

Definiens

Definiens XD 2.0

Release Notes

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Definiens Documentation:

Definiens XD 2.0

Release Notes

Imprint

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Thank you for using Definiens software. We appreciate being of service to you with image intelligence solutions. At Definiens we constantly strive to improve our products. We therefore appreciate all comments and suggestions for improvements concerning our software, training, and documentation. Feel free to contact us via web form on the Definiens support website www.definiens.com/support

Thank you.

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Under certain circumstances the solutions and applications developed using Definiens Developer XD may fall under specific regulations (e.g. medical device or IVD regulations) in your country. Please ensure that you check and follow local regulations before using or taking your solution or application into commerce. If you require specific data about Definiens Developer XD, please contact your dealer or our sales staff.

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1 Overview

Definiens XD is a comprehensive image analysis platform for multi-dimensional image analysis. It contains all the client and server software needed to extract intelligence from any digital image in a fully-automated or semi-automated way.

1.1 About Definiens XD 2.0

Definiens XD 2.0 is a major update for the Definiens XD product line. It includes, for the first time, both 32bit and native 64 bit editions of all products.

- Definiens Developer XD (32bit and 64bit Editions)
- Definiens Architect XD (32bit and 64bit Editions)
- Definiens Viewer XD (32bit and 64bit Editions)

Definiens Tissue Studio® 3.0 is also available as a 32bit and 64bit edition.

Native 64 bit editions provide benefits for memory computationally intensive processes, such as 3D Rendering, Image Registration and the analysis of large multidimensional data sets. Aside from the memory handling characteristics, 32bit and 64bit editions are functionally equivalent. Definiens recommends customers using previous versions upgrade to Definiens XD 2.0.

Please see the following knowledge base article for a more detailed discussion of the 64bit editions. [FAQ - Definiens 64bit Editions](#)

Definiens XD 2.0 also includes many new features and improvements designed to further enhance the benefits of using Definiens XD software.

Users wishing to upgrade to Definiens Tissue Studio® 3.0 Libraries will need to upgrade to Definiens XD 2.0.

1.2 Key Features

Definiens XD clients for application developers and end users

- Definiens Developer XD - The powerful development environment for biomedical image analysis.
- Definiens Architect XD - The easy to use end user application for running solutions.
- Definiens Viewer XD - The free viewer for reviewing and sharing results.

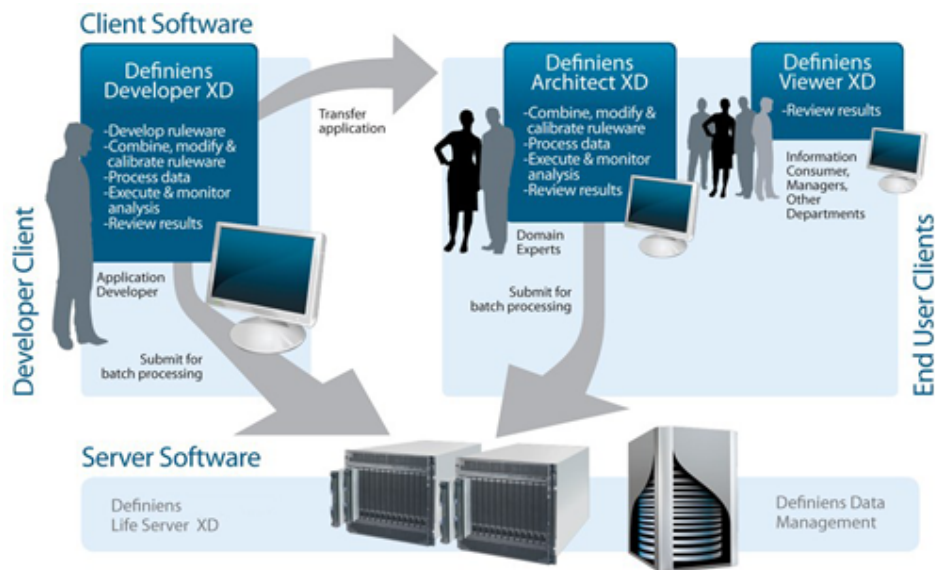


Figure 1.1. Definiens XD multi-dimensional image analysis software

Definiens Server[®] XD

A scalable, server-based batch processing environment for multidimensional analysis of biomedical images.

Comprehensive multi-dimensional data import

- Generic import builder tool
- Multidimensional data model
- Support for comprehensive range of multi-dimensional image formats

High performance analysis of complex multidimensional data

- Definiens Cognition Network Technology[®] for XD
- Object-based pixel processing
- Multimap support and regions to support flexible analysis workflows including multi-magnification, registration and comparison workflows

Full multi-dimensional object model

- 3D features and algorithms
- Object linking for time series support

Multi-dimensional image viewing

- Multi-planar projections (XY,YZ,ZX)
- Animations of time series data

- Comparison views of multiple images side by side
- Linked object selection and picking
- Independent or synchronized views

Sophisticated 3D visualization

- Surface rendering of classified objects
- Rotation, zoom, class selection, transparency settings and export
- OpenGL hardware acceleration

Integrated image registration

- Rigid and elastic transformations
- Landmark and non-landmark based schemes
- Automated, semi-automated or manual landmark identification

Comprehensive SDK for integration of XD image analysis into existing workflows or applications

- Automation API
- Data IO API
- Engine API

1.3 Highlights

Definiens XD 2.0 includes many new features, including the following highlights.

Key Features

- 64bit Editions for memory computationally intensive processes (e.g. 3D Rendering, Image Registration, Large 3D data sets)
- CNL - Array Concept
- Machine Learning Algorithms (Bayes, KNN, Support Vector Machine, Decision Trees)
- Aperio Annotation Support (file system and from Aperio Spectrum)
- New File Browser Dialog (for file system and database browsing)
- JPG2000 high performance driver with pyramid support for very large images.
- New and Updated Algorithms and Features
- Export supports > 260 character file paths
- Workspace audit trail report

Algorithms

- Override current level parameter for all segmentation algorithms
- Watershed segmentation (new)
- Multi-resolution segmentation (parameterized layer weightings)
- Fill pixel values (new)
- Classifier Algorithm(s) (machine learning) - Bayes, KNN, Support Vector Machine, Trees

- 3D/4D Support for synchronize maps

Features

- Scene name
- Statistic of object value
- Histogram of object value

Latest Operating Systems Support

- Full support for the latest generation of 32bit and 64bit operating systems. See System Requirements documentation for full details of certified operating systems.

Improved Stability and Performance

- Significant range of bug fixes that improves the stability and performance of Definiens XD products.

Please note: When using Windows 7 and Windows 2008 the default settings of the Windows firewall may prevent successful installation and usage. Please see the knowledge base article¹ for detailed information and an example script to update firewall configuration.

1. <https://definiens.zendesk.com/entries/225149-windows-2008-and-windows-7-firewall-configuration>

2 Features, Bug Fixes and Limitations

2.1 New Features

Table 2.1. New features in Definiens XD 2.0

| Category | Reference | Description |
|----------------|-----------|--|
| 3D Rendering | 17227 | 3D Rendering can be cancelled by deselecting all classes. Also 3D Rendering can handle more objects and/or higher quality with 64bit processing. |
| 64bit | 16878 | All supported image drivers ported to 64bit. |
| Action Library | 16919 | Prompt the user to confirm if they wish to upgrade to latest action library. |
| Admin Console | 16246 | New support reporting tool for collecting log files from all nodes in a GRID. |
| Algorithms | 16357 | Added parameter to all segmentation algorithm to override existing level. |
| Algorithms | 16332 | New option "Create new class" for "Class mode". Newly created classes receive unique color (not similar to colors of existing classes). |
| Algorithms | 16831 | New algorithm Fill Pixel Values. The Fill Pixel Values algorithm lets you fill in raster regions based on the image object domain, by interpolation from neighbor object pixels. It is generally suitable for interpolating non-data areas in continuously varying rasters (such as elevation models). |

Continues...

| Category | Reference | Description |
|-------------|-----------|---|
| Algorithms | 16959 | New 'watershed segmentation' process implements the classic watershed algorithm with custom fusion options. With fusion disabled, the algorithm creates an image object at each local minima of the specified layer. To overcome over segmentation, one can apply the well known 'seed based fusion' principle. Each object can be either Seed or Candidate. Objects are merged until there are only Seeds left. Seeds merge only with candidate objects. Candidate objects become Seeds when criteria are met. |
| Algorithms | 17147 | Support for parameterized layer weighting in multiresolution segmentation. Allows setting layer weighting from within an Architect solution. |
| Annotations | 14022 | Read and write of Aperio XML annotation files. |
| Arrays | 16352 | CNL Array concept. |
| Arrays | 16616 | Array support in widgets for Architect, static filter for single feature selector. |
| Arrays | 16655 | Support arrays for class filters. |
| Arrays | 16957 | Display array information in process tree. |
| Audit Trail | 16506 | A new audit trail tool can be used to display all operations on a workspace. This can assist a customer if they have to meet regulatory audit requirements. |
| Performance | 17180 | Support for caching of feature values to avoid additional computation. e.g. LiDAR, especially when this by image object. <ul style="list-style-type: none"> • Dynamic Image Object Value Cache • Features can be registered for caching • Values for this registered features can be calculated and stored by an algorithm. • Value gets invalidated if the image object is changed |
| Export | 16271 | The limit of 260 characters for an export path limit has been removed for operating systems (where supported by OS). |
| Features | 16009 | New feature "Scene name". |
| Features | 16562 | Features can return additional data types, not just strings and numbers. |
| Features | 16690 | New Scene Feature: Statistic of Object Value. |
| Features | 16693 | New feature allows the calculation of histogram of objects over object's feature. For example "Histogram 5 slots of Nuclei, Layer 1". |

Continues...

| Category | Reference | Description |
|--------------------------|-----------|--|
| Features | 17082 | Added feature to get the name for a feature variable. |
| Image Object Information | 17210 | If the project does not contain any layer, Image Object Information does not show anything. As we can execute rule set and have scene variables scene features are now displayed. |
| Image Proxy Server | 16688 | Image pyramids are not created inside existing files as not all 3rd party viewers can work with these pyramids properly. |
| Import | 16798 | Leica SCN 400 driver has been updated to the v2.0 specification from Leica for both windows and linux. |
| Import | 17351 | Support for importing Aperio annotations from the file system has been added to Tissue Studio. |
| Import | 17442 | New import dialog has been added to support better location of images, rulesets, solutions etc. This dialog can also be used to browse integrated data management solutions/databases. |
| Import | 16489 | Upgraded GDAL library to 1.8.0. Using geospatial raster formats using a new GDAL library should bring Data-I/O improvements: <ul style="list-style-type: none"> • using a newer libTIFF library - better TIFF support (OME-TIFF consolidation) • better support of image pyramids (including cubic resampling - see http://gdal.org/gdaladdo.html ; .ovr format of GDAL is used in ESRI ArcGIS 10 too) |
| Import | 17219 | Resolution metadata from TIFF files produced by Metasystems scanner are read automatically. |
| Import | 17392 | JPG2000 driver now supports very large images and image pyramids and performance improvements. |
| Integration | 15817 | Developer and Architect XD can access Aperio Spectrum database from the new Import Dialog. This allows customers to use Tissue Studio® Client Server and retrieve images and annotations directly from Aperio Spectrum. |
| Licensing | 16294 | Improved license borrowing usability for Windows 7 by upgrading to Flexnet v11.9 license server. |
| Local Engines | 16555 | Intelligent shutdown of control service shutdown all components if they are not processing. Avoids the situation where a user might leave local engines running and licenses not returned to shared license pool. |

Continues...

| Category | Reference | Description |
|-----------------------|-----------|--|
| Machine Learning | 16876 | Regression Tree (CART) Classifier |
| Machine Learning | 17385 | Support Vector Machine (SVM) classifier |
| Manual Classification | 17527 | Allow the use of a class filter to specify objects that are eligible for manual classification. |
| Maps | 16290 | Synchronize maps algorithm fully supports 3D/4D subsets |
| Maps | 16305 | Ability to navigate more than 4 maps simultaneously from Developer XD. |
| Maps | 16632 | Simplify ruleset development by allowing the user to specify a map that currently does not exist for a domain. |
| Maps | 16822 | Start thematic edit mode and finish thematic edit mode should work on the map of the processes domain, not on the active map. It should be possible, to start them edit mode on several maps in parallel, and then finish it on all those maps after user has had opportunity to draw. |
| SDK | 16224 | DIAMkWksp extended to be able to create Tissue Studio@workspaces. |
| SDK | 16307 | DIACMDLineTools supports rollback workspace and set time out value. |
| SDK | 16712 | DIACmdClient has additional -pkg option which allows you to specify which engine package should be used for processing. |
| Support | 17148 | Added new performance profiling to collect machine resource usage whilst running jobs. Helpful for diagnosing any specific performance problems reported. |
| Support | 16577 | GRID usage log added to Admin console interface. |
| Tissue Studio | 16272 | Add name of solution used for analysis to the analysis report. |
| Tissue Studio | 16613 | New group of scene-related features, called architect-related, where new features are added, also added new algo called "actions to array". |
| Tissue Studio | 16629 | View settings are stored while switching the tabs. |

Continues...

| Category | Reference | Description |
|---------------|-----------|---|
| Tissue Studio | 16675 | Manual Selection on Training Data Sets: Users would like to visualize and use manually selected regions on training data sets. This would allow for Composer training on preselected regions. Additionally, users would be able to perform the configuration on the manually selected regions. This will allow a correct preview of the final results, which is not possible at the moment. |
| Tissue Studio | 16679 | 64bit Edition for all Tissue Studio® installers. |
| Tissue Studio | 16954 | Modified multiple layer select widget to access parameter set array. implemented ability to add arrays to parameter sets. |

2.2 Bug Fixes

Table 2.2. Bugs Fixed in Definiens XD 1.5.2

| Category | Reference | Description |
|---------------|-----------|--|
| Algorithm | 16490 | Synchronize map may crash for 3D/4D subsets. |
| Algorithm | 16448 | Algorithm: Copy map: 50 % smooth leads to strange gray values |
| Algorithm | 17423 | Sliding Window Pixel Filter (Gaussian) does not appear to work in Z dimension for large data sets |
| Algorithm | 17424 | 3D distance map algorithm may crash for large 3D data sets. |
| Algorithm | 17852 | Synchronize map may lead to one pxl shift. |
| Developer | 16282 | Saving/reloading .dax can cause processes to be duplicated. |
| Developer | 17321 | Crash when trying to delete unused custom algorithm. |
| Developer | 17364 | Crash when using manual editing with open action library. |
| Developer | 16254 | Workspace sql errors if project name is different on rollback |
| Developer | 16641 | Crash when using update variable with a parameter (from parameter set). |
| Developer | 16897 | Developer may crash on workspace with > 10000 thumbnails. Now only first 10000 thumbnails will be created. |
| Developer | 17108 | Crash when loading ruleset due to duplicate classes in customized algorithm. |
| Documentation | 17320 | Documentation for the “save/restore project state” algorithm. |

Continues...

| Category | Reference | Description |
|---------------|-----------|---|
| Documentation | 17756 | Documentation: System requirements should be "Xeon-based" CPU and not "Xenon". |
| Export | 16461 | Export>Generate Report : can crash clients. |
| Export | 17319 | Additional parameter to export image algorithm used to specify if an existing image should be overwritten or not. |
| Import | 16232 | Leica SCN: Thumbnails not displayed. |
| Import | 17219 | Image resolution from TIFF metadata for Metasystems TIFF files not read. |
| Import | 17452 | Import: Mirax: Thumbnails blank when image imported with mirax cropped driver. |
| Import | 17707 | Mirax import meta data missing due to error in customized import definition. |
| Installation | 14617 | "Syntax errors in system configuration file" message when a user starts Developer with local server. No image server starts and no control service running. Caused by lack of write permissions on Windows 7 and Windows 2008 to program files folder. Installer updated. |
| Installation | 16203 | Linux: Harmless windows dll's included with linux GRID are removed. |
| Installation | 16453 | Solution tree empty when loading solution because installer sets false user rights. |
| Installation | 17719 | Upper cache threshold for x64 should be configurable to handle certain extremely large image data sets. |
| Maps | 16195 | Copy Map: pixel size is not reset correctly to initial pixel size of main map. |
| Maps | 16783 | Copy map/synchronize map (scale=1) can lead to one pixel shift. |
| Maps | 16805 | Copied map is not displayed on processed scene unless opened again. |
| Processing | 17824 | No tiles created when tiles size <= 5x5. |
| Processing | 17827 | Engine crash on loading certain rulesets. |
| Processing | 17954 | Potential engine crash with JPEG2000 files. |
| SDK | 16492 | SDK: class DMISample should not depend on dmi_map.h. |

Continues...

| Category | Reference | Description |
|-----------------|-----------|---|
| Thematic Layers | 16672 | Loading thematic layer on scaled map may fail. |
| Tissue Studio | 17565 | “Ctrl A” allows the editing of algorithms in the Developer Tissue Studio® portal. |
| TMA | 16931 | TMA: it should not be possible to define Training Data Set in TMA portal. |
| Viewer | 16362 | MPR: outlines are missing in the axial view. |
| Viewer | 16738 | Green line in crosshair tool disappears if crosshair position is changed. |
| Workspace | 16818 | Original scene ID may be lost on rollback. |

2.3 Known Issues and Limitations

Maximum 10,000 thumbnails created for a Workspace.

The maximum number of thumbnails that will be created for a workspace is 10,000. Workspaces with greater than 10,000 images are supported but only 10,000 thumbnails will be created.

Image viewing for Mirax Slides on 64-bit

At the time of writing a small number of non-reproducible crashes have been reported accessing Mirax slides using the native 64-bit edition of Definiens Developer XD. If you experience problems accessing Mirax images using the 64-bit edition please report these to support@definiens.com. In the event that you do encounter problems you may use the 32-bit editions of the software.

Image Proxy Server (IPS) Cache for large images (> 2³²-1 bytes) created with XD 1.5 IPS

A bug has been corrected with the Image Proxy Server (1.5) that affects the image statistics calculation for large images. In XD 1.5 this may have resulted in different results when comparing the analysis of images, with and without the IPS. The new version of the IPS will create the correct image statistics.

Any existing cache created by the IPS for these images (1.5) will have the old incorrect image statistics and therefore may produce different results. If you wish to re-analyse existing cached slides and produce the new (corrected) results it will be necessary to remove the previous slides from the cache. Please contact support@definiens.com for specific advice regarding this topic.

Red Hat Enterprise Linux 5 64-bit – libungif Package Dependency for 32-bit Edition

Users who install the 32-bit server edition (or 32-bit package) on Red Hat 5 x64 should note that libungif is a required package.

2.4 Errata

None

3 Additional Information

For additional information please contact support@definiens.com

3.1 Upgrading to Definiens XD 2.0 from previous versions of XD

Upgrading Definiens Client Products

You may choose to install updated versions of the client software alongside previous versions. This includes both 32bit and 64bit editions. During installation, please name the folder and program menu to distinguish clearly between different versions/editions. If you wish to install multiple XD 2.0 clients please ensure you set the local server service to start manually. This will allow you, if you are using the local server, to control which version of the local server you are using.

Upgrading Your Definiens Server XD

You are recommended to update you GRID to XD 2.0 as there are some optimizations to the Job Scheduler and the Administration Console (log file reporting) designed to make you environment easier to manage and support.

Please always ensure that you make backups of any required data files prior to upgrading.

- jobscheduler.dat (job history)
- Admin Console Database (GRID setup and configuration - in folder *AdminConsoleData*)
- Any modified configuration files with custom settings (advanced)

Please note, previous installations should be removed as installing multiple versions of the GRID on the same computer will cause processing problems. You may also not install 32bit and 64bit Definiens Server XD side by side, however you may upload both 32bit and 64 bit packages to your server.

For a full discussion of interoperability between 32bit and 64bit editions please see [FAQ - Definiens XD 2.0 64bit](#)

Image Proxy Server

Image proxy server ports have been consolidated to avoid confusing messages for users about previous image proxy server versions. The default port for a central image proxy server has also been changed and is now 8388.

Please speak with support@definiens.com if you have a centralized Image Proxy Server setup and they will be happy to guide you through configuration changes that will be necessary.

3.2 Further Information

For detailed information regarding the new capabilities of Definiens XD products, please refer to the respective user guides. These also contain difference between XD and the 2D product range to assist with planning upgrades.

As with all updates also please consult the System Requirements documentation. Users wishing to take advantage of 64bit editions may wish to upgrade the available memory for clients and servers.

Acknowledgments

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