

Service Deployment Guideline in DetNet Network

[draft-dang-detnet-deployment-00](#)

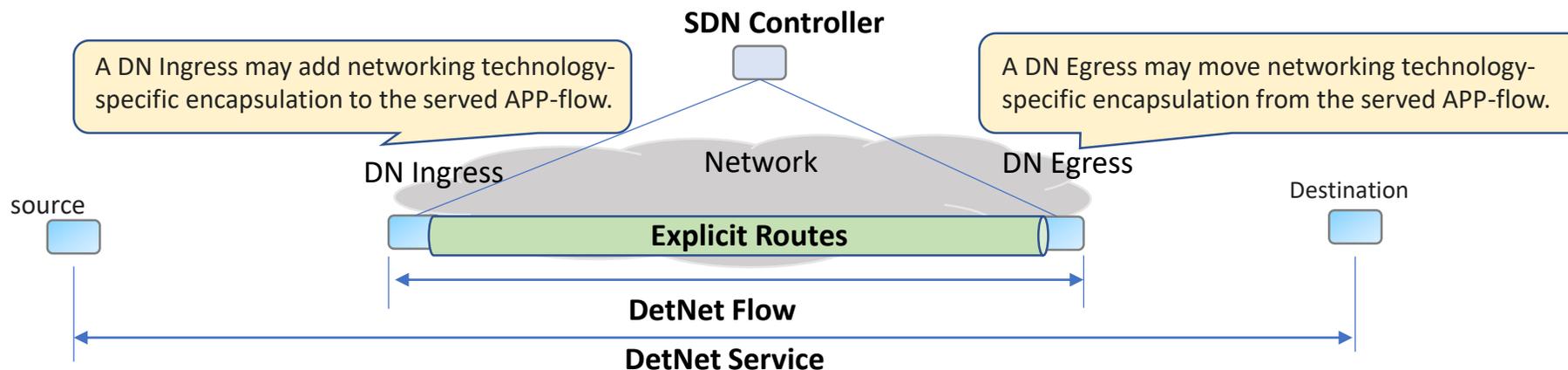
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IETF-111 : July 2021, Online

A reminder to new attendees ...

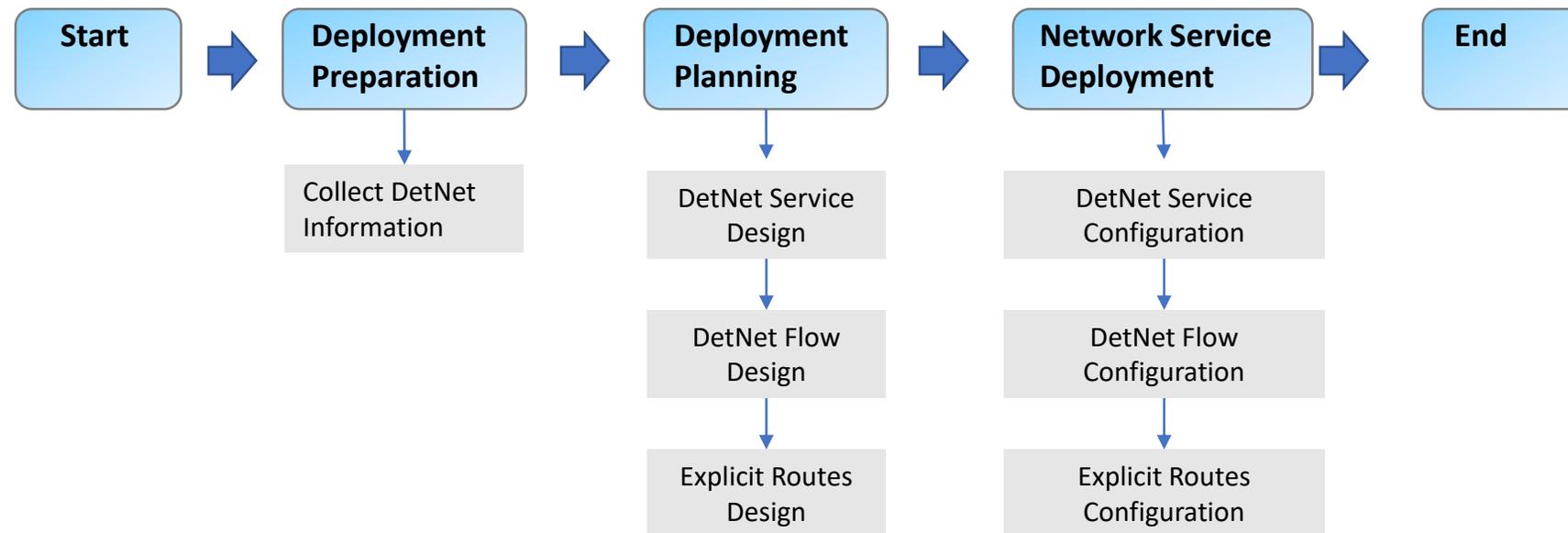
- DetNet
 - Deterministic Networking (DetNet) defined in [\[RFC8655\]](#) provides a capability for the delivery of data flows with extremely low packet loss rates and bounded end-to-end delivery latency.
- DetNet Service
 - The DetNet service described in [\[RFC9016\]](#) can be defined as a service that provides a capability to carry a unicast or a multicast data flow for an application with constrained requirements on network performance, e.g., low packet loss rate and/or latency.
- DetNet Flow
 - A DetNet flow described in [\[RFC9016\]](#) includes one or more application-level flow (DetNet Service) as payload.



Introduction

- While the DetNet technologies are becoming mature, the DetNet deployment is about to enter the live network experiment and even to large-scale commercial deployment. The DetNet network is actively managed by a network operations entity (the "administrator", whether a single person or a department of administrators). A network administrator is responsible for the deployment of DetNet services, who can must master the skills of how to introduce deterministic flows into DetNet networks and the related maintenance.
- This document is intended as guidance for DetNet network administrators.

Process of DetNet Network Service Deployment



Deployment Preparation: Collecting DetNet Information

Before deployment, a DetNet network administrator must fully understand DetNet service, DetNet flow and explicit routes and provide necessary inputs for network deployment to accurately evaluate the solution feasibility. The following table lists the DetNet information described in RFC 9016 and draft-ietf-detnet-yang to be collected.

DetNet Service	DetNet flow	Explicit Routes
DnServiceID	DnFlowID • Adding DnServiceID into DnFlowID	PathID • Mapping DetNet flow to Explicit Routes
DnServiceDeliveryType • Ethernet, or MPLS, or IP	DnPayloadType • The same as DnServiceDeliveryType	
	DnFlowFormat • MPLS, or Segment Routing, or IP	PathFormat • The same as DnFlowFormat
	DnFlowEndpoints: Ingress PE, Egress PE	PathEndpoints: The same as DnFlowEndpoints
DNServiceConnectivity: P2P, or P2MP		PathConnectivity: The same as DNServiceConnectivity
DnServiceBiDir		PathBiDir: The same as DnServiceBiDir
DnServiceDeliveryProfile • MinBandwidth, MaxLatency, MaxLatencyVariation, MaxLoss, MaxConsecutiveLossTolerance, MaxMisordering	DnFlowRequirements • MinBandwidth: the sum of MinBandwidth of DetNet services in the group; • Other parameters are the same as DnServiceDeliveryProfile	<ul style="list-style-type: none"> • Resource Assessment and Reservation along the Explicit Path • Service Protection
DnServiceSpecification	DnTrafficSpecification • Interval, MaxPacketsPerInterval, MaxPayloadSize, MinPacketsPerInterval	Queuing mechanism: DiffServ, Or Cyclic Queuing Forwarding The buffer length set for queue scheduling needs to take these parameters into consideration.
DnServiceRank	DnFlowRank	Queuing Scheduling: In the case of insufficient resources, DetNet services with high priority will preempt resources of some DetNet services with low priority.

Deployment Planning: DetNet Service Design

A DetNet network administrator should specify the DetNet Service Information on the interface of SDN controller. The following table lists the DetNet Service information provided by DetNet Service Provider.

Parameters	Key Points
DnServiceID	Specifying or automatically generating DnServiceID, which is a unique (management) identifier for each DetNet service within the DetNet domain. It can be used to define the many-to-one mapping of DetNet flows to a DetNet service
DnServiceDeliveryType <ul style="list-style-type: none">• <i>Ethernet, or MPLS, or IP</i>	Specifying DnServiceDeliveryType
DnServiceSpecification	Specifying DnFlowSpecification, which is used to identify the DetNet flows Ethernet: MAC, VLAN; IP: IP 6-tuple; MPLS: label
DnServiceConnectivity <ul style="list-style-type: none">• <i>P2P, or P2MP</i>	Specifying DnServiceConnectivity
DnServiceBiDir	Specifying DnServiceBiDir
DnServiceDeliveryProfile <ul style="list-style-type: none">• <i>MinBandwidth, MaxLatency, MaxLatencyVariation, MaxLoss, MaxConsecutiveLossTolerance, MaxMisordering</i>	Specifying DnServiceDeliveryProfile
DnServiceRank	Specifying DnServiceRank, which provides the rank of a service instance relative to other services in the DetNet domain

Deployment Planning: DetNet Flow Design

A DetNet network administrator should specify the DetNet Flow Information on the interface of SDN controller.

Parameters	Key Points
DnFlowID <ul style="list-style-type: none">• <i>Adding DnServiceID into DnFlowID</i>	<ul style="list-style-type: none">• Specifying or automatically generating DnFlowID, which is used to define the N:1 mapping of DetNet flows to a DetNet service.• Mapping one or more DnServiceID to DnFlowID
DnPayloadType	Automatically copying DnServiceDeliveryType of DetNet services which is in this DetNet flow
DnFlowFormat <ul style="list-style-type: none">• <i>MPLS, or Segment Routing, or IP</i>	Specifying DnFlowFormat, which is set according to the DetNet PSN technology.
DnFlowSpecification	Automatically generating DnFlowSpecification according to DnFlowFormat <ul style="list-style-type: none">• <i>DetNet IP flows: IP 6-tuple</i>• <i>DetNet MPLS flows: Slabel + Flabel</i>
DnFlowEndpoints <ul style="list-style-type: none">• <i>Ingress PE, Egress PE</i>	Specifying Ingress node, UNI of ingress node, Egress node
DnFlowRequirements	<ul style="list-style-type: none">• <i>Automatically calculating MinBandwidth: the sum of MinBandwidth of DetNet services in one group;</i>• <i>Other parameters are the same as DnServiceDeliveryProfile</i>
DnTrafficSpecification <ul style="list-style-type: none">• <i>Interval, MaxPacketsPerInterval, MaxPayloadSize, MinPacketsPerInterval</i>	Collecting all of the related DetNet services
DnFlowRank	<i>Not Related</i>

Deployment Planning: Explicit Routes Design

A DetNet network administrator should specify the Explicit Path Information on the interface of SDN controller.

Parameters	Key Points
Mapping DetNet flow to Explicit Routes	Specifying the mapping policy
PathFormat	Automatically copying <i>DnFlowFormat</i> of the related DetNet flow
PathEndpoints	Automatically copying PathEndpoints of the related DetNet flow <i>Notes: The Ingress may add Dnflowformat header to the served Detnet services; A DN Egress may move Dnflowformat header from the served Detnet services.</i>
PathConnectivity	Automatically copying PathConnectivity of the related DetNet flow
PathBiDir: the same as DnServiceBiDir	Automatically copying DnServiceBiDir of the related DetNet flow
Resource Assessment and Reservation along the Explicit Path	Performing Resource assessment according to DnFlowRequirements of the related DetNet flow. <ul style="list-style-type: none"> Centralized system: The controller performs network calculations for evaluation. Distributed system: The network nodes exchange network resources each other via signaling protocol, and support resource calculation independently.
Service Protection: aiming to mitigate or eliminate packet loss due to equipment failures	<ul style="list-style-type: none"> Adding multiple disjoint explicit paths to one protection group Enabling PREOF capabilities
Queuing Mechanism: <i>DiffServ, Or Cyclic Queuing Forwarding</i> <i>The buffer length set for queue scheduling needs to take these parameters into consideration.</i>	Calculating the available buffer size according DnTrafficSpecification the related DetNet flow

Network Service Deployment: Configuration

- After the information is input by the DetNet network administrator, the controller will convert the information into the network configuration and send it to the DetNet network element node, using a protocol such as NETCONF [\[RFC6241\]](#)/YANG [\[RFC6020\]](#). Deterministic Networking (DetNet) YANG Model defined in [\[DetNet-YANG\]](#) contains the specification for the Deterministic Networking YANG Model for configuration and operational data for DetNet Flows.
 - Basic Network Configuration among DetNet Network nodes
 - MPLS TE or Segment Routing configuration
 - RSVP configuration for resource reservation(optional)
 - Configuration Enabling DetNet capability
 - Configuration of Queuing mechanism
 - Ingress Node
 - DetNet services Configuration
 - DetNet flow Configuration
 - Explicit path configuration
 - Configuration of Mapping DetNet flow to explicit path
 - Configuration of Service Protection
 - Configuration of Queuing mechanism
 - Egress
 - Configuration of Queuing mechanism
 - Configuration of Service Protection

Network Service Deployment: Functions

- Functions of Ingress Node
 - Identify the DetNet services
 - Map DetNet services to DetNet flow
 - Establish explicit path
 - Map DetNet flow to explicit path
 - Add Dnflowformat header to the served Detnet services
 - Perform Queuing scheduling
 - Perform Service Protection
- P Node/nodes
 - Perform Queuing scheduling
- Functions of Egress Node
 - Perform Queuing scheduling
 - Move Dnflowformat header from the served Detnet services

Others

- Security Consideration
 - Deterministic Networking (DetNet) Security Considerations refer to RFC9055.

Welcome to comment, contribute or co-author it.

Thank you!