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| 3GPP TR 23.700-88 V0.1.0 (2022-02) |
| Technical Report |
| 3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Study on architecture enhancements for Personal IoT Network (PIN)(Release 18) |
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# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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where:

x the first digit:

1 presented to TSG for information;

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The scope of this Technical Report is to study the enhancement of 5G System to support Personal IoT Networks (PIN). The study addresses the service requirements documented in TS 22.261 [5] for the Personal IoT Networks. The following aspects needs to be studied:

* Architecture enhancement:
* To study the potential architectural enhancements for supporting management of PIN, access of PIN via PIN Element with Gateway Capability (PEGC), and communication of PIN (e.g. PIN Element communicates with other PIN Elements directly or via PEGC or via PEGC and 5GS).
* To study the potential architecture enhancements for supporting identifying PIN and the PIN Elements.
* Security related:

NOTE 1: The study may need cooperation with SA3. If solutions are related to security impact, they will be studied in SA3.

* To study how to identify PIN and the PIN Elements in the PIN at 5GC level to serve for authentication/authorization.
* Management as well as policy and routing control enforcement:
* To study the management of a PIN..
* To study the procedures for PIN discovery, PIN Element discovery.

本技术报告的范围是研究如何增强5G系统以支持个人物联网网络（PIN）。该研究涉及TS 22.261[5]中记载的个人物联网网络的服务要求。需要研究以下几个方面。

- 架构增强。

 - 研究潜在的架构改进，以支持PIN的管理，通过具有网关能力的PIN元素（PEGC）访问PIN，以及PIN的通信（例如，PIN元素直接或通过PEGC或通过PEGC和5GS与其他PIN元素通信）。

 - 研究潜在的结构改进，以支持识别PIN和PIN元素。

- 与安全有关。

 注1：该研究可能需要与SA3合作。如果解决方案与安全影响有关，它们将在SA3中进行研究。

 - 研究如何在5GC层面上识别PIN和PIN元素，以服务于认证/授权。

 - 管理以及政策和路由控制的执行。

- 研究PIN码的管理问题。

- 研究PIN码的发现和PIN码元素的发现程序。

注：本研究针对scope主要进行了是否包含PINE与PEGC之间使用ProSe通信的讨论，结论是不包含，相关内容与ProSe保持一致即可，不需要额外研究。（索尼、高通、vivo、诺基亚参与讨论）

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G system, Stage 2".

[4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[5] 3GPP TS 22.261: " Service requirements for the 5G system; Stage 1"

# 3 Definitions of terms and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1], in 23.501 [2] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1] or in 23.501 [2].

**Personal IoT Network:** A configured and managed group of at least one PIN Element with Gateway Capability and one or more PIN Element that are able to communicate each other and with 5G network via PIN Element with Gateway Capability.

**PIN Element:** A device that can communicate within a PIN (via PIN direct connection or via PEGC), or outside the PIN via a PEGC.

**PIN Element with Gateway Capability:** APIN Element with the ability to provide connectivity to and from the 5G network for other PIN Elements, or provide relay for the communication between PIN Elements.

**PIN Element with Management Capability:** A PIN Element with capability to manage the PIN.

NOTE: A PIN Element can have both PIN Management Capability and Gateway Capability.

**PIN direct connection:** the connection between two PIN Elements without any 3GPP RAN or core network entity in the middle.

就本文件而言，TR 21.905[1]、23.501[2]和以下文件中给出的术语适用。本文件中定义的术语优先于TR 21.905[1]或23.501[2]中对同一术语的定义（如有）。

**个人物联网网络：**一个由至少一个具有网关能力的PIN元素和一个或多个PIN元素组成的配置和管理小组，能够通过具有网关能力的PIN元素相互通信并与5G网络通信。

**PIN元素：**一个可以在PIN内（通过PIN直接连接或通过PEGC），或在PIN外通过PEGC进行通信的设备。

**具有网关能力的PIN元素：**有能力为其他PIN元素提供与5G网络的连接，或为PIN元素之间的通信提供中继的APIN元素。

**具有管理能力的PIN元素：**具有管理PIN的能力的PIN元素。

注意：一个PIN元素可以同时拥有PIN管理能力和网关能力。

**PIN直接连接：**两个PIN元素之间的连接，中间没有任何3GPP RAN或核心网络实体。

注：本节主要针对是否需要将定义与SA1定义相同进行了讨论（结论为大体一致即可，因需要具体技术细节，所以SA2可以自行定义），以及PINE与PINE之间的通信是否支持有中继（结论为暂时不支持），参与讨论的单位：vivo、华为、sony、小米、爱立信、飞利浦。

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], in 23.501 [2] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1] or in 23.501 [2].

PIN Personal IoT Networks

PINE PIN Element

PEGC PIN Elements with Gateway Capability

PEMC PIN Elements with Management Capability

# 4 Architectural requirements and assumptions

4.1 Architectural Requirements

This study has following architectural requirements:

- If sidelink is used for the direct communication between PEMC and PEGC, reuse procedures defined for 5G ProSe Direct Communication without introducing new features to sidelink.

- There shall be no change to underlying non-3GPP access (e.g. WIFI, Bluetooth) standards.

4.2 Architectural Assumptions

This study has following architectural assumptions:

- Only a 3GPP UE can act as PEGC and/or PEMC.

- There are one or more PEGCs in a PIN.

- There are one or more PEMCs in a PIN.

- The PIN Elements assumes to use non-3GPP access (e.g. WIFI, Bluetooth) for direct communication, the PEMC can use 5G ProSe Direct Communication for direct communication with PEGC.

NOTE: In this release the 5G-RG is considered outside the scope of the study and consequently not part of PIN.

Editor’s note: It is FFS whether data traffic of PINE over control plane is in scope of this study.

本研究有以下架构假设。

- 只有3GPP UE可以充当PEGC和/或PEMC。

- 一个PIN中有一个或多个PEGC。

- 一个PIN中有一个或多个PEMC。

- PIN元素假设使用非3GPP接入（如WIFI、蓝牙）进行直接通信，PEMC可以使用5G ProSe直接通信与PEGC进行直接通信。

注意：在这个版本中，5G-RG被认为不在研究范围内，因此不属于PIN的一部分。

编者注：PINE在控制平面上的数据流量在本研究的范围待定。

注：讨论点如下：

RG是否可作为PINE：否，至少R18阶段；

是否允许多个PEMC、PEGC：是；

是否在某一时间内只有同一个PEMC可以控制：是；

是否考虑sidelink与ProSe的区别单独讨论：目前只支持ProSe；

# 5 Key issues

## 5.1 Key Issue #1: 5GC architecture enhancements to support PIN

### 5.1.1 Description

It is required that at least one PEGC is in a PIN, which is able to relay the traffic between 5GS and PINEs that are behind the PEGC. A PINE may be a non-3GPP device, or can be a UE. There are one or more PEMCs for a PIN, at any point of time one of which is able to control the PIN, e.g., create/delete a PIN, add/remove a PINE for the PIN, etc.

The following aspects will be studied:

- Whether additional 5GC function(s) and/or interface(s) are needed for supporting identification of PIN and PIN Elements, management of PIN, access of PIN via PEGC and communication of PIN.

- Define the architecture of the Personal IoT Network.

NOTE: If new function(s) or new interface(s) are introduced in solution proposals addressed to other key issues, the architecture proposal needs to be addressed in this key issue, and those solutions needs to indicate the architecture proposal addressed to this key issue.

要求至少有一个PEGC在PIN中，它能够在5GS和PEGC后面的PINE之间转发流量。PINE可以是一个非3GPP设备，也可以是一个UE。一个PIN有一个或多个PEMC，在任何时间点，其中一个PEMC能够控制PIN，例如，创建/删除PIN，添加/删除PIN的PINE，等等。

将对以下方面进行研究：

- 是否需要额外的5GC功能和/或接口来支持PIN和PIN元素的识别、PIN的管理、通过PEGC访问PIN以及PIN的通信。

- 定义个人物联网网络的结构。

注意：如果在针对其他关键问题的解决方案建议中引入了新的功能或新的接口，则该架构建议需要在该关键问题中得到解决，并且这些解决方案需要指出针对该关键问题的架构建议。

## 5.2 Key Issue #2: PIN and PIN element discovery and selection

### 5.2.1 Description

The PIN discovery is used for a device to discover a PIN. PINE discovery is used for device to discover the PIN elements (i.e. PINE, PEGC, and PEMC).

Following issues need to be addressed in this key issue:

- How to discover and select a PIN.

- How to discover and select PIN Elements with Gateway Capability (PEGC) and with Management Capability (PEMC)

- How to discover PIN elements in a PIN based on criterias, for example, the capability, availability, reachability and services (e.g. printer).

- How to enable and manage the discovery for all possible case, for example, whether a PIN element is discoverable by devices that are not members of the PIN or by other PIN elements of the same PIN.

PIN发现用于设备发现一个PIN。PINE发现用于设备发现PIN元素（即PINE、PEGC和PEMC）。

在这个关键问题上，需要解决以下问题。

- 如何发现和选择PIN。

- 如何发现和选择具有网关能力（PEGC）和具有管理能力（PEMC）的PIN元素。

- 如何根据标准发现PIN中的PIN元素，例如，能力、可用性、可及性和服务（例如，打印机）。

- 如何启用和管理所有可能情况下的发现，例如，一个PIN元素是否可被非PIN成员的设备发现，或被同一PIN的其他PIN元素发现。

## 5.3 Key Issue #3: Management of PIN and PIN Elements

### 5.3.1 Description

This key issue intends to support the management of the PIN, including the management of different types of PIN Elements and the configuration of the PIN. Both the network operator and authorized 3rd party, i.e. PIN Element with Management Capability (PEMC) could create and configure the PIN and its elements.

After a PIN has been created, PEMC can add a PEGC into the PIN, or remove a PEGC from the PIN, as well as add a PIN Element into the PIN and associate it to some PEGCs that have already been added into the PIN, or remove a PIN Element from the PIN.

The Key Issue is to study the following aspects in the 5GS:

- How to support mechanisms for network operator or authorized 3rd party (e.g., a PEMC) for PIN management, e.g., create/modify/delete/activate/deactivate a PIN, etc.

- How to support for the management of PIN Elements, including to add/remove the PIN Elements, as well as the association between PEGC and other PIN Elements.

- How to support establishing and enforcing the validity duration and the time validity of a PIN (e.g. the PIN is valid for 30 minutes, the PIN is valid from 15:00 UTC to 23:00 UTC) and of the PIN Elements in a PIN (e.g. the PINE will be member of PIN for 1 hour, the PIN element will be member of PIN from 16:00 UTC to 17;: UTC).

这个KI旨在支持PIN的管理，包括不同类型的PIN元素的管理和PIN的配置。网络运营商和经授权的第三方，即具有管理能力的PIN要素（PEMC）都可以创建和配置PIN及其要素。

在PIN创建之后，PEMC可以在PIN码中添加一个PEGC，或从PIN中删除一个PEGC，也可以在PIN中添加一个PIN元素，并将其与一些已经添加到PIN码中的PEGC相关联，或从PIN码中删除一个PIN元素。

关键问题是要在5GS中研究以下几个方面。

- 如何支持网络运营商或授权第三方（如PEMC）的PIN管理机制，如创建/修改/删除/激活/停用PIN等。

- 如何支持PIN元素的管理，包括添加/删除PIN元素，以及PEGC与其他PIN元素之间的关联。

- 如何支持建立和执行PIN的有效期和时间有效期（例如，PIN的有效期为30分钟，PIN的有效期为15:00 UTC至23:00 UTC）以及PIN中的PIN元素的有效期（例如，PINE将成为PIN的成员，有效期为1小时，PIN元素将成为PIN的成员，有效期为16:00 UTC至17;: UTC）。

## 5.4 Key Issue #4: Communication of PIN

### 5.4.1 Description

The PIN connectivity supports communications between PIN elements, communications between PIN elements and 5GS.

The PINE behind the PEGC may run an application with different QoS requirement, which may need the PEGC to have a corresponding QoS flow for relaying the traffic.

Following issues need to be addressed in this key issue:

- How to support communications between PIN elements within a PIN.

- How to enable a PIN Element to use a PIN Element with Gateway Capability to communicate (PEGC) with the 5GS.

- Whether and how 5GS supports relay path management for a PINE when a PEGC is used for the relay, e.g. including setup and release.

- How to select communication path for communication between PIN elements, e.g. direct communication, via PEGC, via 5GS.

- Whether and how 5GS supports the policy and QoS differentiation for the traffic relayed between a PINE and 5GS when a PEGC is used for the relay.

PIN连接支持PIN元素之间的通信，PIN元素和5GS之间的通信。

PEGC下层的PINE可能运行具有不同QoS要求的应用程序，这可能需要PEGC有一个相应的QoS流来转发流量。

在此KI上，需要解决以下问题。

- 如何支持一个PIN内的PIN码元素之间的通信。

- 如何使PIN元素使用具有网关能力的PIN元素与5GS进行通信（PEGC）。

- 当PEGC被用于中继时，5GS是否以及如何支持PIN的中继路径管理，例如包括设置和释放。

- 如何选择PIN元素之间的通信路径，如直接通信、通过PEGC、通过5GS。

- 当PEGC用于中继时，5GS是否以及如何支持PINE和5GS之间中继流量的策略和QoS区分。

## 5.5 Key Issue #5: Authorization for PIN

### 5.5.1 Description

The owner of a PIN may configure authorization information for the PIN, e.g., whether a PINE can communicate with other PINEs or with a specific data network, whether a UE is allowed to act as a PEMC and/or a PEGC, etc.

The following aspects will be studied:

- How to support authorization in a PIN, including following aspects:

- How to authorize/deauthorize a PIN element to access 5GS service.

- How to authorize/de-authorize PIN Elements with Management Capability (PEMC) to manage the PIN.

- How to authorize/de-authorize PIN Elements with Gateway Capability (PEGC) to provide connectivity to and from the 5G network for other PIN Elements that is not capable to access the 5G network, considering the case when there are multiple PEGC capable UEs present in a specific PIN

 - How to enforce the authorization result for a PIN.

PIN的所有者可以为PIN配置授权信息，例如，PINE是否可以与其他PINE或与特定的数据网络进行通信，UE是否被允许作为PEMC和/或PEGC，等等。

将对以下方面进行研究：

- 如何支持PIN中的授权，包括以下方面。

- 如何授权/取消授权PIN元素来访问5GS服务。

- 如何授权/取消授权具有管理能力的PIN元素（PEMC）来管理PIN。

- 如何授权/取消授权具有网关能力（PEGC）的PIN元素，为其他没有能力接入5G网络的PIN元素提供与5G网络的连接，考虑到一个特定PIN中存在多个具有PEGC能力的UE的情况。

 - 如何执行PIN的授权结果。

## 5.6 Key Issue #6: Policy and parameters provisioning for PIN

### 5.6.1 Description

In order to support the necessary procedures regarding to PIN, e.g., communication between PINEs, PINE/PEGC/PEMC discovery, authorization for PINE/PEGC/PEMC, etc., necessary policy/parameters configuration are needed.

The following aspects will be studied:

- Whether and How the PIN related policy and parameter(s) identified in the other KIs for PIN discovery, PINE discovery, authentication/authorization for PINE and PIN communication are configured to the PEMC, PEGC and PINE.

- Whether and how 5GC supports provisioning of configuration information to PEGC for access control.

为了支持有关PIN的必要程序，如PINE之间的通信，PINE/PEGC/PEMC的发现，PINE/PEGC/PEMC的授权等，需要必要的政策/参数配置。

将对以下方面进行研究。

- 是否以及如何将其他KI中确定的PIN相关策略和参数配置到PEMC、PEGC和PINE中，用于PIN发现、PINE发现、PINE的认证/授权以及PIN通信。

- 5GC是否以及如何支持向PEGC提供配置信息以进行访问控制。

## 5.X Key Issue #X: <Key Issue Title>

### 5.X.1 Description

Editor's note: This clause provides a description of the key issue.

# 6 Solutions

## 6.0 Mapping of Solutions to Key Issues

|  |  |
| --- | --- |
|  | Key Issues |
| Solutions |  |  |  |  |
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## 6.X Solution #X: <Solution Title>

### 6.X.1 Description

Editor's note: This clause will describe the solution principles and architecture assumptions for corresponding key issue(s). (Sub) clause(s) may be added to capture details.

### 6.X.2 Procedures

Editor's note: This clause describes high-level procedures and information flows for the solution.

### 6.X.3 Impacts on Existing Nodes and Functionality

Editor's note: This clause captures impacts on existing 3GPP nodes and functional elements.

# 7 Evaluation

Editor's note: This clause will provide evaluation of different solutions.

# 8 Conclusions

Editor's note: This clause will list conclusions that have been agreed during the course of the study item activities.

# Annex X:Change history

|  |
| --- |
| **Change history** |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2022-02 | SA2#149e | S2-2201792 |  |  |  | TR23.700-88 skeleton | 0.0.0 |
| 2022-02 | SA2#149e | S2-2201793 |  |  |  | Scope of PIN study | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201794 |  |  |  | Definitions of terms and abbreviations | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201795 |  |  |  | Architectural assumptions and principles | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201796 |  |  |  | Key Issue: 5GC architecture enhancements to support PIN | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201797 |  |  |  | Key Issue: 5GC supports authorization in PIN | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201798 |  |  |  | Key Issue of support for management of the PIN and its elements | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201799 |  |  |  | New KI: PIN discovery and selection | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201800 |  |  |  | New KI: PIN connectivity | 0.1.0 |
| 2022-02 | SA2#149e | S2-2201801 |  |  |  | Key Issue: Authorization and policy/parameters provisioning for PIN | 0.1.0 |