Prepaid Packet Data Service in cdma2000 Wireless IP Network

**Stage 1 Requirements**
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1 INTRODUCTION AND SCOPE

Prepaid service allows the subscriber to pay for packet data services prior to usage. A prepaid subscriber establishes an account with the service provider to access packet data services in home and roaming networks. Charges for packet data services are applied to the prepaid service account by decrementing the account in real-time. The prepaid subscriber may be notified about the account information at the beginning, during, or at the end of the packet data session. When the account balance is low the subscriber may be notified so that the subscriber may recharge the account. When the account balance is below a pre-defined threshold, the subscriber’s packet data services may be de-authorized. The access authentication of the mobile station is outside the scope of this stage1 document.

Note that in this document the term prepaid user/subscriber means that the user/subscriber gets packet data service on a prepaid basis independent of the user's/subscriber's account status for postpaid packet service and/or postpaid and prepaid circuit switched service.

2 REFERENCES

Applicable references for this specification include the following:

2.1 Normative References


1 cdma2000 is the trademark used by the Organizational Partners to refer to the technical nomenclature used by the Organizational Partners (OPs) of 3GPP2 in their standardization activities and to signify equipment and services that are designed to comply with 3GPP2 specifications and OP cdma2000 standards. Geographically, in the United States, cdma2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).
2.2 Informative References

3 DEFINITIONS AND ABBREVIATIONS

The terms and abbreviations that are used within this document are as follows:

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<tr>
<td>AAA</td>
<td>Authentication Authorization and Accounting</td>
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<td>HA</td>
<td>Home Agent</td>
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<td>HAAA</td>
<td>Home AAA</td>
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<td>MS</td>
<td>Mobile Station</td>
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<td>PDSN</td>
<td>Packet Data Serving Node</td>
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Prepaid Service: A service allowing a subscriber to use a Prepaid Service Provider accepted form of payment to pay in advance for the use of packet data services. The Prepaid Service Provider maintains the user’s/subscriber’s account balance.

Prepaid Server: It maintains the prepaid accounts on a per user basis or on a per service type basis for a user. It communicates with the prepaid packet data service client for control of the prepaid packet data service.

Prepaid Client: An entity that resides in the wireless IP network and communicates with the prepaid server. It requests prepaid account authorization for a user and monitors the user’s session to determine when the limits of the authorization have been exceeded.

Prepaid User (or Subscriber): A subscriber charged by a wireless IP Network Provider or 3rd Party Service Provider for prepaid service. Note that in this document the term prepaid user/subscriber means that the user/subscriber gets packet data service on a prepaid basis independent of the user’s/subscriber’s account status for postpaid packet service or post and prepaid circuit switched service.

3rd Party Prepaid Service Provider: A service provider that is separate from the wireless IP network provider and has a business relationship with the wireless IP network provider for prepaid service.
Active Packet Data Session: A packet data session is active during the time the MS is sending and/or receiving IP packets over any of the associated service instance.

4 GENERAL FEATURE DESCRIPTION

4.1 Prepaid Service Model

The prepaid service is based on a client-server model. The prepaid user uses an accepted form of payment to pay in advance for the use of network resources. These resources include duration and volume. The purpose of the prepaid client is to gather and report accounting information related to prepaid packet data service. Another entity in the prepaid service model is the prepaid server. The prepaid server is in charge of maintaining the account balance and authorizing the service. It may be located either in the wireless IP network or in a third party service provider network.

4.2 The Functions of the Prepaid Service Entities

The functions of the prepaid packet data client include the following:

1. Request prepaid accounting authorization for a user from the prepaid packet data server.
2. Update prepaid server with the resource usage information for the prepaid user.
3. Terminate the session when prepaid server requests this action.

The functions of the prepaid packet data server include the following:

1. Authorize requests for prepaid service for a user.
2. Determine the type of prepaid account (duration or volume based) and the amount of account balance available for use.
3. Maintain the account balance available for the user.
4. Translate the account balance into available resources for the user.
5. Determine the portion of the available account balance to allocate based upon statically configured parameters, dynamic parameters such as remaining account balance, the time of the day etc., or a combination of the two.
6. Accepts updates from the prepaid client indicating resource usage for the prepaid user and reconciles the appropriate user account.
7. Request termination of session when user’s account is exhausted.
5 NUMBERED REQUIREMENTS

The following are high-level requirements for Prepaid Service.

5.1 Prepaid Service Requirements

The following are the requirements for Prepaid Packet Data Service:

**PP-01** The prepaid service shall provide packet data service based on an account established prior to use. The prepaid account information shall be maintained on a prepaid server.

**PP-02** The prepaid client shall have the capability to receive account information for a user from the prepaid server and update the server as to the amount of resources (duration or volume) used.

**PP-03** The prepaid client shall communicate with the prepaid server for control of the prepaid packet data service.

**PP-04** Prepaid service shall be based on resource used including volume (number of bytes) and/or time (duration of packet data session or service instance).

**PP-05** Time based prepaid service shall apply to active and connected packet data sessions and/or for the entire packet data session including dormancy.

**PP-06** The prepaid client shall maintain an accurate balance of the used/remaining session account (resources).

**PP-07** The user’s prepaid account shall be reconciled when the user changes serving PDSNs.

**PP-08** The remote address accounting feature shall apply to prepaid service.\(^2\)

**PP-09** Prepaid service should allow supporting multiple prepaid accounts per user that apply to different service instances.

**PP-10** When a user’s account balance is exhausted, the session shall be terminated.

**PP-11** When the prepaid account falls below a pre-defined threshold, the prepaid service shall support the capability to send a notification to the user requesting to replenish the prepaid account during an active prepaid packet data session. When the user successfully replenishes the prepaid account, then the prepaid service shall allow the user’s session to continue.

\(^2\) P.S0001-B
The prepaid service shall be applicable to Simple IP and Mobile IP sessions.

When the subscriber’s packet data session closes, the prepaid client shall send a message to indicate the end of the packet prepaid session to the prepaid server.

The prepaid server shall adjust and credit unused account balance to the prepaid account when a termination notification is received from the prepaid client.

Prepaid services shall include accounting for data transmissions using short data burst over common and dedicated channel.

For Mobile IP subscribers, if there is no prepaid capability in the visited wireless IP network, then the prepaid service may be provided by the user’s home IP network.

Prepaid service shall support the ability to charge differently based on time of day.

6  DETAILED FUNCTIONALITY REQUIREMENTS

6.1  Call Model

During the packet data session setup procedure the prepaid client and the prepaid server exchange user’s prepaid account information based on the user’s subscription profile in the HAAA. The prepaid server maintains the account status of the user during the prepaid service and it reconciles the account based on the update messages from the prepaid client.

6.2  Applicability to Telecommunications Services

The prepaid service described in this document applies to packet data service over cdma2000 wireless IP networks.

6.3  Tones, Announcements, and Indications to the Users

The prepaid user should be able to get information about the user’s account balance.

When the user’s account reaches a low balance, the prepaid service shall provide a low balance notification to the prepaid user.

6.4  Normal Procedures with Successful Outcome

Authorization
The prepaid service shall be authorized based on the user’s subscription profile in the HAAA.

De-Authorization

The prepaid service shall be de-authorized when the subscriber’s prepaid account balance becomes “zero”. The network shall be able to de-authorize prepaid service for a user due to administrative purpose.

Registration

No Registration is required for prepaid packet data service.

Deregistration

No Deregistration is required for prepaid packet data service.

Activation

The prepaid account for packet data shall be activated upon a successful authentication and authorization at the HAAA.

De-Activation

The prepaid account for packet data shall be de-activated upon a failed authentication and authorization at the HAAA or upon depletion of the account balance.

Invocation

The prepaid service shall be invoked by the network at the packet data session setup.
6.4.1 **Normal Operation with Successful Outcome**

The user requests a packet data session with the PDSN. The PDSN initiates authorization/authentication of the user during the packet data session establishment phase. If the authenticated user is authorized for prepaid service and if funds are available, the user is granted prepaid packet data service.

6.4.2 **Call Detail Record**

The prepaid client shall record some or all of the following call detail informations:

1. Bytes used on the forward link for a volume based Prepaid Service.
2. Bytes used on the reverse link for a volume based Prepaid Service.
3. Total duration of packet data service for a time based Prepaid Service.
4. Duration of active packet data session for timer based Prepaid Service.
5. The Prepaid Service setup information (i.e. time of day the service is started)
6. The Prepaid Service termination information (i.e. time of day the service is terminated)

6.5 **Exception Procedures or Unsuccessful Outcome**

6.5.1 **Authorization**

If prepaid packet data service authorization fails due to account balance exhaustion, then the prepaid system may re-direct the user’s session to a recharging system. The user should not be billed for any notification or re-direction. Otherwise the user’s packet data session shall be terminated.

6.5.2 **De-Authorization**

None identified.

6.5.3 **Registration**

None identified.

6.5.4 **Deregistration**

None identified.
6.5.5 Activation
None identified.

6.5.6 Deactivation
None identified.

6.5.7 Invocation
None identified.

6.5.8 Exceptions While Roaming
If the visited wireless access provider network does not support packet data prepaid functionality, then the prepaid service shall be provided by the prepaid client in the home network for a subscriber using Mobile IP.

6.5.9 Exceptions During Intersystem Handoff
None identified.