

# What You Should Know: Intel® Cache Acceleration Software (CAS) and the New Open CAS Project

## Open Source Projects versus Products

“Open source” software is a term that is widely used in the IT industry. However, when it comes to actually using open source software in real life, there are often assumptions made that significantly impact a company’s ability to use, support, and succeed with the software. Intel participates with software source code contributions across a wide-variety of community driven projects, including Linux\* kernel, KVM/QEMU\*, Hadoop\*, Spark\*, Ceph\* and many, other community projects. In addition, Intel supports its own open source projects and products derived from the open source.

The purpose of this paper is to explain the differences between using two particular open source efforts that Intel is driving to modernize the caching layer of the open source industry. The goal of Intel’s investment in caching is to enable a quick and easy way for OEMs, cloud service providers and end-users to deliver solutions that benefit from the new Intel® NVMe\* SSDs, especially Intel® Optane™ technology-based SSDs. There are two caching solutions: 1) the Open CAS project, and 2) the Intel® Cache Acceleration software (Intel® CAS) product. There is a difference between an open source “project” and a “product” relative to Intel caching software. The table below shows the major items to consider when selecting where to acquire and use Open CAS community project or Intel® CAS:

	Open CAS Community Project	Intel® Cache Acceleration Software Product
Key Characteristics	<ul style="list-style-type: none"> <li>Upstream community project <a href="https://github.com/Open-CAS">https://github.com/Open-CAS</a></li> <li>OCF is the intelligent caching mechanism extracted as a library from multiple years of investment of Intel CAS product.</li> <li>OCF library is currently available to the community for further enhancement.</li> <li>Open CAS Linux is deployable in Linux Kernel</li> <li>OCF Adapter is available in upstream SPDK</li> </ul>	<ul style="list-style-type: none"> <li>New! Pulls source from the Open CAS community</li> <li>Validated, supported product from Intel with enterprise quality</li> </ul>
Source Code Availability	<ul style="list-style-type: none"> <li>Updates from community contributions</li> <li>Makefile based installer</li> <li>Future, periodic RPM packages available on Epel* for certain Red Hat and SUSE kernel releases</li> </ul>	<ul style="list-style-type: none"> <li>Customer-driven releases</li> <li>Flexible installer with Intel supported build chain tailored to the customer environment</li> <li>Support for RPM packages included</li> </ul>
Business License Terms	<ul style="list-style-type: none"> <li>Yes with permissive open source licenses including BSD 3-Clause Clear License (<a href="https://github.com/Open-CAS/ocf/blob/master/LICENSE">https://github.com/Open-CAS/ocf/blob/master/LICENSE</a>)</li> </ul>	<ul style="list-style-type: none"> <li>Yes with permissive open source licenses including BSD 3-Clause Clear License (<a href="https://github.com/Open-CAS/ocf/blob/master/LICENSE">https://github.com/Open-CAS/ocf/blob/master/LICENSE</a>)</li> </ul>
Quality (as measured by validation)	<ul style="list-style-type: none"> <li>Future reference code unit testing on upstream kernel only</li> </ul>	<ul style="list-style-type: none"> <li>Validated on customer O/S version and kernel, with enterprise quality</li> </ul>
Customer Specification Feature Support	<ul style="list-style-type: none"> <li>Customers can contribute to the community project</li> </ul>	<ul style="list-style-type: none"> <li>Backports available for customer</li> <li>Bug fixes and incremental support included</li> <li>Optional negotiated customer innovation branch for Intel engineers to develop new customer specific features, with eventual integration to the Open CAS community</li> </ul>
O/S Validation	<ul style="list-style-type: none"> <li>Upstream kernels only</li> </ul>	<ul style="list-style-type: none"> <li>Validated on customer O/S and kernel, eventual integration to Open CAS if appropriate</li> <li>&gt;3000 validation tests</li> </ul>
Service Level Agreement	<ul style="list-style-type: none"> <li>No SLA; rely on community support for issues</li> </ul>	<ul style="list-style-type: none"> <li>Multi-tier SLA with 8x5x5 support</li> </ul>

## What is Intel® Cache Acceleration Software (Intel® CAS) Product?

Intel CAS is a fully-validated and supported open source product from Intel. Intel CAS provides a quick and easy way for OEMs, cloud service providers and end-users to deliver solutions that benefit from the new Intel® NVMe SSDs, especially Intel® Optane™ technology-based SSDs. The Intel CAS product is offered with a standard open source license, but a support license is required from Intel to provide validation on customer specified operating systems and Linux kernels. Sometimes this requires that Intel backport Intel CAS to older Linux or custom Linux environments. Intel may engage on innovation branches to support new customer features. Customer specific features are assumed to be private between Intel and the customer, with the expectation that the improvement will eventually be contributed to the OCF community.

- Smarter caching with I/O classification
- Incredible performance
- Optimized for Intel® Optane™ SSDs
- Improved application SLA
- Enterprise validated and supported
- Robust roadmap
- No application changes

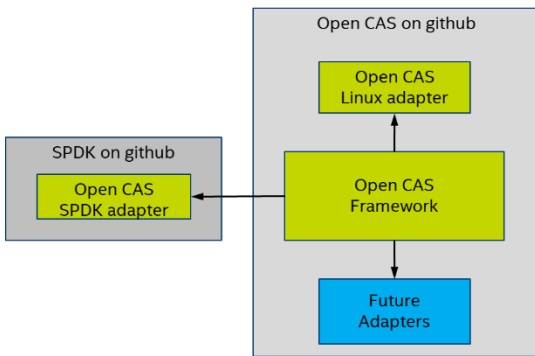
## Intel® CAS Service Level Agreement

Intel CAS support via a formal Service Level Agreement (SLA) is a primary reason to obtain a support license from Intel. The SLA consists of first level, second level, and third level support, which are generally aligned to the industry standard support models, including time to respond and time to resolve a customer issue. For SLA, please contact your local Intel representative.

## What is the Open CAS community project?

Open CAS is a new open source community project, originally sponsored by Intel, but with the intent to grow a robust community of contributors over time. Open CAS was first posted to GitHub\* in November of 2018, and continues to be publicly hosted on GitHub <https://github.com/Open-CAS>. The Open CAS source code and related tools are offered with a standard open source license. In addition to the source code, the community supports the standard tools and testing infrastructure, and documentation. Bug fixing and feature implementation priority is determined by the Open CAS community.

## Why have a separate Open CAS Framework (OCF)?



SSD caching has very broad applicability in a multitude of enterprise and cloud usages. Intel has found that many of the existing solutions are not optimized for the new NVMe SSDs. Intel built a new modern caching architecture focused on very low read latency. As part of building the Open CAS community, Intel has extracted this architecture and implemented it as a flexible library, which we call the Open CAS Framework (OCF). This OCF library is a key component of the contribution that Intel made to the Open CAS community and enables flexible support for many different usages of caching. Currently, the plans are to support implementations in the Linux Kernel with a Linux Adapter and within the Storage Performance Development Kit (SPDK) project, which is also available on Github (<https://github.com/spdk>).

## Why would I want to pay for a license to Intel® CAS when the Open CAS Framework is free?

The intent of the Open CAS project is to continue Intel's long time support for driving innovation into the open source. Many veterans of open source software development are capable of building their own implementations by developing on the source code and tools provided by the Open CAS Framework. The aspiration is that the community builds and contributes back more innovation to the project. So, why would a company want to engage in a support license from Intel? Here are eight reasons:

- 1. Quality and validation:** As part of the validation of each release of the Intel CAS product, we will validate CAS with your specific OS/kernel against over 3000 stress tests to provide a robust product with multiple data integrity checks, and to confirm the product will work properly in your environment.
- 2. Your operating system and Linux kernel may not just work out of the box:** Even though Intel provides an installer, we have found that many customers need some integration work to install and use caching software. Intel has done several backports to make the product fit into different customer environments.

- 3. Support when you need it:** As part of your support contract with Intel, you will receive 8x5x5 support. We know your production environment is critical to your business. With an active Intel support license, you will not need to wait for the Open Source community to get to your issue; should you encounter issues Intel will be there to work on them in a timely manner.
- 4. It's already a sizable and complex project:** At the time of this publication, the core OCF library is over 38,000 lines of source code and the Linux adapter is over 30,000 lines of code.
- 5. Future open source innovation brings both benefits and headaches:** The ability for the community to contribute to the open source provides amazing benefits to the broad IT industry. But innovations might prove difficult to embrace seamlessly. Being able to support incremental innovation in your existing Intel CAS, while maintaining a stable production environment, is a good reason to engage in support license.
- 6. Customer specific innovation:** Intel provides an option for customers who engage in the Intel CAS support license to engage in a customer innovation branch. The Intel engineers will define statement-of-work and develop new customer specific features. Since we cannot a priori know the scope of these changes, we will need to negotiate the scope, schedule, and any monetary considerations. Intel would negotiate with the expectation that any innovation will eventually be integrated back to the Open CAS community.
- 7. Long term support of your SSD:** Intel provides up to 5 years of reasonable support for the Intel CAS product, which is licensed on a per SSD basis.
- 8. Storage technologies are critical parts of infrastructure:** Storage has always been a very important ingredient of infrastructure. It is critical to make sure that user data are not under risk and running on reliable technologies that can be provided via extensive quality assurance that Intel offers.

## Conclusion

With the introduction of the new Open CAS community and the continued support for Intel Cache Acceleration Software, Intel provides the best of both types of customers. The Open CAS community provides a free and collaborative environment for caching innovation. Intel CAS provides a support model to help customers embrace modern SSD in their enterprise class systems.

### More Information:

Intel Cache Acceleration Software: <http://intel.com/cas>

Intel® SSD product specifications:  
<http://www.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-ssd.html>

Open CAS project: <https://github.com/Open-CAS>

