A web server extension for M/Caché/IRIS and YottaDB

mg_web

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Contents

1 Introduction

mg_web provides a high-performance minimalistic interface between three popular web servers (Microsoft IIS, Apache and Nginx) and M-like DB Servers (YottaDB, InterSystems IRIS and Caché).

HTTP requests passed to the DB Server via **mg_web** are processed by a simple function of the form:

```
Response = DBServerFunction(CGI, Content, System)
```

Where ***CGI*** represents an array of CGI Environment Variables, ***Content*** represents the request payload and ***System*** is reserved for **mg_web** use.

A simple 'Hello World' function would look something like the following pseudo-code:

```
DBServerFunction(CGI, Content, System)
{
      // Create HTTP response headers
      Response = ”HTTP/1.1 200 OK” + crlf
      Response = Response + ”Content-type: text/html” + crlf
      Response = Response + crlf
      //
      // Add the HTML content
      Response = Response + ”<html>" + crlf
      Response = Response + ”<head><title>” + crlf
      Response = Response + ”Hello World” + crlf
      Response = Response + ”</title></head>” + crlf
      Response = Response + ”<h1>Hello World</h1>” + crlf
      return Response
}
```

In production, the above function would, of course, be crafted in the scripting language provided by the DB Server.

2 Web Server Components

In this section we discuss the process for building and configuring the **mg_web** component for all supported web servers.

2.1 mg_web for Microsoft IIS

mg_web for IIS is implemented as an ***IIS Native Module***.

2.1.1 Building from source

It is assumed that you have Visual C++ installed.

Copy the contents of **/src/** and **/src/iis/** to a directory of your choice. You should now have the following files in that directory.

```
Makefile.win
mg_web.c
mg_webstatus.c
mg_webstatus.h
mg_webtls.c
mg_webtls.h
mg_websocket.c
mg_websocket.h
mg_web.h
mg_websys.h
mg_web_iis.cpp
```

If TLS functionality is required, edit the following line in the **mg_websys.h** file:

```
#define DBX_WITH_TLS            0
```

Change the value of this symbol to 1:

```
#define DBX_WITH_TLS            1
```

Save **mg_websys.h**

Also, check (and edit if necessary) the location of the OpenSSL C header files in the **Makefile.win** file.

```
# Headers for OpenSSL
TLS=/openssl/include
```

- Hint: ***Under*** the location specified in **TLS** you should see file **/openssl/rsa.h**

To build **mg_web** for IIS (**mg_web_iis.dll):**

```
nmake -f Makefile.win
```

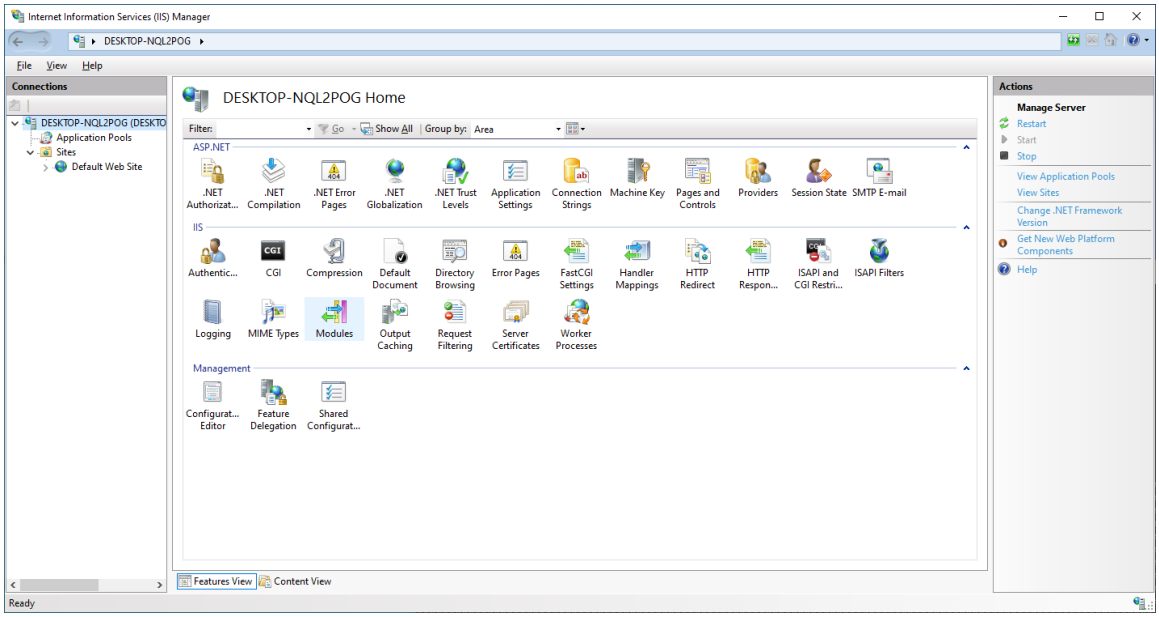
The following command will simply copy the module (**mg_web_iis.dll**) to the **c:\inetpub\mgweb** directory. You will need to create this directory first.

```
nmake -f Makefile.win install
```

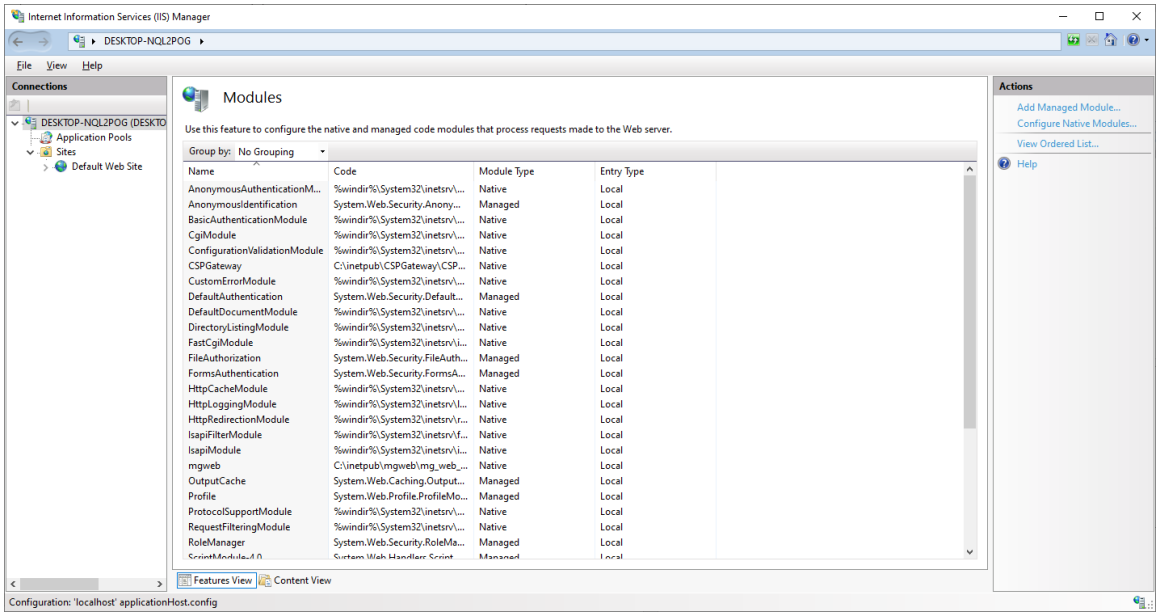
2.1.2 Web Server configuration

The **mg_web** module must be registered as an IIS ***'Native Module'***.

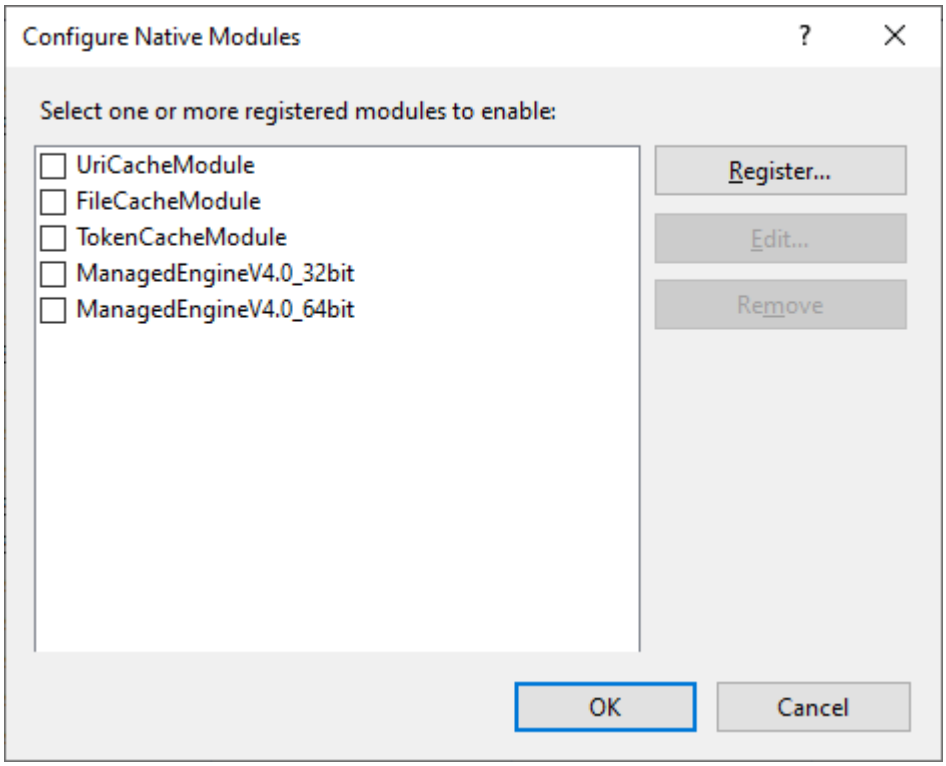
Open the ***IIS Control Panel*** with focus on the root of the IIS installation in the left-hand panel. Open the ***Modules*** Control Panel.



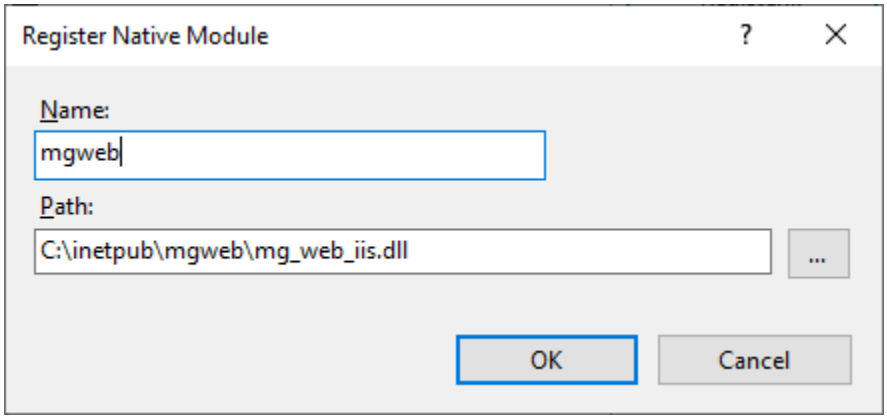
The ***Modules*** Control Panel. Choose the '***Configure Native Modules***' option in the right-hand panel.



The '***Configure Native Modules***' Control Panel. Note the ***Register*** button.

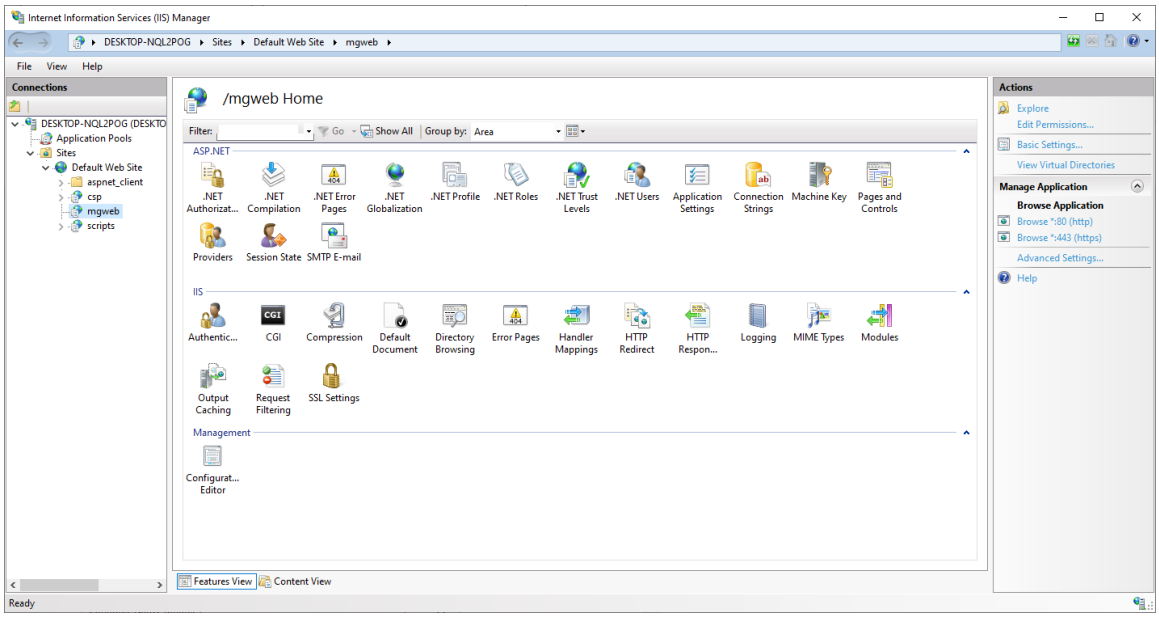


Press the ***Register*** button to add the **mg_web** module for IIS (**mg_web_iis**).

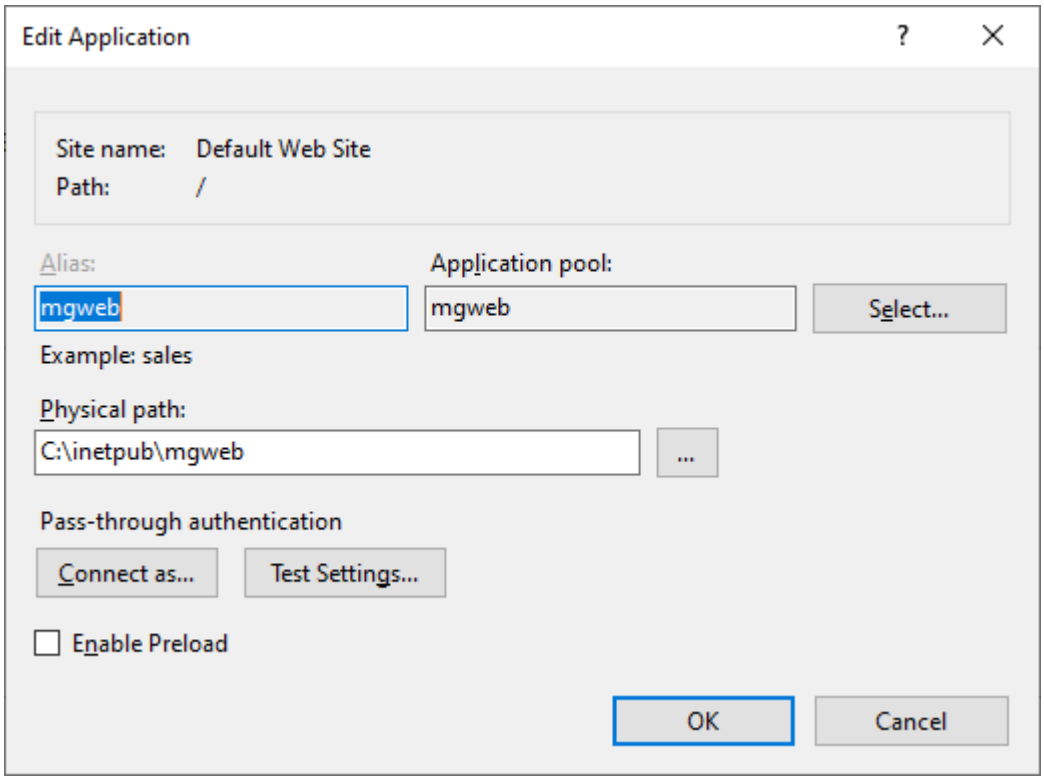


You can assign a name of your choice to the registration – **mgweb** is used in the above example. When the **mg_web** module is registered it can be associated with a particular (virtual) application path and/or specific file types.

To create a new virtual path for applications, right-click on the appropriate web site in the left-hand panel and choose the '***Add Application***' option. In the example below, virtual application path ***mgweb*** was added beneath the ***Default Web Site***.

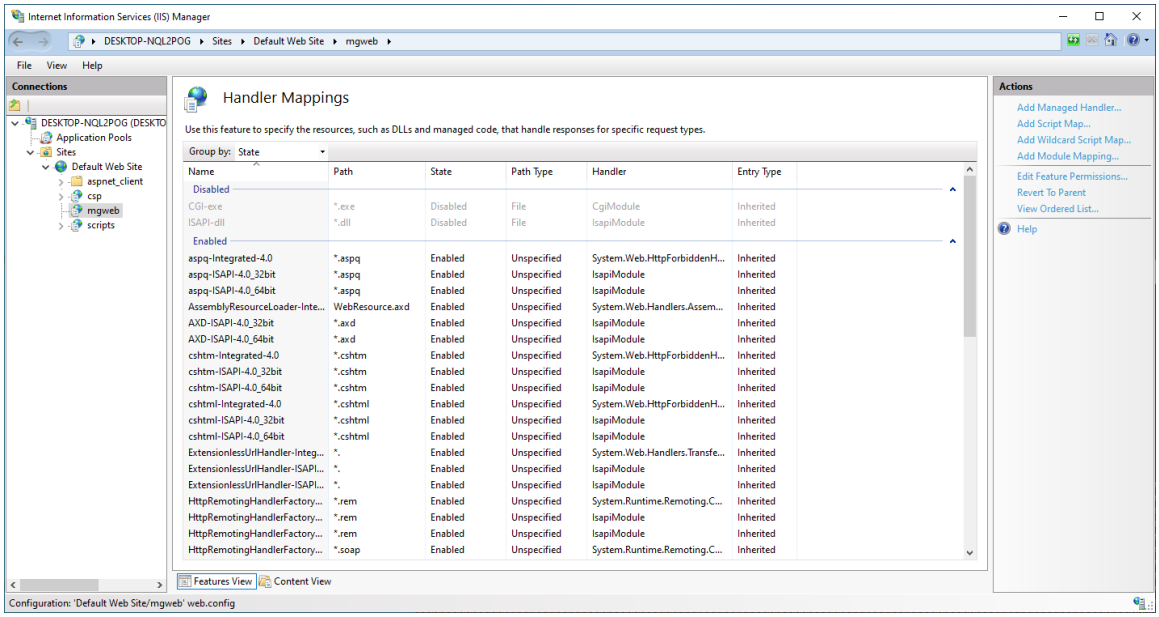


The properties for the virtual application path are shown in the following example. You have to assign an alias (e.g. ***mgweb***) and choose an ***application pool*** to process **mg_web** requests (again named ***mgweb*** in this example).

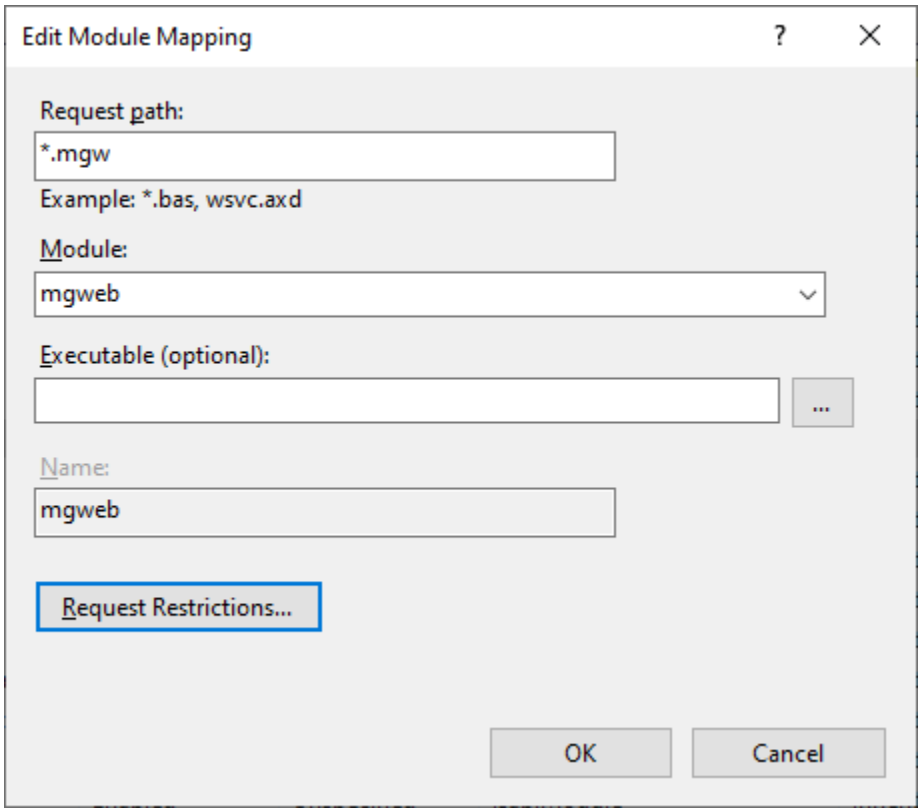


Having created a virtual application path for hosting **mg_web** requests, the next task is to map specific file types to the **mg_web** extension. In the following example, we will configure IIS to pass all requests for files of type ***.mgw*** to **mg_web** for processing.

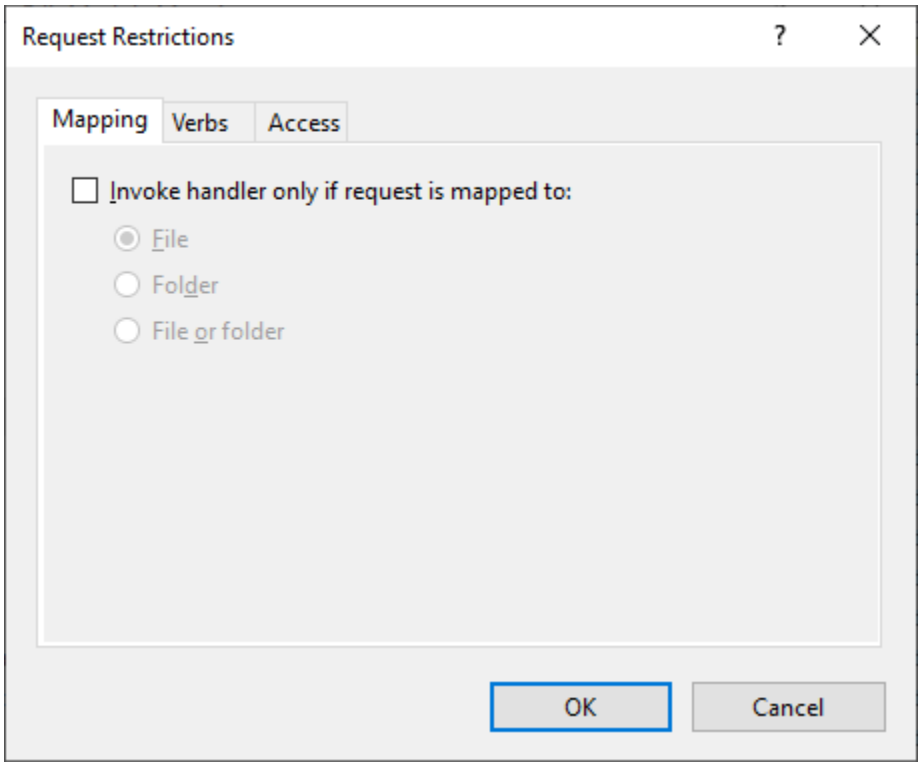
With the focus on the virtual application path previously created (***mgweb***) in the left-hand panel, open the '***Handler Mappings***' Control Panel and choose '***Add Module Mapping***' in the right-hand panel.



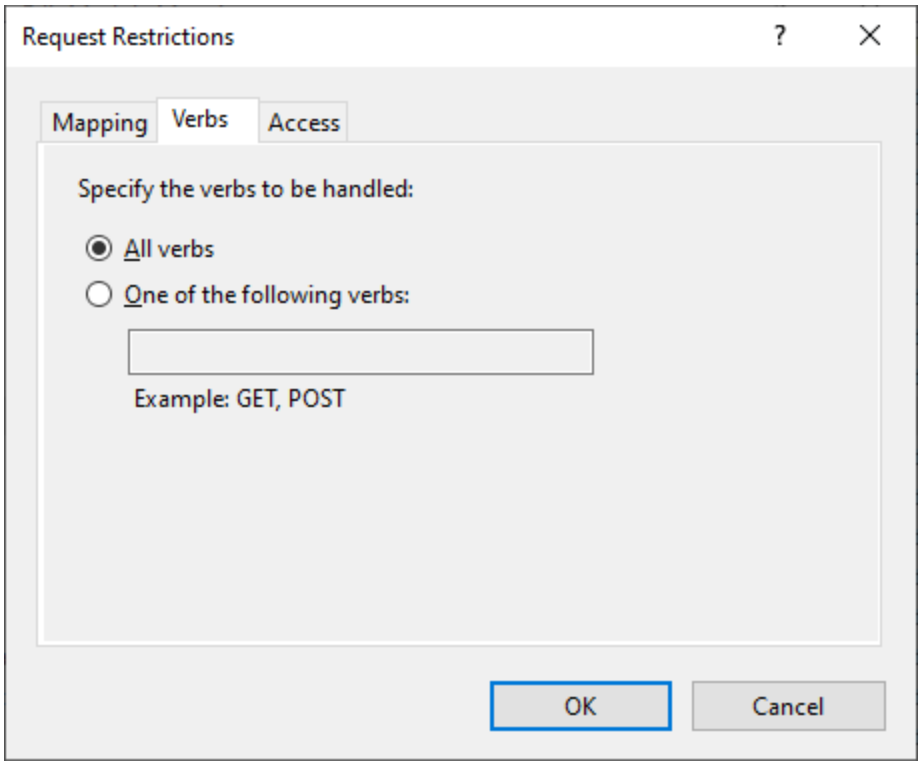
The module name is **mgweb** and we wish to process all files of type ***.mgw*** with **mg_web** This is defined in the ***Request Path*** text box. You can name the Module Mapping with a name of your choice – **mgweb** is used in the example below.



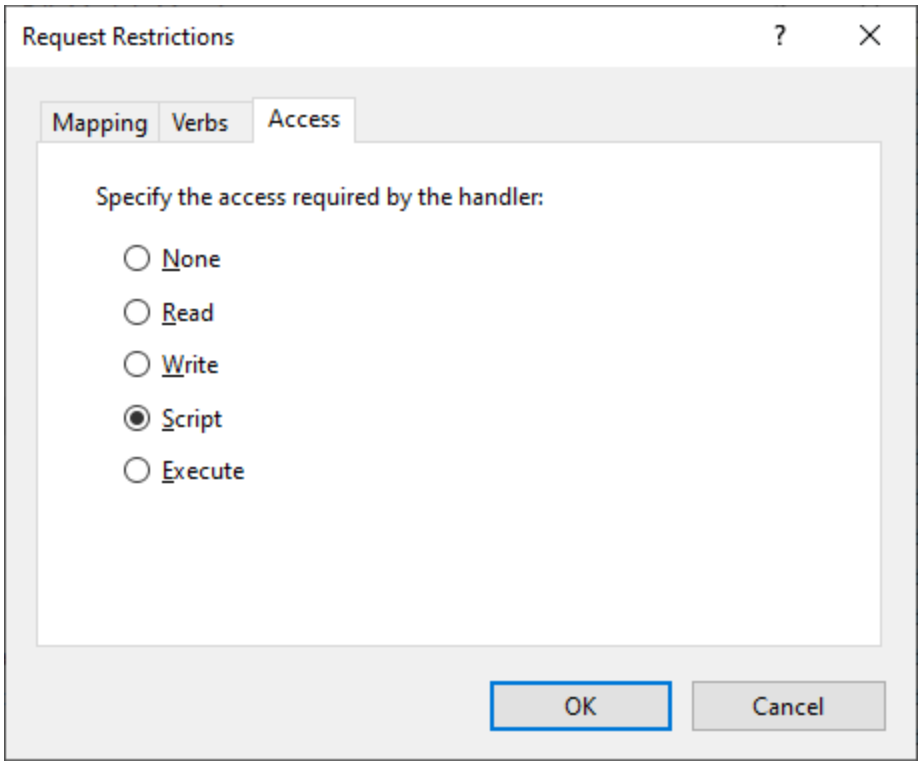
Press the ***Request Restrictions*** button and make sure that '***Invoke handler only if request is mapped to'*** is unchecked. Web resources served my **mg_web** do not physically exist on the web server.



Check that all verbs (i.e. HTTP methods) can be served by **mg_web**.



Check that '***Script'*** is selected in the ***Access*** panel.



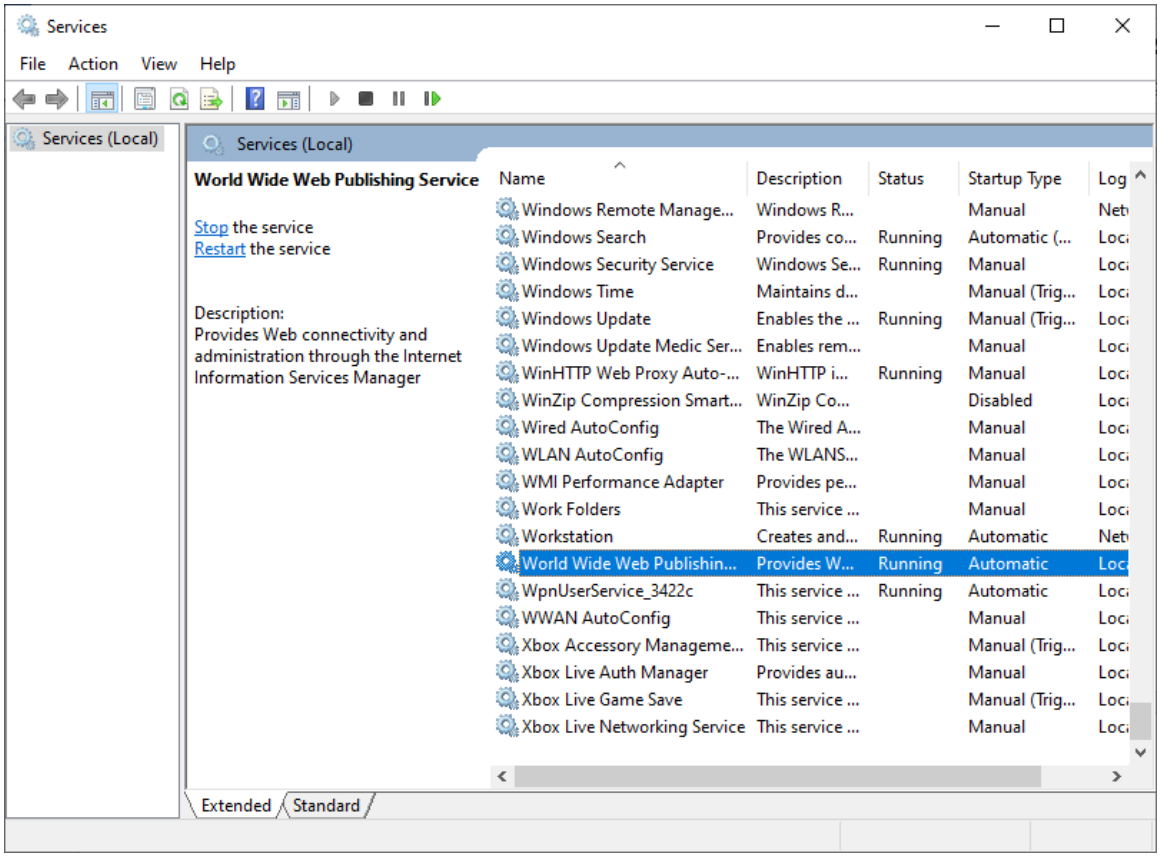
The **mg_web** configuration and log files (**mgweb.conf** and **mgweb.log**) will be expected to exist in the same directory as that hosting the **mg_web** module. The IIS worker processes must have permission to access these files. Create these files and use the following commands to grant full access to IIS.

```
cacls C:\inetpub\mgweb\mgweb.conf /E /G IIS_IUSRS:F
cacls C:\inetpub\mgweb\mgweb.log /E /G IIS_IUSRS:F
```

Final contents of the **mg_web** directory (**C:\inetpub\mgweb**):

```
mg_web_iis.dll
mgweb.conf
mgweb.log
```


Finally, restart IIS from the main Windows Services Control Panel (***World Wide Web Publishing Service***).



IIS will now pass all requests for files of type ***.mgw*** in path ***mgweb*** to **mg_web** for processing. For example:

http://localhost/mgweb/myfile.mgw

2.2 mg_web for Apache

mg_web for Apache is implemented as an ***Apache Extension Module***.

2.2.1 Building from source

It is assumed that you have a suitable C/C++ compiler installed. For example, GCC for Linux and Visual C++ for Windows.

Copy the contents of **/src/** and **/src/apache/** to a directory of your choice. You should now have the following files in that directory.

```
mg_web.c
mg_websocket.c
mg_websocket.h
mg_webstatus.c
mg_webstatus.h
mg_webtls.c
mg_webtls.h
mg_web.h
mg_websys.h
mg_web_apache.c
```

If TLS functionality is required, edit the following line in the **mg_websys.h** file:

```
#define DBX_WITH_TLS            0
```

Change the value of this symbol to 1:

```
#define DBX_WITH_TLS            1
```

Save **mg_websys.h**

To build **mg_web** for Apache (**mg_web_apache.so** or **mg_web_apache.dll):**

Using the Apache extension compiler tool - ***APache eXtenSion tool*** (**apxs**):

```
apxs -a -i -c mg_web_apache.c mg_web.c mg_webstatus.c \
              mg_webtls.c mg_websocket.c
```

This will compile the **mg_web** extension for Apache, install the module in the Apache ***modules*** directory, and add the following line to the Apache configuration file (***httpd.conf***):

```
LoadModule mg_web_module       modules/mg_web_apache.so
```

2.2.2 Web Server configuration

Check that the **mg_web** module is registered in the Apache configuration file (***httpd.conf***).

```
LoadModule mg_web_module       modules/mg_web_apache.so
```

Add the full path of the **mg_web** configuration file (***mgweb.conf***) and log file (***mgweb.log***) to the Apache configuration file (***httpd.conf***). For example:

```
MGWEBConfigFile c:/Apache2433/conf/mgweb.conf
MGWEBLogFile c:/Apache2433/logs/mgweb.log
```

Create a location through which **mg_web** requests will be processed. For example, **mg_web** can be active for a whole path (***mgweb*** in this example):

```
<Location /mgweb>
    MGWEB On
</Location>
```

Alternatively, **mg_web** can be set to configure only specific file types.

```
<Location /mgweb>
    MGWEBFileTypes .mgw .mgweb
</Location>
```

Finally, restart Apache with the new configuration and the web server will now (for example) pass all requests for files of type ***.mgw*** in path ***mgweb*** to **mg_web** for processing.

http://apachehost/mgweb/myfile.mgw

2.3 mg_web for Nginx

mg_web for Nginx is implemented as a ***Nginx Addon Module***. Unlike the other web server solutions where **mg_web** is created as a dynamically loaded library, **mg_web** functionality is built directly into the Nginx core executable.

2.3.1 Building from source

It is assumed that you have a suitable C/C++ compiler installed. For example, GCC for Linux and Visual C++ for Windows. Additionally, on Windows Nginx is built using the MSYS toolkit and that should be installed. The Nginx instructions for building this web server under Windows can be found here.

http://nginx.org/en/docs/howto_build_on_win32.html

Copy the contents of **/src/** and **/src/nginx/** to a directory of your choice For example, /**opt/mgweb/**. You should now have the following files in that directory.

```
config
mg_web.c
mg_websocket.c
mg_websocket.h
mg_webstatus.c
mg_webstatus.h
mg_webtls.c
mg_webtls.h
mg_web.h
mg_websys.h
mg_web_nginx.c
```

If TLS functionality is required, edit the following line in the **mg_websys.h** file:

```
#define DBX_WITH_TLS            0
```

Change the value of this symbol to 1:

```
#define DBX_WITH_TLS            1
```

Save **mg_websys.h**

To build **mg_web** into Nginx:

For UNIX systems, add the **mg_web** module directory to the pre-build configuration step. For example:

```
./configure --prefix=/opt/nginx1180 \
            --with-threads \
            --add-module=/opt/mgweb
```

Note that the '--with-threads' option must be included if **mg_web** is to take advantage of Nginx thread pooling (recommended).

Having run the configuration step, the Nginx web server with **mg_web** included can be built using:

```
make
make install
```

For Windows systems, using the MSYS environment, the process is very similar. Add the **mg_web** module directory to the pre-build configuration step. For example:

```
auto/configure --with-cc=cl --builddir=objs --prefix= \
--conf-path=conf/nginx.conf --pid-path=logs/nginx.pid \
--http-log-path=logs/access.log                --error-log-
path=logs/error.log \
--sbin-path=nginx.exe \
--http-client-body-temp-path=temp/client_body_temp \
--http-proxy-temp-path=temp/proxy_temp \
--http-fastcgi-temp-path=temp/fastcgi_temp \
--with-cc-opt=-DFD_SETSIZE=1024 \
--without-http_rewrite_module \
--without-http_gzip_module \
--with-select_module \
--add-module=/opt/mgweb
```

Having run the configuration step, the Nginx web server with **mg_web** can be built using:

```
nmake -f objs/Makefile
```

2.3.2 Web Server configuration

Add the full path of the **mg_web** configuration file (**mgweb.conf**) and log file (**mgweb.log**) to the Nginx configuration file (***nginx.conf***). These directives should be added to the ***http*** section of ***nginx.conf***. For example:

```
MGWEBConfigFile /opt/nginx1180/conf/mgweb.conf;
MGWEBLogFile /opt/nginx1180/logs/mgweb.log;
```

Create a location through which **mg_web** requests will be processed. These directives should be added to the ***server*** section of ***nginx.conf.*** For example, **mg_web** can be active for a whole path:

```
location /mgweb {
    MGWEB On;
    MGWEBThreadPool default;
}
```

Alternatively, **mg_web** can be set to configure only specific file types.

```
location /mgweb {
    MGWEBFileTypes .mgw .mgweb;
    MGWEBThreadPool default;
}
```

Note that in both cases **mg_web** is configured to use a Nginx thread pool called ***default***.

Finally, restart Nginx with the new configuration and the web server will now (for example) pass all requests for files of type ***.mgw*** in path ***mgweb*** to **mg_web** for processing.

http://nginxhost/mgweb/myfile.mgw

2.4 Working with Security-Enhanced Linux (SELinux)

Security-Enhanced Linux (SELinux) is a security architecture for Linux systems that allows administrators to have more control over who can access system resources such as individual files and the network.

When an SELinux policy is enforced, changes need to be made to the SELinux configuration so that **mg_web** can have access to its configuration and log files. It also requires permission to access the DB Server over the network.

Use the following commands to grant read access to the configuration file **(mgweb.conf**) and read/write access to the log file (**mgweb.log**). The commands shown use the sudo facility in order to run them with system administrator privileges. If you are logged in as 'root' then sudo will not be required.

```
sudo semanage fcontext -a -t httpd_sys_content_t mgweb.conf
sudo semanage fcontext -a -t httpd_log_t mgweb.log
```


These will make the appropriate changes to the SELinux configuration but not the current run-time context. The following commands will reflect the changes in the current context.

```
sudo restorecon -v mgweb.conf
sudo restorecon -v mgweb.log
```

Finally, **mg_web** needs network access to the DB Server.

Grant network access to web server components for the current run-time context:

```
sudo setsebool httpd_can_network_connect 1
```

Make the change permanent:

```
sudo setsebool -P httpd_can_network_connect 1
```

Some older Linux distributions may require the following commands to grant **mg_web** access to the configuration and log files.

To modify permissions for the current run-time context:

```
sudo chcon -R -t httpd_sys_rw_content_t mgweb.log
sudo chcon -R -t httpd_sys_r_content_t mgweb.conf
```

These settings will expire on reboot, so to permanently change the SELinux policy:

```
sudo semanage fcontext -a -t httpd_sys_rw_content_t mgweb.log
sudo semanage fcontext -a -t httpd_sys_r_content_t mgweb.conf
```

Finally, grant **mg_web** network access as shown previously.

3 Installing the DB Superserver

The DB Server components are held in the MGateway *Service Integration Gateway* (**mgsi)** GitHub repository. These components are two DB Server routines (i.e. M routines): **%zmgsi** and **%zmgsis**. In this section we will look at the procedure for installing them.

https://github.com/chrisemunt/mgsi

3.1 Installation for InterSystems Caché or IRIS

Log in to the Manager Namespace (%SYS) and install the **zmgsi** routines held in the **/isc/zmgsi_isc.ro** package (these are found in the **mgsi** GitHub repository).

```
do $system.OBJ.Load("/isc/zmgsi_isc.ro","ck")
```

Change to your development UCI and check the installation:

```
do ^%zmgsi

MGateway Ltd - Service Integration Gateway
Version: 4.5; Revision 37 (9 March 2025)
```

3.2 Installation for YottaDB

Install the two **zmgsi** routines held in the **/yottadb/** directory of the **mgsi** GitHub repository.

The instructions given here assume a standard 'out of the box' installation of **YottaDB** (v3.8) deployed in the following location:

```
/usr/local/lib/yottadb/r138
```

The primary default location for routines:

```
/root/.yottadb/r1.38_x86_64/r
```

Copy all the routines (i.e. all files with an 'm' extension) held in the GitHub **/yottadb** directory to:

```
/root/.yottadb/r1.38_x86_64/r
```

Change directory to the following location and start a **YottaDB** command shell:

```
cd /usr/local/lib/yottadb/r138
./ydb
```

Check the installation:

```
do ^%zmgsi

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Version: 4.5; Revision 37 (9 March 2025)
```

Note that the version of **zmgsi** is successfully displayed.

3.3 Starting the DB Superserver

The default TCP server port on which the DB Superserver (**%zmgsi)** listens is **7041**. If you wish to use an alternative port then modify the following instructions accordingly.

3.3.1 Starting the DB Superserver from the DB command prompt

The DB Superserver can be started from the DB command prompt for both YottaDB and InterSystems DB Servers. This is the easiest way to get the Superserver up and running.

For **YottaDB**, as an alternative to using this method, it is possible to manage DB Superserver processes via the UNIX ***Extended Internet Services Daemon*** (**xinetd**) and this will be discussed in a subsequent section.

- For **InterSystems** DB servers, the DB Superserver should be started in the **%SYS** Namespace.
- For **YottaDB,** be sure to check that the **ydb_routines** environment variable includes the path to the routines that are used to implement your web application.

Start the DB Superserver using the following command:

```
do start^%zmgsi(0)
```

To use a server TCP port other than 7041, specify it in the start-up command (as opposed to using zero to indicate the default port of 7041).

3.3.1.1 Using InterSystems TLS configurations

DB Superserver version 4.4 (and later) can accept secured connections from clients over TLS. This facility is only available with InterSystems DB Servers. To use an

InterSystems TLS ***Server*** configuration, specify this configuration name as the second argument to the DB Superserver **start** function.

```
Do start^%zmgsi(0,"MyInterSystemsTLSServerConfiguration")
```

3.3.2 Managing the DB Superserver using the xinetd daemon

Note that this method can only be used for **YottaDB**.

As an alternative to starting the DB Superserver via the DB command prompt (as described previously) the ***Extended Internet Services Daemon*** (**xinetd**) can be used to manage the DB Superserver. This section describes the **xinetd** configuration.

First create the following launch script (called **zmgsi_ydb** here):

```
/usr/local/lib/yottadb/r138/zmgsi_ydb
```

Content:

```
#!/bin/bash
cd /usr/local/lib/yottadb/r138
export ydb_dir=/root/.yottadb
export ydb_dist=/usr/local/lib/yottadb/r138
export
ydb_routines="/root/.yottadb/r1.38_x86_64/o*(/root/.yottadb/r1.38_x86_6
4/r /root/.yottadb/r) /usr/local/lib/yottadb/r138/libyottadbutil.so"
export ydb_gbldir="/root/.yottadb/r1.38_x86_64/g/yottadb.gld"
$ydb_dist/ydb -r xinetd^%zmgsis
```

Create the **xinetd** script (called **zmgsi_xinetd** here):

```
/etc/xinetd.d/zmgsi_xinetd
```

Content:

```
service zmgsi_xinetd
{
     disable         = no
     type            = UNLISTED
     port            = 7041
     socket_type     = stream
     wait            = no
     user            = root
     server          = /usr/local/lib/yottadb/r138/zmgsi_ydb
}
```

- Note: sample copies of **zmgsi_xinetd** and **zmgsi_ydb** are included in the **/unix** directory of the **mgsi** GitHub repository.

Edit the services file:

```
/etc/services
```

Add the following line to this file:

```
zmgsi_xinetd          7041/tcp                        # ZMGSI
```

Finally restart the **xinetd** service:

```
/etc/init.d/xinetd restart
```

4 General mg_web configuration (mgweb.conf)

The **mg_web** configuration file (***mgweb.conf***) contains the instructions for connecting to each DB Server and which web paths should be routed to each DB Server.

The following configuration parameters are specified at the global level and apply to the whole **mg_web** installation.

Timeouts

```
timeout 30
```

This is the amount of time (in seconds) that **mg_web** will wait for a response to be returned by the DB Server.

The Event Log

You can control the amount of information written to the Event Log:

```
log_level <directives>
```

Where the ***directives*** may include:

- **e** Log error conditions.
  f Log the basic framing information for the request and response buffers.
- **t** Log the contents of the request and response data buffers transmitted between **mg_web** and the DB Server.
- **w** Log the final response buffers dispatched from **mg_web** to the Web Server, showing the chunked transfer protocol where applicable.
- **s** Log the outcome of TLS function calls made when creating TLS-secured connections to the DB Superserver.
- **S** In addition to the information collected for log level ‘s’, record the outcome of each TLS read and write operation (to the DB Superserver).

Example:

```
log_level eftw
```

CGI Environment Variables

You can also define lists of CGI environment variables to be sent to the DB Server with each request. For example, the following directive will instruct **mg_web** to send to the

DB Server all CGI environment variables derived from client HTTP request headers (***HTTP****) and the web server ***Server Software*** with each request.

```
<cgi>
   HTTP*
   SERVER_SOFTWARE
</cgi>
```

Note that, by default, **mg_web** will only send the following CGI environment variables to the DB Server with each request.

```
REQUEST_METHOD
SCRIPT_NAME
QUERY_STRING
```

Chunking

It is also possible to control the level at which HTTP chunked transfer of the response payload will occur. By default, **mg_web** will read approximately 64K of response data from the DB Server before switching on chunking for the response. Up to that point the whole response will be cached in a single buffer and a 'Content-Length' header added. The use of chunked transfer can be completely disabled as follows:

```
chunking off
```

Alternatively, a size threshold can be defined after which chunking will take place. The value for this field can be specified in Bytes, Kilobytes (KB) or Megabytes (MB). For example, to instruct **mg_web** to use chunked transfer for response payloads exceeding 250 Kilobytes:

```
chunking 250KB
```

- Note that if the application on the DB Server returns a 'Content-Length' field, **mg_web** will use it. Take care to ensure that the value supplied is accurate!

Working Buffer Size

By default, **mg_web** will allocate enough internal working buffer space to accommodate the request payload or 128KB, whichever is the greater. This same buffer is used to receive the response payload from the DB Server. While **mg_web** can receive response payloads that exceed the size of the pre-allocated working buffer, the following configuration parameter can be used to set a minimum size for the buffer.

```
request_buffer_size 500KB
```

The above parameter, when added to the global section of the configuration file, will instruct **mg_web** to allocate at least 500KB of working buffer space. You would typically increase the size of this buffer to optimize installations that routinely return more than 128KB of response payload (including HTTP response headers). The effects of such optimizations are particularly significant for configurations that communicate with local DB Servers via their API.

Custom Error Pages

Finally, in the global section of the configuration, it is possible to define custom HTML pages to be returned when errors are encountered by **mg_web**. There are three types of error condition for which it is possible to define a custom response.

DB Server is currently unavailable (i.e. a connectivity problem).
Example:

```
custompage_dbserver_unavailable http://webserver/dbserver_unavailable.html
```

DB Server is currently busy (i.e. capacity of installation exceeded).
Example:

```
custompage_dbserver_busy http://webserver/dbserver_busy.html
```

DB Server is currently disabled (i.e. DB Server is deliberately taken out of service).
Example:

```
custompage_dbserver_disabled http:// webserver/dbserver_disabled.html
```

DB Server does not respond to a request within the timeout period (i.e. HTTP 504 Gateway Timeout).
Example:

```
custompage_dbserver_timeout http:// webserver/dbserver_timeout.html
```

4.1 Defining Servers

The following examples will illustrate how DB Server access should be defined for **mg_web**.

Network based access to InterSystems IRIS (or Caché) listening on TCP port 7041:

```
<server local>
   type IRIS
   host localhost
   tcp_port 7041
   namespace USER
</server>
```

API based access to InterSystems IRIS (or Caché):

```
<server local>
   type Cache
   path /opt/cache20181/mgr
   username _SYSTEM
   password SYS
   namespace USER
</server>
```

Network based access to YottaDB listening on TCP port 7041:

```
<server local>
   type YottaDB
   host localhost
   tcp_port 7041
</server>
```

API based access to YottaDB:

```
<server local>
   type YottaDB
   path /usr/local/lib/yottadb/r138
   <env>
      ydb_dir=/root/.yottadb
      ydb_rel=r1.38_x86_64
      ydb_gbldir=/opt/webapps/yottadb.gld
      ydb_routines=/opt/webapps
      ydb_ci=/usr/local/lib/yottadb/r138/zmgsi.ci
   </env>
</server>
```

The routine interface file (named ***zmgsi.ci*** in the above example) must contain the following line:

```
ifc_zmgsis: ydb_string_t * ifc^%zmgsis(I:ydb_string_t *,
I:ydb_string_t *, I:ydb_string_t *)
```

The DB Server configuration parameters in detail.

type

The type of DB Server. This will be InterSystems **Cache**, **IRIS** or **YottaDB.**

host

Network based connectivity: the network name (or IP address) of the DB Server.

tcp_port

Network based connectivity: the TCP port of the DB Server Superserver.

path

API based connectivity: the path to the local DB Server installation.

username

InterSystems API based connectivity: the username required by the InterSystems '***callin'*** API.

password

InterSystems API based connectivity: the password required by the InterSystems '***callin'*** API.

env

API based connectivity: a list of environment variables that should be set before linking to the DB Server's API.

namespace

InterSystems DB Servers: the target '***Namespace'*** for the web application.

health_check

The period after which offline DB Servers should be re-tried. This parameter is specified in seconds.

connection_retries

This parameter controls the number of connection-retry attempts and the total amount of time to be spent attempting to connect after which the DB Server will be marked offline.

Format:

```
connection_retries number_of_connection_retries/total_time_allowed
```

Example 1:

```
connection_retries 5/30
```

This setting results in a maximum of 5 connection retries over a total period of 30 seconds. The DB Server will be marked offline after 5 unsuccessful attempts to connect or 30 seconds elapse after attempting to connect for the first time (i.e. whichever constraint is reached first).

Example 2:

```
connection_retries 0/30
```

30 seconds will be spent trying to connect to the DB Server, irrespective of the number of retries.

```
connection_retries 7/0
```

7 attempts will be made to connect to the DB Server regardless of how long it takes.

The default behavior is for one attempt to be made at connecting to the DB Server.

max_connections

This parameter limits the number of connections that can be made to the DB Server.

Format:

```
max_connections maximum_number_of_connections
```

Example:

```
max_connections 100
```

This will result in **mg_web** not creating more than 100 connections to the DB Server. When this limit is reached on account of all available connections in the pool being busy, the request will be queued up to the **timeout** value specified in the configuration (or for a maximum of 60 seconds if a **timeout** value is not specified in the configuration).

idle_timeout

This parameter limits the amount of time that a network connection will remain in the pool without receiving any work.

Format:

```
idle_timeout timeout_in_seconds
```

Example:

```
idle_timeout 300
```

This will result in **mg_web** closing-down network connections that have been idle for more than 5 minutes

- Note: To be fully effective, the use of this parameter requires DB Superserver version 4.5; Revision 26 (or later).

tls

The name of the TLS configuration to be used for this DB Server. This name must correspond to a named TLS configuration found in ***mgweb.conf***. TLS secured connectivity between **mg_web** and the DB Server is supported for InterSystems DB Servers.

4.2 Defining Paths

The following examples will illustrate how web paths should be defined for **mg_web**.

The root path (effectively the default mapping):

```
<location />
   function web^%zmgweb
   servers local
</location>
```

Further examples:

```
<location /mgweb/path1>
   function web1^%zmgweb
   servers local1
</location>

<location /mgweb/path2>
   function web2^%zmgweb
   servers local2
</location>
```

A hierarchical system of inheritance for the paths is applied. For Example:

http://webserver/mgweb/path1/file.mgw

This request will be routed to DB Server **local1**

http://webserver/mgweb/path2/file.mgw

This request will be routed to DB Server **local2**

http://webserver/mgweb/path2/abc/file.mgw

This request will be routed to DB Server **local2**

http://webserver/mgweb/file.mgw

This request will be routed to DB server **local**

http://webserver/xyz/file.mgw

This request will be routed to DB server **local** (assuming the web server is configured to pass requests with a path of **/xyz** to **mg_web**).

We now look at the web path configuration parameters in detail.

function

The DB Server function to be invoked for this path. For example:

```
function web^%zmgweb
```

The form of this function is described in more detail in a later section. In brief, web functions should be constructed as follows.

```
web^%zmgweb(%cgi,%content,%system)
   ; process request and generate response
   quit response
```

websocket

The DB Server function to be invoked for this websocket. For example:

```
websocket mywebsocket.mgw websocket^%zmgweb
```

Where:

- `mywebsocket.mgw` is the name of the virtual file mapped to the WebSocket function. This is the name used within the form to invoke the WebSocket.
- `websocket^%zmgweb` is the name of the corresponding function on the DB Server side.

The form of the DB Server function is described in more detail in a later section. In brief, WebSocket functions should be constructed as follows.

```
websocket^%zmgweb(%cgi,%content,%system)
   set %status=$$websocket^%zmgsis(.%sys,0,"")
   ; Read from and Write to the client
   quit %status
```

servers

One or more DB Server can be defined for the path. For example:

```
server dbserver0 dbserver1 dbserver2 etc …
```

4.2.1 Load balancing and Failover

We have already seen that multiple servers can be defined for each path. Additional DB Servers can be used only for the purposes of fail-over (the default) or used for load balancing and failover.

```
load_balancing <on|off> (default is off)
```

For example, to enable load balancing amongst the available servers.

```
load_balancing on
```

With load balancing comes the issue of ***server affinity***, often known as ***sticky sessions***. In other words, once a user has connected to a web application via one particular DB Server, you want them to continue to use that server for the duration of their application session. This can be achieved either via a form/URL variable or via a 'server affinity' cookie.

Server affinity using a variable

```
server_affinity variable:<variable(s)>
```

For example, using a form URL variable called **MyServer**:

```
server_affinity variable:MyServer
```

```
http://webserver/mgweb/path1/file.mgw?MyServer=dbserver2
```

DB Servers are numbered from zero (left to right), so the following equivalent URL could be used:

```
http://webserver/mgweb/path1/file.mgw?MyServer=2
```

The ***server name*** and ***server number*** used is presented to the application code in the **%system** array. For example:

```
%system("server")="dbserver2"
%system("server_no")=2
```

It is possible to specify that multiple variables be used for server affinity. For example:

```
server_affinity variable:MyServer1,MyServer2
```

In this case the DB Server name (or number) can be specified either in form/URL variable ***MyServer1*** or ***MyServer2***.

Server affinity using a cookie

```
server_affinity cookie:<name>
```

For example, using a server affinity cookie called **mgweb_dberver**:

```
server_affinity cookie:mgweb_dbserver
```

If a server affinity cookie is used, **mg_web** will assume responsibility for inserting the appropriate cookie value in the HTTP response headers.

It is possible to specify that both form/URL variables and a cookie be used for server affinity. Examples:

```
server_affinity variable:MyServer cookie:mgweb_dbserver
```

In this case **mg_web** will first look for the specified form/URL variable and then look for the cookie if not found.

```
server_affinity cookie:mgweb_dbserver variable:MyServer
```

In this case **mg_web** will first look for the specified cookie and then look for the form/URL variable if not found.

Finally, load balancing is implemented as simple 'round robin' and in cases where a DB Server becomes unresponsive, the request is failed over to the next DB Server in the list.

4.2.2 Excluding DB Servers from Load balancing and Failover

There may be situations where it is necessary to mark specific DB Servers as being for exclusive use (by a particular application) and not used for the purposes of Load-balancing and Failover. Such DB Servers should be marked with the 'ex' qualifier. For example:

```
server dbserver0 dbserver1 dbserver2:ex
```

DB Server ***dbserver2*** is marked for exclusive use: it can only be used if a Server Affinity Variable specifically addresses it. For example:

http://webserver/mgweb/path1/file.mgw?MyServer=dbserver2

or:

http://webserver/mgweb/path1/file.mgw?MyServer=2

These requests will not be able to failover to any other DB Server in the list. All other requests will be Load-balanced between ***dbserver0*** and ***dbserver1***. For example:

`http://webserver/mgweb/path1/file.mgw`

4.2.3 Managing DB Servers marked as being 'offline'

Once a DB Server is marked as being 'offline', **mg_web** will not attempt to (re)connect to it for the remaining life of the web server run. All DB Server 'offline' status flags are reset when the hosting web server is restarted.

However, if a situation arises where a request for a path fails on account of all associated DB Servers being marked as 'offline', all servers in the set will be automatically marked as being 'online' so that subsequent requests have a chance of succeeding in the event of any of the DB Servers later becoming available.

Also, **mg_web** can be instructed to retry 'offline' DB Servers after a certain period time by specifying a value (in seconds) for the **health_check** parameter. For example:

```
<server local>
   type IRIS
   host localhost
   tcp_port 7041
   namespace USER
   health_check 600
</server>
```

In this example, if server '*local'* is part of a load-balanced (or failover) set and is marked as being 'offline', **mg_web** will attempt to connect it again after 600 seconds (since being marked 'offline') have elapsed.

4.3 Defining TLS configurations

mg_web is capable of connecting to InterSystems DB Servers over TLS secured connections. Of course, this facility is only applicable to network-based connectivity between **mg_web** and the DB Server.

In order to use this functionality, DB Superserver version 4.4 (or later) should be used and started such that it uses a valid server-side TLS configuration. For example:

```
Do start^%zmgsi(7041,"MyTLSConfiguration")
```

The following example illustrates a basic TLS configuration (in **mgweb.conf**) without a client certificate being specified.

```
<tls my_tls_configuration>
  protocols SSLv2 SSLv3 TLSv1.0 TLSv1.1 TLSv1.2
  key_type RSA
  cipher_list ALL:!aNULL:!eNULL:!EXP:!SSLv2
</tls>
```

This configuration can then be activated in a DB Server configuration block as follows:

```
<server local>
   type IRIS
   host localhost
   tcp_port 7041
   namespace USER
   tls my_tls_configuration
</server>
```

The TLS configuration parameters in detail.

path

The path to the TLS (OpenSSL) libraries. The libraries providing TLS functionality are as follows:

- UNIX: **libcrypto.so and libssl.so**
- Windows: **libeay32.dll and ssleay32.dll**

For most installations 'path' need not be specified as **mg_web** will load and use the default TLS libraries installed in the OS Path. If, for example, you wish to use an alternative OpenSSL build then the path to the directory holding the libraries should be specified. For example:

```
path /iris2021/bin
```

protocols

A list of supported TLS protocols. Valid options include: **SSLv2 SSLv3 TLSv1.0 TLSv1.1 TLSv1.2**

key_type

The Private Key type. This should be set to **RSA** (most common) or **DSA**.

cipher_list

The list of enabled Cipher Suites. For example: **ALL:!aNULL:!eNULL:!EXP:!SSLv2**

certificate_file

The name (including the full path) of the TLS X.509 Certificate File.

key_file

The name (including full path) of the TLS Private Key File.

password

The password to the TLS Private Key.

ca_certificate_file

The name (including full path) of the TLS Trusted Certification Authority (CA) X.509 Certificate.

ca_certificate_path

The path of the directory containing the TLS Trusted Certification Authority (CA) X.509 Certificates.

verify_peer

If set to **yes mg_web** will require peer certificate verification for this installation. If not specified, the default will be **no** and peer certificate verification will not be required.

4.4 Complete example mgweb.conf

```
timeout 30

<cgi>
   HTTP*
   SERVER_SOFTWARE
</cgi>

<server local>
   type IRIS
   host localhost
   tcp_port 7041
   username _SYSTEM
   password SYS
   namespace USER
</server>

<location />
   function web^%zmgweb
   servers local
</location>
```

4.5 Reporting configuration errors

It is essential that the **mg_web** event log file is specified correctly and that the web server worker processes are granted full access to it as any configuration errors will be reported in the log.

When a web server worker process successfully links to the **mg_web** library, a message such as that shown below will be written to the **mg_web** event log.

```
>>> Time: Thu Jul 23 16:21:44 2020; Build: 1.0.1 pid=9364;tid=27368;
    mg_web: worker initialization
    configuration: C:/inetpub/mgweb/mgweb.conf
```

If a configuration error is detected it will be reported after the initialization message. For example, if parameter ***tcp_port*** is not specified correctly, a sequence of messages similar to those shown below will be reported.

```
>>> Time: Thu Jul 23 16:21:44 2020; Build: 1.0.1 pid=9364;tid=27368;
    mg_web: worker initialization
    configuration: C:/inetpub/mgweb/mgweb.conf
>>> Time: Thu Jul 23 16:21:44 2020; Build: 1.0.1 pid=9364;tid=27368;
    mg_web: configuration error
    Invalid 'server' parameter 'tcpport' on line 11
```

5 The mg_web DB Server function

The signature of DB Server functions for **mg_web** is as follows:

```
web^%zmgweb(%cgi,%content,%system)
   ; process request and generate response
   Quit response
```

Where:

```
%cgi:     List of CGI Environment Variables
%content: The request payload (if any)
%system:  Read-only system array reserved for mg_web use.
```

Of course, the function may be named as you wish but must match the corresponding ***function*** entry in the **mg_web** configuration file (***mgweb.conf***).

If the request payload exceeds the maximum string length of the target DB Server then **%content** will be a numerically keyed array (1 to n) containing chunks of the request content.

The ***System*** array **(%system**) contains the name of the server and path relevant to the current request, as defined in the **mg_web** configuration file (**mgweb.conf**). For example:

```
%system("server")="local"
%system("path")="/"
```

- **Note: It is important that the read-only %*system* array is protected in your application code. It is good practice to extract (from %*system*) any information required by the application then protect it with a DB Server *new* statement. All the examples given here, follow this practice.**

5.1 Helper functions

There are a number of 'helper' functions available to **mg_web** applications. These are described in this section.

5.1.1 Parse application/x-www-form-urlencoded

Parse content of type 'application/x-www-form-urlencoded' OR a QUERY_STRING to return an array of name/value pairs:

```
Set %status=$$nvpair^%zmgsis(.%nv,.%content)
```

Where:

```
%nv:      An array of name/value pairs
%content: The request payload or a QUERY_STRING
```

This function will un-escape all components before placing them in the name/value pair array.

5.1.2 Parse multipart/form-data

Parse content of type 'multipart/form-data' to return an array of name/section pairs:

```
Set %status=$$multipart^%zmgsis(.%nv,.%nvhead,.%content,%boundary)
```

Where:

```
%nv:       An array of name/section pairs
%nvhead:   An array of section headers
%content:  The multipart request payload
%boundary: The multipart boundary marker
```

This function will generate a name/section pair array from the multipart payload. Under each section name, the section header directives will be placed in the 'headers' array as follows.

```
%nvhead(name,header_directive)=header_value
```

For example, on uploading a simple text file, you would expect to see something like:

```
%nv("MyFile")="Contents of my text file”
%nvhead("MyFile","Content-Disposition")=
                 "form-data; name="MyFile"; filename="c:\myfile.txt""
%nvhead("MyFile","Content-Type")="text/plain"
```

5.1.3 Generic content parser

Parse content of type ‘application/x-www-form-urlencoded’ OR ‘multipart/form-data’ OR a QUERY_STRING to return an array of name/value (or section) pairs:

```
Set %status=$$content^%zmgsis(.%nv,.%nvhead,.%content,.%cgi)
```

Where:

```
%nv:      An array of name/value (or section) pairs
%nvhead:  An array of section headers (where applicable)
%content: The request payload or a QUERY_STRING
%cgi:     List of CGI Environment Variables
```

This function will call **nvpair^%zmgsis()** or **multipart^%zmgsis()** depending on the payload content type.

5.1.4 Decoding URLs

URL decoding function (URL un-escaping):

```
Set %decoded=$$urld^%zmgsis(%encoded)
```

Where:

```
%encoded: URL-escaped item.
%decoded: URL-unescaped item.
```

URL encoding function (URL escaping):

```
Set %decoded=$$urle^%zmgsis(%decoded)
```

Where:

```
%decoded: URL-unescaped item.
%encoded: URL-escaped item.
```

5.1.5 Maximum DB Server string length

Determine the maximum string length for this DB Server installation:

```
Set %max=$$getmsl^%zmgsis()
```

Where:

```
%max:     Maximum string length.
```

5.2 Streaming the response using 'Write' statements (Block mode)

In addition to the scheme whereby the response is returned from the DB Server function as a single string, **mg_web** provides for the response to be streamed back to the client using ***Write*** statements. Response content can be written out using the ***write*** procedure provided by **mg_web** or, for InterSystems DB Servers, the ***Write*** command provided by the embedded DB scripting language.

To indicate that you wish to return the response content as a stream, the DB Server function must first call the ***stream*** function:

```
Set %str=$$stream^%zmgsis(.%system)
```

Where:

```
%str:       The stream.
%system:    The mg_web reserved system array (passed by reference).
```

The stream variable (i.e. **%str**) must subsequently be returned as the output from your DB Server function.

The **mg_web *write*** procedure is defined as follows:

```
Do write^%zmgsis(.%str,content)
```

Where:

```
%str:       The stream (passed by reference).
content:    The response content to write out.
```

The following two examples will illustrate the two approaches for streaming response content back to the client.

Using the mg_web *write* procedure (InterSystems DB Servers and YottaDB):

```
web^%zmgweb(%cgi,%content,%system)
   set %str=$$stream^%zmgsis(.%system)
   new %system
   do write^%zmgsis(.%str,"HTTP/1.1 200 OK"_$c(13,10))
   do write^%zmgsis(.%str,"Content-type: text/html"_$c(13,10,13,10))
   do write^%zmgsis(.%str,"<html>")
   do write^%zmgsis(.%str,"<head><title>Hello</title></head>")
   do write^%zmgsis(.%str,"<h1>Hello World</h1>")
   do write^%zmgsis(.%str,"</html>")
   quit %str
```

Using the embedded DB Server Write command (InterSystems DB Servers only):

```
web^%zmgweb(%cgi,%content,%system)
   set %str=$$stream^%zmgsis(.%system)
   new %system
   write "HTTP/1.1 200 OK"_$c(13,10)
   write "Content-type: text/html"_$c(13,10,13,10)
   write "<html>"
   write "<head><title>Hello</title></head>"
   write "<h1>Hello World</h1>"
   write "</html>"
   quit %str
```

5.3 Streaming the response using 'Write' statements (ASCII mode)

In addition to the ***Block mode*** scheme for returning content described in the previous section, **mg_web** provides for ASCII content to be streamed back to the client using DB Server Write commands. The benefit of this mode is that DB Server Write statements can be used for both InterSystems DB Servers and YottaDB. The ***Block mode*** should always be used when returning binary data.

To indicate that you wish to return the response content as a stream of ASCII characters, the DB Server function must first call the ***streamascii*** function:

```
Set %str=$$streamascii^%zmgsis(.%system)
```

Where:

```
%str:       The stream.
%system:    The mg_web reserved system array (passed by reference).
```

Response content is then streamed back to the client using DB Server Write statements as shown below.

```
web^%zmgweb(%cgi,%content,%system)
   set %str=$$streamascii^%zmgsis(.%system)
   new %system
   write "HTTP/1.1 200 OK"_$c(13,10)
   write "Content-type: text/html"_$c(13,10,13,10)
   write "<html>"
   write "<head><title>Hello</title></head>"
   write "<h1>Hello World</h1>"
   write "</html>"
   quit %str
```

6 Using WebSockets

WebSockets are supported by **mg_web** according to the following scheme.

WebSocket functions must be declared within a location block in the configuration. For example:

```
websocket mywebsocket.mgw websocket^%zmgweb
```

Where:

```
mywebsocket.mgw:        The name of the virtual file mapped to the
                        WebSocket function.
                        This is the name used within the form to
                        invoke the WebSocket.
websocket^%zmgweb:      The name of the corresponding function
                        on the DB Server side.
```

Assuming the path defined for the location is /mgweb:

```
/mgweb/mywebsocket.mgw
```

This indicates a WebSocket DB Server function of:

```
websocket^%zmgweb
```

The signature of this function is the same as for other **mg_web** web functions.

```
websocket^%zmgweb(%cgi,%content,%system)
    set %status=$$websocket^%zmgsis(.%system,0,"")
    new %system
    ; Read from and write to WebSocket client
    quit %status
```

Note that the WebSocket function must first call the websocket initialization function:

```
Set %status=$$websocket^%zmgsis(.%system,binary,options)
```

Where:

```
%status:    The status (should be "").
%system:    The mg_web reserved system array (passed by reference).
binary:     The binary flag (1 or 0).
            Set to 1 to return binary content to the WebSocket client.
options:    Reserved for future use.
```

6.1 A simple WebSocket example

In this simple WebSocket implementation, the DB Server simply echoes back the data sent by the client with the DB Server internal date and time appended. It will return the DB Server version if $zv is entered, and exit if 'exit' is entered.

Web client-side code:

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
  <head>
    <title>WebSocket Echo</title>
    <script type="text/javascript">
    <!--
      var ws;

      if ((typeof(WebSocket) == 'undefined') &&
          (typeof(MozWebSocket) != 'undefined')) {
        WebSocket = MozWebSocket;
      }

      function init() {
        ws = new WebSocket(((window.location.protocol == "https:") ? "wss:" : "ws:") +
"//" + window.location.host + "/mgweb/mywebsocket.mgw");
        ws.onopen = function(event) {
          document.getElementById("main").style.visibility = "visible";
          document.getElementById("connected").innerHTML = "Connected to WebSocket
server";
        };
        ws.onmessage = function(event) {
          document.getElementById("output").innerHTML = event.data;
        };
        ws.onerror = function(event) { alert("Received error"); };
        ws.onclose = function(event) {
          ws = null;
          document.getElementById("main").style.visibility = "hidden";
          document.getElementById("connected").innerHTML = "Connection Closed";
        }
      }

      function send(message) {
        if (ws) {
          ws.send(message);
        }
      }
    // -->
    </script>
  </head>
  <body onload="init();">
    <h1>WebSocket Echo</h1>
    <div id="connected">Not Connected</div>
    <div id="main" style="visibility:hidden">
    Enter Message: <input type="text" name="message" value="" size="80"
onchange="send(this.value)"/><br/>
    Server says... <div id="output"></div>
    </div>
  </body>
</html>
```

DB Server-side code:

The function first waits for a single character to arrive with a timeout of 30 seconds. If no data is received within the 30 second period, the function will write a message to the client and wait again. If client data does arrive then it reads the rest of the input (using a 0 second timeout). If the client sends '$zv' then the function returns the version of the DB Server, otherwise it appends the internal date and time ($H) to the data and sends it back to the client. If the client sends 'exit' then the server closes the WebSocket.

```
websocket(%cgi,%content,%system)
     set %status=$$websocket^%zmgsis(.%system,0,"")
     new %system
loop ; loop
     read *chr:30 if '$test write "Timeout at "_$H do flush^%zmgsis goto loop
     read data:0 set data=$char(chr)_data
     if data="exit" quit %status
     if data="$zv" s data=$zv
     write "DB server response at "_$H_": "_data do flush^%zmgsis
     goto loop
```

WebSocket server processes are never reused by **mg_web**. The process halts when the WebSocket session is complete. Applications can modify the device characteristics of their primary device to suit the needs of the functionality required. For example, the following scheme, when implemented on InterSystems DB Servers, will make the WebSocket server code work the same way as terminal based applications where ***reads*** are terminated by carriage return and ***writes*** immediately flush their data to the client.

First, adapt the client-side JavaScript code to append a carriage return character to each ***send*** operation.

```
function send(message) {
  if (ws) {
    ws.send(message + String.fromCharCode(13));
  }
}
```

Then the DB Server side code becomes:

```
websocket(%cgi,%content,%system)
     set %status=$$websocket^%zmgsis(.%system,0,"")
     new %system
     use 0:(/terminator=$char(13)::"+Q")
loop ; loop
     read data:30 if '$test write "Timeout at "_$H goto loop
     if data="exit" quit %status
     if data="$zv" s data=$zv
     write "DB server response at "_$H_": "_data
     goto loop
```

Note the simplified ***read*** operation and the absence of the need to ***flush*** the response.

7 Using Server-Sent Events (SSE)

The SSE protocol provides a HTTP-standard method for servers to push real-time updates to the client. Unlike the bidirectional WebSockets protocol, SSE establishes a unidirectional channel from server to client, making it ideal for scenarios where data predominantly flows in a single direction from the server to the client.

The SSE protocol is supported by **mg_web** according to the following scheme.

A client requests a SSE channel to the server by submitting a HTTP **Accept** request header of **text/event-stream**. In practice, the requesting web page will request a SSE channel as follows:

```
function init() {
  if (typeof(EventSource) !== "undefined") {
    // Server-Sent Events support available.
    var source = new EventSource(window.location.protocol + "//"
                 + window.location.host + my_SSE_request);
    source.onmessage = function(event) {
      // server data in event.data;
    };
  }
  else {
    // Server-Sent Events support not available.
  }
}
```

Where **my_SSE_request** is a **mg_web** URL of your choice (for example, something like: **"/mgweb/net/sse.mgw")**

On the DB Server side, a request for a SSE channel is indicated by the following system variable being set to 1.

```
%system("sse")==1
```

The first task for the Server-side SSE code is to initialize the SSE channel using the following function call:

```
set %str=$$sse^%zmgsis(.<%system>,<options>)
```

Example:

```
web^%zmgweb(%cgi,%content,%system)
   new %n,eof
   if ($get(%system("sse"))) do  quit %str
      . set %str=$$sse^%zmgsis(.%system,"")
      . set eof=0
      . for %n=1:1:10 do  if eof quit
      . . write "data: SSE data line "_%n_"
$H="_$Horolog_$char(13,10,13,10)
      . . do flush^%zmgsis
      . . set eof=$$clientgone^%zmgsis(.%system) if eof quit
      . . hang 5
      . . quit
      . do cleanup()
      . quit
   ;
   ; Process non-SSE HTTP requests
   ;
```

This simple function will send 10 lines of SSE data, with the system date and time appended ($Horolog), to the client. There is a 5 second interval (hang 5) between each data ‘event’ being pushed to the client.

Note the use of the **clientgone()** function to detect if the client has disconnected from the SSE channel. It is recommended that this function is called frequently. It will return immediately with a value of 1 (client disconnected) or 0 (client still listening). When the client disconnects, run any cleanup code immediately (**cleanup()** function in the above example) and exit the SSE procedure.

8 Administrator Facilities

The functionality described in this section is currently experimental and subject to change. All feedback welcome.

A number of REST based facilities to determine, and in some cases modify, the internal state of a running **mg_web** installation are described here. To use these facilities a path must be specified in the **mg_web** configuration file for exclusive use by Administrators.

For example:

```
<location /mgweb/sys>
  administrator on
</location>
```

In this example, all Administrator Facilities will be accessible via the **/mgweb/sys** path. It is recommended that access to this path is controlled and/or restricted via the hosting web server configuration.

8.1 View the internal status

```
GET http://[web server]/mgweb/sys/status
```

Example:

```
curl http://localhost/mgweb/sys/status
```

The status will be returned as a JSON object.

Taking the following configuration as an example:

```
timeout 30
<cgi>
   HTTP*
   SERVER_SOFTWARE
</cgi>
<server local>
   type IRIS
   host localhost
   tcp_port 7041
   username _SYSTEM
   password SYS
   namespace USER
</server>
<location />
   function web^%zmgweb
   servers local
</location>
<location /mgweb/sys>
  administrator on
</location>
```

A status report for this configuration would look something like the following:

```
{
"mg_web": {
   "version": "2.4.24",
   "request_timeout": 30,
   "no_requests": 12,
   "log_level": ""
},
"locations": [
   {
      "location": "/",
      "function": "web^%zmgweb",
      "load_balancing": "off",
      "server_affinity_precedence": "none",
      "server_sffinity_cookie": "",
      "servers": [
         {"number": 0, "server": "local", "exclusive": 0, "offline": 0}
      ]
   },
   {
      "location": "/mgweb/sys/",
      "administrator": "on"
   }
],
"servers": [
   {
      "server": "local",
      "type": "InterSystems IRIS",
      "host": "localhost:7041",
      "nagle_algorithm": "off",
```

```
      "tls": "",
      "namespace": "USER",
      "health_check": 0
   }
],
"worker_processes": [
   {
      "process_id": 25684,
      "servers": [
         {
            "server": "local",
            "status": "online",
            "no_connections": 1,
            "no_requests": 12,
            "time_offline": 0
         }
      ]
   }
]
}
```


In the first section (**mg_web**), we see the globally applied properties together with the total number of requests processed (**no_requests**). This is followed by the **locations** and **servers**. Finally, for each web server **worker process**, the status of each server is listed.

- **status** – this will be either 'unknown', 'online' or 'offline'.
- **no_connections** – the total number of connections created to the DB Server from the web server worker process.
- **no_requests** – the total number of requests processed by this DB server for the hosting web server worker process.
- **time_offline** – the number of seconds this DB Server has been marked 'offline'. If a value for a **health_check** period is specified for the DB Server, this field will be shown as **time_offline/health_check_period**.

8.2 View the configuration

```
GET http://[web server]/mgweb/sys/conf/list
```

Example:

```
curl http://localhost/mgweb/sys/conf/list
```

This request will simply return the contents of the **mg_web** configuration file (**mgweb.conf**) as plain text.

8.3 View the log file

View the log file

```
GET http://[web server]/mgweb/sys/log/list
```

Example:

```
curl http://localhost/mgweb/sys/log/list
```

This request will simply return the contents of the **mg_web** log file (**mgweb.log**) as plain text. The curl facility can be used to download a log file from a remote **mg_web** installation.

```
curl -o mgweb.log http://[web server]/mgweb/sys/log/list
```

Get the log file size

```
GET http://[web server]/mgweb/sys/log/size
```

Example:

```
curl http://localhost/mgweb/sys/log/size
```

This request will simply return the size of the **mg_web** log file. For example:

```
{
   "ok": 1,
   "result": "213159",
   "error": ""
}
```

Clear the log file

```
POST http://[web server]/mgweb/sys/log/op
Content-Type: application/json

{
   "op": "clear"
}
```

Example:

```
curl -d "{\"op\": \"clear\"}" -H "Content-Type: application/json" \
     http://localhost/mgweb/sys/log/op/
```

This request will, if successful, clear down the **mg_web** log file. It will return either a 'success' message or an error condition. For example:

```
{
   "ok": 1,
   "result": "success",
   "error": ""
}
```

8.4 Modify the internal status

In this section we look at a limited number of Administrator requests that can be used to modify internal properties of a running **mg_web** instance.

Modify the log level

```
POST http://[web server]/mgweb/sys/update
Content-Type: application/json

{
   "log_level": [new value]
}
```

Example:

```
curl -d "{\"log_level\": \"ev\"}" -H "Content-Type: application/json" \
     http://localhost/mgweb/sys/update
```

This request will, if successful, set the log level to 'ev'. It will return either a 'success' message or an error condition. This command will not result in the **log_level** being updated in the configuration file – the change will remain active only for the life of the hosting worker process.

Mark a DB Server online

```
POST http://[web server]/mgweb/sys/update/server
Content-Type: application/json

{
   "server": [DB Server Name],
   "offline": 0
}
```

Example:

```
curl -d "{\"server\": \"local\", \"offline\": 0}" \
     -H "Content-Type: application/json" \
```

```
     http://localhost/mgweb/sys/update/server
```

This request will, if successful, mark the specified DB Server **online**. It will return either a 'success' message or an error condition.

Mark a DB Server offline

```
POST http://[web server]/mgweb/sys/update/server
Content-Type: application/json

{
   "server": [DB Server Name],
   "offline": 1
}
```

Example:

```
curl -d "{\"server\": \"local\", \"offline\": 1}" \
     -H "Content-Type: application/json" \
     http://localhost/mgweb/sys/update/server
```

This request will, if successful, mark the specified DB Server **offline**. It will return either a 'success' message or an error condition.

9 License

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