

# OCP-IP News

The Official Newsletter of the Open Core Protocol International Partnership

## Membership Announcements

OCP-IP is proud to announce the following recent members:

**Accent**—Consulting and microelectronics design company that belongs to the STMicroelectronics Group, established in 1993 from a joint venture between STMicroelectronics and Cadence Design System.

**Acculent**—Delivering products focused on digital signal processing with an emphasis on IEEE 802.11 a/b/g standards DSP related simulation tools are offered to compliment intellectual property (IP) offerings.

**Advanced Architectures**—Leading design house specializing in developing customized architectures for customer solutions.

**Beach Solutions**—EDA specialist in IP packaging, integration and re-use.

**Design And Reuse**—Leading Silicon IP / SOC exchange.

**Entropic**—Provider of semiconductor products and system solutions for enterprise and residential broadband communications.

**Flextronics**—Leading Electronics Manufacturing Services (EMS) provider focused on delivering operational services to technology companies (Featured Member on page 5).

**Paradigm Works**—Foundry-independent ASIC/FPGA consulting company.

**Pontificia Universidade Catolica do Rio Grande do Sul (PUCRS)**—The largest Catholic non-profit University of Brazil with over 25,000 students. The Engineering School has over 3,500 undergraduate students and offers several courses on telecommunications, computer science, electrical and electronic engineering matters.

**Silicon & Software Systems (S3)**—Specialized in system-level design and integration in three market areas: communications infrastructure, digital consumer and wireless systems.

**Tower Semiconductor**—Pure-play independent wafer foundry established in 1993. The company manufactures integrated circuits with geometries ranging from 1.0 to 0.18 microns and provides complementary manufacturing services and design support.

**YogiTech**—Independent IC design engineering company. YogiTech offers complete digital and analog design capabilities plus verification, synthesis, test and layout services.

## Upcoming Events

### DesignCon

January 27-30, 2003  
Santa Clara Convention Center  
Santa Clara, California

### Design, Automation & Test in Europe (DATE)

March 4-6, 2003  
Messe Munich, Germany

### Embedded Systems Conference

April 22-26, 2003  
Moscone Center  
San Francisco, California

### Design Automation Conference

June 2-6, 2003  
Anaheim Convention Center  
Anaheim, California

### Mission Statement:

Formed to promote and support OCP as the complete socket standard that ensures rapid creation and integration of interoperable virtual components.



## Letter From the President

Welcome to the second edition of the OCP-IP newsletter. The newsletter is a convenient place for our members to stay updated on the latest activities within OCP-IP.

OCP-IP recently celebrated its first anniversary. The organization has met or exceeded every one of the goals set for its first year and is rapidly approaching the 50-member mark.

A few of our major milestones in the last year include:

- More than a dozen press releases
- More than 25 stories published in various international publications
- Launch of OCP-IP newsletter
- Launch of University Program
- Dynamic trade show program
- Six active Working Groups (WGs)
- OCP Specification, Release 2.0/ early Q1 2003

We are extremely pleased with the progress we've made as well as the industry support we have received. This support validates the need for OCP and the value that OCP-IP brings to its members. We look forward to even greater achievements in the coming year.

We hope you find this newsletter format useful and convenient. However, we are always looking for ways to improve. Should you have suggestions on how we can better tailor the newsletter to meet your needs, contact me by sending a message to [ian@ocpip.org](mailto:ian@ocpip.org).

Sincerely,

*Ian Mackintosh*

Ian Mackintosh  
President, OCP-IP

## Working Groups: Reports and Updates

### Specification WG

The Specification WG has been hard at work preparing for the anticipated Q1 2003 release of the OCP Specification, Release 2.0. This work has involved collecting, discussing, revising and agreeing upon updates to the Specification in seven major areas, which were reported last month. New progress includes the creation and agreement upon an integrated draft of the OCP Specification, Release 2.0, which will be released to the membership for review before the end of 2002. The proposed enhancements have been reviewed by the GSC and Sponsor Members and revised based upon their comments. The WG looks forward to feedback from the membership and anticipates standardization early in the first quarter of 2003. ■

### Memory Semantics WG

The Memory Semantics WG has been participating in reviewing and approving the 2.0 Specification work. ■

### Functional Verification WG

The Functional Verification WG continues to work with vendors and OCP-IP members desiring to introduce more new OCP-IP verification products in early 2003, supporting both the 1.0 and 2.0 OCP Specifications. ■

### Technical Vision WG

This group is charged with plotting the future plans and direction for the OCP Specification. The Technical Vision WG played an important role in the proposed enhancements to the OCP Specification, Release 2.0. Once the 2.0 Specification has been released, the group plans to focus its attention to future editions/enhancements to OCP farther in the future and review opportunities for new OCP-IP member products and services. ■

### MWG

The Marketing Working Group (MWG) is one of the most active groups within OCP-IP. The group has been hard at work ensuring the on-time publication of press releases and articles, managing the logistics for all trade shows and playing a key role in the launch of the OCP-IP University Program. The group has been incredibly productive and the fruits of its labor are clearly evident.

Through the work of the MWG, it is clear that OCP-IP's message is being well received both in the press and throughout the industry. The MWG is encouraged by the amount of interest it has seen as companies have understood the benefits of a universal socket as opposed to a bus-specific interface. The MWG expects to see continued escalation of interest and is excited by the opportunities the future presents. ■

# Why join OCP-IP?

By Pete Cumming  
Architecture/SOC Manager, Texas Instruments

To understand the motivation for joining OCP-IP, it might be helpful to explore why TI's industry-leading wireless business helped found the organization and adopted the Open Core Protocol. There are two parts to the answer: one is technical, and the other is organizational.

On the technical side, the fact is that TI needs a standard IP core socket, not a bus interface. A socket - that good old concept that brought board designers close to what is now seen as the unreachable SOC goal of "plug and play" - encapsulates all the parts of a core that allow it to talk to the rest of the chip. They don't limit themselves to the data flow as do traditional interfaces. The OCP socket includes reset, interrupts, DMA and other parts of the system's "control plane" that SOC designers spend so much time verifying and debugging. OCP was designed to be a socket, not an interface, and as it evolves OCP will continue to offer all the benefits of abstraction and verification support that sockets bring.

By including more of the IP core's functionality into the standard, OCP-IP makes it much easier to bring in third-party designs from the growing ranks of members whose products are OCP-compliant. Availability of OCP-compliant, third-party IP cores improves TI's time-to-market for chips assembled out of internally and externally sourced blocks. The tools from OCP-IP's EDA partners are also much more useful to us when they include the full socket rather than just

dealing with reads and writes on a bus interface.

OCP's semantics are rich, meaning that IP designers at TI or elsewhere find it easy to use OCP as a native design target without compromising performance or time-to-market. These same rich semantics mean that TI can easily and cost-effectively "bridge" the data flow part of OCP to less advanced interfaces.

Organizationally, TI, Nokia, MIPS, UMC and Sonics, have shaped OCP-IP into a democratic organization where the standard is owned by its members. We have an organization similar to the successful PCI-SIG. It is administered by an independent body and governed by a board of leading adopters. The technical direction and timing of the specification's evolutions are driven by this group and the other OCP-IP members who wish to contribute.

Our success in attracting new members from across the industry shows TI's desire for a comprehensive socket standard, owned and driven forward by its adopters as it is vital for the future of complex SOC designs. TI and its partners in OCP-IP are exploiting this critical mass of members to ensure that OCP-based SOC design and verification, at all levels of abstraction and complexity, delivers a step function improvement in efficiency, quality and time-to-market.

Won't you join us? ■

## On the Web at [www.OCP-IP.org](http://www.OCP-IP.org)

Some of the recent enhancements to the OCP-IP Web site, [www.ocpip.org](http://www.ocpip.org), are:

- Downloadable OCP-IP E-Kits, which include various pieces of collateral assembled for different audiences ([www.ocpip.org/about/ekits](http://www.ocpip.org/about/ekits))
- A page featuring OCP-IP members, their products and services ([www.ocpip.org/membership/list](http://www.ocpip.org/membership/list)). If you are an OCP-IP member and would like to be linked on this page, please contact us at [admin@ocpip.org](mailto:admin@ocpip.org).

- Design And Reuse IP Catalog link on the OCP-IP Related Resources page ([www.ocpip.org/socket/resources](http://www.ocpip.org/socket/resources)). Search D&R's IP directory directly from the OCP-IP Web site!

The Members Only section remains available for information for members. If you have not yet requested your login information, you may do so at [www.ocpip.org/kmembership\\_info/person\\_signup](http://www.ocpip.org/kmembership_info/person_signup). Members of OCP-IP may make suggestions for improvements to the Members Only section by sending an email to [admin@ocpip.org](mailto:admin@ocpip.org). ■

# Open Core Protocol International Partnership Celebrates One-Year Anniversary

On December 3, 2002, the Open Core Protocol International Partnership (OCP-IP) celebrated its one-year anniversary. We are proud to say that OCP-IP has met or exceeded every one of its first year goals set at the launch of the organization. The fact that we were able to accomplish so much in such a short time is proof of wide industry support and the need for a complete socket standard that everyone can use, no matter what their on-chip architecture is or whose processor cores they are using.

Several of the major accomplishments of the past year include: a membership roster rapidly approaching the 50-member mark, 25 articles printed in various worldwide publications, more than a dozen press releases, the kick-off of a University Program, a highly successful trade show and conference program and six active Working Groups (WGs) covering marketing, technical vision, specification, system-level design, memory semantics and verification.

One of our most widely noted achievements this year was the development of a SystemC modeling methodology for OCP-based SOCs. Nokia, Texas Instruments, Sonics and Synopsys are publishing an application programming interface (API) specification and example models that enable OCP users to utilize best-in-class SystemC design and verification methodologies. Designers of complex systems-on-chips (SOCs) can now create SystemC models for OCP-compliant components.

Typically, trade organizations take several years to see the growth that OCP-IP has enjoyed over the course of the past year. Even in difficult economic times, OCP-IP has seen its membership base expand rapidly. OCP-IP offers tremendous return on investment (ROI) to its members by providing the tools, training and technical support necessary to quickly make IP cores OCP-compliant and ready for rapid SOC integration with other third-party IP.

Member companies have recognized the tremendous value of OCP as the only open, proven, non-proprietary, complete and fully supported standard, maintained and evolved by coordinated efforts of industry leaders. Member companies receive complete documentation including technical and reference manuals, datasheets, white papers and tutorials, eliminating the need to document and maintain their own standard. OCP-IP's CoreCreator software has an easy to use GUI and facilitates streamlined and automated OCP validation and IP packaging ensures reuse without redesign. They also recognize the value of the vast infrastructure they receive access to when joining the organization.

Our Governing Steering Committee (GSC) and WGs have been extremely active and achieved amazing results over the past year. Through the efforts of these groups, OCP-IP anticipates the release of the OCP Specification, Release 2.0 in early Q1 of 2003.

The enhanced specification will include:

- A model for write transfers model—provides for precise end-to-end-responses
- Enhanced burst model—provides both burst length and packet style transfers
- Support for specification endianness
- Support for user-defined in band command data and response extensions
- Even lighter weight OCP interfaces with read only/ write only/FIFO style IP cores
- Support for lazy memory synchronization
- Set of protocol parameters added to optionally tighten the semantics of SThreadBusy and MThreadBusy

OCP-IP thanks everyone who has helped make this year so successful. We look forward to even greater achievements in the future. For more information on the success of OCP-IP's first year, visit [www.ocpip.org](http://www.ocpip.org). ■

# OCP-IP Compliance for A2 Cores

By Roger Thorpe  
CEO, Advanced Architectures

As a leading design house specializing in customized architectures for client solutions, Advanced Architectures must be able to offer connections to and from industry standards so that third-party intellectual property (IP) can be readily incorporated into our architectures.

After considerable research, we felt that the OCP offers the most attractive standard in today's marketplace, as it is accepted across a broad spectrum of product developers. This maximizes IP available to us and allows us to offer our products to a larger audience.

In order to speed the time-to-market we have developed a number of fundamental IP cores that allow our customers to pull from a "tool-chest" of pre-built modules to create the core architecture of their system. This allows them to concentrate on their own core competencies and establish maximum product differentiation while shortening development cycles.

We are developing OCP veneers for our products and began with our simplest bus product. Converting the existing bus protocol to OCP basic took only a few hours, and we expect similar ease to provide fully featured connectivity to our entire product line. The first release of our OCP offerings will begin in the first quarter of 2003.

Further information about A2 can be found at [www.a-2.com](http://www.a-2.com) or by phoning +1 949 856 3486 or emailing [info@a-2.com](mailto:info@a-2.com). ■

## OCP-IP University Program

OCP-IP is proud to highlight our University Program. The program is specifically designed to avoid the budget constraints experienced by universities. If you are interested in learning more about our program, please contact us at [admin@ocpip.org](mailto:admin@ocpip.org). ■

## Featured Member: Flextronics

In today's technology-driven economy, market demand and globalization are driving changes that require companies to be faster and more responsive than ever before. Increased competitive pressures are shortening product lifecycles, making it imperative that OEMs continuously release new products to maintain their market share and margins.

Understanding the need for a truly open, non-proprietary industry standard socket interface that everyone can use, no matter what their on-chip architecture is, or whose processor cores they're using, Flextronics has chosen to support OCP-IP's mission by becoming a Governing Steering Committee (GSC) Member of the organization.

Flextronics will use OCP to provide technology companies with highly efficient and flexible operations that are necessary to maintain a com-

petitive advantage and react to market changes quickly.

As a GSC Member of OCP-IP, Flextronics Semiconductor will take an active role in the partnership's working groups and participate in developing enhancements for future generations of OCP.

Flextronics is headquartered in Singapore and is a leading Electronics Manufacturing Services (EMS) provider focused on delivering operational services to technology companies. With approximately 95,000 employees, Flextronics is a major global operating company with design, engineering, manufacturing and logistics operations in 29 countries and on 5 continents.

For more information on Flextronics, visit [www.flextronics.com](http://www.flextronics.com). ■

# White Paper for SystemC Based SOC Communication Modeling for the OCP Protocol

By Anssi Haverinen, Nokia; Maxime Leclercq, Texas Instruments; Norman Weyrich, Synopsys; and Drew Wingard, Sonics

This paper outlines a conceptual framework for modeling communication in complex systems in various layers of abstraction. It aims to provide a methodology and re-usable concepts for SOC hardware-software co-development. It promotes “system-level” modeling and design as an essential component of SOC design flow. The principles presented for abstracting data and control flows are generic and can be used to express both function and performance of the various hardware and software components implementing a given system. These principles can be implemented with various event-driven modeling languages. To present a practical application for these concepts, we will use Open Core Protocol for hardware communication framework and SystemC for modeling language. Open Core Protocol provides a rich, configurable protocol set, which is completely bus-independent and can express a large variety of hardware communication behaviors. SystemC provides an easily extendable language platform, which can model all the abstraction layers proposed.

The first section gives a brief overview to the motivation for our work and an overlook to the basic concepts. In particular it defines the different communication abstraction layers. The second section gives detailed requirements for each communication abstraction layer. The third section presents an API for a generic point-to-point communication channel. This channel implements the communication between two modules, where a module is an Initiator or Target or both. The channel is generic in the following aspects:

- No assumptions on the communication protocol between the two modules are being made. The channel just implements the communication; the protocol must be implemented in the modules.
- The same channel can be used at different abstraction layers.

Note that the API described in this section is under development and may change in later releases. However it is included to help outline

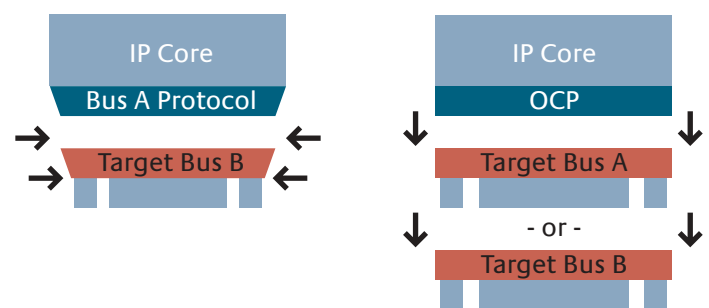
our ideas for better understanding of the scope of this proposal.

The reason for pursuing standards for SOC communication modeling is that the plethora of more or less proprietary methodologies used in system-level modeling and executable specifications does not foster re-use of abstract models or even development of novel system-level EDA tools. Various useful methodologies and tools have sprung up for tasks such as interface synthesis, real-time performance estimation, low-level driver generation, executable specification and hardware-software co-simulation, but they share little in modeling methodology. Also, moving from one abstraction level to another is often cumbersome, due to the lack of overall communication modeling strategy. Verification and performance analysis often become bottlenecks

(continued on page 7)

## Open Core Protocol (OCP) Visual Model

### Core-Centric vs. Bus-Centric



#### Bus-Centric Protocol Interfaces:

- Bus configuration assumptions for a native interface limit IP Core features—AND—eliminate or limit capabilities in successive bus structures
- Do not address ALL core communication
- Sideband Control and Core Test are not addressed

#### OCP is a Core-Centric Protocol:

- Facilitates unrestricted delivery of ALL core signals and features
- Enables unconstrained interface bridge to ANY bus structure

## White Paper (continued from page 6)

with complex embedded systems. The methodology and modeling concepts described here are an attempt to make the link between the up-front architecture exploration and the implementation. System-level design with a scalable range of abstract models is opening new possibilities for improving design cycle and enhancing the overall quality of the designs.

The largest hurdle in SOC integration has been a lack of hardware interconnect standard. It is not practically feasible for the system architect to support and exercise all possible bus and on-chip network architectures when defining and benchmarking a new system. The OCP interface standard lowers this hurdle, since it isolates interconnect from interface, making possible the use of only one set of transactions that are independent of the selected interconnect architecture. It provides a universal view from a socket to another, and modeling the communication pipe between them by a transaction channel enables the architect to quickly exercise and validate new design partitioning.

Another hurdle, almost as severe, is a mental one. So-called system-level modeling languages and environments often concern themselves too much with RTL implementation, neglecting full support for above-RTL analysis. This strategy backfires as RTL methodology is well established and can be improved only incrementally. The biggest gains in SOC design can be achieved in specification phase, by giving designers tools for quick trade-off analyses and functional experiments. Although such tools do exist, few offer reusability of high-level models and test cases with implementation models disconnecting specification from implementation and verification. In our experience, SOC design organizations appreciate most single source and verification reuse. What they abhor is re-writing the same behavior for specification, implementation and verification. We define single source as follows: A certain behavior is defined only once, but more details can be added or behavior can be refined during the design process. More useful, and maybe much more productive method, is to allow mixing abstraction layers in simulation instead of forcing re-implementation of code. An example of the latter is typical DSP ASIC design method, where a high-level model and its test environ-

ment are built in a signal processing simulation tool and implementation and its test bench are re-coded in VHDL or Verilog environment. In the "single-source" method as loosely defined here, the high-level model can still have C-core, but its interfaces are expressed with our high-level transactions. The RTL model uses OCP interfaces. This makes both the test benches and the core models interchangeable and interoperable. Thus, the single-source does not mean that the RTL code must be automatically generated from the golden model C-code, but all behavior (including tests) can be defined with the methodology, which suits the problem best and the various models can be mixed and matched, and system-level tests need not be redesigned for RTL level.

At the early stage of the specification, the architect using SystemC and appropriate communication layers can refine his system while keeping a close link with the implementation. The interoperability given by OCP and its model with different layer of abstraction allow simple hand-off between the architects and the designers.

Our target is to present layers of communication abstraction that can be used for all modeling purposes. The abstractions are selected so that they naturally support the roles of various organizational units doing different aspect of SOC and embedded software design. ■

To view the white paper in its entirety, visit [www.ocpip.org/socket/whitep](http://www.ocpip.org/socket/whitep). The models will be available in Q1 of 2003.

Another article has been written about SystemC and OCP, titled StepNP: A System-Level Exploration Platform for Network Processors, and is posted on the OCP-IP Web site with permission of [IEEE Design & Test Computers](#). To view this article, visit [www.ocpip.org/pressroom/articles](http://www.ocpip.org/pressroom/articles).

# Recent Publications

All available in the OCP-IP Press Room at [www.ocpip.org/pressroom](http://www.ocpip.org/pressroom)

## Press Releases

**9 December, 2002**

Open Core Protocol International Partnership Celebrates One-Year Anniversary

**2 December, 2002**

Acculent, Advanced Architectures, Paradigm, S3, and YogiTech Join Open Core Protocol International Partnership

**25 November, 2002**

Accent Joins Open Core Protocol International Partnership

**25 November, 2002**

Verisity Joins Open Core Protocol International Partnership in Support of Standard Socket for SOC Design

**4 November, 2002**

Tower Semiconductor Joins Open Core Protocol International Partnership

**15 October, 2002**

Synopsys and OCP-IP Members Jointly Develop SystemC Modeling Methodology for OCP-Based SOC Design

## Articles

**November-December 2002**

StepNP: A System-Level Exploration Platform for Network Processors—IEEE Design & Test Computers

**21 October, 2002**

SystemC modeling team aims for open-core SoCs—EE Times

## White Paper

**14 October, 2002**

SystemC Based SOC Communication Modeling for the OCP Protocol

## Presentation

The Role of Sockets in Platform Based Design: A Case Study of the OMAP Platform Presented by Texas Instruments at the IP Based SOC Design 2002 Workshop & SOC For a Connected World in Grenoble, France October 2002



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