SUCCESS **STORY**

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FURUNO and Cadence

FURUNO Electric Reduces Design Time 40% Using AWR Software

FURUNO Electric Co., Ltd., a Japan-based company, manufactures and sells marine and industrial electronic equipment that uses ultrasound and electromagnetic wave sensor technologies. Using radar and GPS as its main technologies, the company has expanded its core business in marine electronics to the manufacture and sale of sea navigation instruments, fishing instruments, and radio communications equipment, including commercial grade radars, sonars, autopilots, VHF, and single-sideband radios.

Key Challenge

Guerilla rain—frequent short, localized rainstorms—and tornadoes have resulted in destruction from house floods, river floods, and mudslides in mountainous areas of Japan. This has motivated FURUNO to shift its focus to weather radar as a new business area. The company believes it can help prevent such natural disasters by using its technology and knowledge acquired over the years from its marine radar products.

Figure 1: FURUNO weather radars

Application

- Signal processing unit for FURUNO weather radars

Software

- Cadence® AWR Design Environment® Software Portfolio, including:
  - Cadence AWR® Visual System Simulator™ (VSS™) communications and radar systems design software

Benefits

- Shortened design time
- Improved productivity

Designed to predict weather and monitor hurricanes and rain fronts, weather radar systems can be large. FURUNO set out to develop a compact, low-cost weather radar system (Figure 1) with flexibility in the signal processing unit to accommodate various potential design changes, incorporating a way to verify the system-level performance by co-simulating the digital and analog sections.

Solution

FURUNO took advantage of the co-simulation capability between the Cadence AWR Design Environment platform, specifically the AWR VSS software, and NI's LabVIEW software to realize the system-level simulation of digital and analog sections together.

The design team used the products' co-simulation capability to call and execute the LabVIEW code from within the AWR VSS software. Designers co-simulated the analog circuits in AWR VSS software and the LabVIEW code by importing the LabVIEW code written by FURUNO's digital engineer for the signal processing unit. This meant the design team could not only verify the performance of the analog section alone, but also verify the system performance, including the signal processing unit. Good agreement was obtained between simulation and measurement.

The entire design flow, including design, prototype, evaluation, and correction of the features and characteristics of the weather radar was done in 40% less time compared to the conventional design approach used with similar new product developments.

FURUNO has high expectations for these co-simulation capabilities, not only for the weather radar, but also for its future design work as well. The company plans to reuse the joint AWR VSS software and LabVIEW methodology for applications completely different from weather radar.

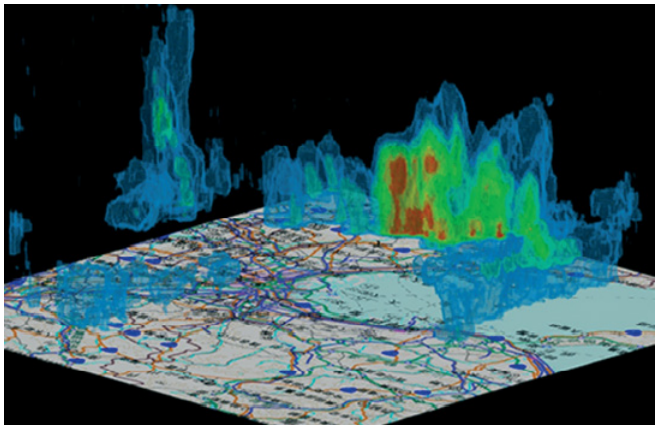

Figure 2: Image acquired by a FURUNO weather radar

> *Compared to a conventional design approach used with similar new product developments, we estimate that we achieved a reduction in development time of more than 40% by adopting Cadence's AWR solution.*
>
> Takuo Kashiwa, PhD
> FURUNO

Conclusion

Until now, there has not been a practical unified environment to perform the simulation of both digital circuits (signal processing unit) and analog circuits. Typically, for this type of RF system, the digital and analog circuits are designed independently and then verified in separate environments.

To improve system performance, the manufacturer must first verify system performance as the metric by designing an analog circuit matched to the manufacturer's unique signal processing unit rather than independently trying to improve the analog circuit performance. Co-simulation of the digital signal processing unit and analog section is necessary to realize this process.

In recognition of this project, PhD student Takuo Kashiwa and Yasunobu Asada from Furuno Electric Co. took home the biggest National Instruments (NI) Engineering Impact Award—Application of the Year.

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