Asynchronous SIP Routing
SIP Express Router (SER) and Kamailio (OpenSER)

SIP-Router.org

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Co-Founder Kamailio
asipto.com
Welcome to Kamailio (OpenSER) – the Open Source SIP Server

Kamailio (former OpenSER) is an Open Source SIP Server released under GPL, able to handle thousands of call setups per second. Among features: asynchronous TCP, UDP and SCTP, secure communication via TLS for VoIP (voice, video), SIMPLE instant messaging and presence, ENUM, least cost routing, load balancing, routing fail-over, accounting, authentication and authorization against MySQL, Postgres, Oracle, Radius, LDAP, XMLRPC control interface, SNMP monitoring. It can be used to build large VoIP servicing platforms or to scale up SIP-to-PSTN gateways, PBX systems or media servers like Asterisk™, FreeSWITCH™ or SEMS.

- Kamailio SIP Router at Google Summer of Code 2010
- SIP Router Devel Meeting, Berlin, June 8, 2010
- Listen VoIP User Conference – The SIP Router Project
- Remarks About v3.0.x Strong Stability
- January 11, 2010 – Kamailio (OpenSER) – New Major Version v3.0.0 Released
- September 01, 2009 – Kamailio awarded Best Open Source Networking Software 2009
Open source, GPL SIP server – IETF RFC3261
- Web: http://www.kamailio.org
- SourceForge Project: http://sourceforge.net/projects/openser/
- SIP Router Project: http://sip-router.org
Awarded

Best Open Source Networking Software

2009

By InfoWorld
Some of biggest VoIP deployments world wide

- 1&1 (members of the management board)
  - Over 3 millions subscribers
  - Over 1.5 billion minutes per month

- Sipgate

- Freenet
  - 0.8 million subscribers
  - Hundreds of millions of minutes per month

http://www.kamailio.org/w/references/
Features

- **SIP proxy, redirect and registrar server**
- **User registration with digest authorization**
- **Customizable routing policy**
- **User location service IPv4-IPv6**
- **UDP/TCP/TLS/SCTP**
- **SIP translator**
- **Instant Messaging Offline message service**
- **Presence server**
- **ENUM lookup support**
- **Advanced routing (dispatching and LCR)**
- **Dialing support aliases and speeddial**
- **Multi-domain support LDAP/H.350 support**
- **Plug in module interface Perl programming interface**
Features

OSP support for peering
Java SIP Servlet
programming interface

Link any application to Kamailio using
FIFO/UNIXSOCK/DATAGRAM/XMLRPC interfaces

Database API
MySQL
PostgreSQL
UNIXODBC
BERKELEYDB
ORACLE
Text files
RADIUS

Gateway
SMS
XMPP

Accounting through log file,
database or Radius/DIAMETER
servers

NAT traversal
Security
permissions
anti-DOS attacks
User call preferences
Call Processing
Language
New in 3.0.0

Released January 11, 2010
3.0 Releases

MODULES_K
- acc
- auth
- auth_db
- dispatcher
- dialog
- Kex
- msilo
- presence
- pua
- registrar
- rr
- sl
- usrlloc
- xlog
- ...
- (over 80 modules)

MODULES
- TM
- app_lua
- auth_identity
- avpops
- db_mysql
- db_postgres
- debugger
- dialplan
- enum
- geoiip
- lcr
- sanity
- tls
- topoh
- ...
- (over 25 modules)

MODULES_S
- acc_db
- auth
- auth_db
- avp
- dispatcher
- dialog
- exec
- msilo
- pdt
- registrar
- rr
- sl
- usrlloc
- xlog
- ...
- (over 50 modules)

SIP Express Router (SER)
- CORE
  - SIP Parser – Memory Manager – Locking
  - Cfg Parser & Interpreter
  - Timer API – Module Interface

Kamailio (OpenSER)
- LIBS
  - DB1 – DB2 – KCore
  - MI – CDS
Improving architecture
New in 3.0.0

- Asynchronous TCP
  - several ten thousands of TCP connections

- Number Portability
  - customizable policies
  - caching system

- SCTP
  - multi-homing
  - multi-streaming
  - statistics

- Topology hiding
  - fast and secure
  - no session dependency

- Web & CLI Tools
  - SIREMIS
  - SERCMD
New in 3.0.0

DNS Caching System
- fast failover
- blacklisting
- avoid blocking

CFG Reload Framework
- update global parameters at runtime

XMLRPC
- scalable control
- interface
- secure

Memcached connector
- data distribution across many instances

CFG Optimizations
- operations - operators
- switch - break - while
New in 3.0.0

- **CFG Directives**
  - include
  - define

- **Transport layer**
  - UDP MTU fallback
  - scalable TLS

- **Auth Identity**
  - RFC4474

- **New routing blocks**
  - onsend route
  - event route

- **Async SIP Message Processing**
  - suspend - process - resume
### Accounting Table

<table>
<thead>
<tr>
<th>Time</th>
<th>SIP Method</th>
<th>Src Username</th>
<th>Src Domain</th>
<th>Dst Username</th>
<th>Dst Domain</th>
<th>SIP Call-ID</th>
<th>SIP Reply Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-01-21 14:47:36</td>
<td>INVITE</td>
<td>bob</td>
<td>asipto.com</td>
<td>alice</td>
<td>192.168.1.23</td>
<td>684598749@192.168.1.5</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 14:47:56</td>
<td>INVITE</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>1142159929@192.168.1.23</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 14:55:41</td>
<td>BYE</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>684598749@192.168.1.5</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 14:55:41</td>
<td>ACK</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>1142159929@192.168.1.23</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 14:56:03</td>
<td>BYE</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>1142159929@192.168.1.23</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 15:29:38</td>
<td>INVITE</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>1553149770@192.168.1.23</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 15:29:38</td>
<td>ACK</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>1553149770@192.168.1.23</td>
<td>200</td>
</tr>
<tr>
<td>2009-01-21 15:31:40</td>
<td>BYE</td>
<td>bob</td>
<td>asipto.com</td>
<td>alice</td>
<td>192.168.1.23</td>
<td>1553149770@192.168.1.23</td>
<td>200</td>
</tr>
</tbody>
</table>

### CDRS

<table>
<thead>
<tr>
<th>Id</th>
<th>Src Username</th>
<th>Src Domain</th>
<th>Dst Username</th>
<th>Dst Domain</th>
<th>Call Start Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>alice</td>
<td>asipto.com</td>
<td>bob</td>
<td>192.168.1.5</td>
<td>2009-01-21 14:55:41</td>
<td>22</td>
</tr>
</tbody>
</table>
Processed 935 records.

User Agents

- asterisk: 231

SERCMD

```
Terminal — ssh — 80×25

?                 | ctl.who            | dst_blacklist_mem_info
cfg.commit        | dns.add_a          | exit
cfg.diff          | dns.add_aaaa       | help
cfg.get           | dns.add_srv        | license
cfg.help          | dns.debug          | list
cfg.list          | dns.debug_all      | listen
cfg.rollback      | dns.delete_a       | ls
cfg.set_delayed_int| dns.delete_aaaa    | mi
cfg.set_delayed_string | dns.delete_all | mi dg
cfg.set_now_int   | dns.delete_cname   | mififo
cfg.set_now_string| dns.delete_ebl      | mi_xmlrpc
core.arg          | dns.delete_naptr   | ps
core.echo         | dns.delete_ptr     | quit
core.kill         | dns.delete_srv     | server
core.printi       | dns.delete_txt     | serverversion
core.prints       | dns.lookup         | system.listMethods
core.ps           | dns.mem_info       | system.methodHelp
core.pwd          | dns.view           | system.methodSignature
core.sctp_info    | dns_debug          | tm.cancel
core.sctp_options | dns_debug_all      | tm.hash_stats
core.shmmem       | dns_mem_info       | tm.reply
core.tcp_info     | dst_blacklist.add  | tm.stats
core.tcp_options  | dst_blacklist.debug| tm.t_uac_start
core.uptime        | dst_blacklist.delete_all | tm.t_uac_wait
--More--
```
```
sercmd> core.tcp_options
{
    connect_timeout: 10
    send_timeout: 10
    connection_lifetime: 120
    max_connections(soft): 2048
    no_connect: 0
    fd_cache: 1
    async: 1
    connect_wait: 1
    conn_wq_max: 32768
    wq_max: 10485760
    defer_accept: 0
    delayed_ack: 1
    syncnt: 0
    linger2: 0
    keepalive: 1
    keepidle: 0
    keepintvl: 0
    keepcnt: 0
    crlf_ping: 1
    accept_aliases: 0
    alias_flags: 1
    new_conn_alias_flags: 2
}
```
New in 3.0.0

http://www.kamailio.org/dokuwiki/doku.php/features:new-in-3.0.x
http://www.kamailio.org/w/kamailio-openser-v3.0.0-release-notes/
New in Development
3.1.0

Autumn 2010
New in devel (upcoming 3.1.0)

- Config Preprocessor Directive
- Embedded Lua
- Tree Caching System
- SIP Registration to Remote Servers
- New Traffic Shaping Module
- Config Message Queuing System
- Embedded Python
- GeoIP API
- SIP Registration to Remote Servers
New in devel (upcoming 3.1.0)

- Load Balancing weight call load
- Interactive Config Debugger
- Config Parameters Reload Framework
- Embedded HTTP & XCAP Server
- Asynchronous TLS
- Reason Header for CANCEL
- XLOG Enhancements line, file
New in devel (upcoming 3.1.0)

Asynchronous SIP Routing
Asynchronous TCP

- present in 3.0.x (latest stable)
  - Issues solved
    - blocking the SIP worker process
    - opening a connection
    - sending data
  - Configuration as easy as:
    - tcp_async = yes
  - Benefits
    - increased processing capacity over TCP
    - better handling of traffic for IM and Presence
    - transparent for modules and config file functions
    - integrated with DNS blacklisting
Asynchronous TCP and TLS for SIP Routing

- worldwide - you can get them only with Kamailio and SER

- in code tree GIT repository (ready for upcoming 3.1.0)
  - Same benefits as for asynchronous TCP
    - asynchronous TCP implies asynchronous TLS
    - same config parameter: tcp_async=yes

- Extra
  - increased capacity of handling secure communication
Asynchronous SIP Message Processing

- present in 3.0.x (latest stable)
  - default message processing
    - receive - process - forward/reply
  - new possibility of message processing
    - receive - process - suspend - do something else - resume - forward/reply
- requirements
  - transaction management module (tm)
- example
  - call comes in, authenticate user, then send a request to billing engine to authorize the call
  - suspend handling the invite (park it), process other SIP requests
  - when billing engine replies, resume INVITE processing and allow or deny the call
Asynchronous SIP Message Processing

T1
-------------------
KAMAIALIO PROCESS A

READ SIP MESSAGE
INVITE X IN
INVITE X INITIAL PROCESSING
SUSPEND INVITE X
OPTIONS Y OUT
READ SIP MESSAGE

T2 = T1 + N1
-------------------
KAMAIALIO PROCESS B

READ SIP MESSAGE
OPTIONS Y REPLY IN
RESUME INVITE X
INVITE X COMPLETING PROCESSING
READ SIP MESSAGE

T3 = T2 + N2
Config Message Queuing System

- in code tree GIT repository (ready for upcoming 3.1.0)
  - New module: mqueue
    - multiple message queues
    - message: (key, body)
  - Features
    - inter-process communication
    - SIP worker process can send commands to timer worker
  - Examples
    - **SIPWEEET**
      - send notifications to Twitter (see my other talk @18:00)
    - email on various events
Questions?

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http://www.asipto.com
http://www.kamailio.org
http://sip-router.org