

# CL-INSTANS

## *Instructions for Installation and Use*

Authors: Esko Nuutila, Mikko Rinne, ...

### Document History:

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8.12.2013	0.0.2	Added description on installing and running	Esko
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22.5.2014	0.0.5	Documented the aggregate library as an example. Removed the -i input parameter.	Mikko

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## Environment

The current version of INSTANS has been developed using Steel Bank Common Lisp (SBCL). The code is likely to work also in other Common Lisp environments, but has not been tested in any others yet.

After installing INSTANS it can be run from the command line (shell) either by using SBCL or directly by giving command line arguments listing the Sparql rule and RDF triples files to be used.

The system has been developed and tested in an OS X (Mac) environment. It should be straightforward to operate also in other \*nix-like environments. Windows is likely to be a bit more exotic.

## Common Lisp Installation

**Note:** In OS X everything else except SBCL is currently installed - if needed - with the `configure` script explained below, so the other components are only listed here for reference.

[Steel Bank Common Lisp](#): We are currently using v. 1.1.16, but v. 1.1.12 and higher are expected to work.

Steel Bank Mac OS X Installation: SBCL is available on [Brew](#). Once Brew is installed, SBCL can be installed from the shell with:

```
$ brew install sbcl
```

Brew is highly recommended for keeping up-to-date with future SBCL releases!

[ASDF](#): Included in the latest SBCL:s. If using another platform you may need to install it separately.

[Quicklisp](#): A truly excellent library manager, must-have also for other reasons than INSTANS. Installation instructions are [here](#), but if you don't have it yet, the configuration script below will install it.

## Downloading, configuring and building INSTANS on OS X (Mac)

1. Clone the repository from github.

```
git clone https://github.com/aaltodsg/instans.git
```

## 2. Change to directory `instans`

```
cd instans
```

## 3. Run the configuration and build script

```
./configure
```

It initializes the system:

- Checks that your Lisp configuration is suitable for INSTANS
- Downloads and installs `quicklisp.lisp`, if it is not installed yet
- Creates a custom SBCL core that contains INSTANS
- Downloads Sparql test cases from [w3.org](http://w3.org).
- Downloads JQuery DataTables that are used to present the Sparql test case coverage.

The `./configure` script assumes that `curl`, `tar`, and `unzip` are installed in your system.

Additional options:

```
./configure --clean
```

Re-compiles everything, i.e. cleans any previous installations of INSTANS. **WARNING: The `--clean` option also re-installs `quicklisp`, removing e.g. `quicklisp-slime-helper` in the process. Use with caution, if you already have a custom installation!**

## Other tools

If you have any plans for developing in Common Lisp, three other components are highly recommended:

1. A good Emacs. We are using [Aquamacs](#) on OS X.
2. [Slime](#): Creates the Lisp development environment on emacs. It is available also on [quicklisp](#), which makes updating easier.
3. [Quicklisp-slime-helper](#): "Makes it easy to use Slime from quicklisp"

Some configuration is needed. The following slime-related lines in your `"~/.emacs"` file do the trick:

```
----- .emacs ----- .emacs -----
(load "~/quicklisp/slime-helper.el") ; your quicklisp directory
(add-to-list 'load-path "~/Dev/Lisp/Slime/") ; your SLIME directory
(add-to-list 'load-path "~/Dev/Lisp/Slime/contrib") ; your SLIME directory
(setq inferior-lisp-program "/usr/local/bin/sbcl") ; your Lisp system path
(require 'slime)
(require 'slime-autoloads)
(slime-setup '(slime-fancy slime-asdf))
(slime-setup '(slime-repl slime-editing-commands slime-scratch slime-asdf))
```

```
(add-hook 'slime-mode-hook
  (lambda ()
    (unless (slime-connected-p)
      (save-excursion (slime))))))
```

---

## Using INSTANS from the command-line

Use the command

```
instans/bin/instans [ arguments ]
```

to run INSTANS on command line. Running `instans` with no arguments prints the following list:

```
Usage: instans [ -h | --help | -v | --version | { <configuration-option> } ]
```

General options:

```
-h | --help          Print this message and exit.
-v | --version       Print version information and exit.
```

Configuration options:

```
-n <string>      | --name <string>      Use <string> as the name of the system.
-d <dir>         | --directory <dir>           Use <dir> as the prefix for file lookup.
                                     You can use a file or an URL as <dir>
-b <url>         | --base <url>                   Use <url> as the base.
-g <graph>       | --graph <graph>               If <graph> is 'default' add the following
                                     inputs to the default graph. If it is <url>
                                     add them to the graph named by <url>
-r <rules>       | --rules <rules>                 Use rules in <rules>.
-t <input>       | --triples <input>               Read input based on <input>.
-o <output>      | --output <output>               Write output based on <output>.
-f <commands>    | --file <commands>             Read options from <commands>.
--triple-processing-policy <policy> See the documentation.
--rule-instance-removal-policy <policy> See the documentation.
--rete-html-page-dir <dir>          Create an HTML page about the Rete network.
--queue-execution-policy <policy> See the documentation.
-e                        | --execute                       Execute the system. This is done by default at
the end of processing all arguments.
--debug <phases>          See the documentation.
--verbose <phases>       Same as --debug.
```

See the documentation for description of the parameters of the options above.

Command line specifiers (`-d`, `-g`, `-n` or `-b`) persist until replaced by a new instance of the same specifier.

### Directory (`-d` or `--directory`) [Status: Implemented]

Use `<dir>` as the prefix for all file or URI lookups (until changed with another `-d` option). The default is the current directory. Both a file system name and URL are valid.

## **Base (-b or --base) [Status: Implemented]**

Use <url> as the base for triple input parsing & IRI expansion (as specified in section 5 of [RFC 3986](#)). The default value is "http://".

Examples:

- "-b file:///." is the current directory of the file system.

## **Graph (-g or --graph) [Status: Implemented]**

If <graph> is 'default' or not specified, add the following inputs to the default graph. If it is <url> add them to the graph named <url>. Multiple -g parameters can be used in one command line to input to multiple graphs.

One file can currently only contain input to one graph.

## **Rules (-r or --rules) [Status: Implemented]**

Use SPARQL rules in <rules>. Valid rules can be either in the local file system or URI:s, in which case the file is fetched from the specified address. Expansion is based on the prefix specified with -d.

## **Input (-t, --triples) [Status: Implemented]**

Read triple input from <input>. Valid inputs can be either in the local file system or URI:s, in which case the file is fetched from the specified address. Expansion is based on the prefix specified with -d.

Input from a Unix pipe can be read using "-t /dev/stdin". E.g.:

```
$ cat mytriples.ttl | instans -r myqueries.rq -t /dev/stdin
```

Currently only turtle serialization is supported.

## **Output (-o or --output) [Status: File support implemented]**

Write output to <output>. Currently <output> can only be a file. If not specified, the results are sent to the standard output.

Future additions are to include definition of an output format and separation of SELECT and CONSTRUCT outputs.

## **Read options from <file or url> (-f or --file) [Status: Implemented]**

The file may contain the same options as the command line. The file must contain the LONG names of the options WITHOUT the "--" prefix. E.g. option "--rules rulefile.rq" would become "rules rulefile.rq".

### **Execute the system (-e or --execute) [Status: Implemented]**

By default the Rete-network is executed at the end of processing all arguments. The -e parameter can be used to request earlier execution of Rete.

### **Define system name (-n or --name) [Status: Implemented]**

Shows as a "key" when executing the system and as the name of the (GraphViz) graph in [the HTML representation of a generated Rete network](#).

### **Rete HTML Visualization (--rete-html-page-dir) [Status: Implemented]**

Creates an HTML page of the constructed Rete network to the specified directory.

### **Triple input policy (--triple-input-policy)**

Specifies how many triples are processed at once from the input. The default is single-triple.

- single-triple: Process one triple at a time
- triples-block: Processing takes place every time a non-terminal according to Turtle [grammar rule 6](#) is identified.
- all: Reads the whole input before doing any processing

Implemented in: src/rete/interpreter/lisp: process-triple-input

### **Triple processing operations (--triple-processing-operations)**

A ':'-separated list of (add|remove|execute). The default is add:execute.

- add: Add the triples, which have been read based on the triple input policy, to the Rete engine.
- remove: Remove the triples, which have been read based on the triple input policy, from the Rete engine.
- execute: Execute the rule instances based on the queue execution policy.

### **Rule Instance Removal Policy (--rule-instance-removal-policy)**

Relates to the rule instance execution queue processing. A ':'-separated list of (remove|...).

- Remove: Removes a rule instance from the queue without executing, if the rule condition is not satisfied anymore.
- Keep: Keeps the rule in the queue despite the original condition not being satisfied.

Implemented in: `src/rete/interpreter/lisp: rete-remove-rule-instance`

## Queue Execution Policy (`--queue-execution-policy`)

A ':'-separated list of (first|snapshot|repeat-first|repeat-snapshot). The default is "repeat-first".

`src/rete/interpreter/lisp: execute-rules`

- first: Takes the first rule from the queue and executes it.
- repeat-first: Repeats "first".
- snapshot: Removes all rules from the current queue and processes them. Only takes new rules after the current snapshot has been processed.
- repeat-snapshot: Repeats "snapshot".

## Verbose output for debugging (`--debug` or `--verbose`)

Print out internal information of the Rete engine for debugging purposes. <phases> can be "true" or "false".

## Running tests

The package comes with a few test scripts, which can be used to verify that the installation is working correctly. All tests are in directory "instans/tests".

### Syntax tests (SPARQL Compliance Test Set)

Tests INSTANS against the SPARQL test set available from <http://www.w3.org/2009/sparql/docs/tests/>. Run from ".../instans/tests" with

```
$ make syntax-tests
```

The results are written to the "syntax-test-results" subdirectory and HTML-formatted in "index.html".

**Note:** The current testing procedure cannot identify tests, which have been "removed" late in the process. Therefore the compilation of results also includes tests, which are no longer compliant with the latest syntax.

## Aggregate Library



Some examples for computing aggregate values (sum, average, min, max) over time windows are available in directory "instans/tests/input/aggr-window". A test can be run by entering:

```
$ ./aggr-test.sh
```

The related files are:

- aggr-lib.rq: The SPARQL "library" to compute aggregates
- ex\_windef.ttl: Window parameters defined in a turtle file
- ex\_events.ttl: Some sample events for window trials (xsd:dateTime timestamp)
- ex\_int\_events.ttl: Sample events with an integer timestamp
- aggr-test.sh: The sample command line to run the example

The library and parameters are documented in the aggr-lib.rq and ex\_windef.ttl files. Not everything is practical to parametrize and therefore users are encouraged to directly modify an own copy of aggr-lib.rq e.g. to match more complex input event formats or to format the output as needed.

Additionally the same folder contains a sample of using the SPARQL built-in AVERAGE aggregate for computing averages. The files are aggr-builtin.rq and aggr-builtin.ttl. The example can be executed with:

```
$ instans -r aggr-builtin.rq -t aggr-builtin.ttl
```

## Close Friends (a.k.a Friends Nearby)

This case is described in:

Rinne, M., Abdullah, H., Törmä, S., Nuutila, E.: Processing Heterogeneous RDF Events with Standing SPARQL Update Rules. In: Meersman, R., Dillon, T. (eds.) OTM 2012 Conferences, Part II. pp. 793–802. Springer-Verlag (2012)

And in this simulation report:

Rinne, M., Abdullah, H., Törmä, S., Nuutila, E.: INSTANS Comparison with C-SPARQL on Close Friends. Available online:

<http://www.cs.hut.fi/~mjrinne/sw/instans/INSTANS-Simulations-March2012.pdf>

At the time of writing the reports the tests were executed with INSTANS v. 0.1 available from [the project homepage](#). To run Close Friends with CL-INSTANS:

1) With 100 location events: \$ make fnb100

2) With 1000 location events: \$ make fnb1000

The query results are compared with an earlier execution and the success or failure (based on similarity) is reported.

## Using INSTANS with SBCL on command-line

These instructions are for running INSTANS with SBCL from the shell, and do not require or use emacs or slime. The easiest way to start SBCL with INSTANS installed is to use

```
instans/bin/sbcl-instans [ sbcl-arguments ]
```

You can use SBCL command line arguments to load Lisp files (`--load filename`) or evaluate expressions (`--eval expr`) before you enter the read-eval-print-loop. See the documentation of SBCL for all available arguments.

## Using INSTANS with Emacs and Slime

TBA.

## Working with INSTANS

### Changes from INSTANS 0.1 & 0.2:

1) Multiple queries and rules in a single file are separated by a semicolon (";").

(INSTANS 0.1 & 0.2: dot (".") was used as the separator. Semicolon is more compliant with SPARQL.)

2) The graph for each triple input can be specified with a command line parameter.

(INSTANS 0.1 & 0.2: A comment line in the beginning of a triple file was used to specify the graph)

3) Turtle input is functional also in triple input files.

(INSTANS 0.1 & 0.2: Turtle parser was only used for SPARQL. Input files had to be converted to ntriples.)

4) Timed events are not yet available

(INSTANS 0.2: Supported timed events, i.e. events programmed with SPARQL to trigger at certain times.)

## Implementation Chart

A table of what is or isn't supported should be added here.