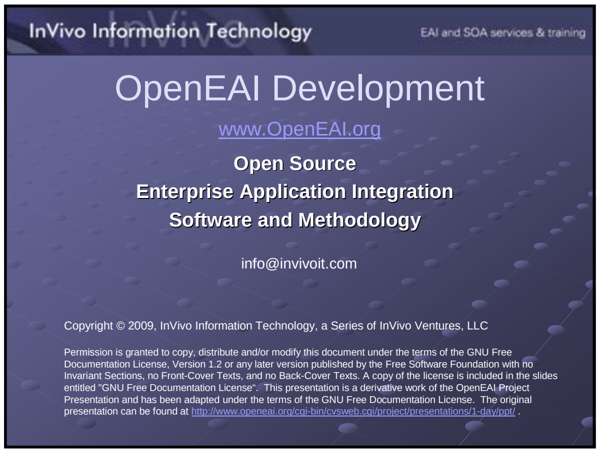
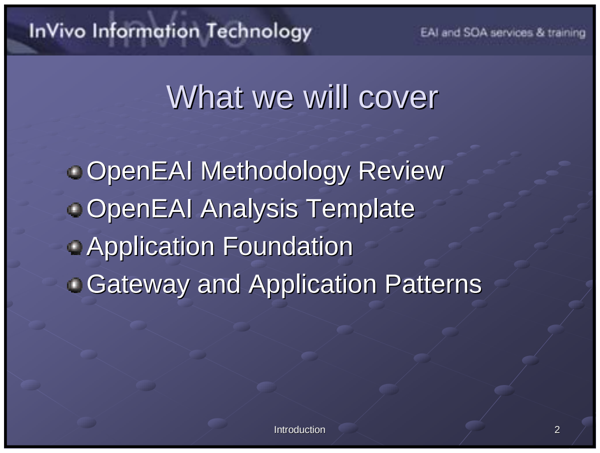

InVivo Information Technology — EAI and SOA services & training

OpenEAI Development

www.OpenEAI.org

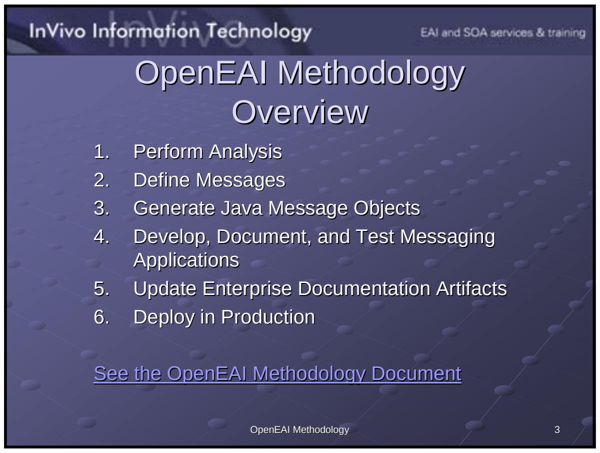
Open Source
Enterprise Application Integration
Software and Methodology

info@invivoit.com


InVivo Information Technology — EAI and SOA services & training

What we will cover

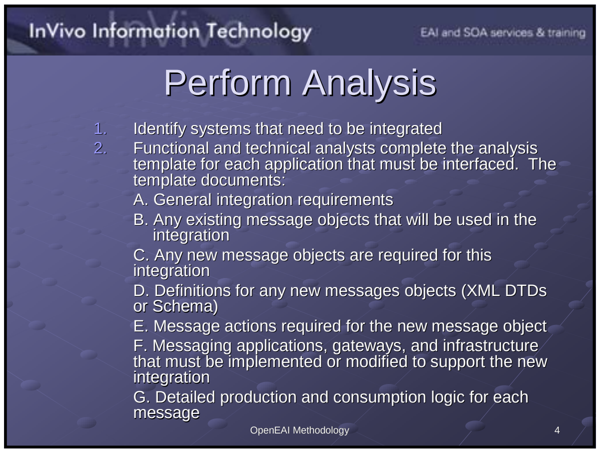
- OpenEAI Methodology Review
- OpenEAI Analysis Template
- Application Foundation
- Gateway and Application Patterns


InVivo Information Technology — EAI and SOA services & training

OpenEAI Methodology Overview

1. Perform Analysis
2. Define Messages
3. Generate Java Message Objects
4. Develop, Document, and Test Messaging Applications
5. Update Enterprise Documentation Artifacts
6. Deploy in Production

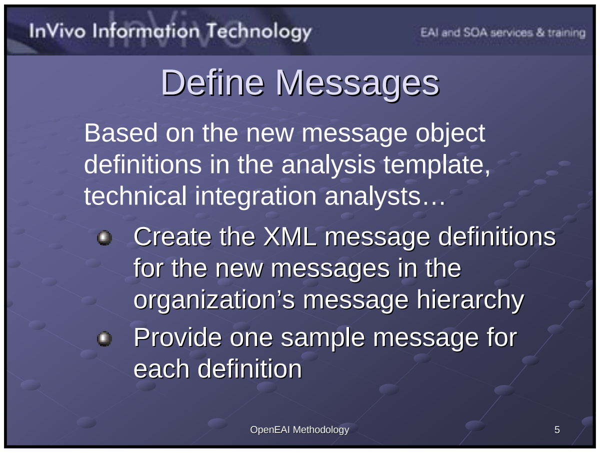
See the OpenEAI Methodology Document


InVivo Information Technology EAI and SOA services & training

Perform Analysis

1. Identify systems that need to be integrated
2. Functional and technical analysts complete the analysis template for each application that must be interfaced. The template documents:
   A. General integration requirements
   B. Any existing message objects that will be used in the integration
   C. Any new message objects are required for this integration
   D. Definitions for any new messages objects (XML DTDs or Schema)
   E. Message actions required for the new message object
   F. Messaging applications, gateways, and infrastructure that must be implemented or modified to support the new integration
   G. Detailed production and consumption logic for each message

OpenEAI Methodology 4

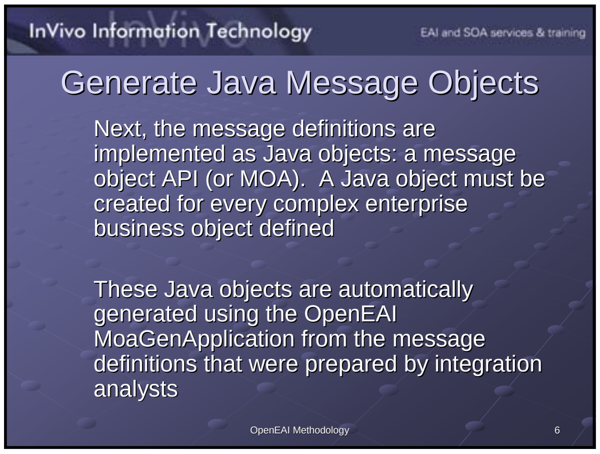

InVivo Information Technology EAI and SOA services & training

Define Messages

Based on the new message object definitions in the analysis template, technical integration analysts…

- Create the XML message definitions for the new messages in the organization's message hierarchy
- Provide one sample message for each definition

OpenEAI Methodology 5

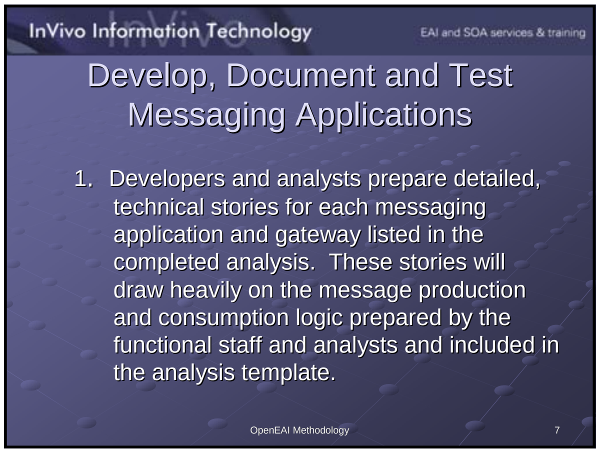

InVivo Information Technology EAI and SOA services & training

Generate Java Message Objects

Next, the message definitions are implemented as Java objects: a message object API (or MOA). A Java object must be created for every complex enterprise business object defined

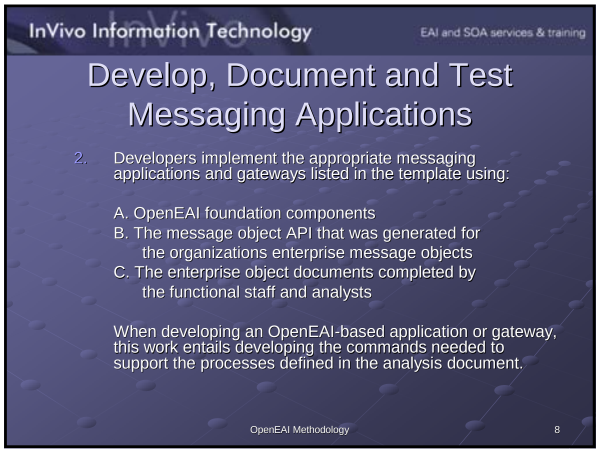
These Java objects are automatically generated using the OpenEAI MoaGenApplication from the message definitions that were prepared by integration analysts

OpenEAI Methodology 6



Develop, Document and Test Messaging Applications

1. Developers and analysts prepare detailed, technical stories for each messaging application and gateway listed in the completed analysis. These stories will draw heavily on the message production and consumption logic prepared by the functional staff and analysts and included in the analysis template.

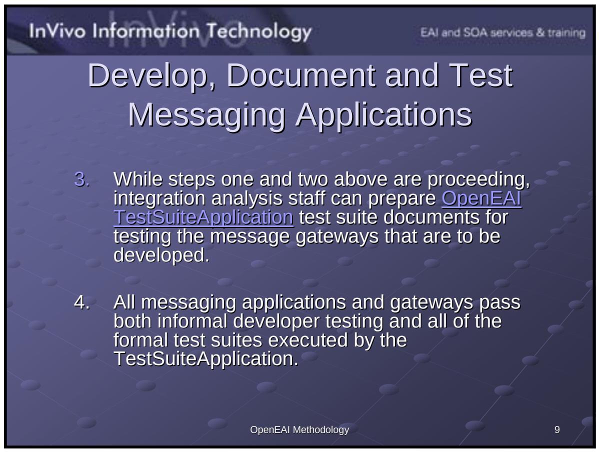


Develop, Document and Test Messaging Applications

2. Developers implement the appropriate messaging applications and gateways listed in the template using:

   A. OpenEAI foundation components
   B. The message object API that was generated for the organizations enterprise message objects
   C. The enterprise object documents completed by the functional staff and analysts

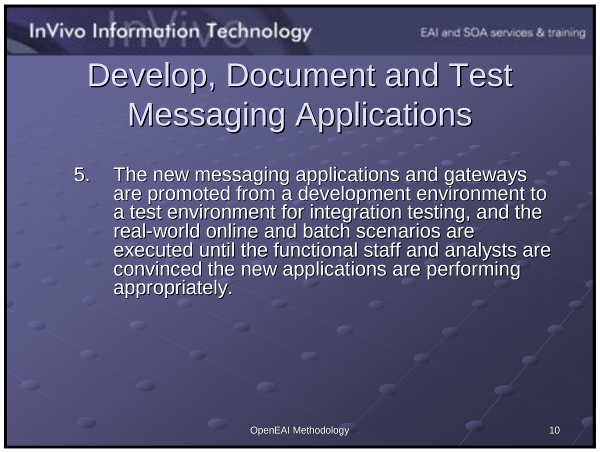
   When developing an OpenEAI-based application or gateway, this work entails developing the commands needed to support the processes defined in the analysis document.



Develop, Document and Test Messaging Applications

3. While steps one and two above are proceeding, integration analysis staff can prepare OpenEAI TestSuiteApplication test suite documents for testing the message gateways that are to be developed.

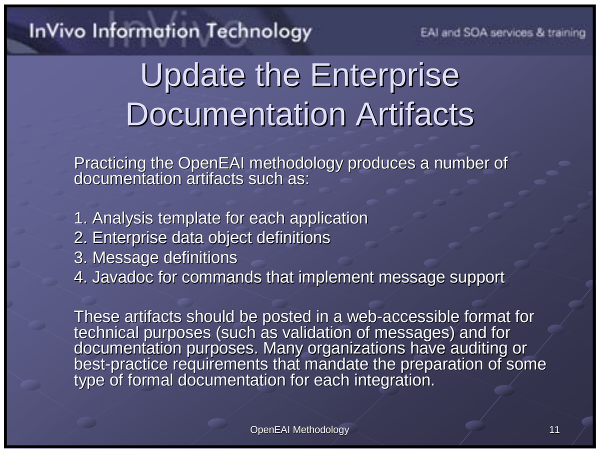
4. All messaging applications and gateways pass both informal developer testing and all of the formal test suites executed by the TestSuiteApplication.


InVivo Information Technology EAI and SOA services & training

Develop, Document and Test Messaging Applications

5. The new messaging applications and gateways are promoted from a development environment to a test environment for integration testing, and the real-world online and batch scenarios are executed until the functional staff and analysts are convinced the new applications are performing appropriately.

OpenEAI Methodology 10


InVivo Information Technology EAI and SOA services & training

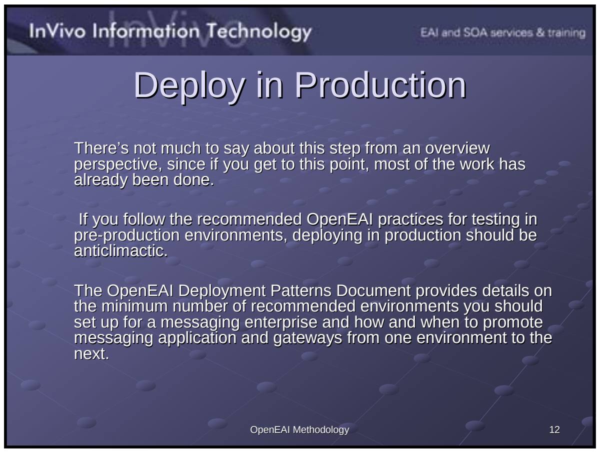
Update the Enterprise Documentation Artifacts

Practicing the OpenEAI methodology produces a number of documentation artifacts such as:

1. Analysis template for each application
2. Enterprise data object definitions
3. Message definitions
4. Javadoc for commands that implement message support

These artifacts should be posted in a web-accessible format for technical purposes (such as validation of messages) and for documentation purposes. Many organizations have auditing or best-practice requirements that mandate the preparation of some type of formal documentation for each integration.

OpenEAI Methodology 11


InVivo Information Technology EAI and SOA services & training

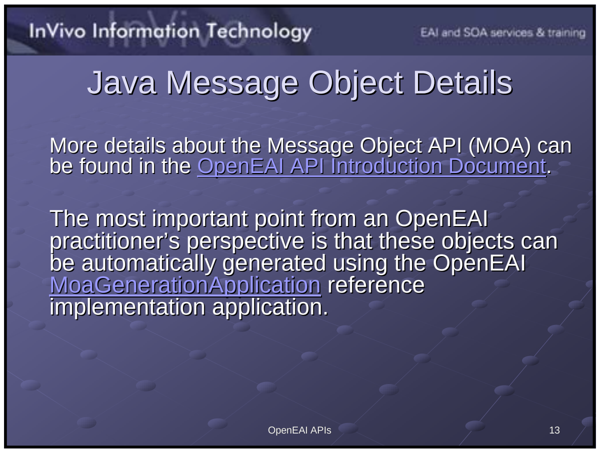
Deploy in Production

There's not much to say about this step from an overview perspective, since if you get to this point, most of the work has already been done.

If you follow the recommended OpenEAI practices for testing in pre-production environments, deploying in production should be anticlimactic.

The OpenEAI Deployment Patterns Document provides details on the minimum number of recommended environments you should set up for a messaging enterprise and how and when to promote messaging application and gateways from one environment to the next.

OpenEAI Methodology 12

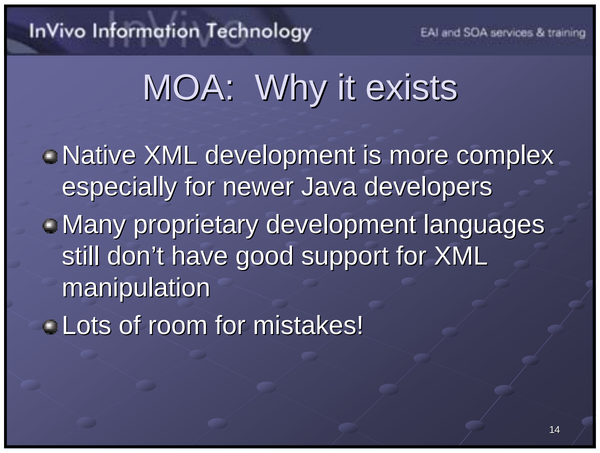

InVivo Information Technology — EAI and SOA services & training

Java Message Object Details

More details about the Message Object API (MOA) can be found in the OpenEAI API Introduction Document.

The most important point from an OpenEAI practitioner's perspective is that these objects can be automatically generated using the OpenEAI MoaGenerationApplication reference implementation application.

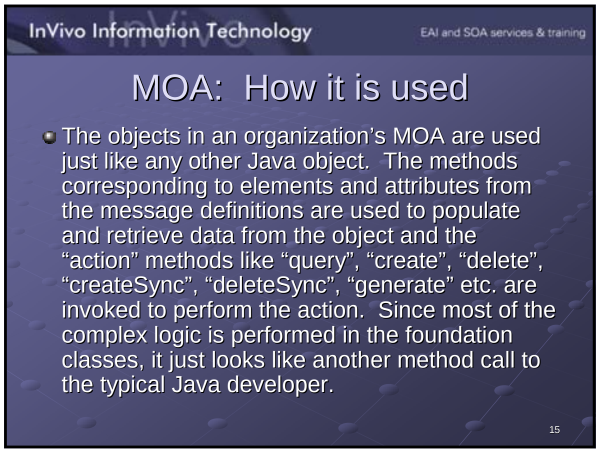
OpenEAI APIs 13


InVivo Information Technology — EAI and SOA services & training

MOA: Why it exists

- Native XML development is more complex especially for newer Java developers
- Many proprietary development languages still don't have good support for XML manipulation
- Lots of room for mistakes!

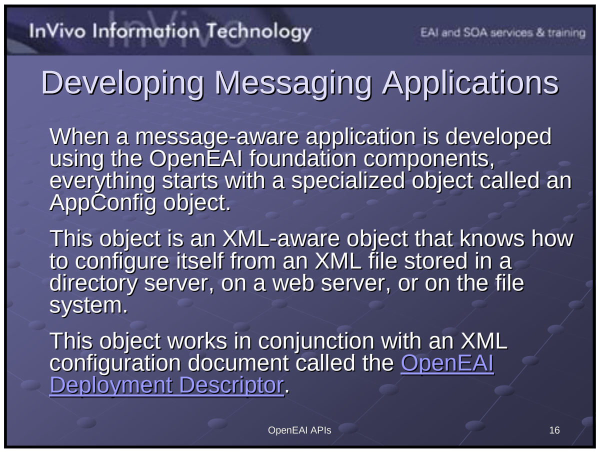
14


InVivo Information Technology — EAI and SOA services & training

MOA: How it is used

- The objects in an organization's MOA are used just like any other Java object. The methods corresponding to elements and attributes from the message definitions are used to populate and retrieve data from the object and the "action" methods like "query", "create", "delete", "createSync", "deleteSync", "generate" etc. are invoked to perform the action. Since most of the complex logic is performed in the foundation classes, it just looks like another method call to the typical Java developer.

15


InVivo Information Technology   EAI and SOA services & training

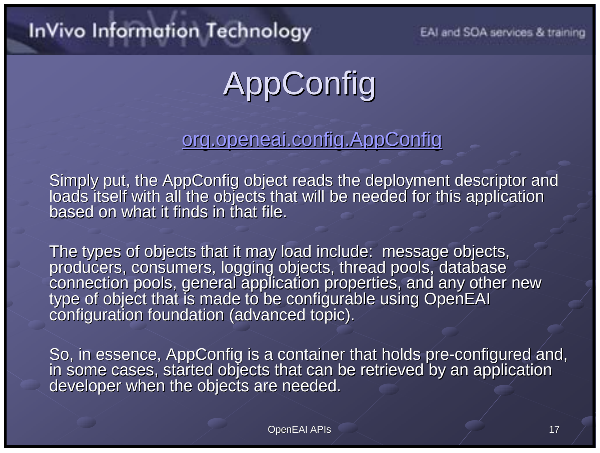
Developing Messaging Applications

When a message-aware application is developed using the OpenEAI foundation components, everything starts with a specialized object called an AppConfig object.

This object is an XML-aware object that knows how to configure itself from an XML file stored in a directory server, on a web server, or on the file system.

This object works in conjunction with an XML configuration document called the OpenEAI Deployment Descriptor.

OpenEAI APIs   16


InVivo Information Technology   EAI and SOA services & training

AppConfig

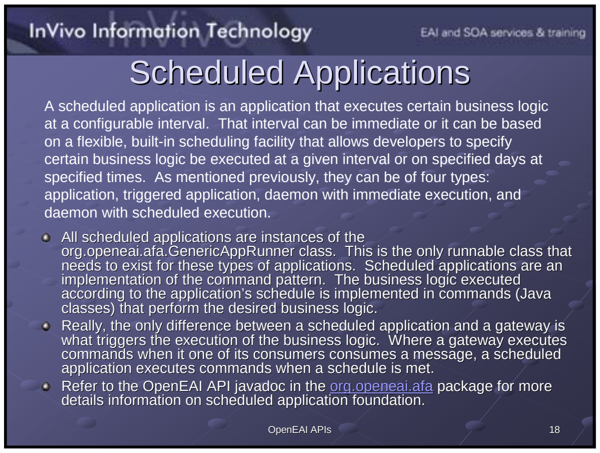
org.openeai.config.AppConfig

Simply put, the AppConfig object reads the deployment descriptor and loads itself with all the objects that will be needed for this application based on what it finds in that file.

The types of objects that it may load include: message objects, producers, consumers, logging objects, thread pools, database connection pools, general application properties, and any other new type of object that is made to be configurable using OpenEAI configuration foundation (advanced topic).

So, in essence, AppConfig is a container that holds pre-configured and, in some cases, started objects that can be retrieved by an application developer when the objects are needed.

OpenEAI APIs   17

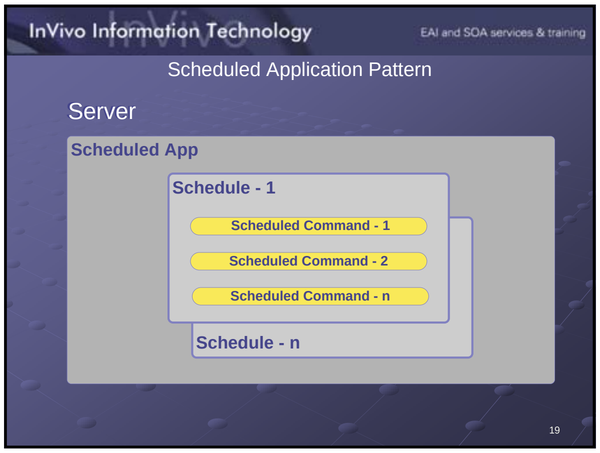

InVivo Information Technology   EAI and SOA services & training

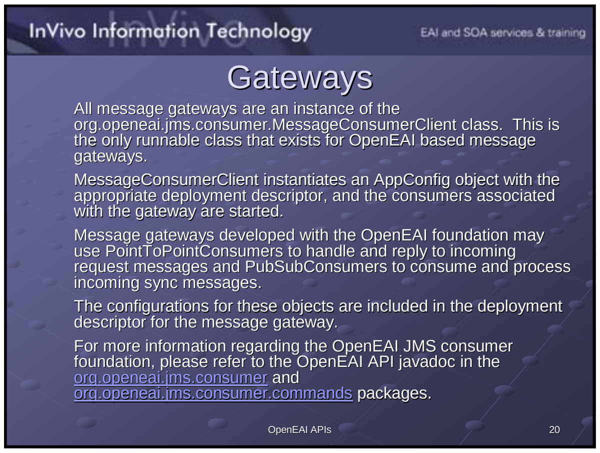
Scheduled Applications

A scheduled application is an application that executes certain business logic at a configurable interval. That interval can be immediate or it can be based on a flexible, built-in scheduling facility that allows developers to specify certain business logic be executed at a given interval or on specified days at specified times. As mentioned previously, they can be of four types: application, triggered application, daemon with immediate execution, and daemon with scheduled execution.

- All scheduled applications are instances of the org.openeai.afa.GenericAppRunner class. This is the only runnable class that needs to exist for these types of applications. Scheduled applications are an implementation of the command pattern. The business logic executed according to the application's schedule is implemented in commands (Java classes) that perform the desired business logic.
- Really, the only difference between a scheduled application and a gateway is what triggers the execution of the business logic. Where a gateway executes commands when it one of its consumers consumes a message, a scheduled application executes commands when a schedule is met.
- Refer to the OpenEAI API javadoc in the org.openeai.afa package for more details information on scheduled application foundation.

OpenEAI APIs   18





Gateways

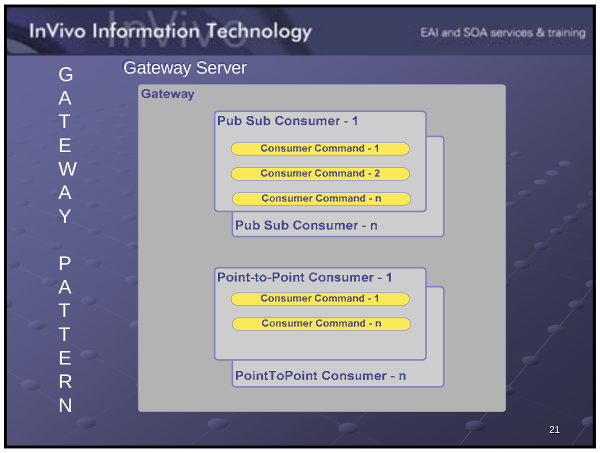
All message gateways are an instance of the org.openeai.jms.consumer.MessageConsumerClient class. This is the only runnable class that exists for OpenEAI based message gateways.

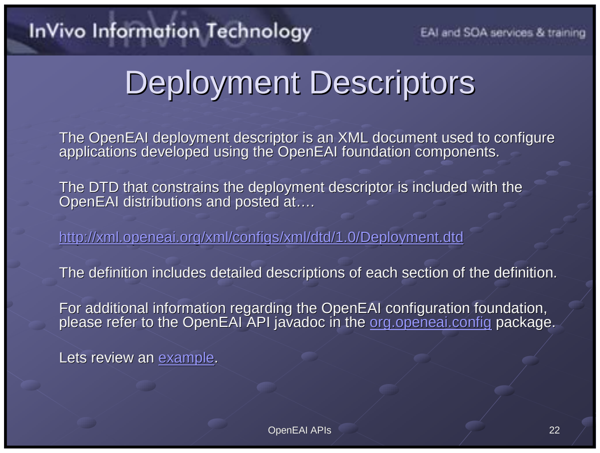
MessageConsumerClient instantiates an AppConfig object with the appropriate deployment descriptor, and the consumers associated with the gateway are started.

Message gateways developed with the OpenEAI foundation may use PointToPointConsumers to handle and reply to incoming request messages and PubSubConsumers to consume and process incoming sync messages.

The configurations for these objects are included in the deployment descriptor for the message gateway.

For more information regarding the OpenEAI JMS consumer foundation, please refer to the OpenEAI API javadoc in the org.openeai.jms.consumer and org.openeai.jms.consumer.commands packages.




InVivo Information Technology

EAI and SOA services & training

Deployment Descriptors

The OpenEAI deployment descriptor is an XML document used to configure applications developed using the OpenEAI foundation components.

The DTD that constrains the deployment descriptor is included with the OpenEAI distributions and posted at….

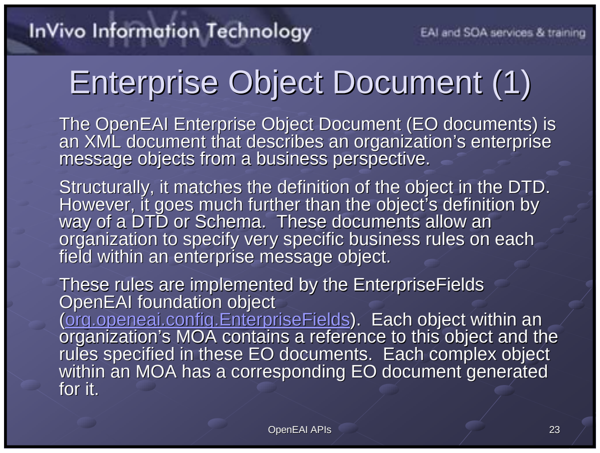
http://xml.openeai.org/xml/configs/xml/dtd/1.0/Deployment.dtd

The definition includes detailed descriptions of each section of the definition.

For additional information regarding the OpenEAI configuration foundation, please refer to the OpenEAI API javadoc in the org.openeai.config package.

Lets review an example.

OpenEAI APIs 22


InVivo Information Technology

EAI and SOA services & training

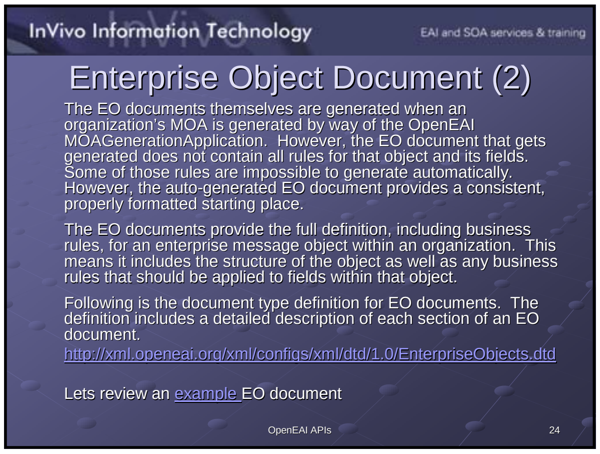
Enterprise Object Document (1)

The OpenEAI Enterprise Object Document (EO documents) is an XML document that describes an organization's enterprise message objects from a business perspective.

Structurally, it matches the definition of the object in the DTD. However, it goes much further than the object's definition by way of a DTD or Schema. These documents allow an organization to specify very specific business rules on each field within an enterprise message object.

These rules are implemented by the EnterpriseFields OpenEAI foundation object (org.openeai.config.EnterpriseFields). Each object within an organization's MOA contains a reference to this object and the rules specified in these EO documents. Each complex object within an MOA has a corresponding EO document generated for it.

OpenEAI APIs 23


InVivo Information Technology

EAI and SOA services & training

Enterprise Object Document (2)

The EO documents themselves are generated when an organization's MOA is generated by way of the OpenEAI MOAGenerationApplication. However, the EO document that gets generated does not contain all rules for that object and its fields. Some of those rules are impossible to generate automatically. However, the auto-generated EO document provides a consistent, properly formatted starting place.

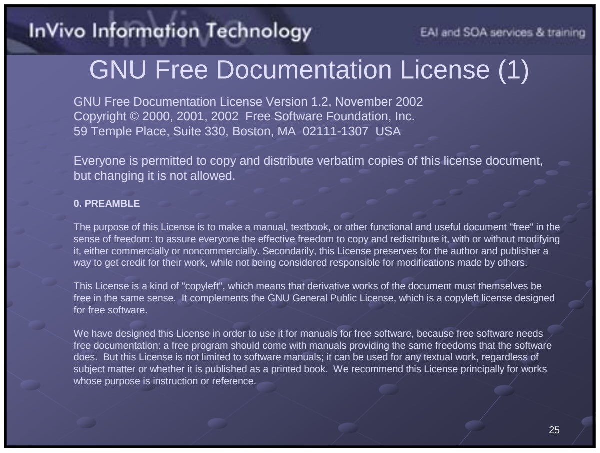
The EO documents provide the full definition, including business rules, for an enterprise message object within an organization. This means it includes the structure of the object as well as any business rules that should be applied to fields within that object.

Following is the document type definition for EO documents. The definition includes a detailed description of each section of an EO document.

http://xml.openeai.org/xml/configs/xml/dtd/1.0/EnterpriseObjects.dtd

Lets review an example EO document

OpenEAI APIs 24



GNU Free Documentation License (1)

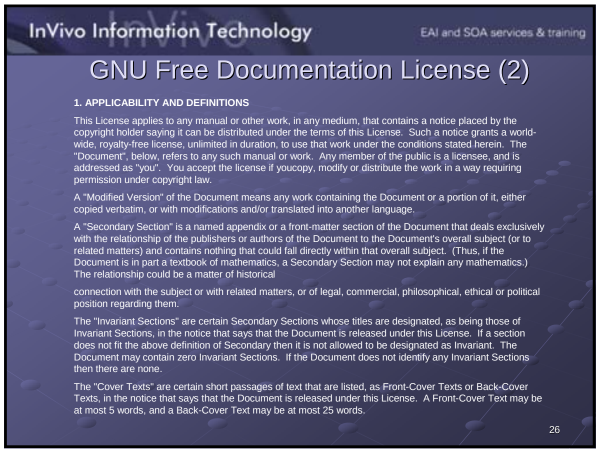
0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

25



GNU Free Documentation License (2)

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if youcopy, modify or distribute the work in a way requiring permission under copyright law.

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

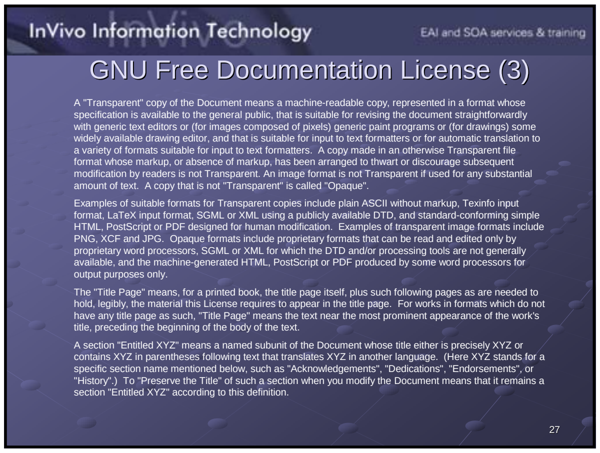
A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical

connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

26



GNU Free Documentation License (3)

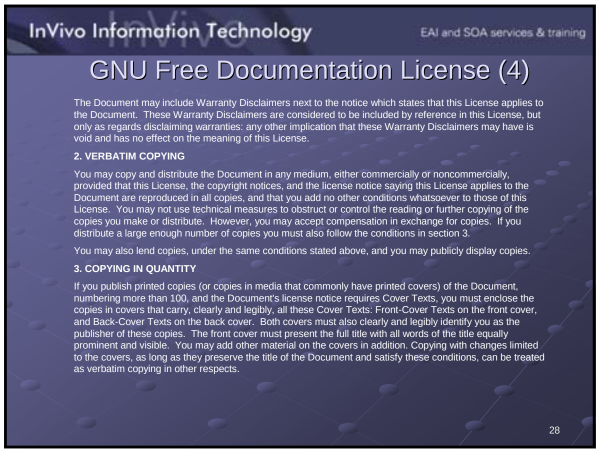
A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

A section "Entitled XYZ" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

27


InVivo Information Technology EAI and SOA services & training

GNU Free Documentation License (4)

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

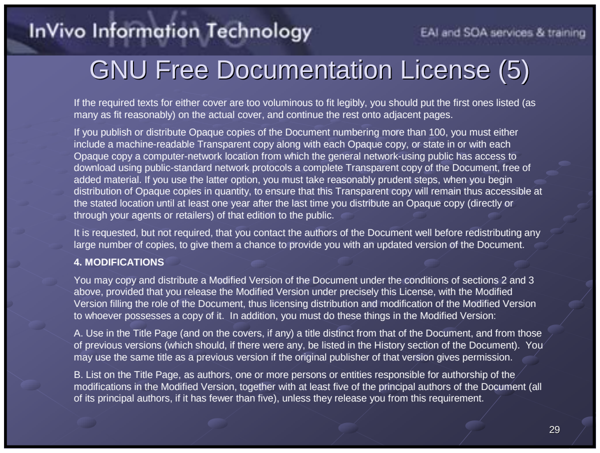
You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

28


InVivo Information Technology EAI and SOA services & training

GNU Free Documentation License (5)

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

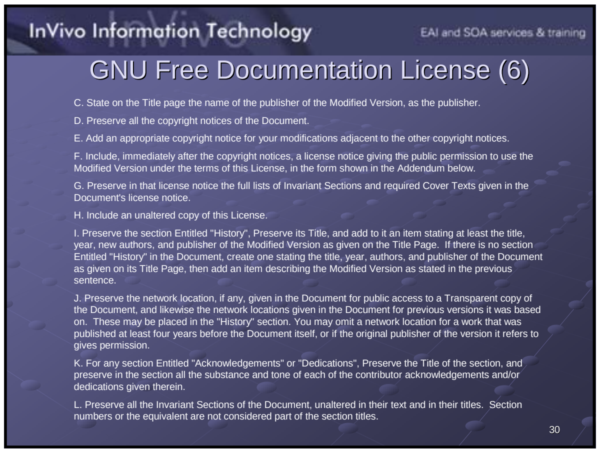
4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.

B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.

29


InVivo Information Technology EAI and SOA services & training

GNU Free Documentation License (6)

C. State on the Title page the name of the publisher of the Modified Version, as the publisher.

D. Preserve all the copyright notices of the Document.

E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.

F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.

G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.

H. Include an unaltered copy of this License.

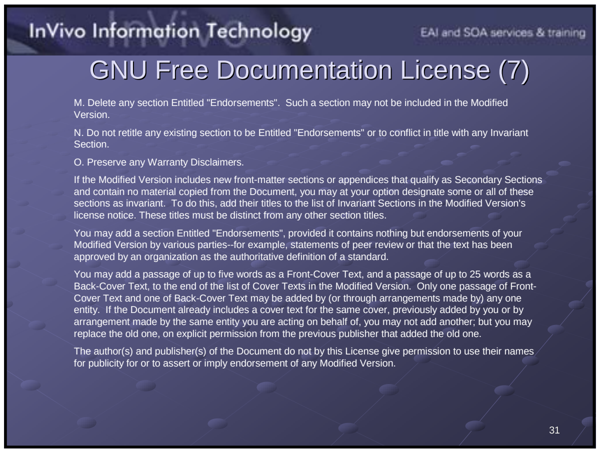
I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.

J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.

K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.

L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.

30


InVivo Information Technology EAI and SOA services & training

GNU Free Documentation License (7)

M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.

N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.

O. Preserve any Warranty Disclaimers.

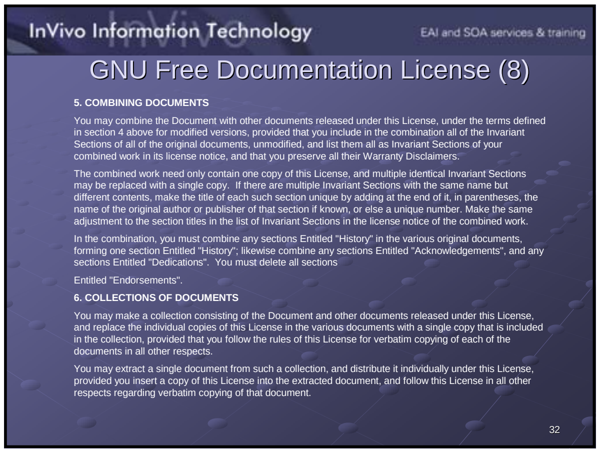
If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties--for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

31


InVivo Information Technology EAI and SOA services & training

GNU Free Documentation License (8)

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections

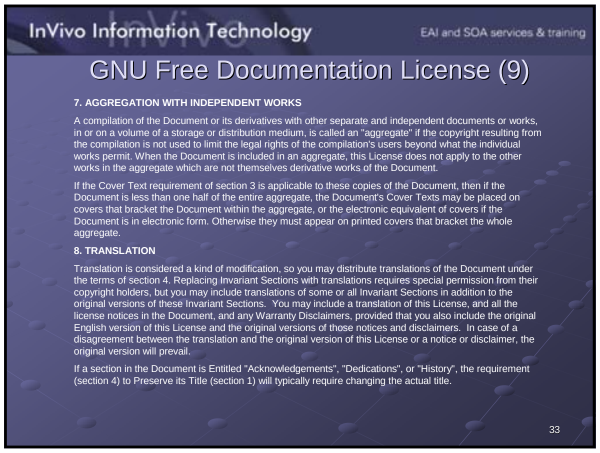
Entitled "Endorsements".

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

32


InVivo Information Technology EAI and SOA services & training

GNU Free Documentation License (9)

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

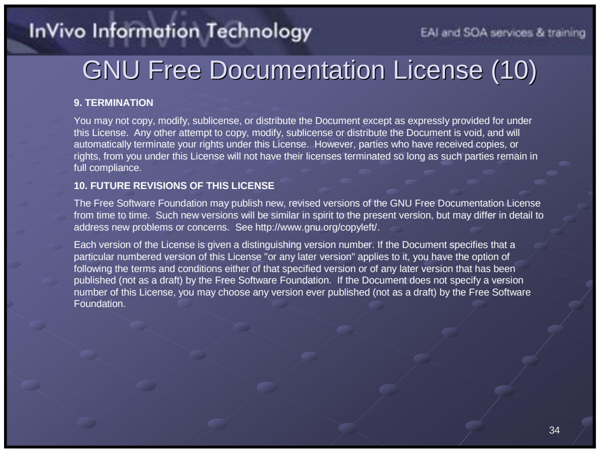
If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

33

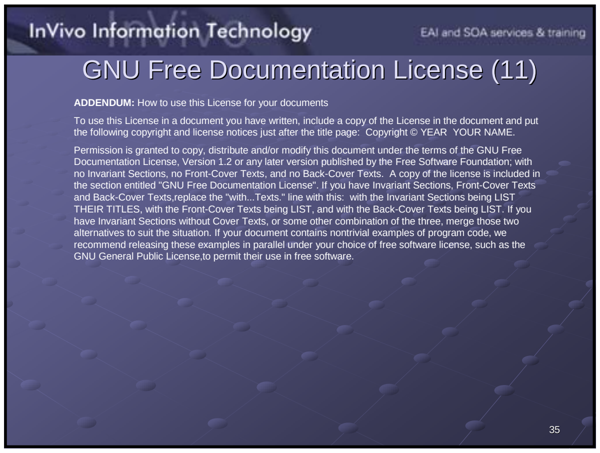


InVivo Information Technology

EAI and SOA services & training

GNU Free Documentation License (10)

34



InVivo Information Technology

EAI and SOA services & training

GNU Free Documentation License (11)

35