Troi Encryptor Plug-in 3.5

for FileMaker Pro 15

USER GUIDE

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Troi Automatisering
Boliviastraat 11
2408 MX Alphen a/d Rijn
The Netherlands

You can also visit the Troi web site at: http://www.troi.com for additional information.

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Installing plug-ins

Starting with FileMaker Pro 12 a plug-in can be installed directly from a container field. Please see the **EasyInstallTroiPlugins.fmp12** example file to install plug-ins with FileMaker Pro 12 to 15.

The instructions below show FileMaker Pro 11.

For Mac OS X:

- Quit FileMaker® Pro.
- Put the file “Troi_Encryptor.fmplugin” from the folder “Mac OS Plug-in” into the “Extensions” folder in the FileMaker Pro application folder.
- If you have installed previous versions of this plug-in, you are asked: “An older item named “Troi_Encryptor.fmplugin” already exists in this location. Do you want to replace it with the one you’re moving?’. Press the OK button.
- Start FileMaker Pro. The first time the Troi Encryptor Plug-in is used it will display a dialog box, indicating that it is loading and showing the registration status.

For Windows:

- Quit FileMaker Pro.
- Put the file "Troi_Encryptor.fmx" from the directory "Windows" into the "Extensions" subdirectory in the FileMaker Pro application directory..
- If you have installed previous versions of this plug-in, you are asked: “This folder already contains a file called 'Troi_Encryptor.fmx'. Would you like to replace the existing file with this one?’. Press the Yes button.
- Start FileMaker Pro. The Troi Encryptor Plug-in will display a dialog box, indicating that it is loading and showing the registration status.

TIP You can check which plug-ins you have loaded by going to the plug-in preferences: Choose **Preferences** from the **Edit** menu, and then choose **Plug-ins**.

You can now open the file "All Encryptor Examples.fmp12" to see how to use the plug-in's functions. There is also a function overview available.

If you have problems

This user guide tries to give you all the information necessary to use this plug-in. So if you have a problem please read this user guide first. Also you might visit our support web page:

http://www.troi.com/support/

This page contains FAQ's (Frequently Asked Questions), help on registration and much more. If that doesn't help you can get free support by email. Send your questions to **support@troi.com** with a full explanation of the problem. Also give as much relevant information (version of the plug-in, which platform, version of the operating system, version of FileMaker Pro) as possible. Note that due to spam we have to filter incoming email. It might happen that non-spam email is filtered out too. If you have sent an email and you don't get an answer, try to send another email, slightly differently formulated and include the word "FileMaker" in the body text.

If you find any mistakes in this manual or have a suggestion please let us know. We appreciate your feedback!

TIP You can get more information on returned error codes from our OSErrrs database on our web site: http://www.troi.com/software/oserrrs.html. This free FileMaker database lists all error codes for Windows and Mac OS X!

What can this plug-in do?

The Troi Encryptor Plug-in is a very powerful tool for dealing efficiently with encryption in your FileMaker Pro database. All from within FileMaker you can:

* Encrypt and decrypt text fields
* Encrypt and decrypt container fields, with for example JPEGs in it
* Create MD5 or SHA1 Message Digests
* And more...

It can use a standard industry strength, 256 bit AES Encryption scheme. And the plug-in is upward and downward compatible with data encrypted with Troi Encryptor Plg-in 2.5.x. It is also still upward compatible with data encrypted with Troi Coding 1.6 for FileMaker Pro 6!

Software requirements

System requirements for Mac OS X

Mac OS X 10.6.8 Snow Leopard, Mac OS X 10.7 Lion, OS X 10.8 Mountain Lion, OS X 10.9 Mavericks, OS X 10.10 Yosemite, OS X 10.11 El Capitan.

System requirements for Windows

Windows 7 on Intel-compatible computer 1 GHz or faster.
Windows 8, Windows 8.1, Windows 10.

FileMaker Pro requirements

FileMaker Pro 12 or FileMaker Pro Advanced 12 or higher.
FileMaker Pro 13 or FileMaker Pro Advanced 13 or higher.
FileMaker Pro 14 or FileMaker Pro Advanced 14 or higher.
FileMaker Pro 15 or FileMaker Pro Advanced 15 or higher.

NOTE We have successfully tested it with FileMaker Pro 11, but we no longer provide active support for this version. Troi Encryptor plug-in will also probably run with FileMaker 7 to 10, but we have not tested this and we no longer provide support for this.

Troi Encryptor Plug-in version 3.5 does NOT run on versions prior to FileMaker Pro 7.0. If you need to run on versions prior to FileMaker Pro 7: see our web site for the Encryptor Plug-in 1.6.2 which is using the 'classic' plug-in API, which is using the External("FunctionName" , "parameter") format. The 1.6.2 version runs on FileMaker Pro 6, 5.x and 4.x.

FileMaker Server requirements

FileMaker Server 12, 13, 14 or 15 or higher.
FileMaker Server Advanced 12, 13, 14 or 15 or higher.

You can use FileMaker Server to serve databases that use functions of the Troi Encryptor Plug-in (client-side): You need to have the plug-in installed at the clients that use these functions.

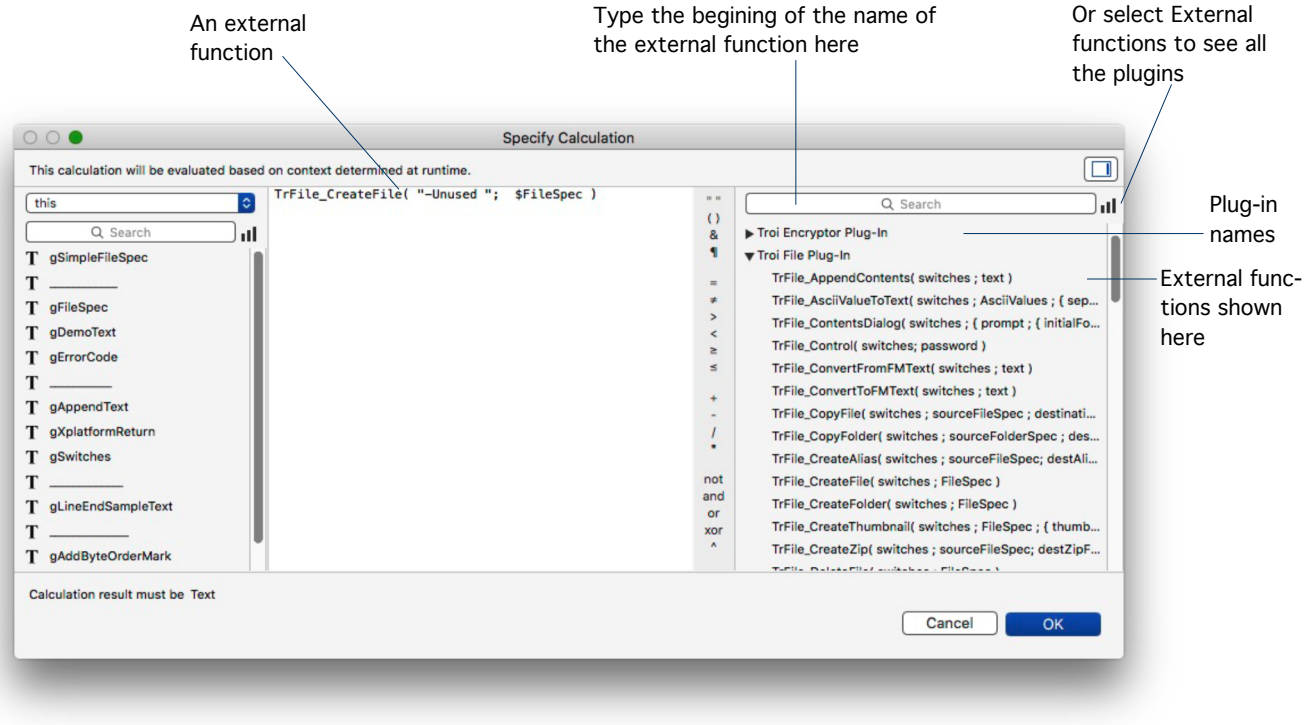
Troi Encryptor Plug-in can also be used by FileMaker Server as a server-side plug-in or as a plug-in used by the web publishing engine. To use Troi Plug-ins as a server-side or web-side plug-in you need to purchase a special Server/Web license. More information can be found in the download or here:

http://www.troi.com/support/filemaker-server-side-plug-ins.html

Getting started

Using external functions

Troi Encryptor Plug-in adds new functions to the standard functions that are available in FileMaker Pro. The functions added by a plug-in are called external functions. You can see those extra functions for all plug-ins at the top right of the Specify Calculation box:



You use the following syntax with external functions: FunctionName(parameter1 ; parameter 2) where FunctionName is the name of an external function. A function can have zero or more parameters. Each parameter is separated by a semi-colon. Plug-ins don't work directly after installation. To access a plug-in function, you need to add the calls to the function in a calculation, for example in a Encryptor calculation in Define Fields or in a script.

Where to add the external functions?

External functions for this plug-in can be used in a calculation field when you are defining fields (choose Define Database from the File menu). Also the plug-in's functions can be used in a script step using a calculation, for example in a Set Field script step.

Simple example

We start with a simple example to get you started. Say you have a database Secrets.fmp12, with a text field called myText, and a text field called EncryptedField. Now add the following script step to a script:

```
Set Field[EncryptedField,  Encr_EncryptRijndaelAES( "-Unused"; "secret" ; myText)]
```

This will encrypt the text from the field myText into the EncryptedField, using the password "secret". This gives this result (or similar, as the encrypted text is different every time):

```
<TROI_AES_STD_ENCR10>
NVFJPSV9fX19fX19fX19fbpsts4SthcI/85T5dcjEv7IsuDGy72Z/t4bfFUyOY7A2ITa3jzEx
wyy+kHnWsgo/IJ1d7BZeRWA6Wbtzn8/xyAgm47SuJ167SJMLb5k/Kl11dKFuaQ==
</TROI_AES_STD_ENCR10>
```

Now the original text can be deleted, but be sure to remember your password, as otherwise you can not retrieve the original text.

Note that function names, like Encr_EncryptRijndaelAES are not case sensitive.

Please take a close look at the included example files, as they provide a great starting point. From there you can move on, using the functions of the plug-in as building blocks. Together they give you all the tools you need to perform powerful encryption and coding.

Rijndael AES Encryption

What is AES?

The Advanced Encryption Standard (AES), also known as Rijndael, is a block cipher adopted as an encryption standard by the US government. It was adopted by National Institute of Standards and Technology (NIST) as US FIPS PUB 197 in November 2001.
See also:

http://www.nist.gov/

http://csrc.nist.gov/CryptoToolkit/tkencryption.html

The cipher was developed by two Belgian cryptographers, Joan Daemen and Vincent Rijmen, and submitted to the AES selection process under the name "Rijndael". Rijndael can be pronounced "Rhine dahl", a long "i" and a silent "e".

AES is considered to be very secure. AES has the potential to remain secure well beyond twenty years. See also here:
http://csrc.nist.gov/CryptoToolkit/aes/aesfact.html

The strength of AES make it very useful in complying with HIPAA guidelines.

For compatibility with Troi Coding Plug-in, the Troi Encryptor Plug-in also still implements the newDES algorithm. Note that newDES is less secure than AES.

TIP It is recommended that for new project you use AES encryption.

What do I need to know about AES?

To be able to work with the plug-in you don't need to know all the technical details. But for those interested the details are in the next section below. Here are some things you do need to know:

- Be sure to remember the password (case sensitive!): without it you can not retrieve the original data.
- It's good practice to use a password that is at least 6 characters long. You can use higher Unicode characters.
- Don't store the password.
- Use a global for the password field.
- The encrypted text is different every time you encrypt the same text. This is not a bug, but a security feature!

How is AES implemented in Troi Encryptor?

The Troi Encryptor Plug-in implements AES in two ways: the Encr_EncryptRijndaelAES function provides an easy way to encrypt, where you provide a password to encrypt the data. You can also use a more advanced approach, with these 3 functions: Encr_AES_CreateKeyAndIV, Encr_AES_EncryptUsingKey and Encr_AES_DecryptUsingKey, where from a passphrase an encryption key and initialization vector is generated. With the key and initialization vector you can then encrypt and decrypt your data. This provides the standard AES-256 or AES-128 implementation. This makes it possible to exhange encrypted data with external systems, for example PHP-mcrypt.

The Encr_EncryptRijndaelAES function is implemented as follows:

1) Convert the input plaintext

The source plaintext is encoded from the FileMaker native Unicode to UTF8.

2) The password is converted to UTF8

Passwords are UTF8 encoded before the key is derived. This means that all Unicode characters can be used for the password.

For example:
"japan_ xx" becomes "japan_0xE698BEE7A4BA" as password (xx are japanese characters)
"españa" becomes "espa0xC3B1a" as password

3) Generation of derived key, Initialization Vector and Salt.

From the UTF8 password a 32 byte encryption key and a 16 byte Initialization Vector (IV) are derived.
This is done via the PBKDF2 standard (RFC 2898 - PKCS #5: Password-Based Cryptography Specification Version 2.0). See:
http://www.faqs.org/rfcs/rfc2898.html

Also a 20 byte salt is generated, which will make the encryption result different each time, making it more secure.

The IV is used in an initial step in the encryption of data and in the corresponding decryption of the data. The IV need not be secret; however, for the CBC modes, the IV for any particular execution of the encryption process must be unpredictable. This is the case with Troi Encryptor.

4) Encryption of the data.

Starting with v3.0 the data is encrypted using AES-256: this is a 256 bit encryption key, CBC with blocksize and IV of 16 byte and a 20 byte salt. Padding is done according to PKCS7. This results in the <Encrypted Data> .

5) Extra information

Extra information is added at the beginning, like this:

<TROI internal use only>	16 bytes
<Salt>	20 bytes
<SHA-1 digest of the password>	20 bytes
<Encrypted Data>	actual length

6) This result is Base64 encoded.

7) The plug-in adds a two tags around the final result:

```
<TROI_AES_STD_ENCR10>
NVFJPSV9fX19fX19fX19fbpsts4SthcI/85T5dcjEv7IsuDGy72Z/t4bfFUyOY7A2ITa3jzEx
wyy+kHnWsgo/IJ1d7BZeRWA6Wbtzn8/xyAgm47SuJ167SJMLb5k/Kl11dKFuaQ==
</TROI_AES_STD_ENCR10>
```

Getting extra information

If you want to know the derived key, Initialization Vector or Salt you can add one or more of these switches to retrieve more information:

-AddIntializationVectorInfo	add the used Initialization Vector at the end of the result (need not be kept secret)
-AddSaltInfo	add the used Salt at the end of the result (need not be kept secret)
-AddKeyInfo	add the derived key at the end of the result (always keep secret!)

For example:

```
Set Field [ secretField,
        Encr_RijndaelAES ("-AddSaltInfo" ;  gEncryptionPassword ; textField )]
```

this will result in:

```
<TROI_AES_STD_ENCR10>
NVFJPSV9fX19fX19fX19fbkO656mTvKWiWbKQqul7R5tZd7+aQ3h0QaLQOO6EUtFjxDLRxNQp
rwFN1JhuE5SNPaSBWbCrteX7uPmqKpdyFrmcGwqX7CjZ5cE/ISIwD6LWh3hguv1JObZqj7+n
fWhvu4AflFM765T8hlg6BbeHjI2oUwGz
</TROI_AES_STD_ENCR10>

<TROI_SALT>43bae7a993bca5a259b290aae97b479b5977bf9a</TROI_SALT>
```

Container fields

You can also encrypt any type of container field, even containers that store a reference only. Note that for those containers only the reference is encrypted, not the original. This applies for all reference pictures and QuickTime movies.

Container data consists of several streams. Each stream is converted to Base64 and this text is then encrypted. The Troi Encryptor Plug-in formats the container data like this:

<TROI_BINARY_CONTAINER10><number of streams>
<- ->
<length stream1><stream1 data>
<- ->
<length stream2><stream2 data>
<- ->
<length stream3><stream3 data>
...
</TROI_BINARY_CONTAINER10>

The resulting text is then encrypted the same way as a text field would be.

Message Digests

SHA-1 and MD5 algorithms

SHA-1 is the Secure Hash Algorithm (SHA) was developed by NIST and is specified in the Secure Hash Standard (SHS, FIPS 180). SHA-1 is a revision to this version and was published in 1994. It is also described in the ANSI X9.30 (part 2) standard. SHA-1 produces a 160-bit (20 byte) message digest. Although slower than MD5, this larger digest size makes it stronger against brute force attacks.

MD5: MD5 was developed by Professor Ronald L. Rivest in 1994. Its 128 bit (16 byte) message digest makes it a faster implementation than SHA-1.

NOTE MD5 is no longer considered collision-free/unique. You can find more info on this here:
http://www.mscs.dal.ca/~selinger/md5collision/

So it is better to use SHA-1 when more security is needed. In this case, the fingerprint (message digest) is non-reversible: your data can not be retrieved from the message digest, yet the digest uniquely identifies the data.

What is a hash algorithm?

MD5 and SHA-1 are hash algorithms for computing a 'condensed representation' of a message or a data file. The 'condensed representation' is of fixed length and is known as a 'message digest' or 'fingerprint'.

What makes this useful, is that it is computationally infeasible to produce two messages having the same message digest. This uniqueness enables the message digest to act as a 'fingerprint' of the message. This opens up the possibility of using this technology for issue like data integrity and comparison checking.

For instance when you download or receive a text, you can use SHA-1 to guarantee that you have the correct, unaltered text by comparing its hash with the original. You are essentially verifying the text's integrity.

Summary of functions

The Troi Encryptor Plug-in adds the following functions to FileMaker Pro:

function name	short description
Encr_AES_CreateKeyAndIV	Creates an encryption key and initialization vector, for AES encryption and decryption.
Encr_AES_DecryptUsingKey	Decrypts using the AES and an encryption key and initialization vector.
Encr_AES_EncryptUsingKey	Encrypts using the AES and an encryption key and initialization vector.
Encr_BinaryToNum	Converts a binary number to its decimal representation.
Encr_Checksum	Sum of the ASCII values of the characters modulo 1024.
Encr_Code	Performs a encryption or decryption of the data field, depending on switches.
Encr_Compress	Compresses text using a ZLIB algorithm.
Encr_DecodeBase64	Decodes a text formatted in Base64 to the original text.
Encr_DecodeSafeAscii	Decodes a text in the SafeASCII format to the original text.
Encr_Decompress	Decompresses text that was previously compressed.
Encr_DecryptNewDES	Decrypts text using a newDES algorithm and the current crypt key.
Encr_DecryptRijndaelAES	Decrypts text using a the Rijndael AES algorithm and the password.
Encr_EncodeBase64	Encodes a text to Base64 encoding.
Encr_EncodeSafeAscii	Encodes a text to lower ASCII characters in the range 45...127.
Encr_EncodeShortSafeAscii	Encodes a text to Ascii characters in the range 45...127.
Encr_EncryptNewDES	Encrypts text using a DES algorithm and the current crypt key.
Encr_EncryptRijndaelAES	Encrypts text using a the Rijndael AES algorithm and the password.
Encr_MakeDigest	Generates a MD5 or SHA1 digest.
Encr_NumToBinary	Converts a number to its binary representation.
Encr_Rotate13	Very simple coding of text.
Encr_SetCryptKey	Specify which key is used to encrypt and decrypt a text.
Encr_TextSignature	Generates a signature of the characters that you can see
Encr_SavePasswordToKeychain	Saves a password into the keychain (for this account and/or yourID).
Encr_GetPasswordFromKeychain	Gets a password from the keychain (for this account and/or yourID).
Encr_DeletePasswordFromKeychain	Deletes a password from the keychain (for this account and/or yourID).
Encr_Version	Use this function to see which version of the plug-in is loaded. This function is also used to register the plug-in.
Encr_VersionAutoUpdate	standard version number for AutoUpdate of FileMaker Server.

Function Reference

Encr_AES_CreateKeyAndIV

Syntax Encr_AES_CreateKeyAndIV(switches ; passphrase ; salt)

Creates an encryption key and initialization vector, which can be used for AES encryption and decryption.

Parameters

switches	modifies the behavior of the function
passphrase	the passphrase (password) to use
salt	a random text to make encryption more secure, make this 8 to about 20 characters long

Switches must be one of:

-KeySize=256	(default) create a key for AES-256 encryption
-KeySize=128	create a key for AES-128 encryption

Other switches are not (yet) possible.

Returned result

the created key and the IV each on a separate line. The function can also return an error code.

Possible error codes are:

$$-4244	kErrPwdEmpty	no passphrase was given
$$-50	paramErr	Parameter error (incorrect key size given)

Other error codes can be returned.

Special considerations

This is an advanced function, for exchanging data with other systems. You might want to use the more simple Encr_EncryptRijndaelAES function.
You use this in conjunction with the Encr_AES_EncryptUsingKey and Encr_AES_DecryptUsingKey functions.

Make the random salt 8 to about 20 characters long (1000 chars is the maximum).

The key is derived from a SHA1 hash of the salt and the passphrase.
You can use AES-128 or AES-256.

Technical details:
AES-128: 128 bit, CBC with a 16 byte key. Blocksize is 16 byte so the IV generated is 16 byte.
AES-256: 256 bit, CBC with a 32 byte key. Blocksize is also 16 byte so the IV generated is 16 byte.

Example usage

```
Set Variable [ $KeyAndIV ; Encr_AES_CreateKeyAndIV( "-KeySize=256" ; "mySecretKey" ; "bZz%gABQ6lBpfNwgeD?v" ) ]
```

This will return the encryption key and the initialization vector each on a separate line, the result will be similar to:

```
ZTBkMDczYzdkN2NhZDNiMjFmMDM1MTdiOWMwM2Q3ZDg=
QXoxqKimWqRGyrpKesrKYQ==
```

The 2 lines are encoded as base64.
For AES-128 the key and initialization vector are 16 bytes.
For AES-256 the key is 32 bytes and initialization vector is 16 bytes long.

Encr_AES_CreateKeyAndIV

Example 2

With the passphrase and the random salt you can generate the key and the initialization vector suitable for AES-256 encryption. You can use these script steps:

```
Set Variable [ $Passphrase; YourPassphraseField // get the passphrase from a field. ]

# set the salt; this should be a random string.
Set Variable [ $UseFixedTestSalt; Value:0 ]

# Generate a 20 character random salt
  Loop
    Set Variable [ $RandomChar; Let( allowedChars =
        "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890!@#$%&*+?";
        Middle ( allowedChars ; Int ( Random * Length ( allowedChars ) ) + 1 ; 1))]
    Set Variable [ $Salt; $Salt & $RandomChar ]
    Exit Loop If [ Length ( $Salt ) >= 20 ]
  End Loop
End If
# Set the wanted keysize: The sizes are given in bits. This is a key of 32 byte and IV of 16 byte
Set Variable [ $Switches; "-KeySize=256" ]

# Generate the key now:
Set Variable [ $KeyAndIV; Value:Encr_AES_CreateKeyAndIV( $Switches; $Passphrase ; $Salt )
 ]

If [ Left ($KeyAndIV ; 2) = "$$" ]
    Set Field [ this::gErrorCode; $KeyAndIV ]
    Perform Script [ " Handle Errors" ]
Else
  Set Field [ this::gErrorCode; 0 ]

# NOTE the result is on two lines: first the key and the IV on the next line. The key and IV are Base64 encoded.

Set Variable [ $Key; Value:Left($KeyAndIV ; Position($KeyAndIV ; "¶"; 1; 1) -1) ]
Set Variable [ $IV; Value:Middle($KeyAndIV ; Position($KeyAndIV ; "¶"; 1; 1) + 1; Length($KeyAndIV)) ]
```

Now the key + IV are generated, you can encrypt data with the Encr_AES_EncryptUsingKey function.

Encr_AES_DecryptUsingKey

Syntax Encr_AES_DecryptUsingKey(switches ; key ; initializationVector; dataToDecrypt ; {paddingScheme})

Decrypts the data using the AES algorithm using an encryption key and initialization vector.

Parameters

switches	modifies the behavior of the function
key	the key to use
initializationVector	the initialization vector (IV) to use (formatted in Base64)
dataToDecrypt	the text to decrypt
paddingScheme	(optional) the padding that was used, can be: PKCS7 (default) or ZeroPadding.

You can add one or more of these switches to retrieve extra information:

-AddSaltInfo	add the used Salt at the end of the result (need not be kept secret)

Other switches are not (yet) possible.

Returned result

the decrypted text or an error code.

Possible error codes are:

$$-4244	kErrPwdEmpty	no decryption key was given
$$-50	paramErr	Parameter error (incorrect key size or IV size given)

Other error codes can be returned.

Special considerations

This is an advanced function, for exchanging data with other systems. You might want to use the more simple Encr_DecryptRijndaelAES function.

You use this in conjunction with the Encr_AES_CreateKeyAndIV function (and to encrypt the Encr_AES_EncryptUsingKey function)..

Technical details:
AES-128: 128 bit, CBC with a 16 byte key. Blocksize is 16 byte so the IV is 16 byte.
AES-256: 256 bit, CBC with a 32 byte key. Blocksize is also 16 byte so the IV is 16 byte.

Example usage

Use the result of the Encr_AES_CreateKeyAndIV function to fill the following variables:

```
Set Variable [ $EncryptionKey; "ZTBkMDczYzdkN2NhZDNiMjFmMDM1MTdiOWMwM2Q3ZDg=" ]
Set Variable [ $InitializationVector; "eYylMTRugzqcaHrqW7JxQg==" ]
```

Also set the following variables:

```
Set Variable [ $OriginalText; "9/0bnrlHqOTojVF2qrmrRw== "]
Set Variable [ $PaddingScheme; "PKCS7" ]
```

Then decrypt it:

```
Set Variable [ $DecryptedText;
        Encr_AES_DecryptUsingKey( "-unused" ; $EncryptionKey ; $InitializationVector; $OriginalText ;
$PaddingScheme ) ]
```

The result will be the original data, for example:
"your text to be made secret"

If the key or iv is different from the encryption the result will be random data.

Encr_AES_EncryptUsingKey

Syntax Encr_AES_EncryptUsingKey(switches ; key ; initializationVector; dataToEncrypt ; {paddingScheme})

Encrypts the data using the AES algorithm using an encryption key and initialization vector.

Parameters

switches	modifies the behavior of the function
key	the key to use
initializationVector	the initialization vector (IV) to use (formatted in Base64)
dataToEncrypt	the text to encrypt
paddingScheme	(optional) the padding to be used, can be: PKCS7 (default) or ZeroPadding.

You can add one or more of these switches to retrieve extra information:

-AddSaltInfo	add the used Salt at the end of the result (need not be kept secret)

Other switches are not (yet) possible.

Returned result

the encrypted text (in base64 encoding) or an error code.

Possible error codes are:

$$-4244	kErrPwdEmpty	no encryption key was given
$$-50	paramErr	Parameter error (incorrect key size or IV size given)

Other error codes can be returned.

Special considerations

This is an advanced function, for exchanging data with other systems (like PHP-mcrypt). You might want to use the more simple Encr_EncryptRijndaelAES function.

You use this in conjunction with the Encr_AES_CreateKeyAndIV function(and with the Encr_AES_DecryptUsingKey function to decrypt).

From the length of the key the function will determine if you want AES-128 or AES-256 encryption.

Technical details:
AES-128: 128 bit, CBC with a 16 byte key. Blocksize and the IV is 16 byte.
AES-256: 256 bit, CBC with a 32 byte key. Blocksize and the IV is 16 byte.

See the PHP-mcrypt folder in the download for an example how to decrypt data encrypted with Troi Encryptor Plug-in.

Example usage

```
Set Variable [ $EncryptionKey; "ZTBkMDczYzdkN2NhZDNiMjFmMDM1MTdiOWMwM2Q3ZDg=" ]
Set Variable [ $InitializationVector; "eYylMTRugzqcaHrqW7JxQg==" ]
Set Variable [ $OriginalText; "your text to be made secret"]
Set Variable [ $PaddingScheme; "PKCS7" ]

# Encrypt it:
Set Variable [ $EncryptedText;
                Encr_AES_EncryptUsingKey( "-unused" ; $EncryptionKey ; $InitializationVector; $OriginalText ;
$PaddingScheme ) ]
```

The result: will be similar to thisl:
9/0bnrlHqOTojVF2qrmrRw==

Encr_BinaryToNum

Syntax Encr_BinaryToNum(switches ; binaryNumber)

Converts a binary number to its decimal representation.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
binaryNumber	the number that needs to be converted to its decimal representation.

Returned result

A decimal number

Special considerations

See also the Encr_NumToBinary function for the reverse functionality.

Example usage

Set Field [result, Encr_BinaryToNum("-Unused" ; 10)] will return as result 2.

Set Field [result, Encr_BinaryToNum("-Unused" ; 10010)] will return as result 18.

Encr_Checksum

Syntax Encr_Checksum(switches ; text)

Sum of the ASCII values of the characters modulo 1024. ALL characters are counted, also non-printing characters like spaces and returns.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to calculate the checksum of

Returned result

a number

Special considerations

A checksum might be the same for 2 different texts. The chance on this is normally quite low (one in 1024).
See also the Encr_MakeDigest function for a more robust check if text is the same.

Compatibility with Troi Coding Plug-in:
Text is converted to the FileMaker Pro 6 character set. For other characters the UNICODE value sum modulo 1024 is used.
This ensures that fields with data from older FileMaker 6 databases will have the same checksum.

Example usage

Set Field [result, Encr_Checksum("-Unused" ; "Hello world.")] will give a result of 106.

You can use this function to see if the contents of a field has changed. You store the checksum and then later compare it to the current checksum.

Encr_Code

Syntax Encr_Code(switches ; password ; data)

Performs an encryption or decryption of the data field, depending on switches.

Parameters

switches	specify what (de)coding action to perform
password	the password to use
data	the text (or container) to perform the action on

Switches can be:

-EncryptDES	encrypt using the newDES algorithm (and the password)
-DecryptDES	decrypt using the newDES algorithm (and the password)
-EncryptRijndaelAES	encrypt using the (more secure) AES algorithm (and the password)
-DecryptRijndaelAES	decrypt using the (more secure) AES algorithm (and the password)
-DecodeSafeAsciiDecryptDESDecompress	first decode from SafeAscii, then decryptDES and then decompress

for Rijndael encryption you can also add one or more of these switches to retrieve extra information:

-AddIntializationVectorInfo	add the used Intialization Vector at the end of the result (need not be kept secret)
-AddSaltInfo	add the used Salt at the end of the result (need not be kept secret)
-AddKeyInfo	add the derived Key (derived from the password) at the end of the result (keep secret!)

Other switches are not (yet) possible.

Returned result

the coded text. This can be encrypted text or decrypted text.

Special considerations

- You can use this function to encrypt and decrypt without a script.
- For good security make sure the password is at least 8 characters long. Also be aware that the password is case sensitive.
- Rijndael AES is a more secure algorithm than NewDES.
See Encr_EncryptRijndaelAES for more technical information on the AES implementation.
- New in v2.5.2: the switch "-DecodeSafeAsciiDecryptDESDecompress". This will perform three actions in succession: first decode from SafeAscii, then decrypt the intermediate result (using decryptDES) and finally decompress it.

Example usage

```
Set Field [ secretField,
        Encr_Code( "-EncryptDES" ;  gEncryptionPassword ; textField )]

Set Field [ result,
        Encr_Code( "-DecryptDES" ;  gDecryptionPassword ;  secretField )]
```

gDecryptionPassword = a global text field where the user can type in the password that will be used to generate a key for the encryption or decryption.

Example 2

```
Set Field [ secretField,
        Encr_Code( "-EncryptRijndaelAES -AddSaltInfo" ;  gEncryptionPassword ; textField )]
```

this will result in:

```
<TROI_AES_STD_ENCR10>
NVFJPSV9fX19fX19fX19fbkO656mTvKWiWbKQqul7R5tZd7+aQ3h0QaLQOO6EUtFjxDLRxNQp
```

Encr_Code

rwFN1JhuE5SNPaSBWbCrteX7uPmqKpdyFrmcGwqX7CjZ5cE/ISIwD6LWh3hguv1JObZqj7+n
fWhvu4AflFM765T8hlg6BbeHjI2oUwGz
</TROI_AES_STD_ENCR10>

<TROI_SALT>43bae7a993bca5a259b290aae97b479b5977bf9a</TROI_SALT>

Encr_Compress

Syntax Encr_Compress(switches ; text)

Compresses text using a ZLIB algorithm.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to compress

Returned result

the compressed text string.

Special considerations

NOTE 1: short strings (less than 20 characters) of text might be longer after compression.
NOTE 2: the compression result can contain all ASCII codes (0-255). See "Encr_EncodeSafeAscii" for conversion to safe ASCII codes.

Example usage

Set Field [result, Encr_Compress("-Unused" ; "123456789 123456789 123456789")]
will result in the compressed string: "xú3426153∑∞T0ƒd W ÿ"

Example 2

In a document database you have defined a text field named "letterContents" which contains the main part of a letter. Then you can define a calculation field:

LetterCompressCalc calculation = Encr_Compress("-Unused" ; LetterContents)]

this field will contain the compressed version of the field.

Encr_DecodeBase64

Syntax Encr_DecodeBase64(switches ; text)

Decodes a text formatted in Base64 to the original text.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	text to decode

Returned result

The result will be the original text

Special considerations

You can encode text with: "Encr_EncodeBase64".

Example usage

```
Set Field [ result, Encr_DecodeBase64(  "-Unused" ;
    "SGVyZSBpcyBhIGJpdCBvZiBleGFtcGxlIHRleHQuIKUgRG9u1XQgZm9yZ2V0IHRv
    IGhhdmUgZnVuLCBHn250aGVyIGFuZCBCv3JnISA=" )]
```

gives this result:

Here is a bit of example text. • Don’t forget to have fun, Günther and Børg!

Encr_DecodeSafeAscii

Syntax Encr_DecodeSafeAscii(switches ; text)

Decodes a text in the SafeASCII format to the original text.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to decode

Returned result

the original text
OR
"$$-301 (Decoding Error)" , when the decoding failed.

Special considerations

See also: Encr_EncodeSafeAscii and Encr_EncodeShortSafeAscii.

Example usage

```
Set Field [ result, Encr_DecodeSafeAscii(  "-Unused" ;
  "this text is ignored!!!
    %Troi SafeAscii v1.0
     .V-PDon/Tt-Pforget-Pto-Phave-Pfun-\-PG.Pnther-Pand-PB/>rg-Q-P
   %End SafeAscii v1.0
   this text too...")]
```

gives this result: "• Don’t forget to have fun, Günther and Børg! "

Example 2

In a database you have defined a text field named "receivedEmail" which contains the body of an email which contains a part that is encoded as ASCII Safe. Then you can define a calculation field:

```
DecodedCalc   calculation     = Encr_DecodeSafeAscii(  "-Unused" ;  ReceivedEmail )]
```

this field will contain the decoded text.

Encr_Decompress

Syntax Encr_Decompress(switches ; text)

Decompresses text that was previously compressed.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to decompress

Returned result

the decompressed text
OR
"$$ Decompression Error" + an error code, when the decompression failed.

Special considerations

NOTE 1: this function can only decompress text that was previously compressed with "Encr_Compress" function (ZLIB algorithm). Currently no other algorithms, like ZIP and Stuffit (.sit) are supported.

Example usage

Set Field [result, Encr_Decompress("-Unused"; "xú3426153∑∞T0ƒd W ÿ")]
will result in the decompressed string: "123456789 123456789 123456789"

Example 2

In a document database you have defined a text field named "letterCompressed" which contains the main part of a letter, compressed. Then you can define a calculation field:

letterContentsCalc calculation Unstored, = Encr_Decompress("-Unused"; letterCompressed)]

this field will contain the uncompressed version of the contents.

Encr_DecryptNewDES

Syntax Encr_DecryptNewDES(switches ; text)

Decrypts text using a newDES algorithm and the current crypt key. Specify the correct key first with the function Encr_SetCryptKey.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to decrypt

Returned result

the decrypted text

Special considerations

If the current key does not match the key used to encrypt, the text is not decrypted and the input text is returned unchanged.
- Rijndael AES is a more secure algorithm than NewDES: see Encr_EncryptRijndaelAES for information on this algorithm.

Example usage

```
Set Field [ gErrorCode, Encr_SetCryptKey(  "-Unused" ; "mySecret" )]
If [gErrorCode = 0]
  Set Field [ result, Encr_Decrypt(  "-Unused" ;  "l’ùé—JtO<=! Û¡ \}0Óÿ„]˜¿Cºdè ≈˘" )]
End If
```

gives this result: "Hello World".

Encr_DecryptRijndaelAES

Syntax Encr_DecryptRijndaelAES(switches ; password ; text)

Decrypts text using the Rijndael AES algorithm and the password.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
password	the password to use
text	the text to decrypt

Returned result

the decrypted text or container data or an error code.

Possible error codes are:
$$-4244 no password was given

Special considerations

- Be sure to remember the password (case sensitive!): without it you can not retrieve the original text.
- The result field should be the same type as the original field that was encrypted.
See Encr_EncryptRijndaelAES for more technical information on the AES implementation.

Example usage

```
Encr_DecryptRijndaelAES(  "-Unused" ; "mypassword" ;
        "<TROI_AES_STD_ENCR10>
        NVFJPSV9fX19fX19fX19fbpsts4SthcI/85T5dcjEv7IsuDGy72Z/t4bfFUyOY7A2ITa3jzEx
        wyy+kHnWsgo/IJ1d7BZeRWA6Wbtzn8/xyAgm47SuJ167SJMLb5k/Kl11dKFuaQ==
        </TROI_AES_STD_ENCR10>" )
```

This will gives this result:
        mySecretTexts

Example 2

In a database you have defined a text field named "encryptedPatientData" which contains encrypted illness data. Then define a calculation field:

```
    patientDataCalc    calculation   Unstored  = Encr_DecryptRijndaelAES(  "-Unused" ; gPasswordField ; patientData )
```

the calculation field will contain the decrypted text, but only if the password is correct.

Encr_DeletePasswordFromKeychain

Syntax Encr_DeletePasswordFromKeychain(switches ; account { ; yourID })

Deletes a password from the keychain (for this account and/or yourID).

Parameters

switches	not used, reserved for future use. Leave blank or put "-Unused"
account	the name of the account for this password
yourID	(optional) the extra ID that was used for this password

Returned result

The returned result is an error code. An error always starts with 2 dollars, followed by the error code. You should always check for errors. Returned error codes can be:

0	No error: the password was deleted from the keychain
$$-25300	The password could not be found in the keychain
$$-50	Parameter error

Other error codes can be returned.

Special considerations

The password is safely stored in the keychain and it can be deleted from the keychain without the user needing to enter the (keychain) password. The keychain is unlocked when the user logs in into the operating system.
Be careful when using this function, a deleted password can no longer be retrieved.
If you specify an account and/or yourID combination for which no password exists, the plug-in returns error code $$ -25300.

Example usage

Set Variable[$ErrorCode ; TrFile_DeletePasswordFromKeychain("-Unused" ; "John Deere")]

This will delete the password for the account "John Deere" from the keychain.

Example 2

Set Variable[$ErrorCode ; TrFile_DeletePasswordFromKeychain("-Unused" ; "Sales" ; "Invoices|Notes|REC1001")]

This will remove the password from the keychain which was stored with the account parameter "Sales" and the yourID parameter "Invoices|Notes|REC1001".

Encr_EncodeBase64

Syntax Encr_EncodeBase64(switches ; text)

Encodes a text to Base64 encoding. The result can be sent safely over internet without any characters being changed. This function formats the output so that it is better readable for email.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	text to encode

Returned result

The result will be formatted in base64.

Special considerations

You can decode it with: "Encr_DecodeBase64".
base64 can be about 4/3 as big as the original.

From Wikipedia, the free encyclopedia:
...base64 is a data encoding scheme whereby binary-encoded data is converted to printable ASCII characters. It is defined as a MIME content transfer encoding for use in internet e-mail. The only characters used are the upper- and lower-case Roman alphabet characters (A-Z, a-z), the numerals (0-9), and the "+" and "/" symbols, with the "=" symbol as a special suffix code. More information:
http://en.wikipedia.org/wiki/Base64

Example usage

Set Field [result, Encr_EncodeBase64("-Unused" ; "Here is a bit of example text. • Don’t forget to have fun, Günther and Børg! ")]

gives this result:

```
SGVyZSBpcyBhIGJpdCBvZiBleGFtcGxlIHRleHQuIKUgRG9u1XQgZm9yZ2V0IHRv
IGhhdmUgZnVuLCBHn250aGVyIGFuZCBCv3JnISA=
```

Encr_EncodeSafeAscii

Syntax Encr_EncodeSafeAscii(switches ; text)

Encodes a text to lower ASCII characters in the range 45...127. The result can be sent safely over internet without any characters being changed. This function formats the output so that it is better readable for email.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	text to encode

Returned result

The result will be formatted like this:

```
%Troi SafeAscii v1.0
safe text line 1
safe text line 2
...
%End SafeAscii v1.0
```

Special considerations

You can decode it with: "Encr_DecodeSafeAscii".

NOTE: If you don't want formating (a return and a header and footer) use "Encr-EncodeShortSafeAscii" function.

Example usage

Set Field [result, Encr_EncodeSafeAscii("-Unused" ; "• Don’t forget to have fun, Günther and Børg! ")]

gives this result:

```
%Troi SafeAscii v1.0
.V-PDon/Tt-Pforget-Pto-Phave-Pfun-\-PG.Pnther-Pand-PB/>rg-Q-P
%End SafeAscii v1.0
```

Encr_EncodeShortSafeAscii

Syntax Encr_EncodeShortSafeAscii(switches ; text)

Encodes a text to Ascii characters in the range 45...127. These characters can be exported as tab separated text and also sent safely over internet.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	text to encode

Returned result

The result will be formatted like this:

%Bencodedsafe text%E

The result of this function can be safely exported to for example TAB separated text.

Special considerations

See also:
Troi-EncodeSafeAscii and Troi-DecodeSafeAscii.

Example usage

Set Field [result, Encr_EncodeShortSafeAscii("-Unused" ; "• Don't forget to have fun, Günther and Børg! ")]

gives this result: "%B.V-PDon/Tt-Pforget-Pto-Phave-Pfun-\-PG.Pnther-Pand-PB/>rg-Q-P%E"

Example 2

In a database you have defined a text field named "patientName" and "patientData" which contains user data. Then you can define a calculation field:

safeNameCalc calculation = Encr_EncodeShortSafeAscii ("-Unused" ; patientName)]
safeDataCalc calculation = Encr_EncodeShortSafeAscii ("-Unused" ; patientData)]

these fields will contain the encoded text. If you export these safe fields you can get it like this:

Bj/>rn<TAB>Broken heel

TIP Use this function for sending encrypted data.

Encr_EncryptNewDES

Syntax Encr_EncryptNewDES(switches ; text)

Encrypts text using a DES algorithm and the current crypt key. Specify a key first with the function Encr_SetCryptKey.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to encrypt

Returned result

the encrypted text

Special considerations

- Rijndael AES is a more secure algorithm than NewDES. See the function Encr_EncryptRijndaelAES.
- Be sure to remember the key (case sensitive!): without it you can not retrieve the original text.
Use Encr_Code to encrypt without the need for a script.
- The result field should be a text field. If you encrypt into a date or number field it won't work as FileMaker wants to interpret is as a (date) number.

Compatibility with Troi Coding Plug-in:
For backward compatibility, passwords are still Mac ASCII encoded except for chars not in the Mac ASCII set, these chars are now UTF8 encoded before the key is derived. For example:

"japan_ "	becomes "japan_0xE698BEE7A4BA" as password
"españa"	becomes "españa" as password

Text is converted to the FileMaker Pro 6 character set. For other characters the UNICODE value is converted to a numeral reference. This ensures that fields with data from older FileMaker 6 databases will have the same encryption. the numeral references look like: À which is the greek small letter pi.

Example usage

```
Set Field [ gErrorCode, Encr_SetCryptKey(  "-Unused" ; "mySecret" )]
If [gErrorCode = 0]
  Set Field [ result, Encr_EncryptNewDES(  "-Unused" ; "Hello World" )]
  Set Field [ gErrorCode, Encr_SetCryptKey( "-Unused" ; "different Key" )]
End If
```

gives this result: "l’ùé—JtO<=! Û¡ \}0Óÿ„]˘¿Cºdè ≈˘"

Example 2

In a database you have defined a text field named "patientData" which contains illness data. Then define a calculation field:

```
encryptedDataCalc  calculation  Unstored  = Encr_Encrypt(  "-Unused" ; patientData )]
```

this field will contain the encrypted text.

TIP Use the Encr_EncodeSafeAscii function for sending data safely over internet.

Encr_EncryptRijndaelAES

Syntax Encr_EncryptRijndaelAES(switches ; password ; dataToEncrypt)

Encrypts text using the Rijndael AES algorithm and the password.

Parameters

switches	modifies the behavior of the function
password	the password to use
dataToEncrypt	the text (or container data) to encrypt

Switches can be one of:

-KeySize=256	(default) create a key for AES-256 encryption
-KeySize=128	create a key for AES-128 encryption

You can add one or more of these switches to retrieve extra information:

-AddIntializationVectorInfo	add the used Initialization Vector at the end of the result (need not be kept secret)
-AddSaltInfo	add the used Salt at the end of the result (need not be kept secret)
-AddKeyInfo	add the derived Key (derived from the password) at the end of the result (keep secret!)

Other switches are not (yet) possible.

Returned result

the encrypted text or an error code.

Possible error codes are:
$$-4244 no password was given

Special considerations

- Be sure to remember the password (case sensitive!): without it you can not retrieve the original data.
- It's good practice to use a password that is at least 8 characters long. You can use higher Unicode characters!
- Don't store the password.
- Use a global for the password field.
- The encrypted text is different every time you encrypt the same text. This is not a bug, but a security feature!

Technical details:

By default (or if you use the switch -KeySize=256) the text is encrypted using AES-256 bit CBC with a 32 byte key and 16 byte IV (derived via PBKDF2) and 20 byte salt. Padding according to PKCS7. Result is Base64 encoded.

If you use the switch -KeySize=128 the text is encrypted using AES-128 bit CBC with a 16 byte key and IV (derived via PBKDF2) and 20 byte salt. Padding according to PKCS7. Result is Base64 encoded.

More technical details can be found at the beginning of the user guide.

About Unicode and Passwords:
Passwords are always UTF8 encoded before the key is derived. This means that all Unicode characters can be used for the password.
For example:

"japan_ "	becomes "japan_0xE698BEE7A4BA" as password
"españa"	becomes "espa0xC3B1a" as password

Text is also UTF8 encoded before encryption.

Containers:
- You can also encrypt any type of container field, even containers that store a reference only. Note that for those containers only the reference is encrypted, not the original. This applies for all reference pictures and QuickTime movies.

Container data consists of several streams. Each stream is converted to base64 and this text is then encrypted. The text is formatted like this:

Encr_EncryptRijndaelAES

<TROI_BINARY_CONTAINER10><number of streams>
<- ->
<length stream1><stream1 data>
<- ->
<length stream2><stream2 data>
<- ->
<length stream3><stream3 data>
...
</TROI_BINARY_CONTAINER10>

Example usage

Encr_EncryptRijndaelAES("-Unused" ; "mypassword" ; "mySecretTexts")

This will give this result (or similar, as the encrypted text is different every time):

<TROI_AES_STD_ENCR10>
NVFJPSV9fX19fX19fX19fbpsts4SthcI/85T5dcjEv7IsuDGy72Z/t4bfFUyOY7A2ITa3jzEx
wyy+kHnWsgo/IJ1d7BZeRWA6Wbtzn8/xyAgm47SuJ167SJMLb5k/Kl11dKFuaQ==
</TROI_AES_STD_ENCR10>

Example 2

In a database you have defined a text field named "patientData" which contains illness data. Then define a calculation field:

encryptedDataCalc calculation Unstored = Encr_EncryptRijndaelAES("-Unused" ; gPasswordField ; patientData)

the calculation field will contain the encrypted text.

Example 3

Set Field [secretField,
Encr_EncryptRijndaelAES("-AddSaltInfo" ; gEncryptionPassword ; textField)]

this will result in:

<TROI_AES_STD_ENCR10>
NVFJPSV9fX19fX19fX19fbkO656mTvKWiWbKQqul7R5tZd7+aQ3h0QaLQOO6EUtFjxDLRxNQp
rwFN1JhuE5SNPaSBWbCrteX7uPmqKpdyFrmcGwqX7CjZ5cE/ISIwD6LWh3hguv1JObZqj7+n
fWhvu4AflFM765T8hlg6BbeHjI2oUwGz
</TROI_AES_STD_ENCR10>

<TROI_SALT>43bae7a993bca5a259b290aae97b479b5977bf9a</TROI_SALT>

The last part contains the so called Salt, which was used to change the encryption result. NOTE: Normally it is not necessary to know about Salt, IV's and derived Keys to use it. If you want to decrypt the data on a non-FileMaker system it might be useful.

Encr_GetPasswordFromKeychain

Syntax Encr_GetPasswordFromKeychain(switches ; account { ; yourID })

Gets a password from the keychain (for this account and/or yourID).

Parameters

switches	not used, reserved for future use. Leave blank or put "-Unused"
account	the name of the account (or user) that has been used when saving this password
yourID	(optional) the extra ID that was used when saving this password

Returned result

the saved password or an error code.

Possible error codes are:

$$-25300	the password could not be found in the keychain
$$-50	Parameter error

Other error codes can be returned.

Special considerations

The password is safely stored in the keychain and it can be retrieved from the keychain with this function without the user needing to enter the (keychain) password. The keychain is unlocked when the user logs in to the operating system.

If you specify an account and/or yourID combination for which no password exists, the plug-in returns error code $$ -25300.

Example usage

Set Variable[$Password ; TrFile_GetPasswordFromKeychain("-Unused" ; "John Deere")]

This will get the password for the user "John Deere" from the keychain, and the result will be for example "secret".

Example 2

Set Variable[$Password ; TrFile_GetPasswordFromKeychain("-Unused" ; "Sales" ; "Invoices|Notes|REC1001")]

This will get the password from the keychain which was previously stored with the Encr_SavePasswordToKeychain function and the account parameter "Sales" and the yourID parameter "Invoices|Notes|REC1001".
You can now use this returned password to decrypt text in a field, for example with the Encr_DecryptRijndaelAES function.

Encr_MakeDigest

Syntax Encr_MakeDigest(switches ; text)

Generates a MD5 or SHA1 digest.

Parameters

switches	determines the behaviour of the function
text	the text to calculate the digest of

Switches can be one of this:

-md5	use the MD5 algorithm
-sha1	use the SHA-1 algorithm

You can also add one or more of the switches below:

-hex	(default) output as a hex dump. This is the default for a "normal" digest as opposed to a digital signature.
-colons	add colons between the result
-Encoding=UTF8	this will encode higher Unicode to UTF8 first, before calculating the digest. This is useful for for example Russian or Chinese texts.
-DigestCompatibleWithv30	generate the (incorrect) digests of v3.0, which only differ for digests of text bigger than 32000 characters.

Returned result

the digest, which is a string of bits.
MD5: a digest of 128 bits, formatted as 32 characters
SHA-1: a digest of 160 bits, formatted as 40 characters

The characters are all lower ASCII and therefore safe to send across internet.

Special considerations

What is MD5 and SHA-1?

MD5: MD5 was developed by Prof. Rivest in 1994. Its 128 bit (16 characters) message digest makes it a faster implementation than SHA-1.

SHA-1: The Secure Hash Algorithm (SHA) was developed by NIST and is specified in the Secure Hash Standard (SHS, FIPS 180). SHA-1 produces a 160-bit (20 characters) message digest. This larger digest size makes it stronger against brute force attacks.

Note that MD5 is no longer considered collision-free/unique. If possible use SHA-1. You can find more info on this here: http://www.mscs.dal.ca/~selinger/md5collision/

Please note that we fixed a bug in v3.0.1 which was introduced in v3.0: when creating a MD5 digest an incorrect digest would be returned for texts bigger than 32000 characters. We have added a switch "-DigestsCompatibleWithv30" so you can generate the (incorrect) digests of v3.0 if needed.

Example usage

```
Encr_MakeDigest( "-md5" ;
                 "Here is a sample text that you can see the digest of." )
```

gives this result: "937ddb8fcd1c7d947aa3bb66789e82e8"
If you add the "-colons " switch, the result is:
"93:7d:db:8f:cd:1c:7d:94:7a:a3:bb:66:78:9e:82:e8"
If you use the "-sha1" as switch, the result is:
"0e987e2893ba31b7b724d53991bf7b3d6bdabb75"
If you use "-sha1 -colons " as switches, the result is:
"0e:98:7e:28:93:ba:31:b7:b7:24:d5:39:91:bf:7b:3d:6b:da:bb:75"

Encr_MakeDigest

Example 2

You can use this function to check if the (meaning) of a text was not changed, by adding the signature to the message.

Send Message[message & "¶MD5 Digest=" & Encr_MakeDigest("-md5" ; message)]

At the receiving end you need these fields:
signaturePos = Position(messageReceived, "¶MD5 Digest=", 1,1)
messageClean = Left(messageReceived, signaturePos)
signatureReceived = Middle(messageReceived, signaturePos + 12, Length(messageReceived))
messageOK = Encr_MakeDigest("-md5" ; messageClean) = signatureReceived

Encr_NumToBinary

Syntax Encr_NumToBinary(switches ; number)

Converts a number to its binary representation.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
number	the number that needs to be converted to a binary.

Returned result

The number in binary notation.

Special considerations

The maximum number to be converted = 4294967295

Example usage

Set Field [result, Encr_NumToBinary("-Unused" ; 2)] will return as result "10"

Set Field [result, Encr_NumToBinary("-Unused" ; 18)] will return as result "10010"

Example 2

This example uses a negative number:

Set Field [result, Encr_NumToBinary(-2)] will return as result "11111111111111111111111111111110" which is the ones complement of 2.

Encr_Rotate13

Syntax Encr_Rotate13(switches ; text)

Very simple coding of text. Shifts the character values by 13 to encrypt text stored in a FileMaker field. The field may be decrypted by using Rotate13 again.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to Rotate

Returned result

the text that was rotated.

Special considerations

Use this only as a simple way to make reading difficult.

Example usage

Set Field [result, Encr_Rotate13("-Unused" ; "Hello World")]

gives this result: "Uryyb Jbeyq"

Example 2

Set Field [result, Encr_Rotate13("-Unused" ; "Uryyb Jbeyq")]

gives this result: "Hello World"

Encr_SavePasswordToKeychain

Syntax Encr_SavePasswordToKeychain(switches ; password ; account { ; yourID })

Saves a password into the keychain (for this account and/or yourID).

Parameters

switches	modifies the behavior of the function
password	the password to save
account	the name of the account (or user) associated with this password
yourID	(optional) an extra ID for this password, store for example the solution name here

Switches can be left empty or be:

-OverwriteExisting	overwrite an existing password (with the same account and yourID).

Other switches are not (yet) possible.

Returned result

The returned result is an error code. An error always starts with 2 dollars, followed by the error code. You should always check for errors. Returned error codes can be:

0	no error	The password was saved in the keychain
$$-25299	the password	already exists (for this account and yourID combination)

Other error codes can be returned.

Special considerations

The password is safely stored in the keychain and it can be later retrieved from the keychain without the user needing to enter the (keychain) password. The keychain is unlocked when the user logs in to the operating system.
Be careful when using the -OverwriteExisting switch, after overwriting the previous password can no longer be retrieved.

Example usage

Set Variable[$ErrorCode ; TrFile_SavePasswordToKeychain("-Unused" ; "secret"; "John Deere")]

This will save the password for the user "John Deere" into the keychain.

Example 2

Set Variable[$ErrorCode ; TrFile_SavePasswordToKeychain("-Unused" ; "secret234G"; "Sales" ; "Invoices|Notes|REC1001")]

This will store the password "secret234G" into the keychain for the account "Sales". The yourID parameter adds extra info which helps you distinguish between different passwords for the same account. Here the name of the database, the field Notes and even the recordID is stored. This shows the possibility of a very fine grained approach of giving access to a field on a per record basis.
You can later retrieve the password with this exact combination of account and yourID .

Note that this may be a too detailed approach, you can of course also save a password on a per database level (or even on a solution level). In this case the yourID parameter might be "Invoices" (or "MySolution").

Encr_SetCryptKey

Syntax Encr_SetCryptKey(switches ; the_key)

Specify which key is used to encrypt and decrypt a text.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
the_key	the key is used to encrypt and decrypt a text.

Use this before you use the function "Encr_EncryptNewDES" or "Encr_DecryptNewDES". The key has to be at least 6 characters long and is case sensitive.

Returned result

0 if the key was set succesfully.

Special considerations

This is an obsolete function. Please use the more secure AES functions.

Example usage

```
Set Field [ gErrorCode, Encr_SetCryptKey( "-Unused" ; "mySecret" )]
If [gErrorCode = 0]
  Set Field [ result, Encr_EncryptNewDES( "-Unused" ; "Hello World" )]
  Set Field [ gErrorCode, Encr_SetCryptKey( "-Unused" ; "different Key" )]
End If
```

gives this result: "l’ùé—JtO<=! Û¡ \}0Óÿ„]˘¿Cºdè ≈˘"

Note that after the encryption the key is set to a different one, to prevent subsequent use of it.

Encr_TextSignature

Syntax Encr_TextSignature(switches ; text)

Generates a signature of the characters that you can see. This means that only characters a-z, A-Z and 0-9 are used to generate the signature. So adding non-printing characters like spaces and returns doesn't change the signature.

Parameters

switches	reserved for future use, leave empty or set to "-Unused"
text	the text to calculate the signature for

Returned result

Signature: a string of 24 characters.

Special considerations

See also the Encr_MakeDigest function for a more robust check if text is the same.

The characters in the result are all lower ASCII and are therefore safe to send across internet.

Compatibility with Troi Coding Plug-in:
Text is converted to the FileMaker Pro 6 character set. For other characters the UNICODE value is converted. This ensures that fields with data from older FileMaker 6 databases will have the same TextSignature.

Example usage

```
Set Field [ result, Encr_TextSignature( "-Unused" ;
                    "Here is a sample text that you can see the signature of." )]
```

gives this result: "Cqd5yentvR5TN9bYSHG2MKdZ"

Example 2

You can use this function to check if the (meaning) of a text was not changed, by adding the signature to the message.

```
Send Message[ message & "¶Signature=" & Encr_TextSignature( "-Unused" ; message )]
```

At the receiving end you need these fields:

```
signaturePos        = Position(messageReceived, "¶Signature=", 1,1)
messageClean        = Left(messageReceived,  signaturePos)
signatureReceived   = Middle(messageReceived,  signaturePos+ 12, Length(messageReceived))
messageOK           = Encr_TextSignature( "-Unused" ; messageClean ) = signatureReceived
```

Encr_Version

Syntax Encr_Version(switches)

Use this function to see which version of the plug-in is loaded.
Note: This function is also used to register the plug-in.

Parameters

switches determines the behavior of the function

switches can be one of this:

-GetVersionString	the version string is returned (default)
-GetVersionNumber	returns the version number of the plug-in
-GetPluginInstallPath	returns the path where the plug-in is installed
-ShowFlashDialog	shows the Flash Dialog of the plug-in (returns 0)
-GetRegistrationState	get the registration state of the plug-in: 0 = not registered ; 1 = registered
-UnregisterPlugin	sets the registration state of the plug-in to unregistered

If you leave the parameter empty the version string is returned.

Returned result

The function returns ? if this plug-in is not loaded. If the plug-in is loaded the result depends on the input parameter. It is either a:

VersionString:
If you asked for the version string it will return for example "Troi Encryptor Plug-in 3.0"

VersionNumber:
If you asked for the version number it returns the version number of the plug-in x 1000. For example version 2.5 will return number 2500.

ShowFlashDialogResult:
This will show the flash dialog and then return the error code 0.

Special considerations

Important: always use this function to determine if the plug-in is loaded. If the plug-in is not loaded use of external functions may result in data loss, as FileMaker will return an empty field to any external function that is not loaded.

Example usage

We assume that a calculation number field cVersion is defined like this:

```
cVersion = Encr_Version
```

This will evaluate to "Troi Encryptor Plug-in <version number>". This currently returns "Troi Encryptor Plug-in 3.5".

Example 2

Encr_Version("-GetVersionNumber") will return 2600 for version 2.6.
Encr_Version("-GetVersionNumber") will return 2510 for version 2.5.1
Encr_Version("-GetVersionNumber") will return 3000 for version 3.0

So for example to use a feature introduced with version 2.0 test if the result is equal or greater than 2000.

Encr_VersionAutoUpdate

Syntax Encr_VersionAutoUpdate

Use this function to see which version of the plug-in is loaded, formatted for FileMaker Server's AutoUpdate function. Returns 8 digit number to represent an AutoUpdate version.

Parameters

none

Returned result

The function returns ? if this plug-in is not loaded. If the plug-in is loaded the result is a version number, it is returned in the format aabbccdd where every letter represents a digit of the level, so versions can be easily compared.

Special considerations

The Encr_VersionAutoUpdate function is part of a standard for FileMaker plug-ins of third party vendors of plug-ins. The version number can be easily compared, when using the Autoupdate functionality of FileMaker Server.

Example usage

Encr_VersionAutoUpdate will return 02050000 for version 2.5
Encr_VersionAutoUpdate will return 02060203 for version 2.6.2.3

So for example to use a feature introduced with version 2.6 test if the result is equal or greater than 02060000.