

Reusable **Learning Object Authoring** Guidelines: How to Build Modules, Lessons, and Topics

This white paper provides the structure and guidelines used by the Cisco Systems Internet Learning Solutions Group (ILSG) to build reusable learning objects (RLOs). The information in this paper had previously been included as part of Version 4.0 of the “Reusable Learning Object Strategy” white paper, but with the release of Version 4.5, the guidelines are now contained in this companion white paper.

To avoid confusion between the terms “reusable learning object” and “reusable information object” used in previous versions of the strategy paper, the generic term “learning object” is used in the bulk of this document. Furthermore, the term “lesson” is used in place of the equivalent term, reusable learning object (RLO), and the term “topic” is used instead of the equivalent term, reusable information object (RIO). It is felt that the process of designing, developing, and implementing learning objects could better be described without the use of additional technical terms.

Although many of the guidelines included in this document are oriented toward development of ILSG instructor-led training (ILT) certification courses, the overall learning object strategy can be applied to any content, regardless of delivery format.



Table of Contents

Table of Contents	2
Related Documents	3
Using this Document	3
Contributors	3
Document Organization	4
Structural Specifications	5
Practices and Assessments	8
Course-Level Guidelines	9
Module-Level Guidelines	11
Lesson-Level Guidelines	12
Topic-Level Guidelines	17
Building a Concept	19
Building a Fact	21
Building a Procedure	23
Building a Process	25
Building a Principle	27
Conclusion	29
Bibliography and Additional References	30



Related Documents

Here are additional Cisco documents that are closely related to this white paper:

- “Enhancing the Learner Experience”
- “Reusable Learning Object Strategy: Designing and Developing Learning Objects for Multiple Learning Approaches”
- “Blueprint for Enterprise E-Learning”

Using this Document

This white paper is a companion to “Reusable Learning Object Strategy: Designing and Developing Learning Objects for Multiple Learning Approaches.” It provides authors with the detailed guidelines they need to structure specific types of objects.

Here authors will find structural specifications for each type of object, as well as helpful guidelines and examples for classifying different content types. This paper also provides practical advice on when and how to write the various types of content that comprise learning objects, such as practices and assessments.

Although the guidelines included in this paper can be applied to any learning object-based solution, they are oriented toward the ILT courses designed and developed by ILSG. ILSG has found that when it develops ILT using these guidelines, its training delivery partners can more efficiently reuse and repurpose the design specifications, media elements, and topics to build web-based learning and blended learning solutions.

Contributors

A few of the many contributors at Cisco:

Barbara Termaat	Rick Crowley
Beryl Agua	Matt Tabor
Bob McGough	Shawna Darling
Corliss Lee	Jim Lee
Deb Lewis	Brenda Nichols
Kenis Dunne	Christine Yoshida
Lisa Epperson	Peg Maddocks
Matt O'Donoghue	Cisco Networking Academy Program
Michael King	Libby Goga
Shelley Uyeda	Steve Birch

Additional acknowledgment to these external resources:

John Alonso, OutStart, Inc.	Ruth Clark, Clark Training & Consulting
Jeffrey Katzman, Peer3 Software	IMS (www.imsproject.org)
Richard Horn, Horn Interactive	ADL (www.adlnet.org)
Lee Alderman, Redwood Credit Union	Wayne Hodgins, AutoDesk



Document Organization

This document is organized into the following sections:

- Overall Structure
- Practices and Assessments
- Course-Level Guidelines
- Module-Level Guidelines
- Lesson-Level Guidelines
- Topic-Level Guidelines
- Building a Concept
- Building a Fact
- Building a Procedure
- Building a Process
- Building a Principle
- Conclusion
- References



Structural Specifications

The RLO strategy provides a five-level hierarchy that authors can use to ensure consistent structures across multiple courses. The levels are:

- Course
- Module
- Lesson
- Topic
- Subtopic

The table shows structural specifications for the different levels of content in a Cisco Career Certification course. Guidelines for each level are provided in the remainder of this paper. This structure is specific to the Career Certification program; other object-based learning programs employ modified structures.

Cisco Career Certification Course Content Structure

Chart_head Style Sheet Text	Chart_head Style Sheet Text
Course	<ul style="list-style-type: none">• Introduction (r)• Module (o)• Lesson (r)• Topic (r)• Subtopic (r)• Practice (o)• Assessment (o)
Course Introduction	<ul style="list-style-type: none">• Overview (r)• Cisco Certifications (r)• Learner Skills and Knowledge (r)• Learner Responsibilities (r)• General Administration (r)• Course Flow Diagram (r)• Icons and Symbols (r)• Learner Introductions (r)• Course Evaluation (r)
Course Overview	<ul style="list-style-type: none">• Course Goal and Objectives (r)• Course Outline (r)



Chart_head Style Sheet Text	Chart_head Style Sheet Text
Module	<ul style="list-style-type: none"> • Overview (r) • Lessons (r) • Summary (o) • Practice (o) • Assessment (o)
Module Overview	<ul style="list-style-type: none"> • Introduction (r) • Objectives (r) • Outline (r)
Module Summary	<ul style="list-style-type: none"> • Key points (r)
Lesson	<ul style="list-style-type: none"> • Overview (r) • Topics (r) • Summary (r) • Practice (o) • Assessment (o)
Lesson Overview	<ul style="list-style-type: none"> • Introduction (r) • Importance (r) • Objectives (r) • Prerequisites (r) • Scenario (o) • Outline (r)
Lesson Summary	<ul style="list-style-type: none"> • Review (r) • Next Steps (o) • Additional Resources (o)
Concept Topic	<ul style="list-style-type: none"> • Introduction (r) • Facts (o) • Definition (r) • Example (r) • Non-Example (o) • Analogy (o) • Practice Items (o) ^ • Assessment items (o)^



Chart_head Style Sheet Text	Chart_head Style Sheet Text
Fact Topic	<ul style="list-style-type: none">• Introduction (r)• Facts (r)• Instructor Notes (o)• Practice Items (o)^• Assessment items (o)^
Procedure Topic	<ul style="list-style-type: none">• Introduction (r)• Facts (o)• Procedure Table (e)• Decision Table (e)• Combined Table (e)• Demonstration (o)• Practice Items (o)^• Assessment items (o)^
Process Topic	<ul style="list-style-type: none">• Introduction (r)• Facts (o)• Staged Table (e)• Block Diagrams (e)• Cycle Charts (e)• Instructor Notes (o)• Practice Items (o)^• Assessment items (o)^
Principle Topic	<ul style="list-style-type: none">• Introduction (r)• Facts (o)• Principle Statement (o)• Guidelines (r)• Example (r)• Non-Example (o)• Practice Items (o)^• Assessment items (o)^

(r) = required, (o) = optional, (e) = either

^Practice or assessment items for specific topics can be grouped in a lesson-, module-, or course-level activity.



Practices and Assessments

The RLO strategy enables the use of several types of practice and assessment activities. These activities include:

- Lab exercises
- Role playing
- Case studies
- Games
- Quizzes
- Simulations

This section provides you with general guidelines for designing effective practice and assessment activities. Hierarchy-specific guidelines are included in subsequent sections. Future versions of this white paper will include specific guidelines for each type of practice activity, including how activities are matched to performance objectives.

Comparison of Practice and Assessment

The difference between a practice and an assessment is really one of intent. Both types of activities can be used in a given course at various levels of the course hierarchy.

- The intent of a practice activity is to assist the learner in encoding and integrating new knowledge, as well as to help the learner get ready for the final assessment. The practice provides instructional feedback and points to topics the learner should review for further study.
- In *e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*, Ruth Colvin Clark highlights the significance of practice activities. In it she writes, “e-Learning should promote psychological engagement between the learner and the lesson content in ways that help learners to select, integrate, and retrieve new knowledge. First, they must select the important information in the training. Then they must integrate the new information into existing knowledge in long-term memory. Finally, they must be able to retrieve new knowledge and skills out of long-term memory when they are on the job. Effective e-learning will support all three of these processes by providing practice exercises with features that mirror the physical and psychological environment of the job.”
- The assessment is intended to be a final experience, associated with a passing or failing grade. Assessment is any activity designed to confirm that a learner has mastered the performance objectives at the course, module, or lesson level.

Creating Practice and Assessment Activities

Practice and assessment activities can be placed at the end of a lesson, module, or course. Depending on its hierarchy level, an activity may cover a single performance objective for a lesson or a series of performance objectives for a module.

The design of the activity will depend on the performance objective, the objective type (that is, procedural, conceptual, or principle based), and the cognitive level that the learning objective is reaching (use or remember). For example, a principle-type objective may require that a case study be used to develop sales skills, while a simple concept-based objective may require only a quiz that asks the learner to distinguish among the characteristics of that concept.

To design an activity that addresses a lesson-level objective, follow these guidelines:

- Cover the criteria set forth in the performance objective for that lesson.
- Ensure that the topic-level objectives in that lesson are achieved if the performance objective is met.
- Create activities that reflect the use of skills and knowledge on the job, not simply the recall of information.



Guidelines for Practice Activities

Well-designed practice activities are critical ingredients of an effective, engaging learning experience. Here are general guidelines for ensuring effective practice activities:

- Try to introduce a practice activity within the first 4 hours of an ILT.
- Provide plenty of hands-on opportunities for learners to practice applying their new skills and knowledge throughout any training event.
- For web-based learning, build in even more frequent and varied activities and include robust, helpful feedback to keep learners engaged and active.

Guidelines for Assessment Activities

Assessment activities can be designed to address course- or module-level objectives. The primary differences are placement in the hierarchy and number of objectives covered. Here are guidelines for using assessment activities:

- Communicate to the learner and instructor that the activity is intended to be an assessment; let them know that no feedback will be provided; and give the number of attempts the learner has to complete the assessment, the passing score, and the manner in which scores will be reported.
- You do not need to limit the type of assessment activity to a multiple-choice quiz. Use activity types that are as close to the real-world application of the skills and knowledge being taught as possible and practical.

Course-Level Guidelines

ILSG has created detailed guidelines for ILT materials, such as student workbooks, instructor guides, presentation slides, and evaluations. Here are general guidelines that are applicable to the RLO strategy.

Course Goal

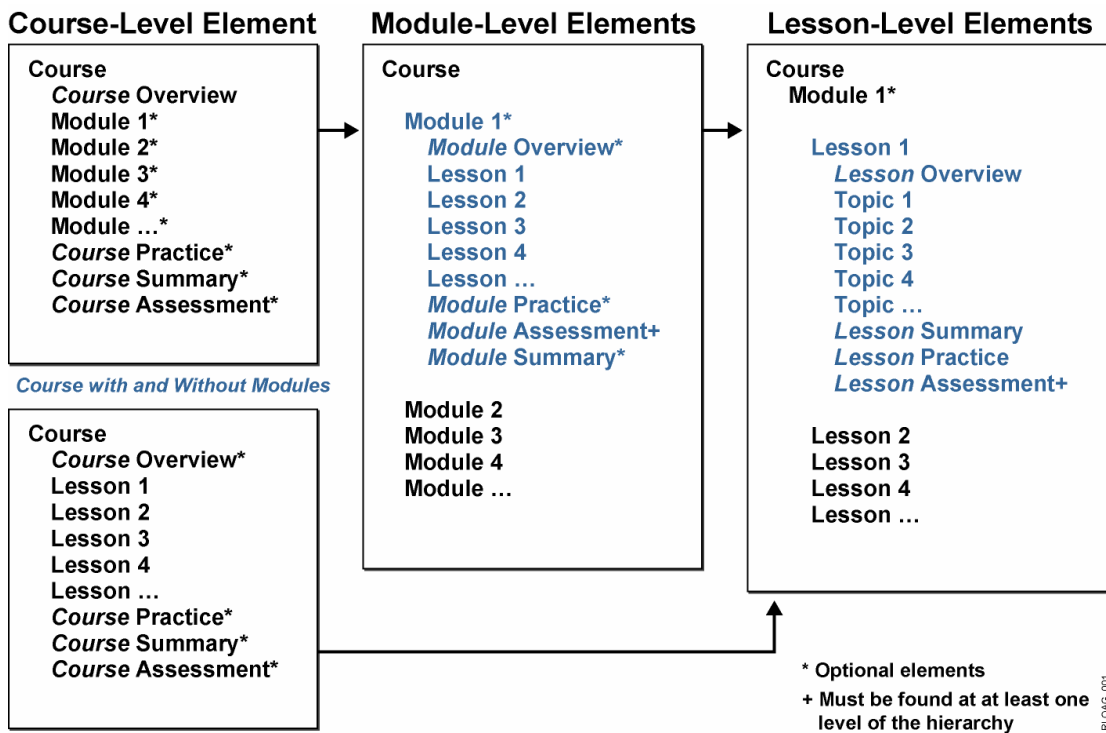
Each course should have a single broad statement that clearly states the intended outcome that each member of the audience will be able to perform once the course delivery is complete. After the course goal statement, include a statement such as “by the end of the course you will be able to perform these objectives,” and list each module objective.



Optional Course-Level Practice and Assessment

Course-level practice and assessment are optional. Practice and assessment at the course level should address broad range of the objectives covered in the course and should, ideally, focus on a job function and associated job tasks.

Hierarchy and Structure for ILT





Module-Level Guidelines

A module is a logical grouping of lessons that, ideally, relates to a specific job function. Inclusion of modules is optional and is done if the number of lessons or the focus of the lessons requires that the lessons be organized by module.

The size of the module is in direct relationship to the requirements of the module objective. It is important that whenever possible the level of each module objective be similar. It is also important to define all acronyms upon first mention in each module. A module represents potentially reusable information that can be moved from one course into another. An exception to this rule is that acronyms are not spelled out in quiz items or as part of the objectives of a module, even if it is the first mention of the acronym.

Module Learning Objective

You should include a module-level objective for each module. A module-level objective is a high-level statement that is supported by a logical collection of performance objectives. It should include a performance-based action statement. You do not need to include a conditional statement or a criterion statement for a module-level objective. A complete collection of module-level objectives represents the course objectives.

One module-level objective should be specified. This objective should ideally include an action that is clearly measurable that you can use to build a module-level practice or assessment.

Each lesson-level objective specified in the module overview should be represented by a single lesson title listed in the outline subtopic of the overview.

Module Overview

Make sure the module has an overview that is completely distinct from the overviews of the lessons contained within the module. In other words, do not merge module components with lesson components.

The module overview includes these components:

- Brief paragraph description that states the purpose of the module
- Module-level objective
- Objectives for each lesson in the module
- Outline list of the lesson titles in the module

Verify that the module outline of lessons contained in the overview duplicates the actual lessons in that module. In other words, are the lesson titles noted in the module introduction the same as the actual lesson titles? And, are all lessons listed in the module overview?

Module Summary

It is optional to include a module summary for purposes of reinforcing learner progress. The module summary should be the last component in a module.



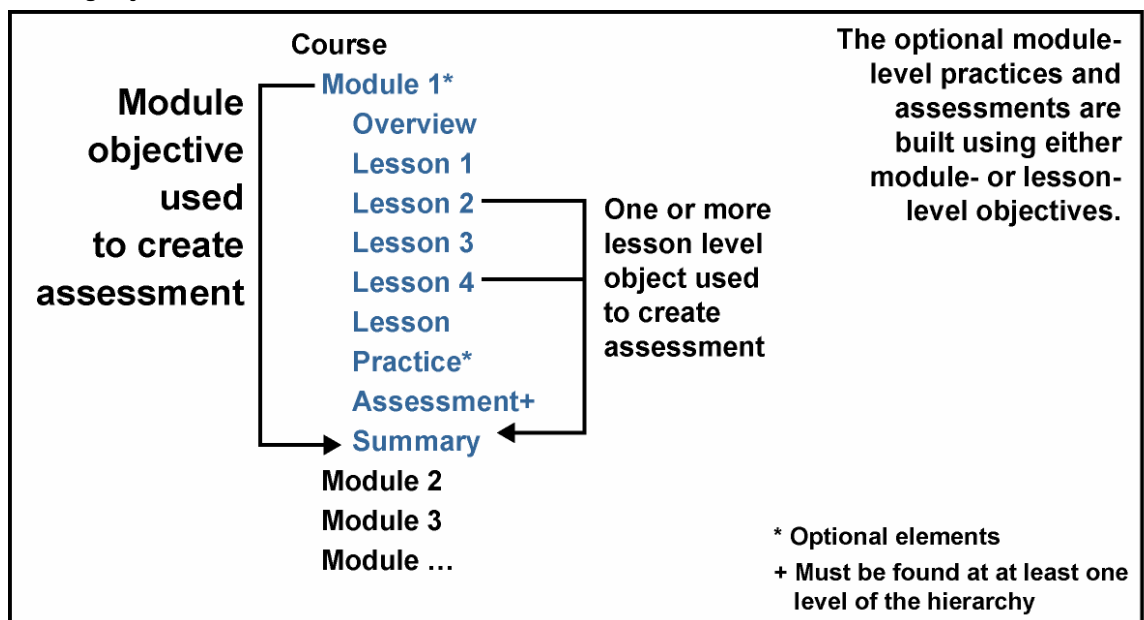
Optional Module-Level Practice and Assessment

At the module level, practice activities should be designed to address the module-level objective. It is optional to include practice activities at the module level.

At the module level, there are two options for structuring and placing assessments. You can create individual lesson assessments, which you should group at the end of the module, before the module summary. Or, you can create a single module-level assessment instead, which should also be placed at the end of the module, before the module summary.

The figure illustrates the placement options for module practice and assessment activities.

Learning Objectives and Module Practice and Assessment Placement



Lesson-Level Guidelines

A lesson is a collection of topics that are grouped together to teach a common job task based on a single learning objective.

Each lesson is a standalone unit and, therefore, must have learner skills associated with it. This information should be a listing of the skills and knowledge required and should not be simply a list of course titles. Depending on the flow of the course, what the learner learns in Lesson 1 could be the learner skills and knowledge for Lesson 2, and so on. In other cases, the sequence in which the learner completes each lesson may be irrelevant, in which case the learner skills and knowledge may be identical for each lesson.

Even if the course has only one set of prerequisites, you should repeat this information in each lesson under the heading "Learner Skills and Knowledge." The masters are designed so that each lesson is a standalone unit, reusable later in a different course with little or no rework. However, it is rare that no other lesson in a course would be a prerequisite, because most courses build skills and knowledge as they move forward.



Lesson Objectives

A lesson objective is a high-level performance objective that is supported by a collection of related objectives. The lesson objective should directly support the module-level objective, and it should include a performance-based action statement. In the design document, include a condition statement and a criterion statement for a lesson-level objective.

Here is an example of a formal lesson-level objective appropriate for use in a design document. It is helpful to separate the three parts of the objective as indicated:

- Action statement: Students will create network configuration documentation...
- Criterion statement: ... so that the information on the network configuration table and topology diagram matches the information returned from the Cisco IOS software commands and applications used to baseline the network components and they are able to identify variations in network conditions...
- Condition statement: ... given a fully operational internetwork, interconnecting end systems using Cisco routers and switches, administrative access to the network, and access to Cisco IOS software commands and applications that are used to discover network baseline configuration information

Based on feedback from instructors and students, it is recommended that you include simplified, versions of each learning objective within the student guide text in each lesson overview. However, instructors and students tell us that they prefer that the instructor slides display the outline of the lesson topics rather than the list of objectives.

The following should also be applied when creating lesson objectives:

- Make sure that you have a clear performance-oriented objective that includes measurable action verbs.
- Make sure that all of your supporting knowledge in each topic clearly supports the lesson objective and that you do not include extraneous information.
- Whenever possible, match the objective to what the learner actually will do on the job, once they have completed the lesson.



Lesson Overview

The overview is used to introduce the lesson. It functions as an advanced organizer for the learner by providing the objective, outline, and job-based scenario for that lesson.

The term “wrapper” is sometimes used to refer to the combination of an overview and summary that encloses a lesson. Because the overview and summary are placed at the front and the back of the lesson, respectively, they are said to enclose the lesson like a wrapper. The overview and summary may be used to provide context to the lesson for the learner, because they establish the scenario, importance, and objectives for the lesson.

Follow the guidelines in the table when writing an overview for a lesson.

Lesson Overview Guidelines

Item	Guideline
Introduction	Give one or two paragraphs that explain the purpose of the module or lesson.
Relevance	State the importance of the lesson. Answer the “what’s in it for me” question, which is useful for motivating the learner. Provide one or two paragraphs that create interest for the learner. Let learners know why they should be interested in the module or lesson by relating the goals to their job function.
Objectives	List one module-level or lower-level objective, followed by either: <ul style="list-style-type: none">• One objective per lesson in the module• One objective per topic in the lesson
Prerequisites	List the knowledge and skills needed to complete the module or lesson. Identify other resources the learner may need. (The system should be able to display prerequisites automatically and show which have been completed.) Focus on the primary, or target, audience for the module or lesson.
Scenario (o)	Relate the information to a job function. You can use a fictitious company to help explain the purpose of the module or lesson. Ideally, make this scenario specific to the primary audience for this module or lesson. Tie the scenario into the summary to bring closure to the module or lesson. Optionally, use a graphic element for the scenario, such as a topology based on the scenario.
Outline	List the title of each lesson contained in the module. List the title of each topic contained in the lesson.



Lesson Summary

The summary is used to conclude the lesson. . It may also offer a suggested course of action for learners to broaden their knowledge and skills. The summary is a transition between the content and the assessment.

The purpose of the summary is to succinctly recap the content in the lesson that supports each objective. Feedback from instructors and students indicates that they prefer a brief summary of key points no longer than one or two slides. It is acceptable to use one bullet point to address more than one topic. Do not restate the topic objectives, and do not introduce new content.

Follow the guidelines in the table when writing a summary.

Lesson Summary Guidelines

Subtopic	Guideline
Review	<ul style="list-style-type: none">• Give one to three sentences that review the purpose of the lesson.• Review the main points of the lesson in the form of full sentences, with at least one key point for each topic objective.• Restate objectives and importance of this the lesson or module.• Conclude the scenario established in the overview.
Next Steps (o)	<ul style="list-style-type: none">• Suggest other resources that are related to this the lesson or module.• Recommend other areas of study.• Give next steps that the learner can take to learn more, as prescribed by the course design.
Additional Resources (o)	<ul style="list-style-type: none">• List references for additional information.• List URLs, PDFs, documents, and other resources that will help the learner learn more about the knowledge and skills covered in the lesson or module.• Provide one sentence to describe each resource so that learners know what to expect when they access the link or file.



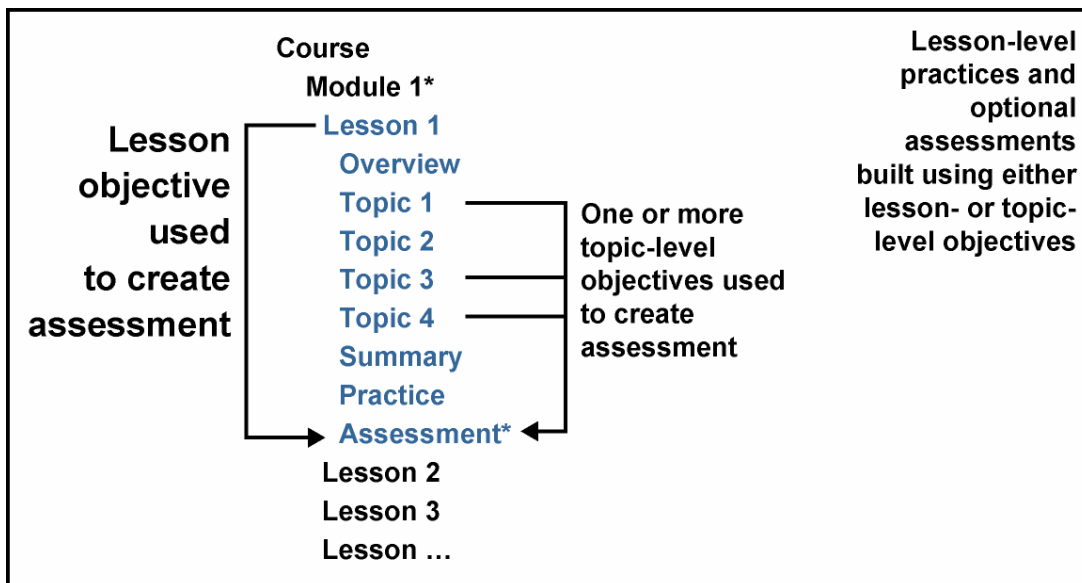
Lesson-Level Practice and Assessment

At the lesson level, practice activities can be a collection of topic-oriented practice items, or they can be a single activity designed to address the lesson-level objective. The latter option is recommended for ILT delivery to provide learners with practice that is closely related to the performance of job tasks. A practice must be placed at the end of the lesson, after the lesson summary. However, if you determine a specific need to provide in-line practice at the topic level for specific topics, you may include these as well.

At the lesson level, there are two options for structuring and placing assessments. First, you can build the lesson assessment from a collection of individual topic-level assessment items. Second, you can create a single assessment that focuses on the job task performance of the performance, lesson-level objective. When modules are used, all lesson-level assessments should be placed at the end of the module, before the module summary. Lesson-level assessments are optional if you decide to provide a single module-level assessment at the end of a module. The use of modules is optional, so if you are not using modules to structure your content, then you should provide a lesson assessment for each lesson. (See figure.)

It is possible to include both a practice and an assessment at the lesson level. In a linear workbook for ILT, the practice precedes the assessment. The instructor is encouraged to have the class work together or in small teams to solve the practice items. The practice in the workbook should include instructional feedback, with the answers provided. The assessment is treated as a self-assessment for the learner, without instructional feedback. The answers are located after the assessment questions.

Learning Objectives and Module Practice and Assessment Placement



Label each practice with the type of activity it represents rather than using the label “Practice.” For example, if you have a quiz-style activity, label it “Quiz” in the outline. If you have a lab exercise, label it “Lab Exercise.” If you have more than one lab exercise, include the title of the exercise in the label; for example, “Lab Exercise: Identifying Neighbors on the Network.”



Topic-Level Guidelines

The RLO strategy is built on the concept of creating small objects that are combined to match the needs of learners, authors, and business. Although these structures can range from a course to an “audio definition,” ILSG has applied the following guidelines and templates for the structure of topics found within a lesson. As with any guideline or template, modify this structure to fit your needs.

Topics are self-contained chunks of information built around a single learning objective. Groups of topics (RIOs) are combined to form a lesson (RLO). Each topic is built of these components:

- Subtopics that contain static and/or interactive content constructed from elements (media and text)
- Practice items
- Assessment items
- Metadata

Topics are classified into five types based on modified information mapping (as defined by Clark):

- Concept
- Fact
- Procedure
- Process
- Principle

Cisco refers to this scheme as “CFP3.” Not only does this classification scheme make topics more reusable, it also provides templates and guidelines to speed the creation of new topics. Any learning objective, and therefore any topic, can be classified into one of the five types.

Note: An enabling objective is a statement in behavioral terms of what is expected of the learner in demonstrating mastery at the knowledge or skill level necessary for achievement of a performance learning objective. A lesson is constructed through combining the topics (as summarized by the enabling objectives) that support the learner in completing the performance objective.

Note: A performance objective is a statement in behavioral terms of what is expected of the learner in demonstrating mastery at the knowledge and skill level necessary for mastering an entire lesson.

The structure of the content within each topic varies depending on whether it is a concept, fact, principle, process, or procedure topic. Each of these types has different required subtopics, such as definitions, examples, non-examples, demonstrations, procedures, guidelines, and so on. The exact requirements for the concept, fact, principle, process, or procedure are listed in subsequent sections of this paper.



Five Object Types

The table compares the five object types: concept, fact, procedure, process, and principle.

Learning Object Type Definitions

Item	Definition	Examples	Sample Titles
Concept	A group of objects, symbols, ideas, or events that are defined by a single word or term, share common features, and vary only in irrelevant features.	Look for multiple examples of the class or group that share common features and that are designated by a single word or term; for example: user, forms, router, needs, requirements, or PSTN.	<ul style="list-style-type: none">• “What Is the PSTN?”• “What Is a Router?”
Fact	Unique, specific information in the form of a statement or data or pictures of specific objects.	Look for unique specific information in the form of a statement or data or picture of specific objects; for example, the setup script on the Cisco 2500 router, or the number of card slots on a Catalyst 5500 switch.	<ul style="list-style-type: none">• “About the Cisco 2500 Router Setup Script”• “About Cisco Catalyst 5500 Switch Slots”• “About the Footprint Size of the Cisco 7600 Router”
Procedure	A sequence of steps to be followed by one individual to accomplish a task or make a decision. A procedure contains directions or procedural tasks and contains actions that are done the same way each time.	Look for directive steps, second-person language, and active voice; for example, how to log on to a computer.	<ul style="list-style-type: none">• “How to Log on to a Computer”• “How to Access the Learning Content Development Pack”
Process	A flow of events that describes how something works. It is not necessarily a task done by one person; many people or an organization may be involved.	Look for descriptive stages, third-person language, and passive voice; for example, identifying data link layer problems.	<ul style="list-style-type: none">• “Identifying Common Physical and Data Link Layer Problem Resolutions”• “Routing Messages”• “Implementing the Course Development Process”
Principle	Directions for tasks that provide employees with guidelines for action. Employees must adapt the guidelines to various job situations. Principles require employees to use judgment and discretion when they apply them. Ask yourself these questions: Is the task completed in a different way each time? Does the outcome of the task rely on the circumstances and on the learner's judgment?	Look for guidelines and judgment calls; for example, designing a multilayer switched network.	<ul style="list-style-type: none">• “Guidelines for Designing a Multilayer Switched Network”• “Positioning the Cisco Catalyst 5500 to IT Managers”• “Handling Customer Objections”



Topic Length

Many authors ask about the length of a topic. This is a fair question, because it helps them think about the size and scope of the topic as they author concepts, principles, processes, procedures, and facts. Although the actual length does depend on the type of content and the practice and media elements included, some general rules can be applied.

For a linear, directive instructor-led course, the core text and media of well-designed topics are typically no longer than two pages in document length. This guideline is designed to help authors focus on the topic and not inadvertently combine multiple objectives into one topic. If practice questions cause the topic to exceed two pages, that is acceptable.

Topic-Level Practices

Practices associated with the topic are optional and are *generally* more appropriate for web-based learning than for ILT presentations. Whether to use in-line topical practices is a judgment call that should be made by the instructional designer, based upon several factors. Consider whether it is more useful to rehearse the material at that point. If doing so would disrupt the flow in the classroom, hold the practice until the lesson ends. Although you can create a practice for each individual topic and place the practice after the content of each topic, the preferred presentation for ILT calls for at least one practice, located at the end of a lesson, that supports the performance objective for the lesson.

Building a Concept

Use a concept topic when you need to teach a group of objects, symbols, ideas, or events that:

- Are designated by a single word or term
- Share a common feature

When sequencing the topics found within the lesson, keep in mind that, typically, concepts are taught before a major topic, because they represent the knowledge needed to do something.

For example, if you are creating a lesson to teach how to configure a standard access list, then you may need a concept topic titled “What Is an Access List?”

Examples

Here are some examples of things you would teach using a concept topic:

- Cat
- Horse
- Computer
- Hub
- Router
- Switch

Identifying a Concept

Generally, you use a concept topic when you can write the job task as:

- What is a technology, object, or species?
- What are the types of technology, object, or species?



Structure Guidelines

Follow the guidelines in the table when building the content items for a concept.

Concept Structure

Subtopic	Guideline
Introduction	<ul style="list-style-type: none">Establish the purpose of the topic and orient learners to what they are expected to learn.Be short and to the point.To help ensure reusability of a topic, do <i>not</i> tie to other topics or assume that the learner has visited other topics within a lesson.
Definition	<ul style="list-style-type: none">Can be a graphic or illustration.Identify related characteristics clearly.Keep short and concise.Use bullets to list characteristics.Define the concept.Emphasize the term being defined.
Fact (o)	<ul style="list-style-type: none">Use only when needed to explain the concept.Follow the guidelines for fact blocks defined in the fact topic guidelines.If there are many facts to communicate, or if a fact requires a number of blocks to describe, then escalate to a fact topic.
Example	<ul style="list-style-type: none">Ideally, include two or more examples.Sequence examples from simple to more complex.Use examples from different contexts.Present using text or graphics.
Non-Example (o)	<ul style="list-style-type: none">Illustrate easily confused examples of related concepts.Sequence from simple to complex.Present using text or graphics.State why the non-example is not a member of the group (not an example).
Analogy (o)	<ul style="list-style-type: none">Make instructionally powerful.Relate to the background of the audience.



Building a Fact

A fact topic is unique in that it can be taught as either a standalone topic or a link from another topic. Facts are presented as statements, data, or pictures of specific objects.

Use a fact topic when you need teach unique, specific, one-of-a-kind pieces of information. Ideally, a fact would have a link to the concept, procedure, process, or principle that it is referencing (or vice versa). Sequence facts so that they flow logically within the lesson, or better yet, link a fact to the other topics that reference that fact.

Examples

Here are some examples of factual information you may teach using a fact:

- This router has four ports.
- That device is a Catalyst 8510 switch.
- That laptop is a Toshiba Tecra 550CDT.
- That beaker holds 500 ml.



Structure Guidelines

Follow the guidelines in the table when building the content items for a fact.

Fact Structure

Subtopic	Guidelines
Introduction	<ul style="list-style-type: none">• Establish the purpose of the topic and orient learners to what they are expected to learn.• Be short and to the point.• Do not tie to other topics or assume that the learner has visited other topics within a lesson.
Fact Graphic	<ul style="list-style-type: none">• Required (type and number based on objective).• Use fact graphics, lists, and tables as needed in any combination or order.• Precede the graphic with a sentence telling what it is.• Identify the key parts.• Follow with a table detailing the key parts.• Label with a few descriptive words.
Fact List	<ul style="list-style-type: none">• Required (type and number based on objective).• Precede with a sentence telling what it is.• Categorize further using labels as needed.• Label to indicate what it includes.
Fact Table	<ul style="list-style-type: none">• Required (type and number based on objective).• Precede with a sentence telling what it is.• List the parts with their functions.• Use appropriate column headings.• Label to indicate what it includes.



Building a Procedure

A procedure is a sequential set of steps to be followed by one individual to accomplish a task or make decisions. It lists directions for procedural tasks. Actions within a procedure must be done the same way each time (within a given situation).

Use a procedure topic when you need to teach a procedure performed on the job. For the learner to be successful, the procedures must be clear. In addition, the topic must provide job-based practice for transfer to the job.

- Typically, a procedure topic will come after a concept or process topic. For example, if you are creating a lesson to teach the configuration of a router, the concept topic titled “What Is a Router?” may be taught first.

Examples

Here are some examples of things you would teach using a procedure topic:

- How to fill out a time sheet
- How to configure Fast EtherChannel on the 8510
- How to troubleshoot network congestion
- How to configure an access list on interface Ethernet 0
- How to verify that your access list is correctly configured

Identifying a Procedure

Generally, you use a procedure topic when you can write the job task as:

- How to ...
- Configuring ...
- Verifying ...
- Operating the ...



Structure Guidelines

Follow the guidelines in the table when building the content items for a procedure topic.

Procedure Structure

Subtopic	Guidelines
Introduction	<ul style="list-style-type: none">Establish the purpose of the topic and orient learners to what they are expected to learn.Be short and to the point.Do <i>not</i> tie to other topics or assume that the learner has visited other topics within a lesson.
Fact (o)	<ul style="list-style-type: none">Use only when needed to explain the procedure.Facts could appear as a column in a procedure table; for example, Cisco IOS software command definitions.Follow the fact block guidelines defined in the fact topic guidelines.If there are many facts to communicate, or if a fact requires a number of blocks to describe, then escalate to a fact topic.
Procedure Table	<ul style="list-style-type: none">Choose one table type per procedure topic.Use an introductory sentence.Label columns "Step" and "Action."Begin each step with an action verb.Limit each step to one action.
Decision Table	<ul style="list-style-type: none">Choose one table type per procedure topic.Use an introductory sentence.Label columns "If" and "Then."Write condition (if) and action (then) so they form a complete sentence.Move repeated words into the column header.
Combined Table	<ul style="list-style-type: none">Choose one table type per procedure topic.Follow guidelines for both procedure and decision tables.Usually begin as a procedure table, with a decision table as one of the steps.Structure as a table within a table.
Demonstration (o)	<ul style="list-style-type: none">Use to illustrate a presentation.Performed by the instructor or media.As instructor cue, text block says, "Your instructor will now demonstrate the procedure for you."



Building a Process

Use a process topic when you need to teach how a system works. A process topic is helpful in supporting underlying job tasks, providing motivation, and ensuring the overall quality of job performance.

A process can be defined as:

- A flow of events that describes how something works
- A task that involves many persons or organizations, not a task to be done by one person
- Mechanical, business, or scientific

You can place a process topic at any point within a lesson. If the goal of the lesson is to teach the process, then multiple processes may be included with concept topics. If a process topic is being presented to establish the context of a procedure, then it should come before the procedure topic within the lesson.

Examples

Here are some examples of things that you would teach using a process topic:

- How a transmission works
- How new employees are hired
- How the Internet works
- How a computer system responds to commands

Identifying a Process

Generally, you use a process topic when you can write the job task as:

- Stages of ...
- How the ... works



Structure Guidelines

Follow the guidelines in the table when building the content items for a process topic.

Process Structure

Subtopic	Guidelines
Introduction	<ul style="list-style-type: none">Establish the purpose of the topic and orient learners to what they are expected to learn.Be short and to the point.Do <i>not</i> tie to other topics or assume that the learner has visited other topics within a lesson.
Fact (o)	<ul style="list-style-type: none">Use only when needed to explain the process.Follow the fact block guidelines defined in the fact topic guidelines.If there are many facts to communicate, or if a fact requires a number of blocks to describe, then escalate to a fact topic.
Staged Table	<ul style="list-style-type: none">Use a table, diagram, or chart (only one of the three is needed).Label columns “Stage” and “What Happens.”Begin with who or what is responsible for the action in that stage.Write in the third person, active voice.Limit each stage to one time period.
Block Diagram	<ul style="list-style-type: none">Use a table, diagram, or chart (only one of the three is needed).Use a block diagram (flow chart).Begin with who or what is responsible for the action in that stage.Write in the third person, active voice.Limit each stage to one time period.
Cycle Chart	<ul style="list-style-type: none">Use a table, diagram, or chart (only one of the three is needed).Begin with who or what is responsible for the action in that stage.Write in the third person, active voice.Label chart as a process.Use learner arrows to show direction.



Building a Principle

Use a principle topic when you need to create a job task that requires judgment or when guidelines must be applied to a job situation.

Typically, a principle topic will come after a concept or process topic. For example, if you are creating a lesson to teach the guidelines for handling employee conflicts, the concept topic titled “What Is a Conflict?” may be taught first.

Examples

Here are some examples of things you would teach using a principle topic:

- Guidelines for handling employees with personal problems
- Guidelines for designing effective visual aids
- Responding appropriately to an angry customer
- Designing learner-centered training

Identifying a Principle Topic

Generally, you use a principle topic when you can write the job task as:

- How to ...
- Guidelines for ...

Notice that the principle and procedure topics both start with “how to.” The distinction is that the principle topic focuses on what the learner will do with the guideline.



Structure Guidelines

Follow the guidelines in the table when building the content items for a principle topic.

Principle Structure

Subtopic	Guideline
Introduction	<ul style="list-style-type: none">Establish the purpose of the topic and orient learners to what they are expected to learn.Be short and to the point.Do <i>not</i> tie to other topics or assume that the learner has visited other topics within a lesson.
Fact (o)	<ul style="list-style-type: none">Use only when needed to explain the principle.Follow the fact block guidelines defined in the fact topic guidelines.If there are many facts to communicate, or if a fact requires a number of blocks to describe, then escalate to a fact topic.
Principle Statement (o)	<ul style="list-style-type: none">Provide a statement describing the accepted standard of behavior.
Guidelines	<ul style="list-style-type: none">Derive guidelines from your analysis of expert performance.
Example	<ul style="list-style-type: none">Two or more examples are recommended.Vary the context of each example.Use different settings and situations.
Non-Example (o)	<ul style="list-style-type: none">Draw attention to how guidelines are violated.Violate only one guideline at a time.State which guideline was not followed and why.
Analogy (o)	<ul style="list-style-type: none">Make instructionally powerful.Make easily identifiable.



Conclusion

This paper provides guidelines on structuring and writing learning objects using the Cisco RLO strategy. It covers each of the five classifications for objectives and practice and assessment activities, and it offers useful guidelines for creating content at each level of a course hierarchy.

Future versions of this paper will include additional guidelines for creating specific types of activities. This information will continue to be updated as refinements to the RLO strategy evolve. Future editions may include specific guidelines for authoring web-based learning, single-source content, and different types of learning approaches.

Additional Resources

It is strongly recommended that you also review the other white papers that represent the Cisco web-based learning ecosystem. Two companion documents to this RLO strategy white paper are the white papers “Reusable Learning Object Strategy: Designing and Developing Learning Objects for Multiple Learning Approaches,” and “Enhancing the Learner Experience.” Both of these documents can be found at www.cisco.com by searching on the document title. It may also be helpful to look at the Cisco web-based learning architecture documents that describe the systems that must interact to enable the RLO strategy and learner experience and that enable employees to gather information and to communicate and collaborate with each other.



Bibliography and Additional References

Books

- Bloom, B.S. ed. (1994). Taxonomy of educational objectives. Handbook 1: Cognitive domain. Menlo Park, California: Addison-Wesley Publishing Company.
- Clark, R.C. (1989). Developing technical training: A structured approach for the development of classroom and computer-based instructional materials. Reading, Massachusetts: Addison-Wesley.
- Clark, R.C. & R.E. Mayer. (2002). e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. San Francisco, California: Jossey-Bass/Pfeiffer.
- Kirkpatrick, D.L. (1994). Evaluating training programs: The four levels. San Francisco, California: Berrett-Koehler Publishers.
- Mager, R.F. (1984). Measuring instructional results, or, got a match? (2nd ed.). Belmont, California: David S. Lake Publishers.
- Mager, R.F. (1975). Preparing instructional objectives (2nd ed.). Belmont, California: David S. Lake Publishers.
- Merrill, M.D. & D.G. Twitchell, eds. (1994). Instructional Design Theory. Englewood Cliffs, NJ: Educational Technology Publications.
- Phillips, J.J. (1997). Return on investment in training and performance improvement programs. Houston, Texas: Gulf Publishing Company.

Articles

- Horn, R.E. (1982). Structured writing and text design. In D.H. Jonassen (Ed.), The technology of text. Englewood Cliffs, New Jersey: Educational Technology Publications.
- Merrill, M.D. (1983). Component display theory. In C.M. Reigeluth (Ed.), Instructional-design theories and models. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

World Wide Web Links

- Advanced Distributed Learning. <http://www.adlnet.org/>
- Aviation Industry CBT Committee. <http://www.aicc.org/>
- Clark Training & Consulting. <http://www.clarktraining.com/>
- E-Learning at Cisco Systems. http://business.cisco.com/prod/tree.taf%3Fasset_id=44748&public_view=true&kbns=1.html
- IMS Global Learning Consortium. <http://www.imsproject.org/>
- Blueprint for Enterprise E-Learning (June 2002)
http://business.cisco.com/prod/tree.taf%3Fasset_id=86589&ID=44748&ListID=82316&public_view=true&kbns=1.html

**Corporate Headquarters**

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters

Cisco Systems International
BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters

Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 317 7777
Fax: +65 317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on
the Cisco Web site at www.cisco.com/go/offices.

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia • Czech Republic
• Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland • Israel • Italy •
Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto
Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan •
Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

Copyright © 2003 Cisco Systems, Inc. All rights reserved. Cisco, Cisco Systems, and the Cisco Systems logo are registered trademarks or
trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries. All other trademarks mentioned in this document
or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and
any other company. (0301R)

Printed in the USA