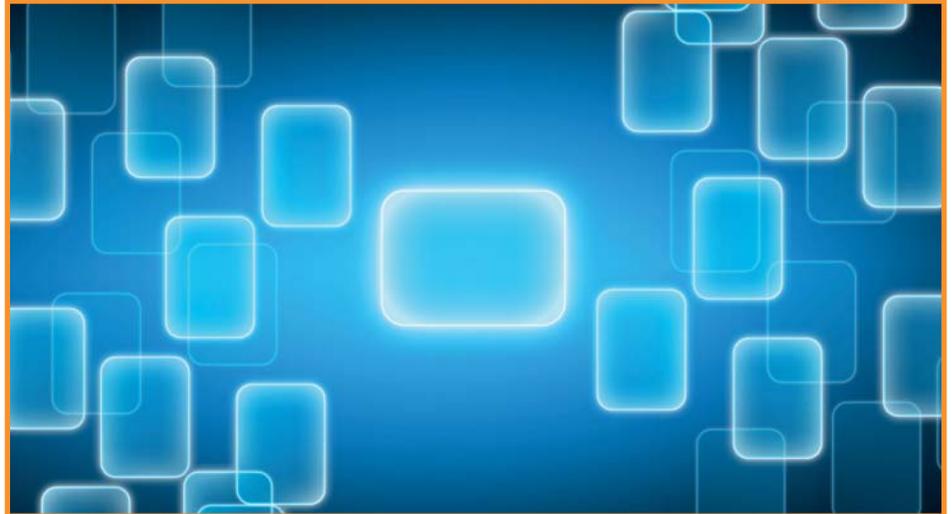




Next Generation Wireless LAN Controllers

A wireless LAN industry leader builds two next generation WLAN controllers: One targeting large Enterprise, and the other targeting SMBs and branches.



CASE STUDY

A leading player in the wireless LAN market, needed to upgrade its WLAN controller portfolio with new platforms targeting different segments of the Enterprise WLAN market. embedUR was engaged to help accelerate time to market, because of our extensive experience with different multi-core processors, wireless chipsets and reference designs, and with porting WLAN software to them.

Line extension for SMBs

Our client had identified growing demand for a small controller for branch offices and small to medium sized businesses, and they needed to fill a gap in their product line, with a more price-competitive platform. As the wireless LAN market matures, it is becoming common practice to use reference designs from the wireless chipset vendors for low-end WLAN controllers and especially for access points. Doing so can reduce cost of development and speed time to market. For this entry-level platform, this seemed an attractive path to follow, especially since almost all vendor differentiation is embodied in the company's own WLAN controller software and not the hardware.

WLAN software and OS port

Because embedUR has a lot of experience with the chipsets and reference platform designs from the major high-performance SoC vendors, the client asked us to help them port an existing mid-range WLAN

controller to a new reference design hardware platform. In addition to bringing up the hardware, the project involved porting the two separate operating systems from a dual SoC legacy platform, to the new lower-cost single SoC multi-core platform.

On the legacy controller, the processor family supported control and data plane forwarding. We merged and optimized the operating systems and the applications and moved them to the new platform and architecture. We also tuned the data-plane to match performance specs for the target market and verified performance in our wireless test lab, using a variety of tools, including IXIA.

In the process of porting the software, we uncovered and fixed several critical bugs in the customers' WLAN software including one important bug in OS kernel. We took complete ownership of delivering a market ready

We keep coming back to embedUR, because they have mature leaders managing projects, and the team has the drive to get it done, whatever it takes.

A.C., Senior Director of Engineering

OBJECTIVE:

Port existing WLAN controller software to new high-end and entry-level platforms to improve price and performance at top and bottom of product family.

SOLUTION:

- Board verification and bring up
- Blade integration with chassis
- Control-plane optimization
- Data-plane optimization
- Port WLAN software and OS
- Comprehensive functional testing
- Performance, scalability testing

RESULTS:

- Beat all scheduled milestones
- Met all functional specifications
- Uncovered and fixed OS kernel bug
- Uncovered WLAN software bugs
- Doubled capacity at high-end
- Entry level shipping in volume
- One code base served both needs
- Small investment, massive ROI

product, by working directly with the customers ODM to create a full system. We also developed and executed a complete test plan to ensure compliance with the functional specifications and interoperability with other controllers and access points in the company portfolio. As a result of porting the controller software from an expensive mid-range platform to this low-cost platform, the client was able to realize substantial COGs savings and increased profitability from a high volume product.

High-end controller blade

At the other end of the product line, the customer needed to boost the performance and capacity of their top-end controller which is a blade for an Enterprise switch. Unlike the entry-level reference design, this was a new custom hardware design equipped with multiple of the latest multi-core SoC processors and utilizing 10 Gigabit Attachment Unit Interfaces (XAUI) for the first time. It required a significant amount of board-level integration with the chassis subsystem. The customer expected double the AP and client capacity of its predecessor along with improved throughput performance from this new blade.

Our job was to validate the board, bring it up, design and implement diagnostic software including data path verification, and port the clients' operating system, drivers and controller software from the existing blade to the new platform. This meant porting the software to run on a completely new hardware architecture. Consequently this required extensive regression testing, so we developed a comprehensive test plan, to validate not only performance and scalability, but also standard WLAN functionality in large scale deployment simulations.

Control and data plane optimization

Our unique experience porting WLAN controller software to multi-core CPUs and optimizing control and data plane performance was a key factor in this project. Beyond the porting efforts, significant control plane and data plane optimization

was required, accounting for almost 30% of engineering time.

We needed to optimize the control plane to massively scale AP and client capacity. It was also necessary to dramatically improve data plane performance to take advantage of higher I/O capacity between the blade and the host system data bus, in order to achieve desired forwarding rates. To that end, we developed a framework that could forward data between multiple SoCs at 10Gbps line rates.

Tough engineering scheduling

One of the complexities of this project was the number of cross-functional teams at the client that we had to collaborate with, in different time zones and geographies. It took extreme endurance, plus painstaking coordination of engineers with the right skills at the right time, to get this done in within the short timeframe of only 9 months from receiving first samples to FCS for the Controller blade and 14 months for the entry-level platform.

On both projects over a period of 18 months, we beat all scheduled milestones, despite customer-induced delays due to code merges from parallel engineering activities from the client's own engineering teams responsible for developing new WLAN features. Both platforms are in production, and the entry-level controller has proved to be a very successful product, shipping in the thousand units per month.

One of the most impressive outcomes was that embedUR enabled the customer to use essentially the same code base to address both the top end and the bottom end of the Enterprise WLAN controller market. Given the relatively small investment in outsourced engineering, compared with the dramatic savings in COGs and increased sales volume, our customers' ROI was spectacular.