



# Technology and Architecture Overview

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**sage**

Enterprise Management

# The next generation business management solution

The consumerization of IT –where individual employees exert control over the choice of the technology used within their business– continues to drive enterprise software strategies. This change is not new. For years, many employees have elected to use their own devices and applications to increase personal productivity, at the office or on the road. Closed networks and technology environments are no longer the norm, and business management solutions can no longer isolate users in administrative functions, ignoring the need for a more open front office. They must be flexible, extendable, and designed for collaboration between front and back office users.

Also, Cloud is increasingly becoming the preferred deployment option for business applications. Beyond simplifying access to data across devices and locations, Cloud solutions are also more cost effective and scalable; providing midsize enterprises with a highly redundant and secured architecture without the need to manage a complex infrastructure, software integrations, security, application updates and upgrades.

These profound evolutions of the technology landscape have shaped the new design of Enterprise Management. It offers a robust Cloud and mobile platform for businesses to tap into the full potential of new applications and services, and helps them achieve the digital transformation necessary to compete and grow on a global scale.

Designed for the Cloud first and foremost, Enterprise Management also recognizes the need to support pragmatic evolutions and changes in today's IT strategies. So, the platform powering Enterprise Management's applications may be deployed in a variety of environment: as a service, in a Sage-managed infrastructure on the world-class Amazon Web Services platform, on customers' own infrastructure on-premises, or in a private Cloud environment of their choice.

Lastly and most critically is the users' access to data. User-centric, collaborative, participative, and social, Enterprise Management harnesses new technologies to help businesses drive process efficiency, improve productivity, increase customer satisfaction, and support better decision making. It offers a Web user experience based on a range of new technology components that are recognized as best in class, industry leading and forward-looking choices for multi-browser and mobile usage, speed search, web service development, and document management.

Enterprise Management is the next generation of Sage business management solutions. Away from the complexity and cost to manage typical enterprise ERP software, it delivers a faster, simpler and flexible way to manage your entire business today, and well into the future.

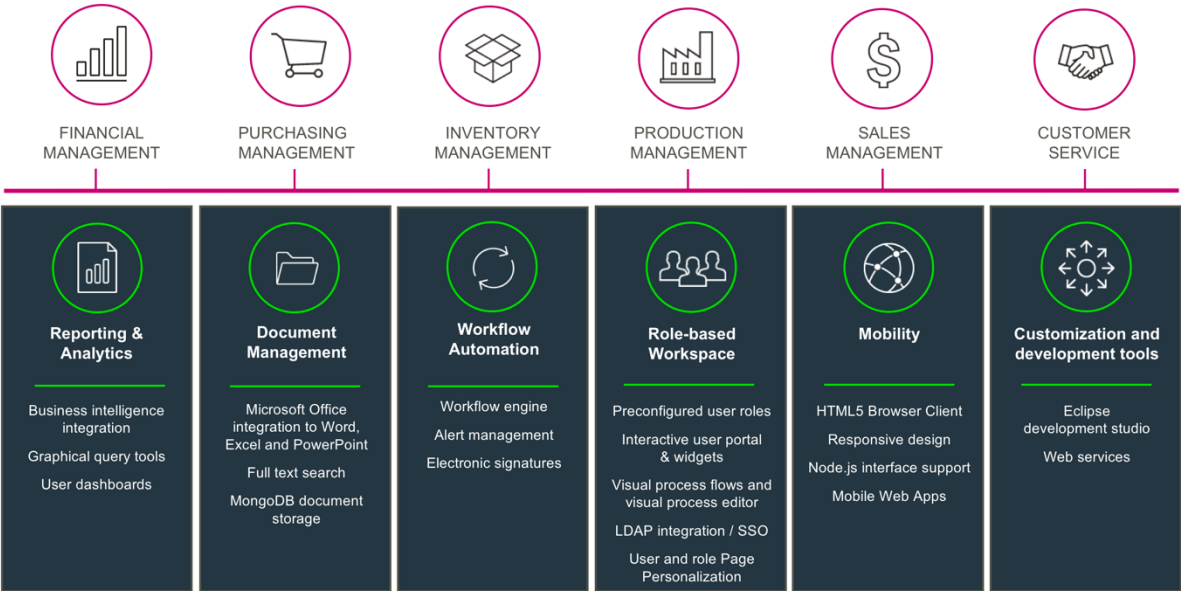
# Enterprise Management technology platform

While Enterprise Management is designed primarily to support the demanding enterprise users, it also benefits from the unparalleled user experience that we have collected over the years serving millions of start-ups and small businesses around the globe.

Our unique approach to technology and application design is differentiating Enterprise Management from the typical enterprise ERP solutions, powerful yet often difficult to use and to manage without a solid IT staff. The result is a comprehensive solution for the enterprise which does not sacrifice the flexibility, usability and simple software management that customers expect from a Sage solution.

The Enterprise Management platform delivers common services across all financial, supply chain management and production management applications. It ensures an effective control of core business processes and a consistent user experience across the various browsers, operating systems and devices used to access the network. A central administration console helps keep things simple to setup and manage the entire system. A rich set of tools is available across all applications for analytics, document management, the import, export and synchronization of data, and the parameterization of workflows and alerts. Additionally, the integrated development environment (IDE) makes it convenient for developers to further customize applications when necessary.

## Enterprise Management platform services



## Cloud and mobility

The architecture of Enterprise Management enables companies to support an open and flexible network of mobile users collaborating on the company data, without compromising the integrity and security of the enterprise system of record.

Cloud is the enabling technology for a connected, collaborative enterprise. Beyond the “convenience” of enabling access to the software as a service (SaaS), the Cloud technology at the core of the Enterprise Management platform is here to support universal Web and mobile access to the Enterprise Management applications, and to connect all services across all line-of-business. Regardless of the deployment option, Enterprise Management relies on a Cloud platform to function.

## Deployment Options

Users may access Enterprise Management as a service in the Cloud, in a browser interface or on mobile devices, via a Web server hosted on customer’s premises, or in a partner private data center.

Opting for the Cloud subscription service managed by Sage eliminates the need for customers to install and to manage the solution infrastructure (Web stack, application server and database), integrations, security and backup procedures, as well as software updates. Users may access the system in a common Web browser, and benefit from the full capabilities of the solution hosted in the secure and scalable Amazon Web Services (AWS) cloud platform, hosted in the Amazon data centers.

Yet the versatile architecture of Enterprise Management does not lock customers in a proprietary Cloud platform, as most conventional SaaS solutions. Companies looking to take full control of their software infrastructure or to leverage their pre-existing environment, may opt for a deployment of Enterprise Management on premises or in a private Web datacenter. This alternative is also often preferred for the flexibility it provides to companies with a rich legacy of applications to integrate with, and/or with requirements to further customize the solution for specific needs.

Enterprise Management deployment options

	On customers' premises	Hosted / Privately owned cloud	AWS Cloud / SaaS
Best value	Most <b>flexible</b> configuration and integration with 3 <sup>rd</sup> party software	<b>Simpler</b> IT management	<b>Fastest</b> deployment and updates <b>Easiest</b> IT management.
Functionality	Full scope, except SF CRM Connector	Full scope	Full scope, except 3 <sup>rd</sup> -party legislations, ADC warehousing and production scheduler
	Optional 'Fast Start' setup, with preconfigured accounting, purchasing, inventory and sales processes <sup>(1)</sup>		
Customizations	Configuration, workflows, UI personalization, data model, mods or application development	Configuration, workflows, UI personalization. Custom development per partner policy.	Configuration, workflows, UI personalization
3 <sup>rd</sup> -party integrations	Full catalog of ISV solutions	Full catalog of ISV solutions. Restrictions may apply per hosting partner security policy	Payments, Fixed Assets, Sales Tax, HR/Payroll, SEI, E-commerce, SF CRM connector
Pricing options	Perpetual license or annual subscription (software only)	Subscription per hosting partner policy	Monthly subscription incl. software, infrastructure, security, backup & recovery, updates and support.

(1) Available in France and South Africa at the time of release

## Scalability

Whether in the AWS Cloud or on customers' premises, there is virtually no limit to the number of users Enterprise Management can support, as the flexible architecture of the system allows for balancing the load across multiple application and data servers –scaling from single-digit to thousands of concurrent users– and is capable to support local or multi-country deployment scenarios. The platform implementation process is designed to meet flexible business requirements. It includes configuration tools, role-based user profiles, and an implementation methodology to streamline the deployment of the system in a variety of environments.

## Mobility

Mobility is essential to ensure the efficient distribution of information to all users in real time, and to support more agile business practices. The Enterprise Management platform supports accessing all services using the popular browsers available on most mobile devices and operating systems, including Windows 10, Android and Apple iOS.

The Enterprise Management platform ensures that all authorized mobile devices connected can access the resources online, but also in bad connections conditions: transactions started online can be completed while offline and synchronized to the server later without loss.

Two dedicated applications available on Apple store (for iOS devices) and Windows stores (for Windows devices) enable to run Enterprise Management mobile functions, while leveraging the native capabilities of each device, such as camera integration, picture tagging, QR code reading, notifications management.

Enterprise Management users can further develop and customize mobile applications, without requiring special mobility development skills.



Mobile applications communicate with the Enterprise Management core system of record via a RESTful service API, and the business logic is shared by all client components.



## User Experience

Usability is a primary focus of the Enterprise Management solution. Easy of use fosters a faster adoption by all users, which is essential to streamline all workflows and enable effective collaboration across business lines. It increases individual efficiency while contributing to the improvement of business performance company-wide. Therefore, Enterprise Management delivers all services in a familiar Web browser experience, while enabling a deep level of personalization by users to adapt to usage, role and preferences.

### *A personalized Web browsing experience*

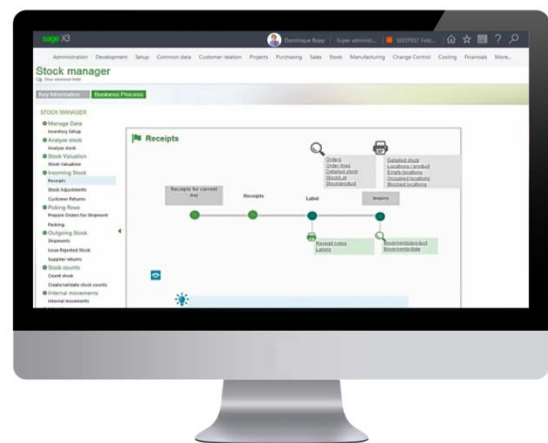
Users interact with the system through familiar Web pages, following typical browsing behaviors to navigate back and forth, bookmark favorite destinations, search for data and more. Enterprise Management also provides broad yet simple personalization capabilities for all pages of the application, directly in the hands of end-users. The forms for data entry can be adjusted to display just the fields users need to complete their task. Power users can personalize the screen layout of Enterprise Management in WYSIWYG mode (What You See Is What You Get), and share personal templates with others. Templates can be defined by user and by role, shared and shipped from one environment to another. Several templates are supplied by default with Enterprise Management, based on the experience of our customers.

### *Navigating complex processes with ease*

Additionally, Enterprise Management helps users navigate complex processes with ease, thanks to visual process maps and workflows –a unique feature of Enterprise Management to deliver a simple user experience.

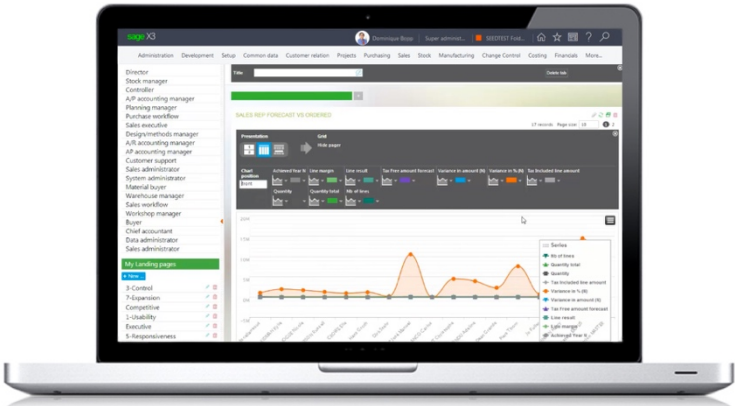
Rather than navigating endless menus and sub-menus to figure out which function corresponds to the task they need to perform next, users are presented step-by-step process maps –in the form of a simple bus line featuring their journey from start to finish.

Process maps are based on user roles and can easily be personalized when needed, using the visual process editor. They can also display instructions and tips for users, at each step of the process.



### Simple data visualization

Enterprise Management comes with a set of performance indicators that can be easily personalized using the graphical analysis tools provided. Users can easily switch views from tables to graphics, represent a new set of data, color code what matters most to them, change the type and shape of a graphic and more.



### Collaboration

With TEAMS –the Enterprise Management collaboration service included with the platform– users can easily set project teams including members of the organization and share, review and contribute to documents. TEAMS helps move projects forward with the right individuals in the organization in an agile manner, regardless of hierarchy and functions, and easily define collaboration workflows amongst them.

### Security

Enterprise Management does not sacrifice security to accessibility. While promoting an easy access to information and collaboration amongst authorized users, the system employs stringent security protocols and safeguards to ensure the integrity and safety of sensitive data and processes.

Enterprise Management is periodically audited and certified by a third-party for safe operation in the Cloud. Specifically, Enterprise Management supports external identity providers like LDAP, Oauth2 (Microsoft Live and Gmail accounts for example), SAML2, and Sage ID. This is increasing security by offloading the management of user credentials, and improves the user experience by providing a Single Sign-On (SSO) experience. User credentials do not transit through Enterprise Management when integrated with Oauth2 identity providers or with Sage ID. In addition, communications with the various client components can be secured with HTTPS, and communications between server-side components are authenticated with certificates.

### Openness

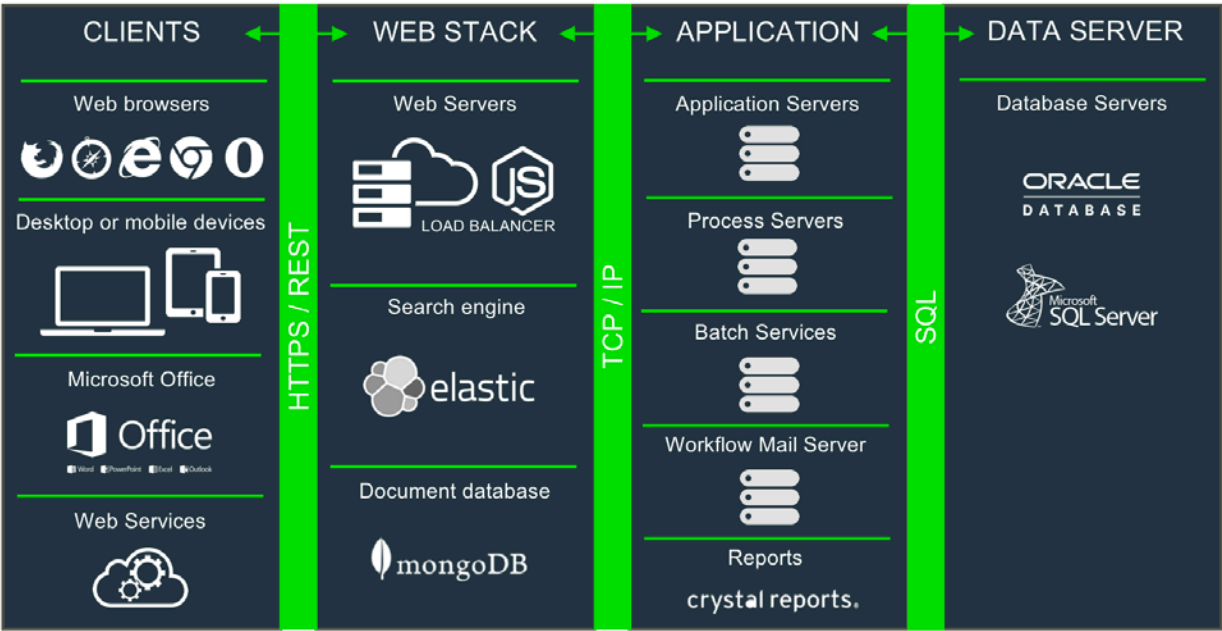
Enterprise Management is designed to streamline internal and external workflows, simplify the integration of business processes, and enable companies to exchange information securely. The solution is architected around RESTful Web APIs, with simple JSON feeds. External processes can easily consume data feeds coming from Enterprise Management, and Enterprise Management can also easily consume data feeds from the external world.

All the new clients (mobile client, web UI, Microsoft Office add-ins) interact with the platform through the RESTful Web API. Service Orientation is handled at the heart of the Enterprise Management platform, rather than through a separate middleware tier.

# Enterprise Management architecture

The architecture of Enterprise Management is organized in layers so that data management, process execution, and information display are handled independently. This multi-tier architecture ensures that the ERP operations are highly reliable in all circumstances. The following diagram summarizes the architecture of Enterprise Management.

Enterprise Management system architecture



When opting for the Enterprise Management Cloud solution as a service, the Web stack, application and data server infrastructure is provisioned and managed by Sage as part of the subscription, and includes additional network security, replication and backup components.

## Clients

### Web Interface

Enterprise Management is accessible from PCs and laptops, including Apple Mac and Linux PC, via its Web interface. The Web interface runs on modern browsers (Internet Explorer, Chrome, Firefox, Opera, and Safari), and it is built in HTML5, CSS3 and JavaScript.





The interface is designed to be fully compliant with today's Web standards. For example, every page has its own URL which can be bookmarked or emailed; the browser's back button and history function is supported as a standard way to navigate ERP functions; communications are asynchronous; and user choices such as last tab visited, column ordering, folded/unfolded sections are saved dynamically. The user portal and navigation menus within Enterprise Management are designed to provide a pleasant and fluid user experience. The search service is indexing all ERP objects and delivers an intuitive and fast full-text search across all applications.

The Web interface is also optimized for tablet devices. Gestures are recognized and users can naturally zoom in/out screen elements to ease manipulation. Tablet users can choose to access specific Enterprise Management functions through native mobile app or access the entire ERP through the mobile browser interface.

## Mobile Devices

The Enterprise Management mobile platform supports multiple devices and operating systems, including smartphones and tablets, Windows, Android and Apple iOS.

The Enterprise Management mobile application framework, written in HTML 5 and JavaScript, supports mobile applications that are optimized for touch screens and small screens. It is downloaded and updated directly from the Enterprise Management Web Server. Mobile applications are modeled via dictionary artifacts and published on the Enterprise Management portal. Users can browse through the list of applications that have been published and install them on their devices. When an application is installed, the dictionary artifacts are downloaded and cached on the device.



Once installed, mobile applications can be used in either online or offline (disconnected) mode. When the device is offline, the applications support data entry by storing the data locally on the device. Data is synchronized to the server when the network is restored.

The service oriented architecture (SOA) of Enterprise Management ensures that the mobile applications rely on the same dictionary artifacts as the desktop and office clients. All clients share the business logic defined by the Enterprise Management code. This makes the design very agile, allowing for the development, customization and publishing of mobile applications without a major investment in development resources.

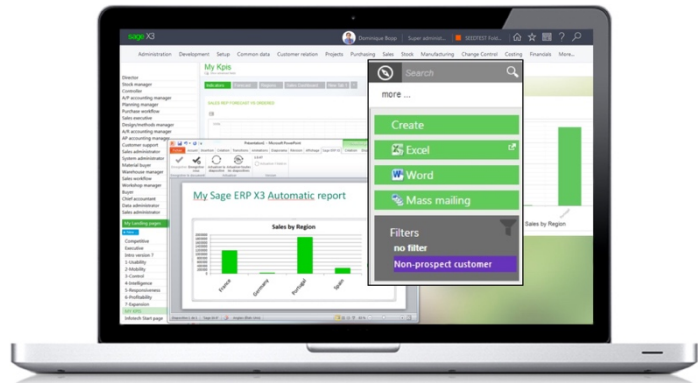
Several mobile applications such as purchase approval, expenses management, and sales information are delivered by default with Enterprise Management. These applications can be used out-of-the-box, or customized. Developers can easily create complementary applications, using the Enterprise Management development tools included, and are not required to dive into the specifics of mobile devices programming such as APIs and native languages.

## Microsoft Office Add-ins

Enterprise Management includes a suite of Microsoft Office add-ins for Excel, Word and PowerPoint that simplifies the sharing of documents and templates between members of a team, using a standard format.

These add-ins provide live links between Microsoft Office documents and the ERP data including Excel tables, PowerPoint tables and charts. Word mass mailing content can also link to Enterprise Management data feeds.

Additionally, Word can be used for reporting output, by populating a template document with data feeds from ERP records. The links are saved as part of the Microsoft Office documents that can then be circulated, re-opened and refreshed as necessary.



The add-ins are available for Microsoft Office 2010, 2013, 2016 for PC only. They are also available for Office 365 when installed on a PC.

For security reasons, user credentials are not kept in the documents. When users open an existing document, they are prompted for credentials, if not already authenticated, to refresh the Enterprise Management data feed linked to the document (if authorized by the individual's own security profile).

## Web Services

Enterprise Management delivers standard capabilities for web-based services that enable customers to integrate external or custom-built systems as part of their business processes. Using Enterprise Management Web Services, users with the appropriate access rights can publish interfaces to Enterprise Management functions available for consumption by third-party applications. Used primarily as a mean for businesses to communicate with each other and with clients, Web Services allow organizations to communicate data without intimate knowledge of each other's IT systems behind the firewall.

The new architecture of Enterprise Management is based on REST, and as such all the services that power interactive clients (mobile, web browsers, add-ins) can be used to access the ERP programmatically. This REST API is SData 2.0 compliant and stateless. The REST API gives access to all Enterprise Management services developed with the new dictionary artifacts (classes and representations), but it does not give access to the "classic" services inherited from older versions of the software (version 6). However, these "classic" services are available through SOAP services for backward compatibility.

## Web Stack

The Enterprise Management Web stack leverages common components widely used in modern Cloud solutions. All the components listed below are scalable and may be deployed in clusters. Regarding the Web servers, a load balancer is included, to front-end the node.js processes.

- **Node.js** is an open source, cross-platform runtime environment for server-side and networking applications. Node.js applications are written in JavaScript, and can be run within the Node.js runtime on OS X, Microsoft Windows, Linux and FreeBSD. Fast and asynchronous, node.js is notably used by Groupon, SAP, LinkedIn, Microsoft, Yahoo!, Walmart, and PayPal.
- **Elasticsearch** is a search server based on Lucene, a free, open source information retrieval software library. It provides a distributed, multitenant-capable full-text search engine with a RESTful Web interface and schema-free JSON documents. Elasticsearch is developed in Java and has been made popular by Deezer, Github, Mac-Graw Hill, Foursquare, Etsy, FDA, CERN and Stack Exchange.
- **MongoDB** is a document database for administration data and documents that is fast, scalable, and able to work very efficiently with JavaScript structures. It is regarded as the most popular NoSQL database system available today. Companies using mongoDB to store production data include Expedia, eBay, Foursquare, LinkedIn, SAP, SourceForge, CERN, Github, and the New York Times.

## Application Server

The application server is composed of a large set of services to ease the configuration and the administration of the platform. This includes:

- A batch server to schedule tasks and recurring tasks.
- A management console to administrate the components and services offered by the solution.
- A workflow engine that can be triggered from any business event
- Import/export tools
- Log and profiling tools to tune the performance at any level.

## Data Tier

Enterprise Management uses one common source for all business management data. Data can be stored on one or multiple data servers for security and capacity to scale, using Oracle or Microsoft SQL Server.

## Reporting and Business Intelligence

Standard reporting and analytics services delivered by the Enterprise Management platform include:

- Requesters to build quickly ad-hoc requests that can be displayed in user dashboards

- Standard data mart with update procedures from exploitation database, on which several business intelligence solutions can connect. This data mart can be personalized through a dictionary.
- A report dictionary with hundreds of predefined reports, associated to the SAP Crystal Reports printing engine.

Additionally, Enterprise Management integrates an intuitive, Excel-based financial reporting tool for flexible financial analysis and distribution.

More full-fledged Business Intelligence solutions also benefit from a standard integration with Enterprise Management, including Sage Enterprise Intelligence, Enterprise Management Data Management and Analytics, and SAP Business Objects.

## Development Environment

The Enterprise Management development environment is based on the following three principles: simplicity of development and evolution, reusability of existing code, and independence from platform execution.

The development tools are inclusive to the solution, so a third-party development environment like Microsoft Visual Studio is not required to customize or extend the solution functionality. It provides a meta-data description of the database structure, including the classes definition and the UI structure, and clear identification of standard, vertical and specific entities as well as modifications that enable the development of customizations. The customizations developed within the Enterprise Management Development Environment are isolated and not affected when standard upgrades are implemented.

Enterprise Management also includes a 4GL object-oriented code with embedded SQL-like syntax that is independent from both the execution environment (Windows, Linux, Unix) and the user interface (Web browser, portable terminals). For the development of applications, a set of integrated development tools such as an editor and debugger are available through an Eclipse integrated development environment (IDE). The same code is used to control business logic across platforms (smartphones, tablets, and desktop computers), and can be called as a REST web-service from another component of the development, from a user interface, or from Microsoft Office.

Last, Enterprise Management includes an automated tool to run the services in QA test mode as part of the development environment.

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