KAMAILIO

The open source SIP Server

EVOLUTION

almost 20 years of development

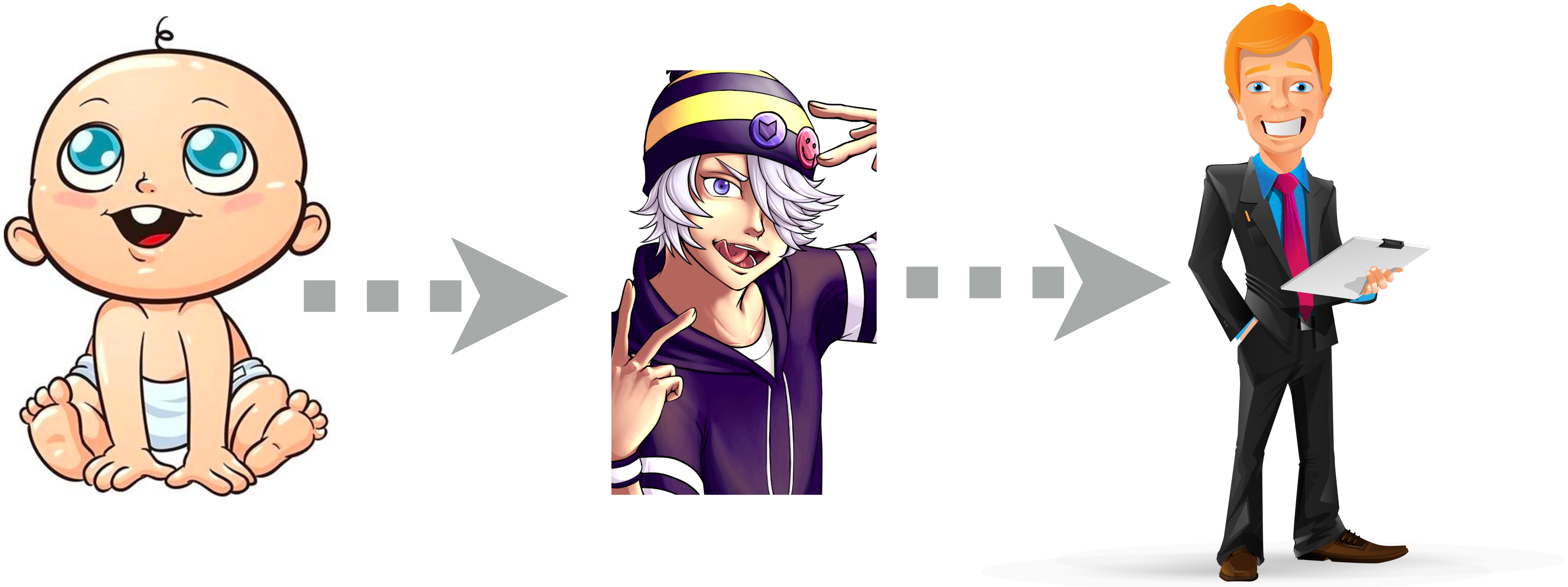
janUScon

September 2019
Naples, Italy

Daniel-Constantin Mierla
Co-Founder Kamailio Project
www.asipto.com
@miconda

KAMAILIO

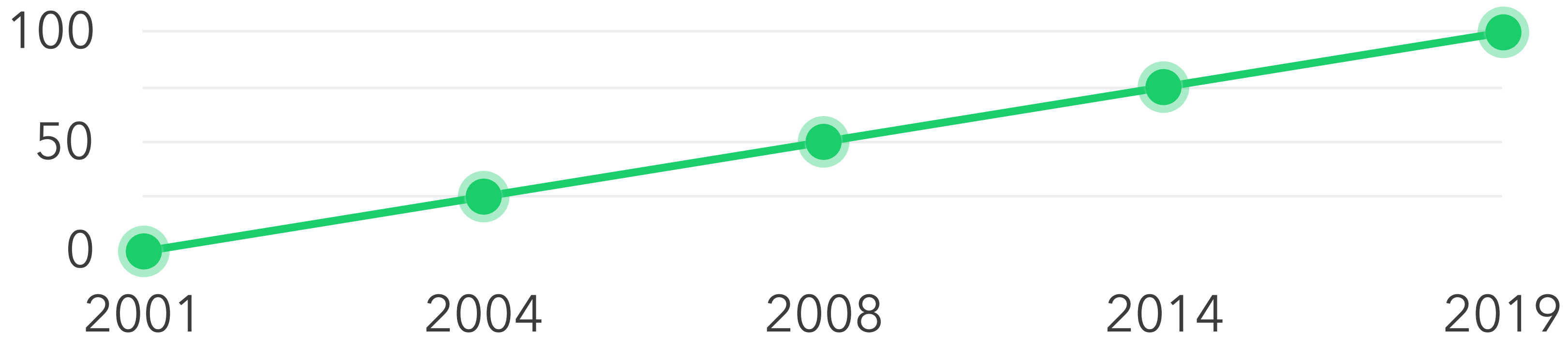
born in 2001



Federating from day 0
IPv6 since 2002
WebSocket since 2012

RFC3261 released in June 2002

Evolution



over 18 years of development

KAMAILIO

Market has transformed
People have changed
Technology has evolved
Demands have increased
Expectations are bigger

leveraging the past to build the future

Four Eras

1

Static

2001-2005

Static configuration
Precompiled routing

2

Dynamic

2005-2008

Variables
Transformations

3

Async

2008-2014

Suspend and resume
Non-blocking TCP/TLS

4

Apps

2014-

API-based routing
Beyond telephony

And So It Begun

```
commit 512dcd9838f5aeb0bfccd02cfc156067b7f02b71
Author: Andrei Pelinescu-Onciul <andrei@iptel.org>
Date:   Mon Sep 3 21:27:11 2001 +0000

    Initial revision
```

```
commit 888ca09df8523374cc59514abc3d3841c949b2c5
Author: Andrei Pelinescu-Onciul <andrei@iptel.org>
Date:   Tue Sep 4 01:41:39 2001 +0000

    parser seems to work
```

```
commit e60a9728a5e49126361431bb42080b45ef9036bc
Author: Andrei Pelinescu-Onciul <andrei@iptel.org>
Date:   Tue Sep 4 20:55:41 2001 +0000

    First working release
```

Born
in
Berlin

Fraunhofer
FOKUS

1st module: print (sample)

2nd module: textops

3rd module: tm

the next ones: auth, mysql, usrloc

Alice … talking with … Bob

- Project Name: SIP Express Router (SER)
- the times of sip routing gun machine
  - sip in, sip out, at very high rate - simply connecting endpoints
  - static rules in kamailio config, no variables, only core keywords
  - database for authentication and backup for restarting location service

Business & Money

- Development investment - easy
  - most of major developers were employed
  - salaries paid by research institute
- Use cases
  - research and academic projects
  - IETF reference testing
  - early stage production usage

Community & Collaboration

- Getting to know each other
  - first external contributions
  - radius, rtpproxy, …
- Developers very protective
  - Each one controlling its core components and modules

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Services start differentiating - New specific needs

- Project Name: OpenSER (fork of SER)
- When the dollars invaded the configuration files
  - but they were only (pseudo-)variable
  - focus on flexibility (variables, transformations), load balancing, least cost routing, presence, instant messaging and security
  - more SQL oriented backends - sqlite, unixodbc, oracle, …

Business & Money

- FhG Fokus sold the exclusive licensing rights
  - Many core developers went to the new company
  - Open source project turned into OpenSER
- Business eco-system getting a shape
  - companies offering IP telephony with Kamailio
  - companies offering professional services for Kamailio
  - companies building integrated platforms on top of Kamailio

Community & Collaboration

- Open source project left without the founding entity
  - Fork of SER to OpenSER
  - Community trying to do self management around a few major contributors
- Development shifted to a more open approach
  - New developers joining the collaboration team
  - Contributions were booming during the 4 years time frame

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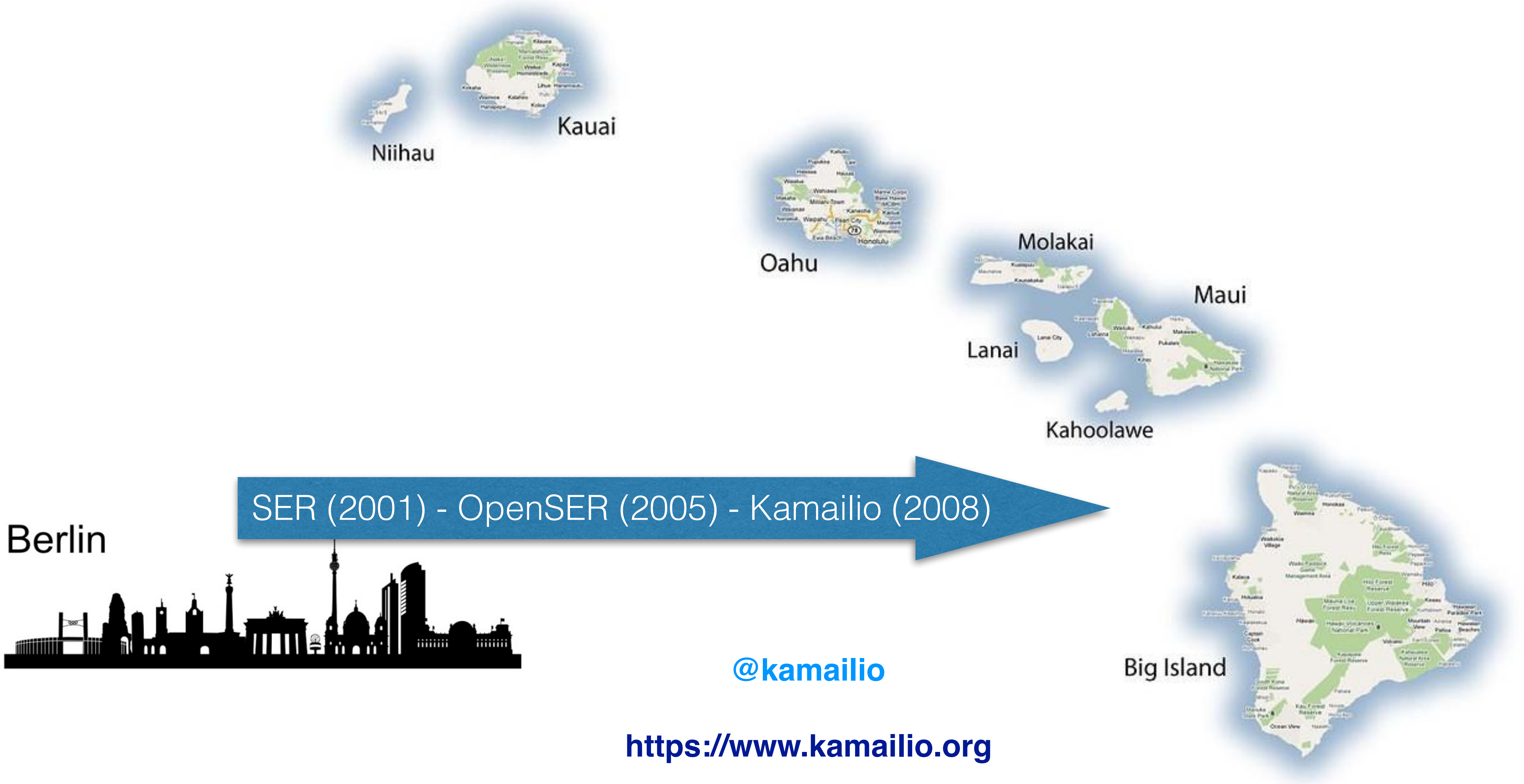
Mobile Devices - Beyond Classic Telephony

- Project Name: Kamailio (rename of OpenSER, trademark issue)
- When endpoints shifted to our pockets
  - Asynchronous TCP, TLS and SIP routing
  - focus on async processing, IMS extensions, integration with external systems via HTTP/REST APIs or event API
  - no-SQL backends - mongodb, redis

LET'S SPEAK SIP = E KAMA'ILIO SIP

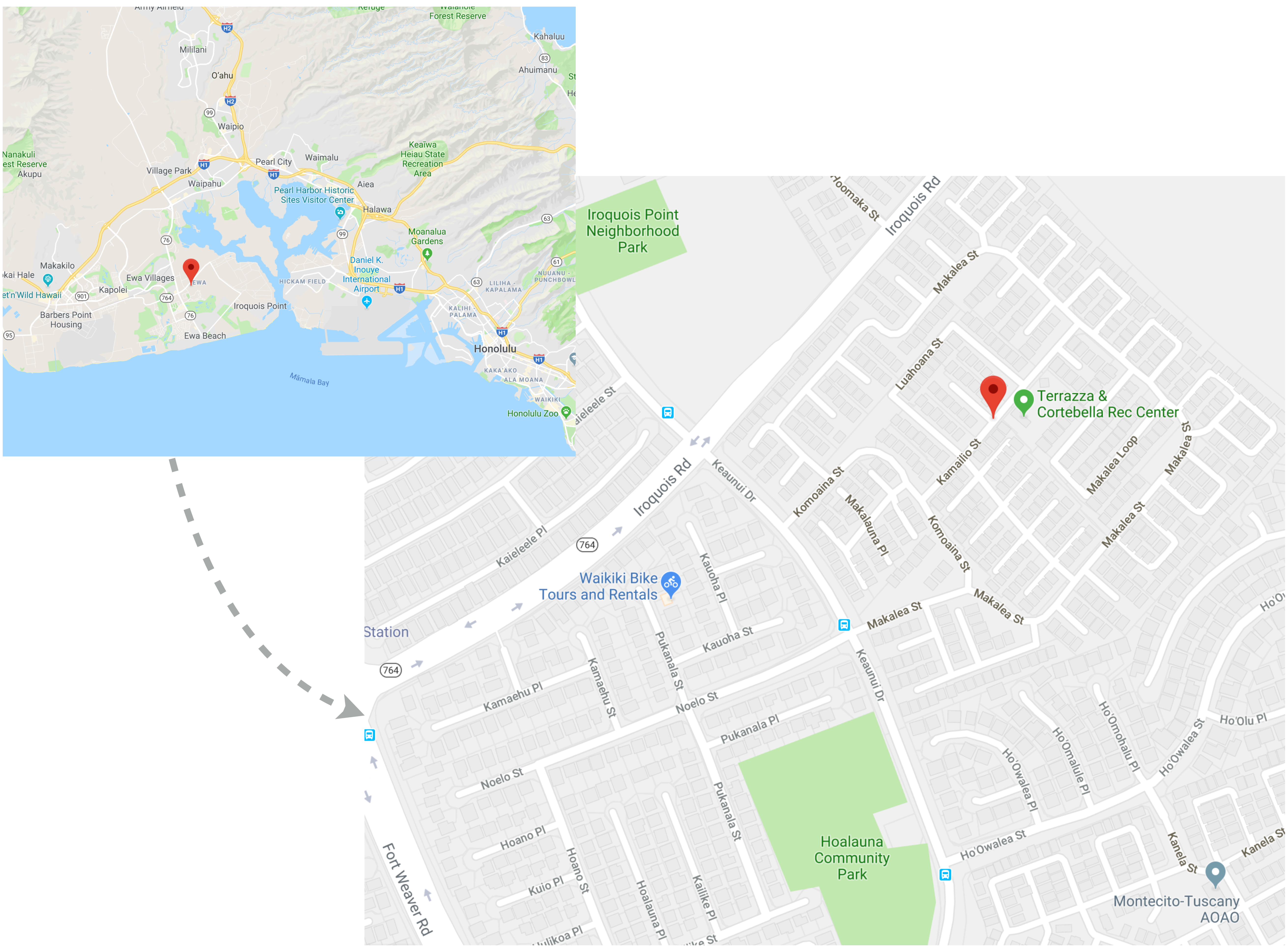


SER (2001) - OpenSER (2005) - Kamailio (2008)

@kamailio

https://www.kamailio.org

KAMAILIO


Mililani
O'ahu
Waipio
Nanakuli Forest Reserve
Akupu
Village Park
Waipahu
Pearl City
Waimalu
Aiea
Keaīwa Heiau State Recreation Area
Pearl Harbor Historic Sites Visitor Center
Halawa
Moanalua Gardens
Daniel K. Inouye International Airport
Hickam Field
Makakilo
Kapolei
Ewa Villages
Ewa
Iroquois Point
Barbers Point Housing
Ewa Beach
Honolulu
Kalihi - Palama
Liliha - Kapalama
Nuuanu - Punchbowl
Kaka'ako
Ala Moana
Waikiki
Honolulu Zoo
Māmala Bay
Kahaluu
Ahuimanu
Waiahole Forest Reserve
Wet'n'Wild Hawaii
Iroquois Point Neighborhood Park
Iroquois Rd
Hoomaka St
Makalea St
Luahoana St
Terrazza & Cortebella Rec Center
Kamailio St
Makalea Loop
Keaunui Dr
Komoaina St
Makaluana Pl
Kaieleele Pl
Kaieleele St
764
Waikiki Bike Tours and Rentals
Station
Kauoha Pl
Kauoha St
Pukanala St
Kamaehu Pl
Kamaehu St
Noelo St
Pukanala Pl
Hoano Pl
Hoano St
Kuio Pl
Hoalauna Pl
Kailike Pl
Fort Weaver Rd
Hoalauna Community Park
Ho'Owalea St
Ho'Owalea Pl
Ho'Omalule Pl
Ho'Omohalu Pl
Ho'Olu Pl
Kanela St
Montecito-Tuscany AOAO

Business & Money

- Business eco-system consolidated
  - Participating at many events world wide
  - Companies actively involved in the project development covering many areas: consultancy, classic telephony systems or service, VoLTE systems, OTT services, …
- Started own dedicated event
  - Kamailio World Conference
  - idea in 2012, first edition in 2013, then every year

Community & Collaboration

- Tighten of relation within the community
  - The open form of collaboration started to show the benefits for the entire eco-system
  - Kamailio project seen as a business enabler
- Development accelerated
  - Major new developers working to core components (2008-2011)
  - IMS/VoLTE and mobile-first oriented service

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Cloud Services - Diversity Everywhere

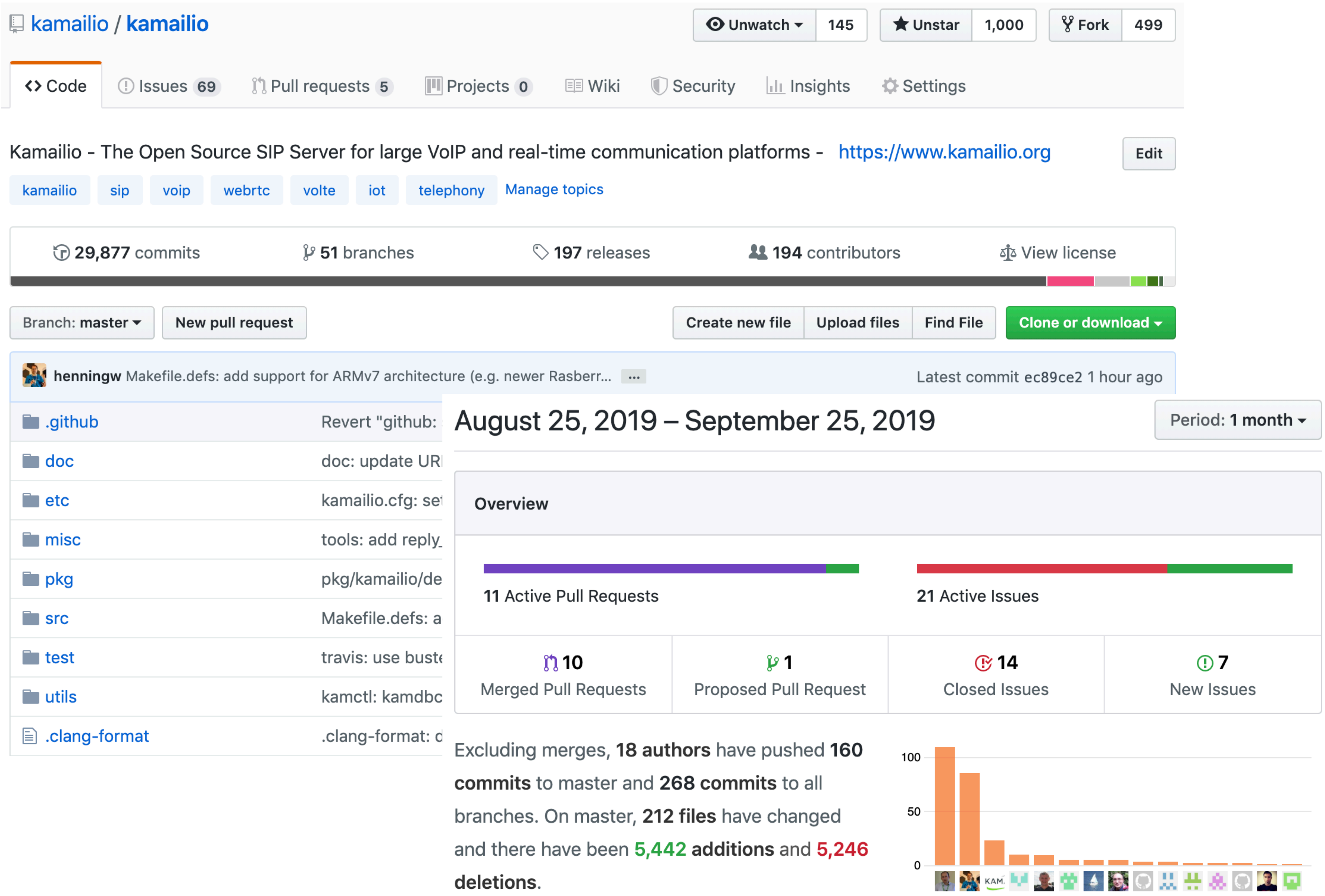
- When everyone needs something else
    - Interaction between humans changed at high speed
    - a lot of systems and services to interact with
    - focus on distribution and integration
    - scripting languages to allow easily in developers with different backgrounds

Business & Money

- Many new companies stepping forward
  - OTT apps, cloud-based services CPaaS, RTC API services …
- A solid eco-system
  - Kamailio World Conference keeps running
  - Separate dedicated developers event in the past two years

Community & Collaboration

- Community contributions beyond code
  - Participation to world wide events
  - Articles and projects focused on redundancy, security high availability
  - How-To's deploy in cloud or containerisation environments
- Development continues at high pace
  - New releases every 9-11 months
  - 5-10 new modules with every release



kamailio / kamailio

Kamailio - The Open Source SIP Server for large VoIP and real-time communication platforms - https://www.kamailio.org

29,877 commits · 51 branches · 197 releases · 194 contributors · View license

henningw Makefile.defs: add support for ARMv7 architecture (e.g. newer Rasberr... ··· Latest commit ec89ce2 1 hour ago

.github	Revert "github:
doc	doc: update URI
etc	kamailio.cfg: set
misc	tools: add reply_
pkg	pkg/kamailio/de
src	Makefile.defs: a
test	travis: use buste
utils	kamctl: kamdbc
.clang-format	.clang-format: d

August 25, 2019 – September 25, 2019

Overview

11 Active Pull Requests

21 Active Issues

10	1	14	7
Merged Pull Requests	Proposed Pull Request	Closed Issues	New Issues

Excluding merges, **18 authors** have pushed **160 commits** to master and **268 commits** to all branches. On master, **212 files** have changed and there have been **5,442 additions** and **5,246 deletions**.

More Control

ROUTING LOGIC
USING DIFFERENT
INTERPRETERS

kemi
kamailio embedded interface

a framework that allows selecting your favourite scripting language for writing sip routing rules

KEMI Framework

Empowering Kamailio Since 2016

- 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***
  - ***enables the use of an extensive number of extensions available in the scripting languages***
  - ***lua, python2, python3, javascript, ruby, squirrel***
- ***non-kemi interpreters: perl, .net (mono), java (?)***

native vs. lua

```
request_route {

        # per request initial checks
        route(REQINIT);

        # NAT detection
        route(NATDETECT);

        # CANCEL processing
        if (is_method("CANCEL")) {
                if (t_check_trans()) {
                        route(RELAY);
                }
                exit;
        }

        # handle requests within SIP dialogs
        route(WITHINDLG);
```

```
function ksr_request_route()

        -- per request initial checks
        ksr_route_reqinit();

        -- NAT detection
        ksr_route_natdetect();

        -- CANCEL processing
        if KSR.pv.get("$rm") == "CANCEL" then
                if KSR.tm.t_check_trans()>0 then
                        ksr_route_relay();
                end
                return 1;
        end

        -- handle requests within SIP dialogs
        ksr_route_withindlg();
```

native vs. lua

```
# Caller NAT detection
route[NATDETECT] {
    force_rport();
    if (nat_uac_test("19")) {
        if (is_method("REGISTER")) {
            fix_nated_register();
        } else {
            if(is_first_hop())
                set_contact_alias();
        }
        setflag(FLT_NATS);
    }
    return;
}
```

```
-- Caller NAT detection
function ksr_route_natdetect()
    KSR.force_rport();
    if KSR.nathelper.nat_uac_test(19)>0 then
        if KSR.pv.get("$rm")=="REGISTER" then
            KSR.nathelper.fix_nated_register();
        elseif KSR.siputils.is_first_hop()>0 then
            KSR.nathelper.set_contact_alias();
        end
        KSR.setflag(FLT_NATS);
    end
    return 1;
end
```

APPS

data

json
xml
serialization

json
jansson
rtjson
xmlops
transformations

transport

http
jsonrpc
sip
custom

utils
http_client
jsonrpc-c
evapi
uac

control

interpreter

native
lua
python
javascript
ruby
perl - .net - java

Kamailio In The WebRTC World

since 2012

- Kamailio - signalling handling
  - websocket (+ xhttp, tls) module
  - rtpengine (+ nathelper) module
- RTPEngine - media handling
  - ICE, encryption-decryption, transcoding
- JS SIP library
  - JsSIP, SIPML5, …
- Use cases
  - Browser to browser calling
  - WebRTC to classic SIP/VoIP gateway

KAMAILIO WORLD
CONFERENCE & EXHIBITION
BERLIN GERMANY APRIL 27-29, 2020

Kamailio World Conference
April 27-29, 2020 - in Berlin, Germany
www.kamailioworld.com

Thank You!

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