USSD-S*Gateway*

Technical Overview v1

Table of Contents

Introduction

The Unstructured Supplementary Service Data (USSD) is a UMTS/GSM Service that allows interactive communication between subscribers and application across a UMTS/GSM network.

It is primary used on real-time and instant messaging type phone services because there is no store-and-forward of messages typical of the short message services (SMS).

The response time of a USSD request is measured between 100 and 200ms compared to the 5-10 seconds of SMS.

The functionalities of USSD make it ideal for information queries like available balance, content downloading and any information services.

Capacity

The current Sigtran USSD-Gateway version supports 16384 simultaneous incoming and outgoing transactions being processed at the same time.

On most deployments the Sigtran USSD-Gateway is limited by the SS7 Network resources or the Application/Database service load.
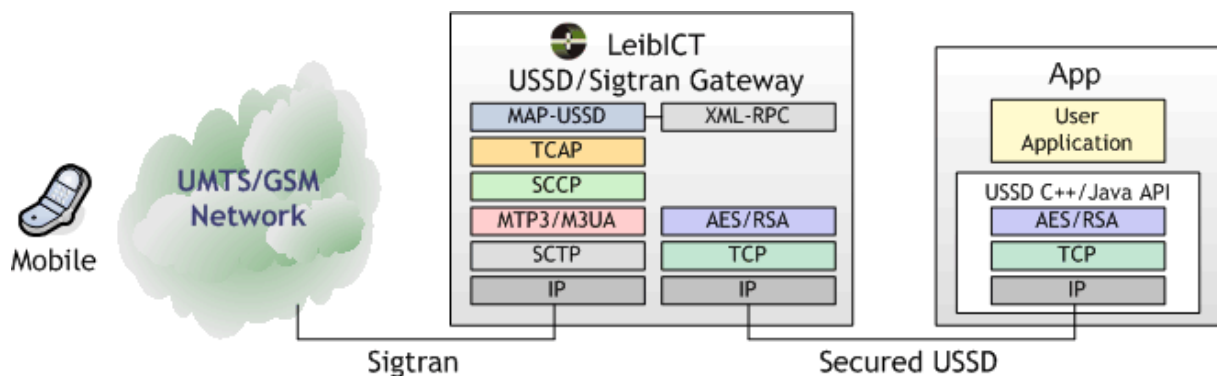
The modular architecture allows increasing system capacity as needed by adding more hardware.

Architecture

The next Implementation View shows the components of the Sigtran USSD Gateway based on a single server.
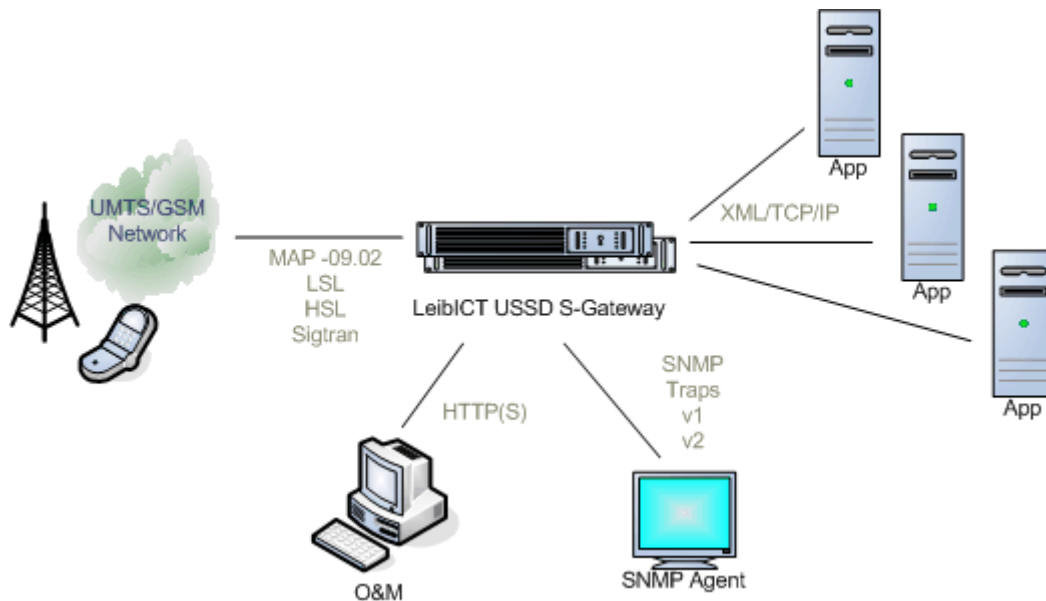
All the software components are Unix daemons that are started at boot time:

Hardware

The Sigtran USSD Gateway is based on standard x86 Servers from HP or Sun. The Operating System can be either Linux (RedHat or CentOS). The next picture shows a dual module configuration:
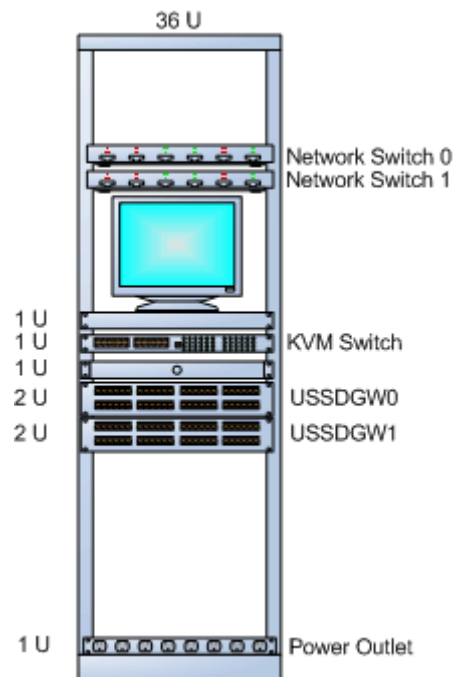
Typical HP/RedHat Solution is based on DL 380 with Intel Core 2 Quad and 4Gb of RAM. Hard disk space depends on customer needs of traffic logging storage. Up to 8Kb bytes are needed per transaction.

Interactivity View

The next scenario shows a ussd transaction ended by the application:
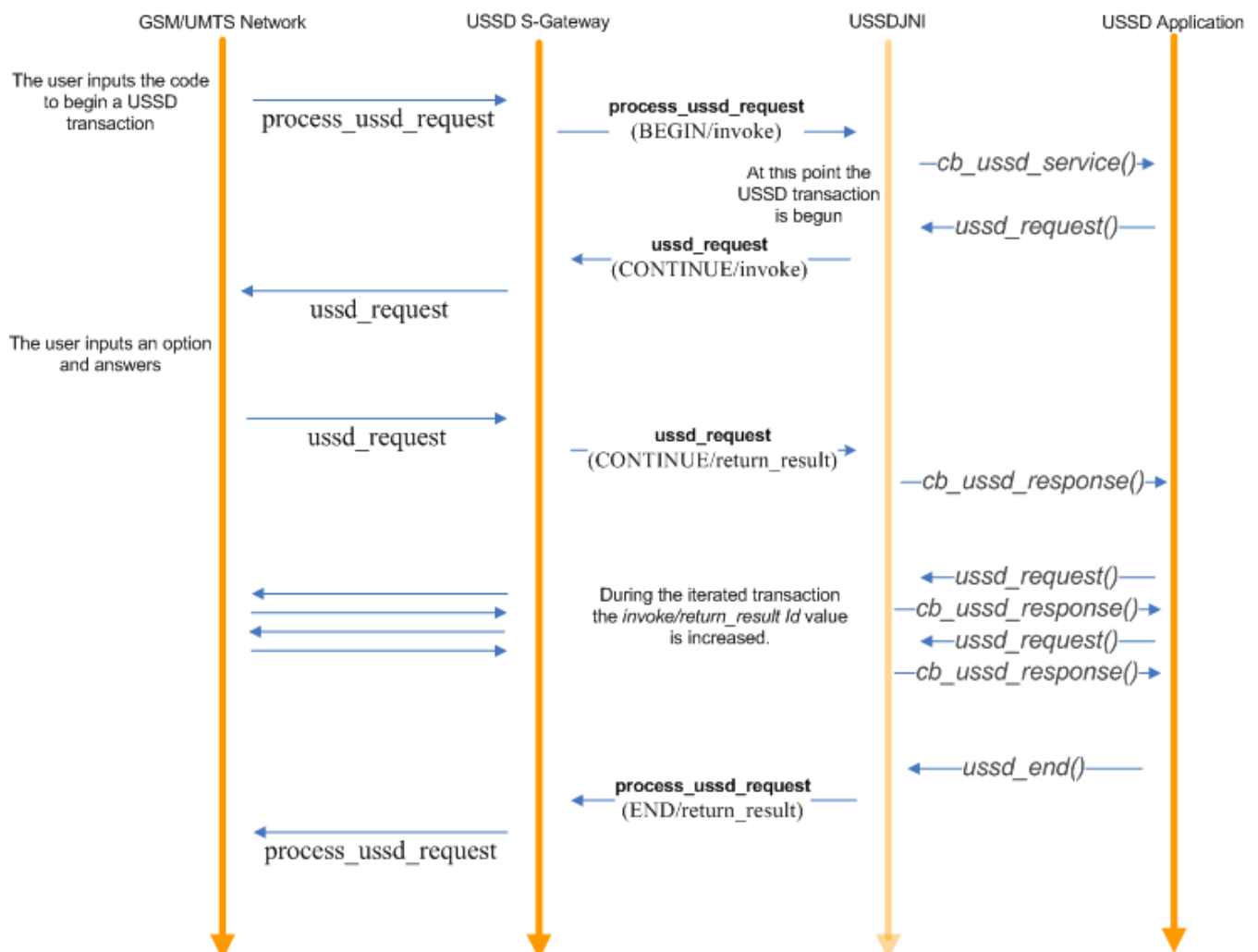
SNMP Traps

The AlarmServer module is responsible of sending traps to the configured destinations. This is the trap list and meanings:

Trap Name	Meaning
notification	Notification o a particular event like user Loggings
congestionDetected	Congestion Detected (of the links)
congestionAbated	Congestion Abated
serviceUp	System is ready to serve
serviceDown	System is down because of failure
associationUp	Signalling link Up
associationDown	Signalling link Down

All the traps have the same structure with an object name, an instance identification and a status.

Configuration

LeibICT Sigtran USSD Gateway has its configuration files deployed in a configurable directory. The default config directory is:

/leibict/ussdgateway/cfg

The main configuration of the SS7 *Stacks is implemented within a XML file:*

```xml
<siggw name="LeibICT">
        <sctp id="0" addr="localhost" port="5400" name="sctp">
                <association id="0" server="0" name="asso0">
                        <local    id="0" addr="192.168.1.100" port="2905" name="local-ep"/>
                        <remote        id="0" addr="192.168.1.20" port="2905" name="remote-ep"/>
                </association>
        </sctp>
        <m3ua id="0" addr="localhost" port="5401" name="m3ua">
                <user id="0" opc="321" name="stack">
                        <destination    id="0"
                                        dpc="123"
                                        name="destination0">
                                <route id="0" associationId="0" name="route0"/>
                        </destination>
                </user>
                <sctp_module id="0"/>
        </m3ua>
        <sccp id="0" addr="localhost" port="5402" name="sccp">
                <user          id="0"
                               addressIndicator="18"
                               pointCode="0"
                               subsystemNumber="146"
                               natureOfAddress="4"
                               translationType="0"
                               numberingPlan="1"
                               encodingScheme="1"
                               globalTitle="5001205280001"/>
                <translator    id="0"
                               prefix=""
                               loadsharing="0">
                        <mtp3_destination id="0"/>
                </translator>
                <mtp3_module id="0"/>
        </sccp>
        <tcap id="0" addr="localhost" port="5403" name="tcap">
                <sccp_module id="0"/>
        </tcap>
</siggw>
```

The XML configuration file consists in four parts, each referring a single stack: SCTP, M3UA, SCCP and TCAP.

1. SCTP

The SCTP layer is a wrapper of the OS SCTP Stack, thus it only contains the operative configuration.

The SCTP Layer has the next parameters:

Field	Description	Example
id	Identification Number of the Stack	"0"
addr	DN or IP Address of the machine where the Stack runs	"localhost"
port	TCP Port where the Stack listen	"5400"
name	Name of the Stack	"sctp0"
association	SCTP Association (s)	

The Association field has the next parameters:

Field	Description	Example
id	Identification Number of the Association	"0"
server	Indicates if the host acts as Server or Client	"0"
name	Name of the Association	"asso0"
local	Local End Point (s) of the Association	*
remote	Remote End Point (s) of the Association	*

The Local and Remote fields has the next parameters:

Field	Description	Example
id	Identification Number of the End Point	"0"
addr	DN or IP Address of the machine where the	"localhost"
port	SCTP Port of the End Point	"2905"
name	Name of the End Point	*

2. M3UA

The M3UA Stack implements the M3UA Protocol and State Machines:

The M3UA Layer has the next parameters:

Field	Description	Example
id	Identification Number of the Stack	"0"
addr	DN or IP Address of the machine where the Stack runs	"localhost"
port	TCP Port where the Stack listen	"5401"
name	Name of the Stack	"m3ua0"
user	M3UA User (s)	*

The M3UA User field has the next parameters:

Field	Description	Example
id	Identification Number of the User	"0"
opc	Originating Point Code	"321"
name	Name of the User	"user0"
destination	M3UA Destination (s)	*

The M3UA Destination field has the next parameters:

Field	Description	Example
id	Identification Number of the Destination	"0"
dpc	Destination Point Code	"123"
name	Name of the User	"dest0"
route	M3UA Route (s)	*

The M3UA Route field has the next parameters:

Field	Description	Example
id	Identification Number of the Route	"0"
associationId	Identification Number of the Association	"0"
name	Name of the Route	"route0"

3. SCCP

The SCCP Stack implements the SCCP Protocol and State Machines:

The SCCP Layer has the next parameters:

Field	Description	Example
id	Identification Number of the Stack	"0"
addr	DN or IP Address of the machine where the Stack runs	"localhost"
port	TCP Port where the Stack listen	"5402"
name	Name of the Stack	"sccp0"
user	SCCP User (s)	*
translator	SCCP Translator (s)	*

The SCCP User field has the next parameters:

Field	Description	Example
id	Identification Number of the User	"0"
addresIndicator		"18"
pointCode		"0"
subsystemNumber		"146"
NatureOfAddress	ITUT Q.713 SCCP Address parameters	"4"
translationType		"0"
numberingPlan		"1"
encodingScheme		"1"
globalTitle		"205280001"

The SCCP Translator field has the next parameters:

Field	Description	Example
id	Identification Number of the Translator	"0"
prefix	Prefix of the Global Title to be translated	"205"
loadsharing	Enable load sharing between entities	"0"
mtp3_destination	M3UA Destination (s)	*

The M3UA Destination field hast the next parameters:

Field	Description	Example
id	Identification Number of the M3UA Destination	"0"

4. TCAP

The TCAP Stack implements the TCAP Protocol and State Machines:

The TCAP Layer has the next parameters:

Field	Description	Example
id	Identification Number of the Stack	"0"
addr	DN or IP Address of the machine where the Stack runs	"localhost"
port	TCP Port where the Stack listen	"5403"
name	Name of the Stack	"tcap0"

Logs Files

All the process modules have a standard, debug and error logs. All the logs are generated in a configurable directory. The default log directory is:

/leibict/ussdgateway/logs

Debug logs are disabled by default, enabling them may cause a performance decrease.

Scalability Plan

The scalability of the solution can be performed by increasing the hardware modules in multiple ways: sharing the same SS7 network addresses (SCCP and MTP) or not and sharing the same TCP/IP network address or not.

By sharing the same SS7 network addresses, up to four nodes can be paired.

Beyond four nodes, more SS7 network addresses must be defined.

By sharing the same TCP/IP network address, a load balancer must be deployed like the one provided in the RedHat Cluster Suite.