

Path Computation API

draft-busibel-ccamp-path-computation-api
IETF 96 – Berlin

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Scope

- Controllers/Orchestrators operate based on Traffic Engineering Database (TED) data
- YANG topology models provide access to TED
 - YANG enables use of NETCONF or RESTCONF
 - Complements existing TED distribution mechanisms
- A path computation API may be needed as well
 - YANG enables use of NETCONF or RESTCONF
 - Complements existing mechanisms (e.g. PCEP)
- -00 of the draft presents use cases for a path computation API

Examples for Use Cases

IP-Optical Integration

- An optical domain is providing connectivity between IP routers

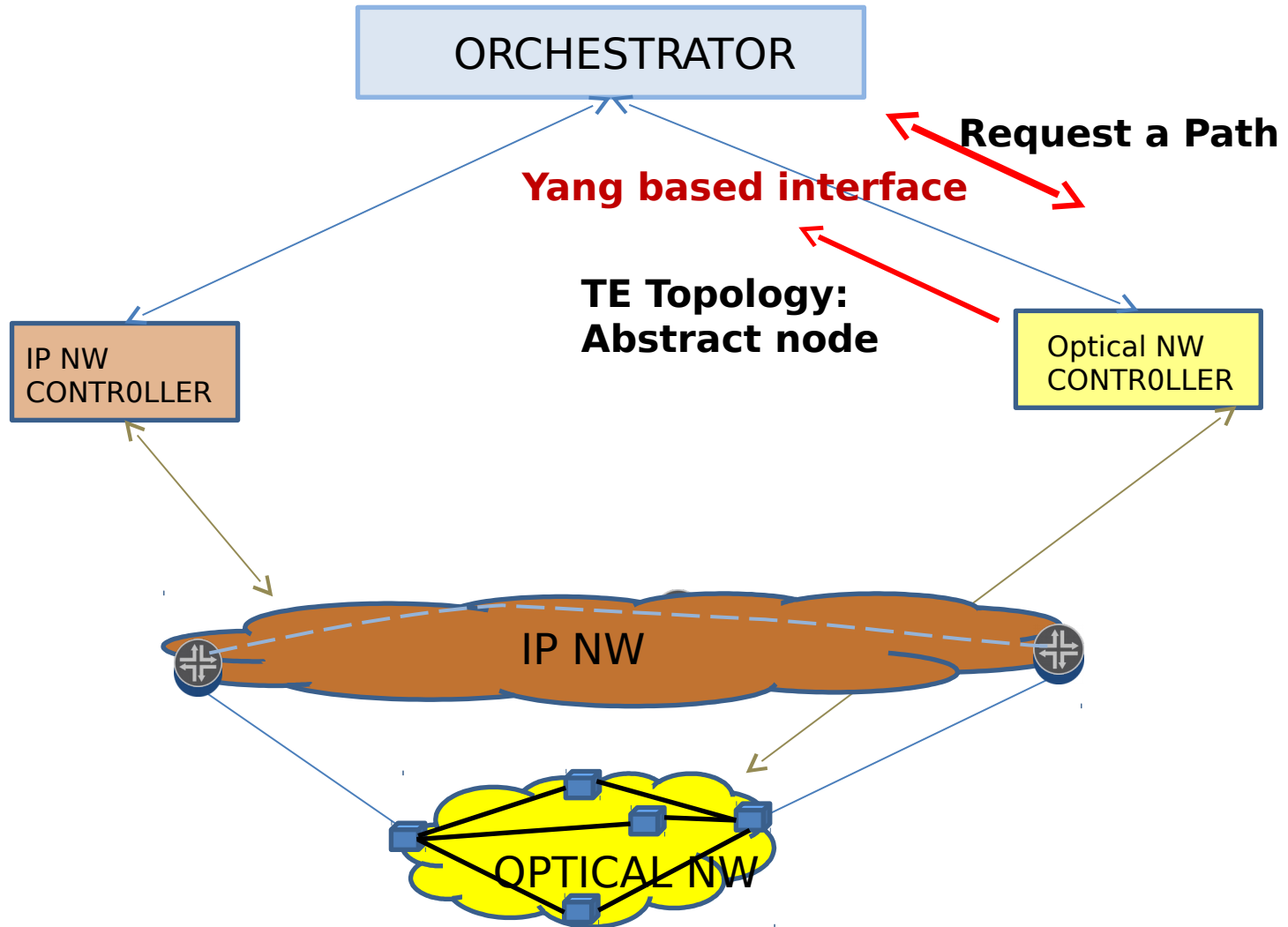
Multi-domain Optical Network

- Optical domains interconnected by multiple inter-domain links

Data Center interconnection

- Optical domain is providing connectivity among data centers

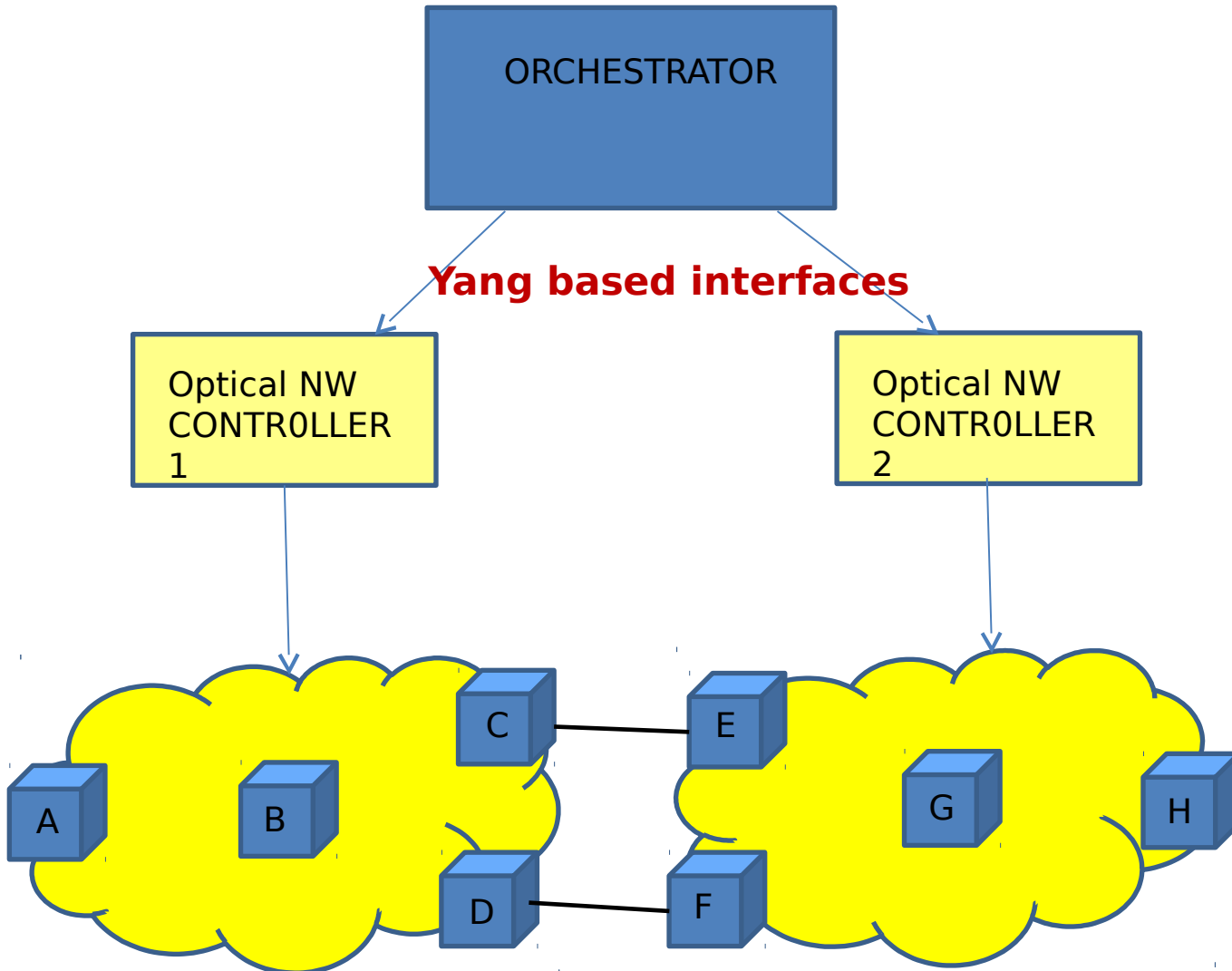
IP-Optical Integration



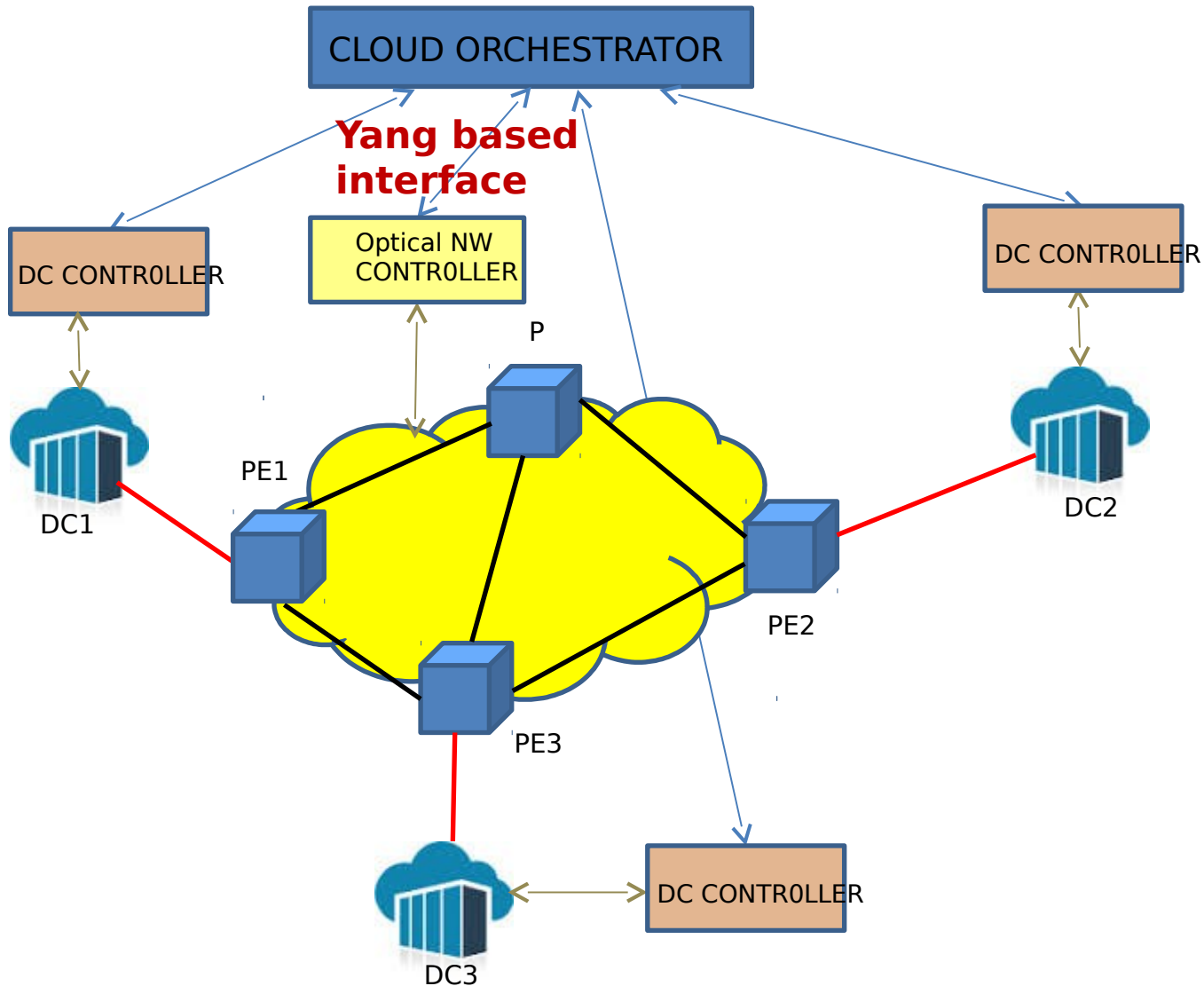
Why Path Computation API in YANG?

- Path computation is only a subset of controller functionality
 - Service setup/modification/deletion is YANG
 - Notifications and telemetry information is YANG
 - YANG is a standard to define controller northbound interfaces
- Reduce complexity by leveraging protocol communality (by using NETCONF, RESTCONF, ...)
 - Avoid per-protocol mechanisms for authentication, authorization, etc.
 - Load balancers can simpler deal with a single protocol
- Leverage the YANG eco-system
 - Fastly growing tools for YANG-based APIs, e.g., in open source
 - Cloud orchestrators and other systems (only) use RESTful APIs

Multi-domain Optical Networks



Data center interconnections



Conclusions

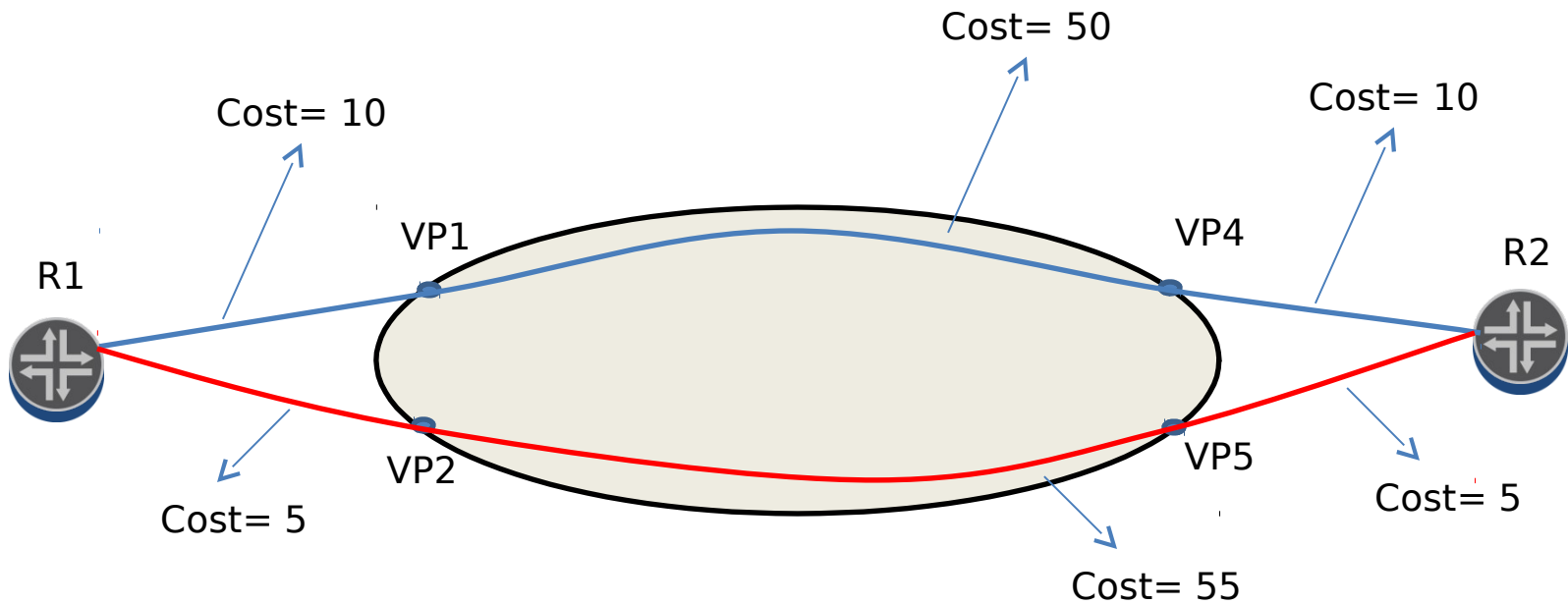
- Tradeoffs when abstracting topology information
 - Accuracy versus Scalability
 - Accuracy versus Up-to-date information
- Path Computation APIs allows the orchestrator to request some of the possible paths
 - Possibly without requiring accurate abstract topology
 - Abstract topology information can be used to reduce the number of path computation requests
- Path computation API and TE topology model are complementary tools

Next Steps

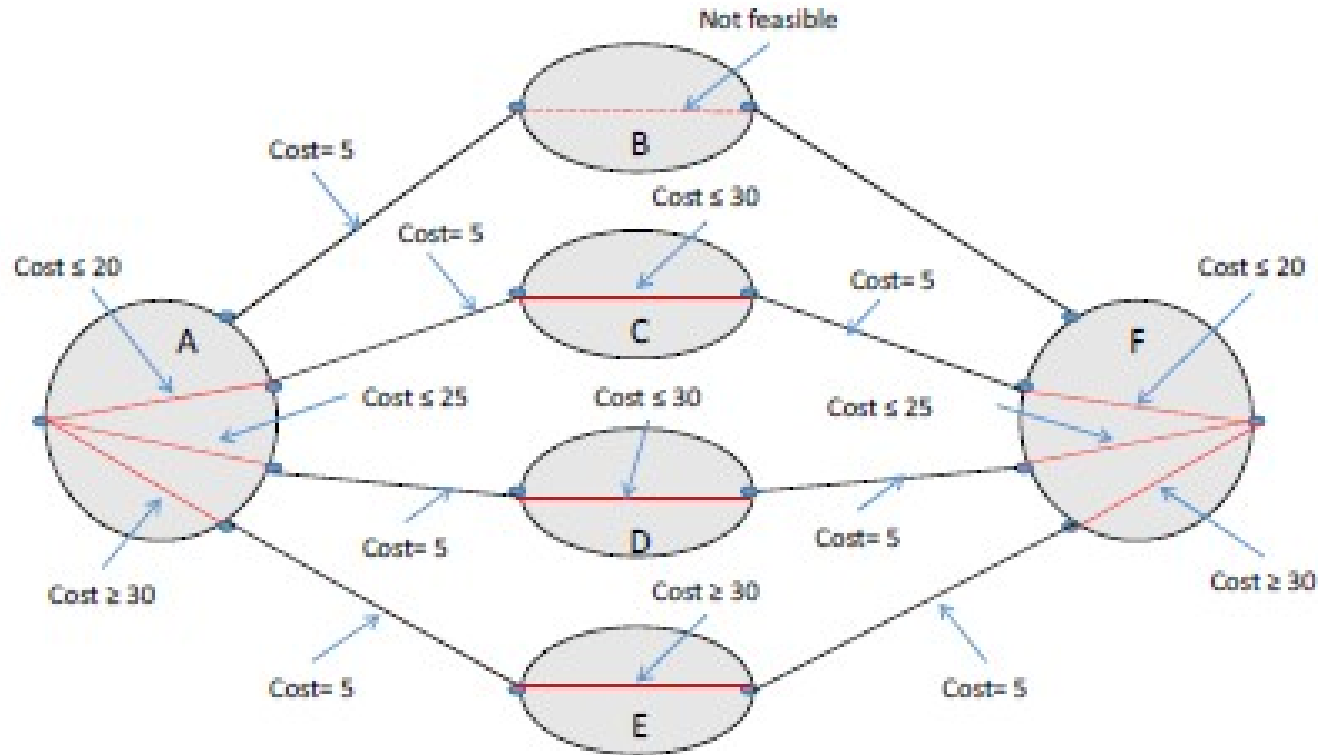
- Seeking guidance on whether the draft should be addressed to TEAS or CCAMP
 - Current use cases for optical networks (CCAMP scope)
 - Issues and solution seems applicable also to packet networks (i.e., TEAS)
- Start analyzing solutions to address the use cases
 - Definition of a YANG model, e.g., with stateless RPC
 - Pre-computed TE Tunnel approach (statefull)
- Seeking comments and feedback from interested WGs

Appendix

IP+Optical: Path Computation Example



Multi-domain Optical Networks (many domains)



- **Combining 2 approaches**

- Abstract topology information provided by domain controllers limiting the number of potential optimal e2e paths
- Path computation API to find optimal path within limited set.

Data center interconnections (2)

- Virtual machine in DC1 needs to transfer data to another virtual machine (in DC2 or DC3)
- Optimal decision based on optical cost (DC1-DC2 or DC1-DC3) and computing power
- Cloud orchestrator uses API to request Optical domain to compute the cost of possible optical paths and to DC controller to compute the cost of computing power, and then take the decision
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