

Synopsys and NXP

Multicore Optimization Technology in Platform Architect Enables NXP to Analyze System-Level Performance and Reduce Cycle Time



Platform Architect allows us to define the optimum system architecture supporting all desired application use-cases in a cost-effective way.”

Rene van den Berg

System Architect, Car Entertainment Solutions, NXP Semiconductors

Business

NXP Semiconductor provides High Performance Mixed Signal and Standard Product solutions that leverage its leading RF, Analog, Power Management, Interface, Security and Digital Processing expertise. These innovations are used in a wide range of automotive, identification, wireless infrastructure, industrial, mobile, consumer and other applications.

Challenges

- ▶ Create an executable system model
- ▶ Enhance DAB architecture to support dual input streams or two tuners
- ▶ Analyze and optimize performance for throughput, latency and resource utilization

System-Level Design Solution

- ▶ Platform Architect with Multicore Optimization Technology for early architecture analysis and optimization

Benefits

- ▶ Easily create and utilize performance models of dynamic multicore applications in SystemC
- ▶ Reach optimal performance levels for both single and dual stream modes
- ▶ Analyze and optimize system architecture months before software is available

Overview

As part of their product portfolio NXP produces digital audio broadcasting (DAB) technology for high definition (HD) radio systems such as their SAF3561 digital radio processor used in car entertainment applications.

Performance analysis of a DAB system is challenging because of numerous country specific transmission modes (I, II, III and IV), the multiplex of compressed audio and data sub-channels called a DAB ensemble, and the fact that users can select at runtime which DAB stream sub-channels are processed. While the previous DAB SoC performed well with a single input stream (1 tuner), NXP needed to support dual input streams (2 tuners).

To explore the performance of the complete system, the team needed to model all DAB streaming modes to analyze the problem and identify a solution to correct system latencies (too high) and stop audio frames from dropping out.

For multicore optimization, the NXP team found the key to getting the most from these models was Platform Architect's Virtual Processing Unit (VPU). NXP mapped the performance workload of DAB application tasks onto multiple VPUs to enable task-driven traffic generation. Any instance of a VPU can act as a shared processor executing multiple application tasks or as a dedicated hardware block (e.g. a Viterbi accelerator). This approach enables separation of the application model from the architecture, providing NXP with the flexibility required to explore the mapping and the hardware configuration (e.g., an interrupt signal for control channels or a DMA transfer for data channels).

The SystemC models are instrumented with analysis monitors to measure the performance of the mapped application use-cases on the architecture. This analysis meant the team could: 1) view dynamic aspects by recording detailed traces and aggregate statistical performance information over

a configurable analysis interval, 2) record relevant metrics like system-level end-to-end latencies and corresponding constraints, 3) record at the right granularity/detail to speed-up the analysis process, and 4) correlate hardware performance data with the AUC processes and channels. This enabled the system architect to identify hardware performance bottlenecks (e.g. bus contention with the root cause in the application use-case).

Results

The project was successful. By adding support for dual tuners, NXP is able to lower cost of ownership for digital terrestrial radio by supporting multiple standards and tuner configurations with one IC.

Unlike other tools, Synopsys' Architecture Design solution offered NXP the tools, models and methodology to begin architectural analysis and optimization much earlier in the design cycle while ensuring the ability to avoid over- and under-design.

