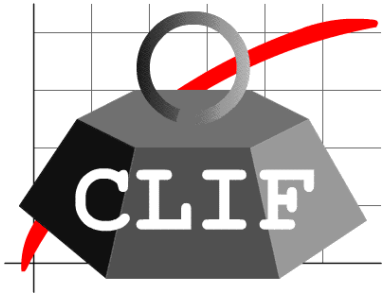
ObjectWeb

# CLIF is a Load Injection Framework (v 1.1)




## a guided tour of ObjectWeb's generic load test platform

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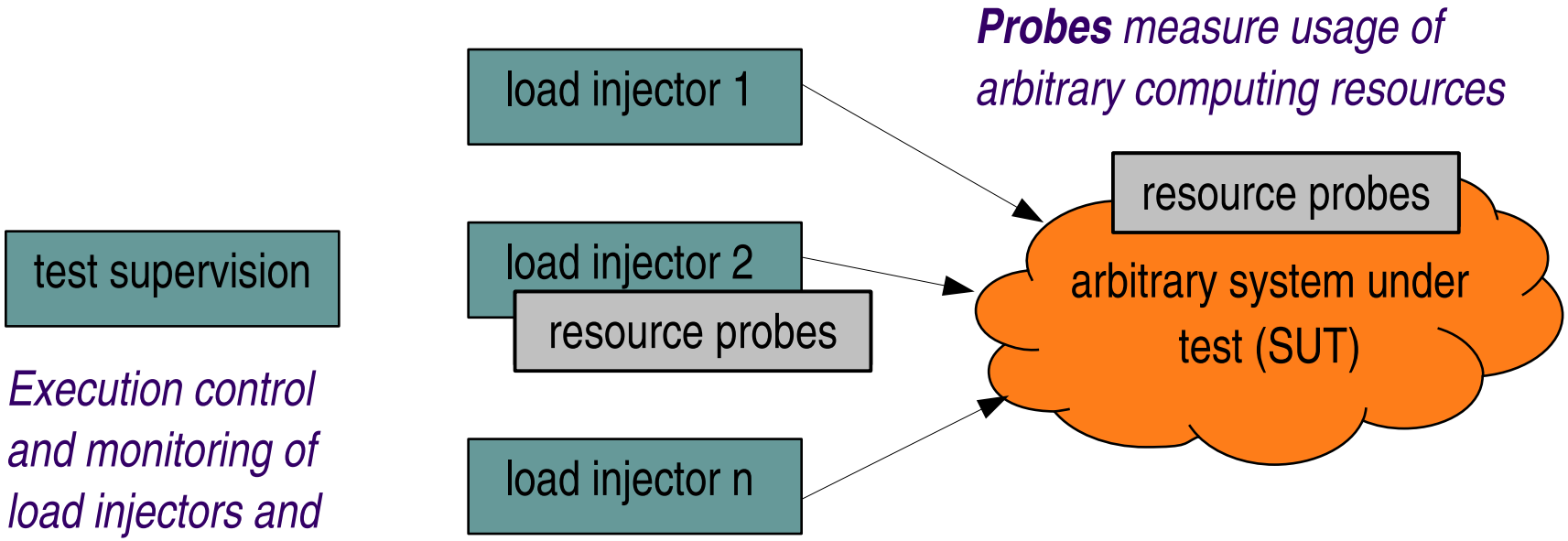
# PART 1

# Overview of Concepts, Principles and Architecture

# Big picture of (distributed) load testing




***Probes** measure usage of arbitrary computing resources*

*Execution control and monitoring of load injectors and resource probes.*

***Load injectors** :*

- *send requests, wait for replies, measure response times*
- *according to a given scenario*
- *for example, emulating the load of a number of real users*

# CLIF is a Load Injection Framework...

## CLIF is dedicated to:

- high-level (distributed) load injection
- performance measurement (response time, error occurrence, etc.)
- resources consumption measurement (probes)

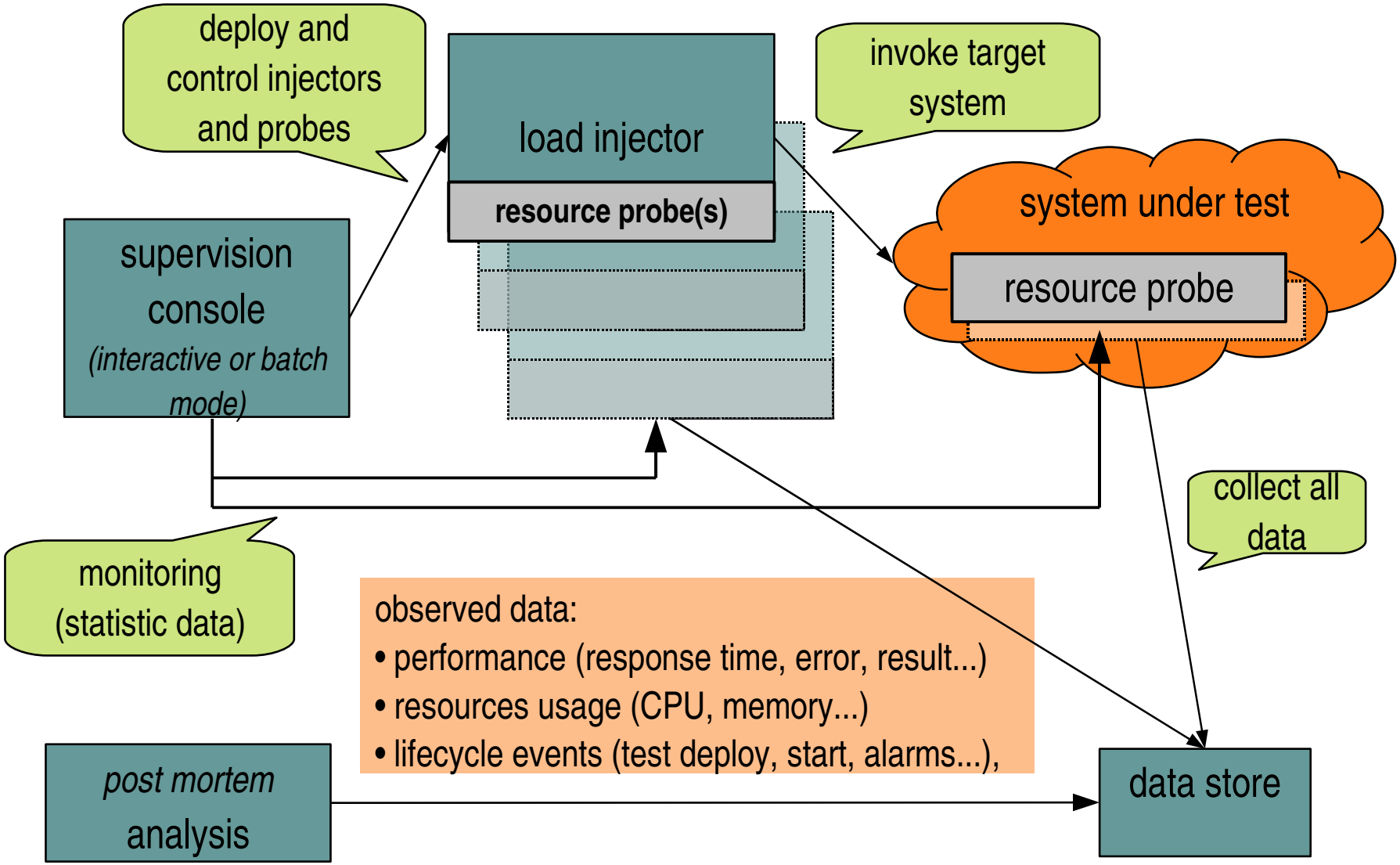
## ... open and flexible...

- the framework is independent from:
  - the scenario definition mode,
  - system under test (invocation protocols, etc.)
  - the type of observed resources
- the architecture uses Fractal Component Model
- CLIF is open source software (http://clif.objectweb.org/)

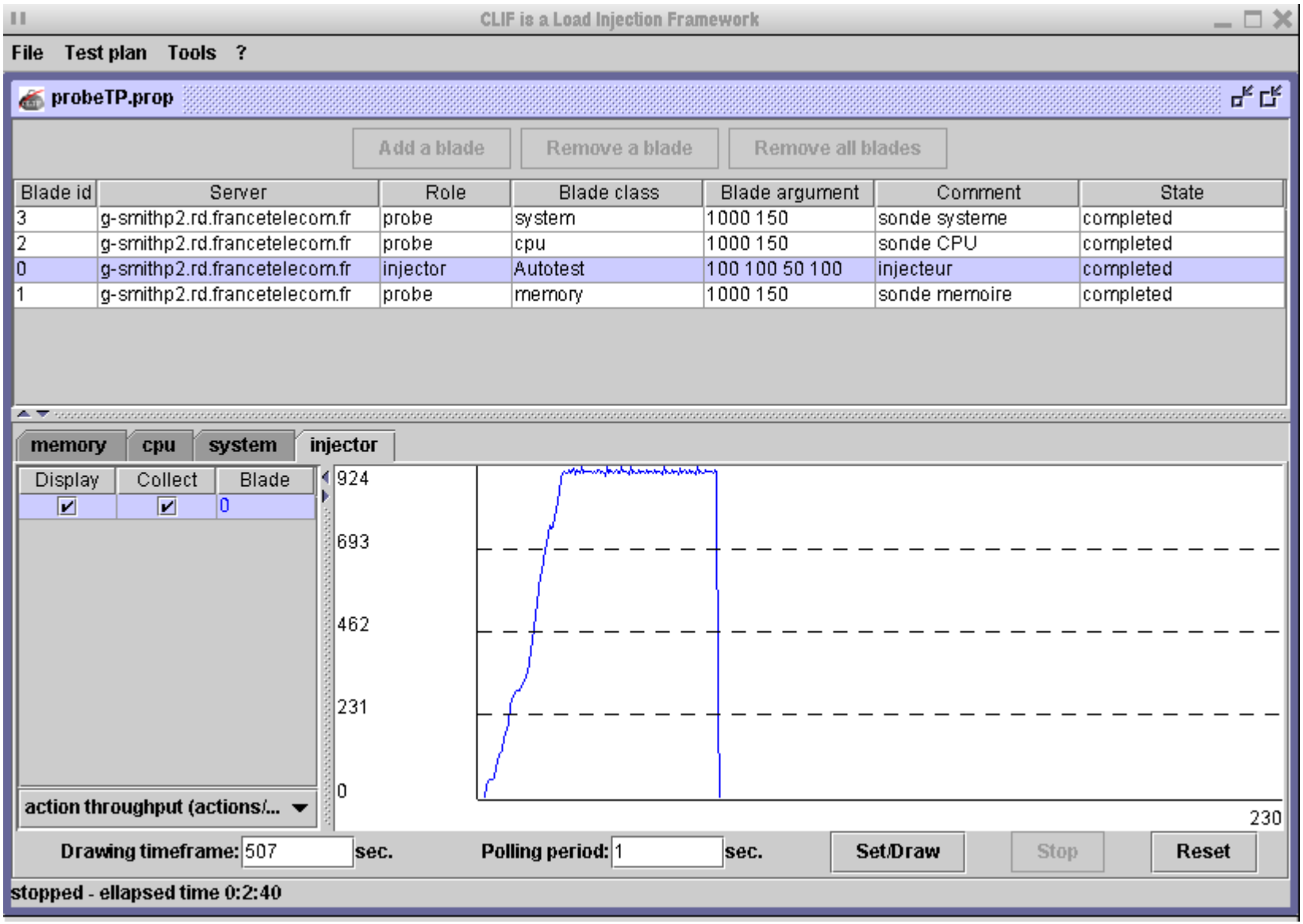
## ... easy to use

- centralized test deployment, control and monitoring of distributed tests
- support for a variety of user skills and needs
- 100% Java (1.4) + integration with Eclipse

# CLIF distributed architecture



# CLIF's Java swing-based GUI

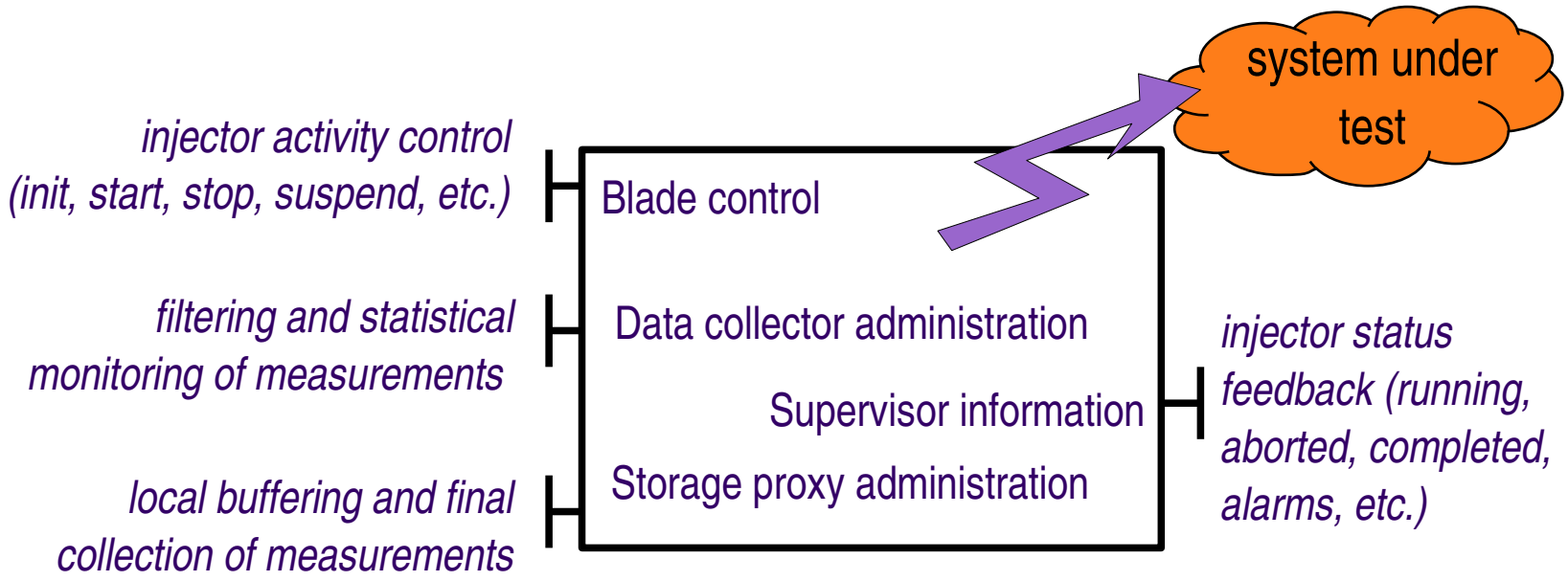


# PART 2

# Tools for defining load test scenarios

# For Fractal-aware Java programmers: implement your own injection component

## An injector must conform to the following component type:

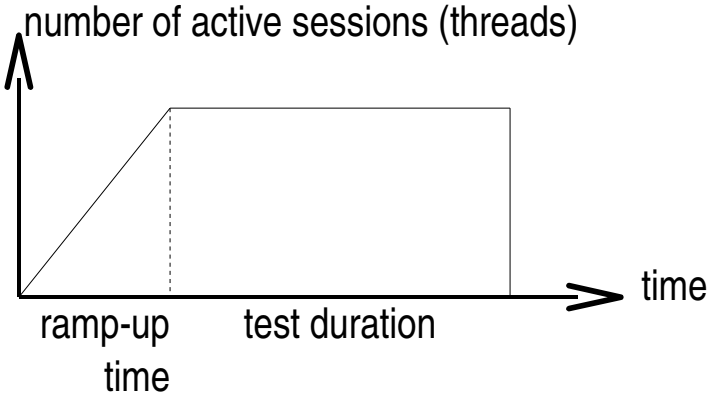



- see org.objectweb.clif.server.api.BladeType.fractal
- see org.objectweb.clif.server.lib.Blade.fractal ("common blade architecture" helper)

# For Java programmers and simple scenarios: MTScenario class

## MTScenario is a generic (abstract) injector component for handling:

- the creation of a given number of sessions (threads)
- and their life-cycle (init, start/stop, suspend/resume...)
- during a given test duration
- with a given ramp-up time




## Used through sub-classing

- the programmer just has to define the “actions” to be performed by each session
- the Webtest example features a simple Web test

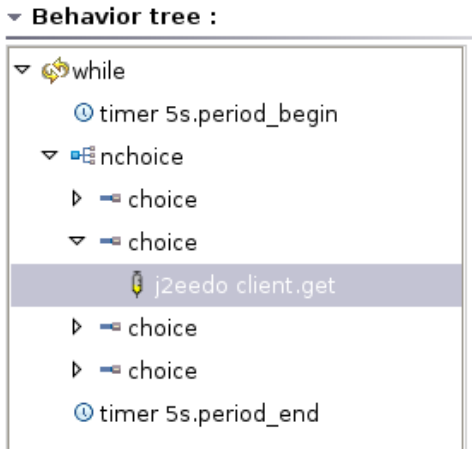
  Takes a list of URLs as parameter (GET/POST). Based on Jakarta HttpClient.

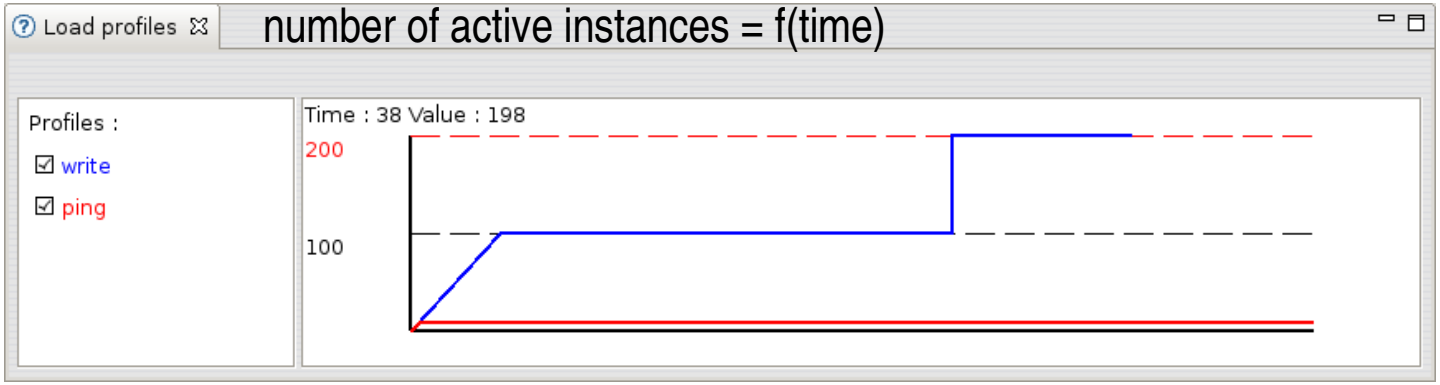
# For all kinds of user and advanced scenarios: ISAC

## "ISAC is a Scenario Architecture for Clif"

- provides a generic, formal and user-friendly way to define an injector load scenario
- a scenario combines
  - the definition of sequential behaviors (typically representing the SUT users) with control constructs

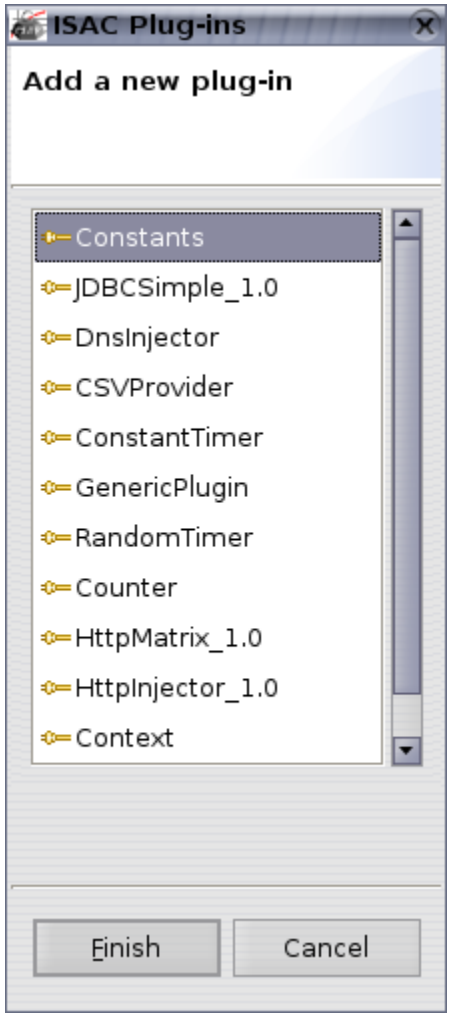
    delay, if-then-else, loop, probabilistic choice, preemption
  - with a load profile specification for each behavior



# ISAC plug-ins

## ISAC is generic and extensible through a plug-in feature




Each behavior defines a generic logic, making use of imported plug-ins to implement:

- delays (think time: constant, random with arbitrary distribution...)
- actions (requests on the system under test)
- conditions (used by if, while, and preemption)
- controls (for specific administration purpose of ISAC plug-ins)
- external data provisioning (to parameterize scenarios with external data sets)

# ISAC execution engines

## First generation engines (for history...)

- 1 behavior instance (i.e. 1 virtual user)  1 execution thread
- practical maximum limit regarding computing resources: thousands of virtual users

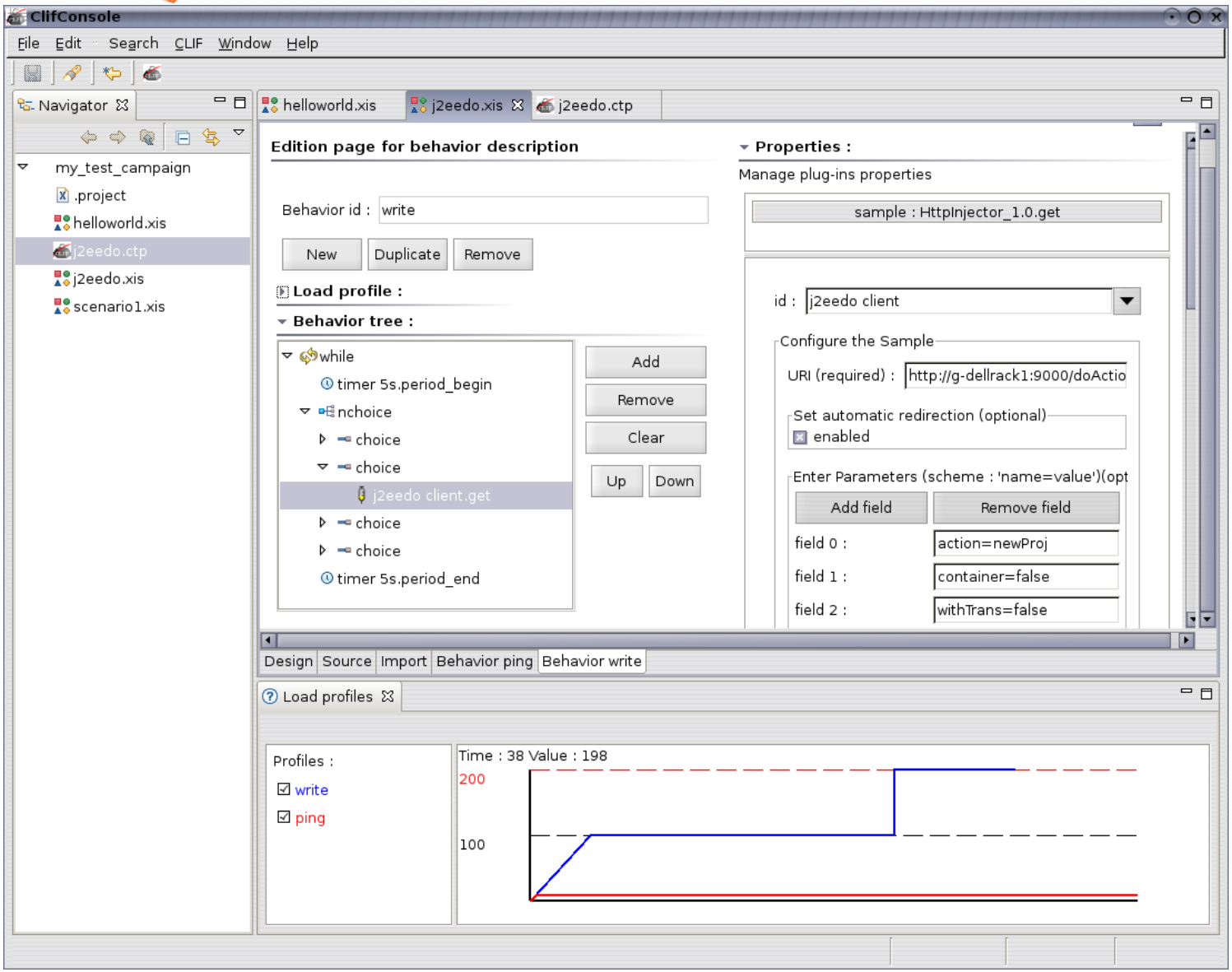
## Second generation engine (as of latest version)

- all behavior instances  f ixed pool of threads (cooperative scheduler)
- new, advanced features
  - the size of the thread pool may be changed on demand during scenario execution
  - the population of any behavior may be changed on demand during scenario execution

  (then, the specified load profile for this behavior, if any, is disabled)
  - alarms are raised when think times are longer than specified (with tunable tolerance)
  - support for external data sets (data provider plug-ins)
- order of magnitude: **million of virtual users, million of requests/second**

  The actual limits depend on the behaviors' think times and the consumption of computing resources by the imported ISAC plug-ins for each behavior instance

# ISAC scenario graphical editor



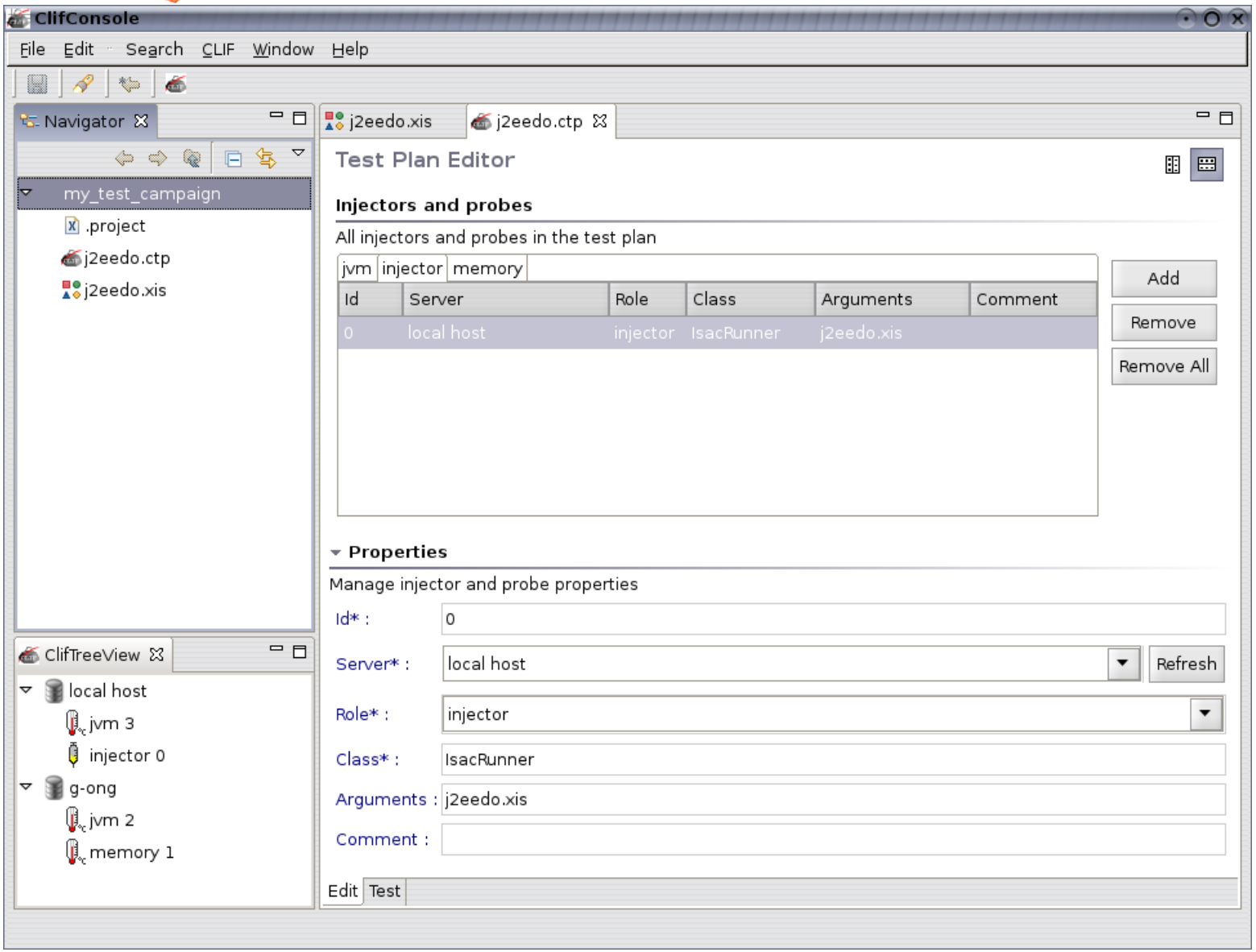
# PART 3

# Using CLIF

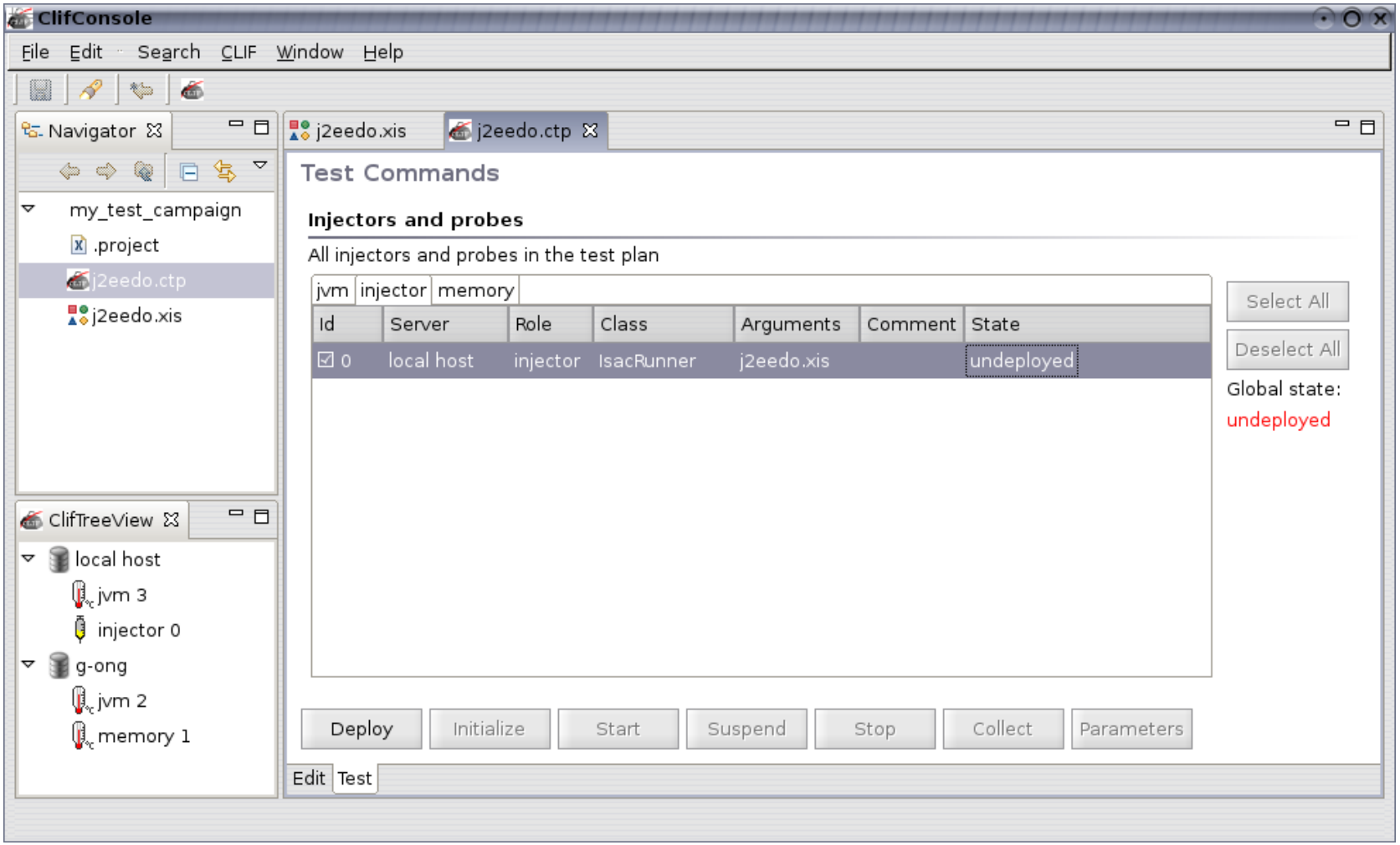
# Overview of load testing process

1. run a CLIF console and start the "CLIF registry" to be able to register "CLIF servers" where you plan to deploy probes and/or load injectors
2. run the CLIF servers on every computer you want to use
3. define your test plan
   - list of load injectors and/or probes with their parameters and the target CLIF server
4. deploy the test plan
5. perform one or several test executions
   - initialize, start, monitor execution (stop, suspend, resume if needed)
   - collect results when execution is done (aborted, stopped or complete)
   - analyze results

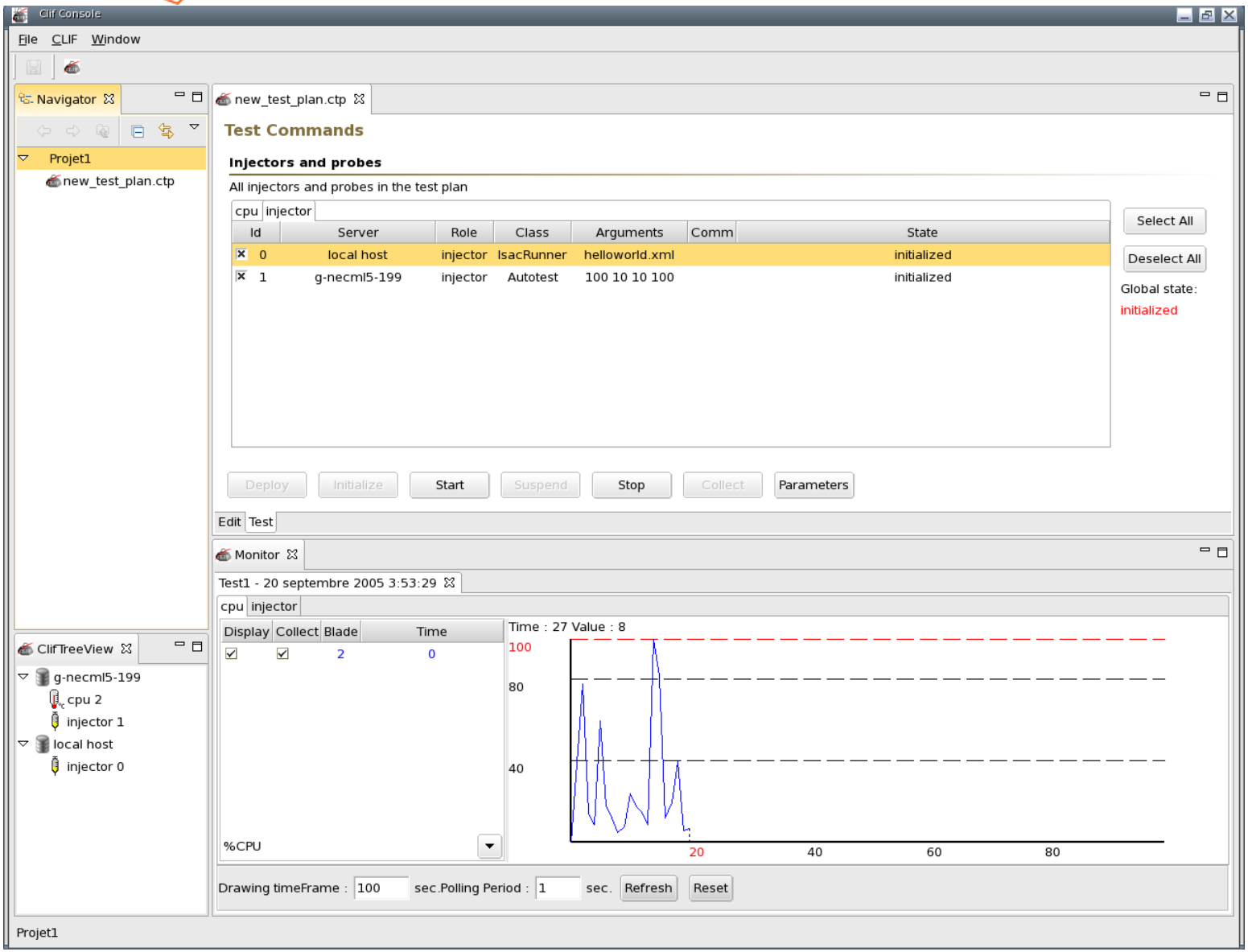
# Test plan edition



# Test plan deployment and initialization



# Test plan execution and monitoring



# Using the command-line tools

- **deploy** - Deploys a new test plan (probes and injectors) as defined by a given test plan file
  ant -Dtestplan.name=name -Dtestplan.file=file.ctp deploy
- **init** - Initializes all probes and injectors from a given test plan, or just a sub-set of them if mentioned.
  ant -Dtestplan.name=name -Dtestrun.id=testId [-Dblades.id=id1:id2:...:idn] init
- **start** - Starts probes and injectors. They must be initialized before.
  ant -Dtestplan.name=name [-Dblades.id=id1:id2:...:idn] start
- **suspend, resume, stop** - Respectively suspends, resumes or stops running or suspended blades.
  ant -Dtestplan.name=name [-Dblades.id=id1:id2:...:idn] suspend/resume/stop
- **join** - Waits until the execution of probes and injectors is terminated (aborted, stopped or completed).
  ant -Dtestplan.name=name [-Dblades.id=id1:id2:...:idn] join
- **collect** - Collects results of completed or stopped probes and injectors.
  ant -Dtestplan.name=name [-Dblades.id=id1:id2:...:idn] collect
- **run** - short-cut for init, start, join, collect on probes and injectors.
  ant -Dtestplan.name=name -Dtestrun.id=testId [-Dblades.id=id1:...:idn] run
- **params** - Lists all parameters that can be changed during execution for a given probe or injector
  ant -Dtestplan.name=name -Dblade.id=id params
- **change** - Changes a parameter value for a given probe or injector
  ant -Dtestplan.name=name -Dblade.id=id -Dparam.name=param -Dparam.value=value change

# Available probes

- **System probes are available for Linux and Windows, based on LeWYS**
  - cpu (processor usage),
  - memory (RAM and swap usage),
  - jvm (JVM memory usage)
  - simple and low footprint design
  - Native code for Windows, pure Java for Linux (using /proc pseudo file system)
  - 2 parameters: polling period in ms, execution duration in seconds.
- **Simple framework to define any kind of probe**
- **Currently, CLIF's probe architecture is about to be re-engineered, considering other technologies wherever relevant:**
  - Eclipse TPTP, JMX, Fractal JMX...
  - Good advices, contributions, discussions are welcome

# Test results

- **Monitoring gives a lot of information at runtime**
  - min/max/average response time
  - requests and errors throughput, error rate
  - specific measurements from probes
  - low footprint design
- **Post mortem analysis**
  - all measurements from injectors and probes are available as CSV-formatted files
  - support tools: work in progress but nothing released yet
  - it is also possible to use CLIF just for massive, background load generation without storing results, and use other dedicated tools for accurate performance analysis.

# Conclusion

# Current status

- **CLIF is internally used by France Telecom's R&D division for load testing and performance evaluation**
  - middleware (application servers, persistence), DNS, DHCP, specific telco platform
- **Development plans for this year:**
  - Eclipse Wizards to create probes and ISAC plug-ins
  - improved probe system and more probes
  - result analysis tools
  - more ISAC plug-ins (including SIP support)
  - capture of HTTP sessions and replay with ISAC HTTP Injector
- **Research plans for next years: autonomic load testing and performance evaluation**

# Thank you for your attention

## Questions & Answers

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http://clif.objectweb.org/