The Microsoft Office Open XML Formats

New File Formats for “Office 12”

White Paper

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# Introduction

With the next version of the Microsoft® Office System, Microsoft will introduce new, XML-based file formats for Microsoft Office Word, Microsoft Office Excel®, and Microsoft Office PowerPoint®. With these new formats, Microsoft ensures that organizations can successfully and completely integrate the Microsoft Office System into their enterprise architectures. This change represents a large step forward in extending Microsoft’s commitment to XML, industry-standard integration technologies, and to open, published file format specifications.

The published specifications for the new Office file formats will be available with a royalty-free license, enabling anyone to freely access the full documentation and quickly learn how to integrate Office files into their solutions. The use of XML offers the benefits of greater transparency and openness than were possible with the previous binary file formats. The new formats allow Office documents to easily integrate with existing and future line-of-business systems, as the contents are now open and accessible. The new formats are also designed with long-term robustness and accessibility in mind, so that file corruptions will be easily repairable, and there is no reliance on any particular software application to provide access to the document contents. “Office 12” files will also be much more efficient, taking up far less space than the previous formats and allowing for quicker transmission times and a smaller impact on storage.

The new file formats represent a major step forward, and will be made available not only to customers who adopt “Office 12,” but also to customers using previous versions of the Microsoft Office System. Free tools will enable users of Office 2000, Office XP, and Office 2003 to open and save to the new formats, so that everyone can benefit from this innovation.

## From .doc to .docx: a brief history of the Office file formats

The binary file formats in use currently were designed in 1994—before the advent of XML and before widespread exchange of documents and data that is common today. These file formats, .doc, .xls, and .ppt, were introduced with the release of Microsoft Office 97, at a time when it was important to optimize the files for storage on slow hard drives and “floppy” disks; it was not as crucial to focus on easy access to data within the files for better content reuse, document generation, and seamless integration of the documents into business processes. Rich collaboration with multiple authors was less common, and the files were primarily suited to single document authoring scenarios.

Subsequent releases of the Office suite built upon the document creation functionality and the growing popularity of the Internet and Internet-enabled technologies to support collaborative authoring and broader sharing of information. In particular, support for XML paved the way for sophisticated document management and data exchange scenarios. Office 2000 introduced an HTML file format with document properties defined in XML; Office XP included the first XML reference schema (SpreadsheetML); and Office 2003 introduced a standard way to store and exchange data stored in documents by using additional reference schemas (WordprocessingML and an enhanced SpreadsheetML) as well as customer-defined schemas.

Now, with the release of “Office 12,” new, XML-based file formats become the default in Word, Excel, and PowerPoint. The new file formats are an extension of the WordprocessingML and SpreadsheetML schemas introduced in previous versions. The new XML-based file formats in these programs enable broader integration and interoperability between Office documents and enterprise applications. Additionally, “Office 12” files are all wrapped using ZIP technologies, which allows for easy access to the content parts as well as standard compression, reducing file sizes and improving reliability and data recovery.

The following sections detail the benefits of the Microsoft Office Open XML Formats, describe the format architecture, and provide an overview of the measures Microsoft is taking to ensure that organizations can make a smooth transition to “Office 12.”

# Benefits of the Microsoft Office Open XML Formats

The new Microsoft Office Open XML Formats combine the power of the world’s most widely used productivity programs with the integration capabilities enabled by XML. This synthesis of functionality and flexibility unlocks the wealth of data stored in Microsoft Office documents, spreadsheets, and presentations, and enables documents to participate fully in business processes. In addition, the new file formats offer improved reliability and significantly reduced file sizes.

## Integration with Business Data

Through its use of industry standards—particularly XML—the Open XML Formats enable advanced data interoperability between the Microsoft Office System and enterprise business systems. Organizations can share and exchange information between Office documents and virtually any other software application or business system. Improved interoperability means that organizations can more easily expose the data and business information now stored in documents—Excel spreadsheets, Word documents, and PowerPoint presentations—in new ways, and help make this information more broadly accessible to other applications, other business systems, and other information workers across the enterprise.

In addition, support for XML enables Office documents to consume information from other business applications. Web services that expose data in enterprise information systems can create, populate, and update Office documents automatically; and developers can create interfaces that allow users to view and retrieve data from line-of-business applications and operational data sources from within the familiar Office environment.

### Support for Customer-Defined Schemas

The Open XML Formats allow Office documents to easily fit into business solutions and for business data to easily fit into the files themselves. By including support for mapping customer-defined schemas into the content of Word and Excel files, “Office 12” ensures that organizations can leverage common vocabularies—within documents and spreadsheets, as well as other business systems. Support for custom schemas enables the inclusion of specific XML vocabularies in Office documents, helping integrate critical business data into the information worker’s document authoring environment.

By ensuring that information workers apply consistent data structures and by delivering business data directly into the documents used to analyze, report on, and publish this data, organizations can ensure the integrity of their information and support a single, common view of this data across the enterprise. This “single version of the truth” is a key element of many compliance initiatives.

### Improved Automation and Programmability

The Open XML Formats provide significantly enhanced opportunities for automation of Office documents and document-based processes. The availability of published format specifications and royalty-free license will stimulate the development of unlimited, third-party solutions that take full advantage of the integration potential of Office documents.

Because documents stored in the Open XML Formats are machine-readable and editable by any text editor or XML processor, solutions need not use Microsoft Office programs to view or edit content within the documents. Enterprise business solutions can access document contents easily and efficiently. Technology providers can utilize the Microsoft Office System and Office authoring applications within their solutions, reuse Microsoft Office documents as other Office documents, or open and act on Office documents on other platforms and in other applications.

Because any solution provider or corporate developer can integrate the Open XML Formats directly into their applications and business processes, the possibilities for automation are virtually limitless. The sections below describe two common scenarios requested by Microsoft customers.

### Scenario: Generating invoices in Microsoft Word

Account reps at Contoso must prepare and submit invoices to their customers, but frequently complain that the corporate accounting system that generates these invoices is difficult to navigate. The account reps do most of their work in the Microsoft Office System; they use Microsoft Outlook® messaging and collaboration client for e-mail, and Excel spreadsheets and Word documents for reporting. When reps are required to interact with complex and unfamiliar line-of-business systems, such as the financial application, their efficiency diminishes—and opportunities for error increase.

When Contoso deploys “Office 12,” it will create a set of automated templates, including an invoice template that connects directly to the corporate accounting system. The invoice template incorporates the same XML schema used in the accounting system, so data can be structured the same and can be exchanged between the Microsoft Office System and the accounting application.

After the rep types the customer name and account number into the invoice, automation behind the invoice template automatically will populate the documents with required data from the accounting and customer relationship management (CRM) systems, including invoice numbers, payment terms, account balances, and customer contact information. Populating invoices directly from these systems will help reduce opportunities for transcription errors and will eliminate the need for reps to learn a new program. When a rep saves the Word document, invoice amounts will be written back to the accounting system to update the accounts receivable tables.

After Contoso deploys “Office 12,” account reps preparing invoices will benefit from the familiarity of the Office interface, and they can take advantage of Word’s rich formatting and printing capabilities to prepare their invoices.

### Scenario: Integrating “live” sales data into forecasting spreadsheets

A sales manager at Contoso prepares monthly sales forecasts by copying information from the company’s sales tracking system into Excel spreadsheets. Traditionally, the manager extracts information manually from the sales tracking system and produces a static report—a report that is out–of-date almost from the moment it is published.

When Contoso utilizes “Office 12,” the manager will be able to take advantage of a new feature of the Open XML Formats, which allows external applications to place streams of XML data within the file. Instead of cutting and pasting, the manager will embed a data stream from the sales tracking system within the forecast spreadsheet. When the manager opens the document in Excel for “Office 12,” the stream will load and the data in the spreadsheet will be updated dynamically.

The forecasting calculations in the spreadsheet are always based on the most current sales data. Because the Excel formulas reside in the report template, users can quickly— in a snap—generate powerful reports from current information. What used to take hours manually aggregating data for the monthly forecasts, will be accomplished in minutes, with a much higher degree of consistency and accuracy, and with the most current information. A current forecast will be obtainable at any time simply by opening the original spreadsheet document.

### Scenario: Extracting abstracts from documents to build a summary report

Contoso produces a collection of white papers on technical topics. The abstracts from these white papers are collected and made available to customers as part of Contoso’s marketing material. Traditionally, excerpting the required information from each document and pasting it into the summary document has been a labor-intensive, manual task.

Microsoft “Office 12” will enable Contoso to automate this task by using a custom schema for their white papers and XML-enabled tools to interrogate documents and extract the desired information. The Open XML Formats allow documents to be searched according to semantic structure, so a search tool can search against an XML schema to find portions of a document within tags—for example, the <abstract> tag in Contoso’s white paper schema.

To create a custom summary, the search tool will scan an entire document library for specific keywords within the abstracts. Compared with the limitations of searching binary files (a brute-force search of the entire text of the documents or a limited search against the file names), a search against structured text, with XML tags providing the structure, is far more efficient and more likely to retrieve the desired information.

With white papers that are saved in the Word XML Format and that utilize support for custom schema, Contoso’s XML-aware search tools can collect abstracts from entire libraries of documents and automate production of the published summary simply by querying the database for a single tag. This will dramatically speed the efficiency and accuracy of search and result in a comprehensive compilation of the abstracts. The increased efficiency will help enable rapid construction of custom, topical summaries—a capability Contoso had been reluctant to offer because of the effort previously required.

### Scenario: Using Active Directory® to retrieve user information when authoring documents

One of the pieces of information users add to a document most often is their names. Users also add information about themselves, for example, job title, phone number, or office location. Considering the number of systems in a secure computing environment that track this type of information, retyping it in every document is an unnecessary effort. With “Office 12” and integrated Web services, the Microsoft Office programs can automatically retrieve personnel data from a Microsoft Active Directory® listing of company personnel, eliminating the chance of misspelling or misidentifying contributors. Document authors can even include e-mail or phone numbers for other people within the company and restrict this information to people inside the company network, while preventing the information from being visible to people outside the network.

This scenario is a simple, but important example of how XML can be utilized to greatly speed the mundane, repetitive data entry tasks that plague employees in their daily work.

## Openness and Transparency

The Open XML Formats achieve an openness and transparency not possible with traditional binary file formats. The new formats are fully documented with publicly available specifications. The XML specifications for the individual parts that make up the file are fully documented and publicly available. What’s more, using ZIP technology as the wrapper for the files means that existing tools can easily open the files and access the component parts within.

This openness allows the development of third-party or custom tools that read and write the new Office file types or view and operate on the component parts of Microsoft Office documents without opening the documents themselves. By supplying open, published specifications for the Open XML Formats, Microsoft is facilitating third-party development, reducing development and integration costs, and helping to foster innovation in the development of document-based solutions.

Transparency helps increase the trustworthiness of documents and document-related processes by allowing programs or users to verify the contents of an Office document without opening the file. The Open XML Formats enable users or applications to see and identify the various parts of a file and to choose whether to load specific components. For example, a user can choose to load macro code independently from document content and other file components. In particular, the ability to identify and handle embedded code supports compliance management and helps reduce security concerns around malicious document code.

Likewise, personally identifiable or business-sensitive information (for example, comments, deletions, user names, file paths, and other document metadata) can be clearly identified and separated from the document data. As a result, organizations can more effectively enforce policies or best practices related to security, privacy, and document management, and they can exchange documents more confidently.

By reducing dependence on the Office programs themselves, the Office Open XML Formats enable the archival strategies mandated by increasingly strict regulatory and compliance guidelines. Organizations that rely on Office documents as the sole repositories of institutional data can be confident about meeting archival requirements, assured that they will be able to access document content in the future—without requiring a copy of the “Office 12” applications.

### Scenario: Identifying and removing comments and document history from documents

Contoso routinely publishes white papers that receive widespread distribution through the company Web site and other online portals. Writing these white papers is a collaborative process, requiring input from numerous consultants. Before publication, the documents go through an intense review and approval process, with input from company executives, legal reviewers, and other stakeholders.

Contoso uses the features of Microsoft Word to track changes and resolve reviewer comments through the document life cycle. During the writing process, these features enable authors to identify who has reviewed the document, when they reviewed it, and to resolve issues among the various stakeholders. The revisions and comments can include the names and contact information of individual contributors, as well as discussion and background concerning Contoso’s proprietary information. Before Contoso publishes documents, it is imperative that the revision history, embedded comments, and identities of individual contributors be removed.

After it deploys “Office 12,” Contoso can take advantage of the transparency of the Open XML Formats to remove all proprietary or personally identifiable information from their documents before publication. The Open XML Formats store all personally identifiable information, document metadata, revision history, and comments separately from the document content. The Contoso Web publishing system can be modified to automatically delete these components from the public version of a document before it is published. There will be no record of document history or personally identifiable information associated with the published file, and Contoso will be certain that its employees’ identities and its proprietary information is being protected.

### Scenario: Editing a Word document 100 years from today

Storing information over long periods of time is a challenge in today’s fast-paced technology environment. Contoso has seen their archive of corporate documents evolve from warehouses full of paper files, to floppy disks, to vast arrays of network-attached storage. The downside of this progress is that it can become very difficult to retrieve information stored in any of these formats quickly. The ability to retrieve an archived document often requires that Contoso have access to a reasonable facsimile of both the hardware and software that had been used to create that document.

Organizations today cannot be confident that they will have access tomorrow to information locked in proprietary document formats, certainly if the program needed to properly display information in those documents is no longer available. Even for so-called “standards” based on non-XML page description languages (PDLs), the cumbersome presentation layer required by this information will make these formats difficult to sustain as an archival format.

By standardizing all corporate documents (spreadsheets, presentations, reports and documents) on the Open XML Formats, Contoso will reduce their dependence on both hardware and software, and will be assured that their collected, corporate knowledge will be accessible to future generations.

Open XML Formats are based on the Unicode standard, and XML tags and schemas can be “read” by any device that reads text. Information stored in the Open XML Formats can be read or edited by any text editor or XML processor, regardless of the underlying storage method. One hundred years from now, text information might be stored as magnetic fields in individual atoms, or as modulations in light beams. But as long as that information can be extracted as ordinary text, both the information and the XML structure built into that information can be read or edited.

This “readability” is a key advantage of XML technology. Because XML is text-based, and the presentation of XML data has been defined in an easy, standardized manner, XML offers a far superior archive format than do printed-page description languages that presume the output media type or presentation method of the document.

### Scenario: Protecting end users from executing embedded code within Word documents

Information workers at Contoso receive documents and spreadsheets from a variety of sources, some of which might be unknown, or whose trustworthiness cannot be evaluated. The fact that these documents might contain embedded code can raise concerns about malicious coding, and there is the danger that viruses or other harmful effects could be hidden in innocent-looking documents.

The transparency of the Open XML Formats and the ability to store and load embedded code separately from document content alleviate these concerns. When deploying “Office 12,” Contoso’s IT staff will put in place group policies that limit the extent to which embedded code can be loaded into documents from sources whose trustworthiness has not been determined.

Documents using the Open XML Formats and containing embedded code will require the use of a special purpose format to enable that code to be executed. This requirement means that the default file formats (for Word, Excel and PowerPoint files) will not be allowed to include embedded code, which will help to improve the safety of information within unknown documents.

For those users who choose to include embedded macros, scripts, or Microsoft ActiveX® controls, a special-purpose format based on the Open XML Formats will be provided. This special-purpose format will enable a clear separation of the files, indicating which files are and are not allowed to execute code that can be hidden in documents.

## Robustness

The Open XML file formats have been designed to be more robust than binary formats, substantially reducing the risk of data loss due to damaged or corrupted files, and offering enhanced opportunity for third-party solutions that act on Office documents.

Because the Open XML Formats segment, store, and compress file components separately, they reduce the risk of corruption and improve the chances of recovering data from within damaged files. The file compression engine algorithm performs cyclic redundancy check (CRC) error detection on each part to help ensure the part has not been corrupted. If one part has been corrupted, the remaining parts can still be used to open the remainder of the file. For example, a corrupt image or error in an embedded macro does not prevent users from opening the entire file, or from recovering the XML data and text-based information.

The “Office 12” programs can easily deal with a missing or corrupt part by ignoring it and moving on to the next, so that any accessible data is salvaged. In addition, because the file formats are open and well documented, anyone can create tools for recovering parts that have been created improperly, for correcting XML parts that are not well formed, or for compensating when required elements are missing.

The reduced risk of corruption also empowers developers to work more confidently with Office files. Third-party solutions that modify content within binary Office documents have been known to contribute to corruption of these files. By using modular, XML-based file formats, with clear separation of the document elements within the file container, “Office 12” allows developers to work with files in new ways—reading, writing, and modifying content from third-party applications that do not rely on Microsoft Office or Visual Basic® for Applications.

The Open XML Formats also produce significantly smaller file sizes compared with Office 2003 binary formats. Reduced file size can substantially reduce storage and bandwidth requirements, and thereby reduce operational costs.

Although the size of each Open XML Format file relative to Office 2003 binary will vary depending of the length and content of that file, Microsoft testing on the current prototypes has demonstrated file size reduction of well over 50% relative to Office 2003.

### Scenario: Saving costs in document storage

Contoso’s many remote locations produce hundreds of thousands of documents each year. Departments and, in some cases, individual workgroups, maintain their own document stores. As these stores grow in size and number, and as regulatory requirements force Contoso to maintain archives of all historical documents, the cost to maintain and add document storage has increased exponentially.

The deployment of “Office 12” to these locations will significantly reduce these storage requirements. The new Open XML Formats utilize ZIP technology to substantially reduce file sizes—by as much as 75 percent in the case of some Word documents and Excel spreadsheets.

When evaluating its storage needs and file retention strategy, Contoso will discover that reducing the total storage requirement for all Word, Excel, and PowerPoint documents across its entire document repository—which includes terabytes of information—will deliver huge benefits.

The demand for e-mail bandwidth will also benefit from these new, compact file formats. If 25 percent of the e-mail messages sent to Contoso’s servers contain Word, Excel, and PowerPoint attachments, the new Open XML Formats will result in substantial open bandwidth just from reducing the size of those file attachments. This level of file compression is a critical advantage for mobile workers, who frequently contend with slow connections and high cost of Internet access.

The reduced storage and bandwidth requirements translate to immediate cost savings for Contoso. What’s more, an initiative to bulk-convert their vast document archives to the Open XML Formats will reclaim large amounts of existing storage—effectively doubling their capacity without additional hardware.

### Scenario: Repairing a damaged chart in an important report

Sales reps at Contoso spend much of their time preparing proposals for new business. Proposal production is a time-consuming but important task for the sales team and frequently comes down to the wire as the team works under pressure to aggregate cost information, prepare copy and graphics, and prepare the document for printing—usually working under an intense deadline. In the past, a corrupted file could compromise the entire proposal process by preventing the document from being delivered on time, and as a result, potentially leading to a missed opportunity.

When Contoso deploys “Office 12,” however, these issues (which happen more frequently than the sales teams like to admit) will be resolved easily—without delaying publication. The Word XML Format stores the various components of the document, the charts, graphics, macros, and other elements of the proposal, separately. If one of these elements becomes corrupted or damaged, it does not prevent the entire document from loading in Word. When an error report displays as a sales rep opens a document, he or she can quickly identify the damaged component, delete it, repair it, or simply choose not to load it; and the deadline is never at risk.

### Scenario: Sharing documents in a mixed Office XP, Office 2003, and “Office 12” environment

Contoso has many offices and subsidiaries across North America. While the corporate office in Pittsburgh always deploys the latest versions of their software programs, other remote locations are slower to follow suit. As a result, Contoso expects to maintain a mixed environment, and deploy “Office 12” to the desktops only at the corporate office, while most other locations will continue to use Office 2003, or in some cases, Office XP.

Many business processes at corporate will be updated to take advantage of the capabilities of the Open XML Formats, including the weekly corporate status reports that roll up input from the remote offices. To ensure seamless exchange of data between locations and between employees using different versions of the Office System, Contoso will deploy an Office 2003 and Office XP “patch,” which will enable users of those versions to save reports in the Open XML Formats. These employees will be able to work in their existing programs, but save status reports in the Word XML Format, so the documents can be aggregated by the tools that roll up the corporate report.

The corporate managers who prepare and disseminate the weekly report will work in an “Office 12” compatibility mode, which ensures that the content and formatting in the documents they create will be preserved when users in the remote offices open the documents.

# Description of the Microsoft Office Open XML Format

As discussed, the Office Open XML Formats are published specifications based on XML and ZIP technologies. With the release of “Office 12,” the new formats will be the default in Word, Excel, and PowerPoint.

All Office programs will continue to support the existing binary formats with full fidelity and no loss of functionality, and organizations will have the capability to override defaults or to specify a compatibility mode appropriate to their environment. The new Office files operate identically to any other Windows file; users interact with the Office files exactly as they do today.

The new file formats introduce new file name extensions to avoid confusion and save the added step of looking within the file itself to determine compatibility. The intent of the new file name extensions is to make it easy to differentiate the binary file formats from the XML-based file formats and to identify files with embedded code, thus making for easy interrogation or conversion.

## Document Parts

The new, XML-based file formats advance the extensive XML integration capabilities of the Microsoft Office System by separating document content from document presentation information. The different types of data that comprise an Office document (document content, images, metadata, embedded code, and so on) are stored within each file as discreet, ZIP-compressed XML components. For example, rather than embedding an image in the document data, the application can store the image as a separate part that can be referenced by the document data. This feature allows other applications access to the image, without requiring that they extract it from the rest of the application data. The individual parts within the container that make up the file are defined by published, fully documented XML specifications.

## Microsoft Office Open XML Format specifications

For “Office 12,” Microsoft will publish a full specification for the each of the new XML-based file formats used by Word, Excel, and PowerPoint. A number of common schemas are being introduced for use by all three applications. In addition, published schema design guidelines will ensure that customer-defined or application-specific schemas are predictable.

The XML reference schemas govern display-oriented attributes and document formatting, while customer-defined schemas define data-oriented structures that represent the business information stored within the document, and can be unique to a particular business or industry.

## Compatibility with new file formats

Microsoft has taken steps to ensure the compatibility of the new file formats with previous versions of the Office applications, including Office 2003, Office XP, and Office 2000. Within “Office 12,” a compatibility mode that automatically restricts features and functionality that are unavailable in target versions will ensure that users can exchange files seamlessly with other versions of Office or collaborate in mixed environments with no loss of fidelity or productivity.

“Office 12” enables systems administrators to select the default file type and default compatibility mode. Defaults can be set during installation or included in policies applied to specific users or specific roles. For example, organizations undertaking staged upgrades or staged rollouts might want to set Office 2003 binary as the default Save option until all desktops have been upgraded.

Users working in previous versions of Microsoft Office System programs will be able to edit and save documents by using the Open XML Formats. To enable previous versions to read and write the new file formats, Microsoft will release patches that can be applied to the existing installations. The patches will also enable older versions of the Office programs and the Windows shell to recognize the new file name extensions.

# For more information

## Microsoft Office Open XML Format: Preview for Developers

This white paper presents a more detailed discussion of the Office Open XML Formats, including solution scenarios from a developer perspective.

## “Office 12” on Microsoft.com

For the latest announcements leading up to the release of “Office 12,” including feature comparisons, developer tools, and deployment resources, visit the “Office 12” site at [www.microsoft.com/office](http://www.microsoft.com/office)

## Brian Jones’ blog

Brian Jones, a Product Manager and 6-year veteran of the Microsoft Office team, maintains a blog on the Microsoft Developer Network (MSDN) devoted to the XML file formats in Office. Brian's blog includes discussion, links to developer resources, and insights into the reasoning behind the "Office 12" design decisions.

<http://blogs.msdn.com/brian_jones/default.aspx>

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