ABC SBC: Software Defined Communication Networks

FRAFOS GmbH

Introduction

SIP was designed with the vision of revolutionizing the way communication services are developed, deployed and operated. Following the end-to-end spirit of the Internet SIP was supposed to turn down the walled gardens of PSTN networks and free communication services from the grip of large telecom operators. By moving the intelligence to the end systems, developers were supposed to be able to develop new communication services that will innovate the way we communicate with each other. This was to be achieved without having to wait for the approval of the various telecommunication standardization groups such as ETSI or the support of incumbent telecoms.

Looking at a typical VoIP infrastructure today is rather disappointing for the End-2-End believer. While more powerful and capable that an analogue phone, a SIP phone does not offer much more services than a plain old phone. The VoIP infrastructure itself consists of a number of signaling components, some centralized application servers and border elements that separate the operator's network from the end users or other operators. In short, the intelligence resides in the center and the closer one gets to the end users, the simpler the involved components get.

A VoIP service provider can introduce new services and features by enhancing the application logic of already deployed application servers or by deploying new application servers. This has two limitations:

- First, any new applications and services should not require changes to the signaling logic and content. Even if the end user applications support such changes, the border elements will not play along and will most likely drop traffic they do not understand. In order to be able to provide these new services the service provider will have to wait for an upgrade from the vendor of the border elements.
- Another issue with keeping all application intelligence in a central location is that all traffic has to be routed to the application servers first. Especially in cases where a call has to fulfill certain requirements in order to benefit from a novel service, having to route a call to the application server and then rejecting it there is a waste of resources. Often it is much more beneficial to already decide at the network border

whether it is worth it to route a call to an application server. This would, however, require the border elements to have some understanding of the new services.

With the ABC Session Border Controller FRAOF is integrating concepts of Software Defined Networks (SDN) into communication networks. With the Software Defined Communication Networks (SDCN) FRAFOS is aiming at breaking the centralized application intelligence model of current VoIP networks. Instead of acting as a hurdle for innovation, the SBC can be considered as part of the application platform. This is achieved by opening the border control logic of the ABC SBC and enabling the operator to adjust the control behavior so as to fit its needs.

Software Defined Communication Networks

Today's Session Border Controllers are static in nature: their security purpose only support scenarios known in advance, novel scenarios are impeded. Such scenarios include call centers integrated with customer care systems, push-services for mobile subscribers or proprietary PBX extensions. Supporting such scenarios requires massive changes to the SBC, and time spent in waiting loop for the new firmware release. The SBCs become a bottleneck in deploying novel services.

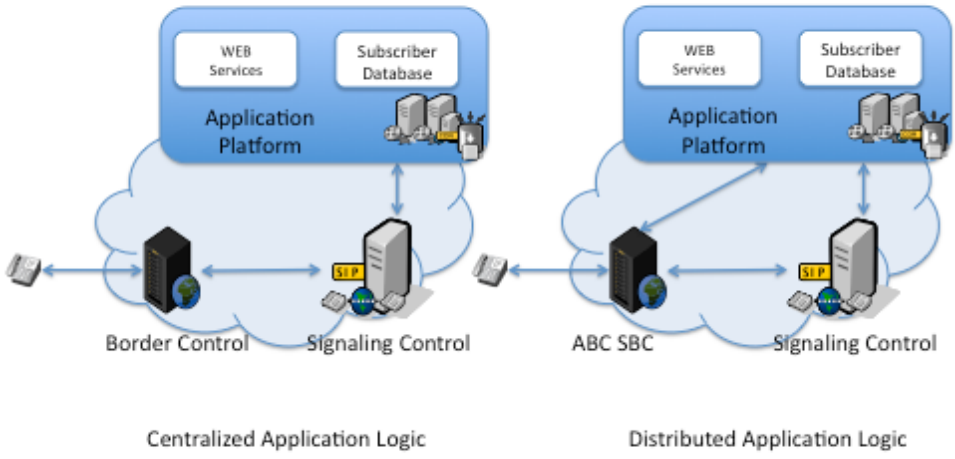

Figure 1 Distribution of application logic with ABC SBC

The FRAFOS ABC Session Border Controller facilitates call control through RESTful web

interface: New scenarios are rapidly implemented without touching the SBC by writing web applications. The "sandboxed" concept of the web interface keeps programming errors away from the SBC and preserves its security function reliably.

At the same time, the FRAFOS ABC SBC keeps the operational burden constrained by building-in common functionalities. It integrates customer-care features to verify that web applications do in fact implement desired call processing. This feature dramatically lowers effort spent on customer support. Similarly, the capability to run in clouds allows the SBC to scale proportionally with demand, just in-time. Built-in multimedia applications save operators running "Yet-Another-Box" for applications, which are almost trivial, such as announcement and recording.

The ABC SBC already provides rich configuration possibilities for specifying routing, message manipulations and security policies. In order to integrate the border control capabilities of the ABC SBC into the application and service logic of the operator, the ABC SBC provides different types of capabilities:

- **Open communication interfaces:** The ABC SBC enables service providers to integrate the call processing logic of a border element with the operator's applications. This is achieved by specifying policies that indicate when should the ABC SBC contact the operator's web servers of databases. For example, the operator can specify that before forwarding a registration request for a certain request, the ABC SBC should query a database that indicates whether the user has actually subscribed to the requested services. The ABC SBC could also communicate over a REST interface or XML RPC with a web server after receiving a certain SIP message. The web server would then decide how to best handle the message and instruct the ABC SBC on how to best deal with this message.
- **Open programming interface:** With its patent pending DSM scripting language, the behavior of the ABS SBC can be customized so as to meet the exact needs of our customers. Using DSM it is possible to adapt the call control and security features of the ABC SBC.
- **Routing and policy framework:** The ABC SBC provides an easy to use routing and policy control framework with which the operator can decide on how to bets handle SIP messages. The basis of the routing and policy framework is the ability of an

operator to decide whether to reject, drop or route a SIP message that has certain content.

- **Built-In Applications**: The ABC SBC integrates a flexible and powerful application platform. Through open interfaces and a flexible configuration language it is possible to integrate applications such as announcements, recording, conferencing and IVR into the SBC's call processing logic. The integration of application execution logic with the ABC SBC helps operators to offload standard and repetitive scenarios from the application servers to the network borders. This reduces the loads on the application servers, optimizes the call flows and reduces the response time. For example instead of routing a call to an application server in order to generate an announcement indicating that a dialed number is unknown, the ABC SBC can generate such an announcement directly once recognizing that the called number is not served by the service provider.

Usage Scenarios and Benefits

The SDCN capabilities embedded in the ABC SBC allow high programmability of the SIP Session Border Controller.

The interface addresses an important dilemma for operators: how to introduce new scenarios, while preserving the existing ones intact. Hardwired product logic compels the operators to request code changes from vendors. Change requests result in unavoidably tedious process taking months of negotiation, changes of changes and delays regardless how small and reasonable the changes are. Therefore ABC SBC comes with the possibility to implement business logic outside the product in an operator-controlled environment.

This capability follows a general trend in which the business logic is concentrated in a single place that defines behavior of relatively "dumb" network elements. The business logic defines security policies (who can call whom), marketing campaigns (at what price), and network behavior (how to route the calls). Placing this logic in a web server relieves operators from inadequate vendor dependencies and allows PHP, Perl, and virtually any web programmer to implement new SIP scenarios in a well understood programming environment enable service operators to deploy and build novel usage scenarios that would not be easily possible with the current static SBCs.

Some of these usage scenarios are listed below.

User Application based security policies

User application-based security policies is basically a fancy name for something that can be very simple: use information that is part of an application such as calendar, address book or even a Facebook profile for controlling who can make a call and who not.

For example as an additional service an operator can provide his subscribers with a service called "Facebook SPAM Filter". The operator provides a web application that with the consent of a subscriber collects the facebook friends list of the subscriber and manages this information at a web server. Whenever this subscriber receives a call, the ABC SBC will contact the web server and check whether the call is coming from a Facebook friend. If yes then the call is allowed to progress otherwise the call can be rejected or forwarded to voicemail.

Non-Standard Signaling

Often some proprietary extensions to the signaling protocols are needed by an operator in order to provide some services. For example imagine the case that an operator would like to offer his subscribers the ability to signal the level of quality of service (QoS) they would like to use. In such a case the subscribers might include a proprietary header in their SIP messages that indicate the QoS level they need. As the is a non standardized application a static SBC would just ignore this information or even remove it from the SIP messages. The ABC SBC can, however, be configured so as to contact a web application whenever this proprietary header is observed in a SIP message. The web application can then process this proprietary information and instruct the ABC SBC to use a certain network that offers the needed QoS or reject the call as the user is not eligible for this service.

Application Offloading

By offloading repetitive tasks from the center of the network to the border, the service provider can reduce the needed resources of rather expensive application servers, optimize the bandwidth usage and reduce the call processing delay. Which application to run and when can again be controlled from a web application. Some of the possible application scenarios that are supported by the ABC SBC are:

- **Announcements**: The ABC SBC can be configured to generate certain

announcements under certain conditions. This can include for example cases like:

  - If the provider does not serve a callee then the ABC SBC can generate an announcement like: “Dialed number unknown”.
  - If the billing system indicates that a user’s pre-paid balance is below a certain threshold then the ABC SBC can warn the user with an announcement like: “Your call will be terminated in 30 seconds. Please recharge your balance”.
  - Under network overload the ABC SBC can reject incoming calls with an announcement indicating: “Network overloaded. Please try at a later point of time”.

- **IVR**: The ABC SBC supports an easy and flexible configuration of interactive voice response (IVR) menus. This feature can be especially interesting when using the ABC SBC as part of the charging system. When the balance of a prepaid subscriber falls below a certain threshold, the ABC SBC can warn the user with an announcement like: “Your call will be terminated in 30 seconds. Do you want to recharge your balance? Please press 1 for Yes and 2 for No”. Using DTMF tones, the subscriber can accept or reject. In case the subscriber decides to recharge his balance, the caller gets connected with an application server that provides credit card processing for example.
- **Recording**: Service providers often need to record the content exchanged in the context of certain services. This is often the case for services such as call centers and emergency services and is done for quality control purposes for example. One option for realizing the recording feature is to implement it in each application requiring it. The other option is to implement it in a central node that can deal with signaling and media. The ABC SBC provides service providers with such a central node. The ABC SBC can be configured to replicate calls coming from certain sources or going to certain destinations. The replicated content can be either saved locally or sent to a recording application. The same concept is also used for enabling lawful interception.

These are some of the possible applications that can be supported by the ABC SBC. The

flexibility of the ABC SBC platform enables FRAFOS to customize the logic of the applications integrated with the ABC SBC to meet the exact needs of our customers.

About FRAFOS

FRAFOS GmbH is a manufacturer of VoIP solutions with offices in Berlin and Prague. FRAFOS was incorporated as privately held company in May 2010, in Berlin, Germany.

The history of FRAFOS team and technology goes back to the late nineties. As researchers at the prestigious German public R&D institute Fraunhofer FOKUS, the FRAFOS founders were the among the first to work the SIP and RTP standards and to develop open source solutions that paved the way for the VoIP revolution.

FRAFOS offers SIP session management and security solutions of the latest generation that come either as a standalone solution or as a cloud ready implementation. The flagship product of FRAFOS, the ABC SBC, offers open interfaces and built in multimedia applications such as recording and announcements. The ABC SBC enables the operators to simplify their service infrastructure and prepares them for future challenges.