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Optimizing GCP Networking: Solutions for Non - Transitive VPC Peering

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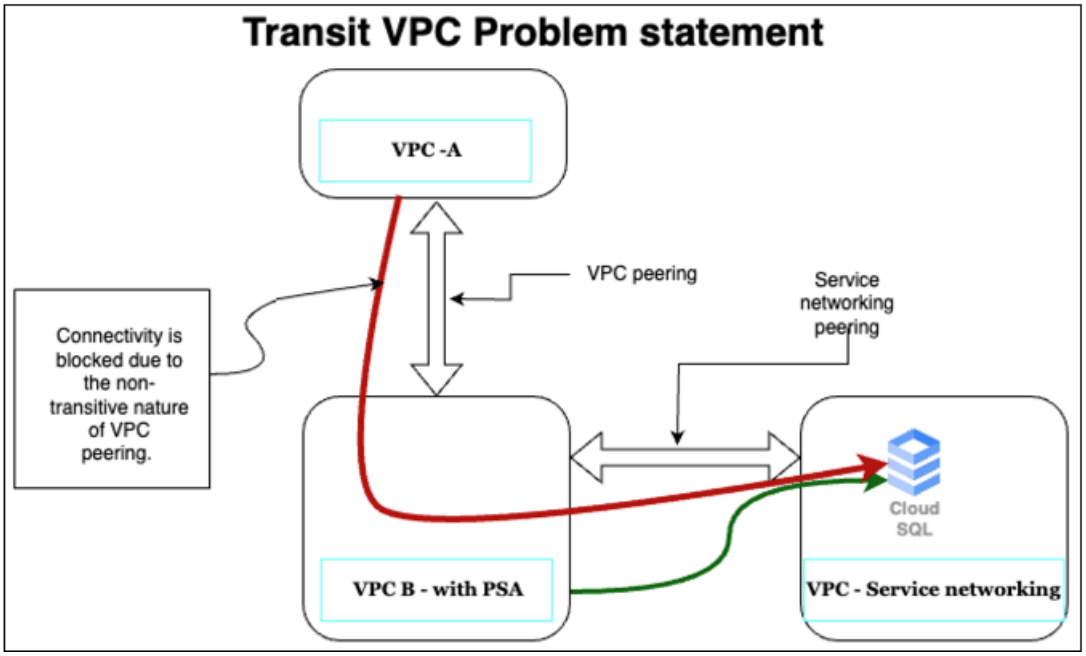
Abstract: ***The PSA (Private Service Access) connection in GCP allows direct communication between a VPC subnet and Google - managed services over a dedicated subnet within the same VPC. When VPC Peering is involved, communication between the PSA subnet and other subnets in a peered VPC is constrained due to the non - transitive nature of GCP VPC peering. This technical report explores a solution to this limitation, focusing on a Regional Internal TCP Proxy Network Load Balancer combined with hybrid connectivity via Network Endpoint Groups (NEGs). This approach enables seamless traffic routing between peered and non - peered environments, enhancing scalability and operational efficiency in hybrid cloud architectures.***

Keywords: GCP shared networking, GCP VPC peering over PSA, Cloud Computing, Scalability

1. Introduction

Network connectivity for GCP PSA subnet over VPC peering refers to establishing a network link between a Google Cloud Platform (GCP) Private Service Access (PSA) subnet and other Virtual Private Cloud (VPC) networks using VPC Peering. PSA allows Google - managed services (like Cloud SQL, AI APIs, etc.) to communicate with a VPC network through a dedicated, internal subnet. VPC peering allows two VPCs to communicate over internal IPs, providing high - bandwidth, low - latency connectivity without routing traffic across multiple hops. This approach optimizes security and performance in hybrid cloud environments.

VPC Peering in GCP establishes a connection between two VPC networks, allowing internal IP communication across the peered networks. However, GCP's VPC Peering does not support transitive peering, meaning that if you have multiple VPCs peered together, traffic between a PSA subnet and subnets in another peered VPC is not allowed by default. This can create limitations when trying to extend PSA connectivity across a multi - VPC architecture, as there is no direct route between the PSA subnet and subnets in other peered VPCs.

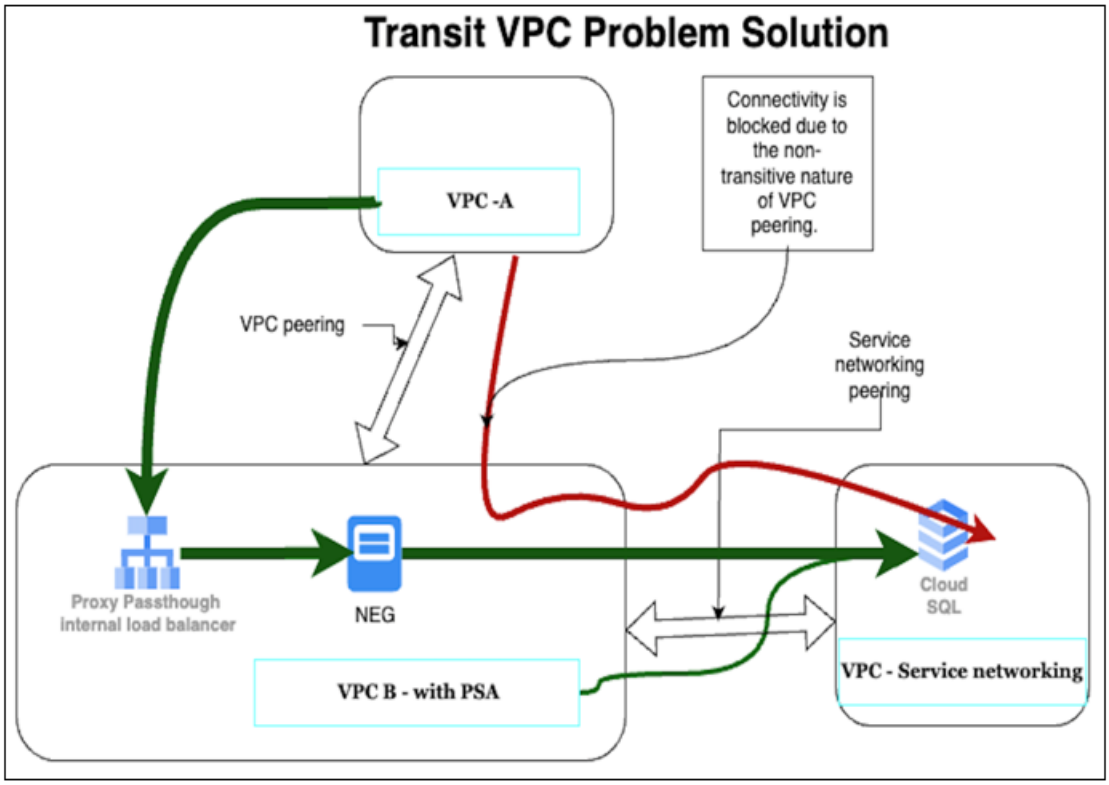


2. Solution Approaches

To address the PSA - based transit VPC issue, a solution involves using Regional Internal TCP Proxy Network Load Balancer (NLB) in combination with hybrid connectivity via a Network Endpoint Group (NEG). The NEG can point to resources like Private Service Connect IPs or PSA block IPs. This setup helps circumvent the non - transitive nature of VPC peering, as it allows traffic to route through the load balancer from a regular subnet, directing it back to the backends (PSA block).

In this approach, the TCP Proxy Load Balancer acts as a pass - through proxy, allowing traffic to be managed from external or hybrid environments, even when spread across different peered VPCs. When combined with hybrid NEGs or Private Service Connect, it helps in ensuring connectivity for workloads across on - premises and cloud environments. This method also offers flexibility to direct traffic through IAAS resources, making it available to peered VPC connections, solving the transit limitations in GCP's VPC peering model. The setup of a hybrid NEG enables external traffic, such as from on - premises systems or another cloud, to route into

Google Cloud services via Cloud Interconnect or VPN, thereby extending the reach of services like PSA. As a result, clients from various VPCs or hybrid environments can connect to a unified NLB IP which then routes the traffic to PSA - based backends. This strategy ensures scalability, hybrid cloud integration, and seamless traffic routing across peered and non - peered environments.



3. Conclusion

Addressing the connectivity challenges of non - transitive GCP VPC peering is critical for organizations integrating multiple VPCs. By implementing a Regional Internal Proxy Network Load Balancer with hybrid connectivity, these limitations can be effectively resolved, ensuring seamless communication across peered networks and enhancing resource utilization. This solution facilitates the development of scalable and robust cloud architectures that align with evolving business needs.

This solution emphasizes the need for smart networking strategies in cloud environments, helping to build scalable systems that can adapt to business changes. By addressing challenges like VPC peering limitations, it ensures smoother and more efficient operations across cloud platforms. The approach also helps businesses using GCP overcome network limitations, ensuring more reliable connections between systems, better use of cloud resources, and overall improved performance in hybrid cloud setups.

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