CCVPN E-Line over OTN NNI

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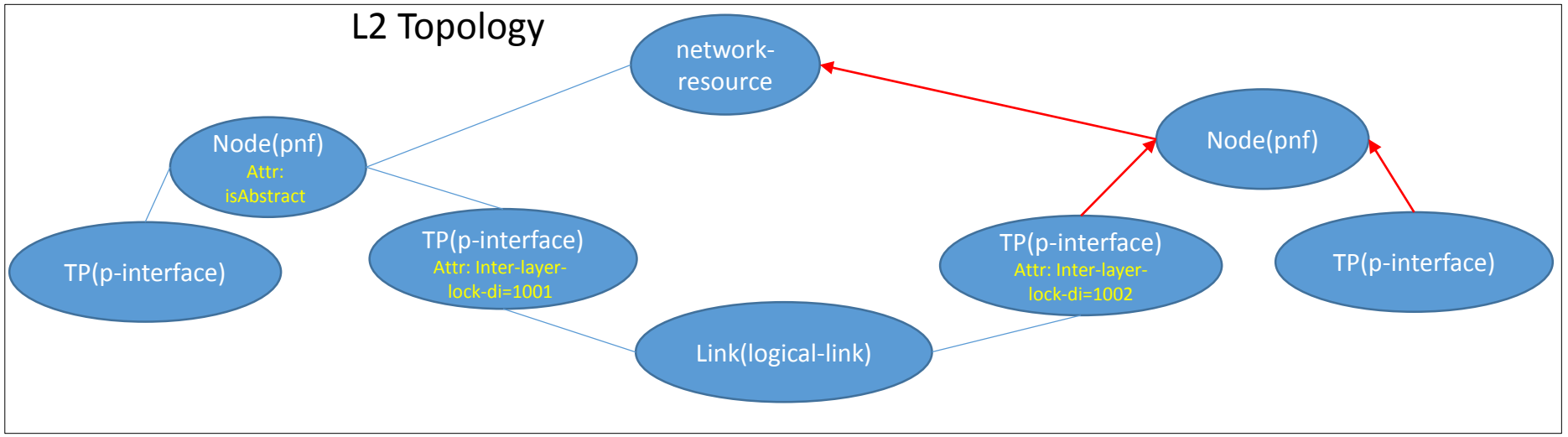
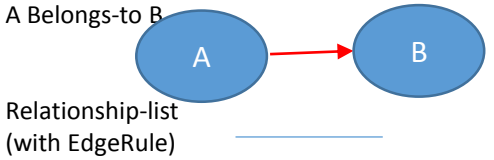
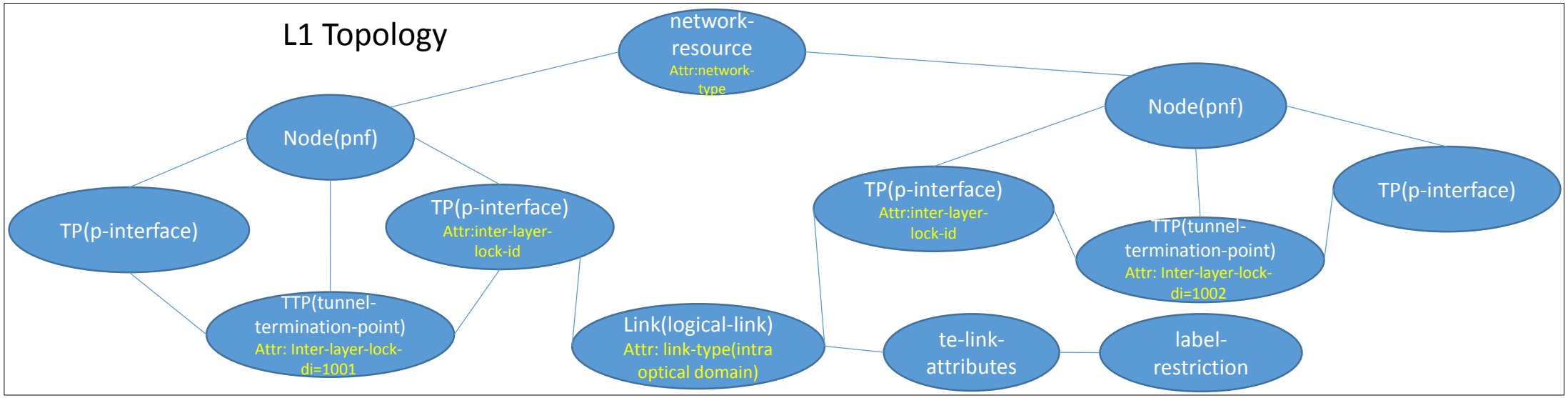
AAI resource creation after topology discovery

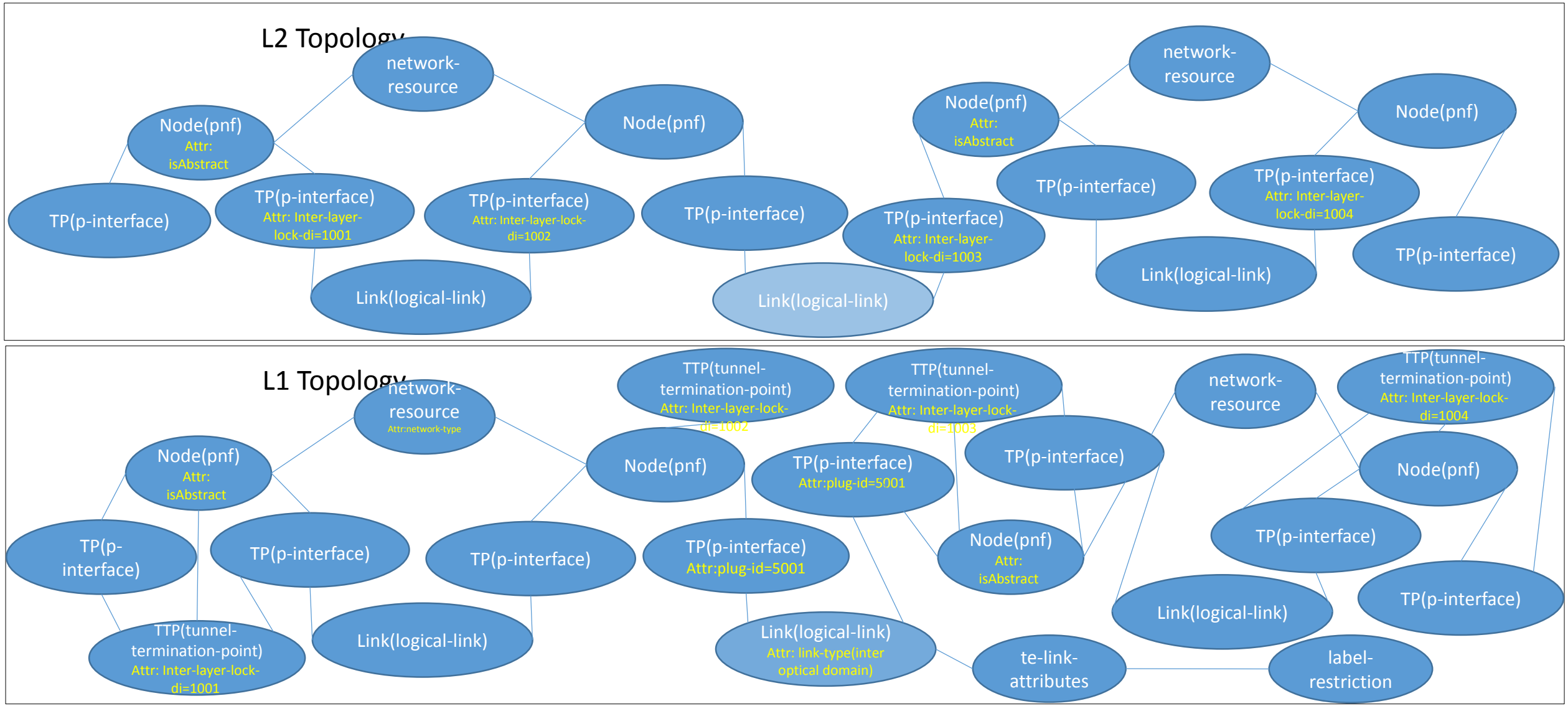






- TP in upper layer node (ETH Node) are associated with TTP in lower layer node (OTN Node) by inter-layer lock ID

AAI resource creation after multi domain topology discovery



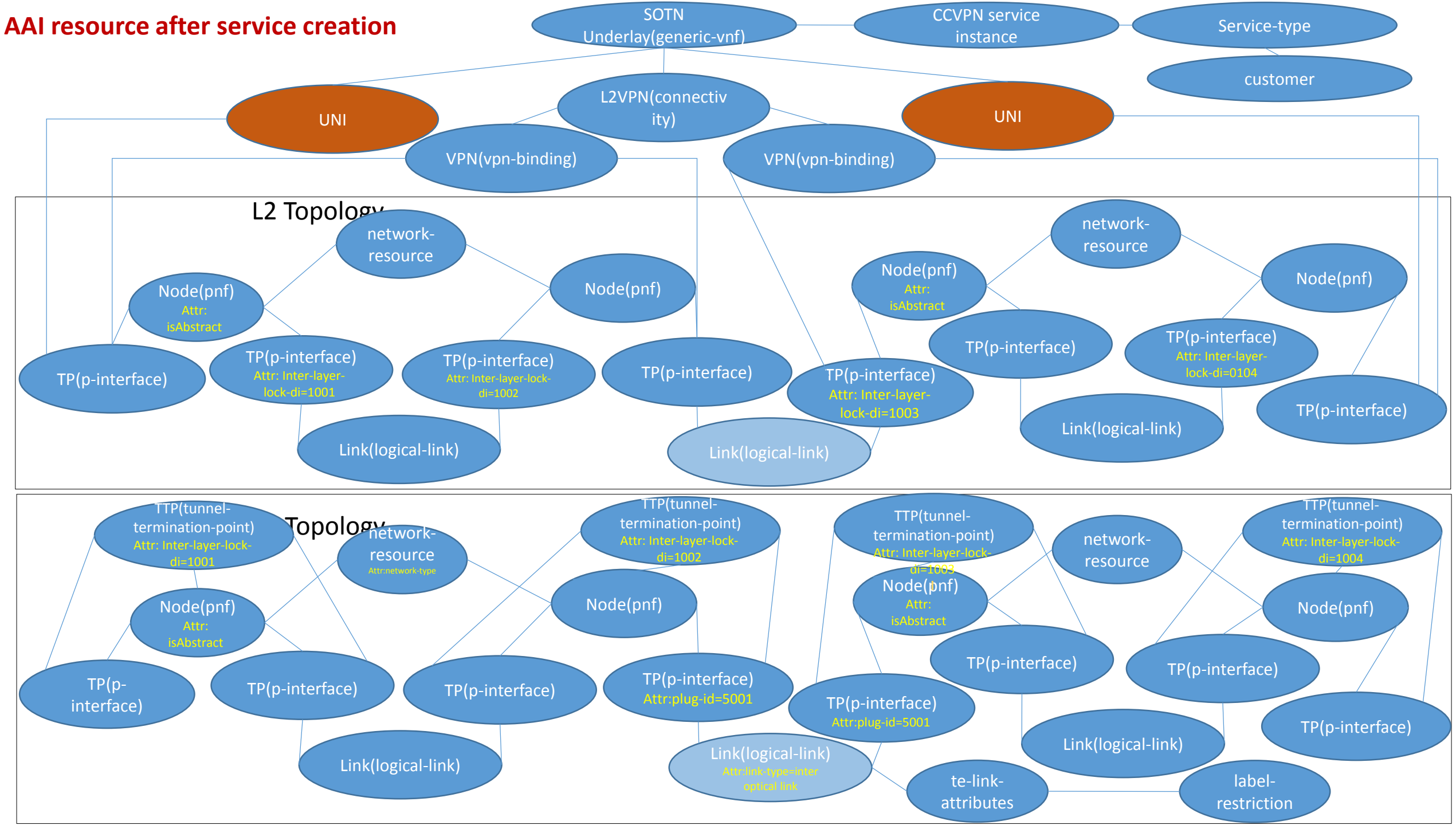
- TP in upper layer node (ETH Node) are associated with TTP in lower layer node (OTN Node) by inter-layer lock ID
- The inter-domain Ethernet link is not reported by NCE as part of the notifications. SDNC needs to create the link using plug-id when it receives the intra-domain link creation notifications in both domains.

AAI Topology Resource parameters usage

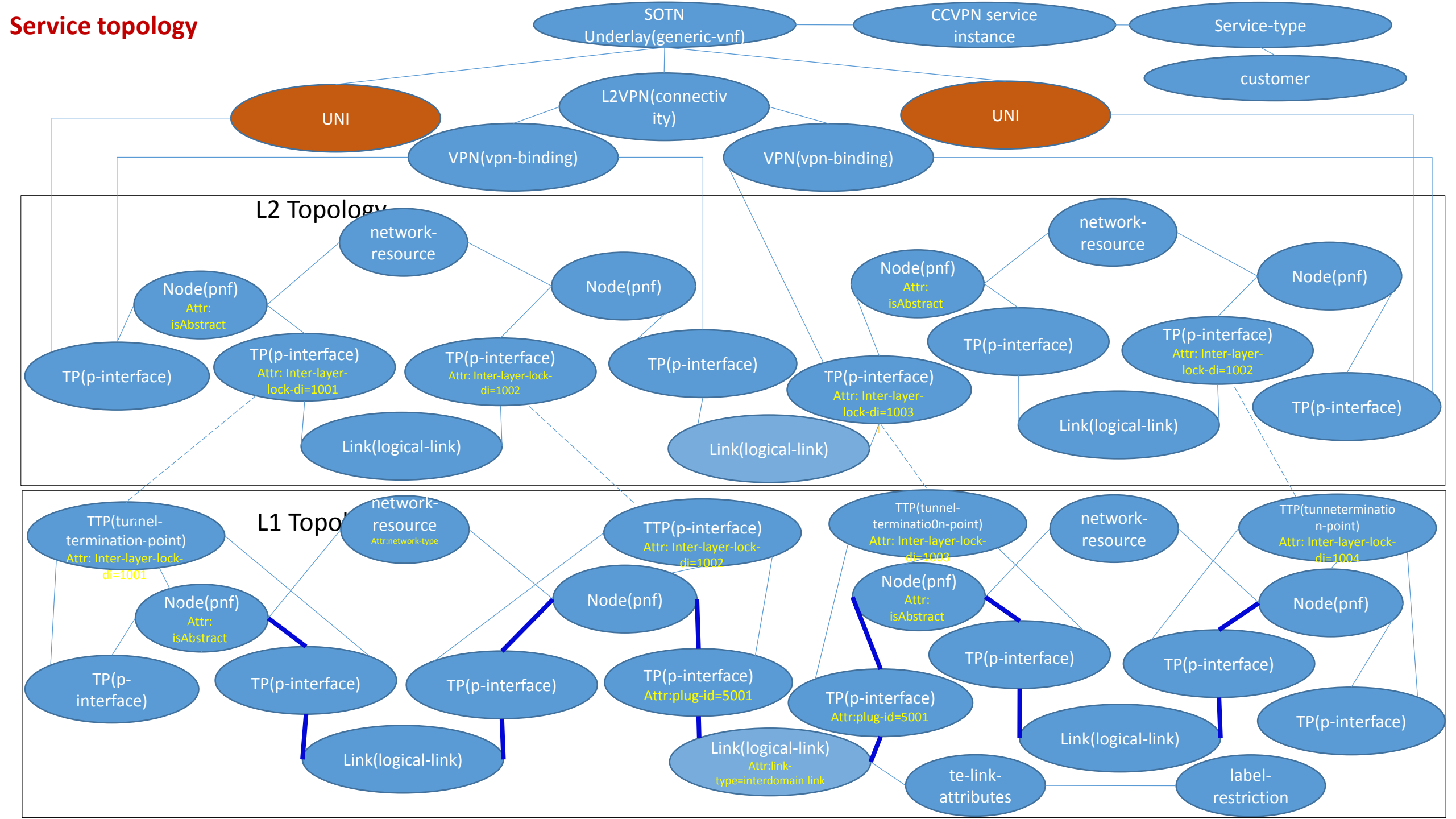
1. SDNC discover ETH(L2) and OTN(L1) topology and update to AAI
2. List of AAI Resource update on discovery
    1.OTN topology:network-resource, pnf, p-interface(TP), logical-link, te-link-attributes, label-restriction, tunnel-termination-point.
    2.ETH topology:network-resource, pnf, p-interface(TP), logical-link.
3. p-interface param “interlayer-layer-lock-id” is used to associate Overlay node with underlay node
4. while updating intra-link, p-interface param “plug-id” is used to add inter-domain link
5.logical-link param “link-type” can be “intra optical domain, inter optical domain, or inter operator domain”
6.network-resource “resource type” can be ETH or OTN
7.pnf param “is-abstract”, true if discovered topology is abstract.

Openpoint: Add supportingNode parameter in pnf to refer underlay node

AAI resource after service creation



Service topology



Service creation flow

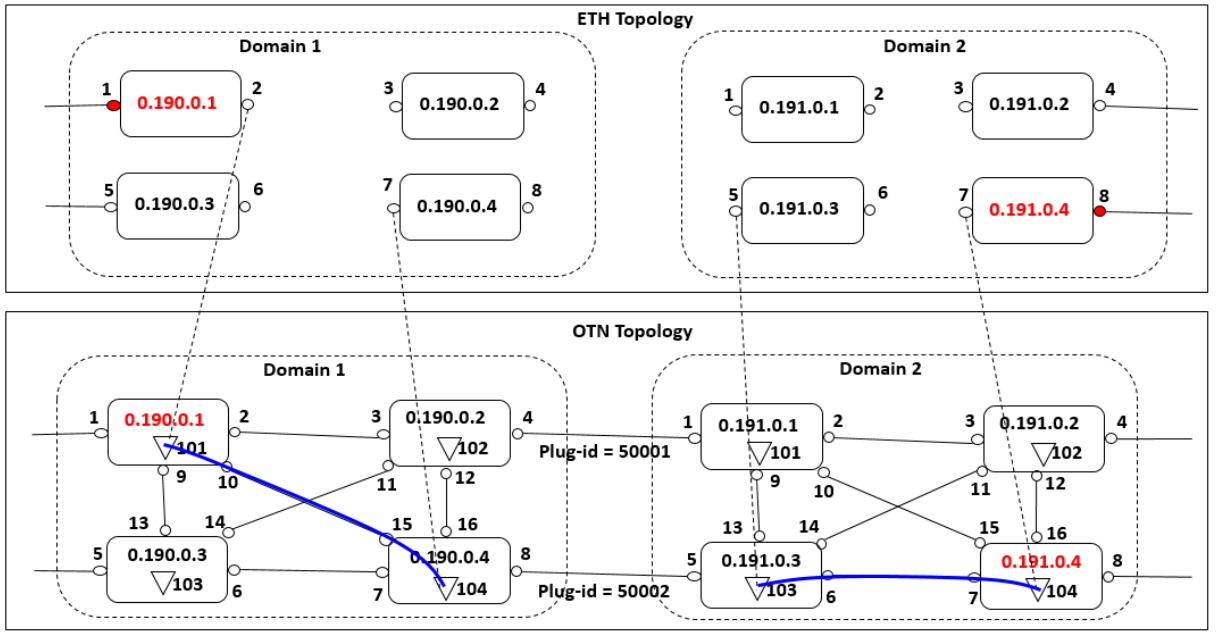
1. SDNC receives resource creation request: source = 0.190.0.1/2; dest = 0.191.0.4/8
2. From source node 0.190.0.1, find the corresponding underlay OTN node (0.190.0.1) using inter-layer-lock-id
3. Similarly, find the destination OTN node (0.191.0.4)
4. Invoke OOF for OTN path computation, with the source OTN node (0.190.0.1) and the dest OTN node (0.191.0.4) as input parameters.
5. OOF returns the array of inter-domain link, through which the OTN tunnel is to be established.
6. From computed OTN tunnel path (marked in blue in the figure), find the inter-domain link, which is 0.190.0.4/8 - 0.191.0.3/5.
7. From the inter-domain link, find the unused ODU resource, i.e., trib port, from the link's label-restriction.
8. Find out the associated TTP from the TP.
9. Send request to OTN controller with below parameters.

OTN tunnel parameters needed by domain 1 controller:

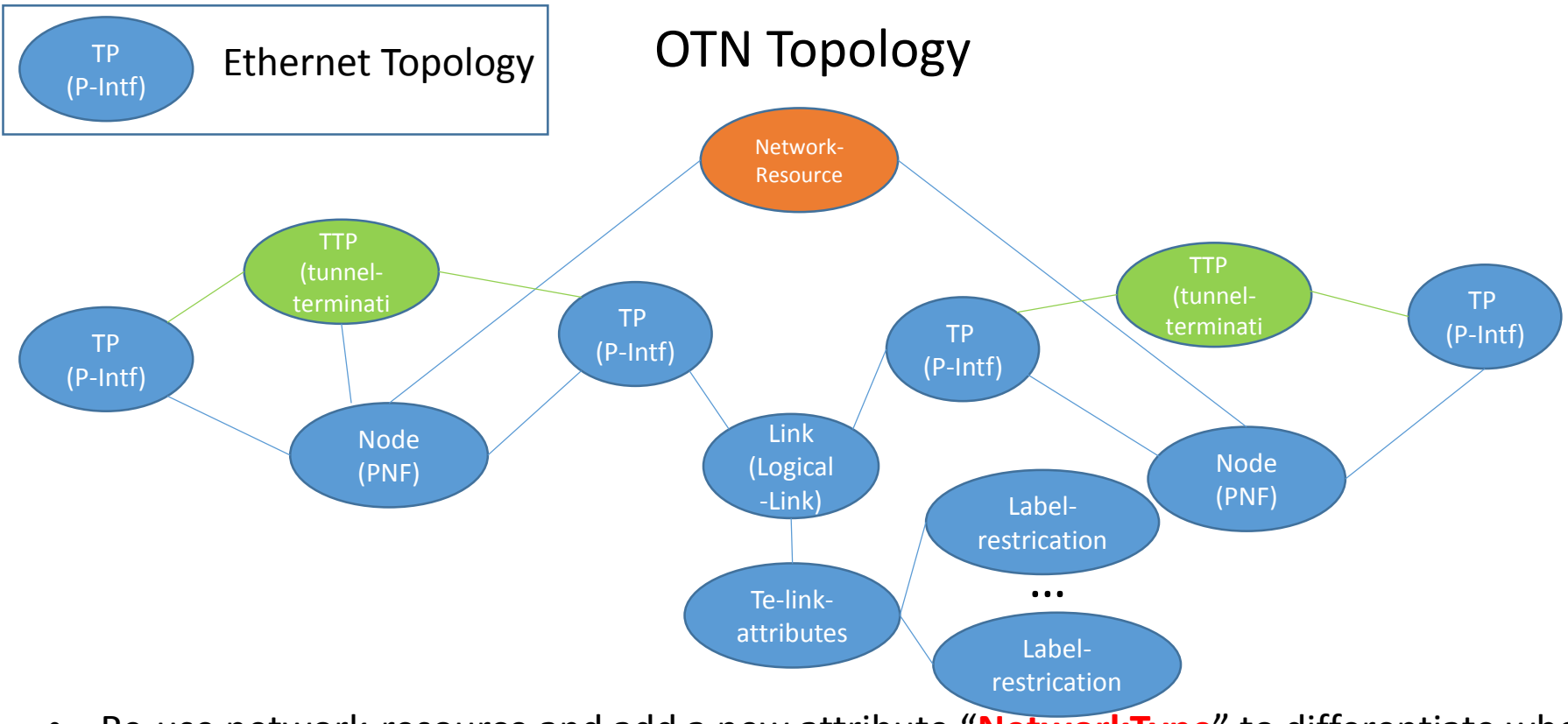
Name	Value
source	0.190.0.1
destination	0.190.0.4
dest-ttp-id	104
dst-tpn	An unused slot # from bitmap

OTN tunnel parameters needed by domain 2 controller:

Name	Value
source	0.190.0.3
destination	0.190.0.4
src-ttp-id	103
src-tpn	Same value as dst-tpn in table 1



Topology Resources in AAI



- Re-use network-resource and add a new attribute "**NetworkType**" to differentiate whether it's a Ethernet topology of OTN topology
- Re-use PNF as a OTN node & P-Intf as TP.
- Also PNF needs to have OneToMany relation with TP
- Added new resource tunnel-termination-point.

network-resource – Existing AAI model

Attributes	Required	Cardinality	Content	Description	Existing
network-id	M	1	String	Uniquely identifies this network-resource by id	Y
provider-id	M	1	String	Store the id of the provider of this network-resource	Y
client-id	M	1	String	Store the id of the client of this network-resource.	Y
te-topo-id	M	1	String	Store the id of the te-topo of this network-resource.	Y
Selflink	M	1	String	Store the link to get more information for this object.	Y
resource-version	M	1	String	Used for optimistic concurrency. Must be empty on create, valid on update and delete.	Y
relationship-list	O	1	String	relationship	Y
network-type	O	1	String	Network typ e.g. ETH topology or OTN topology.	N

Add those attributes with N mentioned below

pnf – Existing AAI model

Attributes	Required	Cardinality	Content	Description	Existing
pnf-name	M	1	String	unique name of Physical Network Function.	Y
provider-id	M	1	String	name of Physical Network Function	Y
selflink	M	1	String	URL to endpoint where AAI can get more details	Y
pnf-name2-source	M	1	String	source of name2	Y
selflink	M	1	String	URL to endpoint where AAI can get more details.	Y
pnf-id	M	1	String	source of name2	Y
equip-type	O	1	String	Equipment type. Source of truth should define valid values.	Y
. . .	…	…	…	…	…
is-abstract	O	1	Boolean	value “true” represent abstract node, i.e. group of PNFs abstracted and presented as a single node by domain controller.	N

Add those attributes with N mentioned below

logical-link– Existing AAI model

Attributes	Required	Cardinality	Content	Description	Existing
link-name	M	1	String	e.g., evc-name, or vnf-nameA_interface-nameA_vnf-nameZ_interface-nameZ	Y
link-name2	M	1	String	Alias or alternate name (CLCI or D1 name).	Y
speed-value	M	1	String	Captures the numeric part of the speed	Y
link-id	M	1	String	UUID of the logical-link, SDNC generates this.	Y
speed-units	M	1	String	Captures the units corresponding to the speed	Y
ip-version	M	1	String	v4, v6, or ds for dual stack	Y
in-maint	O	1	String	used to indicate whether or not this object is in maintenance mode (maintenance mode = true). This field (in conjunction with prov-status) is used to suppress alarms and vSCL on VNFs/VMs	Y
. . .	…	…	…	…	…
link-type	O	1	String	Type of logical link, e.g., evc, intra optical domain, inter optical domain, or inter operator domain	Y

No change in logical-link resource as link-type is already a string, required values intra optical domain, inter optical domain, or inter operator domain can be used

P-interface – Existing AAI model

Attributes	Required	Cardinality	Content	Description	Existing
interface-name	M	1	String	Name that identifies the physical interface	Y
speed-value	M	1	String	Captures the numeric part of the speed	Y
interface-type	M	1	String	Indicates the physical properties of the interface. . e.g. "Tunnel Termination Point (TP)"	Y
link-id	M	1	String	UUID of the logical-link, SDNC generates this.	Y
speed-units	M	1	String	Captures the units corresponding to the speed	Y
ip-version	M	1	String	v4, v6, or ds for dual stack	Y
in-maint	O	1	String	used to indicate whether or not this object is in maintenance mode (maintenance mode = true). This field (in conjunction with prov-status) is used to suppress alarms and vSCL on VNFs/VMs	Y
. . .	…	…	…	…	…
plug-id	O	1	Integer	Unique number that identifies on the network a connectivity supporting a given inter-domain TE-link.	N
inter-layer-lock-id	O	1	Integer	correlation between related objects in ETH topology and OTN topology	N

Add those attributes with N mentioned below

tunnel-termination-point – new AAI model

Attributes	Required	Cardinality	Content	Description	Existing
ttp-id	M	1	String	Name that identifies the tunnel termination point	N
tunnel-tp-id	M	1	String	TTP ID discovered from controller. It is supposed to be binary format, which don't exist in AAI. And it is only unique inside the node.	N
name	O	1	String	Name of TTP, also discovered from controller.	N
admin-status	O	1	String	Enum of {up, down, testing, preparing-maintenance, maintenance}. Admin status of the TTP.	N
oper-status	O	1	String	Enum of {up, down, testing, preparing-maintenance, maintenance}. Operational status of the TTP	N
switching-capability	O	1	String	Enum of {PSC-1, EVPL, L2SC, TDM, OTN}, indicating the switch capability of the TTP	N
encoding	O	1	String	Enum of {packet, Ethernet, PDH, SDH, digital-wrapper, lambda, fiber, fiber-channel, ODUk, optical-channel, line}. Encoding supported by the TTP.	N
protection-type	**O**	**1**	**string**	Enum of {unprotected, reroute, reroute-extra, 1-for-n, unidir-1-to-1, bidir-1-to-1, extra-traffic}, indicating the supported protection type of this TTP	**N**
inter-layer-lock-id	O	1	Integer	correlation between related objects in ETH topology and OTN topology	N

Add those attributes with N mentioned below

te-link-attributes – new AAI model

Attributes	Required	Cardinality	Content	Description	Existing
id	M	1	String	Link attribute id UUID assigned to this instance	N
isAbstract	O	1	Boolean	Indicate whether the link is abstract or native.	N
link-protection-type	O	1	enum	indicate desired protection type of link, unprotected, shared or 1+1	N
access-type	O	1	enum	indicate link access type, point-to-point or multi-access	N

Add those attributes with N mentioned below

label-restriction – new AAI model

Attributes	Required	Cardinality	Content	Description	Existing
id	M	1	String	Label id UUID assigned to this instance	N
label-start	O	1	Integer	First number in label range	N
label-end	O	1	Integer	Last number in label range	N
range-bitmap	O	1	String	Bitmap of available labels starting from label-start to label-end. The bitmap is base64 encoded, so it is save in string	N
label-step	O	1	Integer	step of labels in label range	N
inclusive-exclusive	O	1	String	{Inclusive, exclusive} indicate whether range-bitmap items are inclusive or exclusive	N
rang-type	O	1	String	{trib-slot, trib-port} indicate the label range is TS or TPN	N
trib-slot-granularity	O	1	String	{1.25G, 2.5G} indicate trib slot granularity	N
priority	O	**1**	Integer	priority	**N**

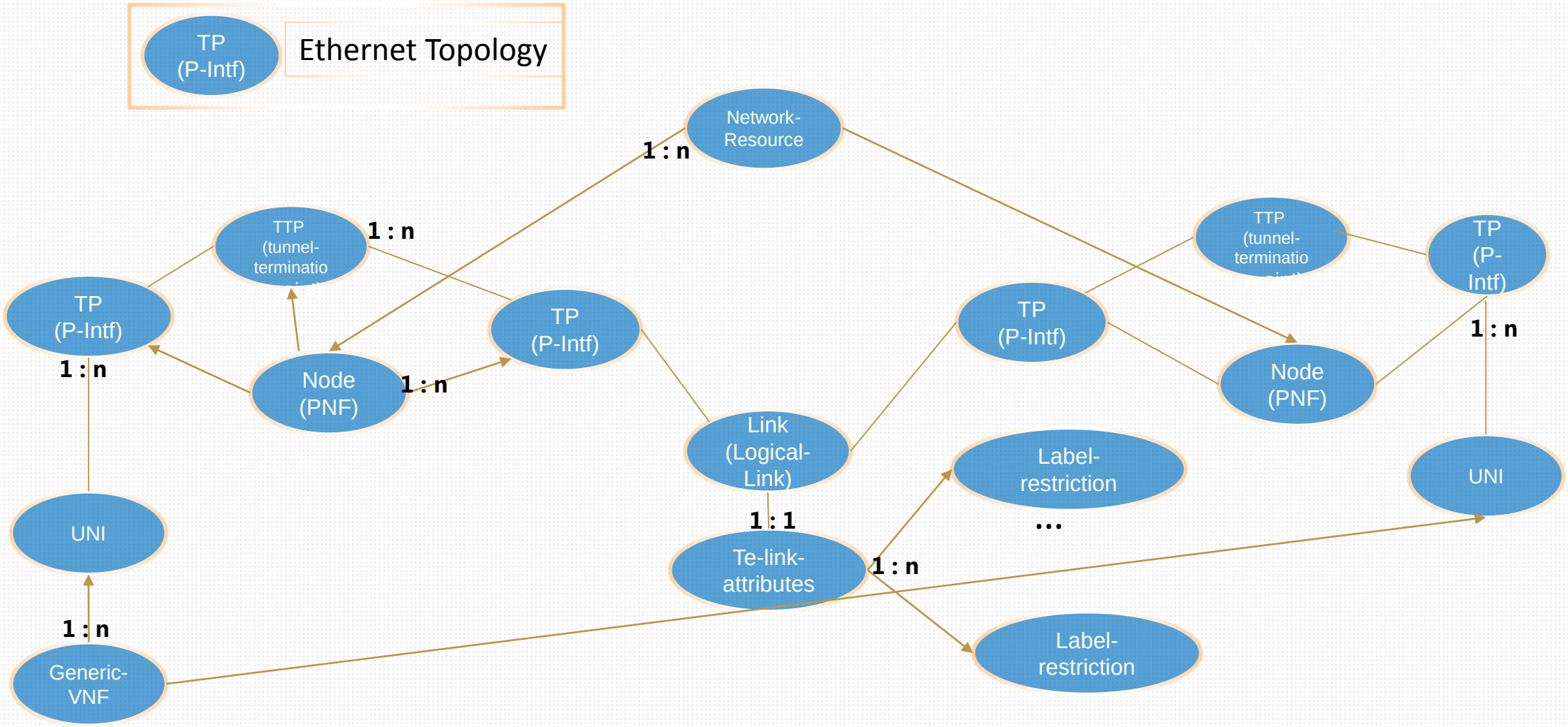
Add those attributes with N mentioned below

UNI – new AAI model

Attributes	Required	Cardinality	Content	Description	Existing
id	M	1	String	UNI id UUID assigned to this instance	N
tpId	O	1	String	Termination point id	N
cVLAN	O	1	String	The cvlan for the site used for ethernet type connectivity.	N

Add those attributes with N mentioned below

Edge-rule relationship



Thank you

Service topology:
AAI Model Design – Proposed
Multi Domain