TITAN.IUM

5G CORE

Product Data Sheet

5G Network Repository Function (NRF)

⟨✓⟩ Business Benefits

- Key function of the 5G Core, service-based signaling network, provides secure Registration & Discovery of network services via their published Profiles.

- Supports Mobile 5G Roaming with Inter-PLMN Service Gateway discovery, forwarding & notification functions.

- Incorporates powerful award-winning Dissector-based Rules Engine enabling flexible customer programmability.

- Part of the Titan.ium InterGENerational™ Cloud-Native Framework interworking of HTTP2, Diameter, SS7 & SIP signaling.

- "Deploy anywhere" installation on premises or in the cloud via Containers.

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5G Network Repository Function (NRF)

⊞ Overview

The Network Repository Function (NRF) is one of the key functions of the 3GPP Service-Based Architecture (SBA) for 5G Core networks, acting as a central Services Discovery broker for all Network Functions (NFs) in the 5G Core. NF Service Producers advertise their capabilities by dynamically registering their NF-Profiles with the NRF, which may then be Discovered by NF-Consumers seeking to use needed services.

Titan.ium NRFs may be deployed as a distributed or hierarchical network of NRFs such that NF-Consumer discovery requests are forwarded to the actual NRF holding matching NF-Producer Profile(s). Gateway-NRF functionality is also provided for service discovery in remote PLMN networks in support of Mobile 5G Roaming scenarios.
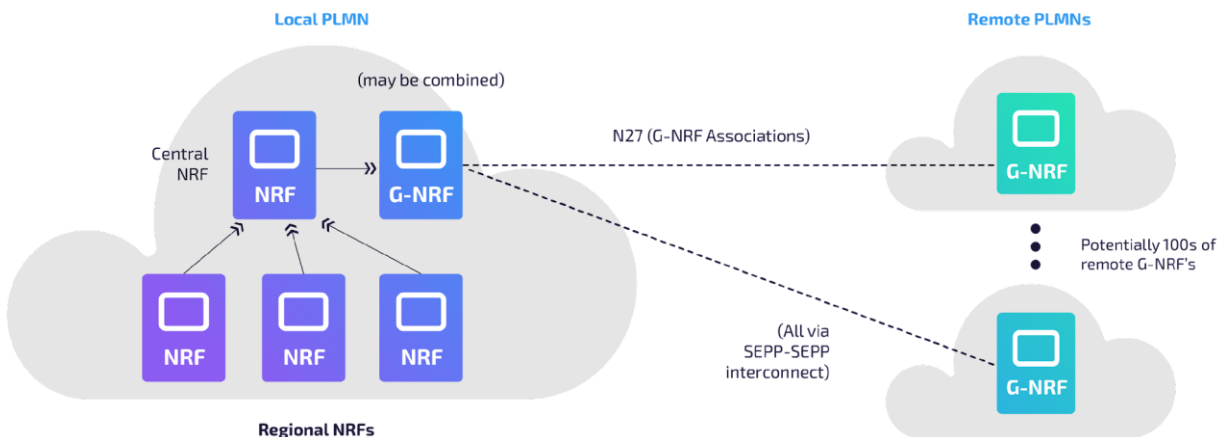
⇟ Key Capabilities

NF-Profile Registration & Discovery
NF Service Producers advertise their capabilities by dynamically registering their NF-Profiles with the NRF, which may then be discovered by NF-Consumers based on multiple compatibility matching rules.

NF-Profile Subscription & Notification
NF Service Consumers may subscribe to receive notifications when certain conditions and/or criteria are met as specified by the Service Consumer.

Hierarchical / Regional NRF Organization
Titan.ium NRFs may be deployed as a flat or hierarchical collection of Regional / Centralized NRFs such that, NF-Consumer discovery requests are forwarded to the actual NRF holding matching NF-Producer Profile(s).

OAuth 2.0 Authorization Server
The NRF acts as OAuth2 Authentication Server in case OAuth2 is used for secure authorized access to NF Producer services. Previously registered NF-Producers declare allowed service access, which the NRF uses to screen prospective NF-Consumers, issuing them a digitally signed OAuth2 token if authorized.

Bootstrapping Service
Allows new NF-Consumers to determine actual set of service interface versions supported by an NRF.

Key Capabilities (continued)

Inter-PLMN Gateway-NRF Support
Any NRF may also be provisioned as a Gateway-NRF which is made aware of remote PLMN NRFs for Inter-PLMN interconnect purposes. Discovery & Subscription requests are forwarded to authorized remote PLMN NRFs in support of Mobile 5G Roaming scenarios.

Dissectors
The Titan.ium Dissector facility includes predefined & user-defined HTTP2 dissectors allowing retrieval of any information contained in an HTTP2 message, which can then be used for routing or service logic.

Dissector-based Rules Engine
Routing & Service logic processing is supported by Titan.ium's powerful Rules Engine allowing programmable logical expressions (And/Or/Not) on different Dissector parameters as needed. Also provided are pre-defined functions that can be applied to optimize user programmable processing logic.

Configurable Actions
The programmable Rules Engine also allows the User to configure context-specific actions. For example, programmable logic may invoke an NRF discovery request, make an NF selection, generate an Event, among other capabilities.

Events and Tracing
Raise Event actions when defined situations occur or disappear, for example with the onset of a certain load level or when it abates. You can also enable tracing for a certain service instance for diagnostics purposes.

Overload Protection
NRF replicas & instances monitor their traffic load interacting with the Service-Router to throttle traffic and/or auto-scale NRF services as needed to handle any overload.

Statistics and Key Performance Indicators (KPI)
The NRF generates Statistics and KPIs so that external servers can retrieve them for performance & health tracking. NRF service logic also uses these statistics for congestion control and for routing decisions based on load/latency of route entries.

Optional Features

The following features may optionally be added to the NRF deployment as needed.

HTTP2 Message Transformation
This feature enables the operator to invoke configurable message Dissectors and Rules-based Actions to transform message content as needed, for example to aid in 5G to 3G/4G interworking.

HTTP2 Traffic Mirroring
Traffic mirroring interface towards external Probing/Monitoring/Analytics system via gRPC protocol. It provides observability over alarms, events and statistics.
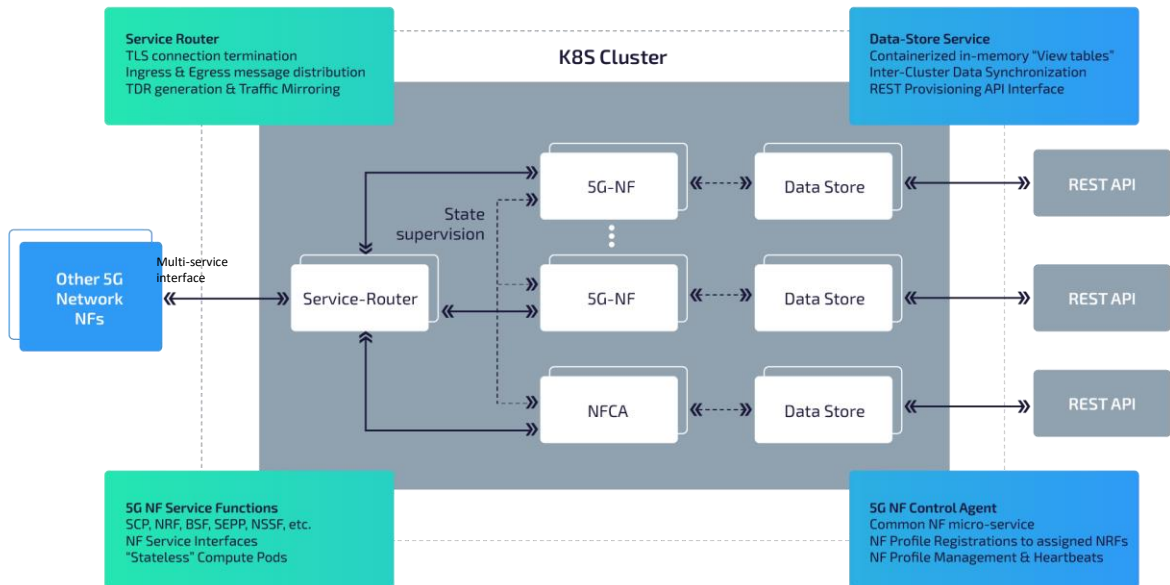
Additional Related Products
Titan.ium also offers an Element Management System (EMS) system which may be used for centralized configuration, performance and fault management of distributed NRFs as needed.

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5G Network Repository Function (NRF)

5G Container-Native Architecture

The NRF is implemented as a set of containerized micro-services, decomposed into a Service-Router network function, NRF compute front-end functions, and back-end Data Store micro-service for persistent storage. All component micro-services may be replicated within a Kubernetes (K8S) Cluster both for resiliency & scalability purposes. In addition, two or more K8S Clusters may comprise a single Titan.ium system deployment to achieve multi-site system geo-redundancy, with cross-site Datastore replication to ensure a common view of NRF persistent data.

The Service-Router provides HTTP1/2 routing services & securely exposes SBI interfaces to external IP networks. All Titan.ium 5G NFs share a common "Network Function Control Agent" (NFCA) micro-service, responsible for common NF management, e.g., to handle Registration of NF-Profiles to their assigned NRF(s) and keep these NF-Profile registrations up to date via heart-beats.

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