

AdvOSS HSS (Home Subscriber Server)

PRODUCT DATA SHEET

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1 AdvOSS HSS

Overview

HSS is the core data repository that stores information about services, their profiles, subscriber identities and their service subscription information.

HSS provides the following functionality and associated data storage:

- User identities and authentication data
- Base subscription information about services of each subscriber
- Add-on subscription information
- Service Profiles
- Service feature level monetization
- Personalization of services

Typical service and access networks in today's broadband world are composed of network functions that deliver services and enforce policies.

A Service can have one or more Network Functions associated with it, each rendered by a different service delivery point.

When a service is defined in the system, the schema of the Service Profile is also added for 'each service function'.

Each service has associated service related parameters that comprise its service profile. A service profile has many levels and is typically composed of several smaller profiles at different levels that combine to form a complete profile.

The parameters contained in different levels of service profiles can be characterized into the following types:

- General parameters applicable to all users subscribing to the service
- Specific parameters that can be personalized at the subscriber level
- Specific parameters that can be personalized at the subscriber's userID level, if the subscriber has different user identities to access the network
- Specific parameters that can be monetized as add-ons to the subscription
- Specific parameters that are part of the base subscription but can be monetized individually

- Specific parameters that can be used to create service differentiation based on Quality of Service (QoS) and Quality of Experience (QoE)

HSS manages all these different types of parameters in service profiles. The AAA applications pull user identities and service profile data from the HSS database when a subscriber session starts and then at several points during an ongoing session.

This data is used by service delivery and policy enforcement points in the service provider network.

AdvOSS HSS identifies two basic functions for each Service; a Border Function and a Core Function. More functions for a Service can also be added.

Storage of Data inside HSS

HSS stores the data to be served in response to query from the network functions. There are four main levels where the data is stored:

- At Service Level i.e. global for anyone using that Service as Global Profile
- At Service Offering or Subscription Level as Service Profile
- At User Profile
- At the UserID level i.e. ID Profile

Upon querying by the A/S, the HSS pulls relevant data from all four levels and merges them into an XML document complying to the schema XSD of the said Service Function and serves to the A/S.

Conflict resolution and notations for default values

Based on the way offerings are designed by the Operator, the Attributes can be divided at any of the possible four levels.

A value stored at a more specific location takes precedence on the value stored above. So e.g. if a value exists in User Profile as well as ServiceOfferings, then the User Profile takes precedence and if the same value exists at UserID level, then the value stored at UserID level takes precedence.

A non-existent or NULL value at any location means that the higher level value can be taken. A specific zero value at a lower location means that the Attribute is to be denied. The Operator needs to define

default profiles in ways that will always make a well formed XML document after merging the Attribute values from all four levels.

Querying HSS

When a new Session starts, the Service delivery or policy enforcement point authorizes the Session using a AAA application. For Authorization, the AAA application sends three values to the HSS:

- UserID used in Identification of the User.
- FunctionID of the network function
- ServiceID

Using these three keys, the HSS replies with a XML document complying with the schema of the Service Profile for that function. The AAA application uses the values in the XML document to render the Service.

Anatomy of the Service Profile

Service Profile is an XML document complying to an XML Schema (XSD). The Schema contains “Attributes”. Each Attribute has its own unique XPath within the XSD. If some attribute depends on another attribute, it can be nested under the first one.

Translation of Service Profile XML into Network format

When the Service Profile XML is received by the AAA Application from the HSS, it translates the XML into a format understandable by the service delivery or enforcement point. This translation is out of scope of the HSS and is to be handled by the AAA Server through scripting customized for each Application Server.

Defining New Layers:

HSS allows defining new layers of hierarchy to store Service Profile data. Some possible such places are:

- ABMFID (Account Balance Management Function ID)
- Department
- Organizational Unit (OU)
- Other Active Directory levels

Support for Subscription based Profiles:

Subscription based profiles are attached when a Service Offering is applied to a user. Along with it, the Service Profile that was created with the Offering is also applied

Support for User Personalizable Attributes:

All Attributes that the Operators wants a User to personalize through his self serve portal, need to go into the User Profile.

Support for paid add-ons

Paid add-on can be created for two types of attributes:

1. If the Attribute is defined over a period of time, a counter is to be created in the Rating Engine
2. If the Attribute is defined over a point of time, then the values of that attribute are to be pushed inside the User Profile upon successful payment of Subscription.

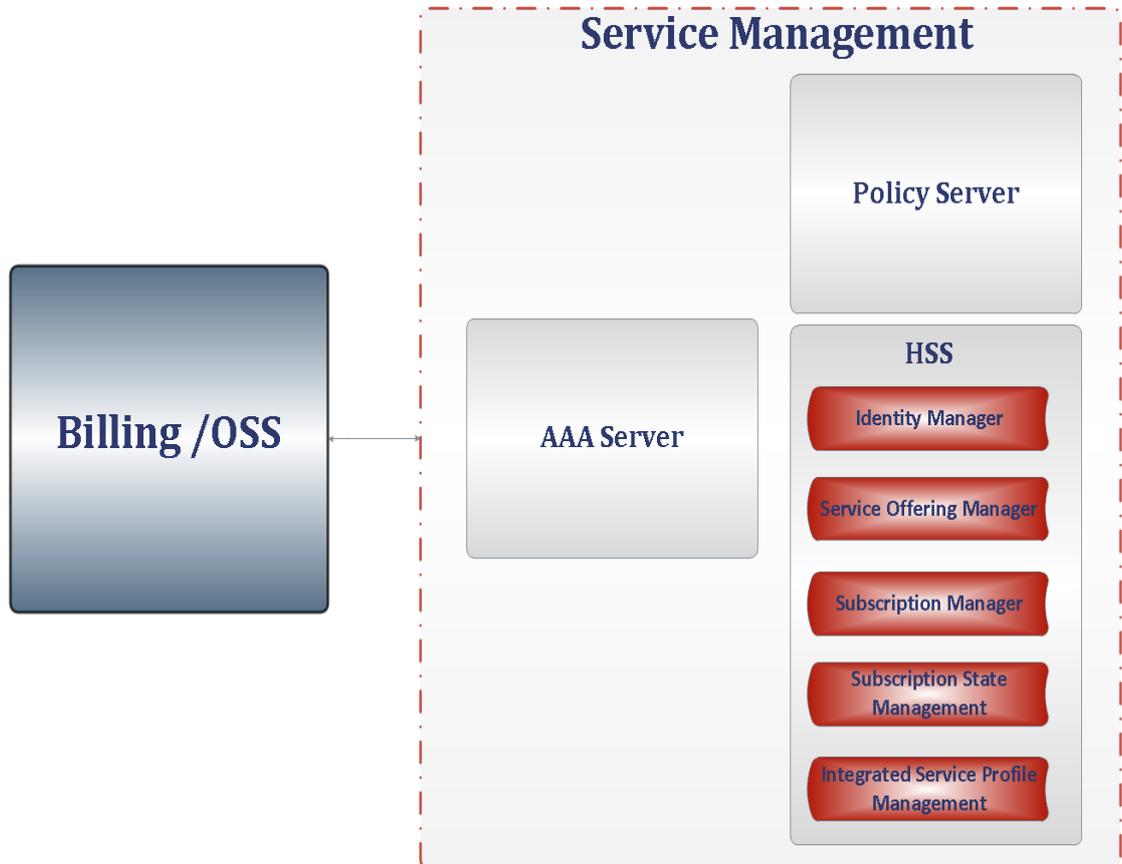
HSS exposes Get and Set APIs to add / delete Attribute values from the User Profile. These are called by the billing engine upon buying subscription to add-on offerings.

Support for Fair Usage and other profiles

Fair-Usage profiles are applied on meeting some given conditions. When the Fair-Usage is applied, the Attributes changed in the Fair-Usage are written in the User Profile thereby superseding the values in Service Profile. Upon removal of Fair-Usage, the extra values are removed from the User Profile so that the default values at Service Profile apply again.

Asynchronous Notifications:

Any Policy Enforcement Point with its own Subscriber Manager may need to be provisioned when a change of profile occurs for a specific User. HSS keeps track of all changes occurring and can push these changes to specific Policy Enforcement Points asynchronously as and when needed.



2 Business Use Cases

HSS supports the following business use cases:

- Subscriber identities storage for multiple public private identities and their mappings to each other
- Subscriber authentication information including username/password and cryptographic keys, certificates, information about subscriber access methods and devices
- Service profiles for all users subscribing to the service

- Service profiles that can be personalized at the subscriber level
- Service profiles that can be personalized at the subscriber's userID level, if the subscriber has different user identities to access the network
- Service profiles that can be monetized and personalized at the network access method and device level e.g. WiMAX, Wi-Fi, landline, optical fiber, DSL etc.
- Service profiles that can be monetized as add-ons to the subscription
- Service profiles that are part of the base subscription but can be monetized individually
- Service profiles that can be used to create service differentiation based on Quality of Service (QoS) and Quality of Experience (QoE)
- Asynchronous notifications for profile changes to multiple network functions

3 Modules

AdvOSS HSS is composed of the following main modules described below.

3.1 Identity Manager

It manages user identities, both public and private, along with authentication data, username/password combinations, cryptographic keys, certificates etc.

3.2 Service Offering Manager

It manages different service offerings and their parameters, service add-ons, monetized service parameters and parameters for service differentiation.

3.3 Subscription Manager

It manages subscription information at the subscriber level, service parameters personalized by the subscriber within the subscription or at the identity level and tracking of subscription change and modification at the subscriber level.

3.4 Subscription State Management

It manages subscription states, their validity, the state of the subscriber and the effect of any state change on all of his or her subscriptions, the blocking/unblocking and suspension of services etc.

3.5 Integrated Service Profile Management

It manages all the complexities of service profile rendering by conflict resolution, identifying which parameters have precedence over others at different levels, and forming a unified profile that can be served to the network function.

4 Integration Points

HSS integrates with the following network elements in the Service provider network

- **AAA applications**
- **Policy server**
- **Provisioning system**

5 Key Benefits

AdvOSS HSS offers the following key benefits to the CSPs, in addition to its feature set:

5.1 Scalability:

The System can scale linearly up to a few million subscribers offering substantial advantages in terms of cost reduction and ease of scalability. Scalability is achieved using various techniques like distributed database design.

5.2 Reliability:

The system provides high reliability and ensure mechanism to avoid system downtime though fully redundant DB architecture.

5.3 Robustness:

The system is very robust and keeps performing in the fact of errors.

5.4 Customizability:

The system is designed to allow for easy and rapid customizations as per CSP requirements, on demand.

5.5 Disaster Recovery:

The System can be deployed in two geographically distant data centers, for disaster recovery reasons. AdvOSS Database solutions provide real-time DB replication to remote slaves. This gives the remote location an almost real-time image of the live database and the system can fall back to remote location in a disaster situation.

5.6 Flexibility:

The system is service agnostic and has the architectural provision to support any business model. This allows for easy customizability to support specific requirements of a CSP.

5.7 Resilience:

The system works at high loads within its thresholds and gracefully keeps working by handling the situations even beyond the guaranteed thresholds e.g. by rejecting requests.

5.8 Speed:

The system guarantees high speed of operations and latency times associated with the operations.

5.9 Data Integrity:

The system preserves the integrity and correct relationship of data in order to guarantee the correct behavior.

5.10 High Availability:

The system uses various techniques to ensure high availability behavior.

5.11 Redundancy:

The system achieves redundancy through multiple methods like having database servers in active/active configuration. The database servers as well as the servers hosting the GUIs are hosted in geographically distributed data centers.