

# Implementing Convertible, Flexible and Scaleable Ultrasound

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In 2004, when a group of local OB/GYN physicians asked Mercy Hospital and Medical Center if they could supply ultrasound services to two off-site clinics, we immediately began to explore the options. The two sites were located about four and eight miles from the hospital respectively and about three miles apart from each other. The issue was, although Mercy also had off-site locations of its own, we had never offered ultrasound services at any remote facility.

We initially considered portable systems, but our radiologists indicated that current portable systems had unacceptable image quality for this purpose. Consequently, we looked to the old stand-by – use one of the 300-400 pound conventional premium systems and transport it via van between the two facilities. It wasn't an ideal situation, but, at the time, it seemed the only way to go.

Then we went to RSNA 2004 where we encountered ZONARE Medical Systems. ZONARE was just introducing the z.one ultrasound system based on Zone Sonography™ technology. This technology provided the basis for the world's first Convertible Ultrasound™ system, allowing the user to convert from a fully-featured, cart-based system to a premium, five and one-half pound compact unit at the touch of a button. Perhaps we had found the answer to our dilemma.

First, however, I think it is important to understand more about the background of Mercy Hospital and Medical Center along with the issues involved in this challenge. Then I will review the step-by-step implementation of the solution, its success and lessons learned along the way.



## **Mercy Hospital and Medical Center**

Mercy Hospital and Medical Center is the first hospital in Chicago. Located just south of Chicago's loop, Mercy has 360 beds and is a level II trauma center. The radiology department of the hospital is located on the first floor next to the emergency department. The radiology de-

partment conducts about 85,000 exams per year. The department is responsible for conducting all ultrasound examinations providing approximately 15,000 exams per year, whether within the department, “on the floor” of the hospital itself or at remote satellite locations. To perform these exams in the past, we used four large, conventional ultrasound systems which were located within the radiology department.

Mercy fosters an environment of healing, providing convenient access and quality care with compassion and excellence to the diverse communities it serves. Part of Mercy’s outreach includes satellite facilities within the city and suburbs. Specifically pertaining to radiology services, Mercy has four off-site facilities located throughout the Chicago metropolitan area. However, until recently, none of these sites offered ultrasound.

## **The Challenge**

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In addition to its own satellite facilities, Mercy was approached in 2004 by an OB/GYN physician group, which held staff privileges at Mercy, to provide ultrasound services to patients at two of its facilities several miles away. The two facilities were approximately three to four miles apart from each other. Volume at the facilities did not warrant two separate ultrasound units at the time. Although the first OB/GYN clinic (OB #1) had a solid volume potential, the second facility (OB #2) initially would have a low volume. Therefore, the scenario would have to involve a shared system between the two facilities in order to make this an economically feasible situation.

## **Vision is Crucial**

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Equally important, whatever solution we selected for these clinics would need to be leveraged to fit similar scenarios at our own remote sites and potentially for other medical staff needing similar assistance in the future. For example, since hospital-employed sonographers would be performing the ultrasound exams, we wanted to standardize the systems we used to help reduce learning curves and maintain excellence in quality.

We also needed to plan how we could network ultrasound exams into our hospital PACS (picture archiving and communications system) remotely. Presently, only OB #1 was connected to our PACS by a T-1. The challenge was to somehow bring exams from OB #2 to the PACS connection at OB #1 on a timely basis without incurring the expense of a second T-1 line.

## **Alternatives Explored**

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The first and foremost consideration in our solution quest was to ensure image quality was without compromise. Obviously, it was a given that images must support high diagnostic confidence. Initially, this factor precluded the selection of any current portable systems. While certainly easy to transport and far less expensive than premium cart-based systems, the portable units on the market at the time were based on traditional beamformer technology. Thus, reduction in size and weight meant a compromise somewhere – and that “somewhere” was in image

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quality. Additionally, as volume grew, eight hours of scanning on a small system with an equally small screen meant greater operator fatigue – something we definitely wanted to avoid.

We then turned to the “tried and true.” Basically, we could take a fully-featured, cart-based premium system and transport it between the two facilities on a routine schedule. This would mean purchasing a mobile van equipped with a lift capable of lifting a 300-400 pound ultrasound system (with a footprint similar to a clothes dryer) into the van and transporting it between OB #1 and OB #2. Frankly, the logistics would be cumbersome and we knew we would be taxing the physical strength of our sonographers in pushing such systems around.

## **An Unexpected Solution**

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As we contemplated our options, the 2004 Radiological Society of North America (RSNA) was about to be held just down the street from Mercy’s main hospital. During our visit to the conference that year, one of our radiologists directed my attention to a new ultrasound company, ZONARE Medical Systems, which was introducing a very unique system to the market. When I looked at the company’s new z.one ultrasound system, I realized I may have found the solution to our satellite office challenge.

The z.one system is based on Zone Sonography technology, which doesn’t use a conventional beamformer platform. Instead, by harnessing the power of DSP chips used throughout the computer industry, Zone Sonography technology allowed ZONARE to design a system that operates either as a fully-featured, cart-based system or a premium compact unit with excellent image quality. The system is the first Convertible Ultrasound platform on the market. At the touch of a button, it converts from the cart-based system to a five and one-half pound scanning engine with the same excellent imaging capabilities. Even in its cart form, the z.one system only weighs about 175 pounds – far less than the 300-400 pound conventional system we were considering as a “mobile” unit.

Additionally, the power of DSP technology employed in the z.one system translates into the ability to take full advantage of advances in DSP chips as these double in capacity every 18 months (leveraging Moore’s Law). This means new applications and improvements in image quality for the z.one system as processing power increases.

As we considered the price-to-value ratio of the z.one system, we determined the convertibility of the platform would provide the necessary flexibility we needed in building out our ultrasound services throughout the satellite facilities. Even



though ZONARE was new at the time, we felt the solution and associated economics fit our situation perfectly.

Most importantly, our radiologists, who were skeptical at first, were pleasantly surprised at the excellent image quality the z.one system provided despite its compact size.

## **Implementing the Solution**

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Providing ultrasound services to satellite facilities would be a new venture for Mercy. We wanted to do it economically, yet ensure high quality images in support of excellent patient care. We knew ZONARE's z.one system would be extremely flexible in providing this solution and allow us to grow as patient volume grew.

To get started, we purchased and installed a full z.one system, SuperCart and scan engine, at OB #1 in spring of 2005. The system was networked into our PACS through the existing T-1 line. Our sonographer conducted patient exams at OB #1 three days per week where patient volume was running around 7-8 patients per day. On the other two days, we removed the scan engine and visited OB #2 where patient volume ran 3-4 per day. In the evening, our sonographer either brought back the scan engine to OB #1 to transfer the data to the PACS or the small flashcard from the scan engine where all the ultrasound data is stored. It is very similar to removing the flashcard from your digital camera and transferring the photographs to your PC or laptop.

With the new service, patient volume quickly grew to 11-12 per day at OB #1 and 8-9 at OB #2. Our sonographers found themselves spending enough hours per day scanning at OB #2 that ergonomically and economically it made sense to add on the full-cart configuration at this growing location. Therefore, we purchased an additional SuperCart and continued to transfer the five and one-half pound scan engine between the two locations.

Growth continued rapidly and the day came when we needed a sonographer at both locations on overlapping days. Hence, we purchased another scan engine, providing a full z.one system for each location. Eventually, we were asked to provide ultrasound services for a third OB location (OB #3). We decided to use the Scan Engine from the OB #2 location one day per week and follow the same template we had initially developed for OB #1 and OB #2.

## **Scaleable Ultrasound**

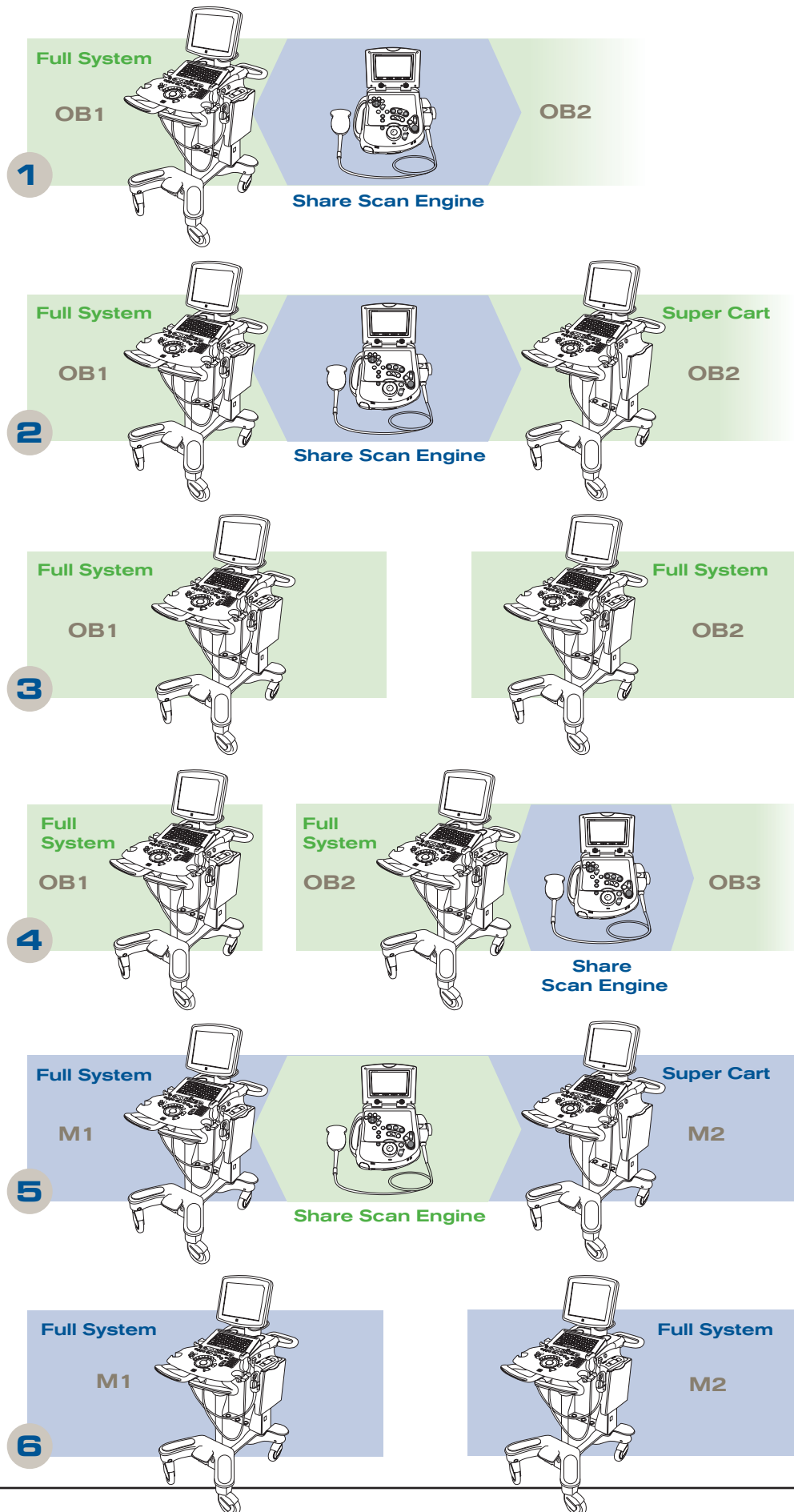
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We knew the ability of the z.one system to convert between full-cart and portable would give us great flexibility in rolling out ultrasound services to offsite facilities. As we took advantage of this modular approach, we soon realized the convertibility and inherent flexibility led to a completely scaleable ultrasound model.

Based on our success, we turned to our Mercy owned and operated satellites and began configuring the first two out of four in a similar manner as we initially did for OB #1 and OB #2.

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# Scaleable Ultrasound - Mercy Hospital

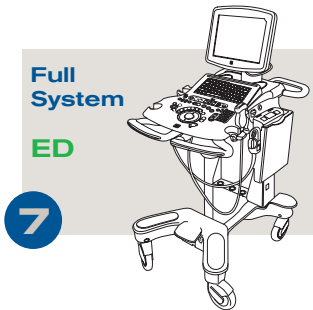


This time, however, we knew our ultrasound volume would be high enough to warrant a full z.one system at the first location (M1) and a SuperCart at the second location (M2). Soon after purchasing this new equipment, we realized we were still being too conservative. We quickly ordered the second scan engine to make two complete z.one systems at both locations.

We're now working on plans to offer ultrasound services at the next two satellites (M3 and M4).

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## Not Just for Satellites



Knowing how well the z.one system met our satellite ultrasound needs, we turned our analysis toward the imaging needs within the hospital and medical center. Although radiology is literally next door to the emergency department, we felt it would be far better patient care to have an ultrasound system within the ED itself. Like all EDs, space is at a premium. Plus there would be many occasions where an ultrasound cart wouldn't fit by a bedside.

The z.one system seemed to be the perfect answer for the ED. After installation, its convertibility and flexibility once again demonstrated its worth. Many times our sonographers are called to the floor for ultrasound exams at the bedside of a patient, especially in the ICU. Pushing a 300-400 pound conventional system to the bedside had been the only option – until the z.one. When the need to go bedside now arises, the sonographers “borrow” the EDs z.one system and either push the light cart to the bedside, or convert it to the premium compact configuration (scan engine).

## Some Lessons Learned

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For the most part, the implementation of satellite ultrasound services went very smoothly. The initial lesson we learned had much more to do with our PACS networking than anything else. Since the z.one system is fully DICOM compliant, we assumed our PACS at OB #1 would just “plug and play.” However, we had some proprietary elements on our PACS which required some additional configurations. This could have easily been resolved up front had we tested out the T-1 line connection with the z.one system before going live. Since that time, we now test any new connections.

It is important to have a partner that also supports their technology with superb sales and service. ZONARE has provided this from the beginning. Even when we had our PACS issue which resulted from our side of the equation, ZONARE sent an engineer out to work with us and get it resolved.

The main key is to look further down the line. Determine how you see expanding your ultrasound services which will enable you to buy the right configuration at the right time. For example, we knew we would eventually want to cover seven remote sites and planned accordingly. It was critical that we standardize the equipment to avoid sonographer confusion and maximize efficiencies. Yet, we didn't want to spend hundreds of thousands of dollars up front.

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## Upgradeable

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As an administrator, I want to be sure I can quickly and economically secure upgrades for my ultrasound systems. Just four months after we installed the first system, ZONARE introduced its first upgrade. It provided clinically significant new imaging, calculations and networking that further advanced our z.one system's performance.

In addition, we were able to download the upgrade over the web. I believe ZONARE is the only ultrasound manufacturer that offers this ability. This helped us tremendously from a time and cost standpoint.



### *Convertible, Flexible, Scaleable....and Economical*

When we look back, we are highly satisfied with the price-to-value ratio we have realized with the z.one system. It is very affordable and reminds us of a puzzle. You buy and fit in the pieces when and where you need them. I don't think we have another piece of capital equipment that provides such an economical approach to growth.

## **Conclusion**

### **Fitting the Pieces Together**

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The keys to successful implementation of satellite ultrasound systems is, first, make sure you understand your long-term goals. Create a vision for growth and determine what makes the most sense to accommodate this growth on an economical basis.

Obviously, image quality is critical as is reliability. Your ultrasound technology cannot sacrifice either. With these criterion met, determine how you can start the roll-out economically and modularly build as your patient volume grows. In other words, determine what the completed puzzle should look like and then decide what piece goes when and where.

At Mercy, we found the z.one ultrasound system and Zone Sonography technology to provide exactly the solution we were looking for in building our satellite and ED ultrasound services. The

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ability to have a Convertible Ultrasound platform that allows you to easily convert between a fully-featured, cart-based system to a premium compact system, gave us tremendous flexibility. This, in turn, allowed us to economically scale our ultrasound services as patient growth dictated. It is a solution we will continue to employ in the future.

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