

# SQL Relay Client for OpenVMS I64 and Alpha

December 2022

VSI-AXPVMS-SQLRELAY-V0109-3-1.PCSI

VSI-I64VMS-SQLRELAY-V0109-3-1.PCSI

## 1. Introduction

Thank you for your interest in this port of the SQL Relay client API to VSI OpenVMS I64 and Alpha. The current release of the SQL Relay client API on OpenVMS is based on the SQL Relay 1.9.3 open source distribution.

SQL Relay is an open source database connection management solution that resides between your application and the database, providing functionality not typically provided by the database directly, including persistent database connection pooling, proxying, throttling, high availability, query routing, query filtering, query translation, and connection scheduling. Of particular interest from an OpenVMS perspective are the proxying capabilities of SQL Relay, which can be used to facilitate access to databases from unsupported platforms. Databases that can be accessed via SQL Relay using the client API include Oracle, Sybase, Microsoft SQL Server, IBM DB2, MySQL, MariaDB, PostgreSQL, Firebird, and SQLite, as well as ODBC data sources. For more information see <http://sqlrelay.sourceforge.net/index.html>.

This OpenVMS port of the SQL Relay client API includes all functionality provided by the Open Source release, including SSL/TLS support (based on OpenSSL 3.0.5). Also included is a wrapper API that makes it easier to use the SQL Relay client API with OpenVMS programming languages other than C/C++, such as COBOL, FORTRAN, Pascal, and BASIC. Additionally, the kit provides several SQL Relay command line tools, including `sqlrsh` (an interactive tool similar to Oracle SQL\*Plus), and `sqlr-export` and `sqlr-import`, which can be used to export and import data from XML files on a per-table basis. Additionally, this release includes a beta version of an embedded SQL pre-processor (`PRESQLR.EXE`) that can be used to port existing Oracle C and COBOL applications that use embedded SQL code to SQL Relay, in place of using the Oracle pre-processor tools and client API<sup>1</sup>.

## 2. Acknowledgements

VMS Software Inc. would like to acknowledge the work of David Muse and the Firstworks SQL Relay development team (<http://www.firstworks.com/index.html>) for their ongoing efforts in developing and supporting this open source software.

## 3. What's new in this release

For a detailed description of the features and bug fixes included in this release, please refer to the `ChangeLog` file in the source repository ([git://git.code.sf.net/p/sqlrelay/sqlrelay](https://git.code.sf.net/p/sqlrelay/sqlrelay)) and

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<sup>1</sup> It should be noted that the pre-processor in its current form is intended for use with embedded SQL code that will interact with an Oracle database. While it is possible to use the tool in conjunction with another database, correct operation of the resultant generated code is not guaranteed.

the version 1.9.3 release announcement (<http://software.firstworks.com/2022/08/sql-relay-193-release-announcement.html>).

## 4. Requirements

The kit you are receiving has been compiled and built using the operating system and compiler versions listed below. While it is highly likely that you will have no problems installing and using the kit on systems running higher versions of the operating system or products listed, we cannot say for sure that you will be so lucky if your system is running older versions.

- VSI OpenVMS V8.4-1H1 or higher (Integrity), or V8.4-2L1 or higher (Alpha)
- VSI TCP/IP Services for OpenVMS, HPE TCP/IP Services for OpenVMS, or MultiNet TCP/IP
- C, COBOL, or other language compiler (depending upon which language or languages you intend to use to develop applications using the SQL Relay client API)
- VSI SSL 3.0-5 (or higher) for VSI OpenVMS

Note that if you wish to statically link application code with the supplied SQL Relay object libraries and require SSL/TLS support, it will be necessary to link with a comparable OpenSSL distribution.

In addition to the above requirements, it is assumed that the reader has a good knowledge of OpenVMS and of software development in the OpenVMS environment.

## 5. Recommended reading

It is recommended that developers and administrators read the extensive documentation provided on the SQL Relay web site (<http://sqlrelay.sourceforge.net/documentation.html>) and that developers carefully examine the provided sample programs before using the software.

## 6. Installing the kit

The kit is provided as an OpenVMS PCSI kit (VSI-I64VMS-SQLRELAY-V0109-3-1.PCSI or VSI-AXPVMS-SQLRELAY-V0109-3-1.PCSI, depending on platform) that can be installed by a suitably privileged user using the following command:

```
$ PRODUCT INSTALL SQLRELAY
```

The installation will then proceed as follows (output may differ slightly from that shown, depending on platform and other factors):

```
Performing product kit validation of signed kits ...
```

```
The following product has been selected:
```

```
    VSI I64VMS SQLRELAY V1.9-3                Layered Product
```

```
Do you want to continue? [YES]
```

```
Configuration phase starting ...
```

```
You will be asked to choose options, if any, for each selected product and for any products that may be installed to satisfy software dependency requirements.
```

Configuring VSI I64VMS SQLRELAY V1.9-3

VMS Software Inc.

\* This product does not have any configuration options.

Execution phase starting ...

The following product will be installed to destination:

VSI I64VMS SQLRELAY V1.9-3                   DISK\$I64SYS:[VMS\$COMMON.]

Portion done:

0%...10%...20%...30%...40%...50%...60%...70%...90%...100%

The following product has been installed:

VSI I64VMS SQLRELAY V1.9-3                   Layered Product

VSI I64VMS SQLRELAY V1.9-3

Post-installation tasks are required.

To enable SQLRelay at system boot time, add the following lines  
To SYS\$MANAGER:SYSTARTUP\_VMS.COM:

```
$ file := SYS$STARTUP:SQLRELAY$STARTUP.COM
$ if f$search("''file'") .nes. "" then @'file'
```

To disable SQLRelay at system shutdown, add the following lines  
To SYS\$MANAGER:SYSHUTDOWN.COM:

```
$ file := SYS$STARTUP:SQLRELAY$SHUTDOWN.COM
$ if f$search("''file'") .nes. "" then @'file'
```

*Note: In addition to installing the SQL Relay client API, on OpenVMS it is also necessary to install and configure the SQL Relay server on the Linux or Windows server hosting the target database, or alternatively to build and use the Docker container as described above.*

*A detailed description of installing and configuring the SQL Relay server software is beyond the scope of this document and the reader should refer to the documentation available on the SQL Relay web site (<http://sqlrelay.sourceforge.net/documentation.html>).*

## **6.1. Post-installation steps**

After the installation has successfully completed, include the commands displayed at the end of the installation procedure into SYSTARTUP\_VMS.COM to ensure that the logical names required in order for developers to use the software are defined system-wide at start-up.

In addition to the logical name SQLR\$ROOT (which points to the root directory of the SQL Relay client software installation), the logical names SQLR\$SHR and SQLR\$LIBESQL\_SHR are also defined. The logical name SQLR\$SHR points to the shareable image SQLR\$SHR.EXE, located in SQLR\$ROOT:[LIB], which can be linked with application code that uses the SQL Relay client API. Alternatively, it is possible to statically link application code with the object libraries found in the SQLR\$ROOT:[LIB] directory. The logical name SQLR\$LIBESQL\_SHR points to the shareable image SQLR\$ROOT:[LIB]SQLR\$LIBESQL\_SHR.EXE, which must be

linked with application code containing embedded SQL statements that is built using the PRESQLR.EXE embedded SQL pre-processor.

Other logical names defined by the SQL Relay start-up script are as follows:

Logical name	Purpose
SQLR\$BASIC	Location of the include file <code>sqlrdef.bas</code> for use with BASIC applications.
SQLR\$BIN	Location of SQL Relay command line utilities ( <code>sqlr-export.exe</code> , <code>sqlr-import.exe</code> , <code>sqlrsh.exe</code> )
SQLR\$COBOL	Location of the include file <code>sqlrdef.cob</code> for use with COBOL applications.
SQLR\$EXAMPLES	Location of example programs in BASIC, FORTRAN, Pascal, COBOL, and C.
SQLR\$FORTRAN	Location of the include file <code>sqlrdef.for</code> for use with FORTRAN applications.
SQLR\$LIB	Location of SQL Relay client API object libraries and shareable image.
SQLR\$PASCAL	Location of the include file <code>sqlrdef.pas</code> for use with Pascal applications.

From a development perspective, for C/C++ programs it should be noted that symbols in the shareable image and object libraries are mixed-case, and developers should therefore use the C and C++ compiler option `/NAMES=(AS_IS,SHORTENED)` or include in their code appropriate `#pragma` directives (C only) to ensure that symbols are correctly resolved when linking. Developers will also need to include in their code the appropriate language header file, from `SQLR$ROOT:[INCLUDE]`. Symbols for the wrapper API that can be used with other OpenVMS programming languages are all upper-case.

Note that the C header file `SQLR$ROOT:[INCLUDE.SQLRELAY]SQLR_WRAP_LIB.H` must be included by C source code modules containing embedded SQL code that is pre-processed by the PRESQLR.EXE embedded SQL pre-processor.

## 6.2. Privileges and quotas

Generally speaking there are no special quota or privilege requirements for applications developed using the SQL Relay client API, although a high `BYTLM` is recommended, and `SYSPRV`, `BYPASS`, or `OPER` privilege will be required if applications developed using the library need to utilise privileged ports (ports below 1024).

The following quotas should be more than adequate for most purposes:

```

Maxjobs:          0  Fillm:          256  Bytlm:          128000
Maxacctjobs:     0  Shrfillm:       0    Pbytlim:        0
Maxdetach:       0  BIOlm:         150  JTquota:       4096
Prclm:           50  DIOlm:         150  WSdef:         4096
Prio:            4  ASTlm:         300  WSquo:         8192
Queprio:         4  TQElm:         100  WSextent:      16384
CPU:             (none)  Enqlm:        4000  Pgflquo:      256000

```

## 7. Sample applications

The directory `SQLR$ROOT:[EXAMPLES]` contains several simple example programs written in C, COBOL, FORTRAN, BASIC, and Pascal that serve to illustrate the usage of the API. The command procedure `SQLR$ROOT:[EXAMPLES]BUILD_EXAMPLES.COM` can be used to build all of the example programs, and assumes that you have all of the relevant language compilers installed on the system in question. If this is not the case, it will be necessary to modify the command procedure to remove or comment out any language examples that you do not wish to build.

These simple example programs are intended to provide an introduction to the SQL Relay API and to hopefully serve as a basis for the development of more sophisticated applications. Note that it will be necessary to have available an appropriately configured SQL Relay server environment in order to run the example programs, and the example programs will need to be modified to specify the correct username, password, network address, and database connection details for your environment.

The directory `SQLR$ROOT:[EXAMPLES.ESQL]` contains a simple example build procedure that illustrates how to build applications using the `presqlr.exe` embedded SQL pre-processor. The example build procedure illustrates some of the command line options that may be used with `presqlr.exe`; in order to see the full list of parameters and options, run the pre-processor without specifying any parameters.

Note that it is mandatory to specify an input file using the `/INAME` qualifier. All other qualifiers are optional, and will default to the values shown, where appropriate.

## 8. Docker container

Also provided for this release is a Dockerfile that can be used to build a Docker image containing the SQL Relay server and Oracle Instant Client. Deploying these components via a Docker container provides an easy way to set up and use the SQL Relay server, with configuration and use equating to little more than modifying the SQL Relay server configuration file to specify the correct connection details, and running a small set of Docker commands to build and start the container image<sup>2</sup>. The Dockerfile and instructions for building the image can be found at <https://github.com/vmssoftware/sqlr-ora>.

## 9. Known issues and limitations

The supplied kit for VSI OpenVMS includes all functionality supported by the open source SQL Relay client API. In addition, the port includes a language-agnostic API that makes it straightforward to write applications using 3GL languages such as COBOL, FORTRAN, Pascal, and BASIC. This release of SQL Relay for VSI OpenVMS also includes a beta version of the `PRESQLR.EXE` embedded SQL pre-processor tool for COBOL and C.

The following list identifies any known issues and limitations associated with this release of SQL Relay for VSI OpenVMS:

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<sup>2</sup> Docker must be installed on the system where you intend to run the container image. Either a Microsoft Windows, macOS, or Linux system may be used for this purpose. See <https://www.docker.com/> for details regarding the installation and use of Docker.

- The `PRESQLR.EXE` embedded SQL pre-processor for SQL Relay on VSI OpenVMS currently supports only the COBOL and C programming languages. It is envisaged that support for additional languages (and in particular FORTRAN) will be included in future releases.
- The `PRESQLR.EXE` embedded SQL pre-processor currently provides support for a subset of Oracle RDBMS SQL statements<sup>3</sup>. Currently supported statements include those for connection and transaction handling (`CONNECT`, `COMMIT`, `ROLLBACK`), cursors (`DECLARE`, `OPEN`, `FETCH`, `CLOSE`), basic DML, DQL, and DDL operations (`INSERT`, `UPDATE`, `DELETE`, `SELECT`, `CREATE`, and `DROP`), PL/SQL (with some limitations), partial support for BLOBs, and standard embedded SQL constructs (`INCLUDE SQLCA`, `BEGIN DECLARE SECTION`, `END DECLARE SECTION`). Support for additional Oracle RDBMS SQL statements will be provided in future releases of the software.
- The embedded SQL `CONNECT` statement for SQL Relay is somewhat different than the `CONNECT` statement for Oracle. Specifically, it is assumed that all databases are remote, and connect string must contain connection details for the remote SQL Relay server in the form `host:port`, where `host` may be the name or IP address of the server running the SQL Relay server, and `port` is the port number being used by the SQL Relay server process. The connect string can be specified via a host variable or a string constant, or alternatively it can be specified via a `PRESQLR.EXE` command line parameter. It should be noted that SQL statements support named connections for parallel activity across the same or different databases using the `AT` clause, where named connections can be defined and created with the `CONNECT` statement.

Subsequent releases of the SQL Relay client for OpenVMS will include addition development tools and utilities, including embedded SQL processors for other programming languages and an enhanced interactive query tool. It is anticipated that the inclusion of these facilities and the scope of the functionality they provide will evolve over the course of several product releases.

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<sup>3</sup> For example, declaring and using cursors for `UPDATE` and `DELETE` is not currently supported.