**3GPP TSG-SA/WG2 Meeting #137E *S2-2001889r12***

 **2020-02-24 -- 2020-02-27, Electronic Meeting**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **23.501** | **CR** | **2021** | **rev** | **3** | **Current version:** | **16.3.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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|  |
| ***Title:***  | Binding for notification reselection corrections |
|  |  |
| ***Source to WG:*** | Ericsson, Nokia, Nokia Shanghai-Bell |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | 5G\_eSBA |  | ***Date:*** | 2020-02-18 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Missing aspects of binding information and its usage.It is wrongly indicated that the service name may be used as the unique value in the Binding indication.It is not indicated how the Binding indication is used once received.CR 23.502#1961 ([S2-2001320](https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_136AH_Incheon/Docs/S2-2001320.zip)) has already been agreed, but related 23.501 updates are still missing:An NF service consumer may subscribe via another network function for notifications. And that two binding indications are then required. For example, NF\_A may subscribe to NF\_B on behalf of NF\_C. NF\_A additionally subscribe to subscription related events.Further, If the NF as a NF consumer provides a Binding Indication for services that the NF produces in service requests, it is ambiguous to which services the binding indication relates.As the binding for notifications and the binding for other services could be described in the same request message, and even binding for several different other services could be provided, those cases need to be kept apart for unambiguous signalling. |
|  |  |
| ***Summary of change:*** | It is corrected that the service name is only possible to be used in combination to other id in the Binding indication, not as an isolated value, It is indicated the usage of the Binding indication (it is used to discover alternative notification endpoints).Clarification that the Routing Binding indication.The Binding Indication in request messages may be associated with an applicability. |
|  |  |
| ***Consequences if not approved:*** | Unclear handling of binding information likely to create incompatible interpretations of specifications |
|  |  |
| ***Clauses affected:*** | 6.3.1.0, 7.1.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* START CHANGES \*\*\*

1st change

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] 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].

**5GLAN Group:** A set of UEs using private communication for 5G LAN-type service.

**5G Access Network:** An access network comprising a NG-RAN and/or non-3GPP AN connecting to a 5G Core Network.

**5G Core Network:** The core network specified in the present document. It connects to a 5G Access Network.

**5G LAN-Type Service:** A service over the 5G system offering private communication using IP and/or non-IP type communications.

**5G LAN-Virtual Network:** A virtual network over the 5G system capable of supporting 5G LAN-type service.

**5G QoS Flow:** The finest granularity for QoS forwarding treatment in the 5G System. All traffic mapped to the same 5G QoS Flow receive the same forwarding treatment (e.g. scheduling policy, queue management policy, rate shaping policy, RLC configuration, etc.). Providing different QoS forwarding treatment requires separate 5G QoS Flow.

**5G QoS Identifier:** A scalar that is used as a reference to a specific QoS forwarding behaviour (e.g. packet loss rate, packet delay budget) to be provided to a 5G QoS Flow. This may be implemented in the access network by the 5QI referencing node specific parameters that control the QoS forwarding treatment (e.g. scheduling weights, admission thresholds, queue management thresholds, link layer protocol configuration, etc.).

**5G System:** 3GPP system consisting of 5G Access Network (AN), 5G Core Network and UE.

**5G-BRG:** The 5G-BRG is a 5G-RG defined in BBF.

**5G-CRG:** The 5G-CRG is a 5G-RG specified in DOCSIS MULPI [89].

**5G-RG:** A 5G-RG is a RG capable of connecting to 5GC playing the role of a UE with regard to the 5G core. It supports secure element and exchanges N1 signalling with 5GC. The 5G-RG can be either a 5G-BRG or 5G-CRG.

**Access Traffic Steering:** The procedure that selects an access network for a new data flow and transfers the traffic of this data flow over the selected access network. Access traffic steering is applicable between one 3GPP access and one non-3GPP access.

**Access Traffic Switching:** The procedure that moves all traffic of an ongoing data flow from one access network to another access network in a way that maintains the continuity of the data flow. Access traffic switching is applicable between one 3GPP access and one non-3GPP access.

**Access Traffic Splitting:** The procedure that splits the traffic of a data flow across multiple access networks. When traffic splitting is applied to a data flow, some traffic of the data flow is transferred via one access and some other traffic of the same data flow is transferred via another access. Access traffic splitting is applicable between one 3GPP access and one non-3GPP access.

**Allowed NSSAI**: NSSAI provided by the Serving PLMN during e.g. a Registration procedure, indicating the S-NSSAIs values the UE could use in the Serving PLMN for the current Registration Area.

**Allowed Area:** Area where the UE is allowed to initiate communication as specified in clause 5.3.2.3.

**AMF Region:** An AMF Region consists of one or multiple AMF Sets.

**AMF Set:** An AMF Set consists of some AMFs that serve a given area and Network Slice(s). AMF Set is unique within an AMF Region and it comprises of AMFs that support the same Network Slice(s). Multiple AMF Sets may be defined per AMF Region.

**Application identifier:** An identifier that can be mapped to a specific application traffic detection rule.

**AUSF Group ID:** This refers to one or more AUSF instances managing a specific set of SUPIs. An AUSF Group consists of one or multiple AUSF Sets.

**Binding Indication:** Information included by a NF service producer to a NF service consumer in request responses or notifications to convey the scope within which selection/reselection of target NF/NF Services may be performed, or information included by the NF service consumer in requests or subscriptions to convey the scope within which selection/reselection of notification targets or the selection of other service(s) that the NF consumer produces for the same data context may be performed. See clause 6.3.1.0.

**Configured NSSAI:** NSSAI provisioned in the UE applicable to one or more PLMNs.

**Delegated Discovery:** This refers to delegating the discovery and associated selection of NF instances or NF service instances to an SCP.

**Direct Communication:** This refers to the communication between NFs or NF services without using an SCP.

**DN Access Identifier (DNAI):** Identifier of a user plane access to one or more DN(s) where applications are deployed.

**Emergency Registered:** A UE is considered Emergency Registered over an Access Type in a PLMN when registered for emergency services only over this Access Type in this PLMN.

**Endpoint Address:** An address used by a NF service consumer to access the NF service (i.e. to invoke service operations) provided by a NF service provider. An Endpoint Address is represented in the syntax of Uniform Resource Identifier (e.g. part of Resource URI of the NF service API).

**En-gNB:** as defined in TS 37.340 [31].

**Expected UE Behaviour:** Set of parameters provisioned by an external party to 5G network functions on the foreseen or expected UE behaviour, see clause 5.20.

**Fixed Network Residential Gateway:** A Fixed Network RG (FN-RG) is a RG that it does not support N1 signalling and it is not 5GC capable.

**Fixed Network Broadband Residential Gateway:** A Fixed Network RG (FN-BRG) is a FN-RG specified in BBF TR‑124 [90].

**Fixed Network Cable Residential Gateway:** A Fixed Network Cable RG (FN-CRG) is a FN-RG with cable modem specified in DOCSIS MULPI [89].

**Forbidden Area:** An area where the UE is not allowed to initiate communication as specified in clause 5.3.2.3.

**GBR QoS Flow:** A QoS Flow using the GBR resource type or the Delay-critical GBR resource type and requiring guaranteed flow bit rate.

**IAB-donor:** This is a NG-RAN node that supports Integrated access and backhaul (IAB) feature and provides connection to the core network to IAB-nodes. It supports the CU function of the CU/DU architecture for IAB defined in TS 38.401 [42].

**IAB-node:** A relay node that supports wireless in-band and out-of-band relaying of NR access traffic via NR Uu backhaul links. It supports the UE function and the DU function of the CU/DU architecture for IAB defined in TS 38.401 [42].

**Indirect Communication:** This refers to the communication between NFs or NF services via an SCP.

**Initial Registration:** UE registration in RM-DEREGISTERED state as specified in clause 5.3.2.

**Intermediate SMF (I-SMF):** An SMF that is inserted, changed or removed to a PDU session as needed to control UPF(s) which cannot be controlled by the original SMF because the UPF(s) belong to a different SMF Service Area.

**Local Area Data Network:** a DN that is accessible by the UE only in specific locations, that provides connectivity to a specific DNN, and whose availability is provided to the UE.

**Local Break Out (LBO):** Roaming scenario for a PDU Session where the PDU Session Anchor and its controlling SMF are located in the serving PLMN (VPLMN).

**MA PDU Session:** A PDU Session that provides a PDU connectivity service, which can use one access network at a time, or simultaneously one 3GPP access network and one non-3GPP access network.

**Mobility Pattern:** Network concept of determining within the AMF the UE mobility parameters as specified in clause 5.3.2.4.

**Mobility Registration Update:** UE re-registration when entering new TA outside the TAI List as specified in clause 5.3.2.

**MPS-subscribed UE:** A UE having a USIM with MPS subscription.

**NB-IoT UE Priority:** Numerical value used by the NG-RAN to prioritise between different UEs accessing via NB-IoT.

**NGAP UE association:** The logical per UE association between a 5G-AN node and an AMF.

**NGAP UE-TNLA-binding:** The binding between a NGAP UE association and a specific TNL association for a given UE.

**Network Function:** A 3GPP adopted or 3GPP defined processing function in a network, which has defined functional behaviour and 3GPP defined interfaces.

NOTE: A network function can be implemented either as a network element on a dedicated hardware, as a software instance running on a dedicated hardware, or as a virtualised function instantiated on an appropriate platform, e.g. on a cloud infrastructure.

**Network Instance**: Information identifying a domain. Used by the UPF for traffic detection and routing.

**Network Slice:** A logical network that provides specific network capabilities and network characteristics.

**Network Slice instance:** A set of Network Function instances and the required resources (e.g. compute, storage and networking resources) which form a deployed Network Slice.

**Non-GBR QoS Flow:** A QoS Flow using the Non-GBR resource type and not requiring guaranteed flow bit rate.

**NSI ID:** an identifier for identifying the Core Network part of a Network Slice instance when multiple Network Slice instances of the same Network Slice are deployed, and there is a need to differentiate between them in the 5GC.

**NF instance:** an identifiable instance of the NF.

**NF service:** a functionality exposed by a NF through a service based interface and consumed by other authorized NFs.

**NF service instance:** an identifiable instance of the NF service.

**NF service operation:** An elementary unit a NF service is composed of.

**NF Service Set:** A group of interchangeable NF service instances of the same service type within an NF instance. The NF service instances in the same NF Service Set have access to the same context data.

**NF Set:** A group of interchangeable NF instances of the same type, supporting the same services and the same Network Slice(s). The NF instances in the same NF Set may be geographically distributed but have access to the same context data.

**NG-RAN:** A radio access network that supports one or more of the following options with the common characteristics that it connects to 5GC:

1) Standalone New Radio.

2) New Radio is the anchor with E-UTRA extensions.

3) Standalone E-UTRA.

4) E-UTRA is the anchor with New Radio extensions.

**Non-Allowed Area:** Area where the UE is allowed to initiate Registration procedure but no other communication as specified in clause 5.3.2.3.

Non-Public Network: See definition in TS 22.261 [2].

**Non-Seamless Non-3GPP offload:** The offload of user plane traffic via non-3GPP access without traversing either N3IWF or UPF.

**PCF Group ID:** This refers to one or more PCF instances managing a specific set of SUPIs. A PCF Group consists of one or multiple PCF Sets.

**PDU Connectivity Service:** A service that provides exchange of PDUs between a UE and a Data Network.

**PDU Session:** Association between the UE and a Data Network that provides a PDU connectivity service.

**PDU Session Type:** The type of PDU Session which can be IPv4, IPv6, IPv4v6, Ethernet or Unstructured.

**Periodic Registration Update:** UE re-registration at expiry of periodic registration timer as specified in clause 5.3.2.

**Private communication:** See definition in TS 22.261 [2].

**Public network integrated NPN:** A non-public network deployed with the support of a PLMN.

**(Radio) Access Network**: See 5G Access Network.

**Requested NSSAI:** NSSAI provided by the UE to the Serving PLMN during registration.

**Residential Gateway:** The Residential Gateway (RG) is a device providing, for example voice, data, broadcast video, video on demand, to other devices in customer premises.

**Routing Binding Indication**: Information included in a request and that can be used by the SCP for discovery and associated selection to of a suitable target. See clauses 6.3.1.0 and 7.1.2

**Routing Indicator:** Indicator that allows together with SUCI/SUPI Home Network Identifier to route network signalling to AUSF and UDM instances capable to serve the subscriber.

**SNPN enabled UE:** A UE configured to use stand-alone Non-Public Networks.

**SNPN access mode:** A UE operating in SNPN access mode only selects stand-alone Non-Public Networks over Uu.

**Service based interface:** It represents how a set of services is provided/exposed by a given NF.

**Service Continuity:** The uninterrupted user experience of a service, including the cases where the IP address and/or anchoring point change.

**Service Data Flow Filter:** A set of packet flow header parameter values/ranges used to identify one or more of the packet (IP or Ethernet) flows constituting a Service Data Flow.

**Service Data Flow Template:** The set of Service Data Flow filters in a policy rule or an application identifier in a policy rule referring to an application detection filter, required for defining a Service Data Flow.

**Session Continuity:** The continuity of a PDU Session. For PDU Session of IPv4 or IPv6 or IPv4v6 type "session continuity" implies that the IP address is preserved for the lifetime of the PDU Session.

**SMF Service Area:** The collection of UPF Service Areas of all UPFs which can be controlled by one SMF.

**Stand-alone Non-Public Network:** A non-public network not relying on network functions provided by a PLMN

**Subscribed S-NSSAI**: S-NSSAI based on subscriber information, which a UE is subscribed to use in a PLMN

**Time Sensitive Communication (TSC):** A communication service that supports deterministic communication and/or isochronous communication with high reliability and availability. It is about providing packet transport with QoS characteristics such as bounds on latency, loss, and reliability, where end systems and relay/transmit nodes can be strictly synchronized.

**UDM Group ID:** This refers to one or more UDM instances managing a specific set of SUPIs. An UDM Group consists of one or multiple UDM Sets.

**UDR Group ID:** This refers to one or more UDR instances managing a specific set of SUPIs. An UDR Group consists of one or multiple UDR Sets.

**UPF Service Area**: An area consisting of one or more TA(s) within which PDU Session associated with the UPF can be served by (R)AN nodes via a N3 interface between the (R)AN and the UPF without need to add a new UPF in between or to remove/re-allocate the UPF.

**Uplink Classifier:** UPF functionality that aims at diverting Uplink traffic, based on filter rules provided by SMF, towards Data Network.

**Wireline 5G Access Network:** The Wireline 5G Access Network (W-5GAN) is a wireline AN that connects to a 5GC via N2 and N3 reference points. The W-5GAN can be either a W-5GBAN or W-5GCAN.

**Wireline 5G Cable Access Network:** The Wireline 5G Cable Access Network (W-5GCAN) is the Access Network defined in CableLabs.

**Wireline BBF Access Network:** The Wireline 5G BBF Access Network (W-5GBAN) is the Access Network defined in BBF.

**Wireline Access Gateway Function (W-AGF):** The Wireline Access Gateway Function (W-AGF) is a Network function in W-5GAN that provides connectivity to the 5G Core to 5G-RG and FN-RG.

2nd change

#### 6.3.1.0 Principles for Binding, Selection and Reselection

Binding can be used to indicate suitable target NF producer instance(s) for NF service instance selection, reselection and routing of subsequent requests associated with a specific NF producer resource (context) and NF service. This allows the NF producer to indicate that the NF consumer, for a particular context, should be bound to an NF service instance, NF instance, NF service set or NF set depending on local policies and other criteria (e.g. at what point it is in the middle of a certain procedure, considering performance aspects etc).

Binding can also be used by the NF consumer to indicate suitable NF consumer instance(s) for notification target instance reselection and routing of subsequent notification requests associated with a specific notification subscription and for providing Binding Indication for service(s) that the NF consumer produces for the same data context and the NF service producer is subsequently likely to invoke.

The Binding Indication contains the information in Table 6.3.1.0-1.

The Routing Binding Indication may be included in Request, Subcsribe or Notification messages (see clause 7.1.2). It can be used in case of indirect communication by the SCP to route the message. The Routing Binding Indication is a copy of the information in the Binding Indicationalso contains the information in Table 6.3.1.0-1.

NOTE x: Subscription request messages can contain both a Binding Indication and a Routing Binding Indication.The NF service producer may provide a Binding Indication to the NF service consumer as part of the Direct or Indirect Communication procedures, to be used in subsequent related service requests. The level of Binding Indication provided by the NF service producer to the NF consumer indicates if the resource in the NF service producer is either bound to NF service instance, NF instance, NF Service Set or NF set as specified in Table 6.3.1.0-1. The Binding Indication may include NF Service Set ID, NF Set ID, NF instance ID, or NF service instance ID, for use by the NF consumer or SCP for NF Service Producer (re-)selection. If the resource is created in the NF Service Producer, the NF Service Producer provides resource information which includes the endpoint address of the NF service producer. For indirect communication, the NF service consumer copies the Binding Indication intoalso the Routing Binding Indication in Request or Subscribe message .

During explicit or implicit notification subscription, a Binding Indication may be provided by the NF service consumer to NF service producer; the NF service consumer will also provide a Notification Endpoint. The NF service consumer may also provide a Binding Indication in response to notification requests. The level of Binding Indication provided by the NF service consumer to the NF service provider indicates if the Notification Endpoint is either bound to NF service instance, NF instance, NF Service Set or NF set as specified in Table 6.3.1.0-1. The Binding Indication shall include at least one of NF Set ID, NF instance ID, NF Service Set ID and/or NF service instance ID, and may also include the service name. The NF Service Set ID, NF service instance ID, and service name relate to the service of the NF service consumer that will handle the notification.

NOTE z: The NF service can either be a standardised service as per this specification or a custom service. The custom service can be used for the sole purpose of registering endpoint address(es) to receive notifications at the NRF.

The Binding Indication is used by the NF service producer as notification sender to reselect an endpoint address and construct the NotificationEndpoint, i.e. the URI where the notification is to be sent, e.g. if the provided Notification Endpoint of the NF service consumer included in the subscription cannot be reached, according to the following:

* If the service name in the Binding Indication is omitted and the binding for notification is on NF Set or NF Instance level, the endpoint address of the NF registered in the NRF at NF Profile level shall be used to construct a new Notification Endpoint

- If the service name is included in the Binding Indication, an endpoint address registered in the NRF for that service in the NF profile shall be used to construct a new Notification Endpoint

For indirect communication, the NF service producer copies the Binding information into the Routing Binding Indication that is included in the Notification request, to be used by the SCP to discover an alternative endpoint address and construct a Notification Endpoint e.g. if the Notification Endpoint in the that the request targets cannot be reached, according to the following:

* If the service name in the Routing Binding Indication is omitted and the binding for notification is on NF Set or NF Instance level, the endpoint address of the NF registered in the NRF at NF Profile level shall be used to construct a new Notification Endpoint.

- If the service name is included in the Routing Binding Indication, an endpoint address registered in the NRF for that service in the NF profile shall be used to construct a new Notification Endpoint.

For subscription to notifications via another network function, a separate Binding Indication for subscription related events may be provided by the NF service consumer (see subclause 4.17.12.4 of TS 23.502 [3]) and if provided shall be associated with an applicability indicating notification for subscription related events.

If the NF as an NF consumer provides a Binding Indication for services that the NF produces in service requests, the Binding Indication shall be associated with an applicability indicating other service and may contain the related service name(s), in addition to the other parameters listed in Table 6.3.1.0-1. If no service name(s) are provided, the Binding Indication relates to all services that the NF produces.

For NF Set or NF Instance level of binding, a Binding Indication for notifications and other services may be combined if it relates to the same service, and that combined Binding Indication shall then be associated with an applicability indicating all scenarios that the Binding Indication relates to (For this purpose, the applicability can indicate a combination of values).If no applicability is indicated in a request or subscribe messages, a Binding Indication in that messages is applicable for notification to all events except for the subscription related event (see subclause 4.17.12.4 of TS 23.502 [3]).

NOTE z1: Such a request message can be used for implicit subscription.

NOTE z3: Request messages can contain both the Binding Indications for services and for notifications, and in addition, the Routing Binding Indication in case of indirect communication.

Table 6.3.1.0-1 defines the selection and reselection behaviour of NF services consumers and SCPs depending on the Binding Indication provided by an NF service producer. The detailed procedures refer to clause 4.17.11 and 4.17.12 of TS 23.502 [3]

Table 6.3.1.0-1: Binding, selection and reselection

|  |  |  |  |
| --- | --- | --- | --- |
| Level of Binding Indication | The NF Consumer / Notification sender / SCP selects | The NF Consumer / Notification sender / SCP can reselect e.g. when selected producer is not available | Binding information for selection and re-selection |
| **NF Service Instance** | The indicated NF Service Instance | An equivalent NF Service instance:- within the NF Service Set (if applicable)- within the NF instance- within the NF Set (if applicable) | NF Service Instance ID, NF Service Set ID, NF Instance ID, NF Set ID, Service name (NOTE 4) |
| **NF Service Set** | Any NF Service instance within the indicated NF Service Set | Any NF Service instance within an equivalent NF Service Set within the NF Set (if applicable)(Note 2) | NF Service Set ID, NF Instance ID, NF Set ID, Service name (NOTE 4) |
| **NF Instance** | Any equivalent NF Service instance within the NF instance. | Any equivalent NF Service instance within a different NF instance within the NF Set (if applicable) | NF Instance ID, NF Set ID, Service name (NOTE 4) |
| **NF Set** | Any equivalent NF Service instance within the indicated NF Set | Any equivalent NF Service instance within the NF Set | NF Set ID, Service name (NOTE 4) |
| NOTE 1: if the Binding Indication is not available, the NF Consumer/SCP routes the service request to the target based on routing information available.NOTE 2: NF Service Sets in different NFs are considered equivalent if they include same type and variant (e.g. identical NF Service Set ID) of NF Services.NOTE 3: If a Routing Binding Indication is not available, the SCP routes the service request to the target based on available routing information.NOTE 4: The service name is only applicable if the Binding Indication relates to a notification target or If the NF as a NF consumer provides a Binding Indication for services that the NF produces. |

\*\*\* NEXT CHANGE \*\*\*

3rd change

### 7.1.2 NF Service Consumer - NF Service Producer interactions

The end-to-end interaction between two Network Functions (Consumer and Producer) within this NF service framework follows two mechanisms, irrespective of whether Direct Communication or Indirect Communication is used:

- "Request-response": A Control Plane NF\_B (NF Service Producer) is requested by another Control Plane NF\_A (NF Service Consumer) to provide a certain NF service, which either performs an action or provides information or both. NF\_B provides an NF service based on the request by NF\_A. In order to fulfil the request, NF\_B may in turn consume NF services from other NFs. In Request-response mechanism, communication is one to one between two NFs (consumer and producer) and a one-time response from the producer to a request from the consumer is expected within a certain timeframe. The NF Service Producer may also add a Binding Indication (see clause 6.3.1.0) in the Response, which may be used by the NF Service Consumer to select suitable NF service producer instance(s) for subsequent requests. For indirect communication, the NF Service Consumer copies the Binding Indication into the Routing Binding indication, that is included in subsequent requests, to be used by the SCP to discover a suitable NF service producer instance(s).



Figure 7.1.2-1: "Request-response" NF Service illustration

- "Subscribe-Notify": A Control Plane NF\_A (NF Service Consumer) subscribes to NF Service offered by another Control Plane NF\_B (NF Service Producer). Multiple Control Plane NFs may subscribe to the same Control Plane NF Service. NF\_B notifies the results of this NF service to the interested NF(s) that subscribed to this NF service. The subscription request shall include the notification endpoint, i.e. Notification Target Address) and a Notification Correlation ID (e.g. the notification URL) of the NF Service Consumer to which the event notification from the NF Service Producer should be sent to.

NOTE 1: The notification endpoint URL can contain both the notification endpoint and the Notification Correlation ID.

 The NF Service Consumer may add a Binding Indication (see clause 6.3.1.0) in the subscribe request, which may be used by the NF Service Producer to discover a suitable notification endpoint. For indirect communication, the NF Service Producer copies the Binding Indication into the Routing Binding Indication, that is included in the response, to be used by the SCP to discover a suitable notification target. The NF Service Producer may also add a Binding Indication (see clause 6.3.1.0) in the subscribe response, which may be used by the NF Service Consumer (or SCP) to select suitable NF service producer instance(s) or NF producer service instance. In addition, the subscription request may include notification request for periodic updates or notification triggered through certain events (e.g., the information requested gets changed, reaches certain threshold etc.). The subscription for notification can be done through one of the following ways:

- Explicit subscription: A separate request/response exchange between the NF Service Consumer and the NF Service Producer; or

- Implicit subscription: The subscription for notification is included as part of another NF service operation of the same NF Service; or

- Default notification endpoint: Registration of a notification endpoint for each type of notification the NF consumer is interested to receive, as a NF service parameter with the NRF during the NF and NF service Registration procedure as specified in TS 23.502 [3] clause 4.17.1.

 The NF Service Consumer may also add a Binding Indication (see clause 6.3.1.0) in the response to the notification request, which may be used by the NF Service Producer to discover a suitable notification endpoint. For indirect communication, the NF Service Producer copies the Binding Indication into the Routing Binding indication that is included in the response. The binding indication is then used by the SCP to discover a suitable notification target.



Figure 7.1.2-2: "Subscribe-Notify" NF Service illustration 1

 A Control Plane NF\_A may also subscribe to NF Service offered by Control Plane NF\_B on behalf of Control Plane NF\_C, i.e. it requests the NF Service Producer to send the event notification to another consumer(s). In this case, NF\_A includes the notification endpoint, i.e. Notification Target Address) and a Notification Correlation ID, of the NF\_C in the subscription request. NF\_A may also additionally include the notification endpoint and a Notification Correlation ID of NF A associated with subscription change related Event ID(s), e.g. Subscription Correlation ID Change, in the subscription request, so that NF\_A can receive the notification of the subscription change related event. The NF\_A may add Binding Indication (see clause 6.3.1.0) in the subscribe request.



Figure 7.1.2-3: "Subscribe-Notify" NF Service illustration 2

Routing of the messages for the NF interaction mechanisms above may be direct, as shown in the figures 7.1.2-1 to 7.1.2-3, or indirect. In case of Indirect Communication, an SCP is employed by the NF service consumer. The SCP routes messages between NF service consumers and NF service producers and may do discovery and associated selection of the NF service producer on behalf of a NF service consumer. Figure 7.1.2-4 shows the principle for a request-response interaction and figure 7.1.2-5 shows an example of a subscribe-notify interaction.



Figure 7.1.2-4: Request response using Indirect Communication



Figure 7.1.2-5: Subscribe-Notify using Indirect Communication

NOTE: The subscribe request and notify request can be routed by different SCPs.

\*\*\* END CHANGES \*\*\*

End of changes