A True Building Block Platform: Nuxeo for Enterprise/SaaS Application Development

Nuxeo White Paper
Introduction:
Application developers need building blocks, not roadblocks

Quick: What first comes to mind when you think of LEGO®?

Chances are you thought about something made using the world-renowned building bricks, from which true works of art can be created. Like the famous building bricks themselves, the LEGO name has withstood the test of time. Used as the company’s name for over 80 years, “LEGO” is a clever abbreviation of two Danish words: “leg godt” – which means “play well.”

The worldwide love for LEGOs seems based on a simple truth: Give people cool building blocks and space to create, and they will build some amazing things. In the software technology world, a strong enterprise application development platform provides developers with those cool building blocks and space to rapidly build and deploy truly innovative applications, for the enterprise or on a SaaS basis.

Of course, not all SaaS application development platforms (or building toys) are equal. Many development teams devote precious time building out their own app dev infrastructure, which is very complex and does not provide value to customers. Others find themselves locked in to an app dev platform that seems to provide more roadblocks than building blocks.

This paper will explore the must-have functionality essential for any enterprise application development platform to fulfill the needs of SaaS vendors and internal enterprise dev teams alike. You will discover how Nuxeo uniquely fulfills these key requirements, while also providing vital platform transparency as an open source content development platform.

Built by developers for developers, the Nuxeo Platform enables enterprise application and SaaS developers to “play well” by rapidly building truly innovative applications and automatically optimized for deployment to the cloud on demand.
Your platform must provide “building block” app dev functionality

Technology enables better customer service, operational efficiencies and better products and services. Today, almost every such innovation requires new application software to support it… Building these new applications requires a new kind of Application Development (AD) organization…

To keep their enterprises competitive, AD leaders must continually embrace new technologies and disciplines, and retire those that are outmoded.¹

Perhaps every content management vendor has at some point used the metaphor of “building blocks” to describe the combined capabilities they offer SaaS or enterprise customers. However, that does not mean the vendor really offers a modular architecture - or even a true platform. Legacy content management systems were often originally developed as enterprise applications that have since exposed some partial functionality through an API.

If the would-be platform’s API can’t build an application, then it’s not a platform; it’s an application with an API… Enterprises that are looking to build their own applications need to be sure that what they are investing in can actually build the necessary applications... [A platform] should also be able to design, code, test, implement and maintain the entire lifecycle around the applications that businesses need.²

Even worse, some legacy content applications now marketed as “platforms” might still rely heavily on Flash, Silverlight or other soon-to-be-outdated rich internet application frameworks, as well the Java Browser Plugin, with its frequent update requirements and security vulnerability risks.

Nuxeo provides a true “building block” end-to-end app dev platform - with maximum customizability

When we at Nuxeo say we provide content application developers with a true “building block” platform, we mean it literally: the Nuxeo Platform was built from the ground up to be fully modular with the maximum possible level of flexibility and extensibility:

• Every Nuxeo Platform feature has been implemented as a separate component. The Nuxeo Platform is made up of a system of loosely coupled components, each one packaged as an OSGi bundle. Each bundle includes a contract that specifies how it can interact with other bundles. Developers can also specify and deploy only those components are required for their application.

• Easily customize and configure all Nuxeo services. Each bundle also exposes extension points, which enable developers to easily configure the behavior of a component (using an XML-based configuration, which can be done quickly and visually using Nuxeo Studio), or extend the behavior of

¹ Gartner, Agenda Overview for Application Development, 2015 (Jan. 6, 2015), emphasis added.
² David Roe, Application Building, APIs, Nudist Beaches & 7 Ideas For A Great Platform, CMS Wire (Oct 25, 2012).
a component (using your own custom code or scripting). The same extension point system is used at every layer of the Nuxeo Platform.

- **An efficient and extensive testing framework is included.** Testing is at the core of all quality software engineering, and the Nuxeo Platform is no exception. Developers are enabled to load only the bundles required for their tests and fully automate testing of your application - in the very same manner that we test the Nuxeo Platform itself.

**Your platform must provide a true “building block” API**

It seems obvious that application developers would want to reduce their overhead by using an enterprise development platform. And yet, many development organizations “roll their own” development stack implementation. Even worse is to lock in with a platform vendor with a poor API that might end up impairing development efforts:

> Why are the majority of APIs painful to use? Because it’s hard to write an API that is a pleasure to use. It’s exceedingly tricky… A lot of APIs also don’t take into account what it’s like to actually use that API… [Is] extra work is being created for me [by] the API designers?

> An API should be a simple definition of building blocks that you build an application out of. But these building blocks need to be fundamental enough that you can build wildly different experiences from them…. **And defining things at that level means reducing them to their core components, and deeply understanding those components.**

Your investment in an enterprise application development platform should be based in no small part on the visible investment the platform developer has made in its own API. The API should demonstrate the vendor’s collective effort in understanding its own platform - and incorporating that understanding in a highly functional, well documented, developer-friendly API that provides functionality down to its core components.

> Many [enterprise application] platforms lack clearly defined API’s… Anyone should be able to re-build [your] client side applications using [your] REST API. If you can’t publish your API publicly because it is too complex for other developers to understand, it will be a huge roadblock…

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3 Paddy Foran, *Your API is Bad (And You Should Feel Bad)*, LeanPub (2014), emphasis added.

**Nuxeo provides a true “building block” API**

Unlike other application development platforms, Nuxeo developed its platform from the beginning to deliver a truly future-proof enterprise app dev platform with a RESTful API that developers will actually enjoy using:

- **Exceptional flexibility and extensibility.** By providing a completely dynamic API along with vast universal extension point system and OSGi bundling, the Nuxeo Platform offers an unmatched level of extensibility. Developers can define their own custom-built services, plug-ins, data structures and data processing routines; selectively expose only those Nuxeo services required by their application; and much more.

- **Comprehensive.** Nuxeo Platform developers can efficiently access everything the application can do through the API.

- **Composable.** Developers can assemble several services calls within a single transaction for efficiency as well as to ensure all services are executed successfully and not partially. Similarly, all required information can be fetched through a single call.

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**For developers to “play well”, the platform must be built well.**

Each enterprise application platform provider must explain their respective platforms address key SaaS requirements, including **scalability, multi-tenancy and customizability.** Another vital requirement - platform **transparency** - also demands equal attention, to assess whether concerns over “lock in” for a particular vendor platform are justified or misgiven.

**How Nuxeo provides enterprise-class scalability to the tune of 1 billion documents and 6,000+ requests per second**

**Processing Scalability (Scale-Up)**

The Nuxeo Platform provides processing scalability through a simple clustering mode, which allows you to have several Nuxeo Platform nodes connected to the same repository. To serve more requests, simply add more Nuxeo nodes.

Additionally, asynchronous tasks (such as converting video files to another format or other resource-intensive, batch-type processing) can be distributed to dedicated processing nodes, ensuring async processing does not slow down interactive processing. *(See Figure 1, next page)*
Nuxeo performance can be significantly improved even further by redirecting complex queries to an Elasticsearch index that is separate from the repository database. This is accomplished through a simple reconfiguration within the Nuxeo Platform; no changes to code or query expressions are required.

**Storage Scalability (Scale-Out)**

The Nuxeo Platform enables enterprise-level storage scalability using both SQL relational database backends (such as PostgreSQL, included with the Nuxeo Platform) and NoSQL storage using MongoDB. MongoDB allows storage to scale out by simply adding nodes to the cluster., To scale out storage using a RDBMS, the Nuxeo Platform supports the use of data sharding and content partitioning across multiple repositories, which are bound to a single Nuxeo-powered application. Users continue to access needed information, fast and easily, through a unified index provided by Elasticsearch spanning all repositories.

In a recent performance test, Nuxeo reached a benchmark of one billion documents managed by a single Nuxeo node, with storage shared among ten PostgreSQL databases.

A separate performance test, based on real-world customer use case, utilized a single Nuxeo node on a virtual server (AWS), hosting a single instance of the Nuxeo Platform, PostgreSQL database and Elasticsearch index. That single Nuxeo instance alone was benchmarked at processing 3,000 user requests per second. By distributing Nuxeo and Elasticsearch across two nodes, processing increased linearly to 6,000 user requests per second, with an average response time of less than 25 milliseconds. By way of comparison, google.com handles 40,000 requests per second.

*Figure 1. You can add new Nuxeo nodes (blue portion of diagram) as the number of user requests increase. You can also manage async tasks in a distributed way (purple portion of diagram).*
How Nuxeo solves the challenges of multi-tenancy

A key capability for SaaS developers, multi-tenancy will also be a concern among large enterprises building web applications for use by external stakeholders (customers, partners and suppliers) or internally across multiple branch locations and national/global regions.

Nuxeo-powered applications can be delivered on a SaaS basis. The Nuxeo Platform supports the traditional single instance multi-tenancy model, including configuration capabilities that allow for the physical separation of databases and content stores for each tenant. (See Figure 2, below)

![Figure 2]

Nuxeo also offers a new dedicated container multi-tenancy model that eliminates the most common limitations of single instance multi-tenancy for different, highly customized applications.

This new model is made possible with Arken, software developed by Nuxeo that allows SaaS providers to achieve high density on cloud VMs, highly efficient use of computing resources, and avoid costs related to unused cloud capacity. Arken is the same software used by Nuxeo to offer nuxeo.io, which provides the Nuxeo Platform for deploying SaaS applications.

Arken performs the automated infrastructure management necessary to provision, start and shut down lightweight application instances on demand. This enables SaaS providers to pack a large set of tenants on the same VM, while fully isolating and controlling each tenant’s data and resources at the system level for optimized utilization of computing resources.

Each tenant is served through an isolated lightweight container (Docker) with its own database server and Nuxeo instance, which is associated with the desired application configuration. If an application or tenant container is no longer needed, it can be passivated (stopped) and restarted quickly when needed. Arken also automatically scales cloud capacity up or down, adding and shutting down VMs as necessary. Costs to SaaS providers are now significantly reduced, as costs incurred are now based on actual usage and not total cloud capacity (whether used or unused). (See Figure 3, next page)
Nuxeo uses its own Nuxeo Platform and nuxeo.io to efficiently power its free trial service of Nuxeo Cloud to ensure the best user experience possible for all users while minimizing costs. SaaS providers can utilize nuxeo.io in similar fashion. At present, Nuxeo hosts over 1,000 Nuxeo Cloud service trials on just 3 VMs.

Large organizations will also find nuxeo.io makes it easy to rapidly spin up development test environments, as well as customize a given application to accommodate different user needs. For example, a global firm, mindful that one size does not fit all, can deploy a world-wide digital asset management (DAM) system while providing each region with its own “flavor” of the system to enable unique localized content and workflows.

The Nuxeo Platform with nuxeo.io provides the necessary infrastructure, including support for multiple repositories, to expedite development and deployment of the “common denominator” aspects of the corporate DAM along with custom components accommodating region-specific requirements. (See Figure 4, right)
As an open source platform, Nuxeo provides full transparency

The core Nuxeo platform, including the Arken infrastructure management software, is open source, providing a fully transparent code base, documentation set and product roadmap.

The open source development model uniquely aligns the best interests of Nuxeo and its customers in ways that commercial developers simply cannot match.

Nuxeo embraces the spirit of information sharing and collaborative open-source development, actively working to extend the advantages of open source to customers in a number of ways:

- The product road map is public, giving developers a way to plan and design applications before new platforms and platform features are formally released.
- The entire build process is public; developers can go to Nuxeo.com and see how the build went.
- All Nuxeo technical documentation is released under a Creative Commons BY-SA, allowing these works to be freely shared and built upon by others.
- All Nuxeo Platform and nuxeo.io code is freely available and there is only one version of each supported release. Developers gain the major benefit of actually seeing the source code to understand how any aspect of the platform works.
- There is no undocumented API functionality or “backdoor” code that only internal personnel are privy to. If Nuxeo customers encounter a bug, then it is a bug for our engineers and solution architects as well.

Finally, just as the Nuxeo Platform itself is an agile platform, the company follows agile development principles with new code releases every 8-12 weeks. This “Fast Track” release cycle make it possible for developers using the Nuxeo Platform to in turn develop applications leveraging the latest technologies.
Conclusion:
Nuxeo Platform empowers developers to "play well"

The transformation to an innovation-oriented Application Development (AD) organization requires a complete overhaul of traditional, cost-oriented AD culture, process and technology.⁵

It might just be more difficult to find articles that do not mention “building blocks” to describe the value of enterprise application development platforms, and it's easy to understand why. The metaphor of building blocks to explain the compelling value of platforms for SaaS and enterprise developers is a strong one. It is a core concept that Nuxeo has embraced from the very beginning, culminating in the Nuxeo Platform – a true building block application development platform with a highly developer-friendly API.

It’s also hard to imagine the time and effort required to replicate a LEGO®-built object using raw materials like wood or metal, instead of simply using actual LEGO® bricks! Similarly, the Nuxeo Platform and nuxeo.io make it just as unnecessary for SaaS vendors and internal enterprise development teams to waste time “rolling their own” development stack.

We invite you to try Nuxeo Platform and experience a transparent application development environment built from the ground up to be as flexible and extensible as possible, and ready to deploy your application to the cloud with exceptional scalability, multi-tenancy and customizability.

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⁵ Gartner, Agenda Overview for Application Development, 2015 (Jan. 6, 2015), emphasis added.
About Nuxeo

Nuxeo dramatically improves how content-based applications are built, managed and deployed, making customers more agile, innovative and successful. Nuxeo provides a next generation, enterprise ready platform for building traditional and cutting-edge content oriented applications.

Combining a powerful application development environment with SaaS-based tools and a modular architecture, the Nuxeo Platform and Products provide clear business value to some of the most recognizable brands including Verizon, Electronic Arts, Netflix, Sharp, FICO, the U.S. Navy, and Boeing. Nuxeo is headquartered in New York and Paris. More information is available at www.nuxeo.com.

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