

Audio/Visual Computing Solution

EmbedTek recently worked with a leader in medical/surgical training and simulation systems to consolidate vendors, reduce costs, simplify lifecycle management, and compete in new markets. We accomplished this by leveraging our embedded systems expertise and our understanding of their market and business needs to invent a single Audio/Visual device their industry had never seen before, and honestly, didn't think was possible.

For years, the Audio/Visual world existed apart from the world of embedded systems. Analog microphones and cameras used different connectors, different standards, and very different ways of delivering power.

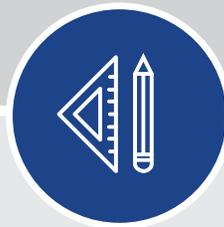
This creates challenges when embedded computers incorporate professional quality audio and visual signals for broadcast, education/training, and surveillance applications. In a typical appliance, multiple external conversion tools are required to create the digital format needed for record and replay, analysis, or further processing. Such was the case in this application.

Our customer is an expert in building review and replay programming into their software solution. If they could consolidate multiple Audio/Visual components into a single package, they would streamline their own manufacturing process and gain a competitive, innovative edge in the market.

Vendor, Component Consolidation

An image capture/encoding appliance accommodating multiple inputs. EmbedTek delivered:

Engineering



They were looking for an image capture/encoding appliance that would accommodate multiple inputs and needed a working prototype in time for an important trade show just 30 days away.

Supply Chain



EmbedTek's task was to review their existing application to first determine if a single unit solution was possible. If it was, in order for the solution to be viable it also needed to fit within software and lifecycle requirements, and work within their demand schedule. Our Design, Supply Chain, and Production teams were up for the challenge.

Outsourced Integration



Designing Under a Deadline

We started with a close look at the separate Audio/Visual sources. First, multiple IP video inputs. The system drew a video signal to provide simulated patient diagnostics. That signal could be analog or digital, depending on the configuration. Again, the previous solution was to use an external video or IP convertor. We leveraged an existing capture device that met the requirements but didn't have the Linux driver support that the customer required for their application.

We were familiar with this capture device and had used it with a different customer. We also knew how to write the necessary drivers and validate them in the system because we had done that before, too. The customer was hesitant to move forward at this point because they weren't confident we could be successful. We not only wrote those drivers, but the high volume capture device lowered the cost of their system.

The audio involved four high quality balanced XLR inputs. The original solution included an audio encoding box with a discrete power supply for the microphone. There are other COTS options available, but we used an EmbedTek-designed 4-port balanced XLR audio board via USB that is 25 percent of the cost, does not require discrete power supply, and it comes with our guarantee of quality and long-term availability.

The existing system also used a powered switch — a separate box that wasn't necessary for networking, but which supplied up to 15 watts to power the multiple Power over Ethernet (PoE) IP cameras. We identified a long life network card with integrated PoE to provide power and connectivity to the cameras without a separate box.

The Goal

Take an existing system, composed of three separate devices from different suppliers, and consolidate them into a single appliance. Oh, and this: deliver a working prototype in less than thirty days for an important trade show.

We said, "Start the clock. We're designing NOW!"



We selected other COTS components such as the motherboard, processor, and storage from EmbedTek's existing supply chain, which passed volume costs, consistent availability, and revision control onto our customer. Our custom chassis design accommodates all the components and optimizes the thermal solution.

The first functional prototype was complete in two breathless weeks. In the end, we delivered two more working prototypes in time for the customer's show.

Result

The resulting solution costs less than \$1,600 and is a design owned by our customer and EmbedTek. The custom components represent less than \$100 and can be applied to other embedded computers without modification. This allows the solution to participate in new computing developments and software releases. The lower cost, easier to install and manage solution is making our customer more competitive in their current market. At the same time, it is opening the door to new markets. In our customer's words, "a Game Changer."

Audio Visual Replay System

Desktop appliance, DIN or rackmount option. Intel 13 processor with onboard graphics. 4 IP video (power over ethernet) inputs plus VGA. Balanced XLR audio with phantom power. Two internal disk drives. Seven year availability.



Consolidating the Supply Chain

The customer engaged EmbedTek with a functional solution involving separate devices from separate vendors. The Sustaining Engineering team responsible for this product knew that if they could consolidate the solution they would be better able to control end of life issues and improve customer satisfaction. Moreover, they knew that if they could lower the overall price point, they could compete in an additional market.

We were positive we could help. EmbedTek offers supply chain management with an eye to both lifecycle management and the functional requirements of the finished product. Here is how we addressed consolidation of the three external input devices:

First, we looked for an integrated solution to replace the external powered switch. Calling on our experience in embedded systems, we were able to locate a long life network card that offered PoE to run the IP cameras. Next, we looked for an analog-to-digital video encoding device to replace an external convertor. We quickly found a solution, but discovered that it lacked the Linux driver necessary to work with the rest of the system. That's where our commitment to design paid off: we were able to deliver our own Linux driver quickly and take advantage of the existing COTS card.

Then we turned our attention to an audio card to replace the external microphone input. There were no COTS cards available with the required 48v phantom power needed for the microphone. Our Design Team created drawings for a custom solution, and received functional samples quickly. This new design is owned by our customer and EmbedTek, so long life and revision control are ensured.

The last challenge was the chassis. EmbedTek designers felt that the combination of small footprint and demanding thermal solution could be best met with a custom chassis. We started with a SolidWorks outline of the footprint requirement and worked to accommodate two disk drives and the necessary boards. The ultimate solution addressed all our needs, and gave us control over the aesthetic design for the initial configuration as well as future versions.

In less than two weeks, we had a completed assembly that consolidated multiple separate devices into a single appliance -- a single SKU that made it easy for buyers to manage. More important, the consolidated product could be offered for less than half the price of the previous solution. That expanded the market by opening new paths to revenue.

Result

A vastly improved product design, pricing that expanded sales opportunities and improved the customer's bottom line, plus a consolidated solution that allowed Sustaining Engineering to focus on other issues.

The Design Process, Priority List.



I/O

Inventory audio, video, and data inputs; then select appropriate hardware considering lifecycle, supply chain, and software support.



Processor

Primary processing requirements determined by the number of HD video streams being processed and recorded by the system.



Connectivity

Professional microphones and cameras have power and connector requirements that are not common in the computer industry.



Packaging

Overall size and mounting requirements, thermal solution, clearance considerations for cable connections.



Lifecycle

The audio sources typically have very long lifecycles; however, capture cards may have much shorter lifecycles.

EmbedTek Operations Capabilities

Realizing the Cost Benefits in Integration

A smaller division of a multi-national corporation had developed a unique replay appliance that could be used in a number of different training situations – even outside the larger organization's training network. The group knew that if they could keep costs down, they would be able to expand their potential sales base, and they might have a chance to become a major profit center.

EmbedTek was able to help them meet these goals by designing an improved product that consolidated multiple boxes into a single unit, reducing the bill of material cost. In addition, this further reduced supplier costs and inventory management cost.

What else could be done?

In this case, the scale of the smaller division and the larger organization were not matched; any integration that took place in-house took on the overhead of the entire group. Additionally, the product scheduling and staffing priorities of the larger organization didn't address the flexible needs of the division. As a result, they couldn't get their small appliance assembled and tested in a timely or cost effective manner.

EmbedTek offers outsourced integration with a very different overhead structure. Our Production Team and our Supply Chain Team work with the customer to implement a flexible demand management strategy. We can be responsive to actual demand (and spikes in demand) while minimizing inventory exposure.

Facility designed specifically for computer integration

- Trained associates, computerized work instructions
- Class 1,000/10,000 Clean Room

Flexible demand management

- Cell-based manufacturing
- Customer-sensitive MOQs
- Forecast/lead time customized to match expected demand profile

Turnkey Integration

- Customer-specific I/O, Image Management
- Integrate customer-specific test fixtures
- Automated electronic testing

Logistics

- Drop ship systems to end user, point of use or stock
- International shipping

Our quality program meshes seamlessly with that of the customer's, and includes a device history record for individual systems. Cellular manufacturing provides flexibility at quantities of one through several thousand, we maintain consistency with computerized work instructions and automated testing. Confident that our systems complemented their own, our customer put a procedure in place for us to drop-ship directly to their end-users. As a result, inventory management costs were eliminated.

It also paved the way to future developments, including private label branding and kitting with other components.

Result

More timely response to end-user demand, greatly reduced inventory cost, and new paths to revenue.

EmbedTek invented a product our customer was hesitant to believe was even possible, in a timeframe that could have seemed impossible as well. By doing so, we built a solid foundation of trust that has led to a true partnership.

EmbedTek designs, invents, and manufactures computers, software, sensors, cameras, and displays for original equipment manufacturers. Our systems improve the quality of imaging in healthcare, simulation programs in the military, video analytics in security, and much more. Throw any challenge at us, from demanding environment and ergonomic requirements to High Level Assembly and nonstandard I/O. We'll evaluate it, carefully attack it, and solve it.