www.kamailio.org

KAMAILIO - PICK YOUR SIP ROUTING SCRIPTING LANGUAGE

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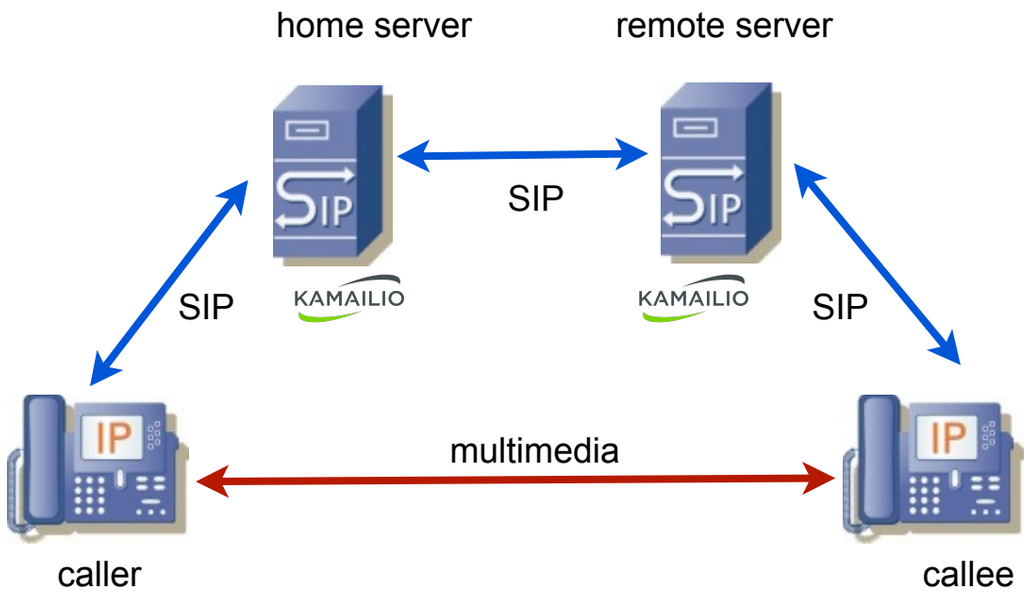
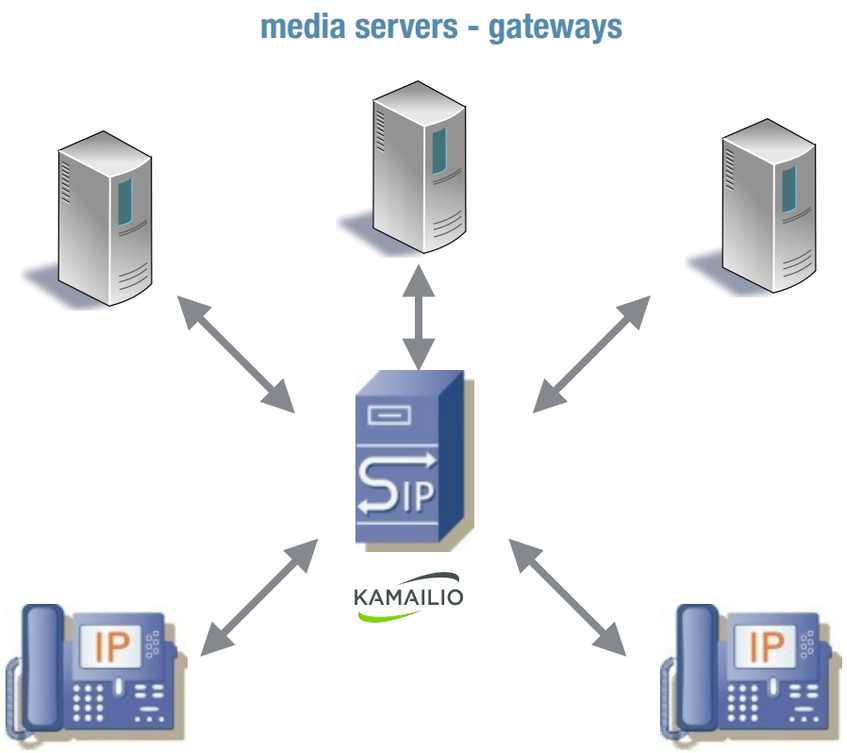
Kamailio In One Slide

- Open Source SIP (IETF RFC3261) Signaling Server implementation
- Developed since 2001 (SER - OpenSER - Kamailio) - started at FhG Fokus Research Institute in Berlin, Germany - now a community driven project
- Can be used for VoIP (Voice, Video, VoLTE/IMS, SIP-I/SIP-T), Instant Messaging, Presence, WebRTC, IoT, Diameter, SQL and NoSQL backends
- Built for flexibility and scalability - used by large telecoms, mobile operators and OTT services world wide
- IPv6/IPv4 - UDP/TCP/TLS/SCTP/WebSocket - asynchronous routing
- Classic SIP - WebRTC gateway using Kamailio + RTPEngine
- Embedded interpreters: Lua, Python, JavaScript, Squirrel, Perl, .Net, Java
- Over 200 modules (extensions) - https://www.kamailio.org/docs/modules/stable/
- Over 50 active developers each year (over 300 contributors over the time)
- Runs its own conference - Kamailio World
  - the 6th edition: May 14-17, 2018, in Berlin, Germany: https://www.kamailioworld.com

Kamailio In The Network





Kamailio Configuration File

- Uses a scripting language developed from scratch since 2001
  - Referred as native scripting language
- Two parts from functionality point of view
  - Initialization of Kamailio
    - Global parameters
    - Loading modules
    - Modules parameters
  - SIP Routing Logic
    - Known as routing blocks
    - Sort of functions executed for each SIP message

Native Scripting Language

- Among benefits
  - Behaviour of the interpreter controlled to the smallest details
  - Can be optimized for specific needs of SIP routing
  - Can control the evolution of the language
- Among drawbacks
  - Reinvent the wheel
    - Example: implement in C common string and arithmetic operations
  - Focus not on scripting language, resulting in no extensive documentation for the language itself
  - No external libraries that can be just imported
  - No usage outside of Kamailio scope
  - Some limitations due to initial design (e.g., no hot reload)

reload of routing logic without restart
more features of the scripting language

KEMI - Kamailio Embedded Interface

- Allow writing the routing logic in well known scripting languages by embedding interpreters
  - reload without restart when possible
- Initial version launched with Kamailio v5.0
- Lots of improvements with Kamailio v5.1
- Implemented for:
  - Lua
  - Python
  - JavaScript
  - Squirrel
- The old inline interpreters still available
  - Perl, .Net (C#), Java

Native Scripting Language - Inline Lua Execution

myscript.lua

```
...
function sr_append_fu_to_reply()
        sr.hdr.append_to_reply("P-From: " .. sr.pv.get("$fu") .. "\r\n");
end
...
```

```
...
modparam("app_lua", "load", "/usr/local/etc/kamailio/lua/myscript.lua")
...
request_route {
    ...
    if(!lua_run("sr_append_fu_to_reply")) {
        xdbg("SCRIPT: failed to execute lua function!\n");
    }
    ...
}
...
```

kamailio.cfg

Routing Block - Native Scripting Language

https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/kamailio-basic-kemi-native.cfg

```
298  # Routing to foreign domains
299  route[SIPOUT] {
300          if (uri==myself) return;
301
302          append_hf("P-hint: outbound\r\n");
303          route(RELAY);
304          exit;
305  }
```

Routing Block - Lua Scripting Language

- app_lua
  - existing since 2010 offering inline execution of Lua scripts
  - https://www.kamailio.org/docs/modules/stable/modules/app_lua.html
- highlights
  - very small interpreter, fast
  - decent number of extensions (native lua libraries)
  - popular in gaming space, also in RTC (Asterisk, FreeSwitch)

https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/kamailio-basic-kemi-lua.lua

```
324  -- Routing to foreign domains
325  function ksr_route_sipout()
326          if KSR.is_myself(KSR.pv.get("$ru")) then return 1; end
327
328          KSR.hdr.append_hf("P-Hint: outbound\r\n");
329          ksr_route_relay();
330          KSR.x.exit();
331  end
```

Routing Block - JavaScript Scripting Language

- introduced in Kamailio v5.1
  - not in stable version
  - https://www.kamailio.org/docs/modules/devel/modules/app_jsdt.html
- highlights
  - duktape.org engine - small, easy to embed by importing source code files
  - very popular scripting language
  - no external dependencies
  - reload of routing script
  - not many extensions

https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/kamailio-basic-kemi-jsdt.js

```
331  // Routing to foreign domains
332  function ksr_route_sipout()
333  {
334          if (KSR.is_myself(KSR.pv.get("$ru"))) { return; }
335
336          KSR.hdr.append_hf("P-Hint: outbound\r\n");
337          ksr_route_relay();
338          KSR.x.exit();
339  }
```

Routing Block - Python Scripting Language

- app_python
  - introduced in 2010 for inline execution of Python scripts
  - https://www.kamailio.org/docs/modules/stable/modules/app_python.html
- highlights
  - popular scripting language
  - most extensive number of extensions
  - object oriented, perceived as slower than other scripting languages
  - reloading of the routing script not completed yet

https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/kamailio-basic-kemi-python.py

```
332     # Routing to foreign domains
333     def ksr_route_sipout(self, msg):
334         if KSR.is_myself(KSR.pv.get("$ru")) :
335             return 1;
336 
337         KSR.hdr.append("P-Hint: outbound\r\n");
338         self.ksr_route_relay(msg);
339         return -255;
```

Routing Block - Squirrel Scripting Language

- app_sqlang
  - introduced in Kamailio 5.1
  - https://www.kamailio.org/docs/modules/devel/modules/app_sqlang.html
- highlights
  - http://www.squirrel-lang.org
  - very small interpreter
  - embedded by importing its source code
  - no external dependency
  - reload of scripting script
  - pre-compilation options

https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/kamailio-basic-kemi-sqlang.sq

```
332  // Routing to foreign domains
333  function ksr_route_sipout()
334  {
335          if (KSR.is_myself(KSR.pv.get("$ru"))) { return; }
336
337          KSR.hdr.append_hf("P-Hint: outbound\r\n");
338          ksr_route_relay();
339          KSR.x.exit();
340  }
```

KEMI Documentation

over 600 functions exported to kemi framework

http://kamailio.org/docs/tutorials/devel/kamailio-kemi-framework/

examples

https://github.com/kamailio/kamailio/tree/master/misc/examples/kemi

The Other Inline Interpreters

- Perl via app_perl module
  - Embeds the standard Perl interpreter
  - The first one added in 2006
  - https://www.kamailio.org/docs/modules/stable/modules/app_perl.html
- .Net (C#) via app_mono module
  - Embeds the Mono interpreter
  - Besides C#, other languages should be supported by building the managed assemblies, such as F#, VisualBasic.NET, Scala — see:
    - http://www.mono-project.com/Languages
  - https://www.kamailio.org/docs/modules/stable/modules/app_mono.html
- Java via app_java module
  - Embeds the JVM interpreter
  - https://www.kamailio.org/docs/modules/stable/modules/app_java.html

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Thank You!

Hope to see some of you at Kamailio World 2018!
www.kamailioworld.com

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