White Paper

A GSM Operators Service Network and the Subscribers Identity

Aydın Eraslan
(aydin.eraslan@turkcell.com.tr)
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Abstract

This paper aims to summarize the study of a wireless operators service network and its ecosystem for creating and delivering mobile services with strong identity and privacy protection concerns. Available mainstream specifications and off-the-shelf products that are compliant with these specifications have been used during this work. This is a Turkcell project made in Turkey. Turkcell delivers value added services to more than 24,3 million subscribers and works with more than 220 companies as service providers.

1 Introduction

The motivation for enforcing a stronger identity related policy in our service network has been conducted by three major driving forces:

- Improving the subscriber privacy,
- Enabling service capabilities to 3rd Party service providers for both location-based and non-location based services without exposing the subscribers identity,
- Offering subscribers the ability to manage his/her federation of service providers and value-added services

The first driving force, subscriber privacy, has gained importance as The National Telecom Regulation Body had released the outline for restricting the distribution and sharing of subscribers MSISDN with the 3rd Party service providers outside the GSM operators network. This restriction will have an impact to change our service network and service providers way of making business. Since business cases and service scenarios of the service providers had been set up mainly based on Mobile Subscriber Number (MSISDN).
Secondly, Location Enabled Service (LES) offerings represented a major need for hiding and/or protecting MSISDN information from service providers as any possible act on abusing MSISDN with the location data may lead to serious consequences that are legally inappropriate for the GSM operator. However, this risk also brought the integration dilemma of the LES platforms, which are without industry standard mechanisms to provide MSISDN protection, into the picture.
Finally, by considering future demands of our subscribers on consolidating the accessibility to the value-added services we decided to push privacy protection of the subscriber to the outer limits of our service network and its ecosystem consisting of value-added service providers. There we ended up with two solution alternatives to realize the privacy protection; either we could use an in-house developed MSISDN conversion (dynamic and/or static) mechanism, which would present disadvantages as the lack of standardization, not being future-proof, and cost inefficient to maintain, or we could search for specifications and a commercial products that would offer us Resource Identification handling, discovery services for service providers and privacy protection for the subscribers in some terms. As a matter of fact, we have found that the Liberty Alliance Specifications are brilliantly matching our needs and even exceeding in some ways.

2 The value added services ecosystem

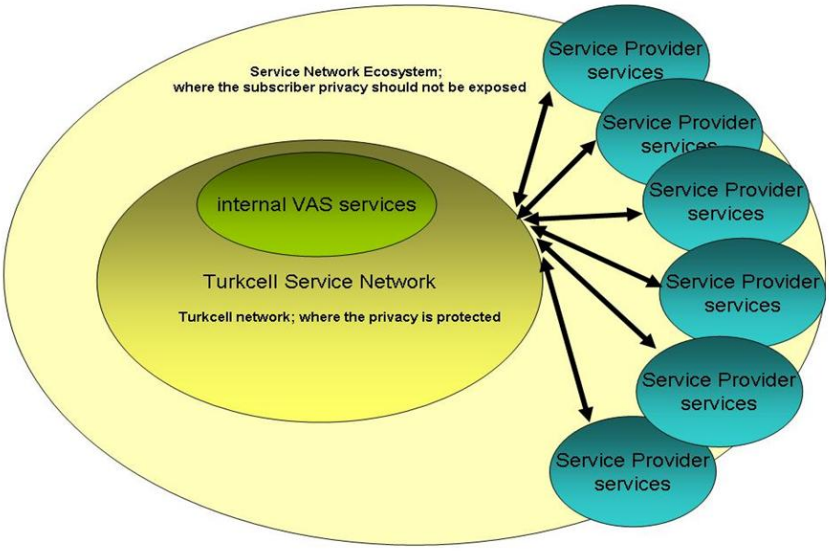

Figure 1: The Value Added Service Chain

Even bound with agreements between SPs and operators; the MSISDN information is being used by bulk SMS services offered by SPs. As subscribers are to be offered the choice of not getting these bulk messages, often very expensive filtering operations have to be performed. As MSISDN represents the primary parameter for both SP while sending bulk messages- and the operator while filtering the unwanted messages-, the concept by offering service capabilities without using the MSISDN outside of the GSM operators network is a brand new idea. The difficulties and technical challenges that a SP is facing and other requirements for the service network regulation have lead us to a VAS client definition and by addressing the requirements mentioned a PoC project has been initiated by Turkcell and Sun Microsystems.

This approach combined with a client specification and also a client application offering (GPL, commercial) for the service network will assist service providers to fully exploit the capabilities of wireless networks with respect to subscribers privacy. We eagerly expect the number of SPs to increase from three digits to four digits.

As a result the customers have his very own liberty and privacy controlled by him, the SP gets unmatchable network capabilities from the wireless operator and finally the operator keeps a wise track of the demands on value-added services while opening brand new ways to flourish the service network ecosystem.

3 Technical perspective

3.1 High Level Architecture and Sample Service Flow

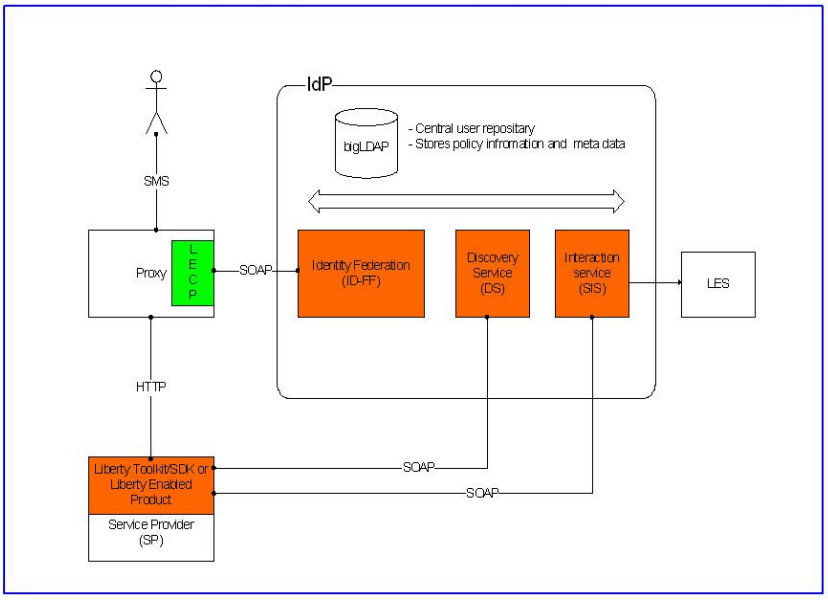

Figure 2: A high level architecture

A sample use case scenario; GSM User sends a service request via SMS to a specific service number to learn restaurants near the location where he/she is. Content provider leverages wireless operators geo-location service, customizes content ,and returns corresponding list of restaurants back to user.

1. Service Request by SMS: The GSM User makes a service request by sending an SMS message to a specific service number.
2. Authentication: SMS GW sends authentication request to IdP and IdP authenticates the user by MSISDN.
   - Validity Check: IdP checks requested content provider's validity and builds federation key.
   - Authentication Approval: IdP returns with 'federation opaque handle' and ID-WSF bootstrap information.
3. Invoke to the Content Provider (CP): SMS GW invokes to the 3rd party CP on behalf of the principal with the resource offering Id, and SMS content.
4. Location Service Discovery: The 3rd party CP invokes to the Discovery Service for LES and SendSMS WS information. In addition to requested info, DS returns a Resource ID which includes MSISDN of the requester in encrypted form.
5. Location Info Request: CP acquires location info of requesting party from LES by using the Resource ID.
6. Service Delivery Invocation: The 3rd party CP/WSC invokes SendSMS WS with the Resource ID and service delivery content.
7. Delivery of the Result: SendSMS Service sends the result to the GSM User.

3.2 The Extended Service Network with VAS Client

Turkcells messaging middleware (CSPS since 2001) is developed in-house by its software development teams as required by a specific design aiming to achieve two major goals: to simplify new services integration into the network and both control and regulate the traffic generated to and from 3rd parties. The specific need to develop a middleware has risen as the rapid expansion of versatile services that run on various platforms increased the difficulty and cost of service management.

CSPS is designed such that it can provide a unified management on various platforms such as: SMSC, MMSC, PTS, USSD Gateway, MPC, CBC (see figure 3). We have started with our Service Centric design of a general gateway(CSPS) for Service Providers in 2001 which can interpretated as a Service Oriented Architecture (SOA). CSPS is the prime node for Servce definitions acting as a Service Repository for many proxies in this midlleware.

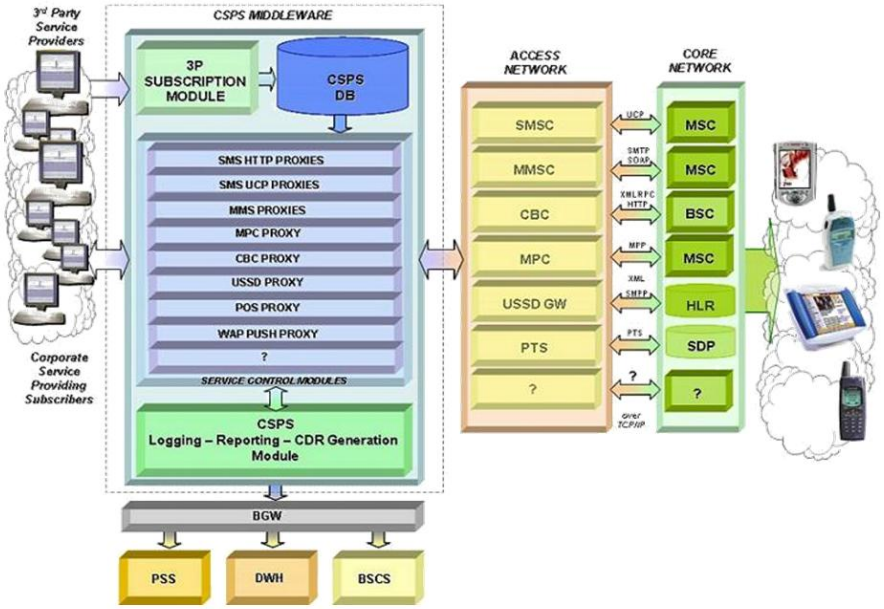

Figure 3: The gateway for Service Providers (CSPS)

However as market dynamics and performance concerns necessitated in time, we have decided to go from passive mode to active mode by pushing the traffic addressed to the SPs networks. Considering the SPs various technical capabilities we have defined 3rd Party VAS Client specification to handle all incoming traffic and have initiated a client development process with GPL and commercial licensing requirements as a responsive action.

As we proceed with improving our client specifications we have found that the liberty specifications exactly match and perfectly cover functionality requirements such as discovery services, personal profile and identity management

across all parties that participate on the service request and delivery. This had led us to place the support of Liberty Web Service Framework into the Vas client Framework specifications as a main prerequisite. A graphical presentation of the client framework can be seen below in Figure 5;

In time we have decided to go from passive mode to active mode by pushing the traffic addressed to the SP's to the SP's networks. Considering the SP's various technical capabilities we have defined 3rd Party VAS Client specification to handle all the incoming traffic and initiated a client development process with GPL and commercial licensing requirements.

As we approached with our client specifications we have found that the liberty specifications exactly match and also cover some functionality such as discovery services, personal profile and identity management across all parties that participate on the service request and delivery. That why the support of

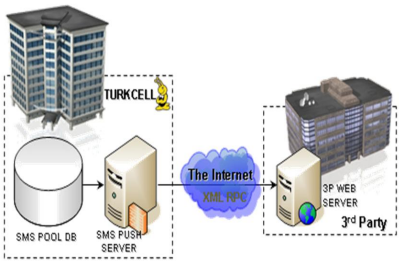

Figure 4: The VAS client and traffic push approch

Liberty Web service framework has been placed into the Vas client Framework specifications. A graphical presentation of the client framework can be seen below;

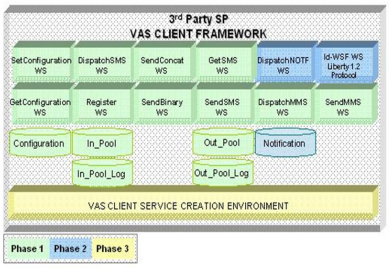

Figure 5: Principle VAS client framework and Liberty Web Services

4 Conclusion

We successfully conducted a PoC project that has resulted with the accomplishment of all pre-defined requirements. The outcomes of the project for the three main parties- the GSM operator, service provider, and the customer - can be listed as following: From the operators point of view; We successfully conducted a PoC project that has shown us that all our requirements can be kept. As the outcome of this project the following benefits can achieved. From the operators point of view;

- From computational power while the service network is extended to the SP's Network perimeter.
- Identity of subscribers is being protected.
- Traffic engineering and network regulation can start from the SP's network.
- A huge number of telco capabilities can be exposed to SP's by a manageable way.

For the service providers;

- has an abstraction of the wireless operators service network.
- are able to develop more sophisticated services with the new capabilities.

With respect to the customer;

- Experiences unmatchable control of his/her identity and related attributes.
- Experiences new personalized and sophisticated services.

5 Acknowledgements

Many tanks for their contribution goes to; Mr. Fulup Ar Foll (Sun), Mr. Ayhan Alkan (Sun), Mr. Orhan Alkan (Sun) and Mr. Sercan Uslu (Turkcell), Mr. Ömür Özoral (Turkcell), Mr. Ersoy Peksen (Turkcell).

6 Actors

About Turkcell,
Turkcell (NYSE: TKC, ISE: TCELL) is the leading GSM operator in Turkey with 24.3 million postpaid and prepaid customers, as of March 31, 2005. Turkcell provides high-quality wireless telephone services throughout Turkey and has coverage of 99.9% of the towns with more than 5,000 inhabitants. Turkcell provides roaming with 447 operators in 176 countries as of May 12, 2005. Turkcell is the only turkish company listed on NYSE. Turkcell has interests in international GSM operations in Azerbaijan, Georgia, Kazakhstan, Moldova and Northern Cyprus, which have a total of 4.2 million subscribers as of March 31, 2005. For more information, visit http://turkcell.com.tr.
About Sun Microsystems,
Since its inception in 1982, a singular vision "The Network Is The Computer" has propelled Sun Microsystems, Inc. (Nasdaq: SUNW) to its position as a leading provider of industrial-strength hardware, software and services that make the Net work. Sun can be found in more than 100 countries and on the World Wide Web at http://sun.com .

6.1 Contacts

TURKCELL, Turkcell Plaza Mesrutiyet Cad. No. 153 34430 Tepebası/ ÍSTANBUL
Tel: (0212) 313 10 00 Web: http://turkcell.com.tr

SUN MICROSYSTEMS, INC. 4150 Network Circle Santa Clara, CA 95054 USA
Phone: 1-650-960-1300 or 1-800-555-9SUN Web: http://sun.com

6.2 Copyrights

6.3 Abbreviations

MSISDN	Mobile Station ISDN Number
ISDN	Integrated Services Digital Network
LES	Location enabled services
SMS	Short Message Service
SMSC	Short Message Service Center
MMSC	Multimedia Service Center
CBC	Cell Broadcast Center
MPC	Mobile Positioning Center
USSD	Unstructured Supplementary Services Data
MSC	Mobile Switching Center
BSC	Base Station controller
HLR	Home Location Register
SDP	Service Data Point
BGw	Billing Gateway
CDR	Call Data Record
BSS	Business Support Services
DWH	Data Warehouse
BSCS	Business Support and Control System
ID-WSF	Liberty Web service framework
SP	Service Provider
CP	Content Provider
VAS	Value Added Services
CSPS	Coorporate Service Providing Subscribers
SOA	Service Oriented Architecture