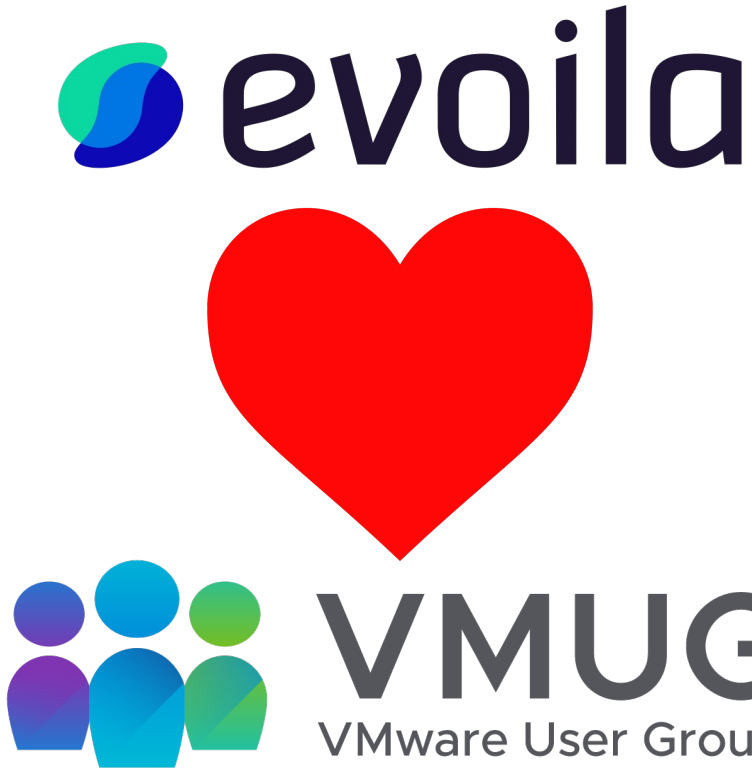
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VPC Networking in VCF 9 / NSX

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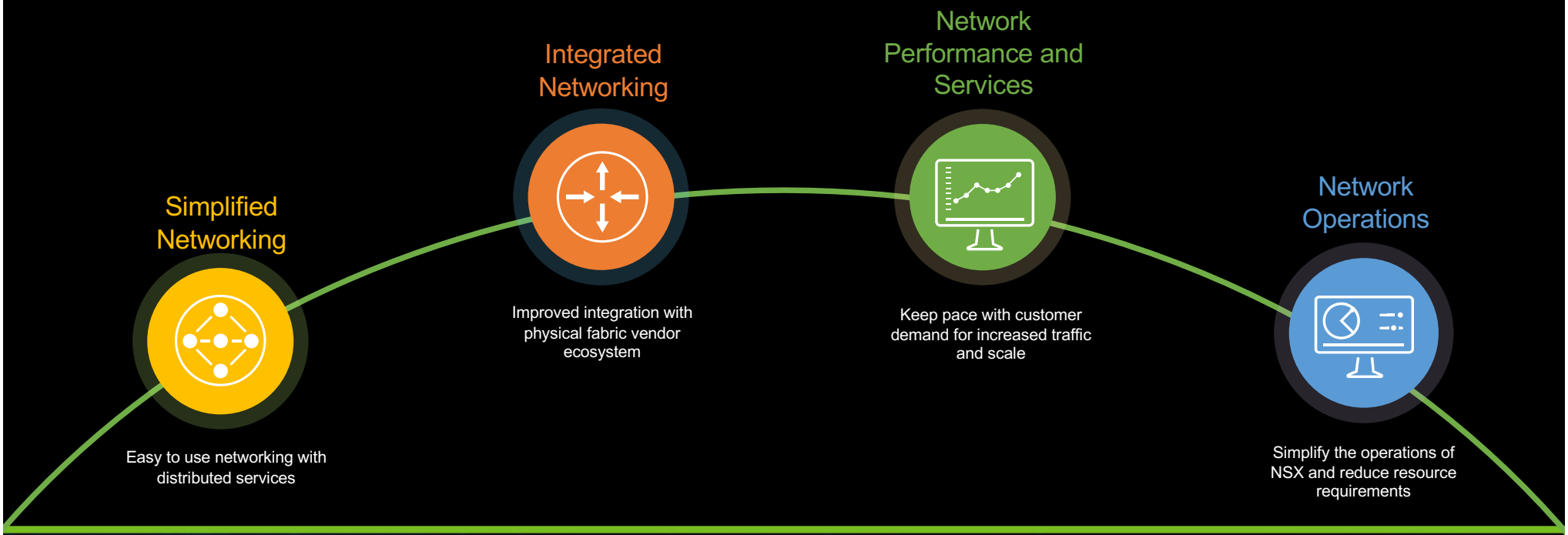
- Homelabber
- vExpert
- Broadcom VCF Knight
- Cloud Architect @ evoila

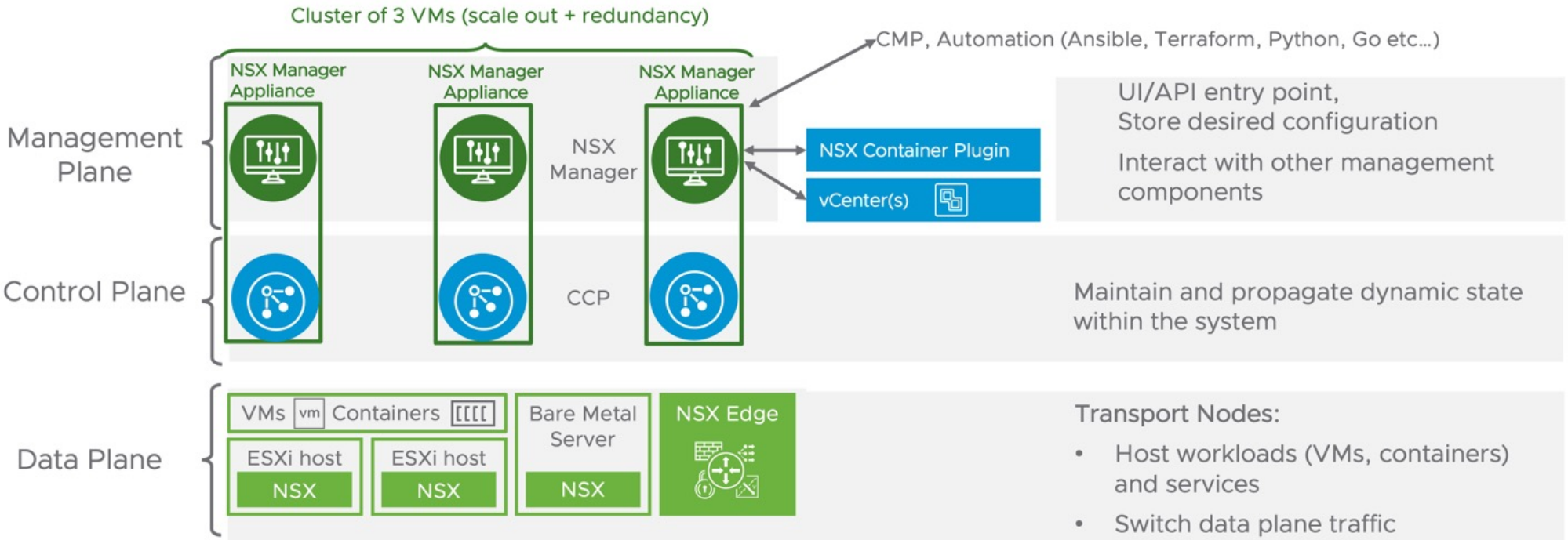
Agenda

- Overview NSX and VPCs
- Demo
- Technical fundamentals of VPCs
- Q & A

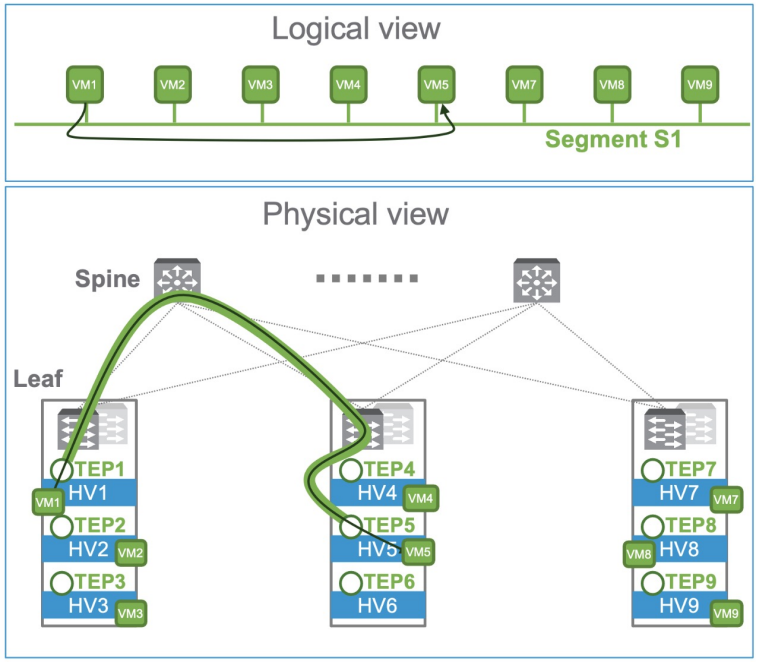
NSX aka VCF Networking



NSX Architecture

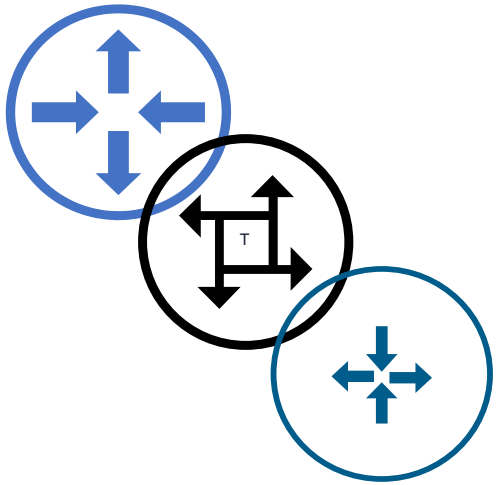


Segments



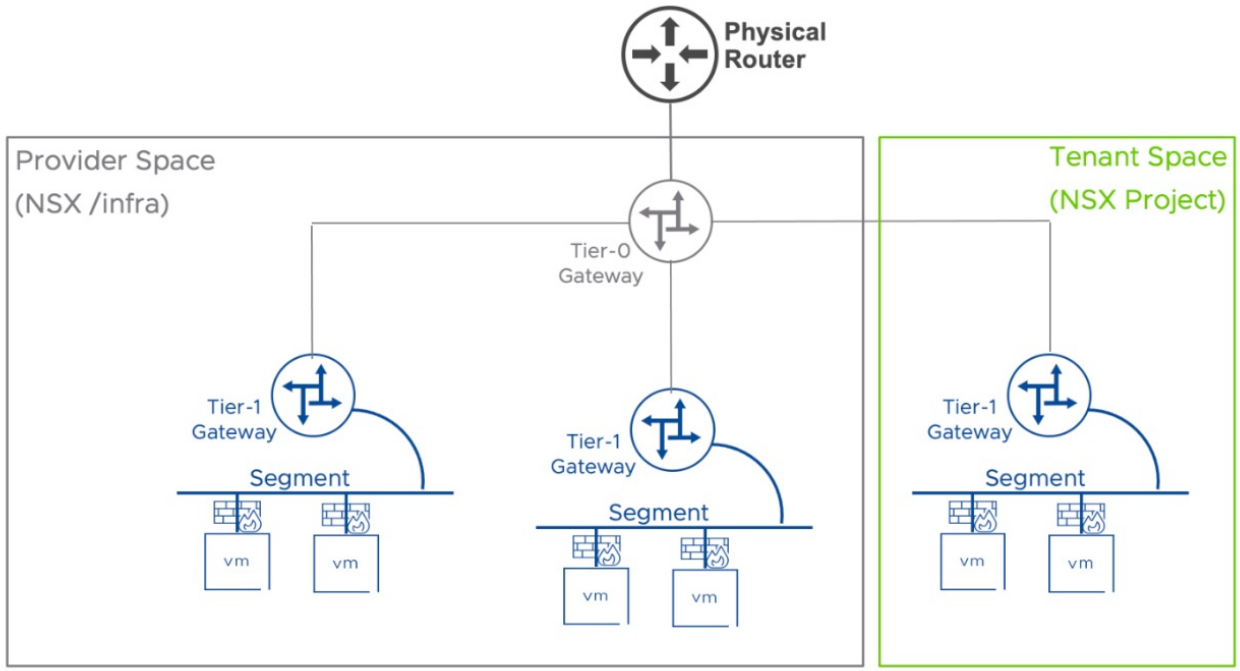
- Layer 2 Domain
- Overlay
- VLAN
- May be on one or neither of the T1/T0 routers

Gateways



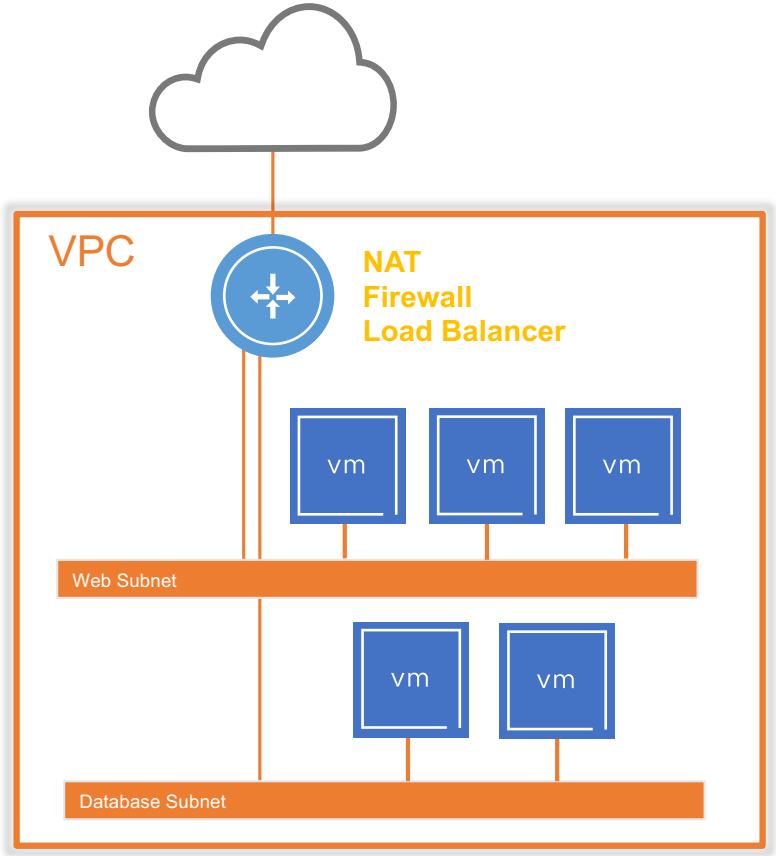
- T0 Router
  - North/South Traffic
  - BGP/OSPF/Static Routing
- T1 Router
  - East/West Routing
  - Stateful Services
- Transit Gateway
  - External Connection for VPCs
- VPC Gateway
  - East/West Routing for VPCs

NSX Projects

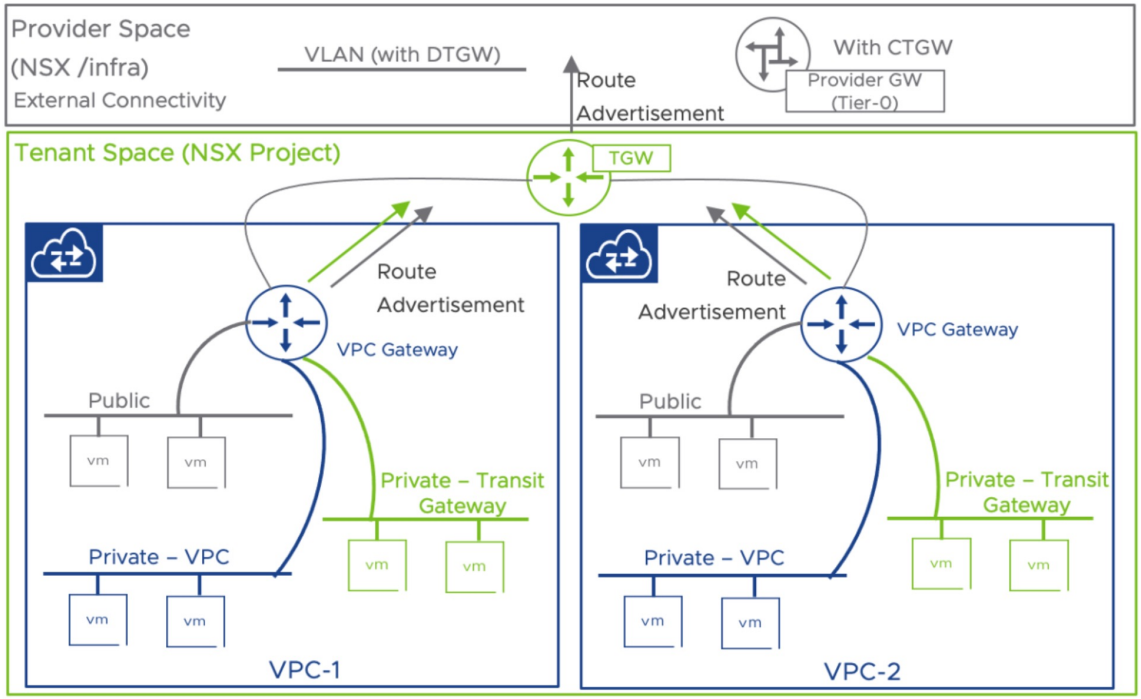


VPCs in VCF9

1. Subnets
2. IP Gateway
3. Network Services

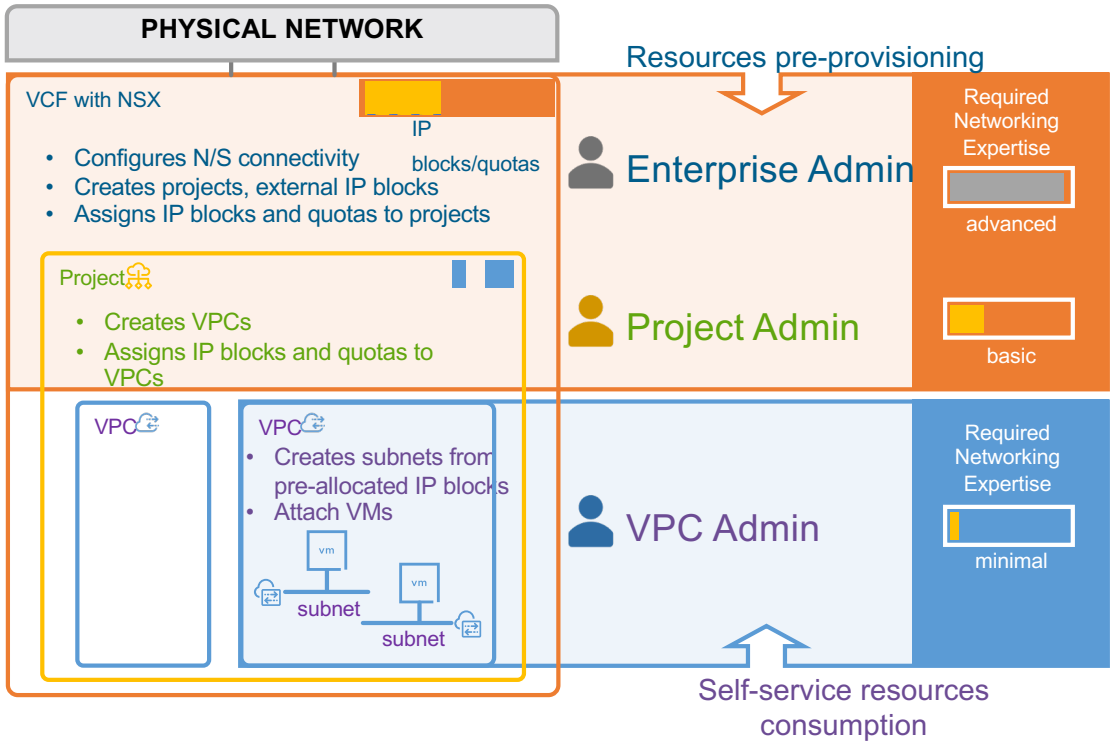


VPC Subnet Types



- Public (Grey)
  - Public subnets provide direct routability
- Private – VPC (Blue)
  - Private VPC subnets are strictly routable within their own VPC boundary
- Private – Transit (Green)
  - Private TGW (Transit Gateway) subnets enable routing
  - between multiple VPCs connected to the same Transit Gateway

Role definition



- Enterprise Admin
  - Owns the physical infrastructure
- Project Admin
  - A tenant
  - No direct access to physical network
- VPC Admin
  - End user
  - Simple, self-service networking

Key Benefits of VPCs

- **Multi-tenancy**
  Secure isolation of multiple tenants or business units
- **Simplified Management**
  Streamlined operations with same pane of glass as compute and storage
- **Scalability**
  Easy expansion and customization to accommodate growth
- **Components Support**
  Supports many VCF components such as VKS, VCF Automation, and AVI Advanced Load balancer. Full NSX Terraform Provider support.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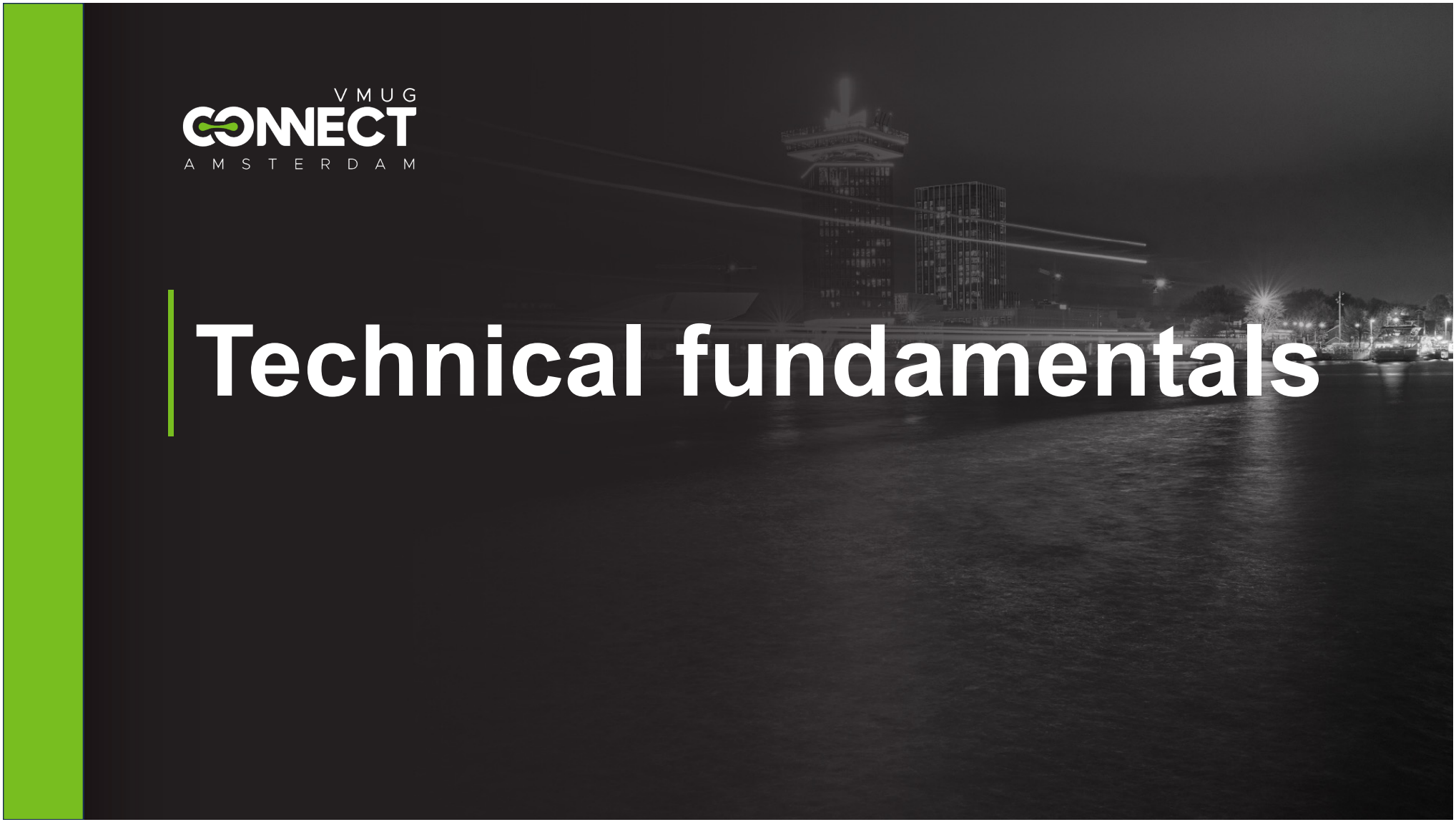
Live Demo
(Fingers crossed)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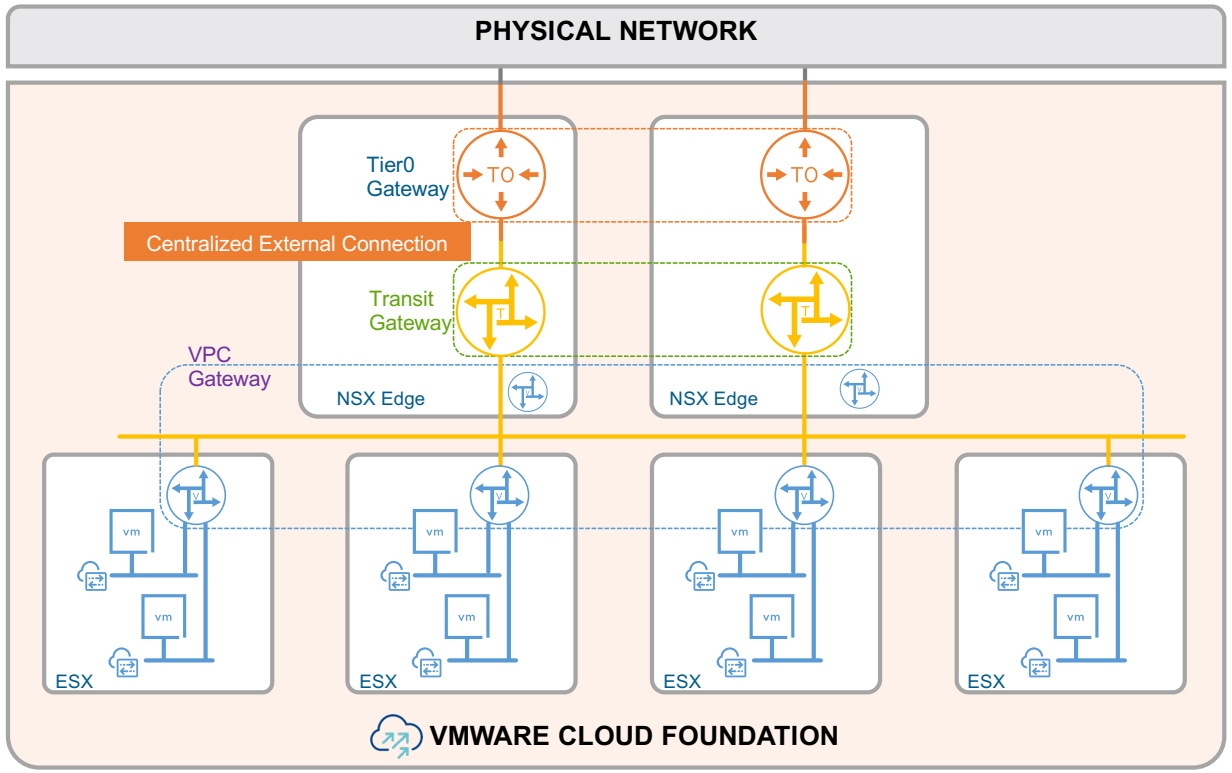
Technical fundamentals

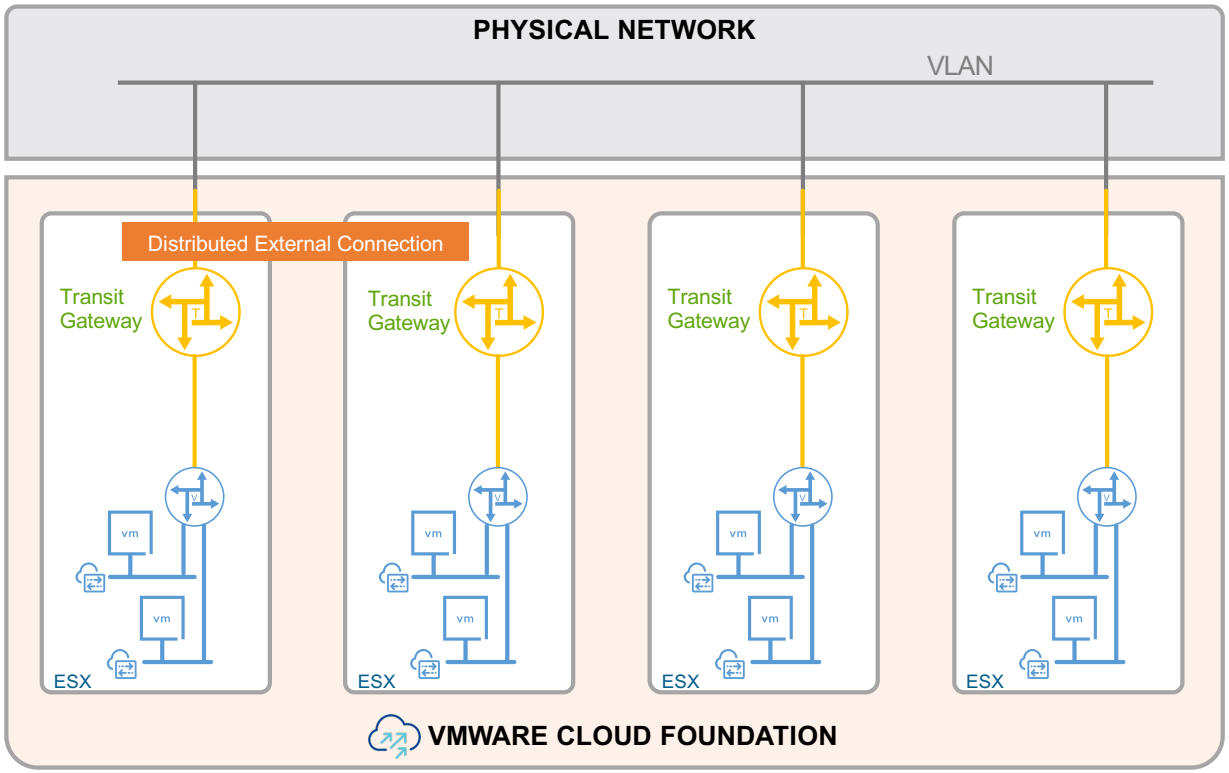
Transit Gateway Centralized



NSX edges required

- NAT
- DHCP
- QoS profiles
- Gateway firewall (with license)
- Supervisor cluster and VCF automation modern experience

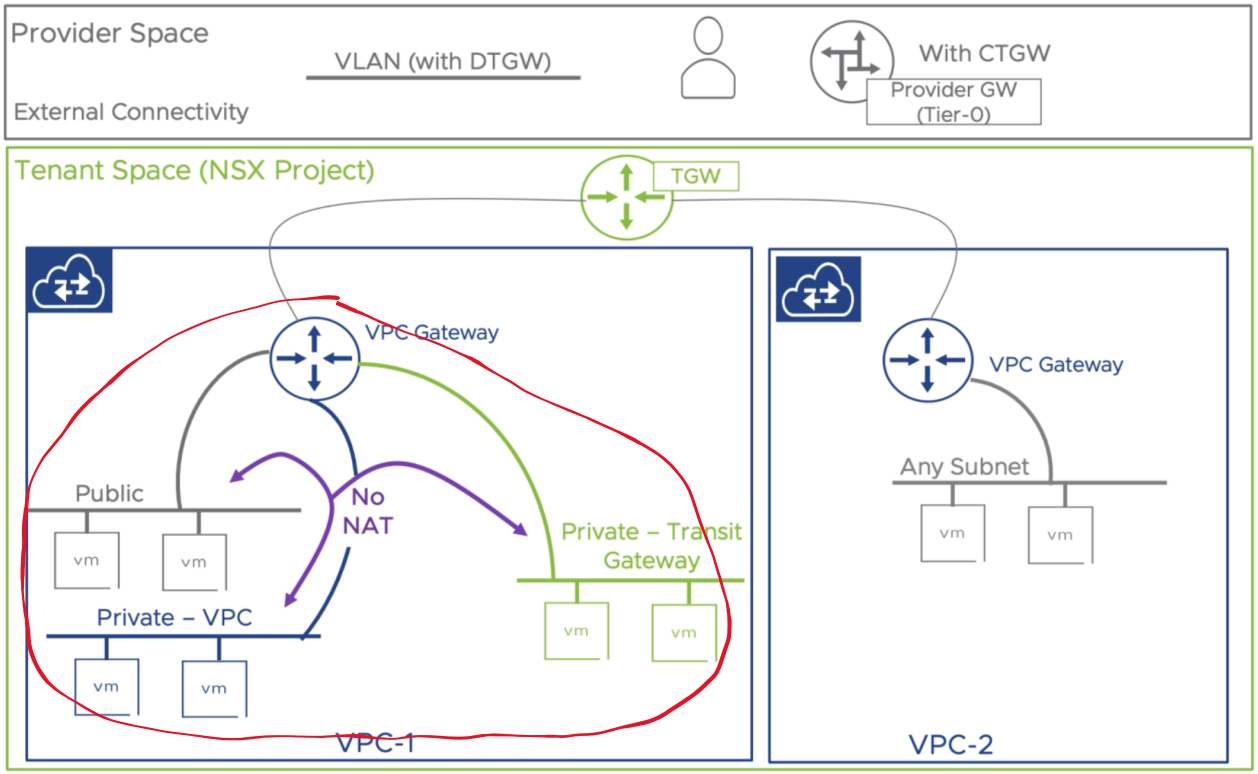
Transit Gateway Distributed



No NSX edges

- All ESX hosts must be connected to a VLAN providing an IP block for external addresses used by VMs
- Distributed services:
- 1:1 NAT (reflexiv)
- distributed DHCP

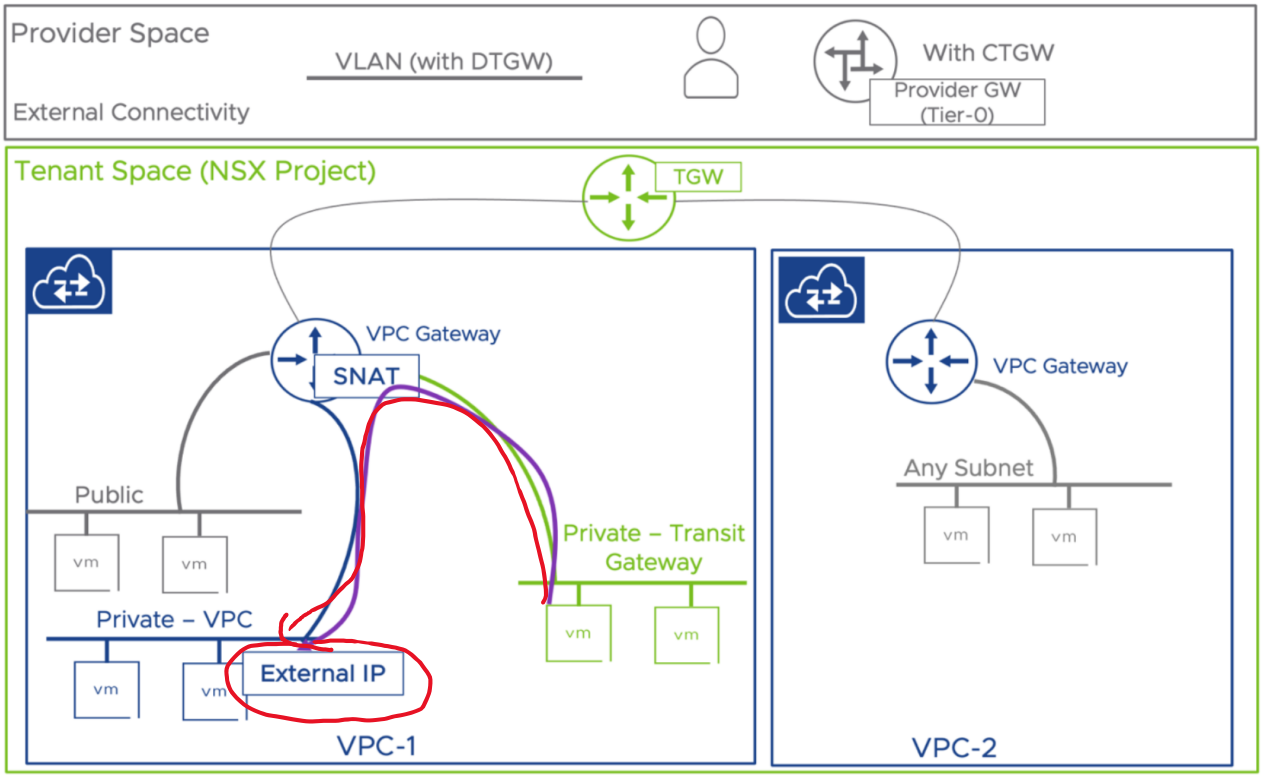
Traffic Flows – VPC Internal communication



No NAT

- By default, traffic between VPC subnets of any type part of the same VPC flows directly without Network Address Translation.
- This subnet-to-subnet routing occurs through the VPC's implicit router, which directs traffic between different subnet networks.

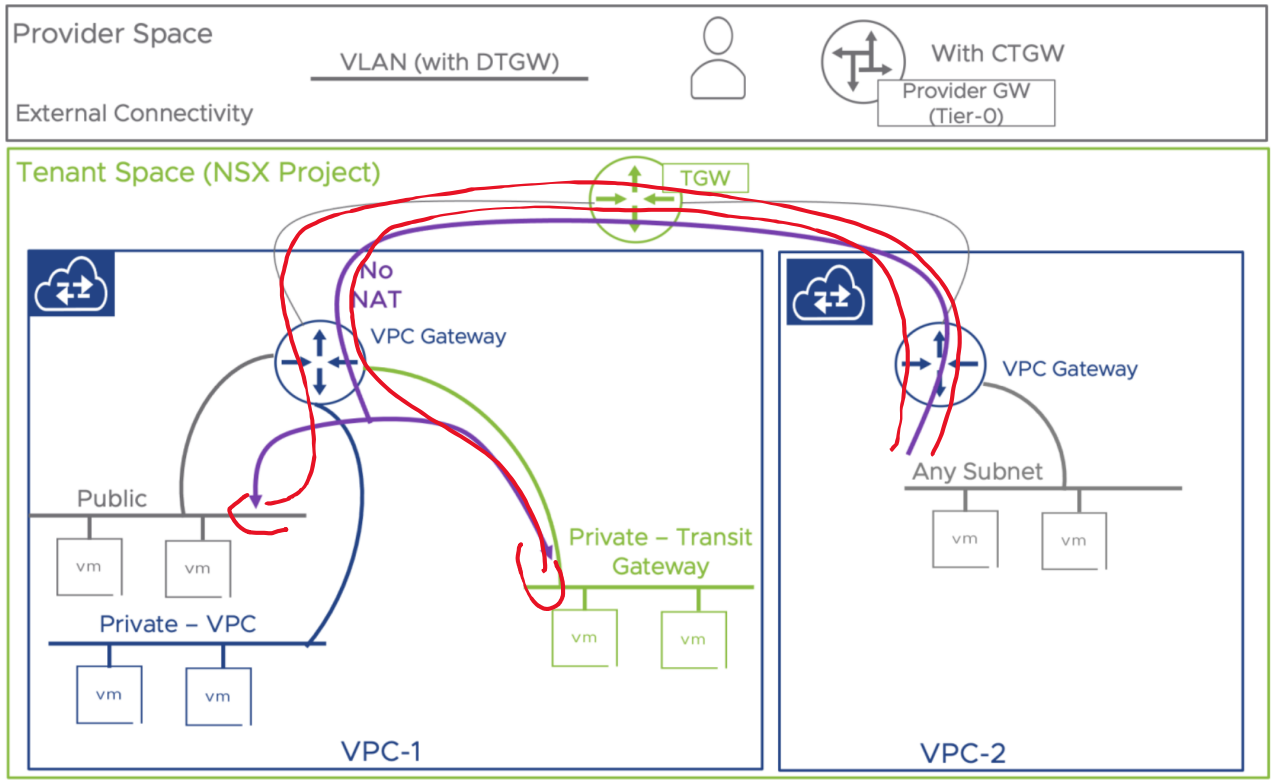
Traffic Flows – VPC Internal communication (Ext IP)



NAT via External IP

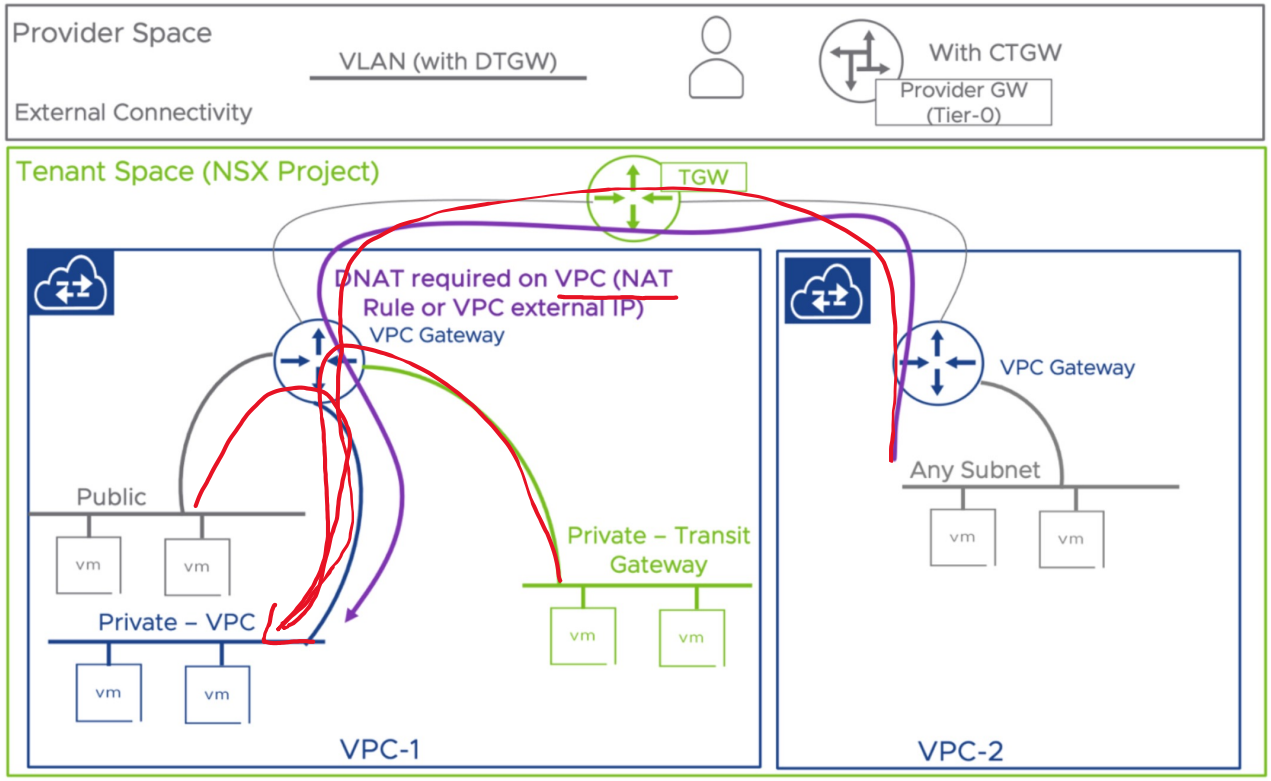
- External IPs are implemented as paired DNAT/SNAT rules on the VPC Service Router (SR) when using CTGW or DTGW.
- In CTGW setups, internal-to-external communication within the same VPC requires SNAT to ensure proper return path via the SR for reverse translation.
- DTGW, internal VPC traffic to External IPs is not supported

Traffic Flows - Inter-VPC communication (Same TGW)



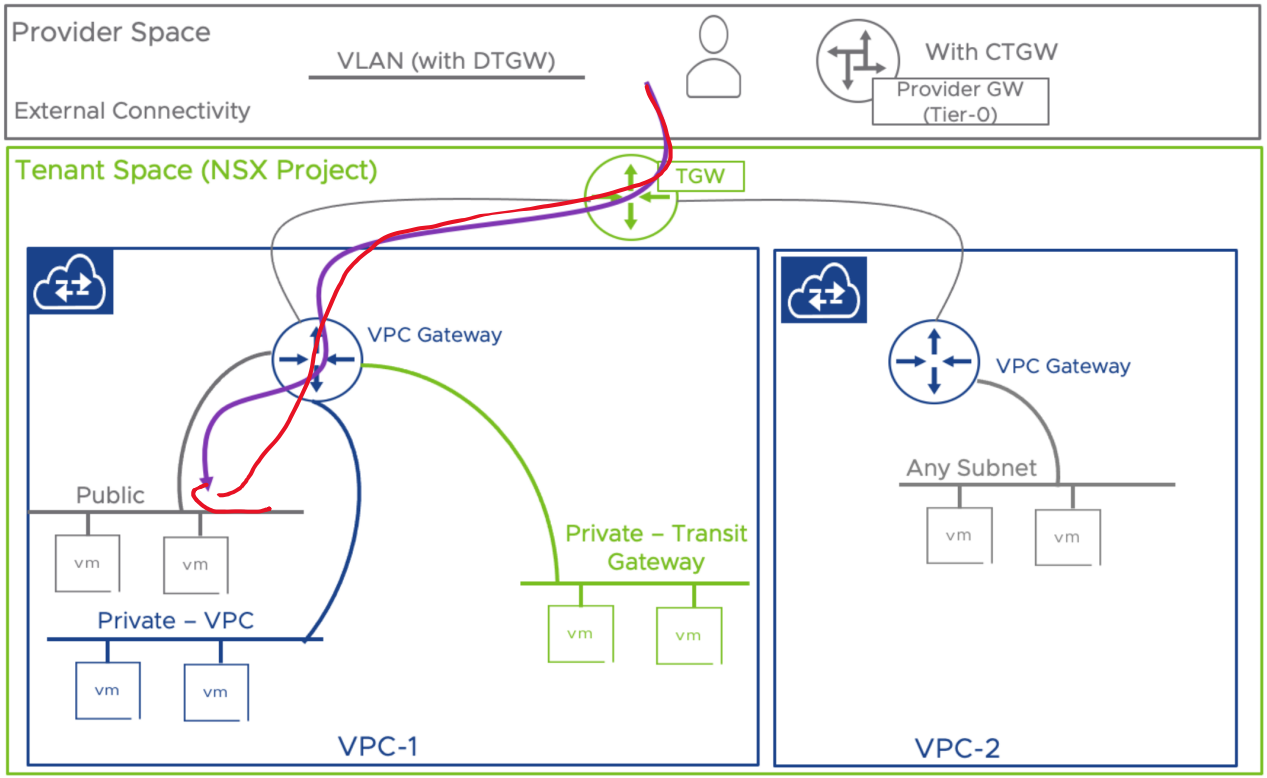
- Public and Private-TGW subnets support direct routing between VPCs via the TGW – no DNAT required.
- Native IPs are preserved, simplifying communication across VPCs connected to the same TGW.
- Private VPC subnets cannot be reached via inter-VPC communication.

Traffic Flows - Any subnet to Private-VPC Subnet



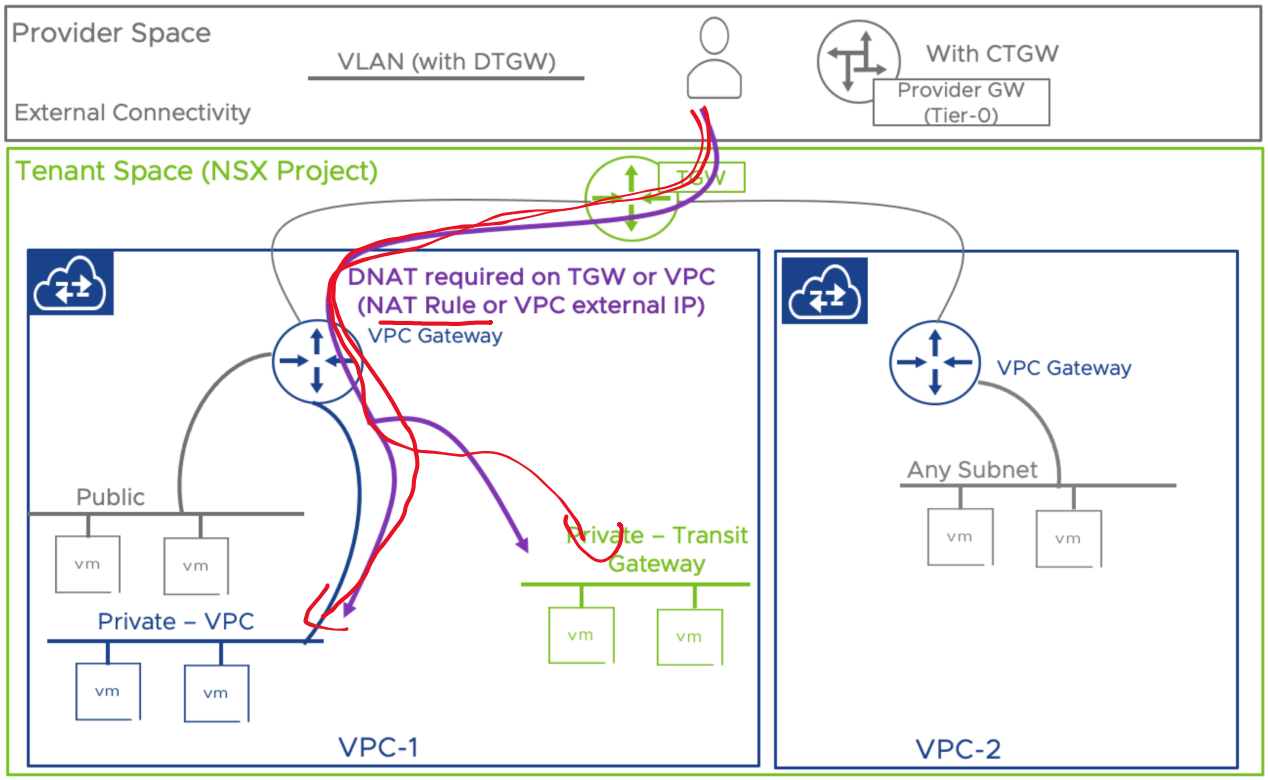
- DNAT is required when targeting workloads on private-VPC subnets across VPC boundaries.
- DNAT can be implemented via a static DNAT rule, reflexive NAT
- All options require north-south services to be enabled on the VPC gateway, preserving routing and security isolation.

Traffic Flows - VPC Inbound Communication



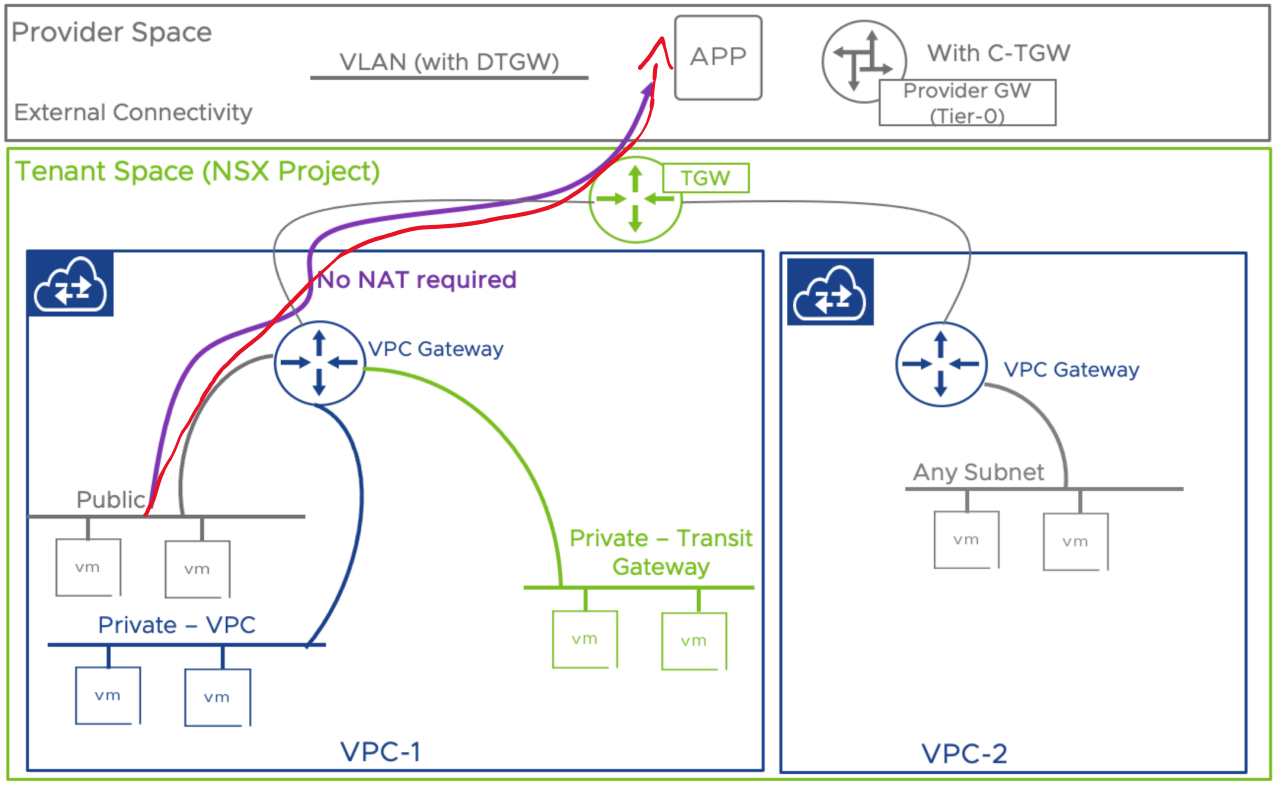
- No DNAT is required for traffic from external clients to workloads on public subnets.
- Public subnets are natively routable and designed for direct external accessibility.

Traffic Flows - External Access to Private Subnets



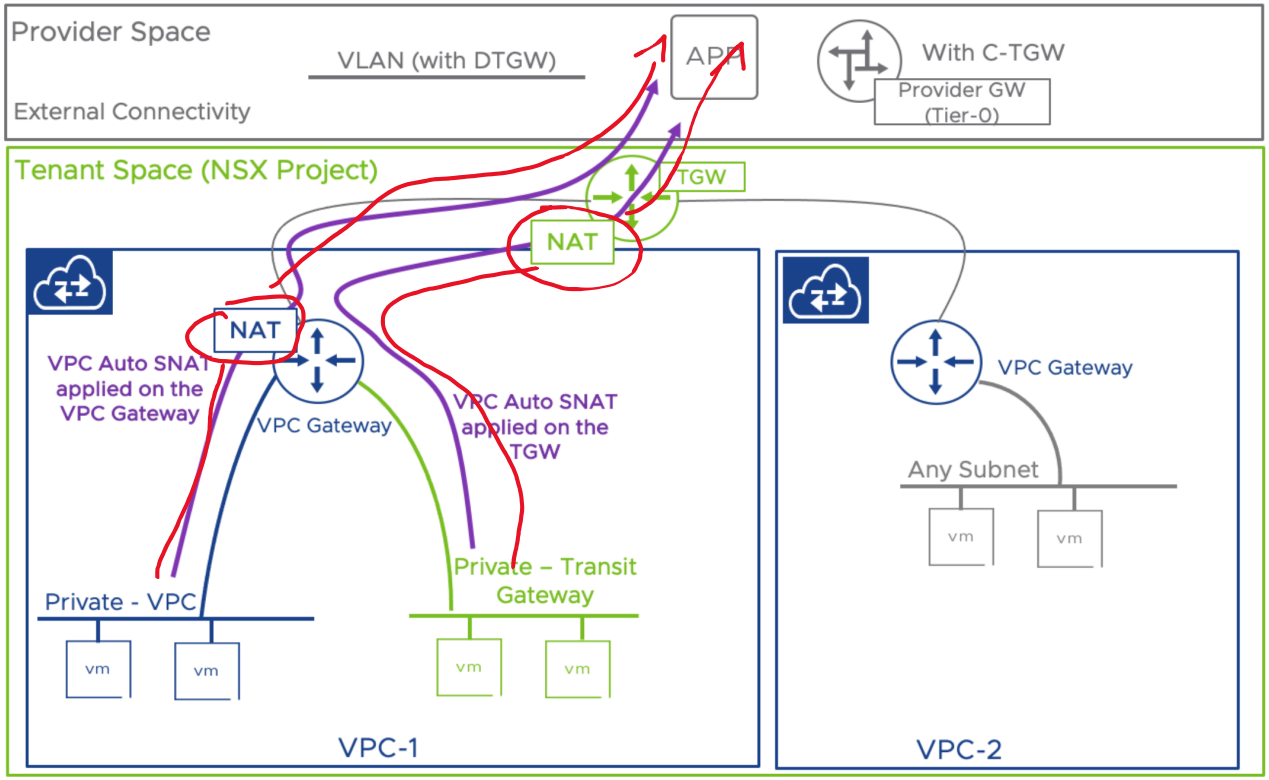
- DNAT is required for external access to private-VPC and private-TGW subnets.
- DNAT can be applied via VPC gateway (static or reflexive NAT) or by assigning an External IP to the workload.
- DNAT at the Transit Gateway
  - Active/Standby mode for DNAT
  - Reflexive NAT works in Active/Active, Active/Standby mode or distributed

Traffic Flows - Outbound Traffic from Public Subnets



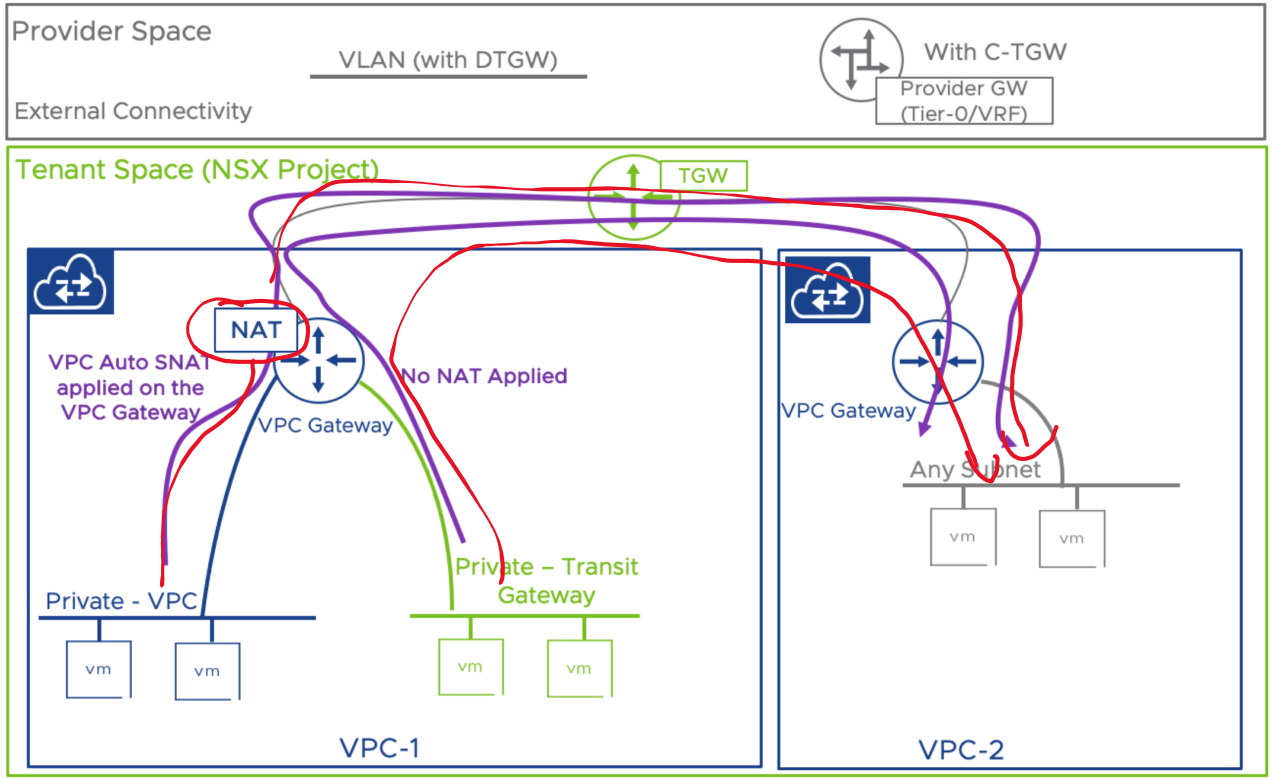
- No SNAT is required when workloads on public subnets communicate with external endpoints.
- The original source IP is preserved end-to-end, enabling direct response from external systems.
- Simplifies outbound connectivity and supports IP visibility for auditing or security use cases.

Traffic Flows - Outbound Traffic with Auto-SNAT



- Private-VPC and Private-TGW subnets use Auto-SNAT for outbound traffic to external endpoints, unless overridden by higher-priority rules.
- SNAT rules are applied on the VPC Gateway (for Private-VPC) and on the Transit Gateway (for Private-TGW; requires Active/Standby mode).
- To avoid port conflicts, the system performs Port Address Translation (PAT) using non-overlapping port ranges.

Traffic Flows - Outbound Traffic to other VPC



- Private-VPC subnets use Auto-SNAT on the VPC Gateway when sending traffic to other VPCs connected to the same TGW.
- The source IP is translated, enabling controlled and isolated cross-VPC communication.
- Private-TGW subnets do not require SNAT and retain their original source IP during inter-VPC traffic.

Brief summary (not all cases)

Subnet Type	Outbound to External	Inbound from External
Public	No NAT	No NAT
Private-TGW	SNAT	DNAT required
Private-VPC	SNAT	DNAT required

Subnet Type	Public other VPC	Private-TGW other VPC	Private-VPC other VPC
Public	No NAT	No NAT	DNAT at target
Private-TGW	No NAT	No NAT	DNAT at target
Private-VPC	SNAT required	SNAT required	SNAT at source + DNAT at target

Thank you!

Daniel Krieger

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