ATIS-0700706.1997(S2017)

Stage 1 Service Description for Personal Communications Service – Enhanced Priority Access and Channel Assignment (PACA-E) Supplementary Service

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ATIS-0700706.1997(R2013), *Stage 1 Service Description for Personal Communications Service – Enhanced Priority Access and Channel Assignment (PACA-E) Supplementary Service*

Is an American National Standard developed by the **Radio Access Networks (RAN)** Subcommittee under the **ATIS Wireless Technologies and Systems Committee (WTSC)**.

Published by
Alliance for Telecommunications Industry Solutions
1200 G Street, NW, Suite 500
Washington, DC 20005

American National Standard
for Telecommunications –

Stage 1 Service Description for Personal Communications Service – Enhanced Priority Access and Channel Assignment (PACA-E) Supplementary Service

1 Scope, purpose, and application

1.1 Scope and purpose

A uniform, nationwide approach is needed to ensure effective implementation of the wireless priority treatment. This standard defines and describes call set-up procedures for the Enhanced Priority Access and Channel Assignment (PACA-E) service for priority access as well as priority egress for Personal Communications Service (PCS) system. This standard defines the functionality required to support the PACA-E priority treatment supplementary service in a PCS Basic Call process. The information in annex A illustrates the incorporation of this service into the circuit-mode bearer service described in *American National Standard for Telecommunications – Stage 1 service description for personal communications service – Circuit-mode bearer services: Basic processes,* ANSI T1.705-1995.

This stage 1 PACA-E Service Description is limited to only call origination from a PACA-E subscriber (priority access), and separately, call delivery to a PACA-E subscriber (priority egress). End-to-End PACA-E service, including priority egress for a call originated from a PACA-E subscriber, is for further study. A graphical representation of priority access, priority egress, and End-to-End priority service is provided in annex D.

1.2 Application

This service is intended to provide priority treatment to a subclass of PCS users (e.g., National Security and Emergency Preparedness (NS/EP) users) and defines a feature that is activated by a PACA-E subscriber originating or receiving a call. PACA-E will support up to 15 priority levels; the top five levels (1 being the highest) are reserved for NS/EP users.

Emergency (911/E911) call requests may be assigned a priority level in accordance with federal/state law. Coordination between PACA-E and emergency service shall be maintained to provide capabilities consistent with use of the services as mandated by law.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

ANSI T1.705-1995, *Telecommunications – Stage 1 service description for personal communications service – Circuit-mode bearer services: Basic processes*

3 Definition

3.1 National Security and Emergency Preparedness (NS/EP): Executive Order (E.O.) 12472 directs the Office of the Manager, National Communications System (OMNCS) to assist in the planning for and provisioning of NS/EP communications for the Federal Government under all circumstances, through the use of commercial, government, and privately owned telecommunication resources. These communities may be classified into national security leadership; national security posture and U.S. population warning; public health, safety, and maintenance of law and order; public welfare and maintenance of the national economic posture.

4 Service description

The PACA-E service comprises two independent feature capabilities: (a) priority access for call origination from a PACA-E subscriber and (b) priority egress for call delivery to a PACA-E subscriber. Priority access and priority egress are considered independent of each other as this allows for subscription of priority access and priority egress separately or together.

PACA-E is intended to support a hierarchy of priority service levels for access to radio channel resources. In this way, the individual levels can be used to differentiate between various subcategories of priority users. PACA-E does not allow preemption of any existing calls or support more than one call in queue for any given PACA-E subscriber.

Queued call attempts are normally serviced on the basis of priority levels first and time of arrival second. The case for contention of radio resources between priority incoming/outgoing call attempts is for further study.

This standard does not require that radio resources be permanently “reserved” or “set aside” for PACA-E usage, rather, when a radio resource becomes available, any PACA-E calls already in queue will be considered before any non-PACA-E calls. It is intended that commercial service will not be totally preempted by priority access calls. In order to maintain commercial service, an available channel may be assigned to a non-priority call rather than a PACA-E call in queue.

4.1 Priority access

This feature enables a PACA-E (access) subscriber placing a call to obtain priority access to radio channel resources during PCS call setup using multilevel priority queuing of call setup attempts when radio resources are congested. Queued outbound calls are serviced on the basis of the PACA-E (access) subscriber’s individual priority level first and time of arrival second.

The PACA-E subscriber’s service is marked busy for incoming calls while waiting in queue for a radio channel to be assigned.

4.2 Priority egress

This feature enables a PACA-E (egress) subscriber receiving a call to obtain priority access to radio channel resources during PCS call delivery through multilevel priority queuing of call delivery attempts when radio resources are congested. Queued inbound calls are serviced on the basis of the PACA-E (egress) subscriber’s individual priority level first and time of arrival second.

The PACA-E subscriber’s service is considered busy by the system for subsequent incoming calls while the PACA-E (egress) feature is invoked.

5 Procedures

The following subclauses describe PACA-E functionality (procedures and states), and their relationship to the procedures of the PCS Basic Call process.

5.1 Priority access (Outbound)

5.1.1 Provisioning/Withdrawal

PACA-E priority access as described in this standard shall be available to those customers who have subscribed accordingly and whose subscription has been provisioned. Withdrawal is the complementary action taken when the user cancels his subscription to PACA-E priority access.

5.1.2 Activation/Deactivation

Activation of PACA-E access enables the user to place a priority call via the invocation of the PACA-E functionality that has been added to a PCS Basic Call process. Deactivation is the complementary action that prevents the priority treatment of this user's calls.

5.1.2.1 Demand activation

When provisioned as a demand-activated service, PACA-E priority access is normally deactivated. It is activated when the user sends a PACA-E priority access service request (e.g., via a feature code entered on the Radio Terminal Equipment) prior to placing or receiving a call. Deactivation occurs upon completion of a PACA-E call.

5.1.2.2 Permanent activation

When provisioned as a permanently activated service, all outbound calls from the user will be treated as priority calls. The user cannot deactivate it except by withdrawal or reprovisioning the service as demand activated.

5.1.3 Invocation/Operation

Once PACA-E priority access is activated, it will be invoked by a Call Modification procedure in a PCS Basic Call process, either during call origination or call delivery (see figure A.1.1, figure A.1.2, and figure A.2 in annex A).

At the time of call origination (access), the PACA-E priority access user shall receive an indication of the PACA-E queuing request status. The PACA-E priority access user may also receive periodic alerting while the call attempt is in queue. PACA-E service is in operation as long as the call attempt remains in the queue. Upon a radio resource becoming available and assigned, the user will be alerted that the call attempt is in progress (e.g., via a distinctive tone) and the user is expected to stay on the line in order to continue the PACA-E process.

When a PACA-E priority access call attempt is invoked in a PCS system, it is processed by a modified PCS Basic Call process that will (a) process the call as usual if resources are available, (b) mark the call attempt as a priority call if PACA-E priority access was activated and resources are not available, (c) include a PACA-E queuing procedure, and (d) modify the radio resource assignment procedure to include the ability to determine if a resource should be assigned to a priority outgoing call attempt (see figure A.1.1, figure A.1.2, and figure A.2 in annex A).

If resources are not available and the call attempt is not a PACA-E call, processing continues as per the original PCS Basic Call process.

If resources are not available and a call is marked as a priority call, a PACA-E queuing procedure is invoked before processing continues and the following scenarios apply:

a) If the priority call attempts queue is not full, the call attempt is placed into the queue on the basis of its PACA-E priority level and time of arrival, and the PACA-E priority access subscriber receives an indication that the call attempt has been queued. While the call attempt is queued, the PACA-E priority access subscriber can abandon the call, the call can be bumped from the queue (e.g., by a higher

priority call, upon queue time-out[1)] or loss of location), or the call can be served with a radio resource. Abandoning the call attempt causes the call to be dropped from the queue. Any other disposition of the queued call, other than call completion, causes an indication of call failure to be sent to the PACA-E priority access subscriber;

b) If the queue is full but there is a call attempt in queue with lower priority, the PACA-E queuing procedure drops the lowest priority call attempt from the bottom of the queue and proceeds as if the queue was not full. If no lower priority call attempt is in the queue, time of arrival of the queued call attempts of the same priority is used to resolve the contention. If the priority call attempt has lower priority and later time of arrival than the queued call attempts, it is treated as a normal PCS call according to the original PCS Basic Call process.

In cases where there is a contention of available RF resources on the basis of call attempts having the same priority level, the time of arrival will normally be used. The details of the Queuing Resolution Process, including contention for radio resources between radio priority incoming/outgoing call attempts, are for further study.

The PCS network shall track the location of the calling party since it may change after the call has been queued. Without periodically updating the location of the calling party, the PCS system would not be able to determine if the user is in a location where a radio resource is available to complete the call. As shown in figure C.1 of annex C, a timer is used to control periodic location updating procedures. The calling party is located and the timer is started. Upon expiration of the timer, if the calling party cannot be located, then the call attempt is removed from the queue and the PACA-E access request is discarded; if the calling party can be located but no resource is available, then the location is recorded, the paging timer is reset and restarted, and the call left in the queue.

5.2 Priority egress (Inbound)

5.2.1 Provisioning/Withdrawal

PACA-E priority egress, as described in this standard, shall be available to those customers who have subscribed accordingly and whose subscription has been provisioned. Withdrawal is the complementary action taken when the user cancels his subscription to PACA-E priority egress.

PACA-E, on egress, is normally provisioned as a demand-activated service, as described in 5.2.2.1. Optionally, it can be provisioned as a permanently activated service, as described in 5.2.2.2.

5.2.2 Activation/Deactivation

Activation of PACA-E egress enables the user to receive a priority call via the invocation of the PACA-E functionality that has been added to a PCS Basic Call process. Deactivation is the complementary action that prevents the priority treatment of this user's calls.

5.2.2.1 Demand activation

When provisioned as a demand-activated service, PACA-E priority egress is normally deactivated. It is activated when the user sends a PACA-E priority egress service request (e.g., via a feature code entered on the Radio Terminal Equipment) prior to placing or receiving a call. Deactivation occurs when the user sends a PACA-E priority egress deactivation request.

5.2.2.2 Permanent activation

When provisioned as a permanently activated service, all inbound calls to the user will be treated as priority calls. The user cannot deactivate it except by withdrawal or reprovisioning the service as demand activated

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1) It is desirable that an administrable timer be provisioned for the queue time-out. The minimum and maximum range of timer values, including timer/timers will be addressed in stage 2.

5.2.3 Invocation/Operation

Once PACA-E priority egress is activated, it will be invoked by a Call Modification procedure in a PCS Basic Call process, either during call origination or call delivery (see figure A.1.1, figure A.1.2, and figure A.2 in annex A).

When a PACA-E priority egress call attempt is invoked in a PCS system, it is processed by a modified PCS Basic Call process that will (a) process the call as usual if resources are available, (b) mark the call attempt as a priority call if PACA-E priority egress was activated and resources are not available, (c) include a PACA-E queuing procedure, and (d) modify radio resource assignment procedure to include the ability to determine if a resource should be assigned to a priority incoming call attempt.

If radio resources are not available and the call attempt is not a PACA-E call, processing continues in accordance with the original PCS Basic Call Process.

If radio resources are not available and a call is marked as a priority call, a PACA-E queuing procedure is invoked before processing continues and the following scenarios apply:

a) If the priority call attempts queue is not full, the call attempt is placed into the queue on the basis of its PACA-E priority level and time of arrival, and the calling party receives an indication (e.g., via an announcement or tone) that the call attempt has been queued, and possibly, a periodic alerting while the call attempt is in queue. While the call attempt is queued, the calling party can abandon the call, the call can be bumped from the queue (e.g., by a higher priority or earlier time of arrival call attempt, queue time-out,[1)] loss of location), or the call can be served with a radio resource. Abandoning the call attempt causes the call to be dropped from the queue. Any other disposition of the queued call, other than call completion, causes an indication of call failure to be sent to the calling party;

b) If the queue is full but there is a call attempt in queue with lower priority, the PACA-E queuing procedure drops the lowest priority call attempt from the bottom of the queue and proceeds as if the queue was not full. If no lower priority call attempt is in the queue, time of arrival of the queued call attempts of the same priority is used to resolve the contention. If the priority call attempt has lower priority and later time of arrival than the queued call attempts, it is treated as a normal PCS call in accordance with the PCS Basic Call process.

In cases where there is a contention of available RF resources based on call attempts having the same priority level, the time of arrival will normally be used. Under certain instances, such as during a system overload, a Queuing Resolution process, as shown in figure C.1, will be used to dictate resource management. The case of contention for radio resources between priority incoming/outgoing call attempts is for further study.

The PCS system shall track the location of the called party since it may change after the call has been queued. Without periodically updating the location of the called party, the PCS system would not be able to determine if the user is in a location where a radio resource is available to complete the call. As shown in figure C.1 of annex C, a timer is used to control periodic location updating procedures. The called party is located prior to the call being queued and the timer is started. Upon expiration of the timer, if the called party cannot be located, then the call attempt is removed from the queue and the PACA-E egress request is discarded; if the called party can be located but no resource is available, then the location is recorded, the paging timer is reset and restarted, and the call left in the queue.

5.3 Interrogation

The PCS subscriber may, by an appropriate control procedure, request the subscription status of PACA-E from the network. Upon receiving an interrogation request, the network shall send the status to the PCS subscriber. The information sent will indicate if:

– the PCS subscriber is authorized for PACA-E service (access and/or egress); and

– the activation state of PACA-E access and/or egress (permanent or on demand).

The information sent in response to the interrogation of this supplementary service shall not imply the status of any other supplementary service.

6 Interaction with other supplementary services

The feature interactions between priority access and priority egress capabilities with other PCS supplementary services is provided in the “Feature interaction table” located in annex B. As additional supplementary services are defined, their interactions with PACA-E will be addressed.

7 Interworking requirements

Systems that support PACA-E shall interoperate transparently with other networks (e.g., PSTN and ISDN).

8 Capabilities for charging

It shall be possible for the PCS service provider to charge separately for the individual PACA-E access and egress capabilities as well as for the complete PACA-E service (access and egress). The mechanisms to support charging within interceding networks will be worked as part of stages 2 and 3.

Annex A
(normative)

Application of PACA-E to the circuit-mode bearer service

The PACA-E service functionality is invoked before the Basic Call processing (as described in ANSI T1.705) proceeds to Reserve Bearer Resources by Call Type and Encrypt (with PACA-E), as shown in figure A.1.2.

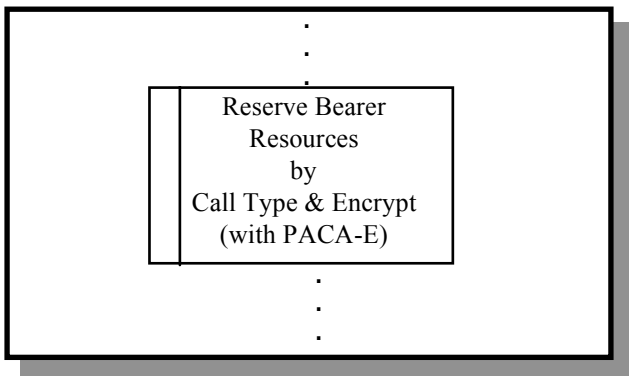

Figure A.1.1 – PCS Call Modification

Figure A.1.1 shows the modification to the “Reserve Bearer Resources by Call Type and Encrypt” macro in figure 2.2.4a.1, Procedure: PCS_Outgoing_Call (Network), and figure 2.2.4a.2, Procedure: PCS_incoming_Call (Network), of ANSI T1.705. Figure A.1.2 is the expansion of figure A.1.1.

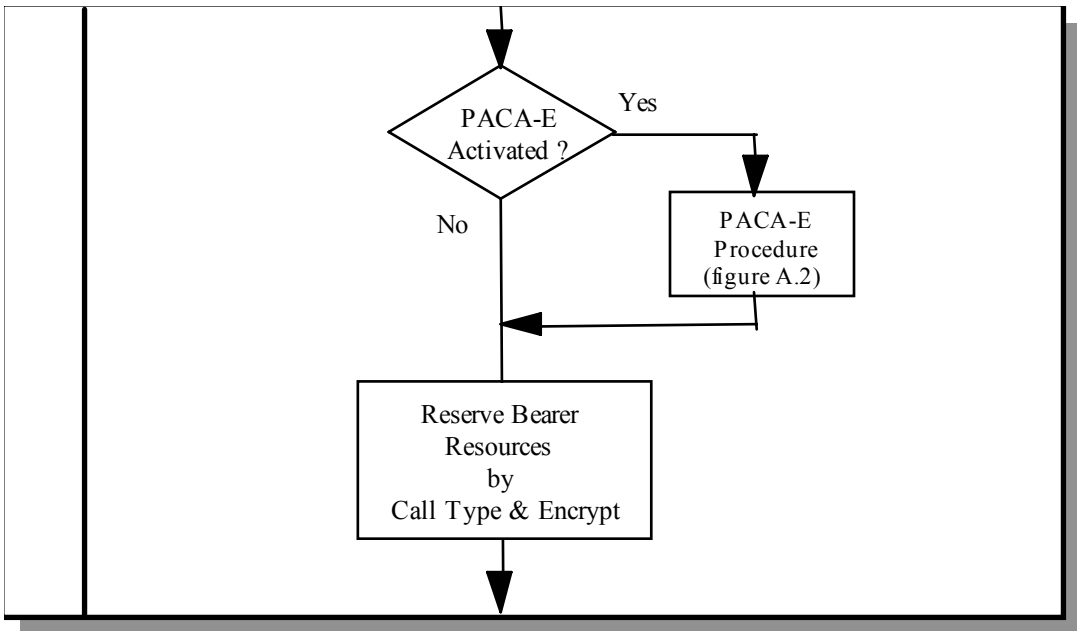

Figure A.1.2 – Reserve Bearer Resources by Call Type and Encrypt (with PACA-E)

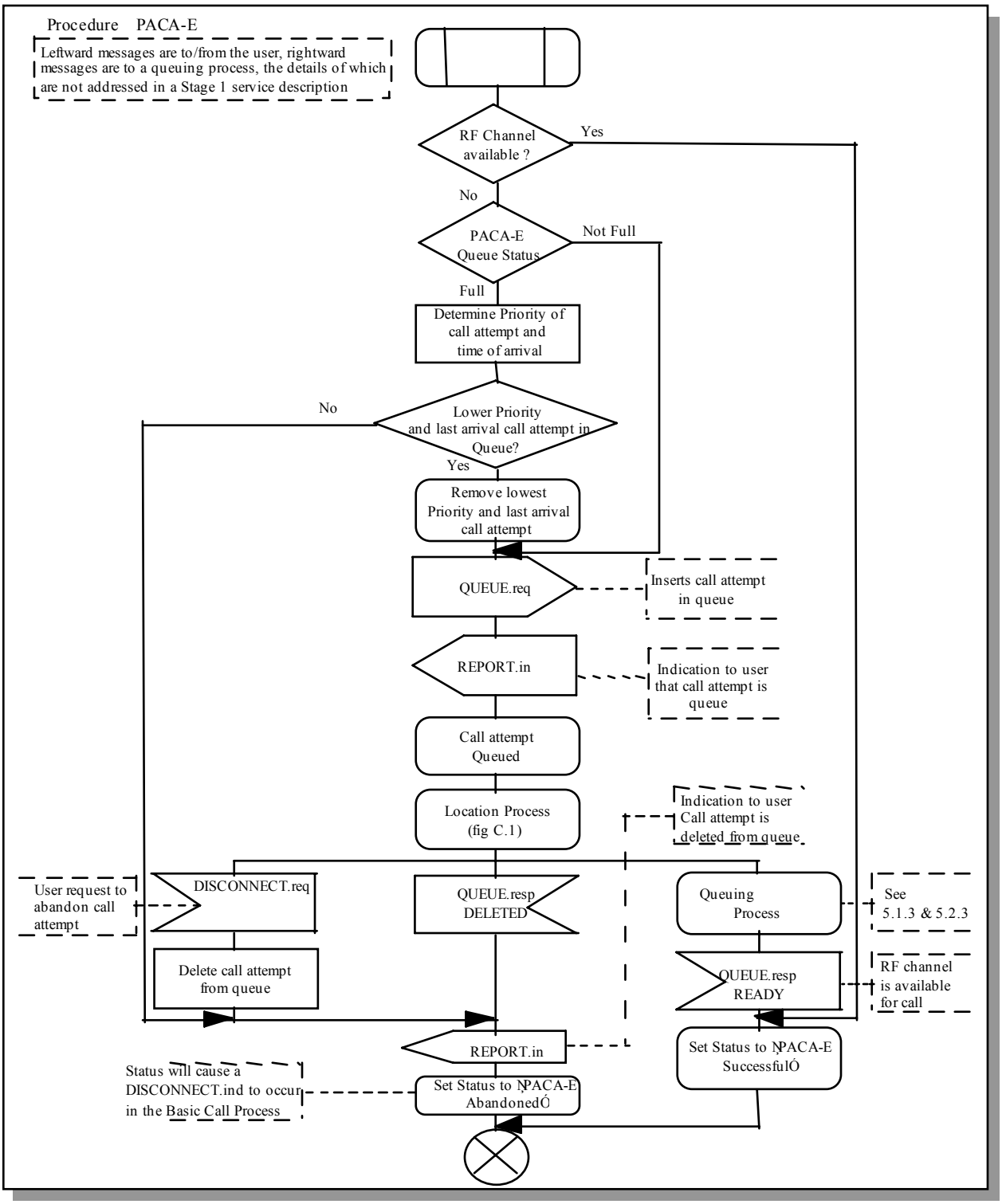

Figure A.2 – PACA-E procedure

Annex B
(informative)

Feature interaction table

Subscriber feature	Feature interaction	
	Access	**Egress**
Asynchronous Data	No	No
Automatic Reverse Charging	No	No
Barring of Incoming Calls	No	Yes (1)
Barring of Outgoing Calls	Yes (2)	No
Call Forwarding-Busy (CFB)	Yes (3)	Yes (3)
Call Forwarding-No Answer (CFNA)	No	No (4)
Call Forwarding-Not Reachable (CFNR)	No	Yes (5)
Call Forwarding-Unconditional (CFU)	No	Yes (6)
Call Hold and Retrieve	No	No
Call Transfer	No	No
Call Waiting	Yes (7)	Yes (8)
Calling Number Identification Restriction (CNIR)	No	No
Closed User Group (CUG)	No	No
Completion of Calls to Busy Subscriber (CCBS)	No (9)	No (9)
Conference Calling	No	No
Connected Line Identification Presentation (COLP)	No	No
Connected Line Identification Restriction (COLR)	No	No
Flexible Alerting (FA)	No	No
Group 3 Facsimile	No	No
Intercept Access Service	No	No
Message Waiting Notification (MWN)	No	No
Multi-Level Precedence and Preemption (MLPP)	Yes (10)	Yes (10)
Multi-Rate Circuit Mode Unrestricted Connection	Yes (11)	Yes (11)
Multi-way Calling (MWC)	No	No
Number Identification Presentation (NIP)	No	No
Reverse Charging (RC)	No	No
Short Message Service (SMS)	No	No
Synchronous Data (SD)	No	No
User Identity Module (UIM)	No	No

Subscriber feature	Feature interaction	
	Access	**Egress**
NOTES: (1) Barring of Incoming Calls takes precedence over PACA-E Egress. (2) PACA-E Access takes precedence over Barring of Outgoing Calls.		

Feature interaction table *(concluded)* *(continued)*

(3) Invocation of PACA-E service, both for Access and Egress, marks the line as busy; therefore, subsequent calls after PACA-E is invoked are subject to CFB treatment.

(4) On Egress, the timing to determine No Answer begins after the radio resource is available and an alert has been sent.

(5) Unavailable radio resources is not treated as “Non-Reachable” when PACA-E egress is activated. Once a radio resource is assigned and a subscriber is determined to be “non-reachable”, the call is forwarded. The interactions of various timers for PACA-E and CFNR are very complex and are for further study.

(6) CFU overrides PACA-E Egress (i.e., all incoming calls are forwarded without priority).

(7) PACA-E has precedence over CW. The CW feature shall not be invoked for incoming calls to a subscriber waiting for a PACA-E channel.

(8) Call Waiting does not apply to a call in queue to a PACA-E subscriber.

(9) Invocation of PACA-E service, both for Access and Egress, marks the line as busy.

(10) MLPP takes precedence over PACA-E.

(11) For an “n times default rate call”, Multi-Rate Circuit Mode Unrestricted Connection requires invocation of PACA-E on all “n” channels.

Annex C
(informative)

Location process

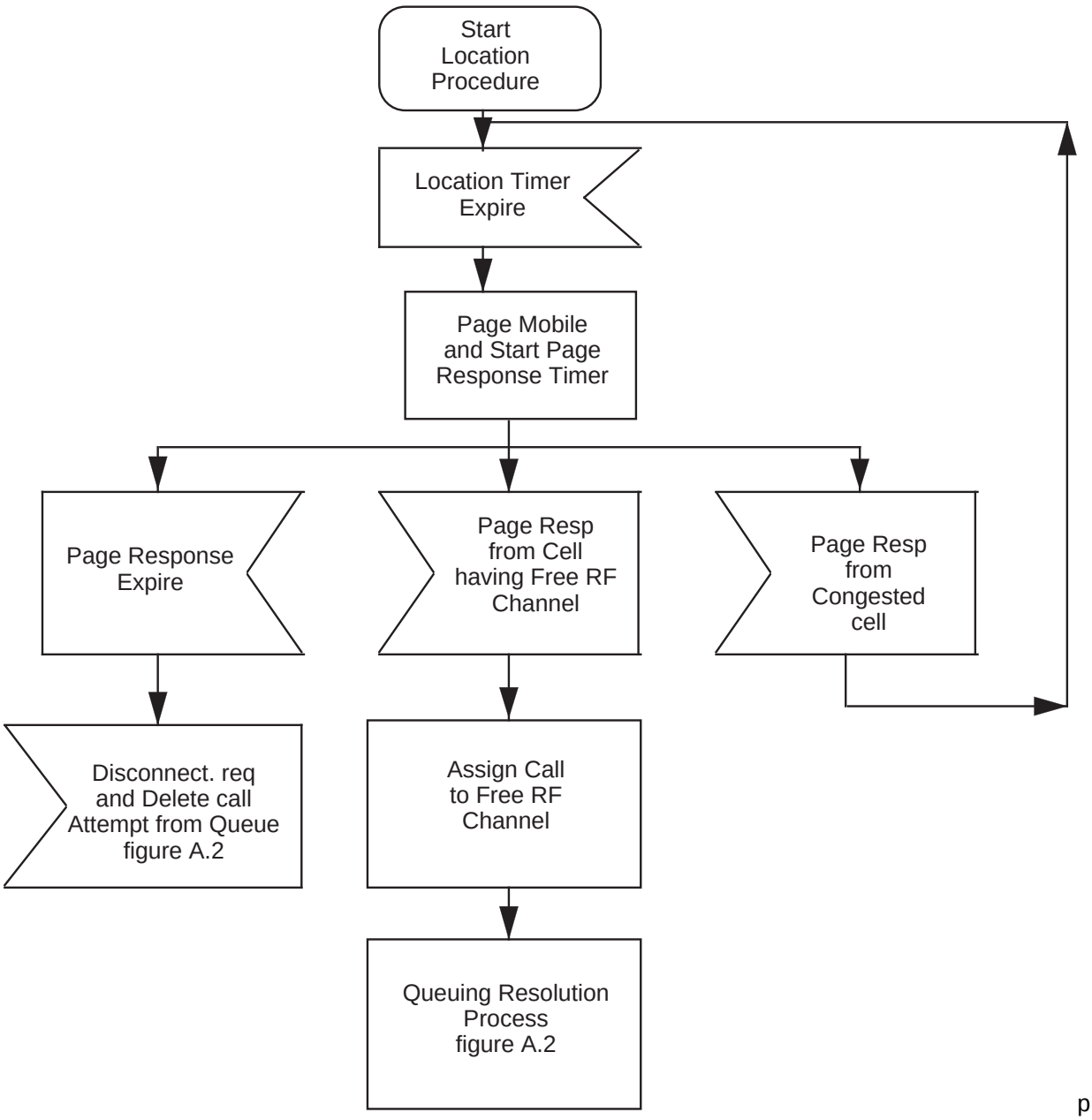

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Figure C.1 – Location process

Annex D
(informative)

Illustrative examples of PACA-E Priority Access, PACA-E Priority Egress, and End-to-End PACA-E Services

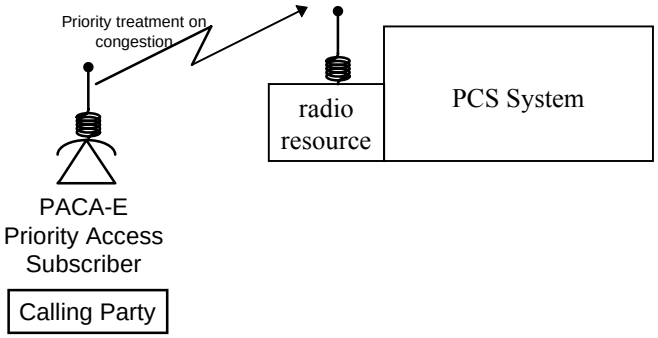

Figure D.1 – PACA-E Priority Access Service

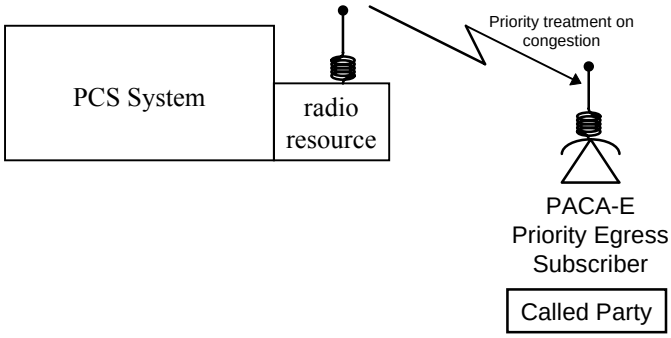

Figure D.2 – PACA-E Priority Egress Service

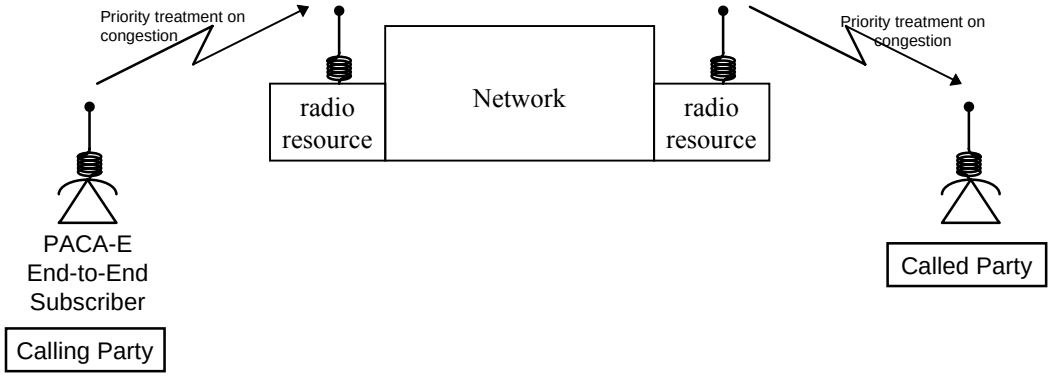

Figure D.3 – PACA-E End-to-End Service

Conventions used for these figures:

– Figures show call flows from call origination to call termination;

– Figures show call origination at left of network and call termination at right of network;

– Arrows are used to indicate the direction of radio connection requests;

– Although only one interceding “network” is shown, this could be viewed as a conglomeration of numerous interceding networks.

Calling and Called Parties are shown only as they impact the PACA-E feature (e.g., for PACA-E priority egress, the nature of the calling party is inconsequential).

Annex E
(informative)

Bibliography

ANSI T1.702-1995, *Telecommunications – Personal communications terminology*

TIA IS-53, *Cellular features description* [2)]

TIA IS-104, *Personal communications service description for 1800 MHz* [2)]

2) Available from the Telecommunications Industry Association, 2500 Wilson Blvd., Suite 300, Arlington, VA 22201.