Geographic redundant VoIP systems with Kamailio

Welcome!

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Kamailio project

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Outline

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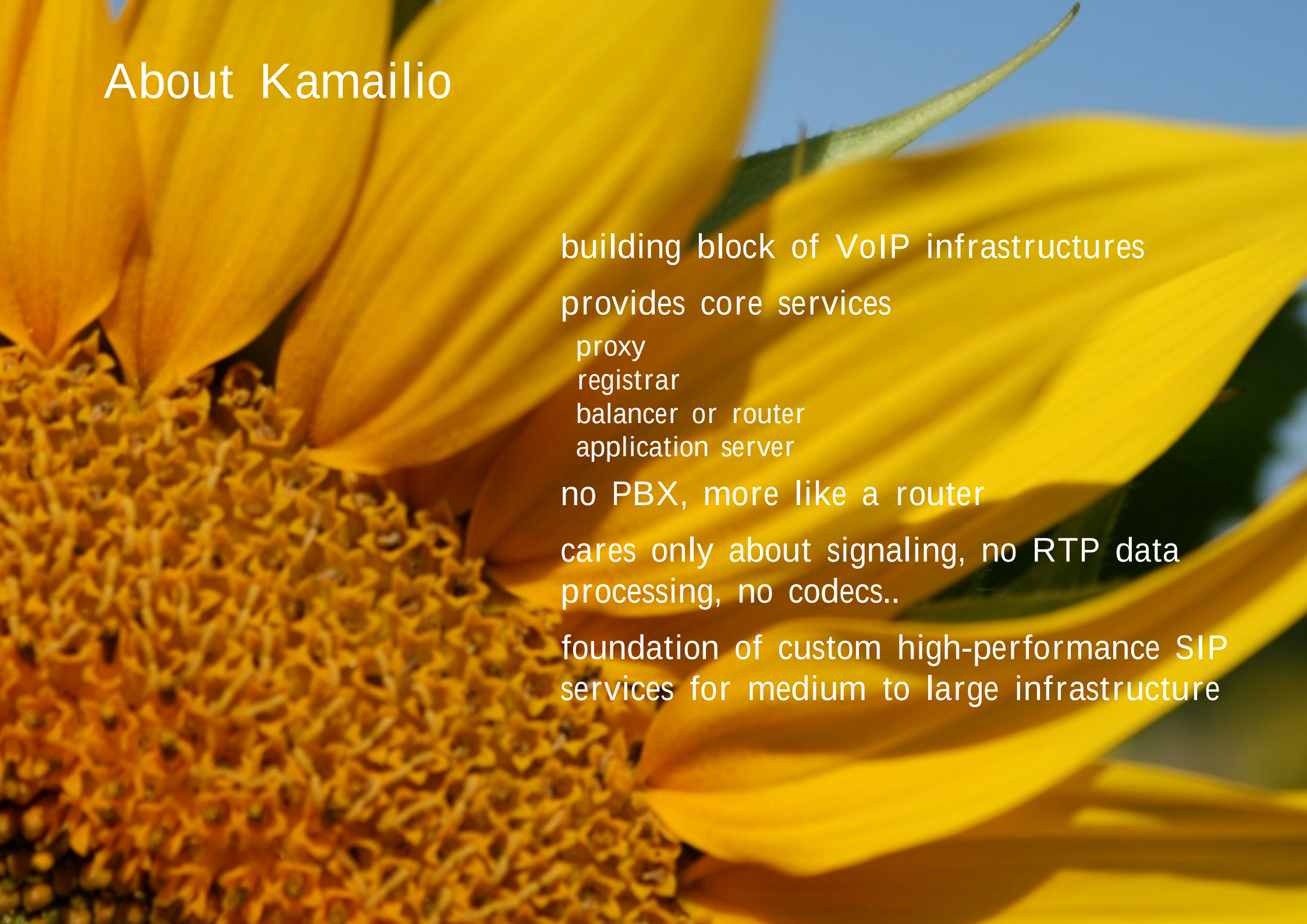


About Kamailio

building block of VoIP infrastructures

provides core services

- proxy
- registrar
- balancer or router
- application server

no PBX, more like a router

cares only about signaling, no RTP data processing, no codecs..

foundation of custom high-performance SIP services for medium to large infrastructure

About Kamailio

an open source project

- licenced under GPL (version 2 or later)
- over 200,000 lines of C code
- frequent time-based releases (roughly every six to eight month)
- managed from a board of core developers

community aspects

- over 20 developers provide support and contribute new features
- friendly and healthy user community
- regular meetings at international free and open source conferences

a mature product

- used from carriers like 1&1, QSC, Telefonica..
- several companies use it to provide turn-key solutions, also sold as appliance

merge with the SER project, Kamailio forked several years ago

- the sip-router project hosts now common repository and mailing lists

1&1 voice over IP backend

purpose

- provide telephony services for our DSL customers
- basic call routing and also supplemental services

some numbers

- over 1500 million minutes per month to the PSTN
- more than 3 Million customers on the platform

redundant infrastructure on several levels

- but no geographical distribution yet

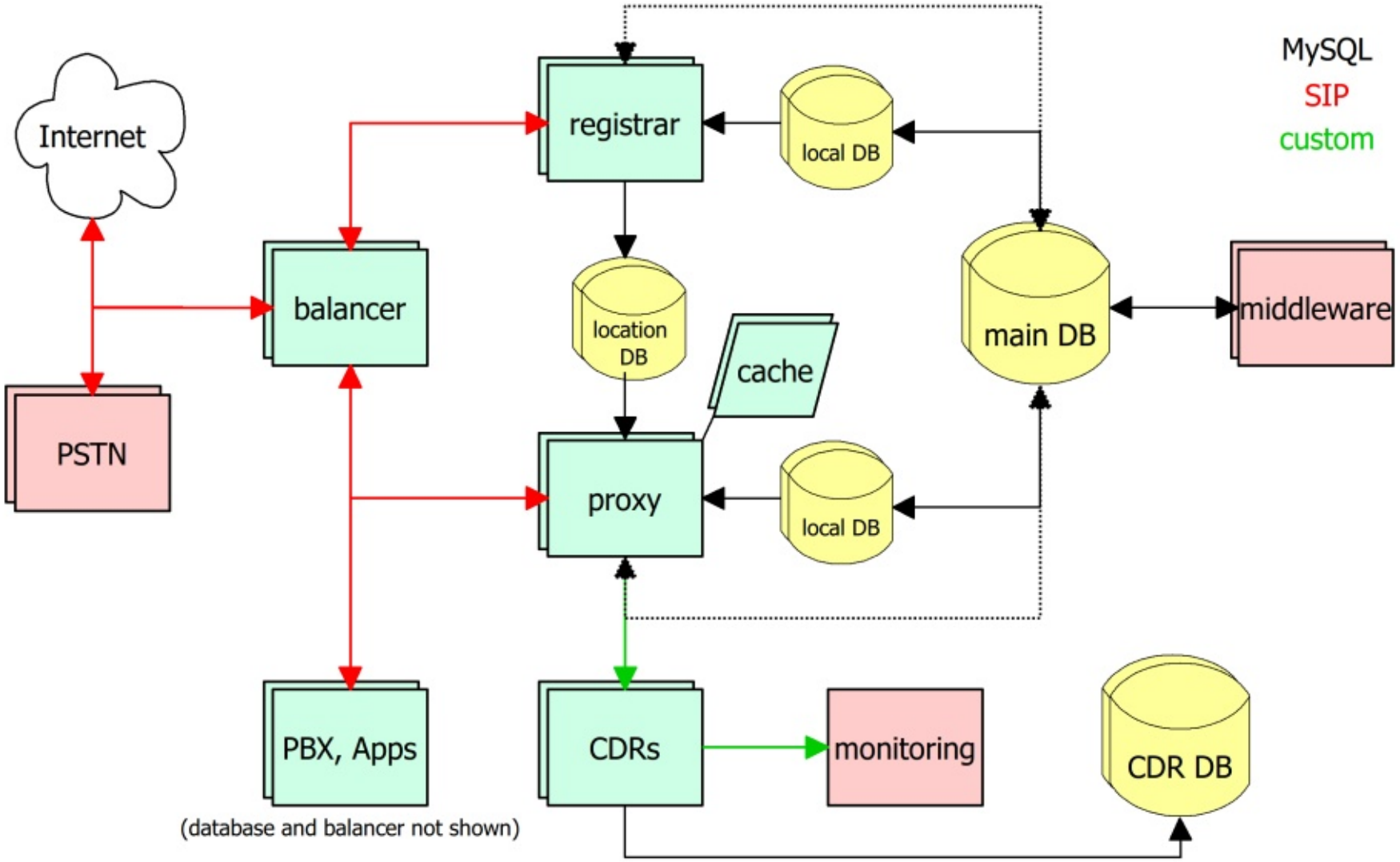
clustering for applications and databases

interfacing to several other carrier networks and internal systems

- incoming and outgoing call routing, order and fulfilment processes

custom testing and monitoring systems

1&1 voice over IP backend



Motivation for geographical redundancy

External service dependencies

to other company services but also to the internet, e.g.
to external IP routing (DE-CIX core router..)
to external DNS service (.de DENIC..)

Scaling issues with SIP VoIP service

order of magnitude difference between normal load and emergency situations
problem of registration retransmission during outtages, exponential traffic increase
in general SIP retransmissions with the UDP protocol a potential problem

Necessary QoS improvements

customer expectations for first line telephony
growth in customer size and/ or service complexity

Legal requirements

increasing pressure from regulation authorities, e.g. for lawful interception, emergency service and availability

Main problems with VoIP geographical

Complexity

- debugging of global failure conditions
- maintaining a proper quality of service

Maintenance

- stable and identical machine setup
- configuration changes
- service changes

Shared database state

- distribution of provisioned subscriber data
- usually a distributed infrastructure
- global availability of user agent location information

Routing and failover

- partioning and distribution
- failover during emergency or for maintenance reasons

Complexity and Maintenance

many existing solutions in this field available

but they need to be implemented thouroughly

- system setup automatisation
- change management
- configuration management

Hot-standby hard to implement on a datacenter level

even on smaller setups better to keep all your systems under load

Partitioning and distribution

Partitioning approaches

- customer groups (if possible)
- SIP message types (INVITE, REGISTER)
- customer and carriers, incoming and outgoing

Distribution approaches

- fixed vs. flexible, random vs. geographical

Tradeoffs

- Maintenance overhead
- changes during emergency or maintenance
- overhead for geographical distribution
- routing accuracy and stability

IP anycast

- gains with anycast not sufficient for added complexity with only two locations
- some approaches needs extensive software or hardware extensions of the setup

Shared database state

subscriber data critical for call setup

- e.g. for authentification and routing, but (mostly) read-only necessary
- distribution with standard replication possible

storage and retrieving of location data

- difficult to scale because of frequent access and changes
- availability is critical for call setup
- necessary to distribute changes to all locations

available clustering options not choosen in evaluation

- MySQL cluster came closest, but not really comparable to standard MySQL
- evaluation areas: in-house knowledge, complexity, stablity and performance
- proprietary partitioning solution inuse, provides also error-handling and automatic failover

application level replication

- easy with kamailio "t_replicate" or "uac_req_send" function to other location

Routing and failover

- several possible solutions
  - front-end load-balancer
  - IP failover inside a datacenter
  - DNS balancing
  - IP routing changes, IP anycast
- Tradeoffs
  - routing capacity
  - change propagation
  - implementation complexity
- no single right tool for the job
  - DNS well understood for global routing
  - BGP changes for routing from one datacenter to the other
  - IP failover and loadbalancing inside one datacenter
  - IP anycast if more than two datacenters in production

Upcoming 3.1 major release

asynchronous TCP and TLS for much better performance and stability

configuration file debugging and configuration value changing on the fly

internal message queue for inter-process communication

more languages for in-server scripting (python, lua)

configuration interface unification (ser, kamailio)

dialog module refactoring (still work in progress)

extensions and refactorings to other important core modules (transactional support, registrar, pseudo-variables..)

more details at http://sip-router.org/wiki/features/new-in-devel

debian packages for development and also stable releases available

Outlook to further development

- further integration between SER and kamailio side
  - duplicated modules
  - redundancy in configuration tools
- branding
  - longer process to unify the ideas behind the projects
  - lack of know how in OSS related to intellectual property issues, branding, design
- continuing to maintain a carrier grade server
- promoting at events
  - several smaller ones all over europe
  - next big probably FOSDEM 2011
- documentation
- any help in any of this areas really appreciated

Thanks for your attention!

More informations and contact:

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sip-router user and developer mailing list
extensive documentation available at http://sip-router.org and http://kamailio.org

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