element
a digital river company

Key Generator SDK

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Note: Recent changes are indicated by a black bar on the right side:

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1 Overview

This document describes the interface between our order processing system and your individual key generators. It defines a set of rules that you should follow closely to ensure proper operation of your key generator with our license servers.

Here the term “key” refers to any type of information that is generated upon the successful completion of a sale and sent to your customers, this could be:

- a license serial number
- a file containing a cryptographic key that unlocks you application
- a HTML file including the key as well as additional registration information
- whatever you can put into a file …

The Key Generator SDK (Software Developers Kit) comprises of

- this documentation,
- code examples in a number of different programming languages and
- a test program that calls your key generator and displays its results.

NOTE: *Please read this document carefully before writing and submitting a custom key generator. We will not accept new key generators that do not comply with the latest key generator specification.*

Supported Types of Key Generators

Your key generator can be implemented in one of several different ways:

- As a CGI program that is hosted on your server and called via HTTP/ HTTPS or
- as a program that runs on our servers:
  - Windows NT / 2000 / XP console application executables (EXE, compiled for the x86 32bit architecture). COM+ server / OCX binaries requiring registration are not supported!
  - JAVA programs (currently JRE Version 1.3 through 1.4.2 supported, see section 9 for information on how to use Java 1.5 compilers.)
  - .NET Framework Version 1.0 through 2.0 assemblies.

Supported Types of Keys

For historical reasons this SDK supports two different types of keys.

- **Textual keys** are made of plain text (e.g. “ABCD-1234-WXYZ”). They will be displayed inline inside the delivery email that is sent to your customer. Optionally you can provide a key template that surrounds your key with additional information. (see section 5 “Delivery e-mail Key Templates”).
- **Binary keys** can include anything and are forwarded to the customer as an attachment to the delivery email. Their content is described by a MIME media type (e.g. text/xml) and a filename that has to be provided by your generator. Obviously binary keys are a superset of textual keys. (see http://www.iana.org/assignments/media-types/)

CONCLUSION: *The textual key generator API is no longer state of the art. Therefore you should write a binary key generator.*

2 Input Values

The key server will collect all available data for the following fields and forward them to your key generator as input. Fields listed in **bold** always contain valid information. Other fields may be left out, if a particular piece of information is neither applicable nor available.

You do not, of course, have to use all of these values to generate the key. Which, and how many of these variables you use, is left to your discretion.

FIELD KEY (TAG)	*SIZE*	*DESCRIPTION*
PURCHASE_ID	10	Our purchase id number. (1st part of the unique key) *Type: decimal string representation of an unsigned 32bit integer number > 0.*
RUNNING_NO	4	If the customer buys multiple products in one purchase they will be enumerated by RUNNING_NO. (2nd part of the unique key. The combination of PURCHASE_ID and RUNNING_NO is guaranteed to be unique!) *Type: decimal string representation in the range 1..9999*
PURCHASE_DATE	10	The date of purchase as string "DD/MM/YYYY", e.g. "24/12/2000": **IMPORTANT: Your code must be able to parse this exact format, regardless of any user and/or OS settings!**
PRODUCT_ID	10	ID of the product purchased. (Useful if you write a key generator that works for multiple products.) *Type: decimal string representation*
QUANTITY	4	The number of copies ordered. *Type: decimal string representation of an unsigned 32bit integer number > 0.*
REG_NAME	100	The name to which the customer chose to license the product.
ADDITIONAL1	500	1st Customizable Field (see below).
ADDITIONAL2	500	2nd Customizable Field (see below).
RESELLER	100	The name of the reseller or affiliate involved in this order (if applicable).
LASTNAME	50	The customer's last name.
FIRSTNAME	50	The customer's first name.
COMPANY	100	The customer's company name (if applicable).
EMAIL	100	The customer's e-mail.
PHONE	50	The customer's telephone number.
FAX	50	The customer's fax number.
STREET	100	The customer's street address.
CITY	100	The customer's city.
ZIP	20	The customer's ZIP or Postal Code.
STATE	40	The customer's state or province (e.G. Florida) (US / Canadian customers only)
COUNTRY	50	The customer's country (English name)
ENCODING	var.	<not present> = ISO-8859-1 (Latin 1) encoding "UTF8" = UTF8 Unicode
LANGUAGE_ID	2	The customer's preferred language: 1=English / 2=German / 3=Portuguese / 4=Spanish / 5=Italian / 6=French / 7=Norwegian / 8=Dutch / 9=Swedish / 10=Finnish / 11=Japanese / 12=Russian / 13=Korean / 14=Danish / 15=Simplified Chinese / 16=Polish

Additional parameters in **Version >= 2**

PROMOTION_NAME	var.	name of the promotion
PROMOTION_COUPON_CODE	var.	the actual promotion coupon code used for this order
ADD[<*identifier*>]	var.	user defined (hidden) additional parameters (see below.)
SUBSCRIPTION_DATE	10	Date of Subscription (format see PURCHASE_DATE)
START_DATE	10	Start date of current re-billing period (format see PURCHASE_DATE)
EXPIRY_DATE	10	Expiry date (date of next re-billing) (format see PURCHASE_DATE)

These additional parameters are only passed to generator that are flagged with a version >= 2 in our system (which is true for all new generator installations).

Version 1 does not pass the newer parameters for enhanced backwards compatibility with poorly written generators that depend on the exact ordering of parameters (which was never guaranteed).

Additional Customizable Fields

In addition to our fixed set of fields, we offer two customizable fields named “ADDITIONAL1” and “ADDITIONAL2”. These additional input values are optional and can be added to your order form by entering them in the Products/Product Delivery/Descriptions section of your Control Panel account.

Provide a short description of the type of information that you would like your customers to enter in these fields. The check boxes on the right side allow you to make a field required/mandatory (checked) or optional (not checked). If your generator relies on these additional input values, don't forget to make the appropriate changes.

Note: There is currently no way to validate additional input fields during the order process. We are currently working on a solution based on JavaScript.

3 API for key generator programs hosted by element 5

The Key Generation Process

Before going into the details of the key generator interface, here is an overview of the steps involved in the key generation process:

1. Order processing system calls key server
    a. Key server writes input values to a temporary file (see section 2)
    b. Key server executes the key generator:
        i. Key generator reads input file
        ii. Key generator decodes & checks input parameters
        iii. Key generator calculates license key(s)
        iv. Key generator writes output files
        v. Key generator returns exit code
    c. Key server checks exit code and reads output files
    d. Key server checks if a key template is available for textual keys and inserts the generated key into the template.
    e. Key server saves output files / error log into the database
2. Order processing prepares the “delivery to customer” email,
    a. binary keys will be attached with the MIME type and filename returned by the key generator
    b. textual keys will be displayed inline

Command line arguments, Input/ Output files

EXE and JAVA generators are called with three command line arguments, all of which are file names. e.g.

```
KeyGen.exe c:\temp\input-12653.txt c:\temp\input-12653.out1
c:\temp\input-12653.out2
```

- First is the input file to be read by the key generator.
- The 2nd and 3rd parameter are output filenames which don’t exist upon invocation of the key generator, since they should be created by the key generator itself. Output filenames are provided by the calling server in order to be able to set their directory, make their names unique, read their contents and delete them after their contents has been copied to the database.

Input File Format

The input file format is somewhat similar to Windows INI file sections. Each line contains a key-value-pair separated by a '='. The values are terminated at the end of line (CR/LF), and may contain non-ASCII characters depending on the input encoding. e.g.

```
PURCHASE_ID=12345678
RUNNING_NO=1
PURCHASE_DATE=04/07/2004
PRODUCT_ID=100000
LANGUAGE_ID=2
QUANTITY=1
REG_NAME=Peter "Test" Müller
LASTNAME=Müller
FIRSTNAME=Peter
EMAIL=mueller@test.net
```

When parsing the lines, all unknown keys should be ignored since there may be new input parameters in the future. There is no guarantee that the lines appear in a defined order, except for the encoding parameter, which is always first – if present.

Character Encoding

The encoding of the in- and output files defaults to the ISO-8859-1 (Latin 1) encoding. If the file starts with the line "`ENCODING=UTF8`" it will be UTF8 encoded. e.g.

```
ENCODING=UTF8
:
REG_NAME=Peter "Test" MÃ¼ller
LASTNAME=MÃ¼ller
:
```

The file written by the key server will not include any byte order marks for UTF8.

For a description of the available input parameters see section 5.

NOTE: *In order for UTF8 input to be sent to your key generator it has to be registered as a Unicode compliant SDK 3 key generator with our support team upon submission / installation of the generator. Otherwise your generator will always get ISO-8859-1 input and non-ISO-8859-1 characters will be replaced by question marks.*

NOTE*: The encoding of emails generated by the order processing system depends on the actual content of the mail body. If your textual key has characters that do not belong to (US-ASCII or ISO-8859-1) it will use the UTF8 encoding. Japanese mails will be encoded using ISO-2022-JP, if possible. Other encodings may be added to support other languages in the future. Since not all customers use UTF8 enabled mail clients, textual keys should only include characters that are common in their language.*

Exit Codes

The generator must provide an exit code, which tells the key server about the success or the reason for failure. See the following table for all predefined exit code values. Please do not return other values or change the numbering scheme provided in the SDK examples!

Exceptions should be caught in the key generator main function and mapped to these error codes. Exception messages should be written to the first output file.

ERC_SUCCESS	no error (a valid textual key has been generated)
ERC_SUCCESS_BIN	no error (a valid binary key has been generated)
ERC_ERROR	general error or runtime exception
ERC_MEMORY	memory allocation failed
ERC_FILE_IO	error during file i/o (map I/O exceptions to this error code)
ERC_BAD_ARGS	missing, incomplete or wrong command line arguments
ERC_BAD_INPUT	missing or incomplete input values or encoding
ERC_EXPIRED	key generator has expired due to a limited validity period
ERC_INTERNAL	other internal errors

Output Files

The data that should be written to the output files depends on success or failure of the key generation and the type of the key generator. Their interpretation by the key server is determined by the exit code.

On *failure* the error message should be provided in the first result file. The second file can be omitted in this case. (e.g. exit code ERC_BAD_INPUT and output file #1 contains: "Value for REG_NAME must contain at least 8 characters!").

On *success* the output file contents depends on the type of the key generator:

Textual Keys = ERC_SUCCESS

The first output file is interpreted as the **User Key** which will be delivered to the customer.

The second output file is interpreted as the so-called **CCKey** (CC for “carbon copy”), and stored for your reference. You can view it in the sales section of the Control Panel, or in the export file. By creating a separate CCKey you can decide which information is reported to you. (e.g. probably your are only interested in the key itself, but not in the instruction text surrounding it.)

IMPORTANT: The file has to be encoded using the same encoding as the input file, using CR/LF for line breaks.

NOTE: You may want to generate a short usage description together with the key. If you would like to provide translations of this text for different languages, you can use the LANGUAGE input value. Anyhow, you should have a look at the key template feature before using this feature as it provides a more convenient way of text customization.

Binary Keys = ERC_SUCCESS_BIN

The first file is interpreted as a content description of the data that is provided in the second file. It comprises of the contents MIME type and the desired filename separated by a single colon. For example:

```
application/octet-stream:key.bin
```

The actual binary key data has to be returned in the second output.

Keep your binary keys small in order to speed up mail delivery. Many email accounts have size restrictions for incoming mail.

***NOTE:** For binary keys there is no carbon copy key feature, but the XML order notification contains a copy of the binary key file.*

4 HTTP Key Generators (CGI)

Web based key generators reside on your server and will be called by our order processing system on each completed sale of a product.

Our system will submit the key generator input values as form data via a HTTP request using the **POST** method. Your server should return the proper key in the response.

e.g. `https://keygen.yourcompany.com/keygen.pl`

We also support the secure HTTPS protocol. You don't need a server certificate from an independent certification authority, a self generated certificate will do.

Input Values will be passed as URL encoded (`application/x-www-form-urlencoded`) CGI variables, we also support Unicode using UTF8 encoding upon request.

The ordering of parameters is not defined, they can appear in any order and may be omitted if they have no value, therefore you should reference them only by their unique identifier.

Error handling

Errors are indicated by status codes other than 200. We recommend that you use “400 Bad Request”. Please return a one line error message indicating the reason for failure.

Our system retries failed requests up to 3 times before giving up. Please make sure to use a reliable provider so that your orders can be fulfilled in real time. If you cannot guarantee 24/7 availability of your server you should consider submitting a generator to be hosted by element 5 (as specified in section 2) or revert to use plain key lists.

Success / Content Disposition and Filename

For a status code of 200 your key generator script must return the key as the content of the HTTP response specifying the proper Content-Type and -Disposition.

- To display the key in line (as part of an email or web page) set the MIME Content-Type header of your response to ‘text/plain’.
- Any other MIME Content-Type will result in an email-attachment / download. In this case you should provide a filename by specifying the Content-Disposition header with your response:

  `Content-Disposition: filename=<filename.ext>`

  We allow the following characters for filenames: a-z, A-Z, 0-9, !_.%$~#-: äöüÄÖÜß@^ (Please note that blanks are not allowed.)

Security Considerations

For security reasons you should limit access to this URL to IP addresses from the following element 5 networks: 217.65.128.0/20 and 85.255.16.0/20.

Please note that this address space might change in the future. In this case you will be asked to adjust your web server configuration.

5 Delivery e-mail Key Templates

A convenient and flexible way to provide additional information with your key is the key template feature: The generated textual key will be embedded into a prepared text template for delivery. This feature enables you to change the texts without submitting a new key generator.

You can edit these templates in the Products/Descriptions section of your control panel account.

In order to use this feature you should write texts for English and optionally other languages which must contain "<%KEY%>" as a placeholder for the actual User Key. The key server will then substitute the key for the first occurrence of the placeholder.

The templates cannot be activated unless the proper key generator has been installed. If you would like to use this feature please notify our signup team to activate the templates upon installation of the key generator that belongs to the templates.

6 General Rules and Prerequisites

- Always remember that our key server is automated. Therefore you should handle all possible situations and exceptions properly. Do not use any user interaction. Return a meaningful exit code and error descriptions in case of failure.
- Some compilers display message boxes (or other dialogs) when exception or fatal errors occur. Please refer to your compilers documentation to see whether this applies to it, and how to override them.
- Your generator should be installable by copying its files into a single network folder. Please do not send installer/setup programs, as our support team has no administrator rights on the key server. Do not send COM servers that require registration.
- Access all auxiliary files via the current directory, which is set to your generators location before it gets invoked. If you need to store persistent information for your key generator you must use a file in the current directory.
- The generators are executed with a time limit of 5000 milliseconds. If the generator takes longer, it will be terminated and thus fail!
- When parsing “DD/MM/YYYY” date strings you cannot not rely on Windows OS date settings. Use conversion functions that allow explicit specification of the date format!

7 How to submit a key generator

Prior to submitting a new key generator, please run several checks on your code and make sure it is stable. You should always use the test environment provided in the SDK. Try different input values or leave them out to test your error handling.

Please include answers to the following questions with your key generator:

- Which Language / Compiler did you use for the creation of this key generator?
- Which Version of this Specification did you refer to when writing the code? (see beginning of this document)
- Which auxiliary files (DLL's, Runtime Environment, etc.) are required for your generator to work?
- Which temporary and/or persistent files are created by the generator?
- Are there any limitations regarding input values?
- Is the generator limited to work only in a predefined period of time? Does it create only a limited number of keys? Do not forget to return ERC_EXPIRED if this is the case.
- Is there anything else we need to know?

8 F.A.Q.

Q: I was wondering if I could call an Internet URL from within the keygen when it runs so I can send a cgi script on my web page some data with POST. Does the generator have access to the Internet when running?

A: The key server is situated behind a firewall and has no access to the Internet. You should consider setting up a CGI based key server.

Q: I know that I could use the 'Additional Field' in keygen to request the computer name, but if a customer is purchasing multiple copies, can you request the 'Additional Field' to be entered for each copy?

A: No. In this case you'll have to use comma separated values or a similar technique.

Q: I want to have certain fields validated, before payment is processed. If fields are incorrect, the user is asked to re-enter correct data (e.g. just like when they enter an invalid card number). I cannot see any way to do this with the Control Panel, is it possible?

A: We're currently planning a verification mechanism using JavaScript on the order forms.

Q: I Would like to use product xyz for key generation. Is it supported by your ordering system?

A: If you can wrap it in a way that meets our specifications, then the answer is yes.

Q: What do you do if the returned value is not ERC_SUCCESS, but some kind of error (for example ERC_INTERNAL)?

A: The purchase is added to a key generation failure list which is processed manually from time to time. Web based key generators will be retried automatically up to 3 times. (e.g. if the server was down)

9 Examples / Templates

Borland Delphi

The Borland Delphi example provides a convenient abstract base class that implements the key generator API. You can create your own generator by descending from the base class.

The example can handle ISO-8859-1 and UTF8 input transparently and provides code for textual as well as binary keys.

The `Value()` function is provided for easy access to the input values. Remember to select "Generate console application" in the Project Options / Linker dialog or use the compiler directive {$APPTYPE CONSOLE}.

FILENAME	*DESCRIPTION*
Example.dpr	project file
KeyIntf.pas	abstract interface classes (don't touch)
KeyUser.pas	key generator (start here with your implementation)

C#

The C# example implements all possible key generator features. The type of key depends on the BINARY_GEN define. The supported encoding on the UNICODE_GEN define.

The examples work with versions 1.0 through 2.0 of the .NET Framework, our servers are running under Windows 2003 with .NET Framework 2.0.

FILENAME	*DESCRIPTION*
Main.cs	key generator class
AssemblyInfo.cs	meta information
make.bat	a simple make batch for the csc.exe command line compiler that also includes a test run using the provided examples

JAVA

Since the standard JAVA main function is declared `void`, we have added a new main function `public static final int KeyMain(String args[])` which has to be implemented in every JAVA key generator. This function gets called via JNI - the JAVA native interface by our key server.

JAVA requires that the name of a class and the filename of its implementation match. Therefore you'll have to rename the example and the class to make it distinguishable from the classes provided by other programmers. Always use the naming scheme "P" followed by your program number (PRODUCT_ID). If you don't have a program number please contact our signup team.

- We also accept JAR files with a proper Manifest that indicates the main class. (see: http://java.sun.com/j2se/1.5.0/docs/guide/jar/jar.html#JAR%20Manifest and http://java.sun.com/j2se/1.5.0/docs/tooldocs/windows/jar.html)
- Our examples were developed using SUN's Java SDK 1.4.
- Our key servers currently run JRE 1.3.1_08 and 1.4.2_09. Our wrapper code examines the MajorVersion of the main class file to determine the proper JRE path. JRE 1.3 is invoked for MajorVersion=45 and JRE 1.4 else.
- The CLASSPATH is set to the JRE default plus the directory of the generator itself.
- IMPORTANT If you're using JAVA 1.5 to compile your key generator, please specify the cross compiling option “-target 1.4” to ensure compatibility. (see: http://java.sun.com/j2se/1.5.0/docs/tooldocs/windows/javac.html)

FILENAME	*DESCRIPTION*
P100000.java	key generator class
make.bat	a simple make batch for the javac.exe command line compiler that also includes a test run using the provided examples and javadoc extraction

Visual Basic .NET

The VB.NET example implements all possible key generator features. The type of key depends on the BINARY_GEN define. The supported encoding on the UNICODE_GEN define.

The examples work with versions 1.0 through 2.0 of the .NET Framework, our servers are running under Windows 2003 with .NET Framework 2.0.

FILENAME	*DESCRIPTION*
KeyGen.vb	key generator class
make.bat	a simple make batch for the vbc.exe command line compiler that also includes a test run using the provided examples

HTTP/CGI Generator Examples

The folder CGI contains examples for webserver-based generators in different languages:

- Perl
- PHP
- Java
- JSP
- VB.NET ASPX (kindly contributed by Sailsoft)

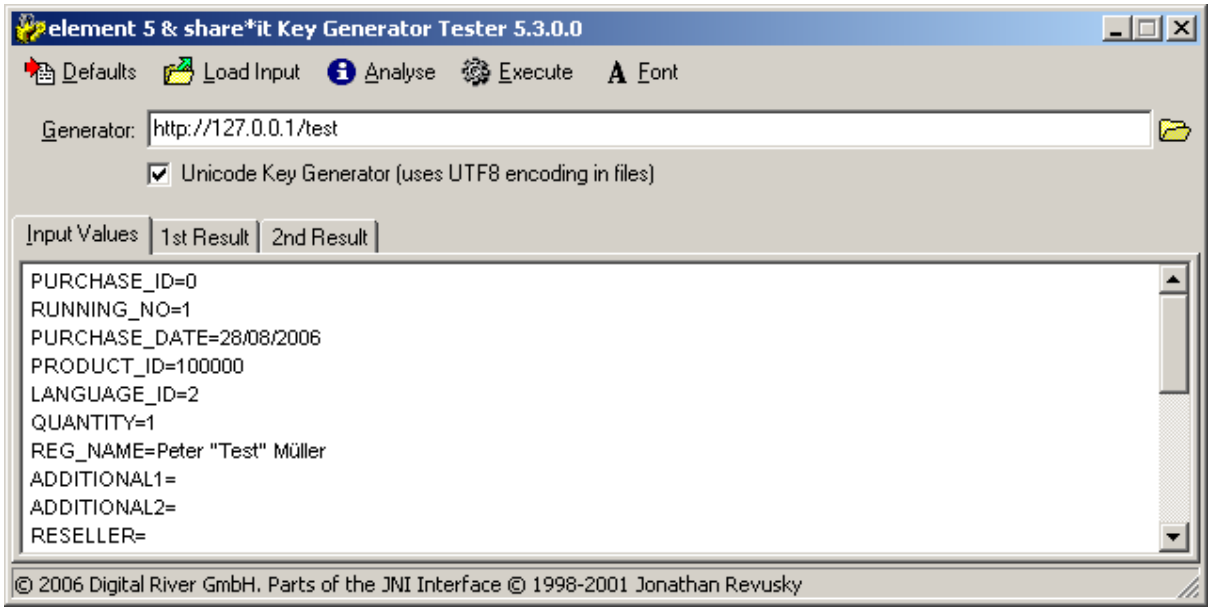
Please refer to the source code comments.

10 Key Generator Tester

The SDK includes a test tool for key generators which shares most of the code with our actual server implementation to provide a good testing aid.

Please test your generators before submitting them.

However, compatibility also depends on the operating system, installed libraries & patches as well as security configuration, so that a successful tests on your PC do not always imply that your code also works on our servers as intended.



Defaults – Initializes the “Input Values” with some test default values.

Load Input – Opens a file dialog to open a text file with input values.

Analyse – This detects the type of generator and outputs valuable information about the runtime dependencies etc.

Execute – Calls your generator with the provided “Input Values”.

- Use the “Unicode ...” check box to select between UTF8 and ISOLatin1 encoding. *If your generator is capable of handling Unicode, please indicate this with your submission as this requires a special configuration in our system.*
- The result status will be displayed in the status bar at the bottom. This should be either ERC_SUCCESS or ERC_SUCCESS_BIN.
- The actual results will be presented in the 2nd and 3rd tab pages. Use the right mouse button for display options on the 3rd tab. (View as Hex, View as ASCII and Save).
- The execution of Java classes and JARs requires the Jwrap.exe which comes with KeyTest.exe.
- The tester will also measure the execution time. Please make sure that your code is fast enough not to run into timeouts.

Font – Choose a different font for the editor.