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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Future networks

Resource control and management function for virtual networks for carriers (vRCMF)

Recommendation ITU-T Y.3014

ITU-T

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GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

GLOBAL INFORMATION INFRASTRUCTURE

General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899

INTERNET PROTOCOL ASPECTS

General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
IPTV over NGN	Y.1900–Y.1999

NEXT GENERATION NETWORKS

Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Enhancements to NGN	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Packet-based Networks	Y.2600–Y.2699
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899
Carrier grade open environment	Y.2900–Y.2999

FUTURE NETWORKS **Y.3000–Y.3499**

CLOUD COMPUTING Y.3500–Y.3999

INTERNET OF THINGS AND SMART CITIES AND COMMUNITIES

General	Y.4000–Y.4049
Definitions and terminologies	Y.4050–Y.4099
Requirements and use cases	Y.4100–Y.4249
Infrastructure, connectivity and networks	Y.4250–Y.4399
Frameworks, architectures and protocols	Y.4400–Y.4549
Services, applications, computation and data processing	Y.4550–Y.4699
Management, control and performance	Y.4700–Y.4799
Identification and security	Y.4800–Y.4899

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Recommendation ITU-T Y.3014

Resource control and management function for virtual networks for carriers (vRCMF)

Summary

Recommendation ITU-T Y.3014 specifies high-level and functional requirements, architectural framework, and procedures necessary to enhance the performance objective of transport-aware carrier virtual network services, such as joint resource optimization, responsiveness to quickly changing demands, enhanced service resilience via cooperative recovery techniques between service and transport strata, and quality of experience (QoE) enhancement via better use of existing transport and application resources.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Definitions	1
	3.1 Terms defined elsewhere	1
	3.2 Terms defined in this Recommendation.....	1
4	Abbreviations and acronyms	2
5	Conventions	3
6	High-level requirements for vRCMF.....	3
7	Functional requirements for vRCMF.....	3
8	Architectural framework for vRCMF	4
	8.1 Functional entities	5
9	Reference Points	7
	9.1 Reference point Vu.....	7
	9.2 Reference point Vsm	9
	9.3 Reference point Va	11
	9.4 Reference point Vt.....	12
	9.5 Reference point Vtm.....	14
	9.6 Reference point Vc	15
10	Procedures.....	17
	10.1 Procedures for resource information collection	17
	10.2 Procedures for resource reservation	18
	10.3 Procedures for resource failure recovery.....	20
	10.4 Procedures for event notification.....	21
11	Security considerations	23

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Recommendation ITU-T Y.3014

Resource control and management function for virtual networks for carriers (vRCMF)

1 Scope

This Recommendation specifies high-level and functional requirements, the architectural framework, and procedures that enable resource control and management capabilities for virtual network for carriers (VNCs).

The resource control and management function for VNCs (vRCMF):

- deals optimally with highly frequent network changes in the VNC environment;
- supports various customers' policies (e.g., access control, logging, quality of service (QoS), etc.) elastically and dynamically by considering both service and network resources simultaneously;
- supports control and management of virtualized resource: optimal control and management of multi-technology and multi-vendor carriers' virtualized resource.

This Recommendation addresses resource control and management issues in VNCs that represent a network aspect of carrier infrastructure (e.g., virtual networks in data centres and virtualized transport networks).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T Q.3316] Recommendation ITU-T Q.3316 (2016), *Interface and Signalling Requirements and Specification for Cross Stratum Optimization*.
- [ITU-T T.50] Recommendation ITUT T.50 (1992), *International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange*.
- [ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 carrier: Infrastructure provider that owns the physical network resources and provides network as a service over them to their customers. A virtual network provider is a customer to the carrier.

3.2.2 customer: Entity requesting virtual network services. They are provided with an abstract resource view of the network resource to support their users and applications. Customers can be internal or external trusted parties with respect to the provider.

3.2.3 virtual network provider: Entity that provides virtual network services to its customers. It typically leases resources from single or multiple carriers' facilities to create virtual network services and offer end-to-end services to their customers.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CRPFE	Customer Request Processing Functional Element
DNS	Domain Name System
DoS	Denial of Service
DWDM	Dense Wavelength Division Multiplexing
IP	Internet Protocol
MIB	Management Information Base
MPLS-TP	Multiprotocol Label Switching-Transport Profile
NaaS	Network as a Service
OAM	Operation, Administration and Maintenance
OTN	Optical Transport Network
PMFE	Profile Mapping Functional Element
QoE	Quality of Experience
QoS	Quality of Service
SDN	Software-Defined Networking
SRCM	Service Resource Control and Management
SRCM-FE	Service Resource Control and Management-Functional Entity
SRCM GFE	Service Resource Control and Management Gateway Functional Element
TRCM	Transport Resource Control and Management
TRCM-FE	Transport Resource Control and Management-Functional Entity
TRCM GFE	Transport Resource Control and Management Gateway Functional Element
TRMFE	Transport Resource Management Functional Element
TROFE	Transport Resource Optimization Functional Element
TRPFE	Transport Resource Provisioning Functional Element
TRRFE	Transport Resource Repository Functional Element
VM	Virtual Machine
VNC	Virtual Network for Carriers
VPN	Virtual Private Network
vRCMF	Resource Control and Management Function for VNCs
VRMFE	Virtual Resource Management Functional Element

VROFE	Virtual Resource Optimization Functional Element
VRPFE	Virtual Resource Provisioning Functional Element
VTRFE	Virtual Topology Repository Functional Element
WDM	Wavelength Division Multiplexing

5 Conventions

None.

6 High-level requirements for vRCMF

vRCMF is required to:

- support resource control and management to handle highly frequent network changes in a VNC environment;
- support various customer's policies (e.g., access control, logging, quality of service (QoS)) during the process of its resource control and management;
- reserve resources such that logically isolated resources for each virtual infrastructure environment can be provided;
- control and manage a large number of resources that may be federated among multiple carriers;
- provide virtual service resource lifecycle management;
- provide optimal resource provisioning management;
- support performance management for both service and transport resources in order to enable optimal resource determination;
- support fault management for both service and transport resources in order to enable optimal resource determination;
- optimize resource control and management by coordinating resource status information acquired from both the service and transport stratum.

7 Functional requirements for vRCMF

- Secure remote control and management are required by choosing secure protocols.
- vRCMF is required to support the following virtual service resource lifecycle management capabilities:
 - creating an instance of, changing, starting, stopping or rebooting, pausing, unpausing, taking a snapshot, listing snapshots, restoring from a snapshot, removing a snapshot, migration and deletion of a virtual resource;
 - creating, reconfiguring and deleting a virtual network;
 - allocation, backup, restore and release of storage.
- vRCMF is required to support the following logical resource isolation capabilities:
 - allocation of processor, memory and storage resources without any impact on performance among VNCs;
 - allocation of physical link and bandwidth resources without impact on performance among VNCs. This requirement is optional for interworking networks connecting multiple carriers.
- vRCMF is required to support the following service resource control and management (SRCM) capabilities:

- user request processing capabilities;
 - virtual resource optimal estimation capabilities;
 - SRCM gateway capabilities;
 - virtual resource performance and fault status monitoring capabilities.
- vRCMF is required to support the following transport resource control and management (TRCM) capabilities:
- TRCM gateway capabilities;
 - service to transport profile mapping capabilities;
 - transport signalling invocation or software-defined networking (SDN) control-triggering capabilities;
 - transport resource optimal estimation capabilities;
 - transport resource performance and fault status monitoring capabilities.

8 Architectural framework for vRCMF

Figure 8-1 shows a service control and management architecture for VNC. Service resource control and management-functional entity (SRCM-FE) and transport resource control and management-functional entity (TRCM-FE) interact with each other via a reference point V_t [ITU-T Q.3316] in order to address the need for transport-aware virtual network services for carriers.

For the sake of simplicity, carrier service (e.g., cloud-based network as a service (NaaS)), control and resource strata are all lumped together as the carrier service stratum, while the transport stratum represents the underlying transport network that actually carries the application data between users and the resources that offer services among carriers, or within a single carrier, depending on the nature of the application services.

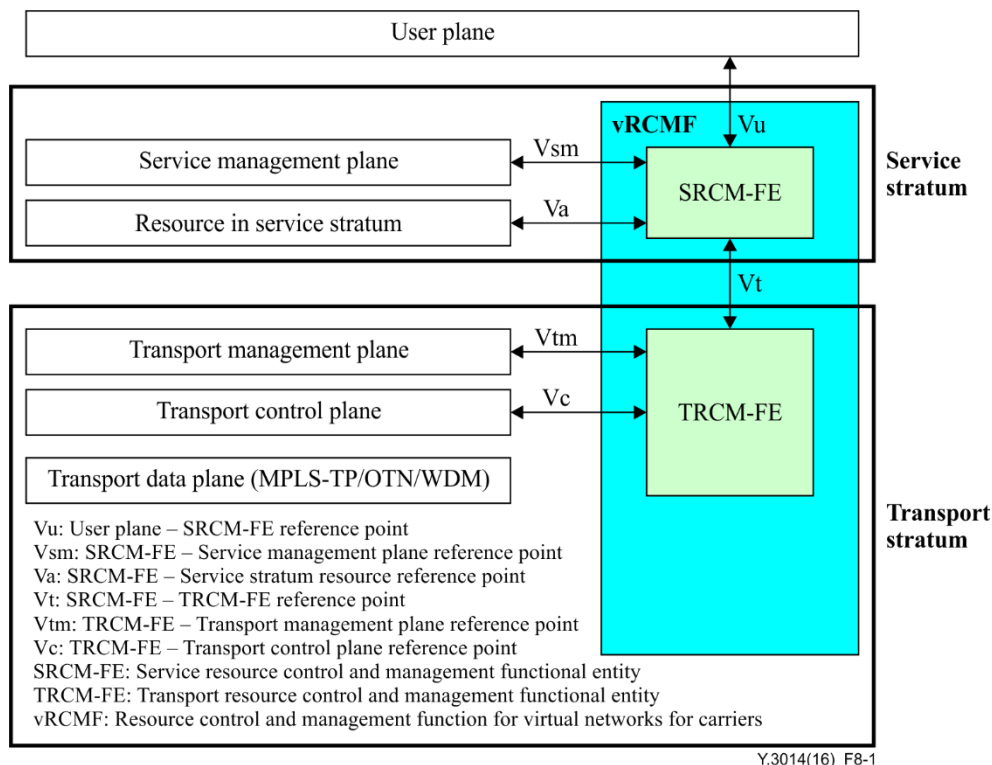


Figure 8-1 – Resource control and management high-level architecture for VNC