# Benchmarking the OpenCloud SIP Application Server on Intel®-Based Modular Communications Platforms

## Executive Summary

Application servers are vital to the success of IP Multimedia Subsystems (IMS) since they provide value-added services such as Click2Dial, Push-to-video and other session-based or IM/location-based services. Therefore, the readiness of the application server is critical to future IMS deployments.

In 3GPP*, three types of application servers have been identified within the IMS framework — the Session Initiation Protocol (SIP) application server, the OSA application server and the CAMEL application server (IM-SSF). Currently, the SIP application server is the predominant solution. Most vendors of SIP application servers choose their products based on the JAVA* platform, which is mainly due to the robust work of JAIN, a series of JAVA/IP communication standards such as SIP Servlet and Service Logic Execution Environment (SLEE).

But, in the past, the JAVA-based solutions have had a reputation for poor performance (throughput and latency) which could be deemed as unsuitable for carrier usage. This paper presents the results of the JAVA-based OpenCloud Rhino* SIP Application Server running on Intel®-based Modular Communications Platforms.

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# Introduction

Advanced Telecom Computing Architecture* (AdvancedTCA*) is a series of industry-standard specifications for the next generation of carrier grade communications equipment. As the largest specification effort in PICMG's* history and with more than 100 companies participating, AdvancedTCA incorporates the latest trends in high-speed interconnect technologies, next-generation processors, and improved reliability, manageability and serviceability, resulting in a new blade (board) and chassis (shelf) form factor optimized for communications. AdvancedTCA provides standardized platform architecture for carrier grade telecommunication applications, with support for carrier grade features such as NEBS, ETSI, and 99.999% availability. AdvancedTCA is a hardware platform intended to specify pieces that meet requirements common to a large fraction of telecom network elements. This platform is designed to address the data plane as well as the control and application planes.

SIP Application Servers deliver three key benefits to service providers:

- Faster application development
- Reduced cost
- Enables more user-friendly interfaces for the end customer

SIP application servers work within the IMS architecture to enable operators to seamlessly develop and deploy new value-added services. Using an off-the-shelf application-ready platform to deploy the servers enables quicker, more cost-effective implementation of new service offerings. Figure 1 illustrates the major components of Modular Communications Platforms (MCP), which support standards such as AdvancedTCA, Carrier Grade operating system and Service Availability Forum* interfaces.

To test the SIP performance of a SIP application server, Intel configured IPtel SER*, a free SIP proxy product, to act similar to a CSCF (with regards to the ISC interface). It is not completely identical to the CSCF and the resulting application server performance may differ from an actual production environment.

The OpenCloud Rhino SIP Application Server served as the system under test. The Rhino SIP Application Server product is based on event driven technology from OpenCloud, an independent software vendor and general member of the Intel® Communications Alliance that has worked in the Intel® MCP Solution Labs in Beijing. It was tested as both a single SIP server and as a real SIP application server with different models (b2bua/proxy). In addition, a real application from OpenCloud-Find Me Follow Me services was tested.

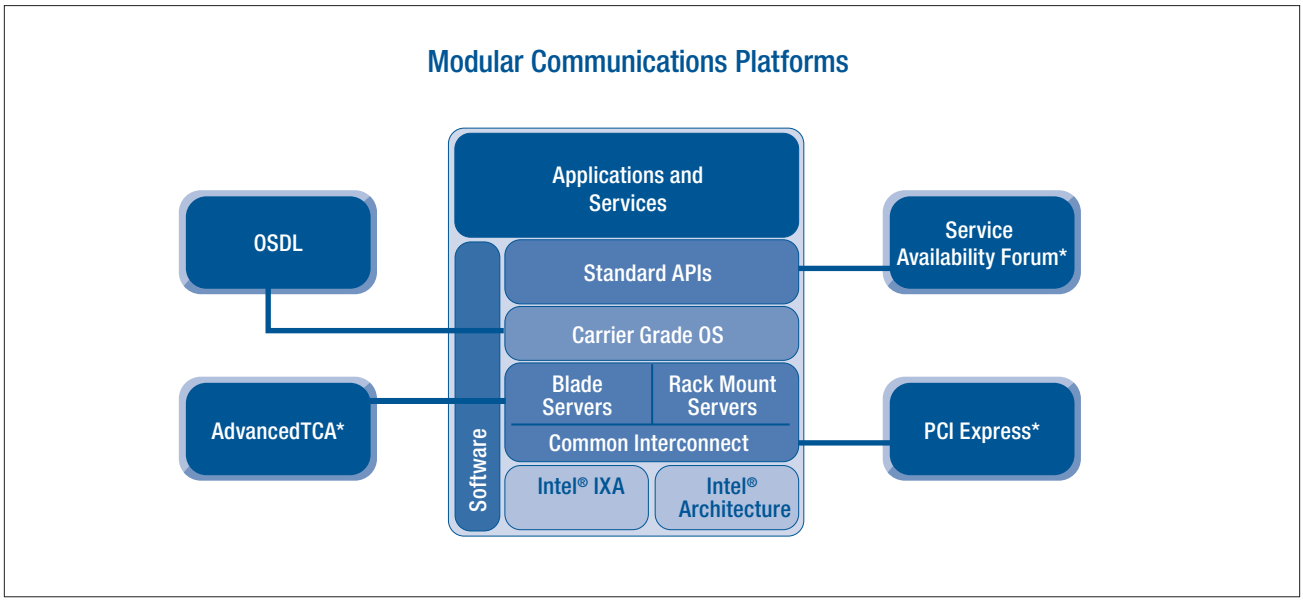



**Figure 1:** Modular Communications Platform components

# Intel and OpenCloud Collaboration

## IMS and Application Server

The delivery of IMS through a standards-based hardware architecture promises to change the way next-generation networks are built and expanded. The IMS services architecture is a unified architecture that supports a wide range of services enabled by the flexibility of SIP. IMS architecture can support multiple application servers providing traditional telephony services and non-telephony services such as instant messaging, push-to-talk, video streaming, multimedia messaging, etc. Therefore, as the service providers differentiate themselves via the services deployed, the application server is a very important component of IMS.

## OpenCloud Event Driven Application Server

Rhino is a suite of open telecommunications products from OpenCloud which includes SIP, Diameter, IP Multimedia – Services Switching Function (IM-SSF), and Service Capability Interaction Manager (SCIM). At the core of the Rhino product suite is an SLEE platform that is fully compliant with JAIN SLEE. The JAIN SLEE specification, as specified in JSR022 and JSR240 of the Java Community Process*, is the most commonly accepted standard for Event Driven Application Servers.

The JAIN SLEE specification has been shown to be mature and is in network deployments with global wireless operators. With the arrival of JAIN SLEE, operators now have a standard execution environment that can provide all the elements needed for network independence and portability of services.

The OpenCloud Rhino JAIN SLEE compliant implementation is also built to take full advantage of the AdvancedTCA platform. The combination of Rhino and AdvancedTCA enables:

- Customer's scaling requirements to be met. System scales dynamically and linearly as blades are added.
- Simple deployment and maintenance. Single environment for flexible telecommunications capability.
- Coordinated single-image system management that meets 99.999% system availability and integrates with existing management systems.
- Hot-swap modular hardware and software, for online maintenance and upgrades (hardware and software).
- Reduced system implementation cost allowing innovative services to be built rapidly and reliably.
- A low barrier to entry for a tool that builds carrier grade convergent systems in IMS, Intelligent Networks (IN), Billing, IM-SSF, SCIM and others.
- An open, standard environment for telecommunications services that is transparent to programmers and operators and supports off-the-shelf network-enabling components (hardware and software).

## Optimizing IMS Solutions with Intel

Intel MCP Solution Labs are dedicated to testing and validating the interoperability of Intel® products and platforms for communications with complementary third-party hardware and software products. The goal is to enable quicker delivery of integrated platform solutions based on open standards by collaborating with customers, and a large community of developers and solution providers. The labs also help further enable Intel-based modular communications platforms in the marketplace and provide an environment where developers can integrate, validate and demonstrate their solutions running on telco server proof-of-concept platforms. An IMS framework has been implemented for use within the three Intel MCP Solution Labs.

# Testing Architecture

## Hardware

- 1 AdvancedTCA Chassis
- 1 ZNYX ZX7000* Switch
- Intel NetStructure® Single Board Computers

The tests were performed on Single Board Computers listed in Table 1.

## Software

- Operating system: Red Hat AS4* 32-bit
- Protocol stack/RFC standards: RFC 3261
- Operating system/driver optimization: None
- BEA JRockit*
- Applications: Rhino 1.4.1
- Database: PostgreSQL–7.3.9-2*

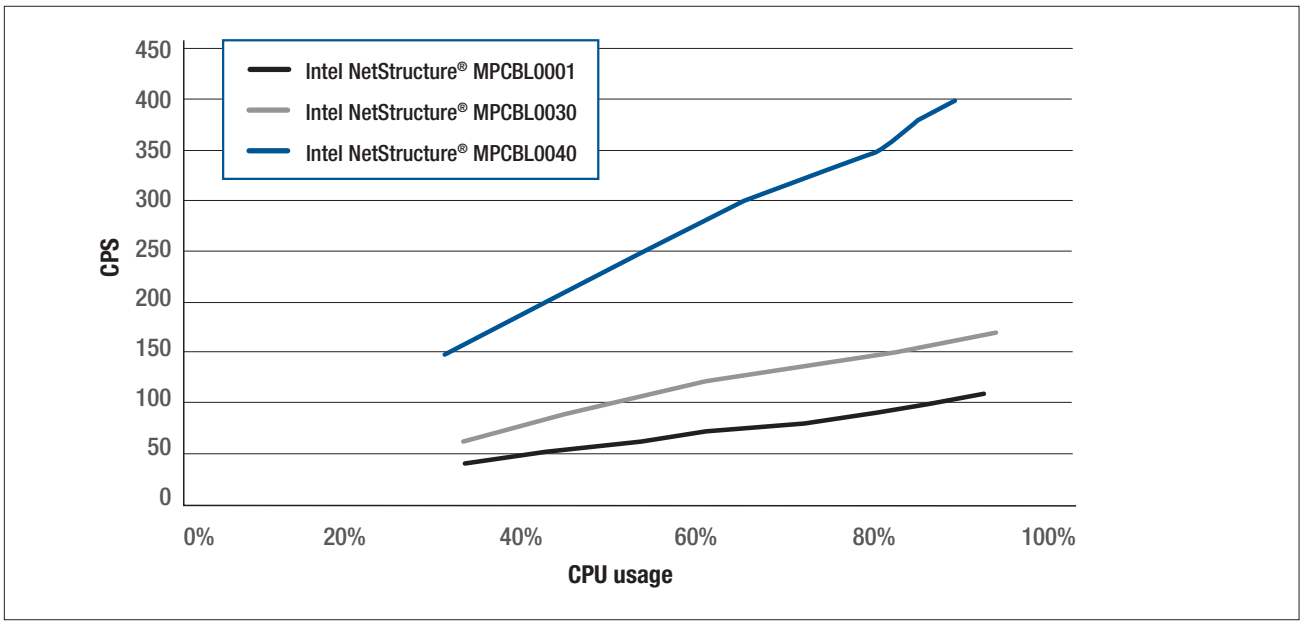
**Table 1:** Single Board Computers and their configurations used in the tests

| SBC | OS | Memory | Processor |
|---|---|---|---|
| Intel NetStructure® MPCBL0001 | 32-bit Red Hat Advanced Server* (AS) 3.0 update 3 | DDR 266 4 GB | Dual Low Voltage Intel® Xeon® processors (2.0 GHz), with Hyper-Threading Technology† |
| Intel NetStructure MPCBL0030 | 32-bit Red Hat AS 3.0 update 3 | DDR2 400 4 GB | Dual Low Voltage Intel Xeon processors (2.8 GHz), with Hyper-Threading Technology |
| Intel NetStructure MPCBL0040 | 32-bit Red Hat AS 3.0 update 3 | DDR2 400 4 GB | Dual Dual-Core Intel Xeon processors LV 2.0 GHz |

## Test Details

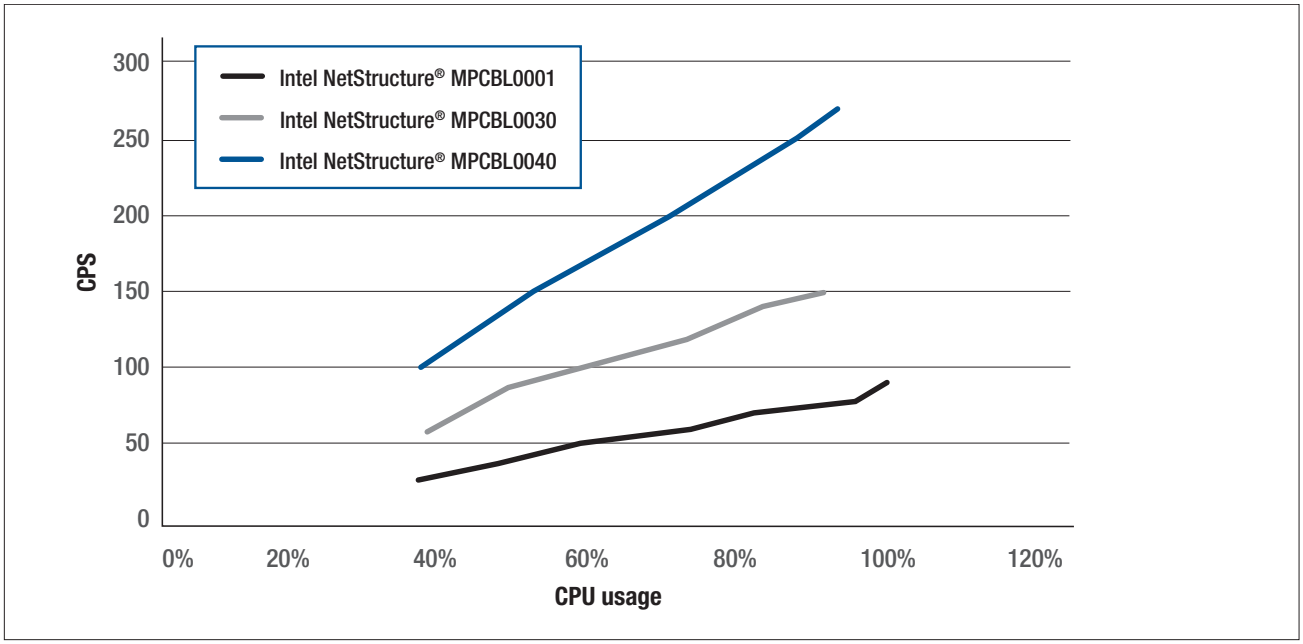
### Test Case I – Rhino as a proxy

In this scenario, the Intel NetStructure MPCBL0030 showed about 150+% performance improvement over the Intel NetStructure MPCBL0001, and the Intel NetStructure MPCBL0040 showed up to 200% capacity improvement over the Intel NetStructure MPCBL0030.



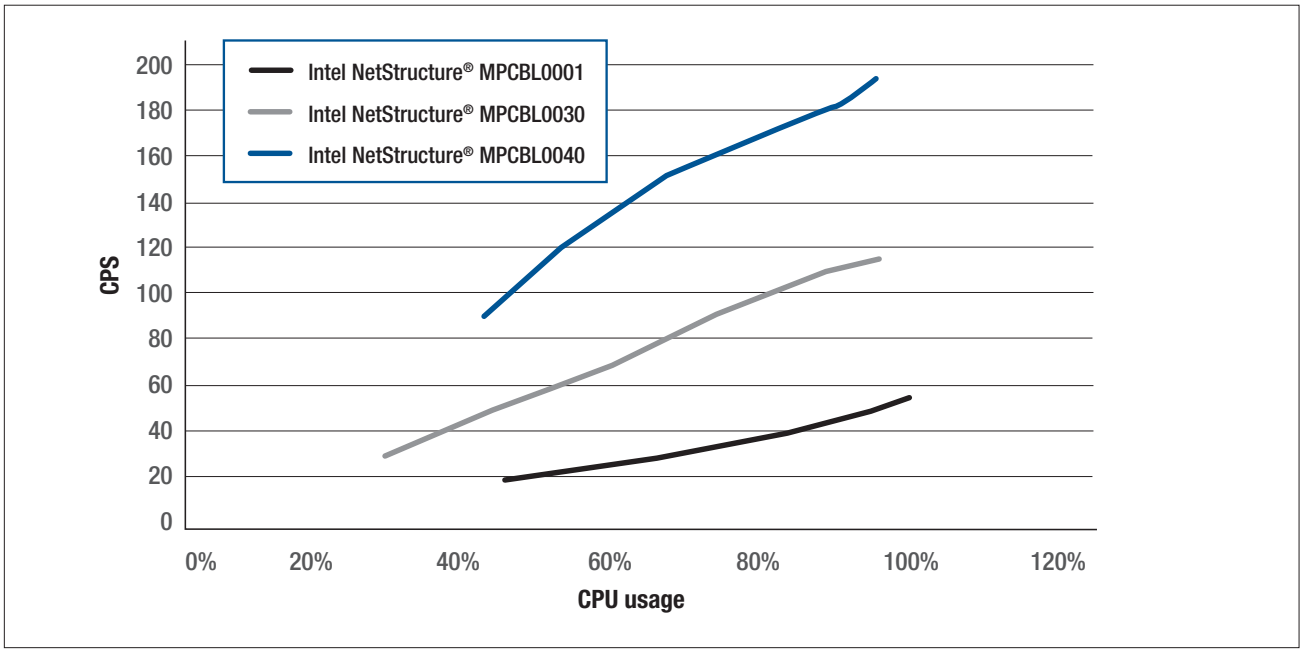
## Test Case II – Rhino as a b2bua

In this scenario, the Intel NetStructure MPCBL0030 showed about 150+% performance improvement over the Intel NetStructure MPCBL0001, and the Intel NetStructure MPCBL0040 showed up to 150% performance capacity improvement over the Intel NetStructure MPCBL0030.




## Test Case III – Find Me Follow Me Service

In this scenario, the Intel NetStructure MPCBL0030 showed about 200% capability improvement over the Intel NetStructure MPCBL0001, and the Intel NetStructure MPCBL0040 showed up to 150% capability improvement over the Intel NetStructure MPCBL0030.



## Next Steps

The work within the Intel MCP Solution Labs is ongoing. Further testing will occur as more IMS components become available. Examples of possible future tests include:

- When the latest OpenCloud Rhino version 1.4.2 is available, run benchmark tests to show the significant gains in performance both in the core platform and in the SIP stack.
- Measure linear scalability across both processors and blades in the AdvancedTCA platform.
- Measure the following: performance of other products in the OpenCloud Rhino suite, such as those for IM-SSF, SCIM; Diameter performance; and interoperability testing with other vendors' products.
- Optimize OpenCloud Rhino for BEA JRockit

## Key Results and Summary

After running the performance studies, the results showed that:

1. OpenCloud Rhino running on the Intel NetStructure MPCBL0030 showed more than 150% SIP capacity improvement over the Intel NetStructure MPCBL0001, even reaching up to 200% improvement in one test case.
2. The Intel NetStructure MPCBL0040 showed about 150% performance capacity improvement over the Intel NetStructure MPCBL0030.

In summary, there are significant performance gains that can be realized as solutions are upgraded and optimized to the latest AdvancedTCA products from Intel.

Through collaboration with the Intel MCP Solution Labs, OpenCloud has been able to benchmark[1] its solution with future opportunity for application tuning and optimization.

## Acronyms and Terms

| | |
|---|---|
| AdvancedTCA | Advanced Telecom Computing Architecture |
| CSCF | Call Session Control Function |
| IM-SSF | IP Multimedia – Services Switching Function |
| IMS | IP Multimedia Subsystem |
| ISC | IMS Service Control |
| JAIN | Java Advanced Intelligent Network |
| MCP | Modular Communications Platform |
| POC | Proof of Concept |
| SCIM | Service Capability Interaction Manager |
| SBC | Single Board Computer |
| SEL | System Event Log |
| SIP | Session Initiation Protocol |
| SLEE | Service Logic Execution Environment |

## References


- PICMG (PCI Industry Computer Manufacturers Group) V3.0, http://www.picmg.org/newinitiative.stm
- 3GPP IMS (IP Multimedia Subsystem) standards
- IETF SIP RFC suites

# Company Information

## About OpenCloud

OpenCloud was formed in New Zealand in 2000 to create open standard software technology that would revolutionize the portability and interoperability of services in telecommunications specifically in the evolution to IP and 3G IMS. The company was founded on the vision that the use of Java in telecommunications would stimulate innovation, interoperability and simplicity in telecommunication systems. OpenCloud works with partners to deliver, integrate and support end-to-end solutions incorporating OpenCloud products to global network operators and service providers. OpenCloud has representatives in Cambridge, UK; Wellington, New Zealand; Madrid; Tokyo, Japan; and San Francisco.

**More information is available at www.opencloud.com.**

## About Intel

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[1] Intel and Open Cloud performed the SIP Application Server tests in May 2006.

[†] Hyper-Threading Technology requires a computer system with an Intel® processor supporting HT Technology and a HT Technology enabled chipset, BIOS and operating system. Performance will vary depending on the specific hardware and software you use. See www.intel.com/homepage/land/hyperthreading_more.htm for additional information.



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