



Hierarchy of IP Controllers (HIC)

draft-li-teas-hierarchy-ip-controllers-01

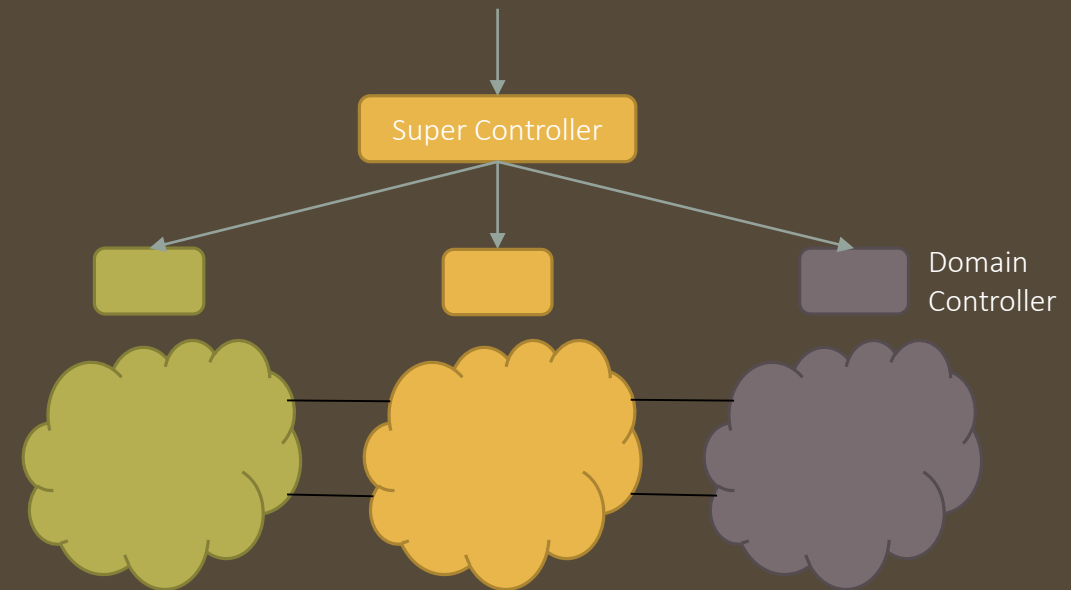
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Introduction

- This I-D describes how multiple IP controllers work in a hierarchical fashion
 - How the ACTN framework is applied to IP controllers
 - Interactions between TE and non-TE components (BGP, VPN)
 - Control Plane and Management Plane considerations
- IP Services Realization
 - Seamless MPLS
 - L3VPN
 - L2VPN/EVPN
- Scope for possible new work

Hierarchy of IP controllers (HIC)

- The Super Controller receives request from the network/service orchestrator to setup dynamic services spanning multiple domains.
- The Super Controller breaks down and assigns tasks to the domain controllers, responsible for communicating to network devices in the domain. It further coordinates between the controller to provide a unified view of the multi-domain network.



Mapping to ACTN

Main Functions in ACTN

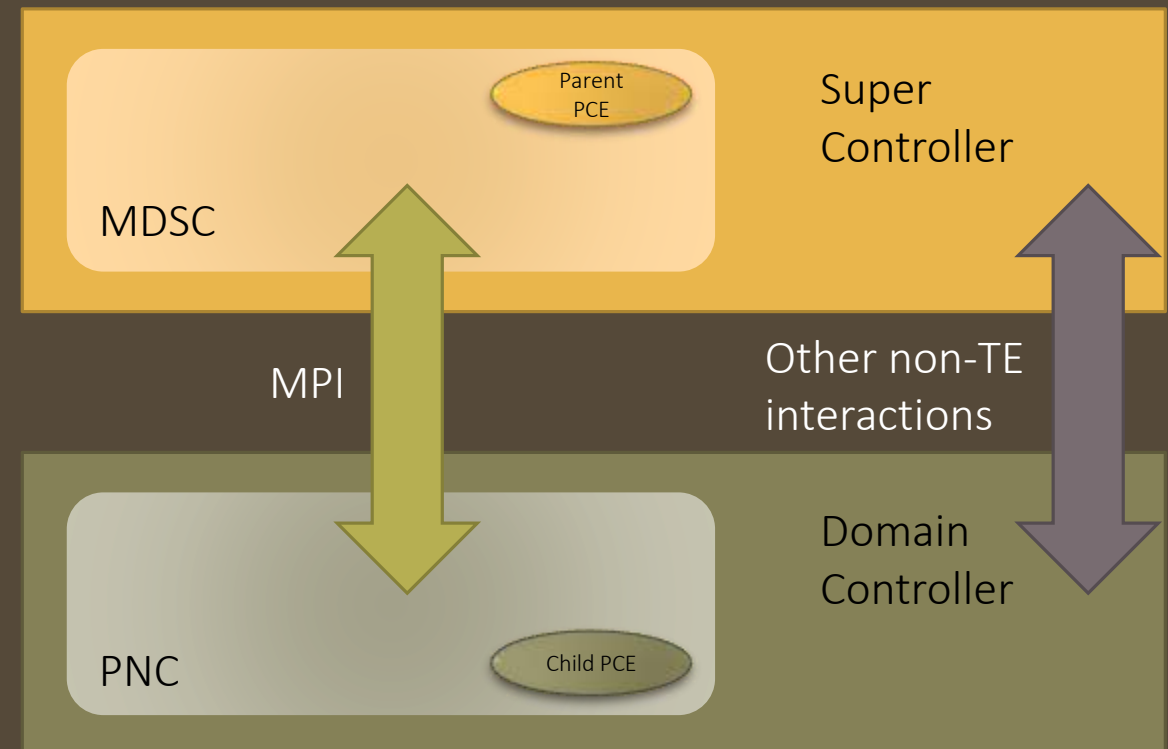
Multi-domain Coordination

Abstraction

Customer mapping/translation

Virtual Service Coordination

- Interface b/w controllers
 - TE & non-TE
 - Control Plane Protocol
 - PCEP, BGP
 - Management Protocol
 - RESTCONF/NETCONF/gRPC



Key Update - BGP

BGP Considerations

- Domain Controller acting as Route Reflector (RR)
- Super Controller also acting as RR

Routing policies

- Preference, AS-path filter, Prefix filter, aggregation etc.
- Distribute via controllers
- Super Controller coordinates policy across domains

RT constraint

- Hierarchical RR to control route advertisement

Key Update - BGP

Flowspec

- Controller originates flow specifications and disseminate
- Redirect to “TE-tunnel” (ACTN)
- Domain Controller as Traffic Sampler
- Super Controller as Flow Analyzer!

BMP

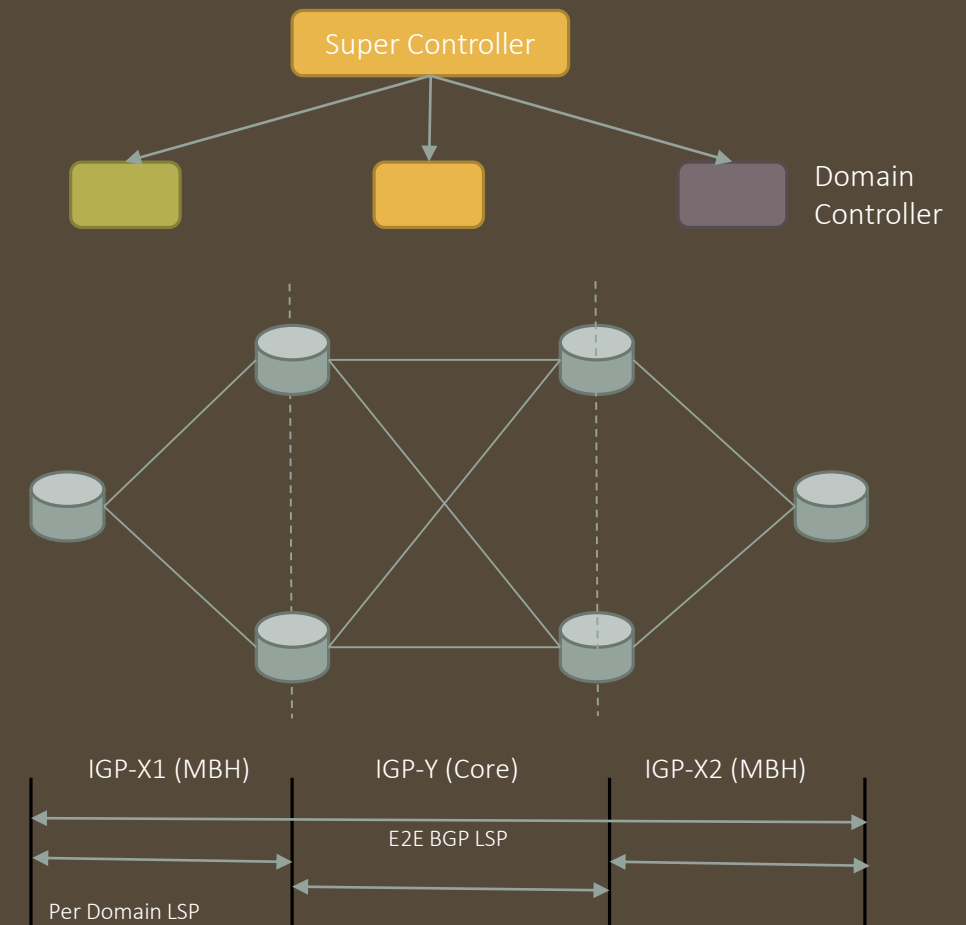
- Monitor BGP sessions
- Controller can be monitoring stations

BGP-LS

- Link state and TE information via BGP
- Controller can use this to learn domain topology and further share the abstracted view to super controller

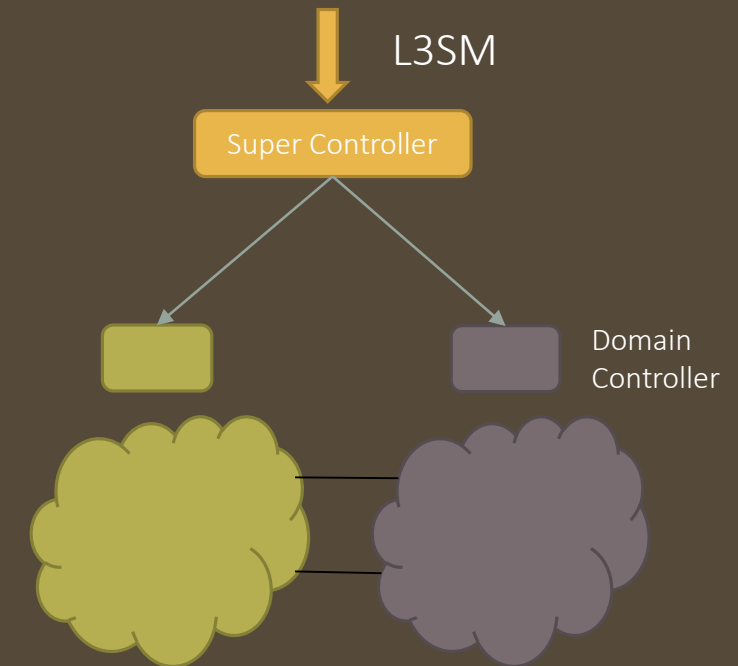
Seamless MPLS

- Extend MPLS to the edge mobile backhaul.
- The super controller is aware of the E2E topology
- Super Controller is responsible to setup the seamless MPLS service from the service model
- The super controller selects the right ABR and create corresponding per-domain tunnels
- *Based on the service model, the Super Controller translates to the network configuration model for the domain controller.*
- The domain controller further breaks into the device configuration model to the PE/ABR to make E2E services.
- Routes can also be learned via the BGP sessions between Domain Controller and Super Controller for intelligent decisions



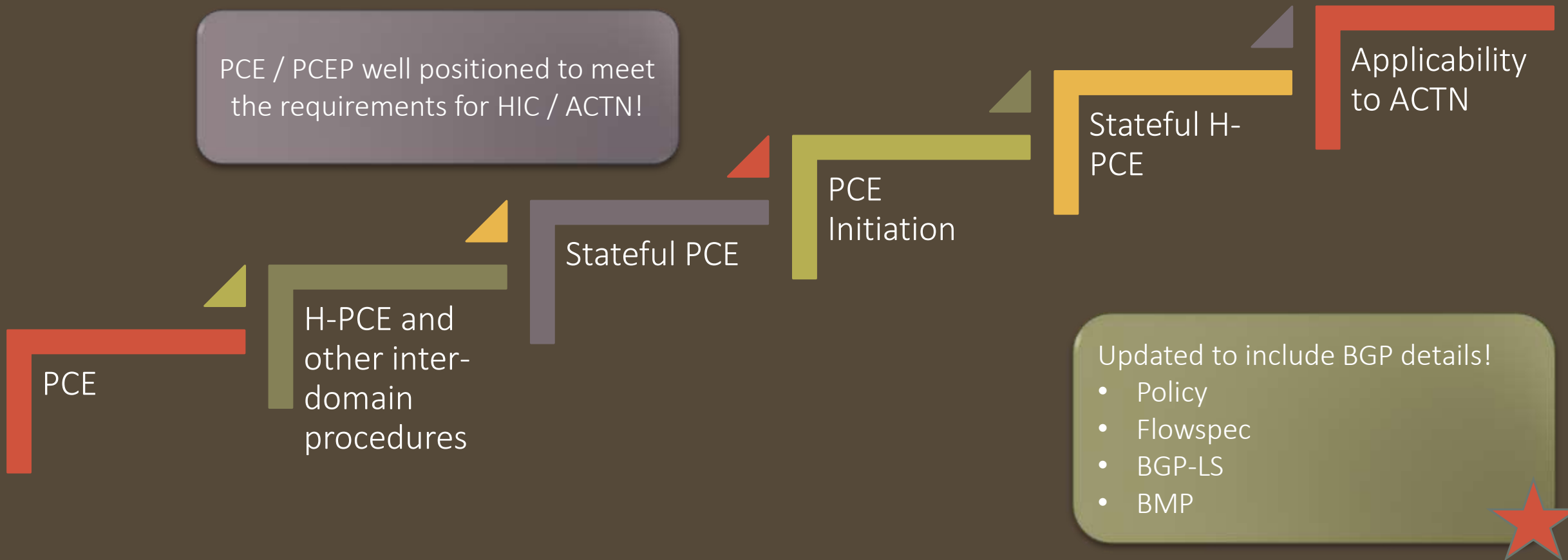
L3VPN

- The Super-controller implements the L3SM model and translate it to network models towards the domain controller, which in turn translate it to the device model.
- Based on QoS/Policy, the Super Controller may -
 - Set the tunnel selection policy at the PE/ASBR routers so that they could select the existing tunnels
 - Select an existing tunnels at the controller level and bind it to the VPN service
 - Initiate the process of creating a new tunnel based on the QoS requirement and bind it the VPN service
 - Initiate the process of creating a new tunnel based on the policy
- Apart from Management Plane, control plane interface between controllers can also be used to setup and maintain the L3VPN service!



* -- applicable to L2VPN/EVPN in similar fashion!

Control Plane Protocols



YANG Models

Service Models
(L3SM, L2SM)

Network
Configuration
Models (?)

Device
Configuration
Models

Topology
Related

Tunnel related

VN and Service-
Mapping
related

OAM

BGP Related

- BGP Policy yang
- Flowspec yang

?

Possible Features/Extensions

Initial Configurations between controllers

- Initial Session Establishments
- Discovery via other protocols
- Service Discovery (DNS)

Relationship / Role of controllers

Learning the mutual capabilities of controllers

Handling of multiple instances of controller for reliability

?

Next Steps

- Get Feedback
 - What is missing?
 - What else can be added / removed?
 - Is such an informational document useful?
- Identified Gaps
 - Need to add more details about other Yang Models that are useful between controllers
 - Need to add more details about OAM
 - If you have expertise in these areas please provide help – Call for collaboration!
- Candidate for WG Adoption (?)



Thank you!