AMPERE®

ORACLE FUSION APPLICATIONS | Case Study

# Oracle Fusion Migrates from x86 to Ampere Processors for a More Sustainable Solution

## SNAPSHOT

Organization: Oracle Cloud Infrastructure (OCI) provides fast, flexible, and affordable compute capacity to fit a diverse set of workload requirements. These range across high performance bare metal instances and flexible VMs to lightweight containers and serverless functions-as-a-service computing.

Challenge: Oracle is growing rapidly, Oracle customers need flexibility, the ability to define core count, memory, and storage to fit the diverse needs of workloads, offering flexibility as a key differentiator. For Fusion applications, Oracle releases hundreds of features on a quarterly basis and supports over 14,000 customers across healthcare, gaming, industrial manufacturing, financial, and telecommunications. Delivering secure, scalable, and cost-effective software as a service to drive success for businesses is paramount for Oracle.

Solution: By migrating Fusion Apps to Ampere processors, Oracle has enabled its customers to achieve deterministic performance and linear scalability under load, without compromising on the performance they expect. With Ampere A1 compute instances, Oracle not only achieves predictable performance, but also a cost-effective and power-efficient infrastructure, so developers can deliver the improved price-performance that Oracle's customers expect. Oracle Cloud provides all the tools that developers need to try modern technologies, get excited about new platforms, and develop new applications.

Results: In a heterogeneous ecosystem where performance is critical, Ampere provides a viable option for Fusion Applications, especially with the help of JDK8 Enterprise Performance Pack. The Fusion Applications ecosystem extends beyond Java, and includes the ability to run C, Python, and other workloads - all of which have been evaluated on Ampere. Considering the gigantic code base for Fusion apps and its impact on TCO and power savings, Oracle plans for most of its fleet to be converted to Ampere platforms soon.

## INTRODUCTION

Oracle Fusion Cloud Applications is a suite of cloud-based business applications using 100% open standards that provide a new way in which businesses innovate, work, and adopt technology.

Fusion Applications are delivered as a complete suite of modular, service-oriented architected (SOA) based applications for enterprise, and help businesses meet their demands and evolve them to a new level of performance. Built on Oracle Fusion Middleware, Fusion applications provide an established, powerful framework that offers complete support for development and deployment. All the capabilities such as supply chain management human capital, risk, governance, financials, customer relationships are provided on a unified technology stack as a complete solution for a better experience. Oracle Fusion Middleware enables business intelligence, activity monitoring, and managed content, providing a framework for collaborative, multi-channel user interface.

Oracle Fusion Applications (OFA) are built using industry-standard languages, including Java, XML, HTML etc. Using a standards-based architecture reduces the cost for integration and enables businesses to reuse systems and technologies. Standards-based architecture also increases the flexibility of the applications so businesses can easily use them by configuring the user interface, business objects, business processes, business logic, and business intelligence.

OFA uses both types of the components that Oracle Fusion Middleware provides-the Java component and the system component. A Java component is an Oracle Fusion Middleware component that is deployed as one or more Java EE applications and a set of resources.

As part of this component, the Oracle WebLogic Server is an enterprise-ready Java application server that supports the deployment of many types of distributed applications in a robust, secure, highly available, and scalable environment. It is an ideal foundation for building and deploying enterprise Java EE applications based on service-oriented architecture (SOA). As part of the SOA suite, the user messaging service supports both Java APIs and web services for integration, making Java an integral part of the overall Fusion application software suite.

The ease of managing Oracle Fusion applications lowers the total cost of ownership and results in a faster return on investment by using tools for rapid setup and flexible deployment models, while providing protection for upgrades. Today, more than 30,000 organizations rely on Oracle Fusion applications to run their business operations.

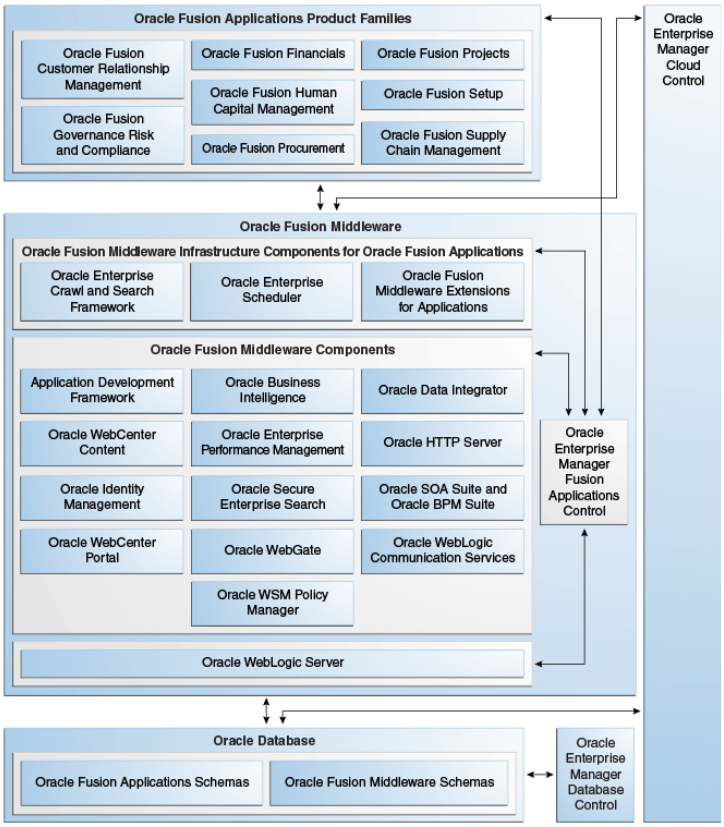


**Fig 1**: Oracle Fusion Applications Architecture
**Reference**: https://docs.oracle.com/applications/architecture

Background
Changes in software paradigm over the years have driven perf/rack optimizations with Ampere for cloud native workloads and cloud native computing. The need to optimize applications to deliver performance led to the development of Oracle's EPP (Enterprise performance pack), which allowed the existing JDK8 to be replaced by JDK17 VM and run applications unmodified.

Bernard Traversat, Vice President of Engineering for the Java Platform Group at Oracle:
*"Trying to migrate existing customers on a platform they have been using for a number of years has a much higher bar than when writing new applications for a new platform. The benefits of change must be high, and the risks must be low. The Java SE Subscription Enterprise Performance Pack (EPP) provides increase and low risks. Customers are looking at performance, and EPP on Ampere is able to meet these characteristics."*

## CHALLENGES

The hardware vendors wanted to build cost effective yet high-performant servers for enterprise workloads. They also wanted to have options to avoid vendor lock-in, bring more architectural choices and introduce flexibility of hardware resources. This was especially important for Oracle's Fusion app code which is gigantic, making TCO and low power consumption critical challenges for the cloud services provider.

## SOLUTION

OCI is scalable and delivers more core density without increasing power consumption. Ampere hits a sweet spot in terms of power, performance, and core density. Adapting Oracle's first-party applications to run on Ampere has enabled Oracle to reduce operating expenditure without impacting performance. It meets customers' requirements of flexibility, scalability, and price-performance, as well as developers' requirements of a seamless way to migrate or develop new apps on Oracle Cloud Infrastructure.

Reasons for choosing Ampere
Java optimizations and investments made over time on Ampere servers improved the application performance, eventually leading to significant improvements with JDK8+EPP (Enterprise Performance Pack) on Ampere. In general, EPP is designed to improve performance and reduce the memory footprint for Java SE 8 workloads. Ampere's price-performance advantage further created differentiation for its servers in the ecosystem. To support increasing demand for low power server-side computing, Oracle added Ampere compute instances to its extensive portfolio of offerings and provided more options to customers for adding the right processors for Cloud-Native workloads. This allowed customers to access an Ampere platform for development and achieve the desired flexibility, scalability, and price-performance. This also allowed developers to move their apps and develop new ones on Oracle Cloud Infrastructure. With the rapid growth of Oracle cloud, and the increasing requirements of power efficiency and price-performance to support a sustainable scalable cloud, Oracle migrated database, Fusion apps and many other OCI services from x86 to Ampere servers.

Bernard Traversat, VP, software development Java platforms, at Oracle said:
*"For customers using JDK8 and interested in moving to Ampere, they can benefit from better performance, and of course price performance with EPP. That's why we created this additional offering where it makes sense at Oracle internally to migrate Fusion Apps and Cloud Services from AMD to Ampere."*

Managing Ampere performance
Ampere processors provide dedicated resources per core to give customer isolation, avoid noisy neighbors and lower the vulnerability to side channel attacks. This results in a consistent predictable performance while maximizing scale for cloud native, mission critical workloads.

In addition, there is a clear power advantage with Ampere processors, allowing for better total cost of ownership, and reduced cost of operations especially when running workloads at scale. This is critical for customers looking to Ampere for reduced power consumption to meet their sustainability and ESG goals for the environment.

For Fusion application migration, where x86 and JDK8 defined the baseline performance, a set of KPIs was defined by customer workloads. Fusion apps are complex Java apps and Java workloads migration to Ampere processors stand a significant validation that the systems are complete in terms of Java capabilities. It also reinforces that application environments are stable so that the mission critical workloads can be moved to the Ampere environment.

### Oracle Fusion Architecture Design

Oracle Fusion is composed of two parts: Fusion Middleware (FMW) and Fusion Applications

- FMW has Oracle applications server and other technology stack components that Oracle has acquired. It covers areas like business intelligence, identity management, content management & SOA.
- Oracle Fusion is a next generation suite of applications which is quite advanced to Oracle Ebusiness Suite.
- Fusion Applications is built on top of the Oracle Fusion Middleware technology stack using fusion architecture as base.
- Oracle Applications is delivered as Suite (Group of Product Families) and modules (subset of Product Families).


Reference: https://www.youtube.com/watch?v=kpX72Oo6aSA

## RESULTS

Fusion apps are significant and complex Java apps. Their performance was optimized by a combination of using Ampere processors and Oracle's Enterprise Performance Pack. Although the Fusion app's team's primary focus was Java, the Fusion applications ecosystem is complex beyond Java, with a lot of C, Python, and other workloads that were evaluated. The applications maintain thread parity, so two cores of Ampere were used for every core of x86. Due to the enormity of the codebase, Oracle reports that running them on Ampere servers provided substantial TCO benefits as well as significant power savings. Additionally, the migration experience was straightforward and resulted in stable enhanced performance.

"For products and services, it's better to be architecture agnostic, which gives you more choices. It allows for flexibility in terms of availability, hardware resources and deployment architectures. The performance becomes critical in a heterogenous eco-system. From a Fusion Applications perspective there are benefits including TCO, and performance is critical. Now, Ampere is a viable option for fusion applications." said Sandeep Mahajan, VP, Corporate Architecture, Cloud reliability and Scalability.

## CONCLUSION

As the rapidly growing Oracle Cloud pushes limits of the power envelope, efficiency as well as price-performance become critical to continue scaling the cloud workloads. Using Ampere for Oracle Fusion applications, Oracle Database services, and other OCI services has become more of an imperative as Ampere becomes OCI's solution for a sustainable cloud. Fusion applications are running on Ampere today, and with a path for conversion in place, the next steps are to convert most of the fleet to Ampere platforms. Oracle Fusion Cloud applications deliver the most complete suite of applications to the most complicated industries in the world. These applications are now seamlessly running on Ampere processors within OCI, delivering on OCI's performance and sustainability goals.

## About Ampere

Built for sustainable cloud computing, Ampere Computing's Cloud Native Processors feature a single-threaded, multiple core design that's scalable, powerful, and efficient.

Learn more

See our solutions for a variety of demanding workloads:
https://amperecomputing.com/solutions

Visit our Developer Center:
https://amperecomputing.com/developers

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