

Online **GeneXus Course**: Changes between version X Evolution 3 and version 16

Evolution 3 online course is [here](#) and Version 16 online course is [here](#).

As from GeneXus 15, the course has been divided into two levels: Junior and Analyst levels, which in X Evolution 3 were the [Basic course](#) and [Advanced Topics part](#). However, the biggest difference is that while in Evolution 3 the Advanced Topics videos were all at the end, as from GeneXus 15 they are interspersed.

In addition, several videos that at first sight seem unchanged have actually been expanded, adding short explanations to more effectively teach the concepts presented through examples.

Below are the most important changes between the materials of both versions.

The videos that:

- Haven't been changed are not included in the list.
- Are highlighted with [this color](#) are new (when they are in a lighter shade of that color, it indicates that even though they are not new, they have changed enough to make it worthwhile to look at them again).
- Are highlighted with [this color](#) have few changes.
- Are not highlighted at all have very few changes, but we wanted to make some recommendation or comment anyway.

In addition, some videos are marked as optional. Those which are optional for the Analyst level are not included in the GeneXus Analyst certification exam questions, but they may be included in a Senior Analyst or Instructor certification exam. Those which are optional for the Junior level are not included only in the GeneXus Junior Analyst certification exam, but may be included in higher-level certification exams.

List of videos that have been changed

- [What is GeneXus?](#): Entirely new video.
- [Course Introduction](#): Watching this short introduction to GeneXus 16 is recommended
- [Knowledge Base creation](#): The newly created Knowledge Base is sent to GeneXus Server.

- [Running the application for the first time](#): Since the videos of the GeneXus 16 course were made using the trial version, there's a change in the video's approach. In addition, Responsive Web Design is introduced here (at the end).
- [Working with attributes and domains](#): The place where domains are located has changed.
- [Nomenclature rules for attributes](#): This video has been added. It explains the recommended way to name attributes.
- [Rules definition](#): This video was changed in relation to the Error rule, which by default allows the user to continue, but not save. Also, the comparison with the Message rule is approached differently. An explanation of what a variable is and a comparison with attributes has been added.
- [Using Patterns](#): Responsiveness is also shown for the Attractions Work With element (when the screen is reduced, less information is displayed). There were also changes in the way added filters and commands are displayed. The difference between sorting at runtime by clicking on the column and adding an order in the pattern is explained. What in Ev3 was advanced material ("Patterns - More information") has been moved to this video: the relationship between the transaction structure, the pattern instance and the objects generated by the pattern (as far as dynamism is concerned). It shows how to disable the option to insert the Work With element. Also, it shows where to change the Default general properties, and how to disable a Pattern.
- [Identifying available attributes](#): An inaccuracy was corrected as to whether to follow the double or single arrow to obtain the extended table.
- [What are subtypes?](#): The Descriptor Attribute is explained here. It is specified why an attribute of a group of subtypes is considered "primary". How subtypes are grouped is explained slightly differently. Other uses of subtypes are described, in addition to those mentioned in the video, of double reference to the same table.
- [More use cases of subtypes](#): The indirect multiple reference case is changed (in the GX Ev3 course it was advanced material), showing not only how subtypes must be used to resolve the ambiguity, but also so that GeneXus doesn't delete a FK. Also, at the end it shows another case of use of subtypes that is not analyzed. It is intended to eliminate unwanted relationships by compound foreign keys.
- [What are formulas?](#): It provides a clearer explanation of what we call horizontal formulas and aggregation formulas. Also, it improves the description of how the Count aggregation formula is navigated in the first example presented. The terms "implied condition" vs. "filter condition" of a formula are specified, as well as "trigger condition". A closing summary is provided to arrange all the explanations; it was not included in the

Ev3 material. The possibility of having combined formulas (horizontal and aggregate) is also mentioned.

- [Rule triggering order in transactions](#): Unlike this same video in Ev3, the example of the AfterLevel event is explained in more depth here. It shows graphically what happens when the Confirm button is pressed. And there is an example in which we ask ourselves if it is useful to trigger a rule at that moment, or if it is better to wait for the Commit operation. It explains the effect of the Commit operation, and the event that occurs afterwards (AfterComplete). Just like in the Ev3 video, the events BeforeInsert (Update/Delete) and AfterInsert (Update/Delete) are introduced.
- [More about rules triggering order in transactions](#): Description of the evaluation tree of rules and formulas that is not included in the [Ev3 material](#). In addition, the study of the different triggering events available is dealt with much more detail and examples.
- [Relations between actors of reality](#): An inaccuracy is corrected with regard to weak 1 to N relationships: they can be represented by two transactions. They don't have to be represented by one. In addition, in the N to N relationship of the example, it shows that the intermediate table can contain attributes of its own (in Ev3 this was not included). At the end, the cases of 1 to 1 relationships are presented (the other case in addition to the specialization).
- [1 to 1 relationships between actors of reality](#): It has been added. It was not included in the Ev3 course. Available for the Junior level.
- [Introduction to For Each command to access the database](#): More accurate explanations of the For Each command are provided. Also, it shows how the filters appear in the navigation list by Where clause when sorted by the same attribute. That is to say, the optimization is shown without explicitly talking about it. An entire conceptualization is added at the end. It was not included in the Ev3 course, and we strongly recommend watching it again.
- [More about For Each command](#): There are (minor) changes in the tables shown in the navigation list. It mentions that indicating a base Transaction is not mandatory. The explanation on predefined and user-defined indexes and their relationship with the optimization has been changed a bit. It is more detailed here (not in Ev3). In particular, it shows what happens when a compound Foreign Key contains one attribute with the Nullable property set to Yes. The topic of optimization has some changes.
- [How to list related information](#): An improved explanation of nesting is provided. Also, the navigation list analysis has been added. It was not included in Ev3. A review is made at the end, explaining the concept of "join" and "Cartesian product".

- [How to list grouped information](#): Grouping is better explained than before. In addition, a summary of the uses of the For Each command has been added at the end.
- [More on nested For Eachs. Cases and navigation](#): The determination of the base tables of every For Each command has been added, as well as a fourth case of bad programming.
- [Inline formulas](#): It is explained much better, including the navigation list analysis. It also mentions the possibility of using variables for calculation and offers a final conceptualization, where a comparison is made with global formulas.
- [Unique clause for the For Each command](#): New video.
- [Data Selectors](#): (Optional for the Analyst level) This topic has been simplified compared to what was explained in Ev3. Also, it has been marked as optional.
- [Paging clauses in the For Each command](#): New video.
- [Communication between objects](#): In Ev3, this topic was included further ahead, but in v16 it has been moved here. Therefore, an explanation/presentation of Web Panels is necessary to show the examples. For the first time, an explanation is provided on how to change the control type of an Edit variable to Dynamic Combo Box. In Ev3 an invocation with an explicit call was used, even though it was said that it wasn't necessary. Here, the explicit call is not mentioned. A suggestion is made to indicate whether the parameter is input (in), output (out) or input/output (inout). It mentions why an object that receives and/or returns values is removed from the developer menu. The differences in the number of parameters between the caller and called object when there is an output parameter, as well as the reception in an attribute is explained in the following video (in Ev3 everything was explained in a single video).
- [Communication between objects: When the invoked object returns a value](#): In Ev3, the GetDiscount procedure was introduced without context; here it is presented as part of an example. An attribute of the transaction structure receives what is returned by it, for example. Or the transaction rules, and its effect can be seen there. It is argued that it could also have been assigned to a variable, not assigned, used in an expression -for example, to condition the triggering of a rule- or used in an event or procedure. The Ev3 course discussed what happens in Data Providers, which already have an Output property to set the output. This explanation has been removed here, since at this point Data Providers have not yet been presented.
- [Compound data types](#): There is terminological precision when saying that "what is declared is a base transaction to be navigated by the Data provider", instead of saying "what is declared is a table to be navigated...". The KB Explorer is mentioned instead of

the Folder View. Also, it indicates when the Parm rule should be programmed for the Data Provider.

- [Variables to store data collections in memory](#): New video (the concept is not new, but it is the first time it is explicitly described in the course).
- [Two ways of returning a collection using a Data Provider](#): New video (it describes the difference between setting the Data Provider's collection property to true or not).

The Ev3 materials "[More about Data Providers](#)" and "[Data Provider that loads a collection with fixed values \(not extracted from the database\)](#)" have been removed.

- [How to update data using the transaction logic without screen](#): This video has been completely changed, with a different example (even though it uses a single-level Business Component.). The example of the Ev3 video showed the increase of flight ticket prices. This video shows an example where two Business Components with referential integrity relationship are used. It describes what is known as "parallel transactions". The Commit command (it was previously assumed that the viewer knew about it) and rollback are explained. First, the Save method is presented (both for inserting and updating the record), and then it is explained that the specific Insert and Update methods could have been used (in the latter case with or without the Load method). There is no preference of one over the other. It remains ambiguous. The method InsertOrUpdate is presented. It shows that while the code used by the Business Components in the example was written in a procedure, it could also have been written in the event of a web panel. It shows how to delete using a Business Component. The inline Find formula is used. It **DOESN'T** show that the methods Insert, Update, InsertOrUpdate return True if the operation was successful, so the Success or Fail method would not be needed to evaluate the result (as is the case when using the Save method).

It is explained that the Business Component also has available, as in the transaction, the inferred attributes (in order to have their value when selecting Load). It is explained that the methods Insert, Update and Delete can be used over a collection of Business Components.

The Ev3 video explained how to run a Business Component as a web service. This has been removed in v16.

Note: In Ev3 this other video came next: [Updating the database using transactions without their form - Another example](#) which showed an example of dragging a web panel grid line to an image, and from there using a Business Component to insert information in a table. It also shows the use of a Windows data type variable. All this has been removed from the v16 course.

- [Updating the database using two-level Business Components](#): Expands and clarifies the same topic that in [Ev3 was presented only to insert a line](#).
 A note mentions why the Insert method would never be used when adding a line through a Business Component. Instead, the Update method is always used. This happens even when deleting a line. New GetByKey method of the line collection to obtain a reference to the line and be able to change it. It didn't exist in Ev3. Likewise, a description is provided of the method that didn't exist in Ev3, RemoveByKey, to delete the element from the line collection.
 The For item in collection command is used to run through the message collection (just like in Ev3). The examples are made with the Save method and not with Update, so the Success method is used to confirm the success of the operation.
- [Data Population using Business Components and Data Providers](#): New video (in GeneXus 15; therefore, it is new for someone who is updating from Ev3).
- [Data population using the transaction itself](#): New video (in GeneXus 15; therefore, it is new for someone who is updating from Ev3. Some errors of the same video in GeneXus 15 have been corrected).
- [Database update using procedures. An introduction](#): In Ev3 there was a [single video](#) (in GeneXus 16 it would be the Junior level) to examine the topic of updating with New, For Each and Delete. In the GX16 course it has been divided into two parts. The introduction presents a basic example.
- [Database update using procedures](#): This video shows detailed information for the Analyst level.
 The differences with the same material in Ev3 are that in v16 the controls made when using update operations (New, assignment with For Each, Delete) are described in more detail. For example, what happens when there are candidate keys -that is to say, Unique indexes- and the When duplicate clause is included in the end. Also, the restrictions regarding which attributes can be updated with a For Each command and when, inside a procedure, GeneXus adds an explicit command. In the end, part of the For Each command syntax is presented (using what has been explained so far in the course) and the Blocking clause is mentioned. In this material in v16, the exercise to increase the price of flights is made for the first time, comparing both solutions (update with For Each vs. with BC) that in Ev3 was made with BC.
 In v16, a comparison is also added with the example of inserting a new category and updating attractions so that they assume that new category as their own, which was the example that had been used to describe Business Components.
- [Syntax of the For Each command](#): New video. It shows the final syntax of the command, with everything that has been seen so far.

- [More about Data Provider uses and their language](#): (Optional for the Analyst level) In addition to introducing cases that take into account the advancements made in GeneXus regarding the explicit setting of base transactions, and also the use of the Insert and other methods of collection Business Components, the entire conceptualization of the Data Provider language is presented again. There are no technical changes, but the topic is examined in a more current way.
 The example that was used in [this Ev3 material](#) (advanced topics) showing how to load fixed values for a menu is already provided in this v16 video, and in previous videos that have already been mentioned.
- [Dynamic Transactions](#): New video (it comes from v15).
- [Transactional integrity](#): It has no changes; it's just explained a bit better for v16.
- [Interactive screens: Web Panel object](#): This video changes a little the approach that was given in the [Ev3 course](#), where for the level that would correspond to Junior level less information was provided (Refresh, for example, was not mentioned, nor when it is necessary to set a grid attribute as invisible, instead of not adding it at all). Also, the comparison with the Work With product is left for the end. The content itself doesn't change in v16. The possibility of conditioning Orders and Conditions is mentioned. Also, it explains when GX sets as readonly a variable in a grid, which we always say are input variables by default.
- [Interactive screens: Web Panel object \(continued\)](#): It is shown here (not in the Ev3 [advanced topics video](#)) that post doesn't cause Refresh and Load. Also, it shows that if the value of a grid variable is modified as a result of the execution of an event of the lines, only that line is automatically refreshed and no other event is triggered. The use of the Refresh command is explained. This is included at the Junior level in v16, while in Ev3, as we've said before, was included in the advanced topics. However, its content is the same.
 The automatic responsiveness implemented by GeneXus is described. An introduction to responsive tables (Responsive Web Design) is provided.
- [Interactive screens: variables in grid and actions in the Work With pattern](#): It shows how to achieve what is indicated in the title through the instance file. It isn't new.
- [Interactive screens: More on the Web Panel object](#): It explains most of what in Ev3 was explained in the only [advanced topics material](#) (which included Master Pages, that are now taught in another material that follows, but which is marked as optional for the Analyst level). In v16, an example of multiple selection in Smart Devices has been added (which should not be presented here, because nothing has yet been taught about Smart Devices and also because in this course Smart Devices are not explained in this level of detail). It explains that it is not possible to send a collection in a parameter to a PDF report, and that the solution is to convert to json/xml and send the string. **Entirely**

New Additions (v16): It is shown how it is possible to change the way a grid's information is displayed through the Custom Render property: HorizontalGrid and also FlexibleGrid. Also, how to allow a grid with paging but with infinite scroll.

It also presents an example of a web component and its events.

New: Global events.

- [Interactive Screens: Menus and Master Pages](#): (Optional for the Analyst level) The section on Action groups that is taught here wasn't included in the Ev3 course. The Master Page part was included in [this material](#).
- [Design Systems. Introduction](#): New video.
- [Design Systems in GeneXus. Default](#): New video.
- [Design Systems in GeneXus. Frontend](#): New video.
- [Design Systems in GeneXus. Frontend: MASTER PAGE](#): New video.
- [Design Systems in GeneXus. Frontend: THEME and CLASSES](#): New video.
- [Design Systems in GeneXus. Frontend: RESPONSIVENESS](#): New video. The material on [Responsive Web Design for Ev3](#) became outdated.
- [Design Systems in GeneXus. Frontend: OVERLAPPING THROUGH CLASSES](#): (Optional for the Analyst level) New video. It is NOT asked in any certification exam.
- [Design Systems in GeneXus. Frontend: STENCILS](#): New video.
- [Design Systems in GeneXus. Frontend: GeneXus Controls and User Controls](#): New video.
- [Designing Queries in GeneXus](#): The video is new, but it doesn't provide new information. It's a short introduction.
- [Designing dynamic queries. Query object](#): New video, which at first was intended for the Junior level but ended up being used for the Analyst level. It's not too different from the existing video in [Ev3](#). The Card type has been added, and in the new video some more examples are shown.
- [Designing Dynamic Queries with parameters](#): (Optional for the Analyst level) This one as marked as optional. It shows how to pass parameters. It's similar to the last page of the [advanced topics material in Ev3](#). More information was provided in Ev3.
- [Designing Dynamic Queries: Dashboard object](#): New video (GX16).

- [Modules and External Objects](#): Entirely new video. They are not new topics but they were not taught before (except external objects). Here, for GX16 what is taught of external objects has been considerably reduced. Examples are not shown as it was done in the video of [Web Services in Ev3](#).
- [Web Services. Introduction](#): Entirely new video. Watching it is recommended because Rest services are described, among other things. It shows how to expose a proc as a service, but not how to consume a web service made by a third party, as shown in the video [Web Services in Ev3](#). It shows how to consume a web service exposed by a GeneXus KB.
- [Web Services that access the provider's database](#): (Optional for the Analyst level) New video (GX16).
- [Notifications. Introduction](#): (Optional for the Analyst level) New (the material, not the topic).
- [Artificial Intelligence in GeneXus. Introduction](#): New video (GX16).
- [Artificial Intelligence in GeneXus](#): (Optional for Analyst level) New video (GX16).
- [Chatbots](#): New video (GX16).
- [Introduction to the development of mobile applications](#): Entirely new video. It's more extensive, and includes many topics that the [previous one](#) didn't. It provides a lot of information (which may not be the time to learn). On the other hand, the Ev3 video shows the customization of a grid with Image Gallery, and uses the Geolocation domain. Also, it explains how to achieve a Break By, but it has some errors and the old appearance that has changed significantly. In addition, it uses the old name Dashboard for the object that is now called Menu for Smart Devices.
- [Build Process](#): (Optional for Analyst level) This material was added in the GX15 course. In the GX16 course it has no changes, but it has been marked as optional for the Analyst level.
- [Introduction to versioning](#): Video made with GX15. Its content hasn't been changed compared to [Versioning in Ev3](#), but some of it has been removed.
- [Introduction to Environments](#): It has the same content compared to GX15, but the course in Ev3 didn't use it.
- [Introduction to GeneXus Server](#): This video is new for GX16, in a series of short videos (How to send a KB to the Server; How to connect to a KB hosted in the Server; Team

development; How to send my changes to the Server; How to view the changes sent to the Server; How to receive changes made by other developers in the Server; KB Viewer - the last 4 are optional) which together have approximately the same content as [the only video in Ev3](#) for the basic level (the advanced topics of Ev3 included more complex issues that are not taught in GX16).

The video in Ev3 is more detailed. A demo is shown of simultaneous changes made to an object (but it doesn't cause a conflict). The case of Ignored Objects is not discussed. However, the content is basically the same.

- [Introduction to BPM Suite](#): It corresponds to the [first part of the video in Ev3](#), whose last part corresponds to the material in v16 "[Defining business processes \(BPM\)](#)" which is marked as optional for the Analyst level. The differences between v16 ("Introduction to BPM Suite" + "Defining business processes (BPM)") and Ev3 ("Defining business processes (BPM)") are very small.
- [Application Testing: Unit Tests. Introduction](#): New in v16.
- [Application Testing: Testing objects that interact with the database](#): (Optional for the Analyst level) New in v16.
- [Application Testing: Interface Testing and Introduction to GXTest](#): (Optional for the Analyst level) New in v16; quite different from the one [included in Ev3](#).
- [Introduction to GAM](#): Entirely new video. There are changes regarding the forms of authentication between versions Ev3 and GX16. Watching it again is recommended. It corresponds to [this Ev3 video](#). In the Ev3 course there is another video that is not shown in v16, which gives a [Use case of GAM APIs](#).
- [Automatic Deployment to your own Cloud \(F6\). Introduction](#): (Optional for the Junior level, mandatory for the Analyst level) New video.
- [Automatic Deployment to your own Cloud \(F6\)](#): New video.
- [Application Deployment Tool. Introduction](#): (Optional for the Junior level, mandatory for the Analyst level) New video.
- [Application Deployment Tool](#): (Optional for the Analyst level) New video.
- [GeneXus Cloud Deployment Services](#): New video.
- [Deployment Unit Object](#): (Optional for the Analyst level) New video.
- [Introduction to DevOps with GeneXus](#): New video.

Videos not included in v16.

- [Accessing external databases](#) is included in Ev3 but not in v16.