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Android Device Service Config Manager

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Abstract - *Device management platform offers various carrier network related services to operator such as GSMA compliant RCS auto configuration server which delivers RCS configurations to RCS capable primary Android devices for enabling and disabling various service on the devices. According to the GSMA specification the term "entitlement" refers to the applicability, availability and status of that service or the feature on a device. The IMS status is exchanged between a VoWiFi, VoLTE or SMSoIP client and a Service Provider's Server. This mechanism for a service provider is known as Entitlement Configuration. But to manage the entitlement services such as VoLTE, VoWiFi and SMSoIP on android devices and to send relevant entitlement configuration settings to enable those services on the device, there is no solution available in the market for operator. This platform offers and manages entitlement configuration for Android devices. Operator can control provisioning of carrier features such as VoLTE, VoWiFi, and SMSoIP. For example, to enable VoWiFi on device, it has to be updated with appropriate configuration settings. Those configurations can be dynamically constructed and sent to device using android service configuration platform.*

Key Words: **Device Management, Service configuration, AppID, Android device, Entitlement.**

.INTRODUCTION

In modern days, mobile phones are an integral part of our lives and major revolutions are taking place in VoWiFi and VoLTE services. As of now, most of the operators provide all the services in a pack. If customer is interested in only single service among VoLTE, VoWiFi or SMSoIP, operator will have to push specific service configuration setting to the subscriber device. But as of now such solutions are provided by the operator to the subscribers. This influences the idea of developing such service solution to serve the customer needs. Android Service configuration platform can help the operator to give a better service experience by introducing more customized plans to satisfy their customer needs.

Service configuration platform for android device is nothing but a device management platform used by operator to send service specific configuration to the subscriber in order to enable or disable the services such as VoLTE, VoWiFi and SMSoIP over the air and to control the android features. These services are commonly used for high speed wireless communication. As in the cable TV subscriptions the subscribers opt for only the selected channels of their interest here the subscribers are provisioned to opt only for selected services of their choice. As all the subscribers will not have the 4G enabled devices this platform can majorly help in reduction of cost for the subscribers and can also be advantageous to operators in terms of profitability.

2. RELATED WORKS

GSMA PRDs IR.51 for IMS services covers various aspects of the entitlement configuration services such as VoLTE,VoWiFi and SMSoIP. Assuming that the connections are available these service specific aspects are obtained either through cellular or wifi connectivity. Entitlement configuration is an optional mechanism which requires end-user's subscription data and information from the SP for network readiness. [1]

GSMA PRD RCC.14 describes that entitlement configuration and service configuration between clients and service providers are independent of each other. Entitlement configuration server supports the protocol described in here to carry the required entitlement data exchange between device's applications and the network. The entitlement configuration procedure and the service configuration procedure specified here are comparatively different. It also specifies that, in the same request a device and an application cannot query for both entitlement and service configuration. The end-user's associated subscription and the core network's readiness is verified and allowing service to the end user which is resulted in the Entitlement configuration. If the VoWiFi, VoLTE or SMSoIP service is not allowed then the client performing the entitlement configuration should be disabled and activated on the device which may happen in case of Technical Adaptation of Device or MNO provisioning

procedure. VoWiFi, VoLTE and SMSoIP parameters defined in this specification are based on network readiness of these services and end user subscription data. [2]

3. PROPOSED METHOD

The figure 1 shows the architecture diagram of the proposed system which includes Android device, Networking elements, Device management platform and external system. The functional blocks here are Android device which is with a valid SIM which makes it capable of exchanging information with the authentication server, Load balancer is used by the device to access the device management platform, Http Proxy is a proxy server used to access FCM or SMSC if no direct connection is available, Fire based Cloud Messaging is used to send notifications and messages to client apps, Short Message Service Centre is a messaging gateway used to deliver SMS messages to devices, Device management platform is an inventory of users, devices, and gateways and it can provision, enroll, delete, observe, and manage resources, Carrier systems provides entitlement information, keeps information on subscribers, and the status of their entitlements, AAA (Authentication, Authorization, Accounting) server supports EAP-AKA-based authentication from primary devices and HSS (Home Subscriber Server) maintains the carrier's user subscription details and subscriptions in order to authorize the users.

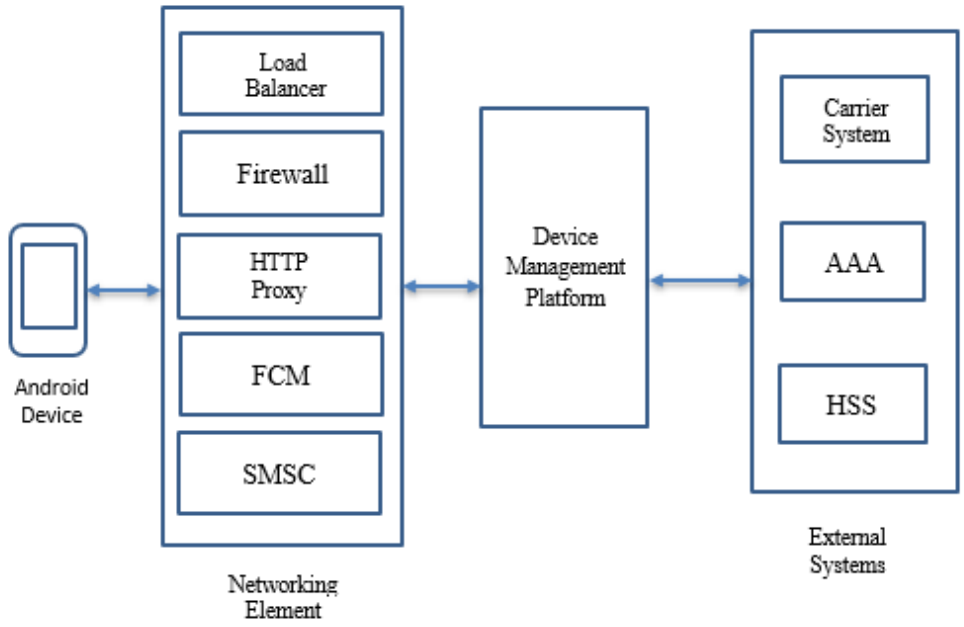


Fig -1: **Architecture diagram**

Android device can trigger either GET or POST entitlement configuration request for the services such as VoLTE, VoWiFi and SMSoIP. As specified by GSMA, the entitlement request for these service configuration request must contain a parameter called app with value 2003, 2005 and 2004 along with other parameters such as IMSI, token, vers, app, terminal_vendor, terminal_model, terminal_sw_version respectively.

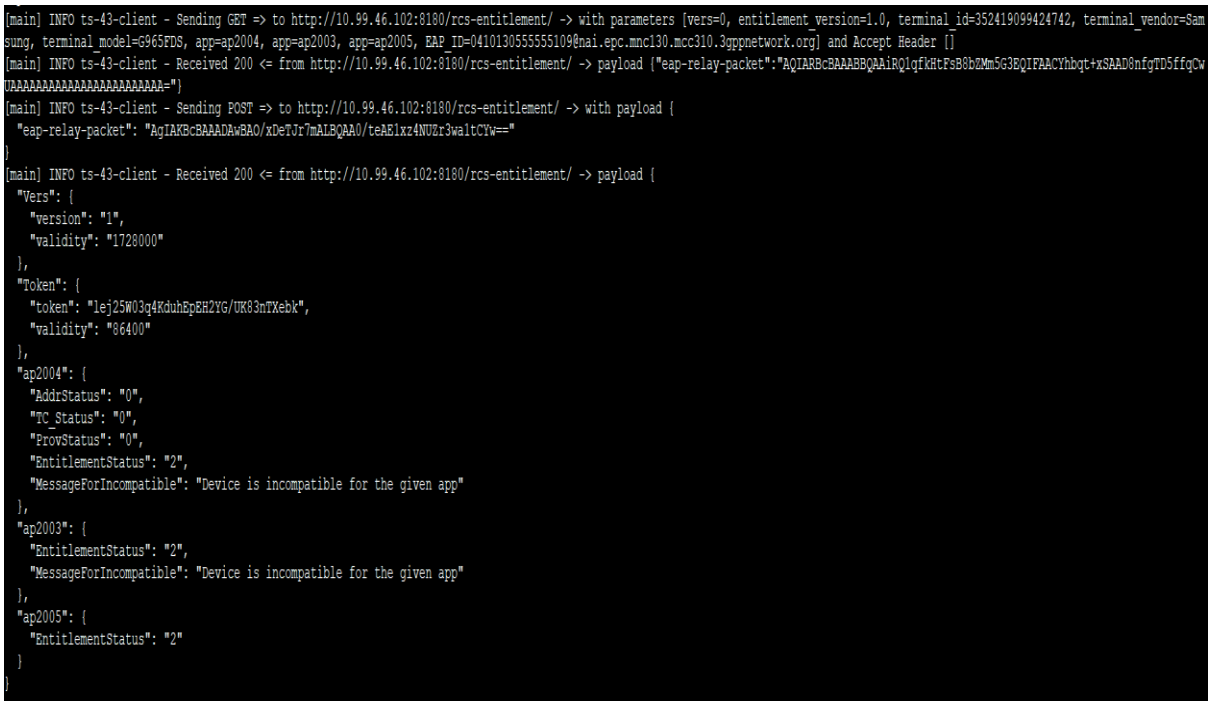
In addition to the HTTP GET, the HTTP POST method can be used by the client to send the entitlement configuration request if the parameters are located in the HTTP message body and should follow the JSON object value format. If POST method is supported by the client, then they can use the POST method instead of the GET method. If the server does not endorse POST, then HTTP response with 405 "Method Not Allowed" should be returned. Followed by that, the client should resend the request using the GET method. The response received from the server can be of two forms XML document composed of a set of characteristic types, each with a number of parameters and JSON object composed of a number of structured values ,a set of fields presented as name-value pairs corresponding to the characteristic present XML document.

4. RESULTS

A client can trigger the request in GET or POST method for any of the three entitlement services together or individually. After the request is successful processed, a status code 200 is received indicating the success. The responses are received in XML and JSON format as indicated in the accept header of the request parameter respectively.

```
[main] INFO ts-43-client - Sending POST => to http://10.99.46.102:8180/rcs-entitlement/ -> with parameters {
  "vers": "0",
  "entitlement_version": "1.0",
  "terminal_id": "352419099424742",
  "terminal_vendor": "Samsung",
  "terminal_model": "G965FDS",
  "EAP_ID": "04101305555555109@nai.epc.mnc130.mcc310.3gppnetwork.org",
  "app": "[ap2004, ap2003, ap2005]"
} and Accept Header []
[main] INFO ts-43-client - Received 200 <= from http://10.99.46.102:8180/rcs-entitlement/ -> payload {"eap-relay-packet":"AQIARBcBAAABBQAAp/oirI273s9XhmiR89C74wIFAABWRVwLXiuAAHVLDzoQg4NmCw
UAAAAAAAAAAAAAAAAAAAAAAA="}
[main] INFO ts-43-client - Sending POST => to http://10.99.46.102:8180/rcs-entitlement/ -> with payload {
  "eap-relay-packet": "AgIAKBcBAAADAwBAMjVfCk5yYj4LBQAA6uO9JvbbmmFV9teymuJ6MQ=="
}
[main] INFO ts-43-client - Received 200 <= from http://10.99.46.102:8180/rcs-entitlement/ -> payload <wap-provisioningdoc version="1.1">
    <characteristic type="VERS">
        <parm name="version" value="1"/>
        <parm name="validity" value="1728000"/>
    </characteristic>
    <characteristic type="TOKEN">
        <parm name="token" value="gX+N1uszRMNZdcoydj00ol9yoU135XuS"/>
        <parm name="validity" value="86400"/>
    </characteristic>
    <characteristic type="APPLICATION">
        <parm name="AppID" value="ap2004"/>
        <parm name="Name" value="VoWiFi Entitlement settings"/>
        <parm name="EntitlementStatus" value="2"/>
        <parm name="MessageForIncompatible" value="Device is incompatible for the given app VoWIFI"/>
        <parm name="AddrStatus" value="0"/>
        <parm name="TC_Status" value="0"/>
        <parm name="ProvStatus" value="0"/>
    </characteristic>
    <characteristic type="APPLICATION">
        <parm name="AppID" value="ap2003"/>
        <parm name="Name" value="VoLTE Entitlement settings"/>
        <parm name="EntitlementStatus" value="2"/>
        <parm name="MessageForIncompatible" value="Device is incompatible for the given app VoLTE"/>
    </characteristic>
    <characteristic type="APPLICATION">
        <parm name="AppID" value="ap2005"/>
        <parm name="Name" value="SMSoIP Entitlement settings"/>
        <parm name="EntitlementStatus" value="2"/>
        <parm name="MessageForIncompatible" value="Device is incompatible for the given app SMSoIP"/>
    </characteristic>
</wap-provisioningdoc>
```

Figure 2: POST request and XML response for all 3 services



```
[main] INFO ts-43-client - Sending GET => to http://10.99.46.102:8180/rcs-entitlement/ -> with parameters [vers=0, entitlement_version=1.0, terminal_id=352419099424742, terminal_vendor=Sam
sung, terminal_model=G965FDS, app=ap2004, app=ap2003, app=ap2005, EAP_ID=04101305555555109@nai.epc.mnc130.mcc310.3gppnetwork.org] and Accept Header []
[main] INFO ts-43-client - Received 200 <= from http://10.99.46.102:8180/rcs-entitlement/ -> payload {"eap-relay-packet":"AQIARBcBAAABBQAAiRQ1qfkHtFsB8bZMm5G3EQIFAACYhbqt+xSAAD8nfgTD5ffqCw
UAAAAAAAAAAAAAAAAAAAAAAA="}
[main] INFO ts-43-client - Sending POST => to http://10.99.46.102:8180/rcs-entitlement/ -> with payload {
  "eap-relay-packet": "AgIAKBcBAAADAwBAO/xDeTJr7mALBQAA0/teAE1xz4NUZr3waltCYw=="
}
[main] INFO ts-43-client - Received 200 <= from http://10.99.46.102:8180/rcs-entitlement/ -> payload {
  "Vers": {
    "version": "1",
    "validity": "1728000"
  },
  "Token": {
    "token": "lej25W03q4KduhEpEH2YG/UK83nTXebk",
    "validity": "86400"
  },
  "ap2004": {
    "AddrStatus": "0",
    "TC_Status": "0",
    "ProvStatus": "0",
    "EntitlementStatus": "2",
    "MessageForIncompatible": "Device is incompatible for the given app"
  },
  "ap2003": {
    "EntitlementStatus": "2",
    "MessageForIncompatible": "Device is incompatible for the given app"
  },
  "ap2005": {
    "EntitlementStatus": "2"
  }
}
```

Figure 3: GET request and JSON response for all 3 services

Figure 4: POST request and JSON response for all 3 services

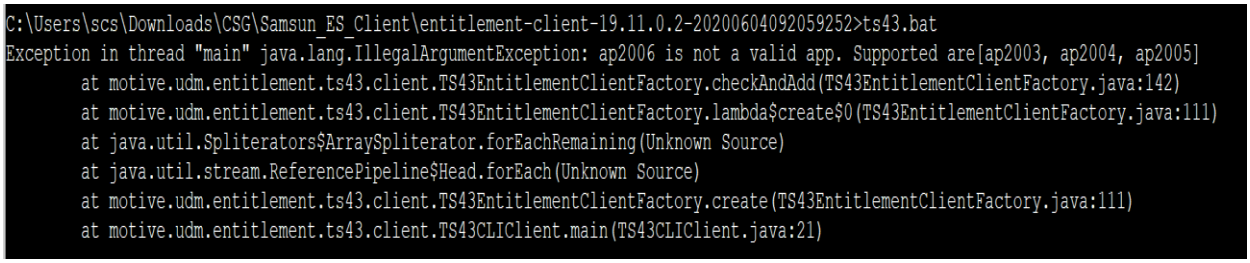


Figure 5: Unknown AppID in the request

If any AppID is sent other than the ap2003, ap2004 and ap2005 is sent then an illegal argument exception is thrown saying that it is not a valid AppID by the server and it also shows the supported AppIDs.

5. CONCLUSION

As per GSMA specification Service configuration settings for VoWiFi, VoLTE and SMSoIP services has been implemented. The entitlement server is enhanced to serve the service configuration on the GET or POST request from client to support this feature and ready to receive the response in XML or JSON. The operator can send entitlement level configuration settings and service status based on service demand from client. And the client can then dynamically activate or deactivate the service according to the status retrieved from the Entitlement Configuration Server using this platform. Operator can influence the features offered by entitlement server to deal with configuration parameters controlling the VoWiFi, VoLTE and SMSoIP service's activation or deactivation which ensures the enriched customer serviceability based on their demands.

6. FUTURE ENHANCEMENT

- As of now, Entitlement server can be used for controlling the activation and deactivation of the service and for generating dynamic service configuration settings for android primary device based on customer service request demand.
- Feature enhancement for supporting and controlling the service configuration settings for secondary device along with the primary device can be done.
- In order to manage subscription on android secondary device, primary device shall invoke the service configuration request on behalf of secondary device.

REFERENCES

[1] It covers device, network and service specific aspects of entitlement configuration of VoWiFi, VoLTE and SMSoIP services GSMA PRD IR.51 - "IMS Profile for Voice, Video and SMS over untrusted Wi-Fi access", Version 5.0, 23 May 2017. http://www.gsma.com

[2] It specifies mechanism to send service provider specific device configuration settings GSMA PRD RCC.14 "Service Provider Device Configuration", Version 5.0, 28 June 2017. http://www.gsma.com

[3] GSMA PRD IR.92 - "IMS Profile for Voice and SMS", Version 11.0, 23 June 2017. http://www.gsma.com.

[4] It provides information about feature specific service activation configuration settings GSMA PRD – "VoWiFi and VoLTE Entitlement Configuration", Version 4.0, 10 December 2019. http://www.gsma.com

[5] It provides information on AppID values and registration of AppIDs are made here in OMA Registry of Application Identifiers which is managed by OMNA http://www.openmobilealliance.org/wp/OMNA/dm/dm_ac_registry.html

[6] It specifies the procedure to implement the HTTP GET and POST method and also HTTP status codes. Hypertext Transfer Protocol HTTP/1.1 IETF RFC, http://tools.ietf.org/html/rfc2616

[7] It gives detailed information on procedure and usage of EAP-AKA authentication. "RFC4187 Extensible protocol method for 3rd generation authentication and key agreement" , https://tools.ietf.org/html/rfc4187

[8] It provides detailed information about the implementation, anatomy and usage of the token based authentication. https://auth0.com/learn/token-based-authentication-made-easy/