

kamailio

sip servers everywhere

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@miconda

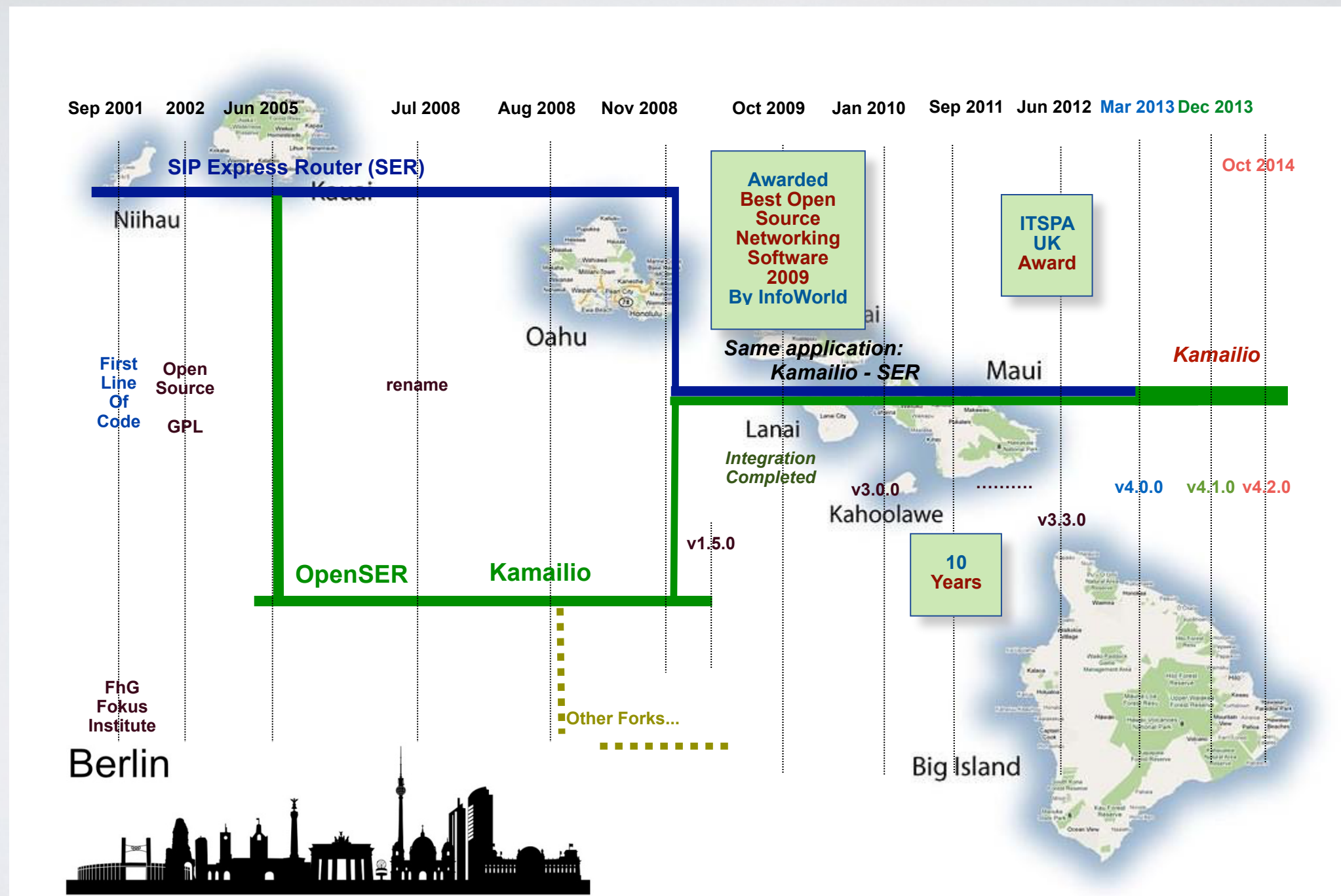
www.asipto.com

www.kamailio.org



WHOIS KAMAILIO

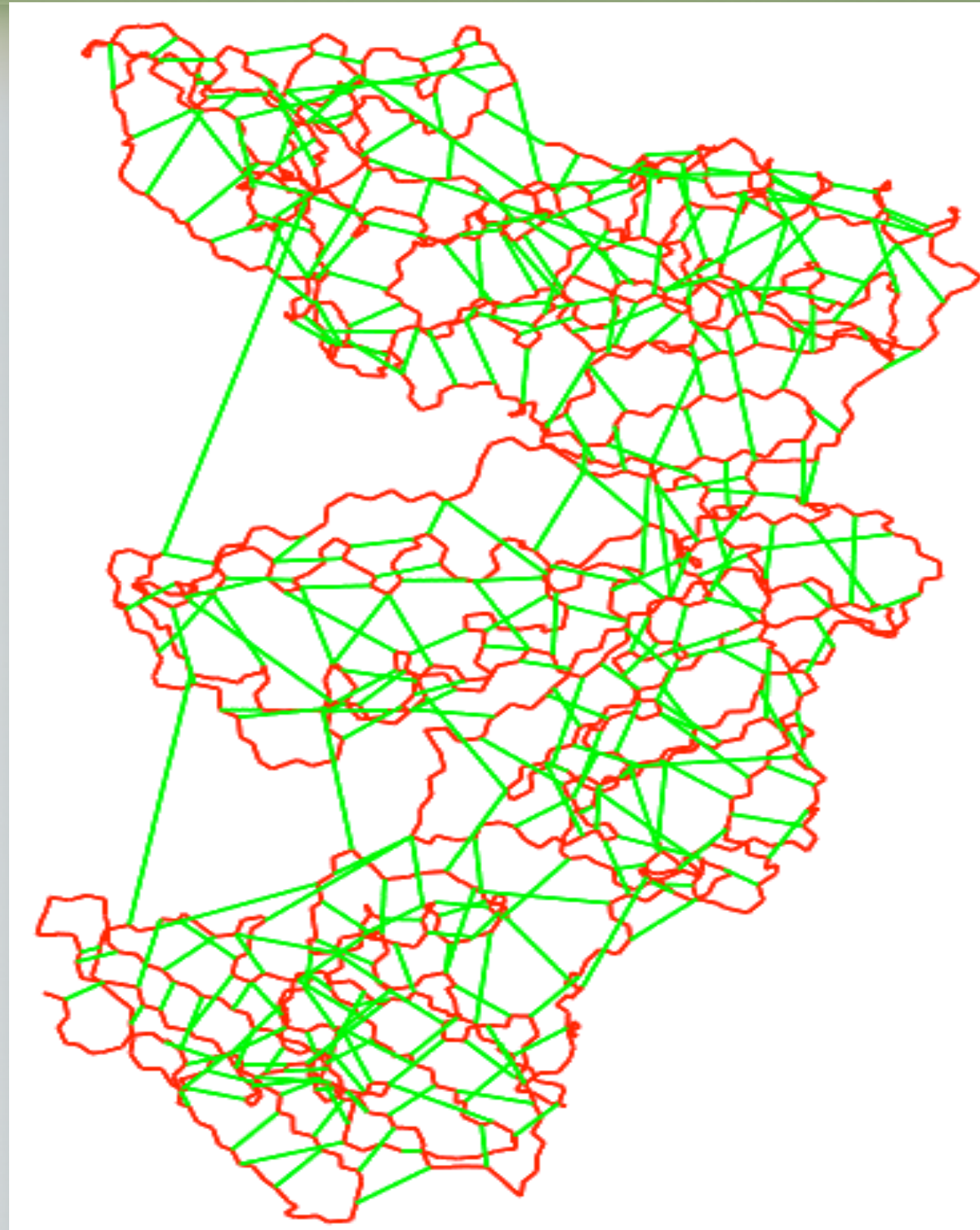
Let's Speak SIP = E Kama'ilio SIP



credits to @voicegal - theivrvoice.com

GROUND ZERO

- SIP signalling routing
 - fast
 - reliable
 - flexible
- In other words
 - not initiating calls
 - not answering calls
 - no audio-video processing



DON'T PANIC

Real Time Communications

multimedia

- **telephony**
- **video conferences**
- **file transfer**
- **desktop sharing**
- **gaming**

notifications

- **instant messaging**
- **presence**
- **alerts**
- **monitoring**
- **mobility**

INTER-NET-WORKING

Real Time Communications

multimedia

- telephony
- video conferences
- file transfer
- desktop sharing
- gaming

Internet of Humans

notifications

- instant messaging
- presence
- alerts
- monitoring
- mobility

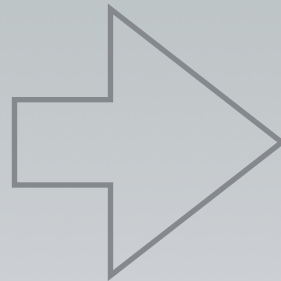
Internet of (Every) Things

THE INVISIBLE SIGNALLING

Real Time Communications

you get

- telephony
- video conferences
- file transfer
- desktop sharing
- gaming



on the net

- Registrations
- Authentication challenges
- NAT keepalives
- Servers monitoring
- Gateway hunting
- Re-routing
- Session updates

THE IMPACT OF SIGNALLING

typical day for a person

morning
at
home

work
not at
home

evening
at
home

going out with friends is work duty

THE IMPACT OF SIGNALLING

typical home phone activity

morning
3–5
calls

work
0–2
calls

evening
3–5
calls

no football game last evening

SIP CALL SIGNALLING



SIP REGISTRATION SIGNALLING



THE IMPACT OF SIGNALLING

a day on the wire

user actions

12 msg x 10 (calls)

120

device actions

4 msg x 24 (regs)
6 msg x 60 x 24 (ka)

8736

8856

SIP SIGNALLING

taking over facebook subscriber base



msgs/day

$$1\ 000 \times 9\ 000 = 9\ 000\ 000$$

...

$$1\ 000\ 000 \times 9\ 000 = 9\ 000\ 000\ 000$$

SIP SIGNALLING

taking over facebook subscriber base



estimated bandwidth / day

1000 phones: $9\,000\,000 \times 1\text{kB} = \sim 9\text{GB}$

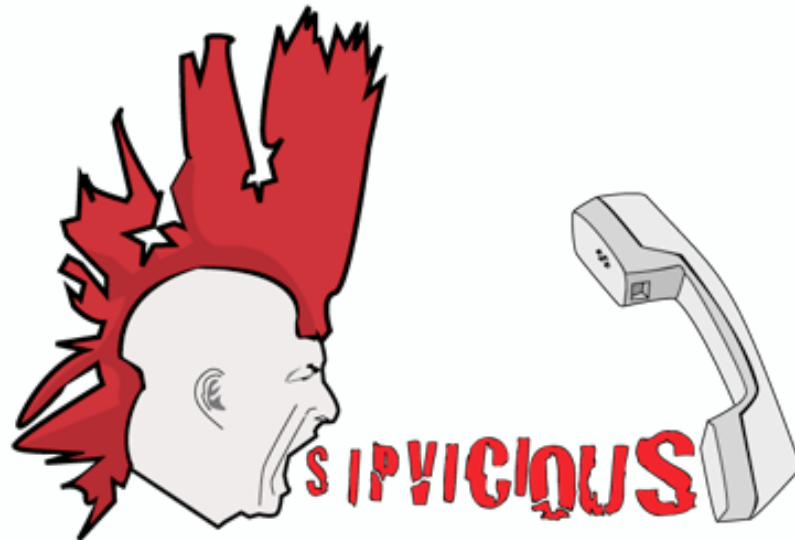
...

1000000 phones: $9\,000\,000\,000 \times 1\text{kB} = \sim 9\text{TB}$

FORGETTING ANYONE?

SIP SIGNALLING

your *friendly* scanners



extra traffic

100 requests/seconds => 200 messages/second

$200 \times 60 \times 60 \times 24 = 17\,280\,000$ msgs/day

17GB/day

SIGNALLING REMARKS

can be a significant source of processing
(both network and application layer)

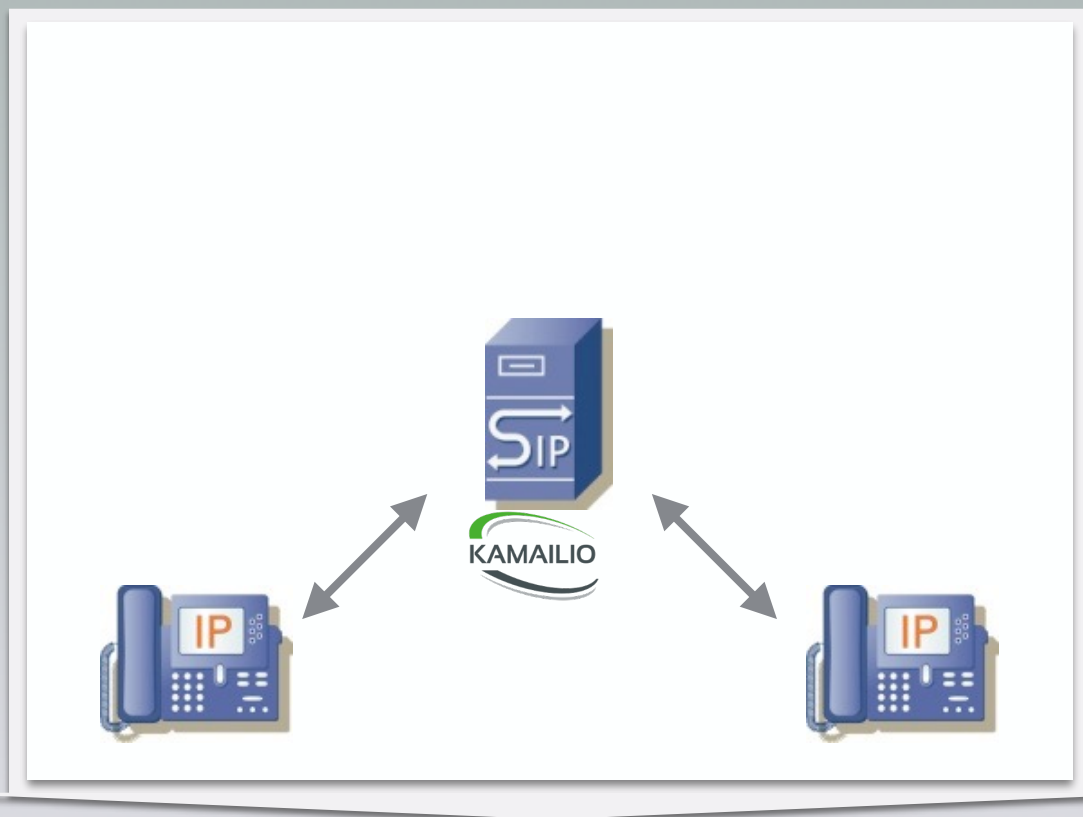
can be a lot even with small subscriber base
(your online *friends* don't let you rest)

numbers estimated for very basic usage model
(imagine instant messaging, presence, mwi, blf, ...)

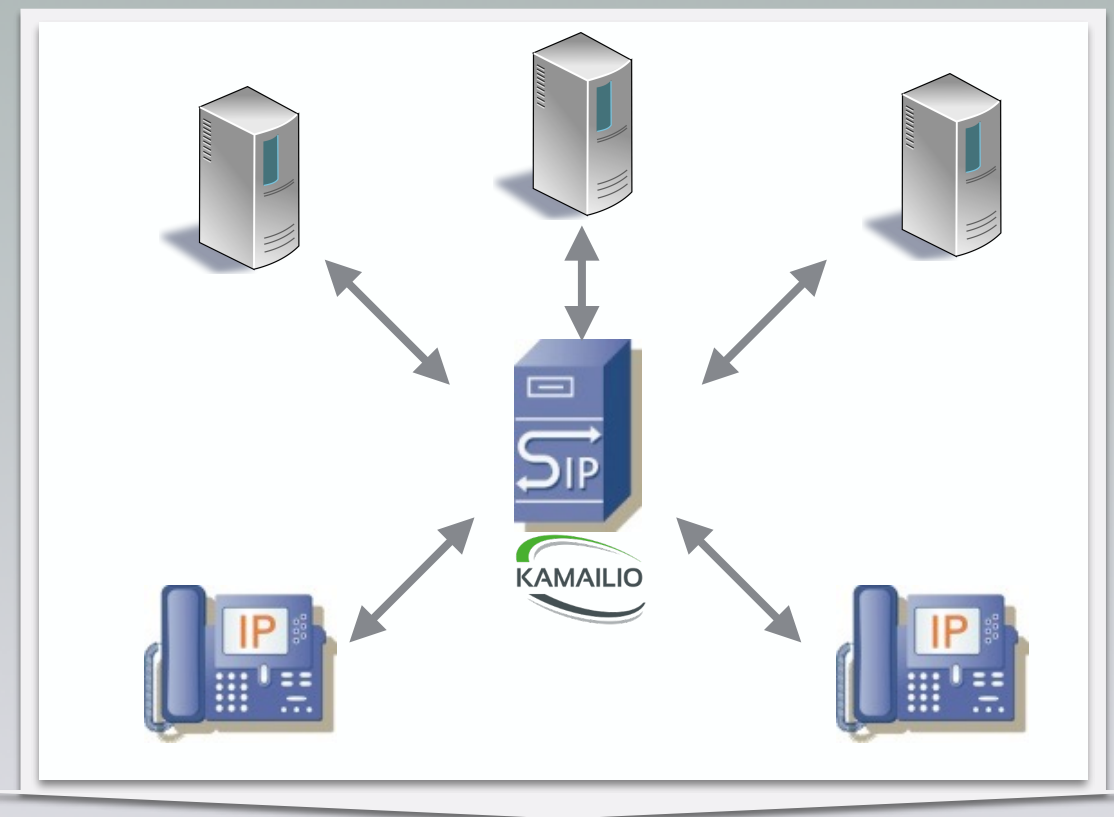
SIP SERVERS EVERYWHERE

TWO BASIC ARCHITECTURES

main signalling server



edge signalling server



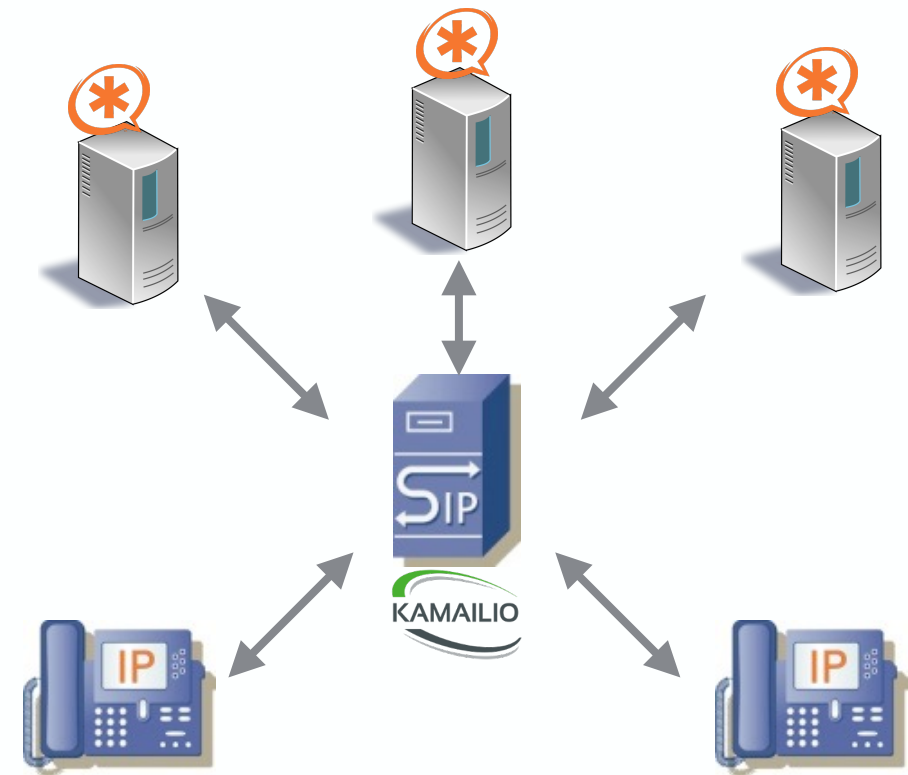
LOAD BALANCER

dispatcher module

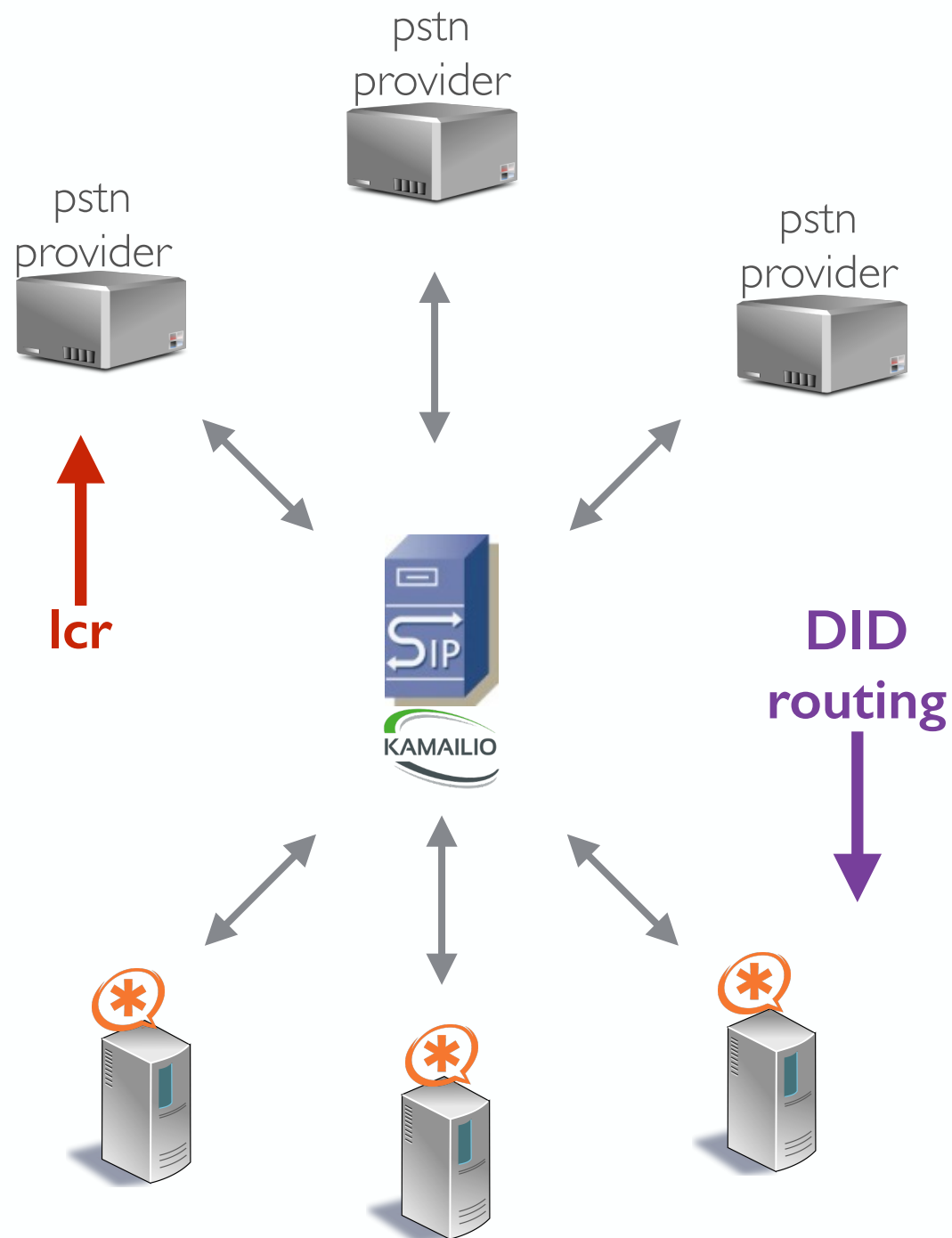
- list of balancing nodes from file or database
- monitoring of nodes (activate/inactivate automatically)
- re-route in case of failure
- various algorithms: hashing, weight distribution, round robin, call load distribution, priority routing
- reload list of nodes without restart

```
# Dispatch requests
route[DISPATCH] {
    # round robin dispatching on gateways group 'I'
    if(!ds_select_dst("I","4")) {
        send_reply("404", "No destination");
        exit;
    }
    xdbg("--- SCRIPT: going to <$ru> via <$du>\n");
    t_on_failure("RTF_DISPATCH");
    route(RELAY);
    exit;
}

# Re-route in case of failure
failure_route[RTF_DISPATCH] {
    if (t_is_canceled()) {
        exit;
    }
    # next node - only for 500 or local timeout
    if (t_check_status("500") || (t_branch_timeout() && !t_branch_replied())) {
        if(ds_next_dst()) {
            t_on_failure("RTF_DISPATCH");
            route(RELAY);
            exit;
        }
    }
}
}
```



LEAST COST OR DID ROUTING



plenty of options

- lcr module
- carrieroute module
- prefix_route module
- drouting module
- combinations: mtree + dispatcher

```
route[LCR] {
    if (!load_gws("l")) {
        send_reply("503", "Error loading gateways");
        exit;
    }
    if (!next_gw()) {
        send_reply("503", "No available gateways");
        exit;
    }
    t_on_failure("RTF_LCR");
    route(RELAY);
    exit;
}

# Re-route in case of failure
failure_route[RTF_LCR] {
    if (t_is_canceled()) {
        exit;
    }
    # next node - only for 500 or local timeout
    if (t_check_status("500") || (t_branch_timeout() && !t_branch_replied())) {
        if(next_gw()) {
            t_on_failure("RTF_LCR");
            route(RELAY);
            exit;
        }
    }
}
```

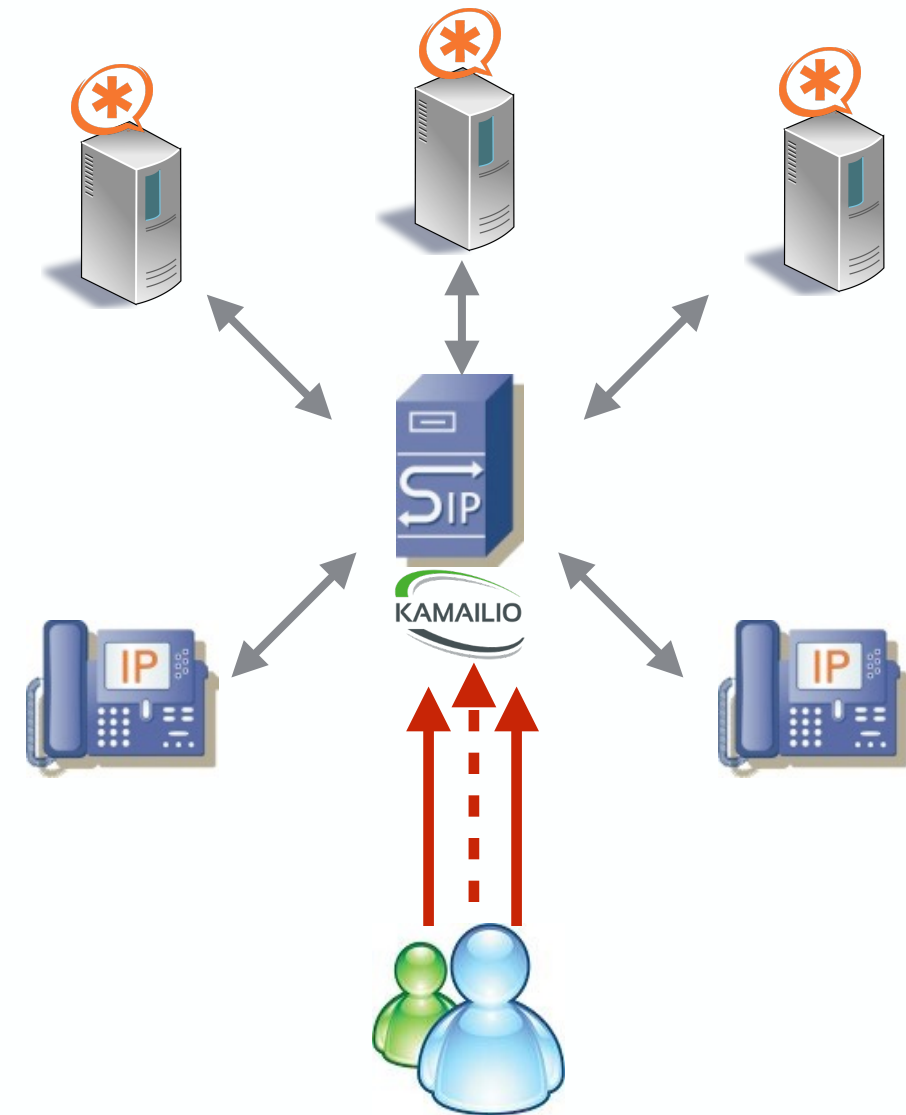
SIP FIREWALL

block DOS or dictionary attacks

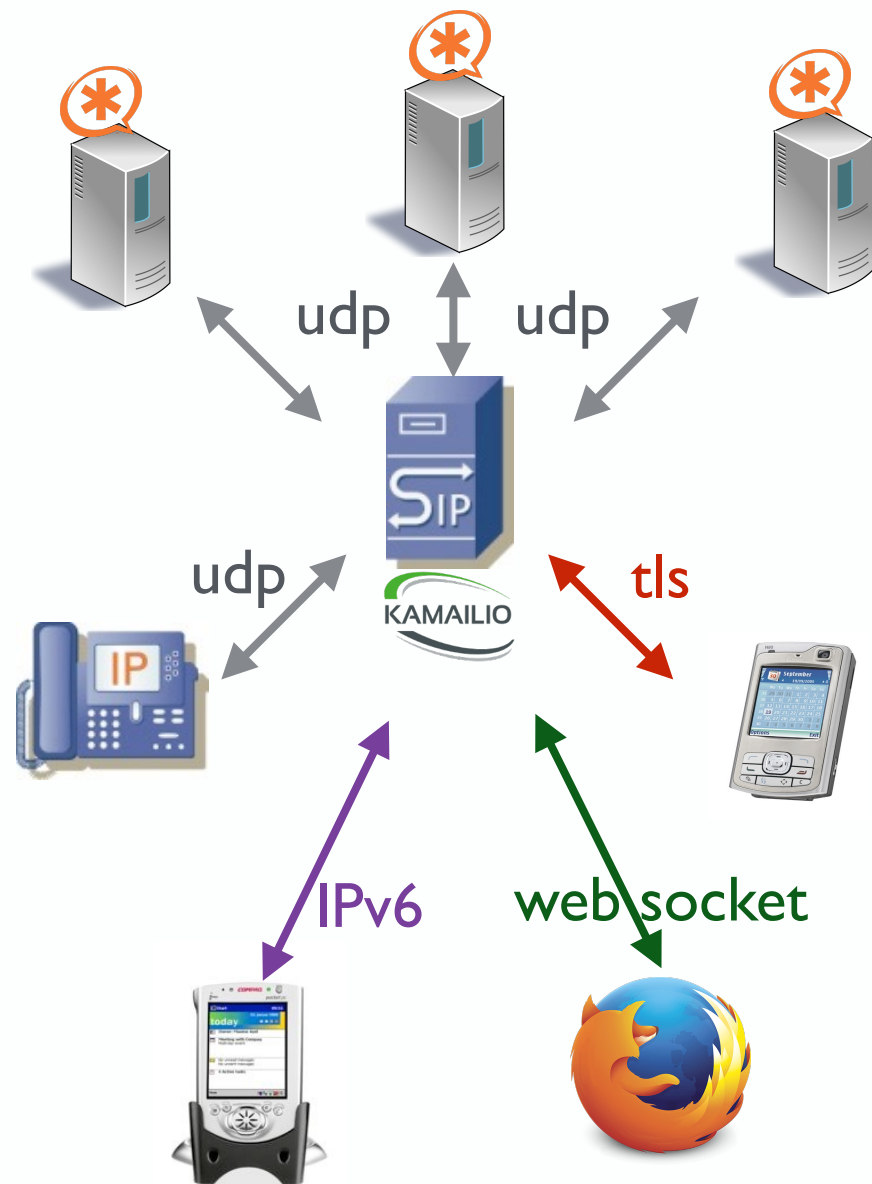
part of default kamailio.cfg

- htable module
- pike module
- detect high volume of traffic from same source and block it for a specific interval of time

```
# ip ban htable with autoexpire after 5 minutes
modparam("htable", "htable", "ipban=>size=8;autoexpire=300;")
...
route[SAFEGUARD] {
    # flood detection from same IP and traffic ban for a specific interval
    # be sure you exclude checking trusted peers, such as pstn gateways
    # - local host excluded (e.g., loop to self)
    if(src_ip!=myself) {
        if($sht(ipban=>$si)!=null) {
            # ip is already blocked
            xdbg("request from blocked IP - $rm from $fu (IP:$si:$sp)\n");
            exit;
        }
        if (!pike_check_req()) {
            xlog("ALERT: pike blocking $rm from $fu (IP:$si:$sp)\n");
            $sht(ipban=>$si) = 1;
            exit;
        }
    }
    if($ua =~ "friendly-scanner") {
        sl_send_reply("200", "OK");
        exit;
    }
}
```



TRANSPORT LAYER GATEWAY



core and tm module

- set transport in R-URI or outbound proxy address
- force transport via dedicated function

bridging networks

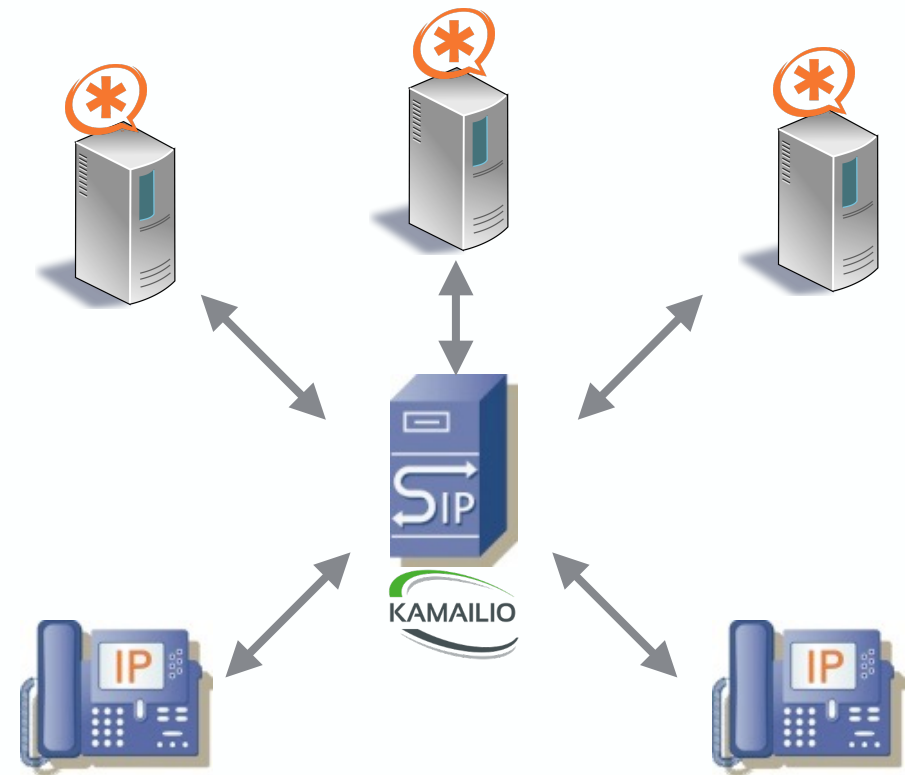
- public to private networks and back
- IPv4 to IPv6 and back
- any transport layer to another one and back

```
# Force UDP
route[TOUDP] {
    # round robin dispatching on gateways group 'I'
    record_route();
    $du = "sip:nexthop.com:5060;transport=udp";
    force_send_socket("udp:10.1.1.10:5080");
    route(RELAY);
    exit;
}
```

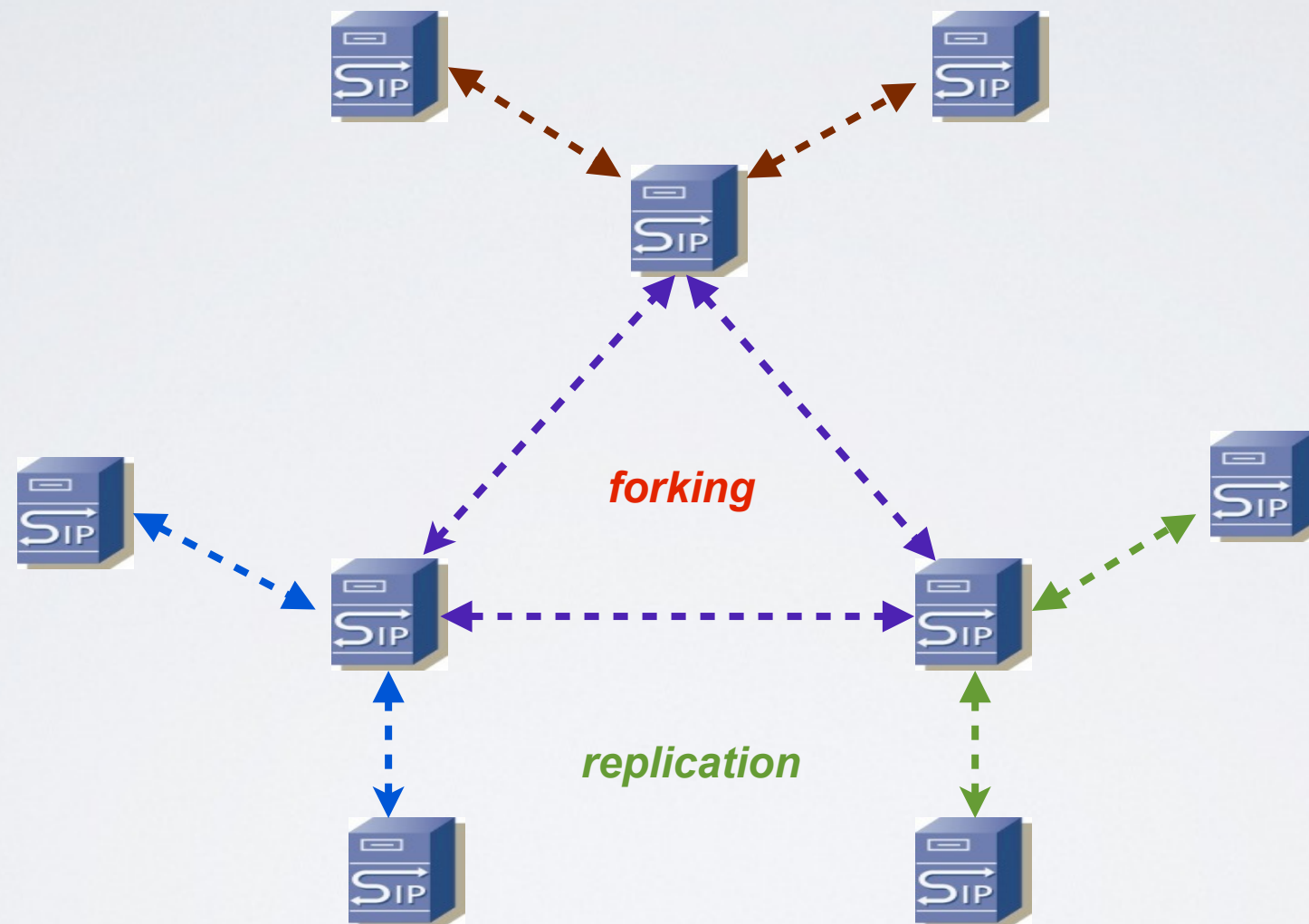
OFFLOAD SIGNALLING PROCESSING

edge proxy

- authentication
- nat traversal
- parallel forking
- serial forking
- call forwarding
- call blocking
- white/black listing
- DNS handling



DESIGNED FOR SCALABILITY



EXTRA FEATURES

plenty at signalling layer

- instant messaging
- presence
- gaming
- notifications

additional functions

- embedded XCAP server
- embedded MSRP relay
- IMS

extensibility

- define your new request types
- flexibility in handling unknown requests, headers, etc.



TO CONCLUDE

SUITABLE FOR

lot of subscribers

lot of traffic (good or bad)

innovation

personal usage

FEATURES

IPv4
IPv6 (since 2002!)
UDP/TCP/TLS/SCTP
SCTP
multi-homing
multi-streaming, statistics
UDP Raw Sockets
DNS NAPTR & SRV

Plug-in Module Interface
(about 200)
Scripting Config Language

Embedded Interpreters
Lua, Perl
Mono (C# and the rest)
Python, Java

Focus

Stability
High Performances
Strong Security
Innovation

WebSocket
(WebRTC)

IMS
OMA

Load Balancing
Least Cost Routing
DID - Prefix
Routing
Aliases
Ring Groups
Speed Dial
ENUM Routing

SQL Backends
MySQL
PostgreSQL
SQLite
UNIXODBC
ORACLE
Text Files

Presence Services
Instant Messaging
Embedded XCAP Sever
Embedded HTTP Client & Server
Embedded MSRP Relay

NoSQL Backends
Memcached
Redis
Cassandra
MongoDB

Control API

XMLRPC
JSONRPC
Event API

Asynchronous Processing
TCP - TLS
SIP Request Processing
Config Route Block Execution
Suspend-Resume Transactions

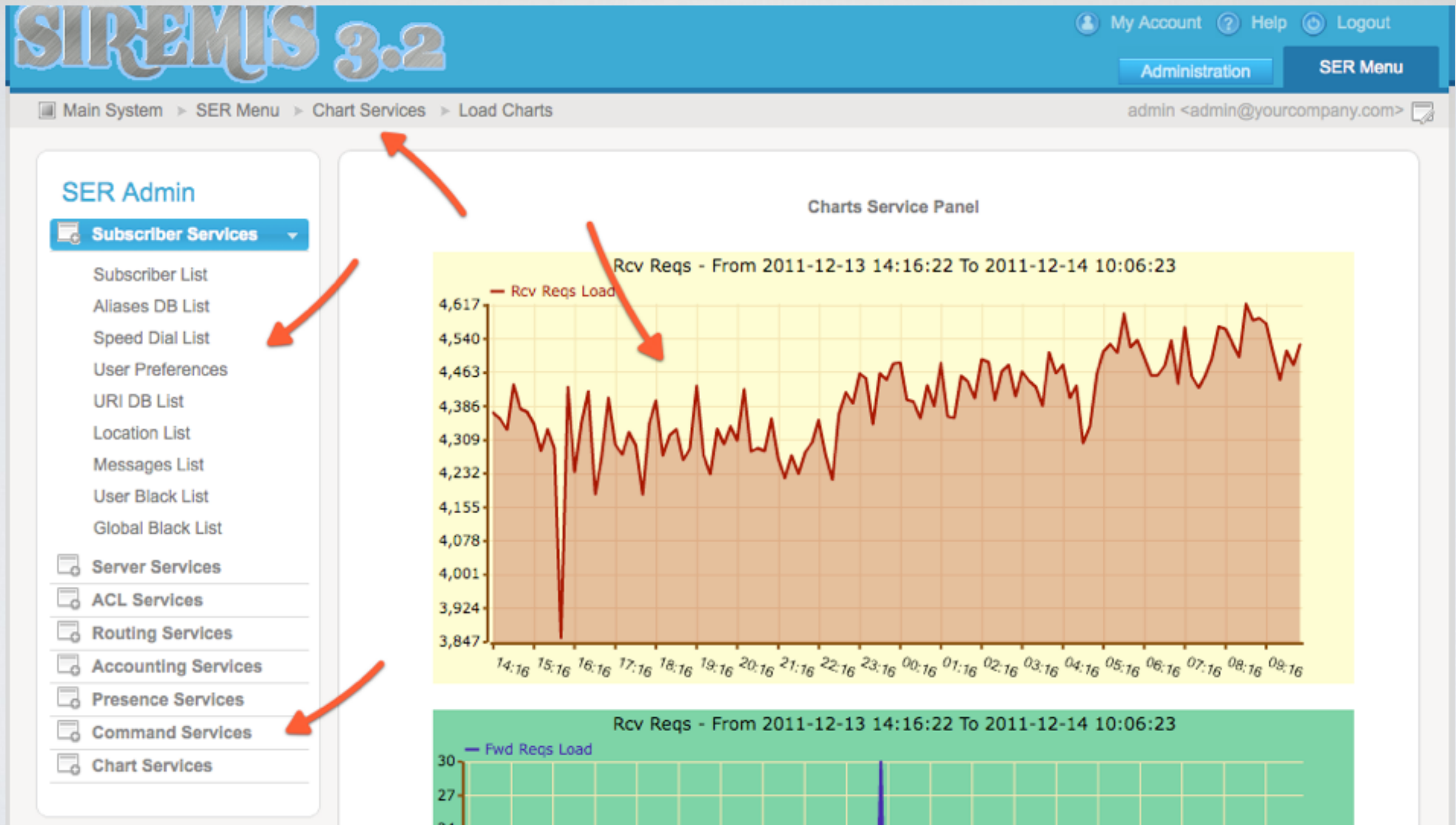
2014 HIGHLIGHTS



V4.2.0 released on Oct 16, 2014

<http://www.kamailio.org/wiki/features/new-in-4.2.x>

SIREMIS WEB INTERFACE



OUT OF THE BOX

open source options

- sip:provider CE
- Elastix 3.0
- Kazoo
- Plivo



www.kamailioworld.com

Thank You!

Questions?

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www.asipto.com

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