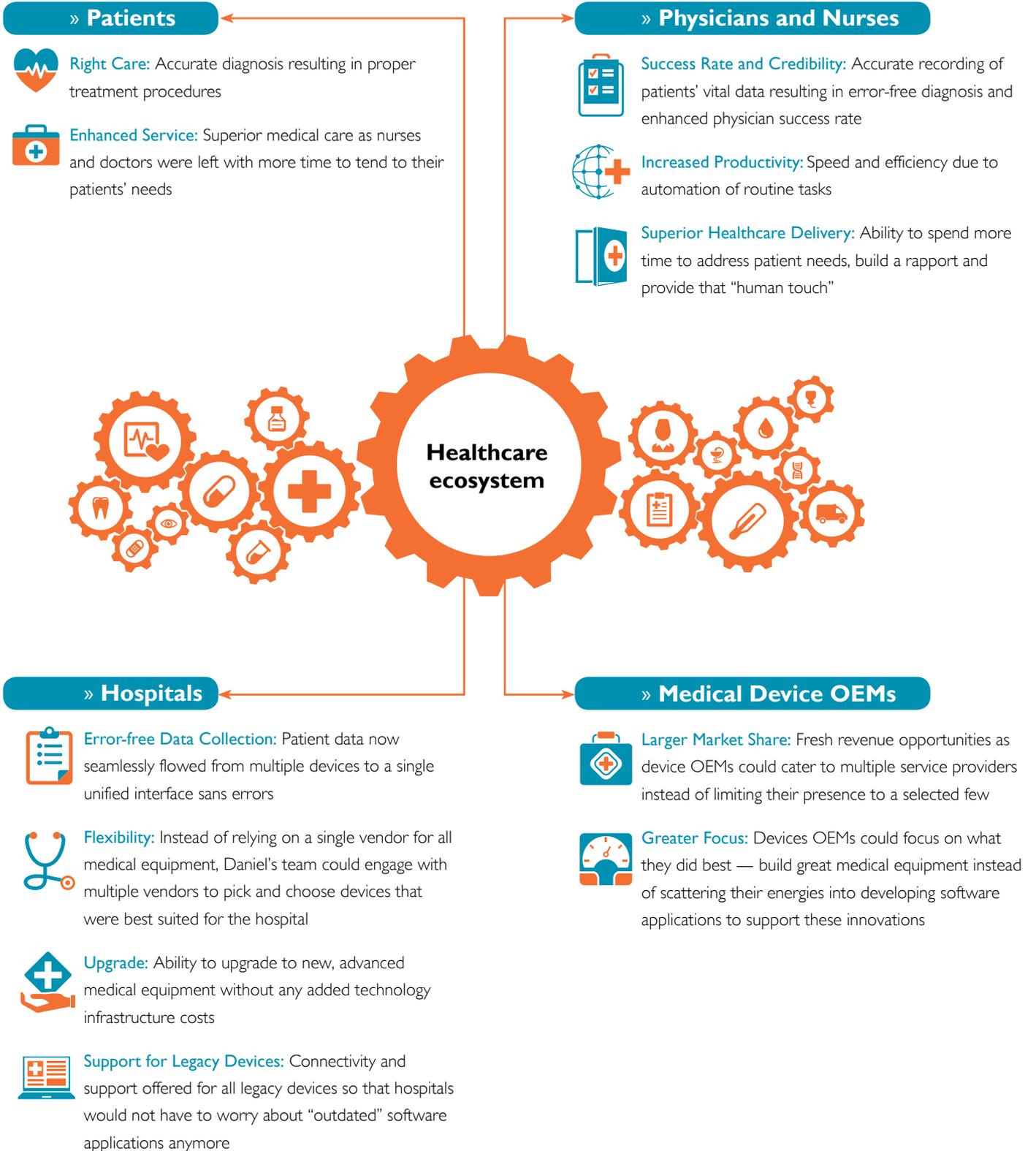
- » Interface with multiple devices
- » Display data in real-time so that doctors and nurses can take immediate action
- » Connect to standard as well as proprietary devices that have a plug-in based architecture
- » Function across multiple platforms so that it can run on the existing platforms of the provider
- » Support next generation medical devices such as wearables

Realizing the Connected Dream

A year passed.

Things seemed to be evolving rapidly at Newborn Hospital. Daniel Hewitt's dream of a "connected" world seemed to be taking shape. The adoption of such a simple yet ingenious approach to consolidating multiple device data had completely transformed his hospital.

The entire healthcare ecosystem was getting a facelift:



Just the beginning...

A unified communication framework is the first step towards realizing the Connected Healthcare vision. From ensuring that patients get the right medical care to facilitating flexibility and cost savings for hospitals, enhancing the productivity and success rate of doctors, and enabling medical device OEMs to capture a larger market share – the Medical Data Aggregator has something for everyone in the healthcare ecosystem.

But the journey doesn't end here. Imagine a time when medical devices could integrate with all other devices in the connected world to put healthcare on the palm of a consumer's hand. Imagine the impact on global healthcare if intelligent support systems could assist physicians in detecting patient complications well in advance. Imagine the impact on efficiency and productivity when diagnostics software could identify device anomalies at a very nascent stage and alert service technicians to take proactive measures.

We see a future with limitless possibilities. What role are you going to play in defining this exciting future?

About the Author

Anirudha Gokhale is a Senior Architect with the Healthcare Practice at the Product Engineering Services division at Wipro Technologies. Anirudha has over 20 years of industry experience which spans across various domains like instrumentation, computing and device connectivity. A subject expert in medical device connectivity, Anirudha has been instrumental in designing a number of Remote Patient Monitoring solutions.

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