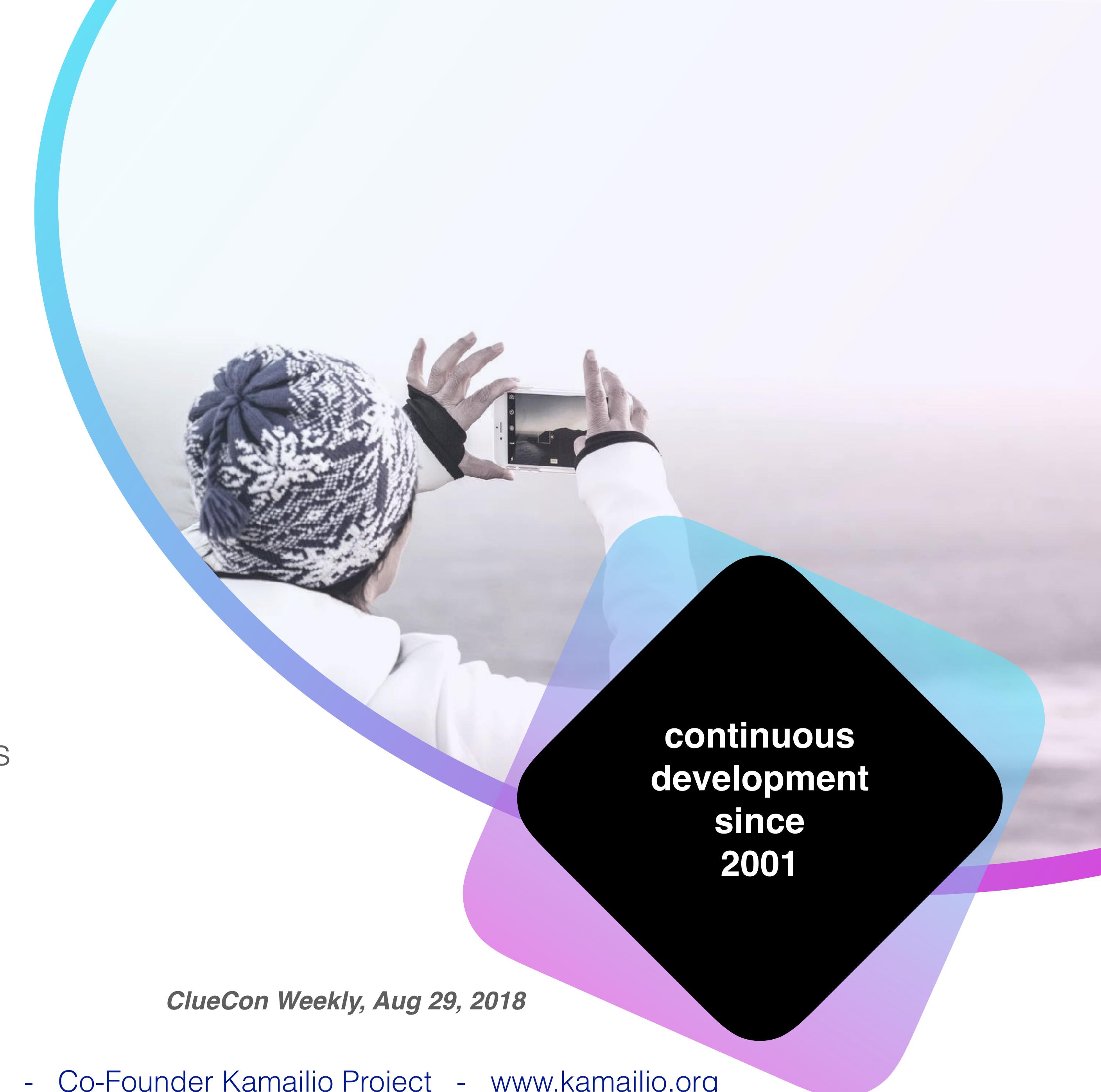




## Project Updates

refactoring, more flexibility, new modules

**voip - ims - volte - presence - instant messaging - webrtc**



*ClueCon Weekly, Aug 29, 2018*

**continuous  
development  
since  
2001**

# Highlights 2017 - 2018

## new modules and scripting languages



### ❖ new modules

- ❖ [acc\\_diameter](#),
- ❖ [app\\_jsdt](#)
- ❖ [ims\\_ocs](#)
- ❖ [nsq](#)
- ❖ [pua\\_rpc](#)
- ❖ [rabbitmq](#)
- ❖ [ss7ops](#)
- ❖ [app\\_sqlang](#)
- ❖ [call\\_obj](#)
- ❖ [evreexec](#)
- ❖ [ims\\_diameter\\_server](#)

### ❖ new modules

- ❖ [acc\\_json](#)
- ❖ [acc\\_python3](#)
- ❖ [db\\_redis](#)
- ❖ [app\\_ruby](#)
- ❖ [phonenum](#)
- ❖ [sipdump](#)
- ❖ [pua\\_json](#)
- ❖ [topos\\_redis](#)
- ❖ [keepalive](#)

### ❖ config scripting languages (kemi)

- ❖ [native](#) - startup optimizations
- ❖ [lua](#) - many libraries, routing logic hot reload
- ❖ [javascript](#) - embedded code, routing logic hot reload
- ❖ [python2/3](#) - lots of libraries, hot reload
- ❖ [ruby](#) - lots of libraries, hot reload
- ❖ [squirrel language](#) - embedded code, routing logic hot reload

<https://www.kamailio.org/wiki/features/new-in-5.1.x>

<https://www.kamailio.org/wiki/features/new-in-5.0.x>

<https://www.kamailio.org/wiki/features/new-in-devel>

# Highlights 2017 - 2018

## kemi framework

- introduced in Kamailio v5.0.0
  - use other scripting languages for writing SIP routing logic (route blocks)
  - exports a function one time and becomes available in embedded interpreters
  - ***allows reloading routing script without restart***



# KEMI Framework

## kamailio embedded (interpreter) interface

- Kamailio Configuration File - Two Main Roles
  - Kamailio application initialization
    - Done once at startup (passive scope)
    - Global parameters, loading modules and modules'parameters
    - Many values can be changed at runtime via RPC (no restart)
  - Rules for handling SIP traffic
    - Done during runtime to decide the routing of SIP messages
    - No reload without restart for native kamailio.cfg scripting language
    - KEMI routing scripts can be reloaded without restart (v5.0+)
- Scripting languages
  - Native scripting language
    - built from scratch, routing blocks with set of actions
  - Kamailio Embedded Interface (KEMI) languages
    - reuse existing (popular) scripting languages
    - replace the routing blocks from native scripting language
    - allow reloading of scripts without restart and more features
  - Inline execution of scripting languages
    - can be executed inside native scripting language
    - support for Lua, JavaScript, Python, Perl, .Net (C#, ...), Squirrel, Java, Ruby



```
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 }
```

# KEMI Framework

## kamailio embedded (interpreter) interface

Native (Custom) Routing Language Since 2001

Kamailio Embedded Interpreter Interface - K E M I

- introduced in Kamailio v5.0.0
  - split parts: **passive** (global and module params) and **active** (routing blocks)
  - live reload of active part
- working for next scripting languages (embedded interpreters)
  - Lua
  - JavaScript
  - Python - Python3
  - Squirrel
  - Ruby
- not yet updated for next existing embedded interpreters
  - can be used with inline execution
    - Perl
    - Mono (.NET, C#, ...)
    - Java (?)
- *native language still available*
  - *the old kamailio.cfg scripting language is still there, maintained and developed*



```
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 }
```

# KEMI Framework

## sip routing logic in lua

- app\_lua
  - existing since 2010 offering inline execution of Lua scripts
  - [https://www.kamailio.org/docs/modules/stable/modules/app\\_lua.html](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)



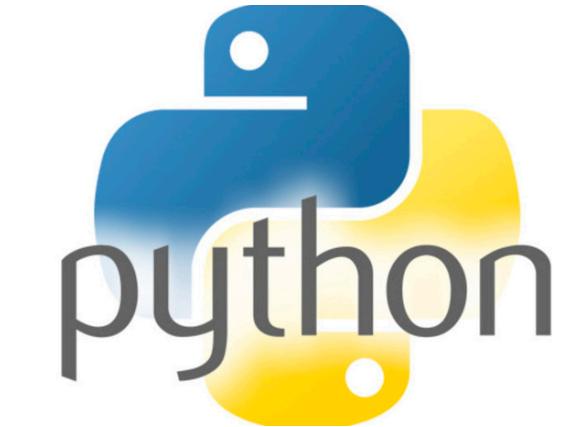
<https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/kamailio-basic-kemi-lua.lua>

```
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
```

# KEMI Framework

## sip routing logic in python

- app\_python - app\_python3
  - introduced in 2010 for inline execution of Python scripts
  - [https://www.kamailio.org/docs/modules/stable/modules/app\\_python.html](https://www.kamailio.org/docs/modules/stable/modules/app_python.html)
  - [https://www.kamailio.org/docs/modules-devel/modules/app\\_python3.html](https://www.kamailio.org/docs/modules-devel/modules/app_python3.html)
- highlights
  - popular scripting language with extensive number of extensions
  - object oriented, perceived as slower than other scripting languages
  - reloading of the routing script not implemented 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;
```

# KEMI Framework

## Kamailio API Exports

- index of exported functions
  - KSR static or dynamic object
  - function names and parameters map (pretty well) over the ones for native kamailio.cfg scripting

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

<https://github.com/kamailio/kamailio/blob/master/misc/examples/kemi/>

# Scalability - Elasticity

## Transparent proxy - Anycast

### ● Expectations

- Forward without adding/removing headers required in SIP specifications
- Mainly about to not alter Via stack
  - Do not add for SIP request
  - Do not remove for SIP response
- Set source IP (\$si) and local socket (\$Ri)
- It was there for very long time - **send(...)** and the variants
  - Easy with deployments running on a single socket

### ● Corex module

- Added some helper functions to help on deployments with multiple network interfaces
- <https://kamailio.org/docs/modules-devel/modules/corex.html>

```
# before forwarding request
via_add_srvid("1");
$xavp(via=>node) = LOCALIP;
via_add_xavp_params("1");
```

```
# response does not belong to a transaction, relay to pair srv
if(!t_check_trans()) {
    append_hf("X-Src-Addr: $su\r\n");
    $var(d) = $(hdr(Via){s.select, , -1}{param.value, node});
    sendx("sip:$var(d)", "LOCALSOCKET", "$mbu");
    drop();
}
```

```
# once receiving a transparent proxied SIP response
set_recv_socket("ANYCASTSOCKET");
set_source_address("$hdr(X-Src-Addr)");
```



.....  
:https://github.com/kamailio/kamailio/blob/master/misc/examples/mixed/kamailio-minimal-anycast.cfg  
.....

# Highlights 2017 - 2018

## Non-SIP Processing Or Forwarding Proxy

- Receiving And Then Forwarding HEP3 Packets To Different Destination
- Actually just a wrapper for `send(...)` and the variants
  - `sip_capture_forward(uri)` - uri can be a static string or can contain script variables
- `sipcapture module`
  - <https://kamailio.org/docs/modules-devel/modules/sipcapture.html>
- Non-SIP Processing - Example: Compressing/Decompressing Data

```
...
loadmodule "app_perl.so"
loadmodule "corex.so"
...
# ----- app_perl params -----
modparam("app_perl", "filename", "/usr/local/etc/kamailio/custom_compress.pl")
modparam("app_perl", "modpath", "/usr/local/lib64/kamailio/perl")

# ----- corex params -----
modparam("corex", "network_io_intercept", 32)
modparam("corex", "min_msg_len", 32)
modparam("corex", "msg_avp", "$avp(msg)")
...
event_route[network:msg] {
    if (is_incoming()) {
        if (perl_exec_simple("do_uncompress", "" + $mb + "")) {
            xlog("L_INFO", "Received message '$avp(msg)' \n");
        } else {
            xlog("L_INFO", "Received message '$mb' \n");
            $avp(msg) = $mb;
        }
    } else {
        xlog("L_INFO", "Sending message '$mb' \n");
        if (!perl_exec_simple("do_compress", "" + $mb + "")) {
            $avp(msg) = $mb;
        }
    }
}
```

```
event_route[sipcapture:request] {
    ...
    if(src_ip==1.2.3.4) {
        sip_capture_forward("sip:2.3.4.5:5090");
        return 0;
    }
    ...
}

use strict;
use warnings;
use IO::Compress::Gzip qw(gzip $GzipError);
use IO::Uncompress::Gunzip qw(gunzip $GunzipError);

sub do_compress() {
    my $input = shift;
    my $output;

    gzip \$input => \$output
        or eval {
            Kamailio::log(L_WARN, "GZIP failed: $GzipError\n");
            $output = $input;
        };
    Kamailio::AVP::add("msg", $output);
}

sub do_uncompress() {
    my $input = shift;
    my $output;

    gunzip \$input => \$output
        or eval {
            Kamailio::log(L_WARN, "GUNZIP failed: $GunzipError\n");
            $output = $input;
        };
    Kamailio::AVP::add("msg", $output);
}
```

# Highlights 2017 - 2018

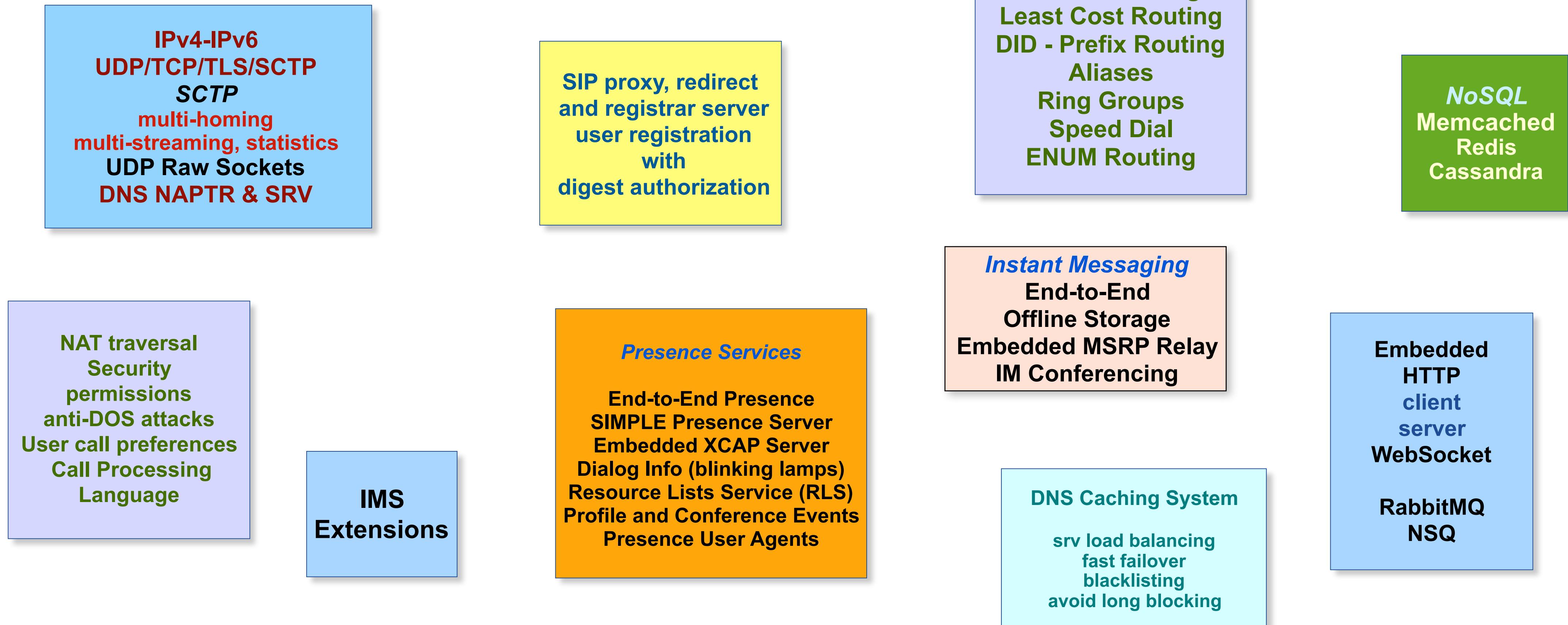
## Enhancements



- Lots of improvements to IMS/VoLTE extensions
- Latency statistics and routing for dispatcher (load balancer)
- Topology stripping (topos module)
- Many Redis-related additions, including cluster support, pipeline and backend for topos
- Stronger algorithms for authentication (SHA256)
- More elasticity for Kamailio nodes authentication - auth with keys (auth\_xkeys)
- Event API sockets - json based interaction with external apps - evapi module
- Asynchronous processing - suspend/resume routing SIP messages
- Optimizations for mobile networks - push notifications
- Distributed platforms - propagation among nodes for user location, dialogs, presence
- Message queues - DMQ, RabbitMQ, NSQ
- Refactored dispatcher (load balancer) internals: linked list replaced with AVL tree indexing, XAVPs instead of AVPs
- RTP recording and transcoding capabilities to **rtpengine**

# VoIP - VoLTE

## telephony for fixed and mobile networks



<https://www.kamailio.org/w/features/>

<https://www.kamailio.org/events/>

<https://www.youtube.com/channel/UCEIq4JNTPd7bs2vbfAAVJA/videos>

# Next Major Kamailio Release

v5.2.0

Autumn 2018



- One more month for development
- 6 to 8 weeks of testing
- Release
- New modules
  - acc\_json
  - app\_python3
  - app\_ruby
  - db\_redis
  - ims\_ipsec\_pcscf
  - pua\_json
- New features and improvements to existing modules
- KEMI enhancements

# Kamailio Developers Meeting

September 27-28, 2018

Dusseldorf, Germany

- Event for Kamailio developers
- Hosted by sipgate.de
- Facilitate interaction between the developers
- Offer a convenient environment for developers to work together on coding for Kamailio and its tools, improve documentation
- <https://www.kamailio.org/w/developers-meeting/>





THANK YOU!

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SEE YOU AT THE NEXT KAMAILIO WORLD CONFERENCE!  
SPRING 2019

Daniel-Constantin Mierla  
Co-Founder Kamailio Project  
@miconda  
[asipto.com](http://asipto.com)