

Cloud Services Architecture

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Cloud Service [1-3]

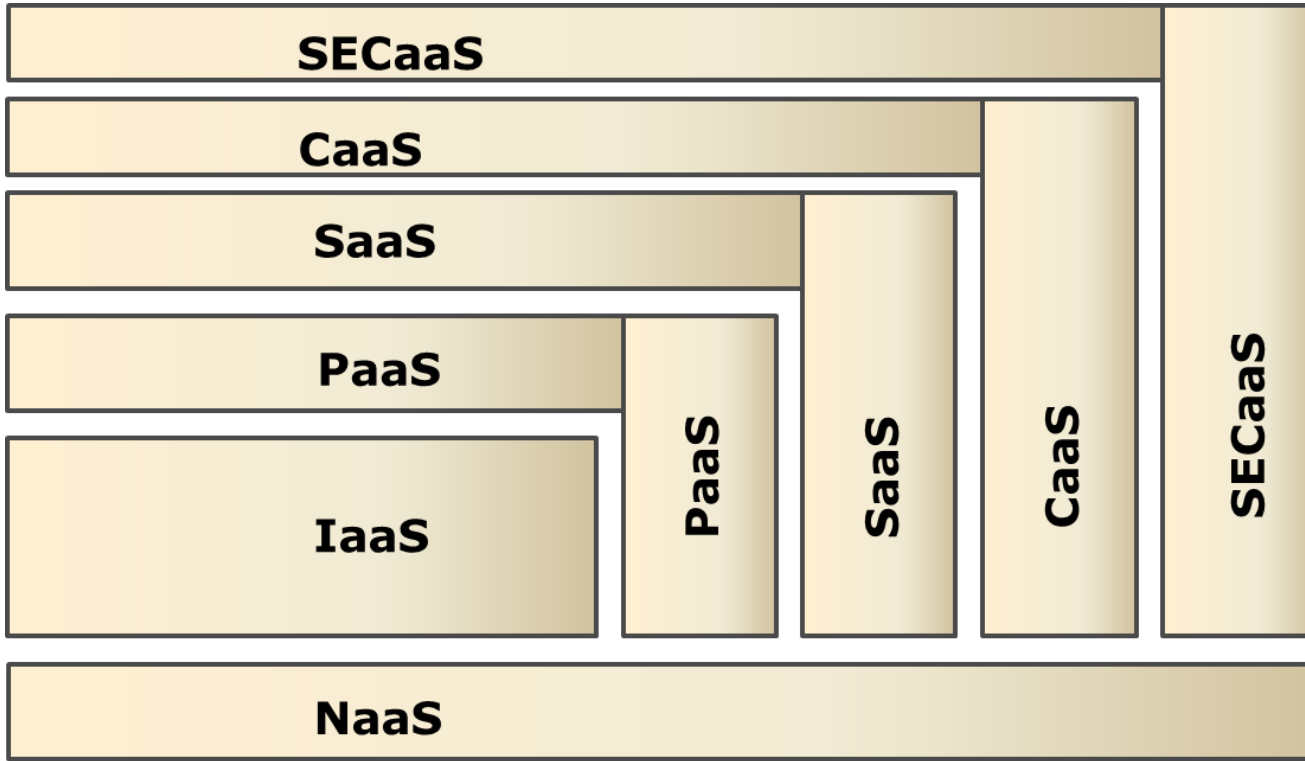
- **A service comprising one or more of compute, storage, and applications, and connectivity among them, that may be accessed by the Subscriber from one or more locations.**
- **It is an end-to-end service that may consist of both virtualized and non-virtualized components.**
- **It consists of applications and connectivity to applications.**

[1]M. Toy, "OCC 1.0 Reference Architecture", December 2014

[2]M. Toy, "Cloud Services Architectures", Science Direct Procedia Computer Science, 2015

[3] M. Toy, MEF Draft-spec "Cloud Services Architecture", February 2019.

Well-Known Cloud Services



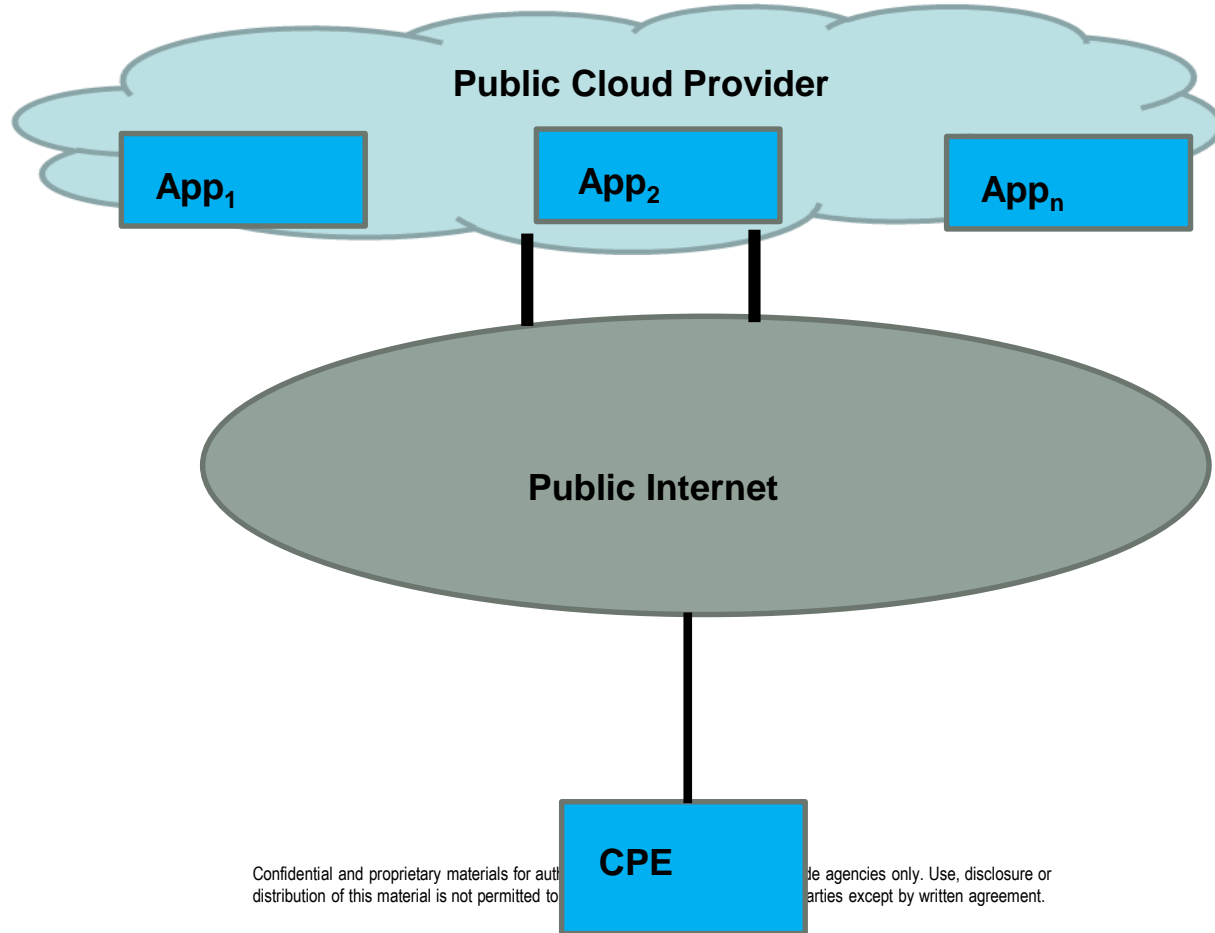
Cloud Service Characteristics

- **Consists of virtualized (VNFs) and non-virtualized functionalities/components (PNFs)**
 - Network Functions (PNFs and VNFs)
 - Applications (VNFs)
 - Connections supported by PNFs and VNFs
- **VNFs and PNFs can be provided by one or more Public Cloud Provider (s), Private Cloud Providers, and Network Operators (Cloud Carriers)**

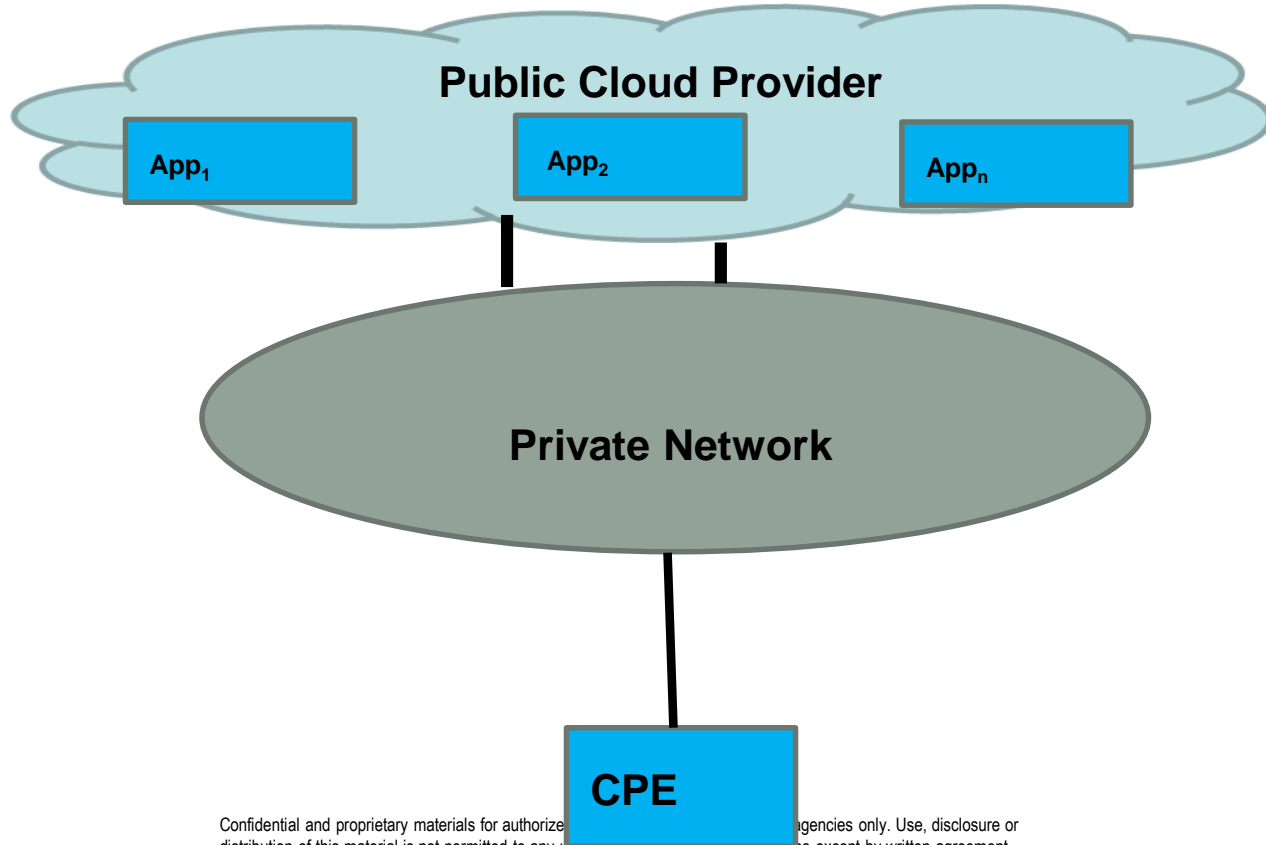
Cloud Service Characteristics (cont.)

- **Elasticity: On-demand service configurations by subscribers**
- **Service monitoring and usage-tracking by subscribers**
- **Self-service and collaboration**
- **Scalability**
- **SLS**
- **Usage based billing**

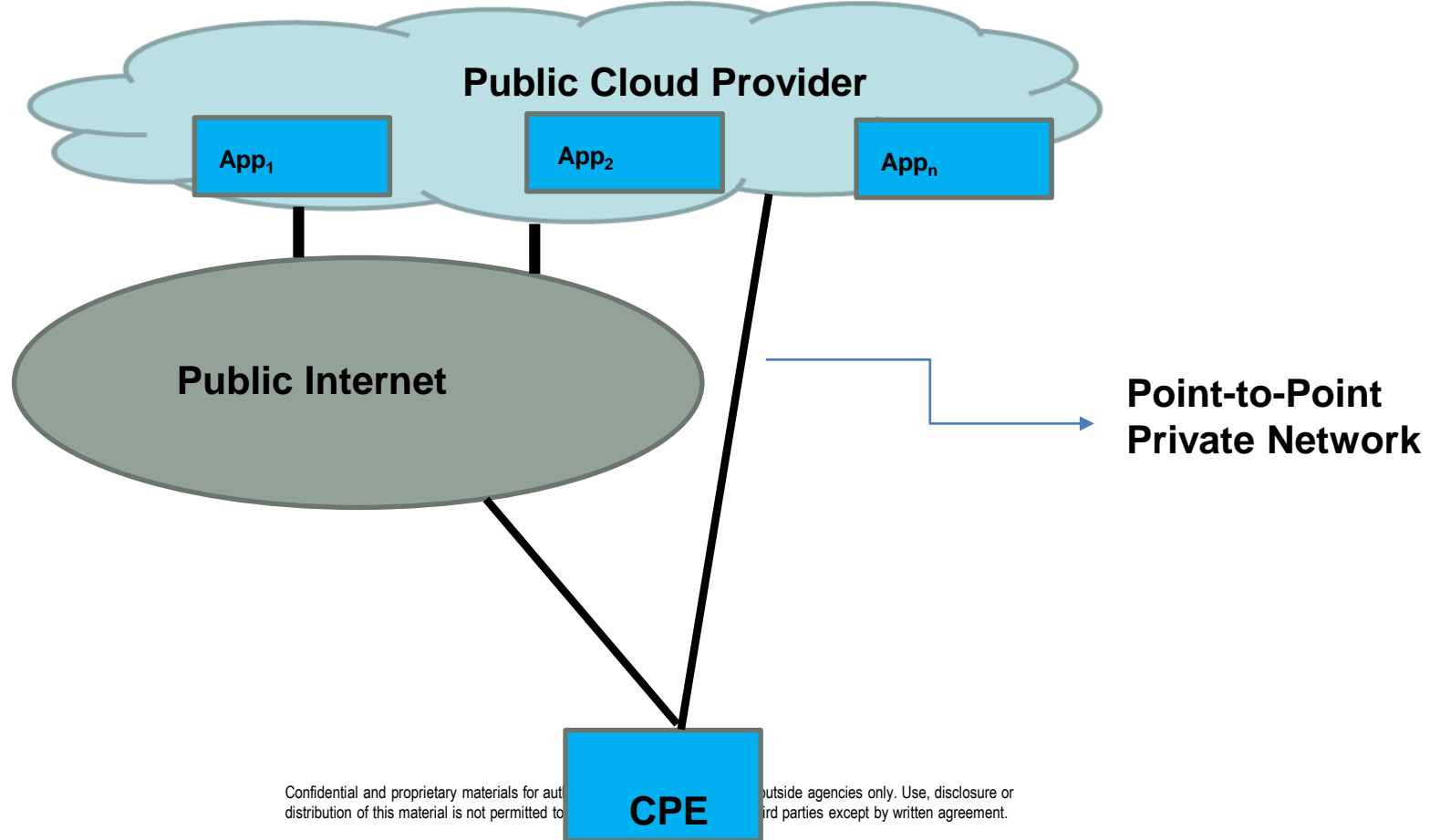
Public CP Access via Internet



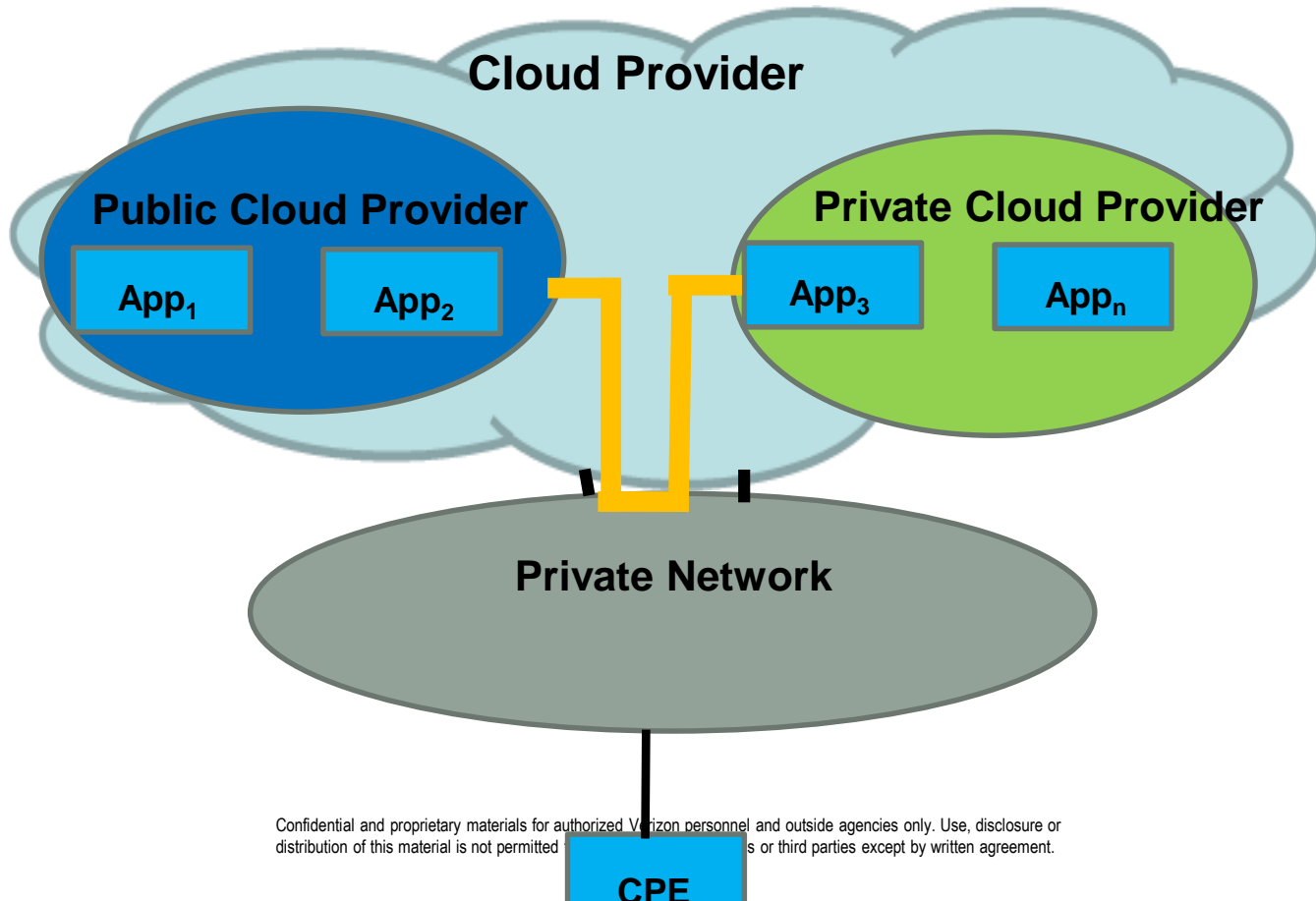
Public CP Access via PN



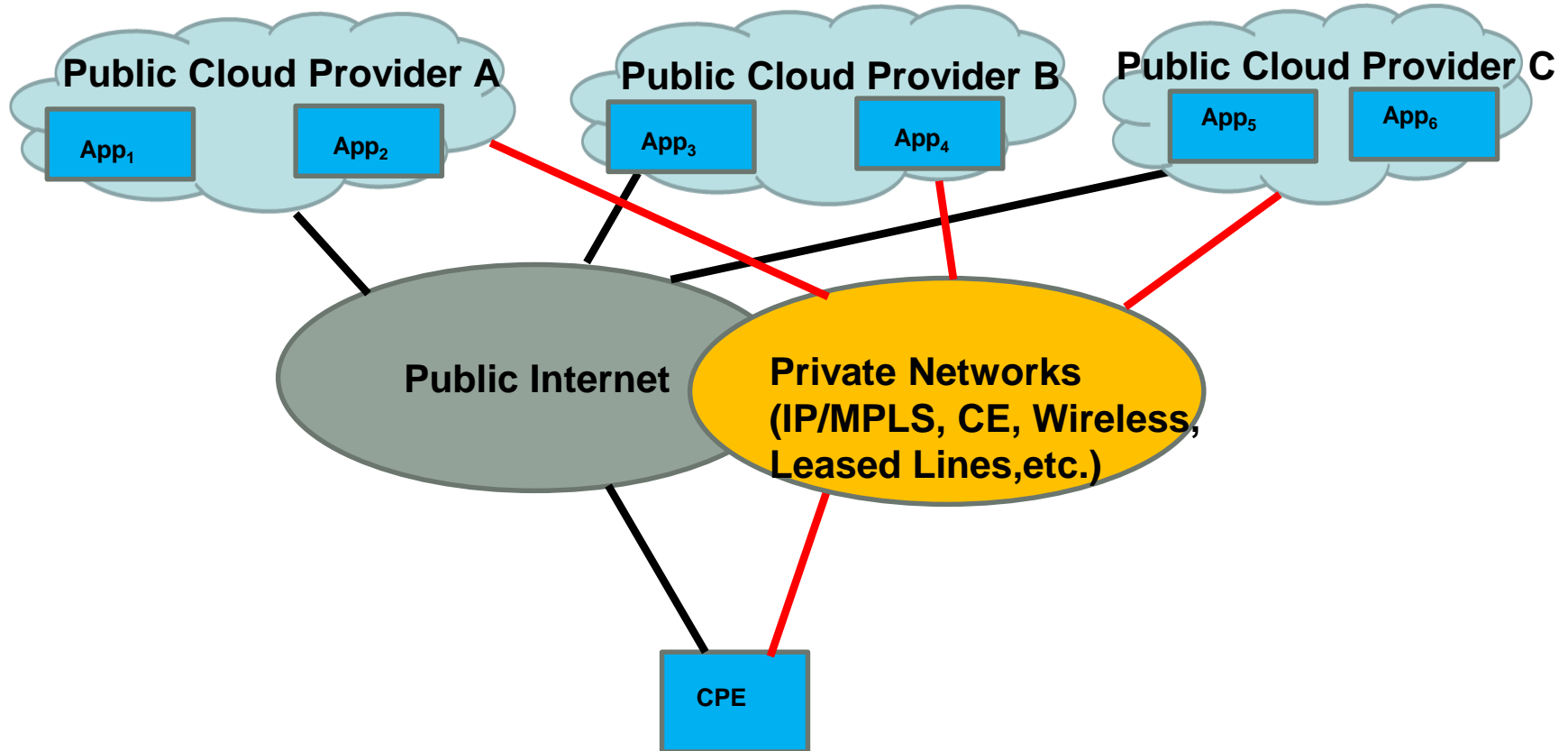
Public CP Access via Internet and PN



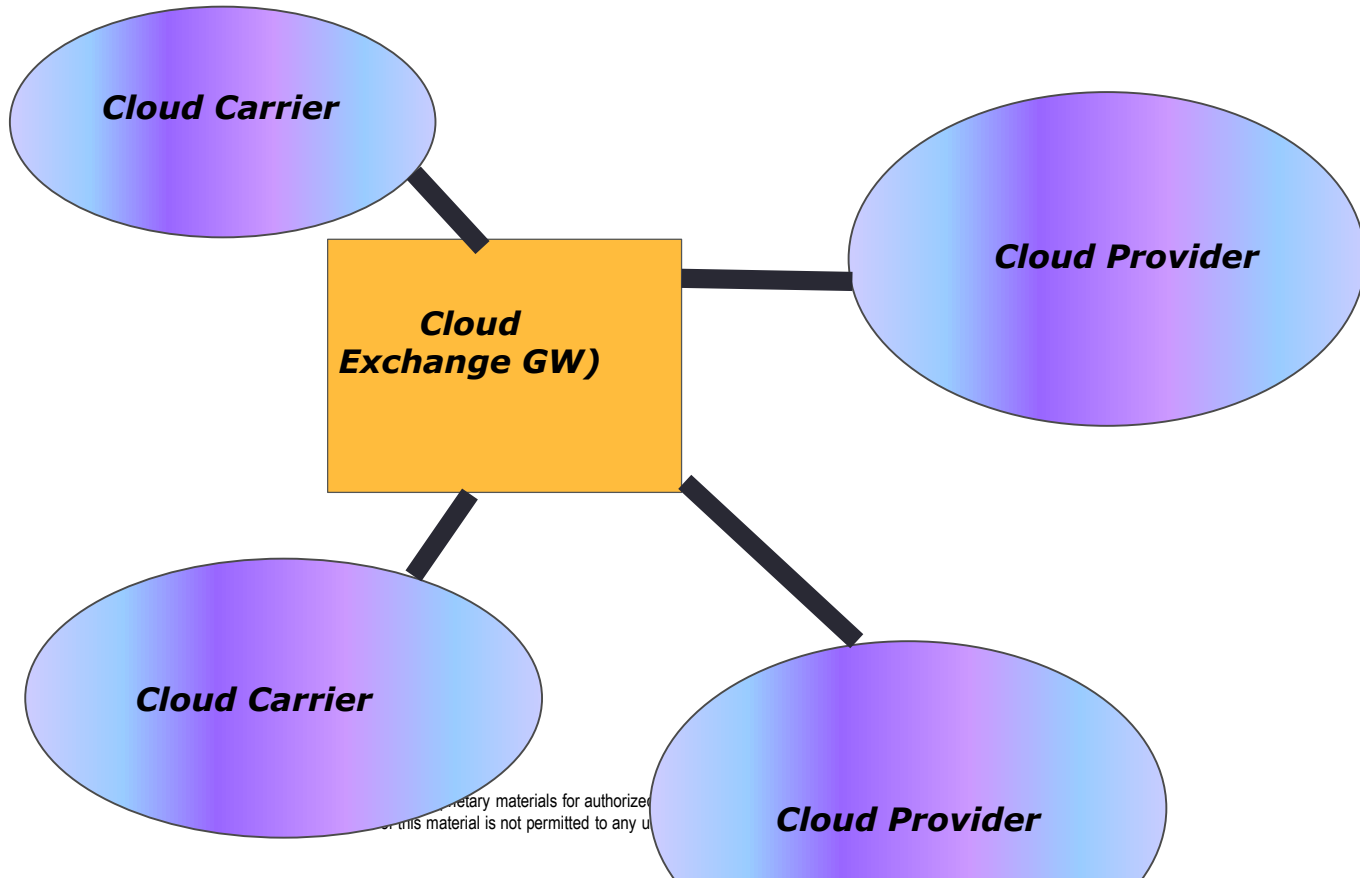
Public CP and Private CP Access via PN



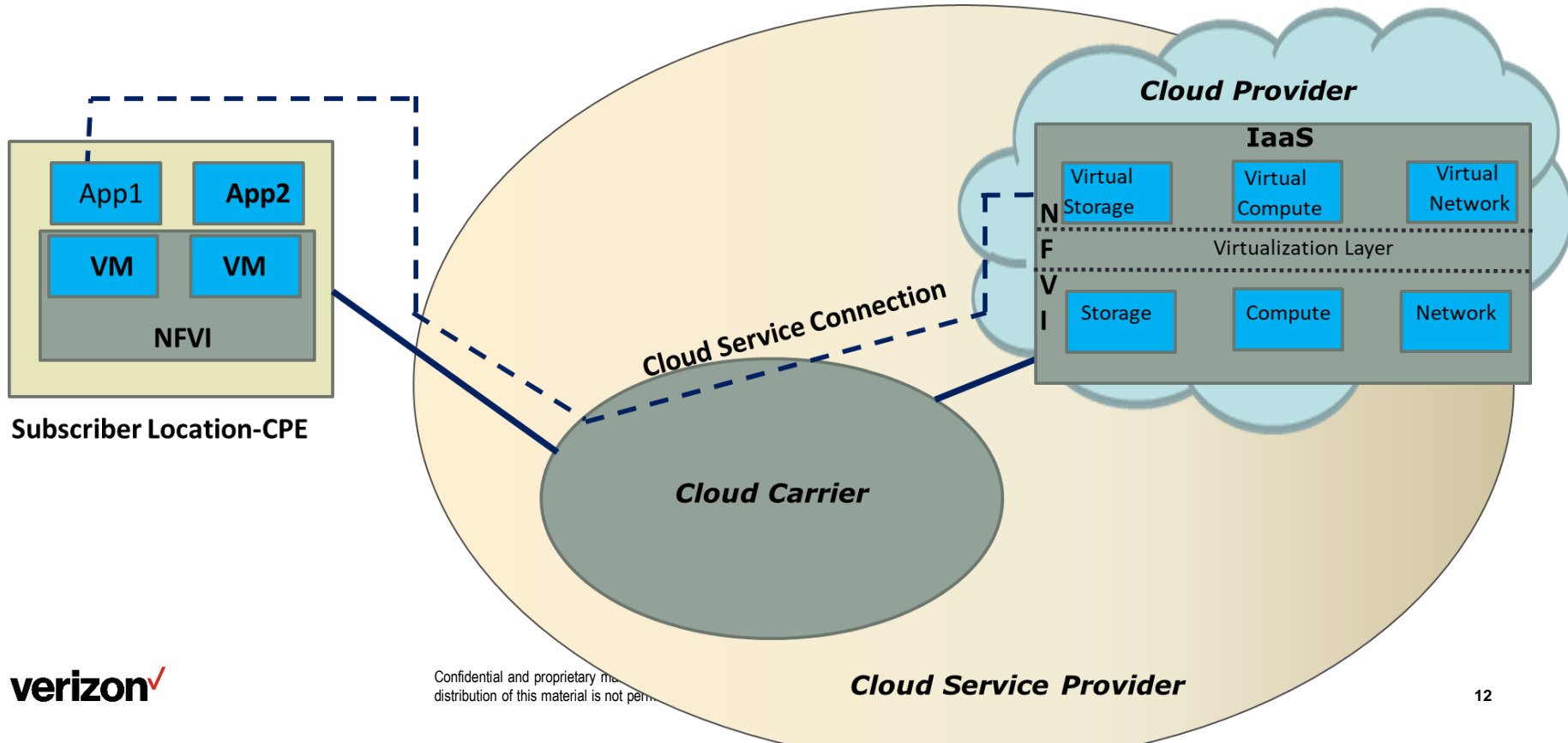
Public CP and Private CP Access via PN



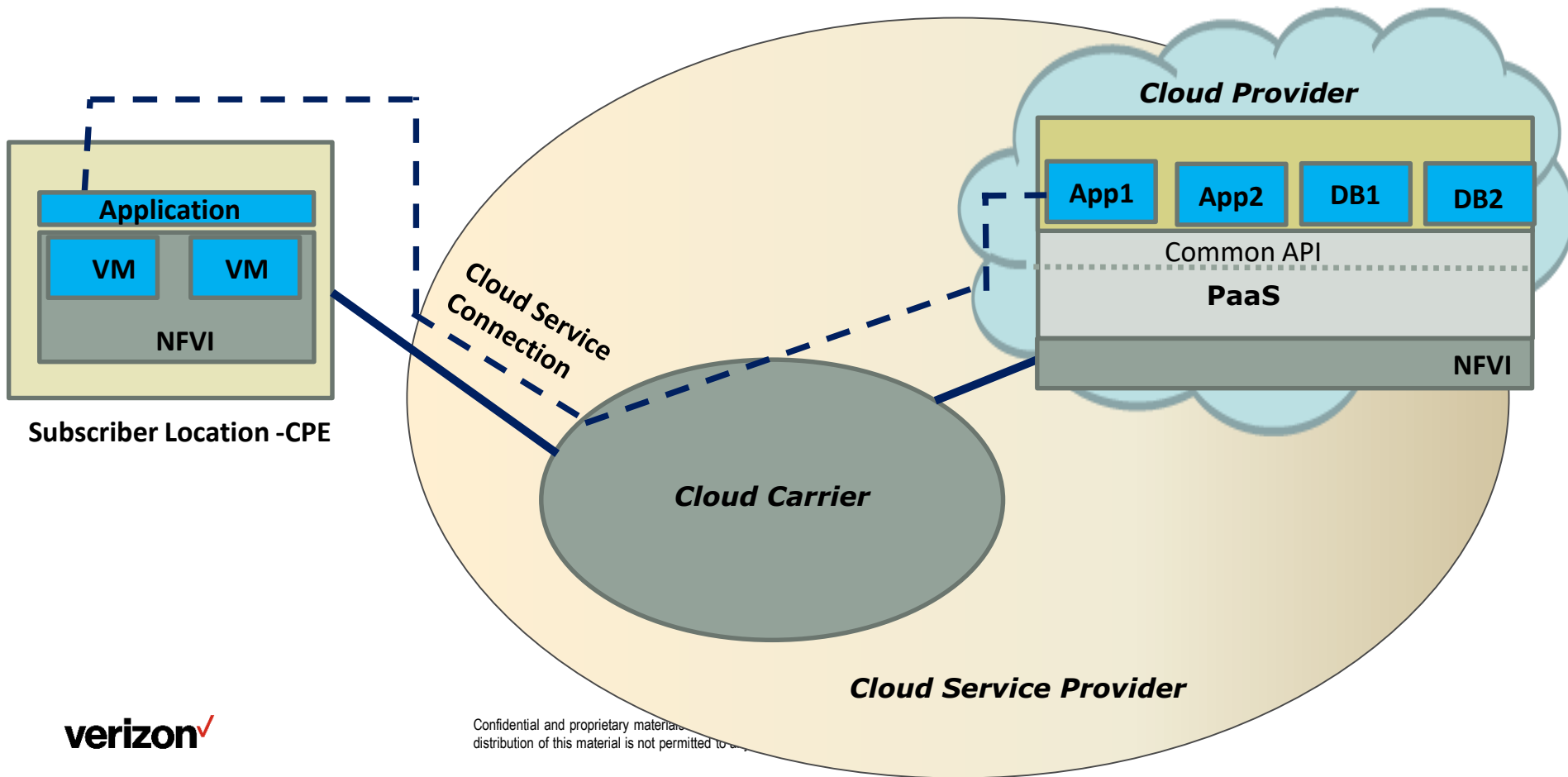
Cloud Exchange GW



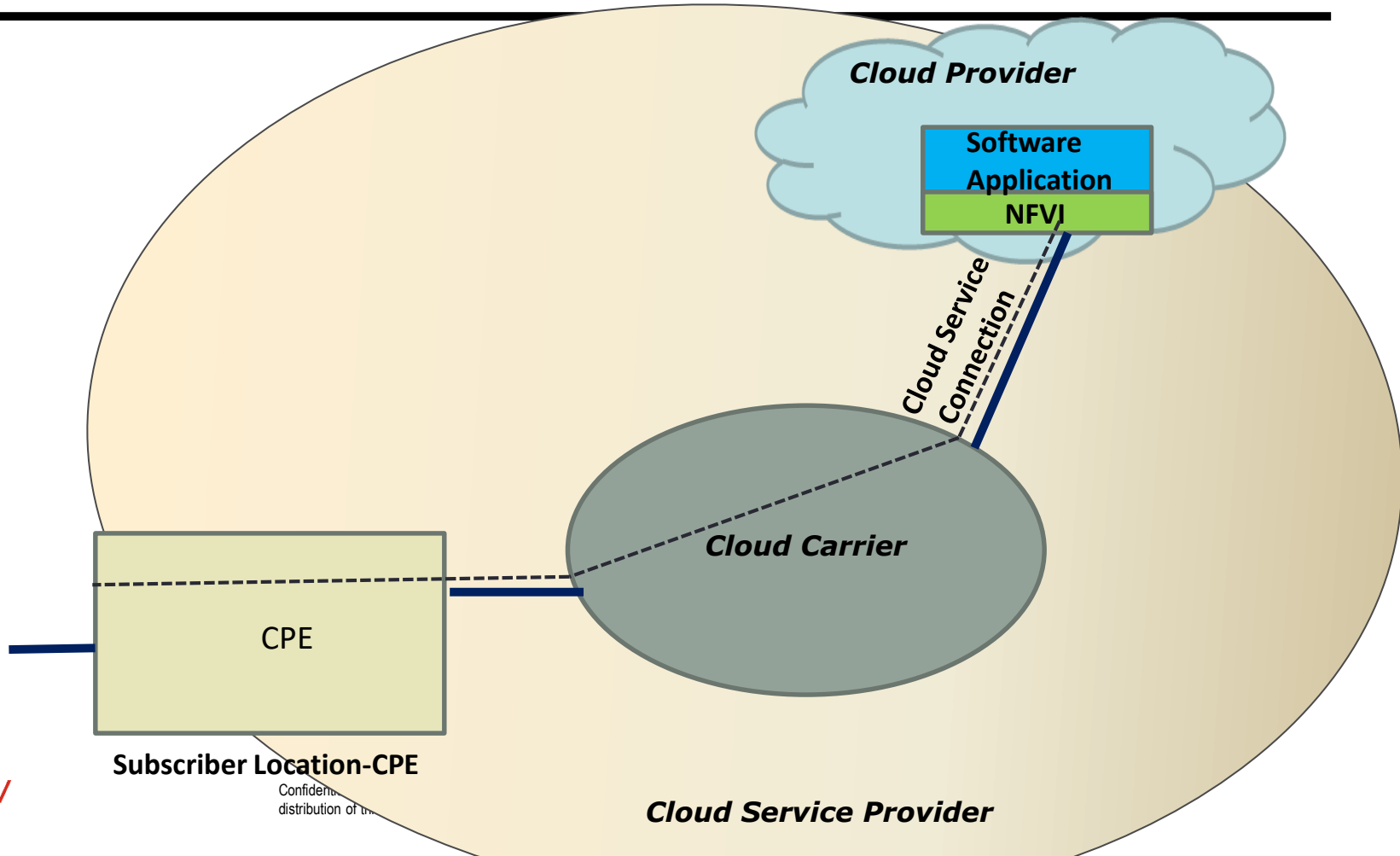
Cloud-in-Box



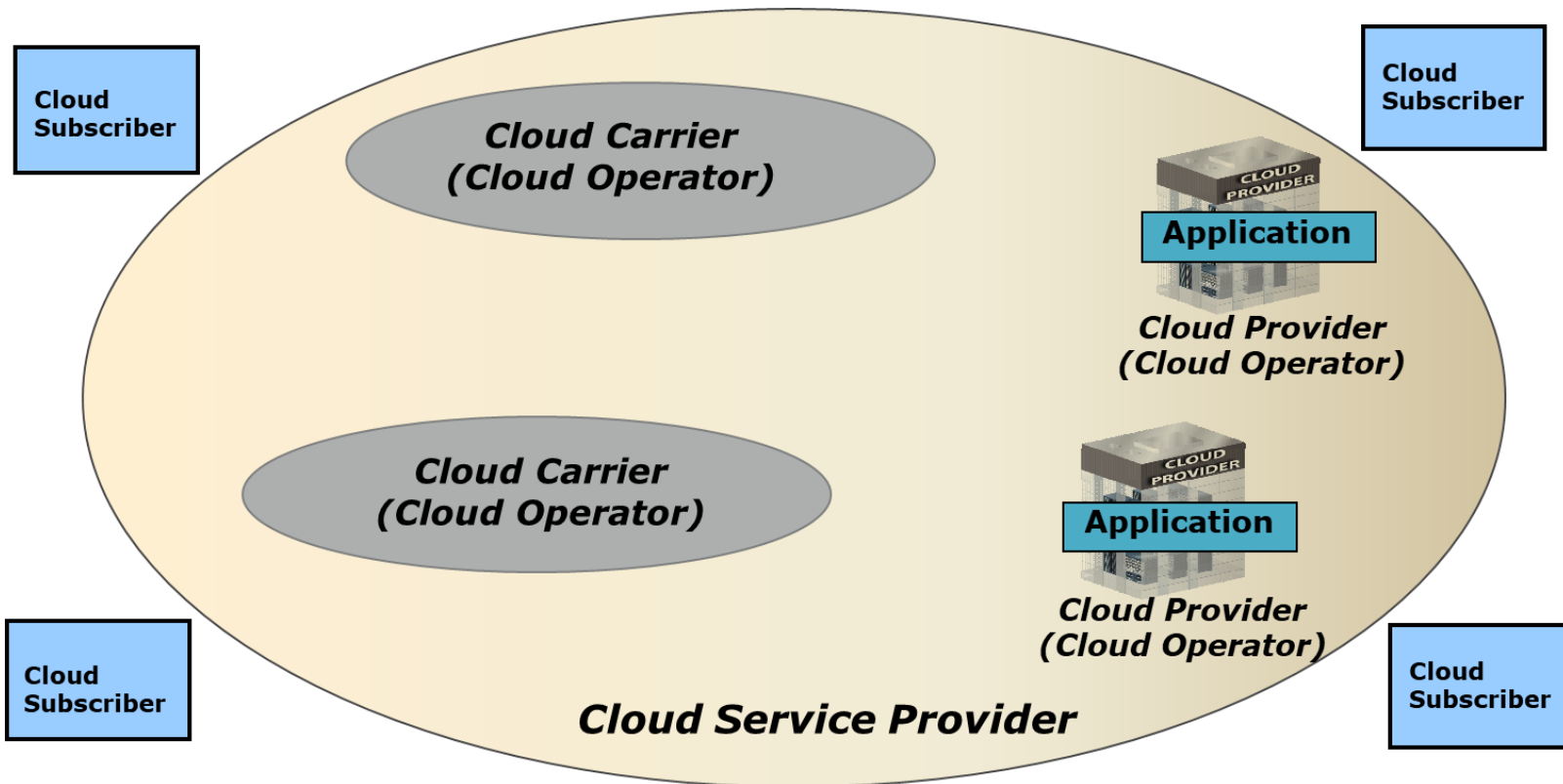
Cloud-in-Box



Cloud-in-a-Box



Actors of Cloud Services



Cloud Services Architecture*

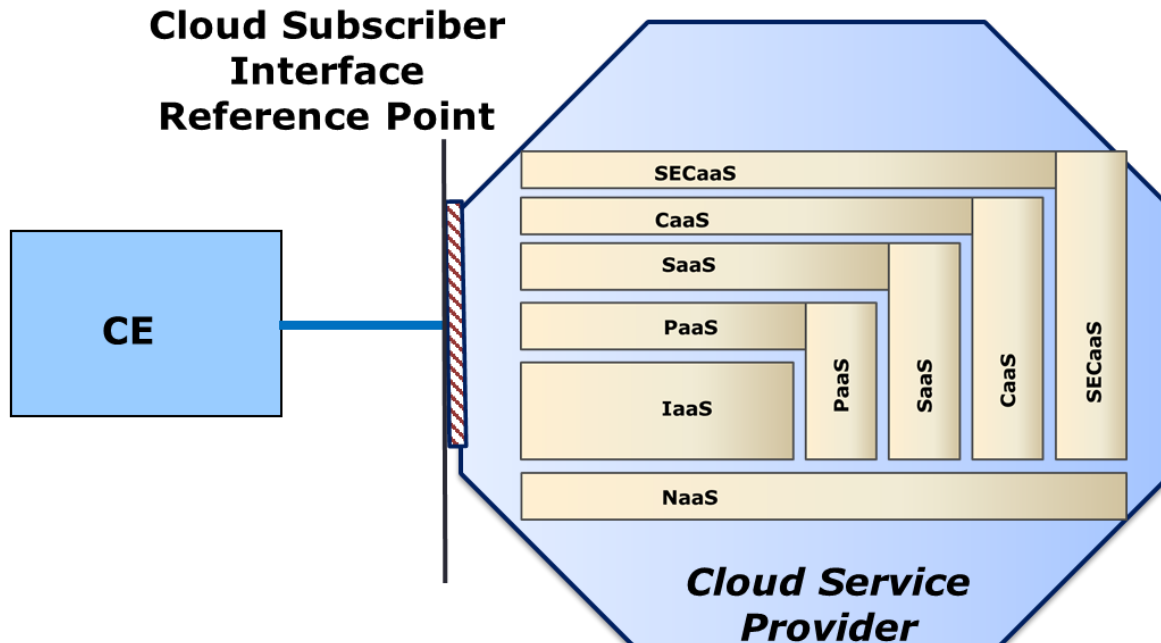
- An architecture that defines standards interfaces, connection and connection end points, among Cloud Service Subscribers, Cloud Service Provider, Cloud Carriers and Cloud Providers.
- Key objectives are
 - Hide implementation complexities from subscribers, as in the cases of MEF Carrier Ethernet Services and IP Services.
 - Allow subscribers to have self-configuration.
 - Use LSO architecture and SOAM techniques developed by MEF as much as possible

**M. Toy, "Cloud Services Architectures", Science Direct Procedia Computer Science, 2015*

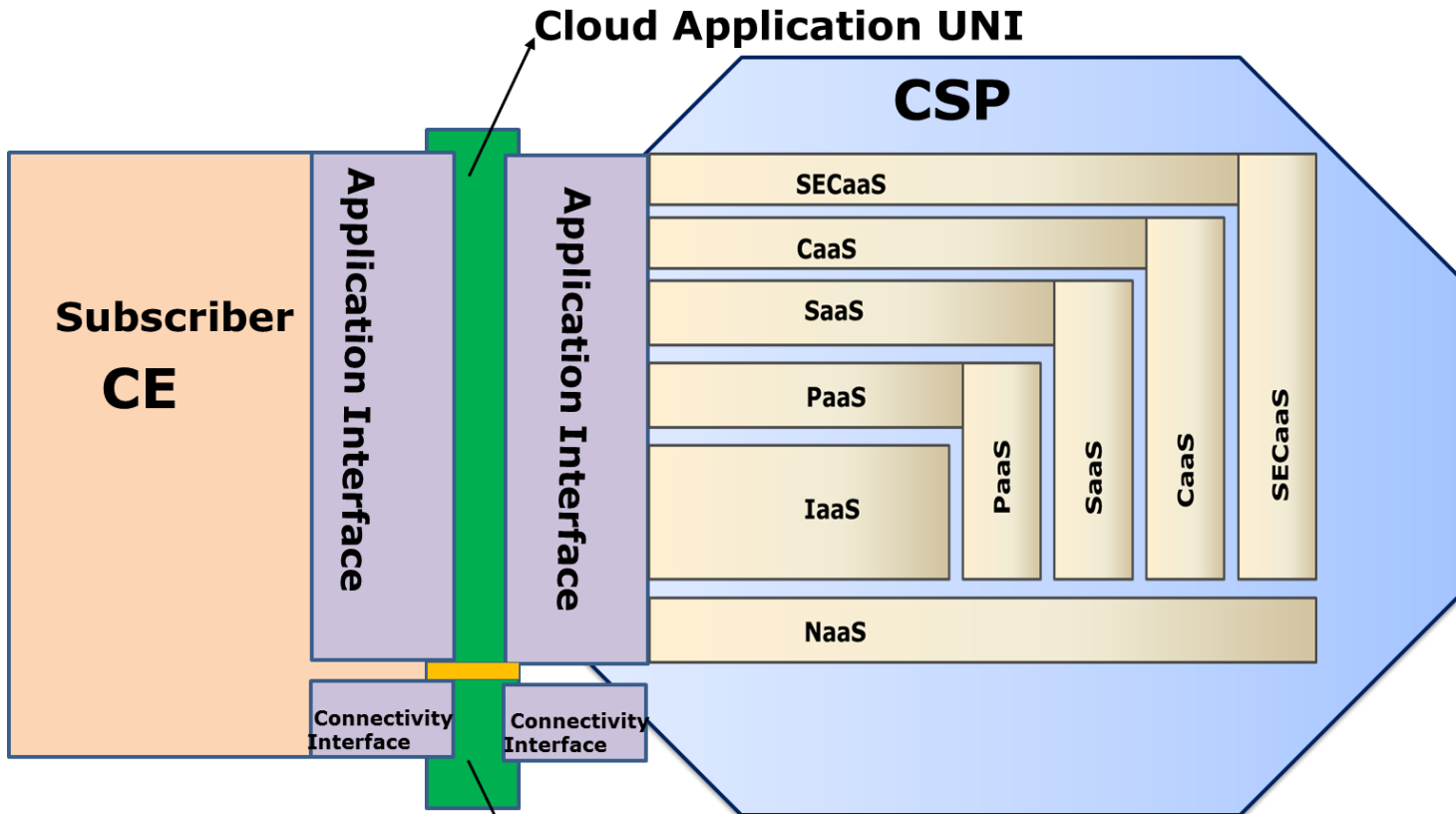


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Subscriber-Cloud Service Provider Interface



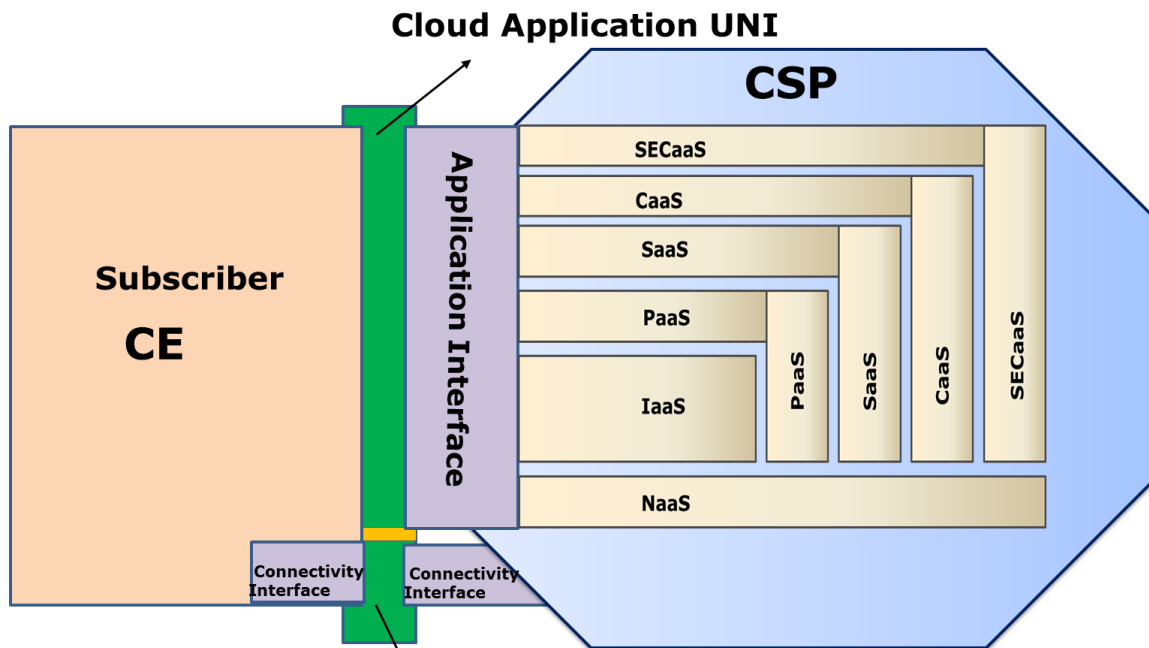
Cloud Application UNI and Cloud Connectivity



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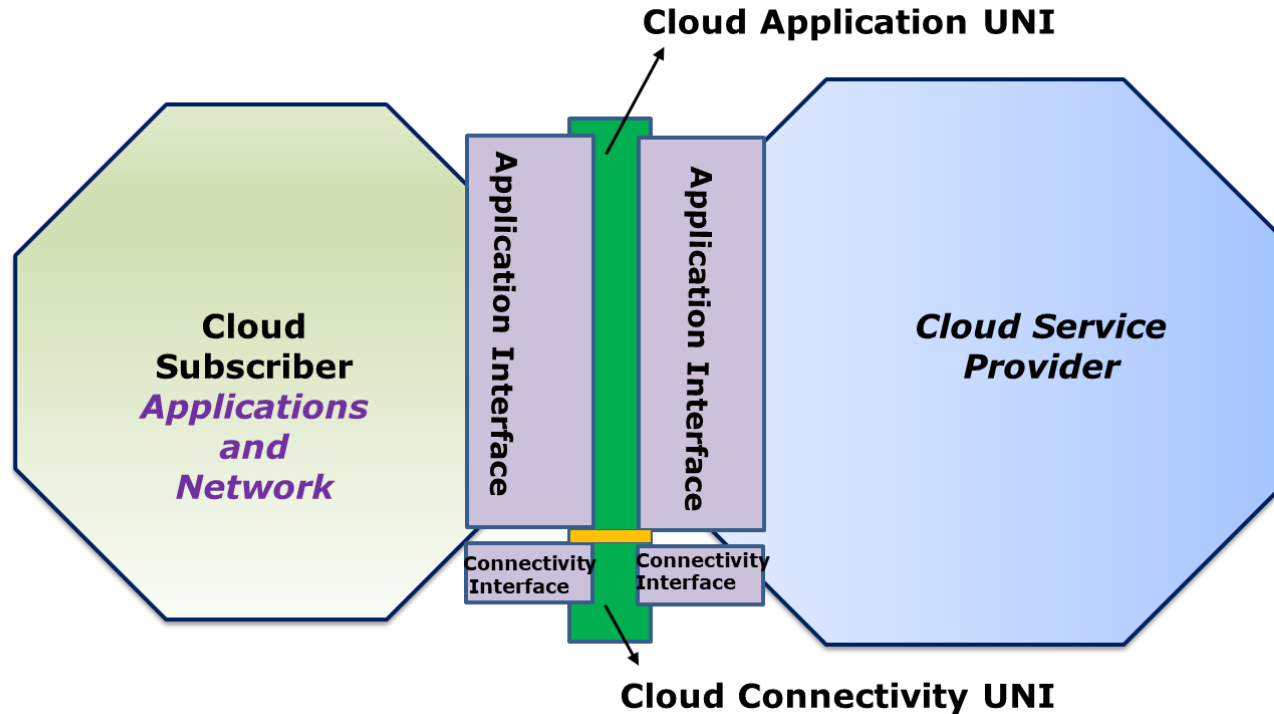
Cloud Application UNI
Cloud Connectivity UNI

Cloud Connectivity UNI

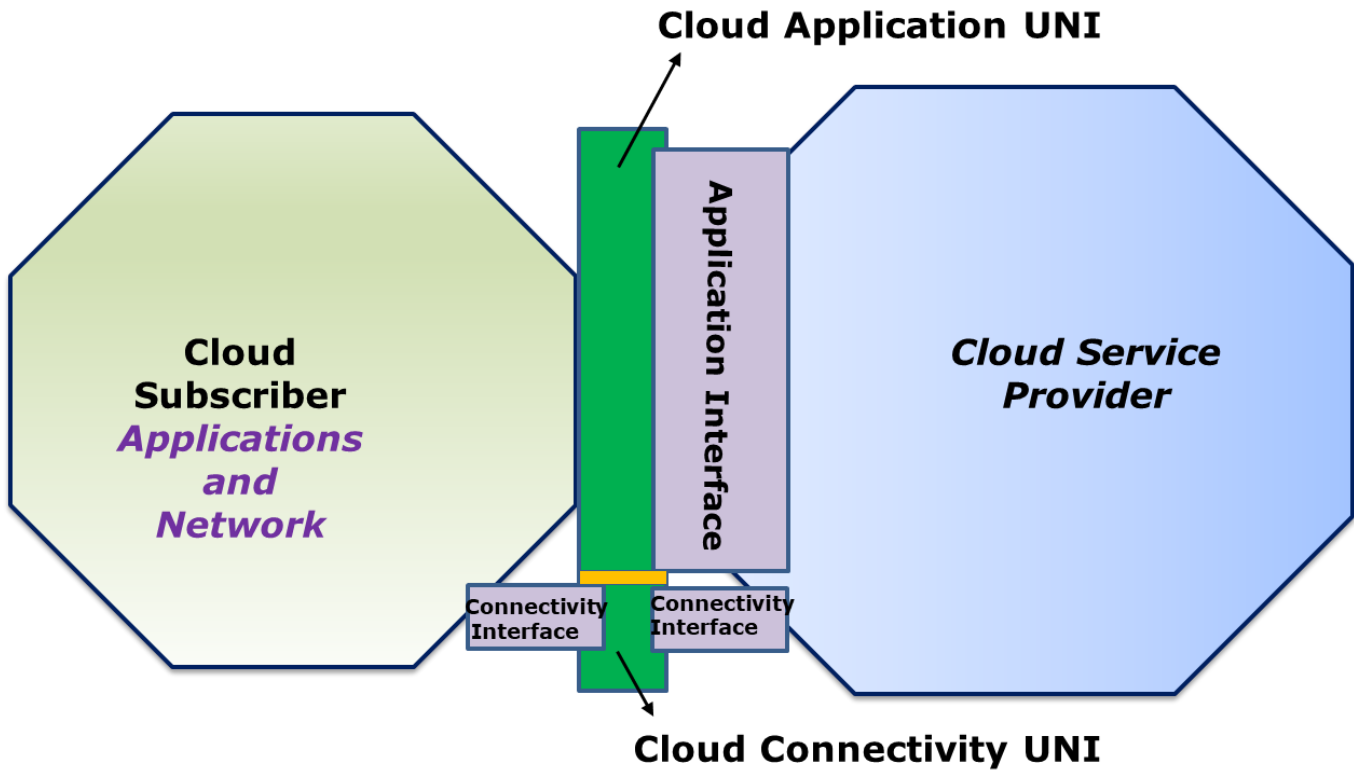


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Subscriber-Cloud Service Provider Interface

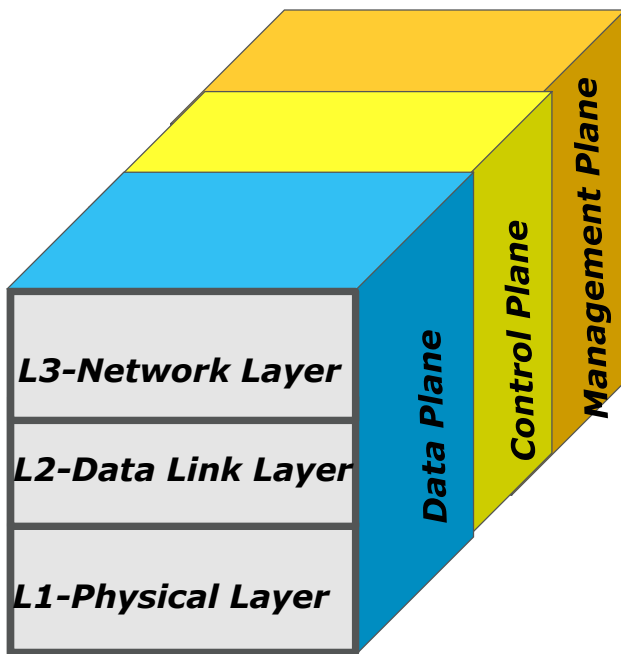


Subscriber-Cloud Service Provider Interface

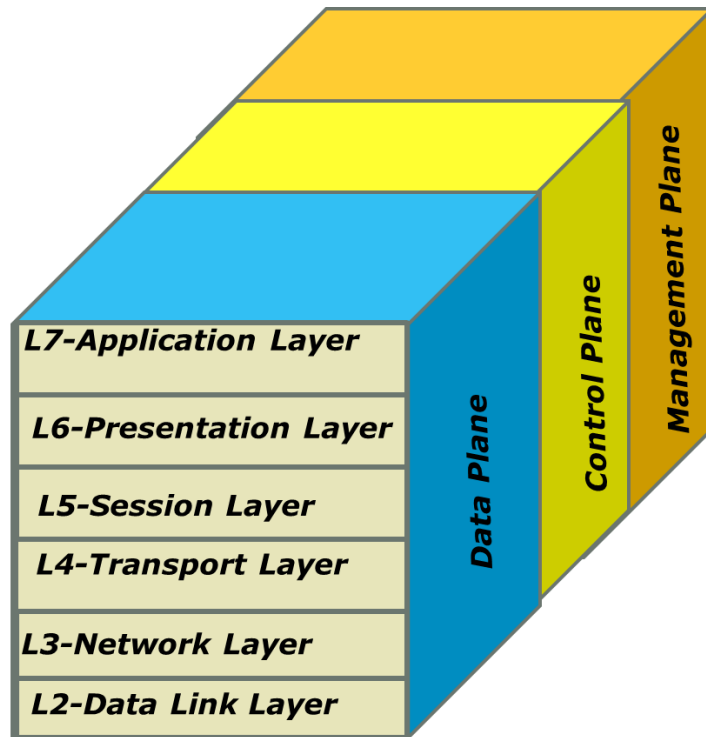


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Protocol Stack

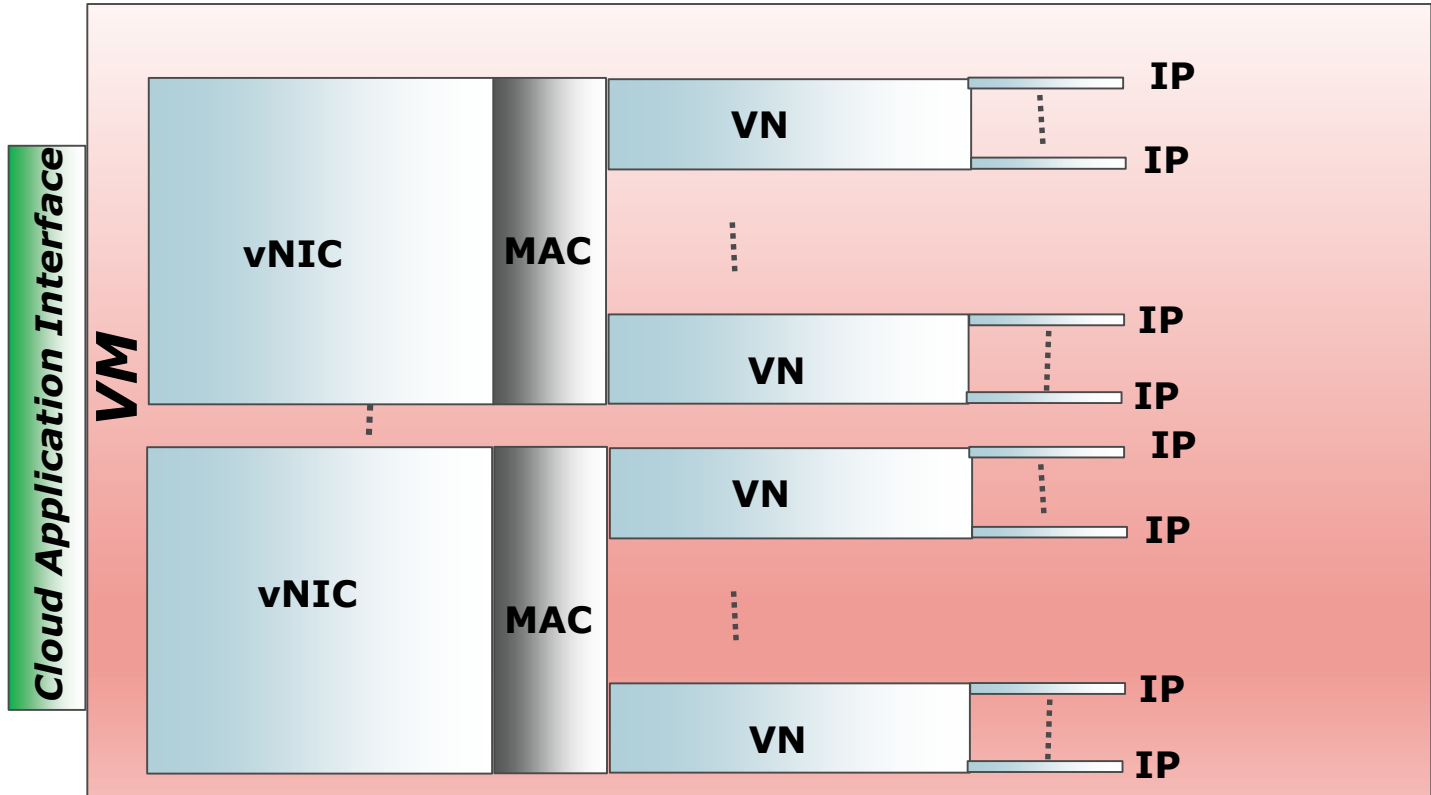


**Cloud
Connectivity
UNI**

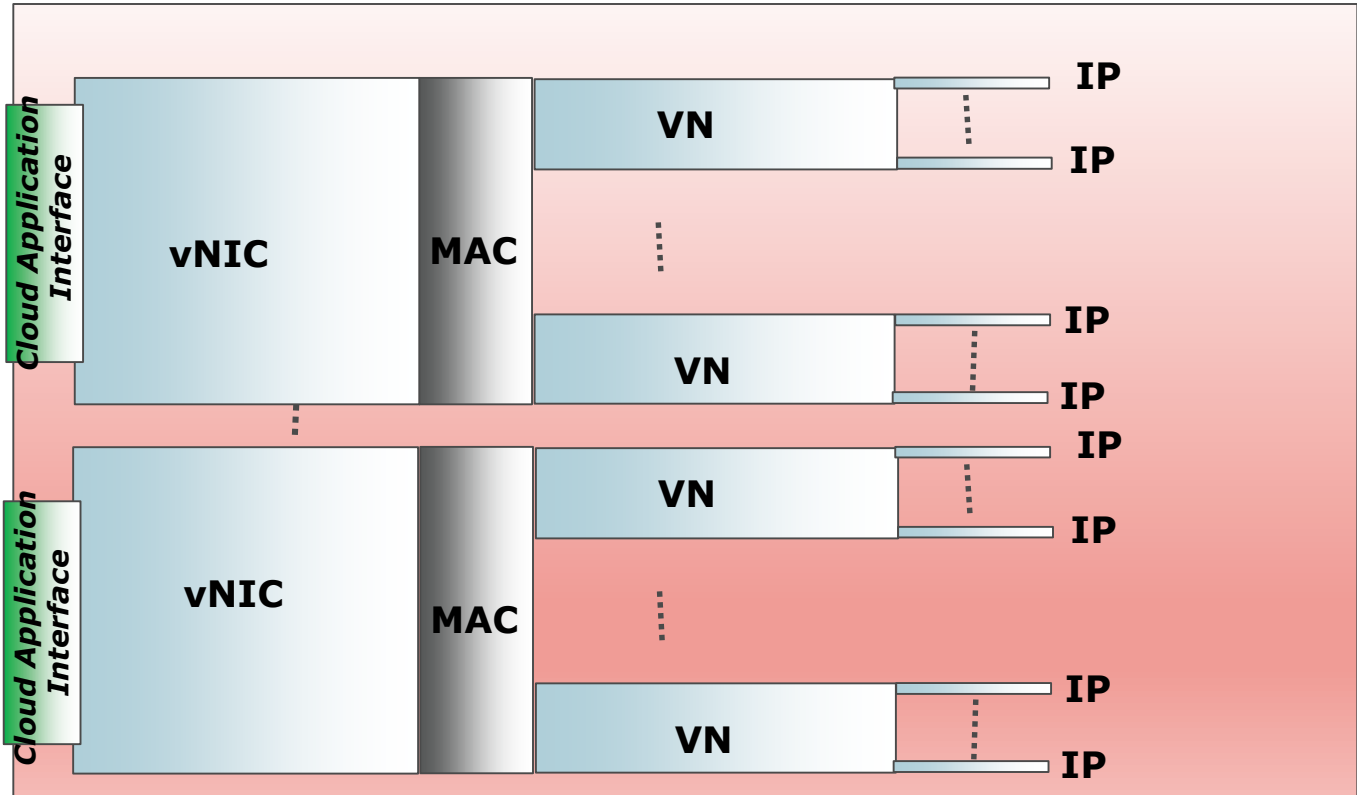


**Cloud
Application
UNI**

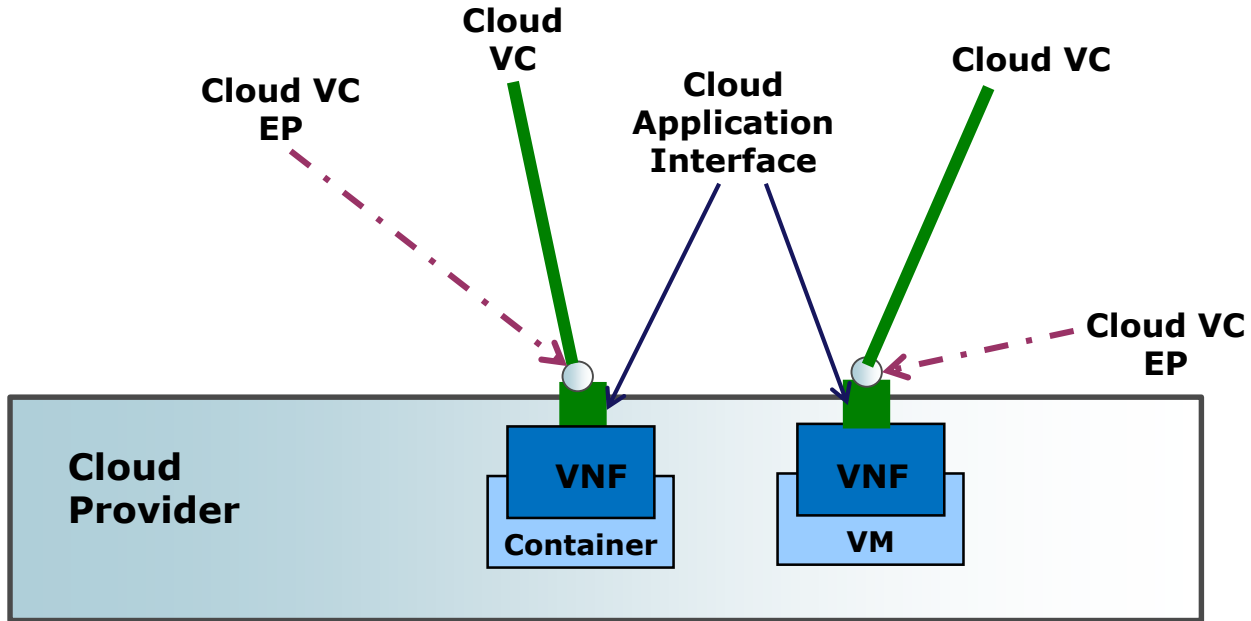
Cloud Application Interface



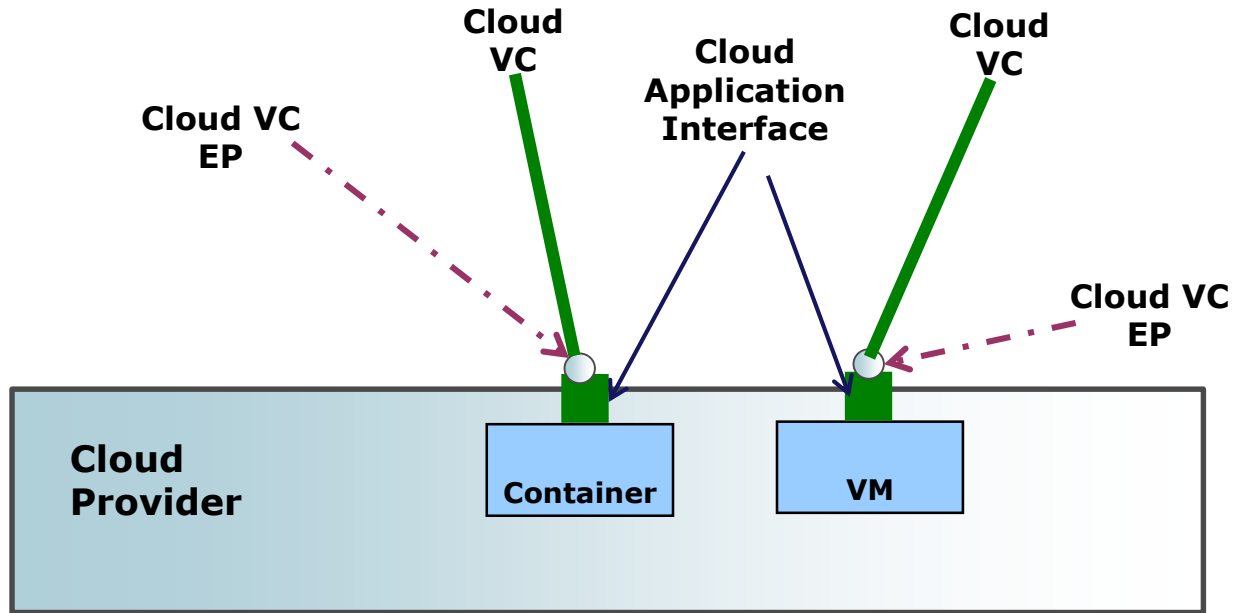
Cloud Application Interface



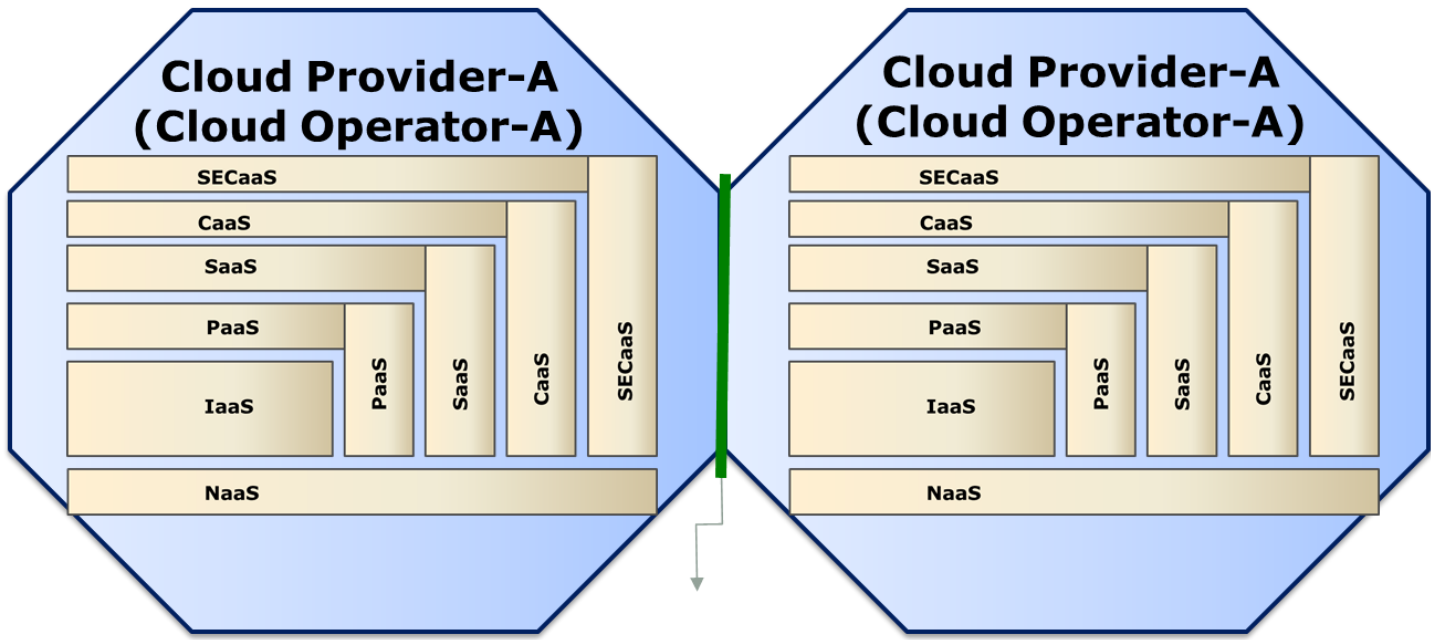
VNF Interface



Container/VM Interface



Cloud Operator-Cloud Operator Interface



Cloud

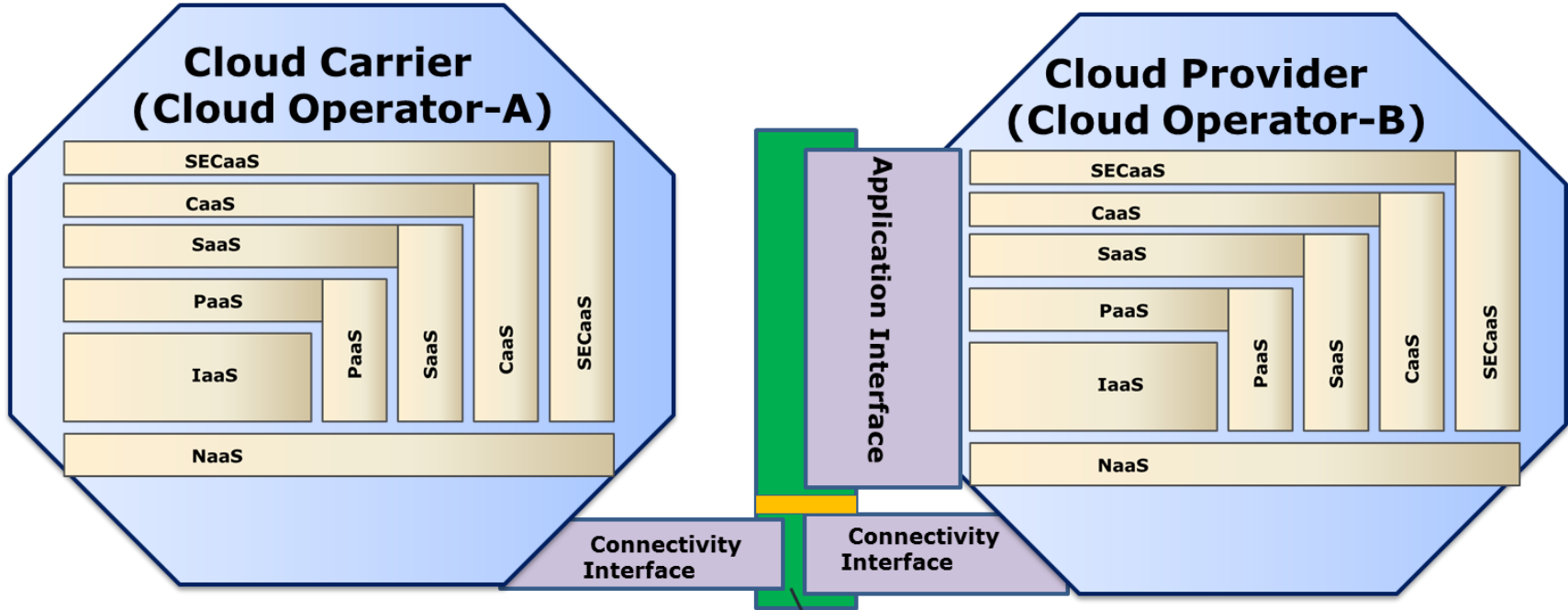
Operator-Operator

Interface

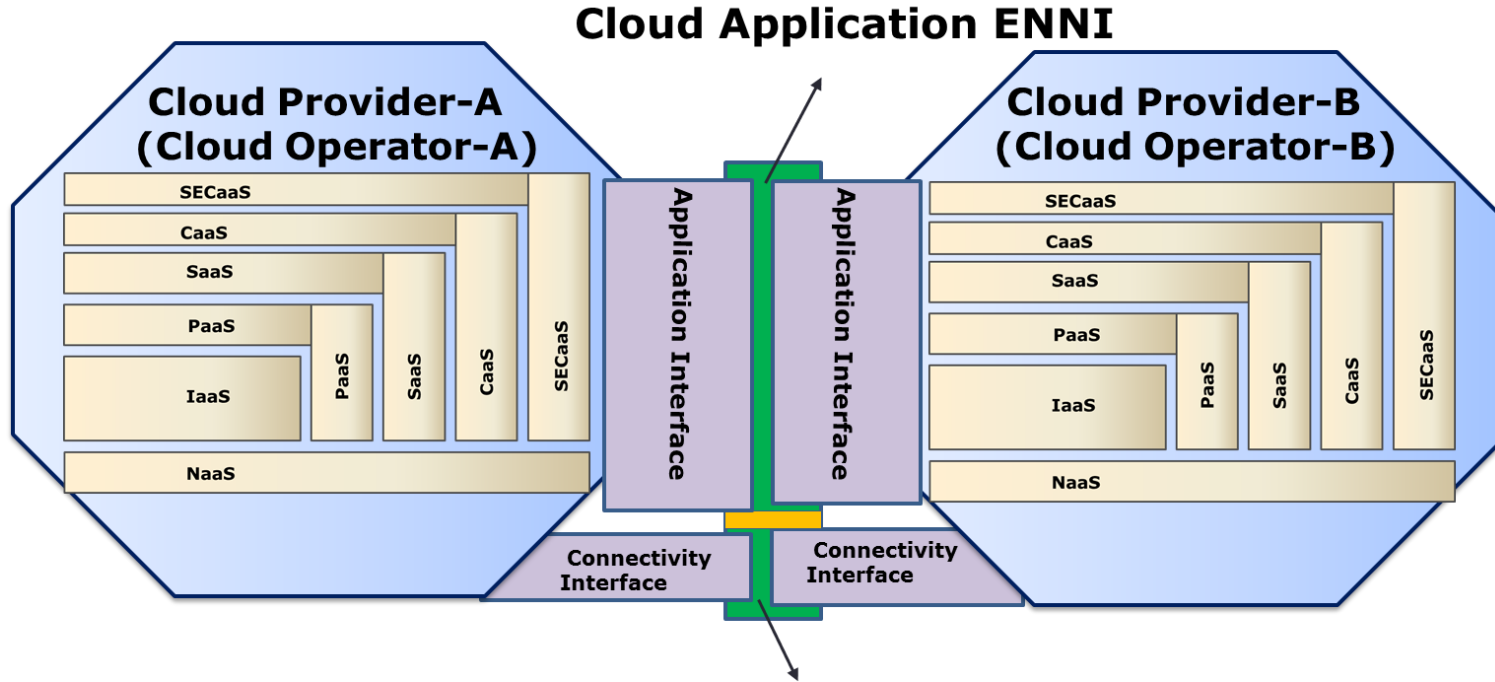


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Cloud Connectivity ENNI

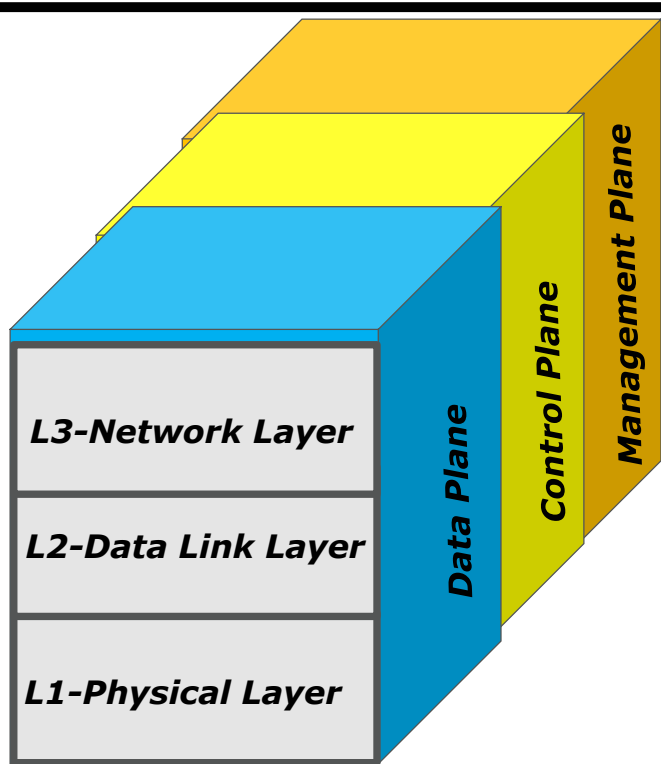


Cloud Connectivity ENNI and Cloud Application

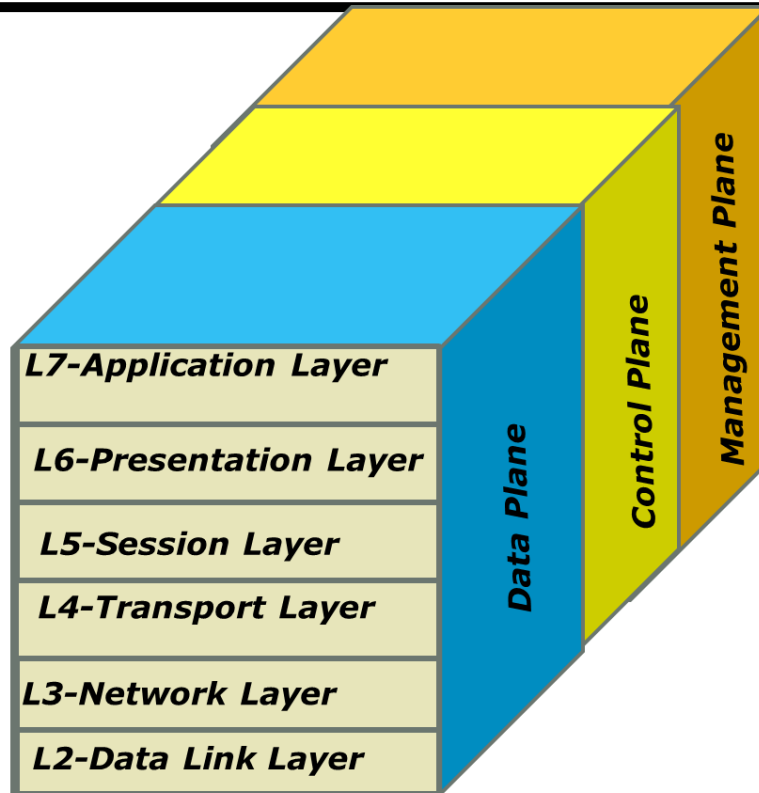


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Protocol Stack

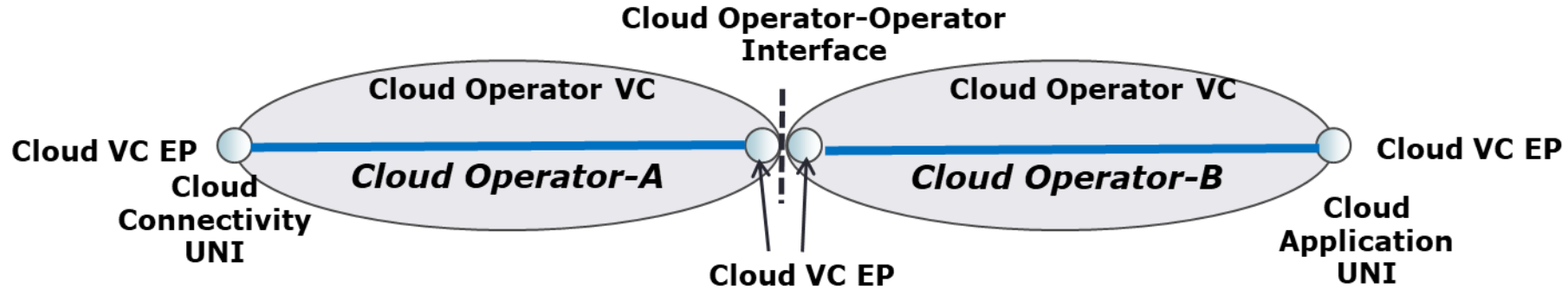
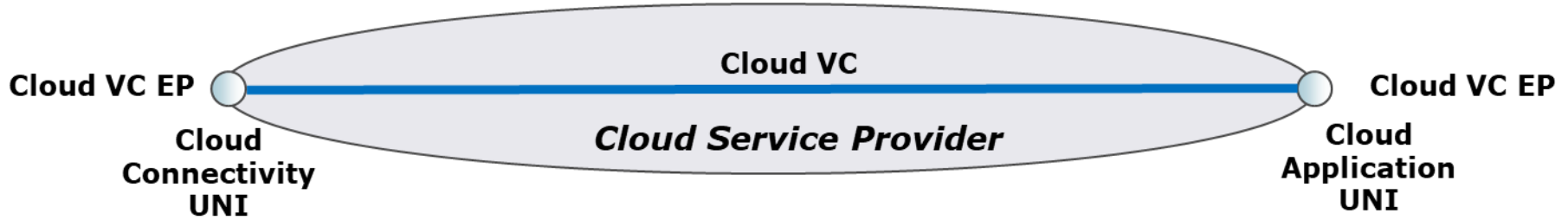


**Cloud
Connectivity
ENNI**

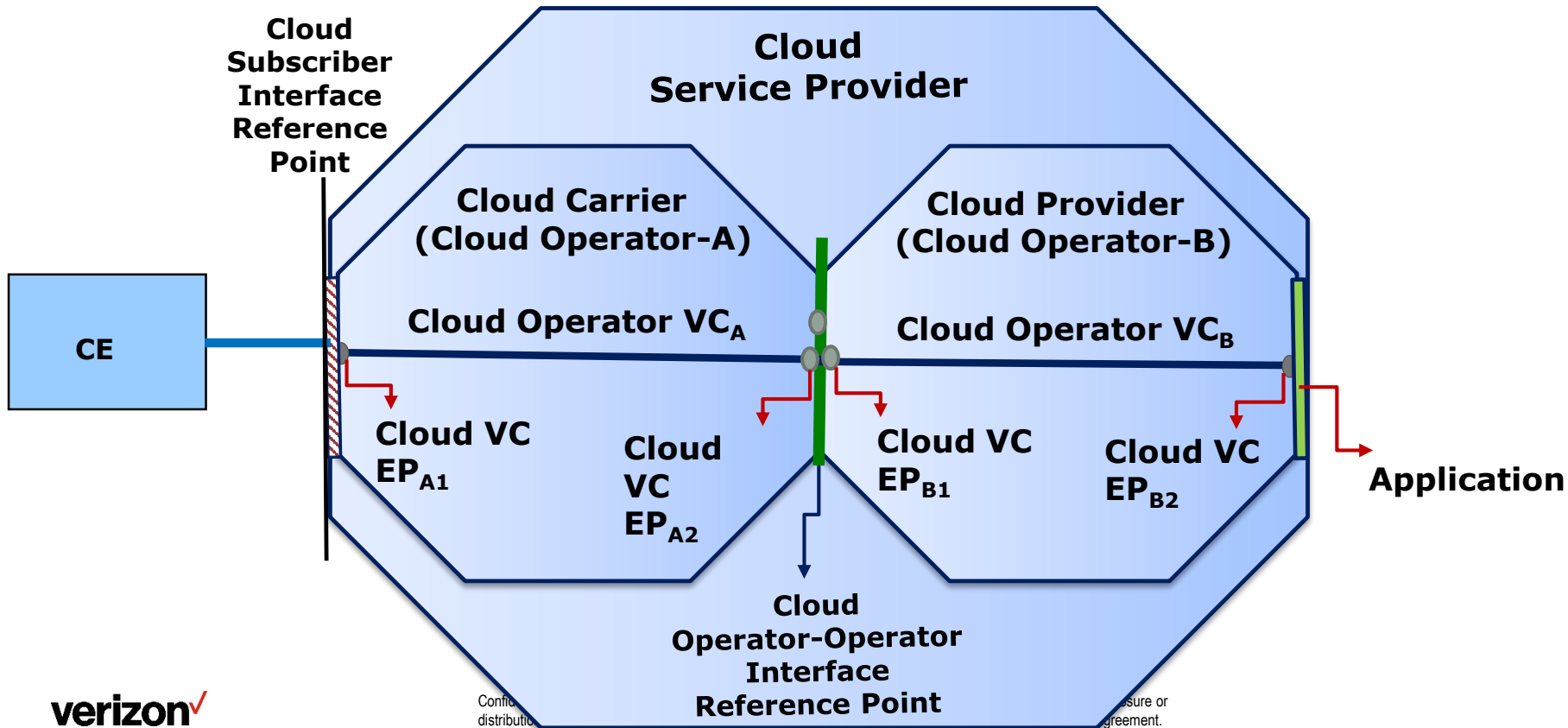


**Cloud
Application
ENNI**

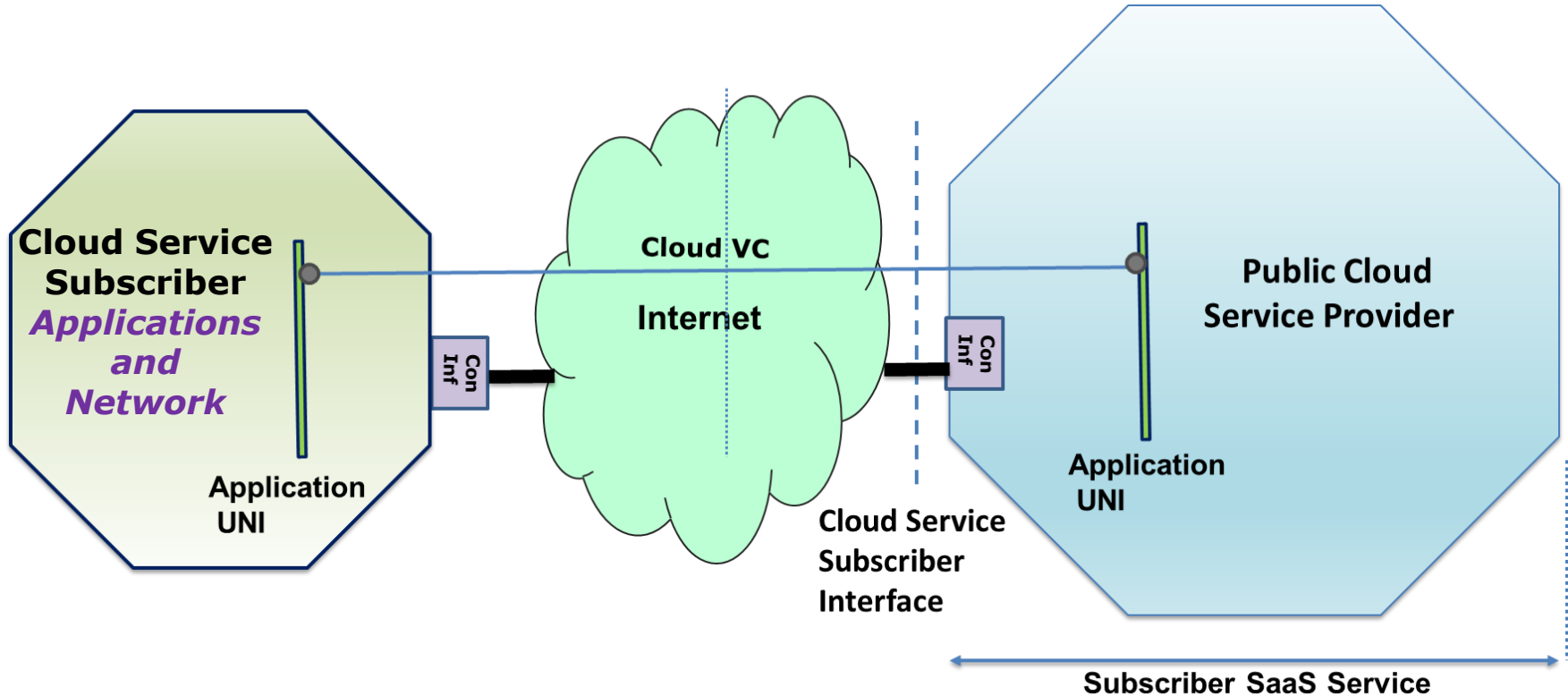
Cloud VC and End Points



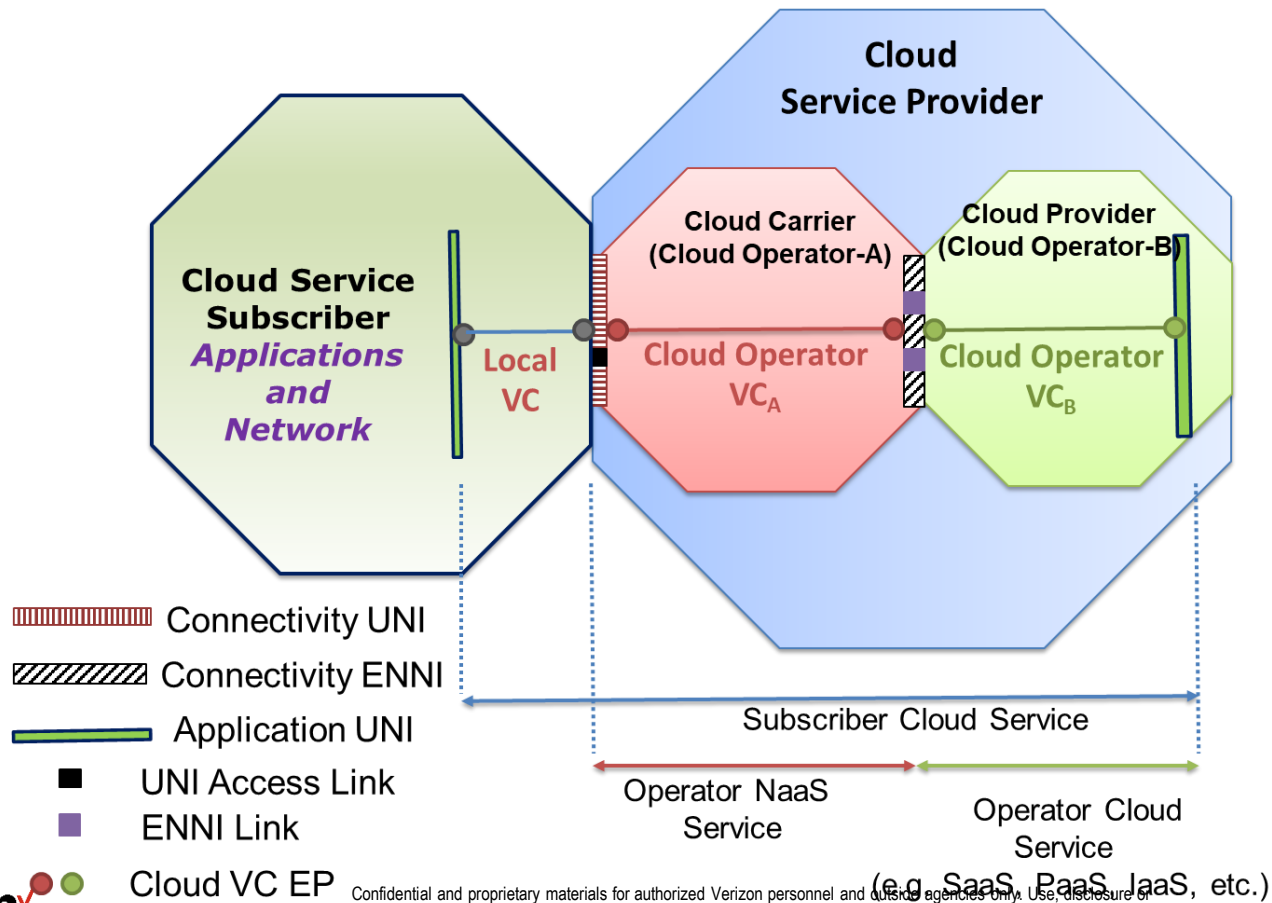
Cloud Operator VC



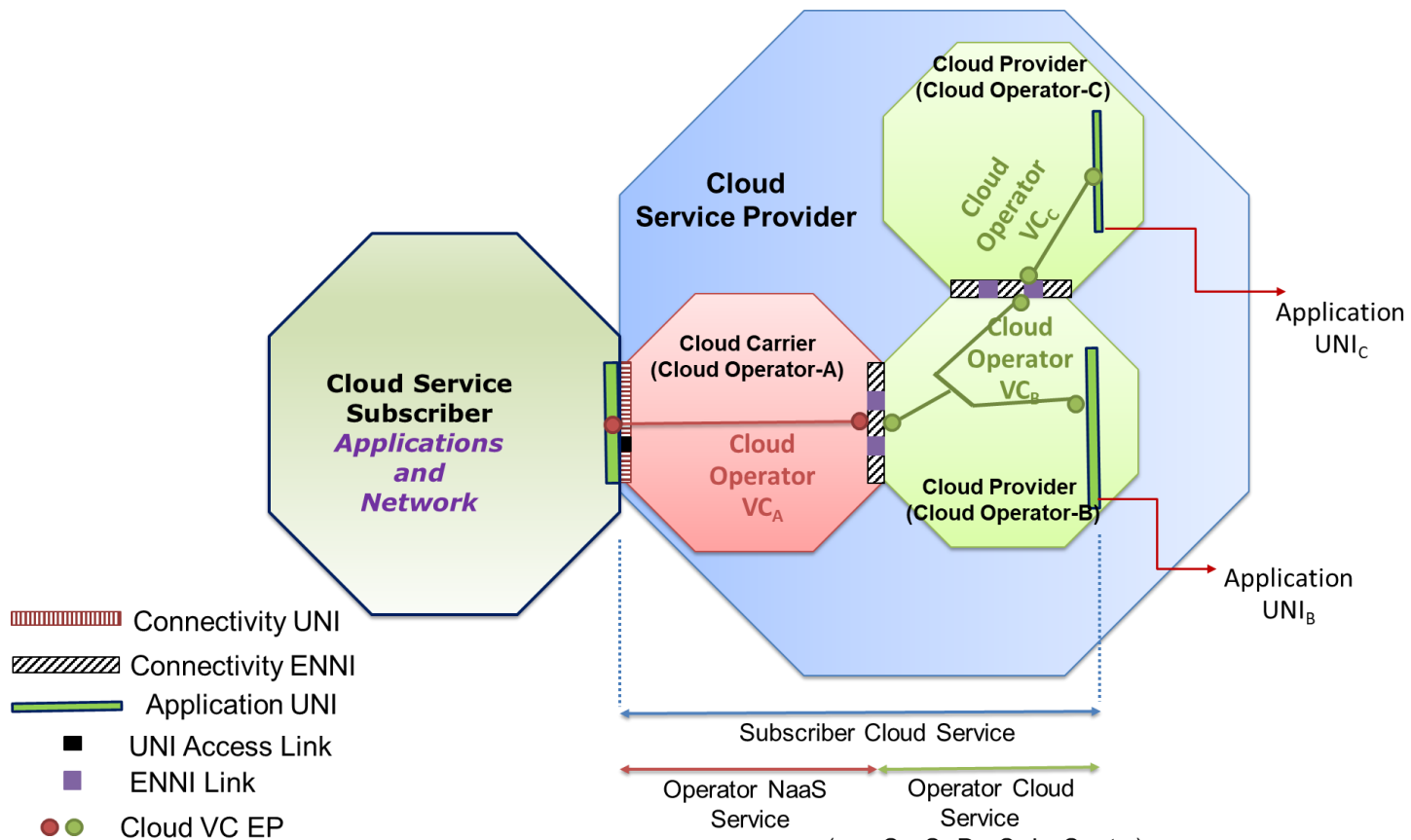
Public Cloud Provider Interface



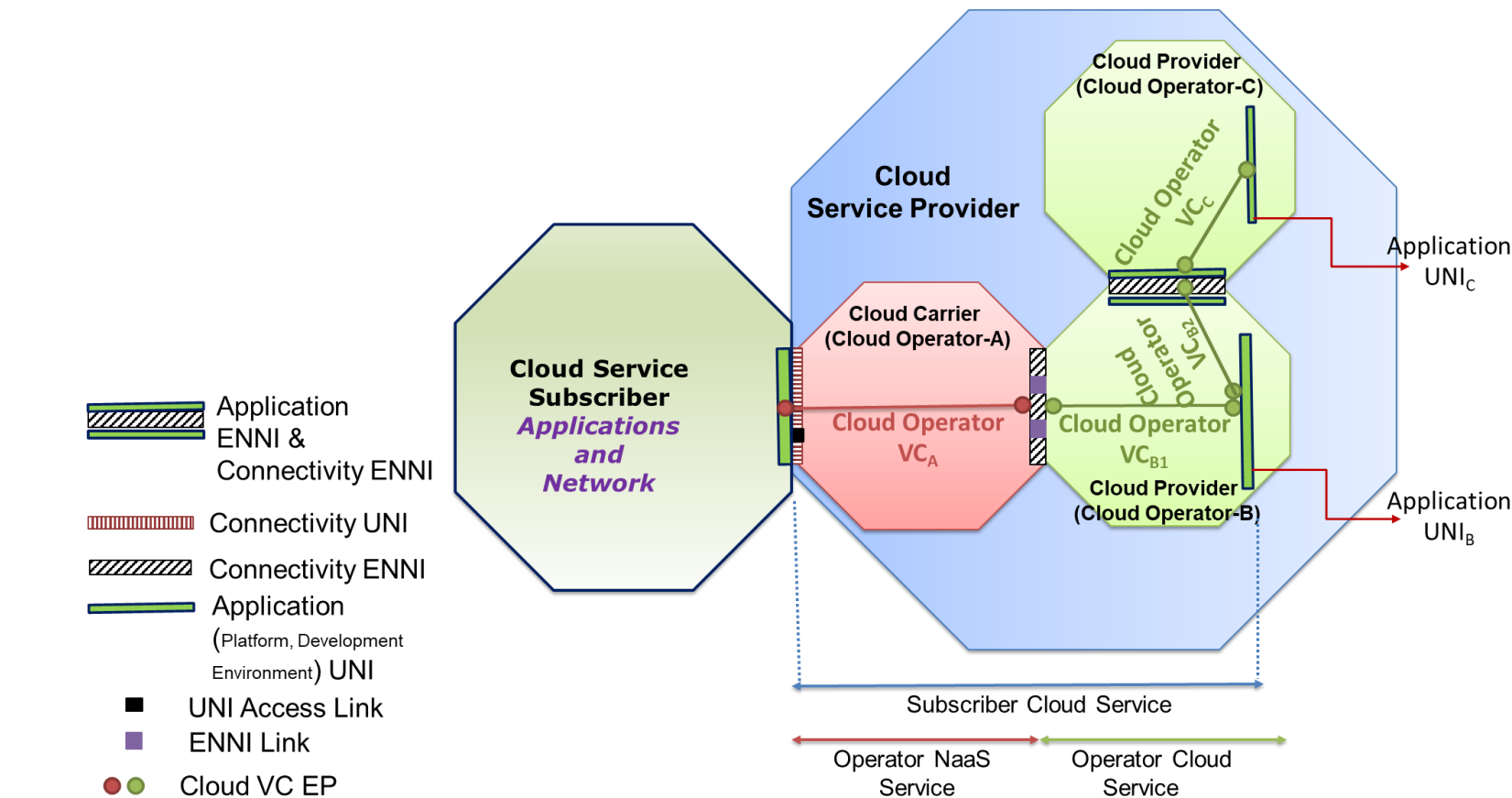
Cloud Service Provided by Two Operators



Cloud Service Provided by Three Operators



Cloud Service Provided by Three Operators



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Thank you.