

The new business internet:

# Premium Internet Underlay

Guaranteed network performance,  
worldwide



Connecting  
your world.

# Why conventional internet is no longer enough

**Modern businesses are turning to cloud-hosted applications that they access over the internet. At most companies, it's hard to imagine not being able to work from anywhere you like using cloud-based applications. IoT applications and services are booming, too. All of this makes a stable connection to the cloud indispensable — and the internet is becoming the transport route of choice for enterprise networking.**

The internet offers high flexibility and low cost, making it a perfect match for modern networks. The biggest drawback to using the internet for data transmission is that sometimes applications run smoothly, but sometimes they don't — depending on the quality of the connection. Conventional internet products, whether for consumers or enterprises, don't promise any specific level of quality.

The other issue in this segment of the market is the lack of transparency regarding the specific path your data takes. That's a problem, because the provider has an incentive to take the cheapest route — not the best one. Especially for intercontinental connections, this results in latency fluctuations, increased packet loss, and lower throughput than the local connection is theoretically capable of. Even within Europe, quality can vary, although this is less common and often more difficult to detect. Many applications don't work correctly under these conditions, resulting in negative user experiences that can impact business operations.

For their business applications to perform as expected, companies must ensure reliable, consistent network quality. Something the internet has, until now, not been able to provide. No wonder the analysts at Gartner have been predicting increased demand for *enhanced* internet<sup>1</sup>. Enhanced internet refers to service offerings that improve the stability and performance of internet-based data transmission, which in turn makes cloud applications run better.



Deutsche Telekom is at the forefront of connecting customers in the best and most efficient way. To reach the next level of internet-based communication, Deutsche Telekom has launched PIU.







<sup>1</sup> Gartner: Magic Quadrant for Network Services, Global, published on February 22, 2023



# What is Premium Internet Underlay?

## Benefits at a glance

-  **Global coverage:** The best network infrastructure with 500 points of presence (PoP) around the world based on the global Deutsche Telekom network as well as the backbones of 25 leading cloud providers and selected international internet access partners.
-  **Unmatched performance:** Exceptional network performance with specified quality levels that rival the reliability of MPLS.
-  **Compatibility:** You can combine Premium Internet Underlay with other underlay and overlay solutions such as IPsec-VPN, SD-WAN, or Zero Trust Network Access (ZTNA).
-  **End-to-end management:** Deutsche Telekom handles everything — that includes internet access, the backbone, and customer premises equipment (CPE) — all to ensure seamless operation.

## How does PIU work?

Premium Internet is based on the combination of Deutsche Telekom internet backbones and a virtual backbone from Teridion Technologies. The Teridion AI-WAN routing technology was developed especially for it. To guarantee the best connectivity in the world, AI-WAN routing uses the backbones of 25 leading cloud providers.

Thousands of sensors in the clouds determine the best path for the current session. If the path gets worse or degradation is expected, the connection fails over to the next best alternative in real time.

This way, you are no longer dependent on specific cloud providers. Instead, you take advantage of the benefits of all cloud providers at once. Teridion nodes encompass 2,000 routers at over 500 PoPs and provide access to the AI-WAN.

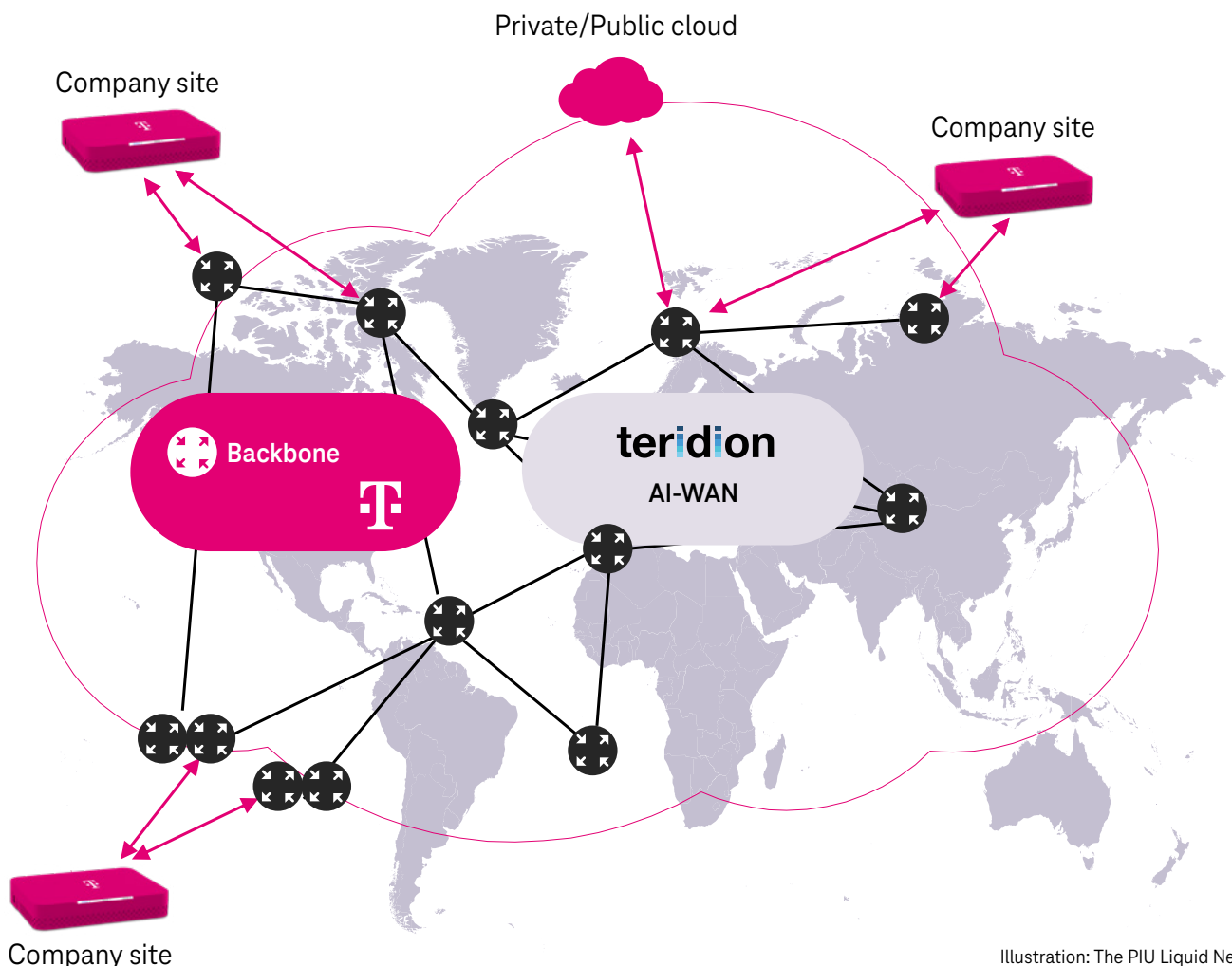


Illustration: The PIU Liquid Network

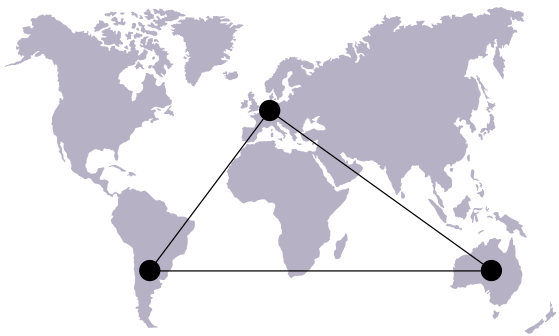
# What can I use PIU for?

Premium Internet Underlay offers performance SLAs that can stabilize and accelerate any business internet traffic between countries and continents including China. PIU checks all the boxes for conventional enterprise networking as well — you get connectivity to public and private clouds in addition to branch networking.

## Typical use cases

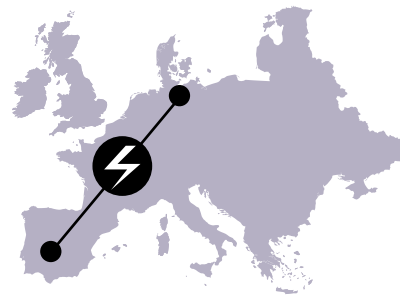
### Branch connectivity across long distances

The longer the distances, the better a PIU connection is compared to the public internet.



### High-performance operation for important applications

PIU offers guaranteed performance and avoids traffic jams that bad peerings can cause. It's a high-performance, cost-efficient alternative to MPLS within Europe as well.



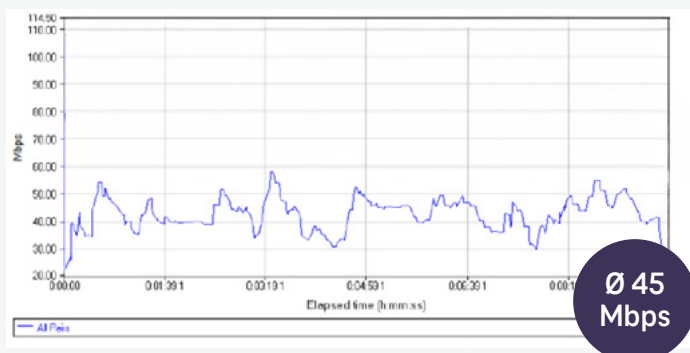
## A real-world example: São Paulo / Hong Kong

This case involving data transmission between distant locations (such as São Paulo and Hong Kong) demonstrates how PIU is capable of achieving previously unimaginable application performance, particularly across long distances. In comparison to conventional internet connections, not only is the actual bandwidth measurably higher, other metrics including packet loss, latency, and jitter are also vastly improved. Premium Internet Underlay avoids the problem of overloaded peerings between providers and long, circuitous paths.

## Benefits

- **First-class data transmission**  
Frequently double or triple the bandwidth versus the public internet for international transmissions
- **No SLA violations**  
Network SLAs for latency and packet loss are adhered to consistently
- **Seamless application performance**  
Improved jitter performance for world-class voice and video streaming
- **Cloud-agnostic**  
No dependency on individual hyperscalers, the downtime of individual cloud providers has no effect on performance

## Internet data transmission



## Premium Internet Underlay data transmission

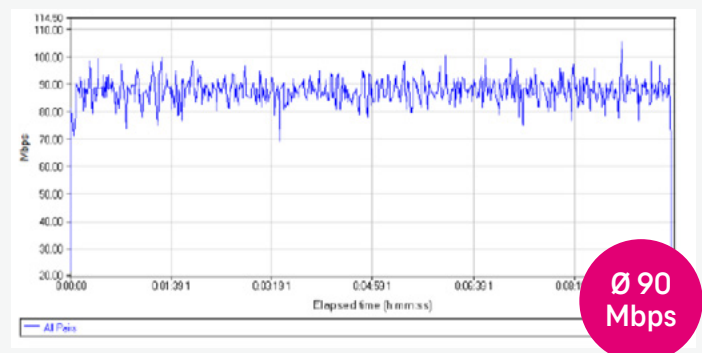


Illustration: Comparison of data transmission between São Paulo and Hong Kong

### Another real-world example: China

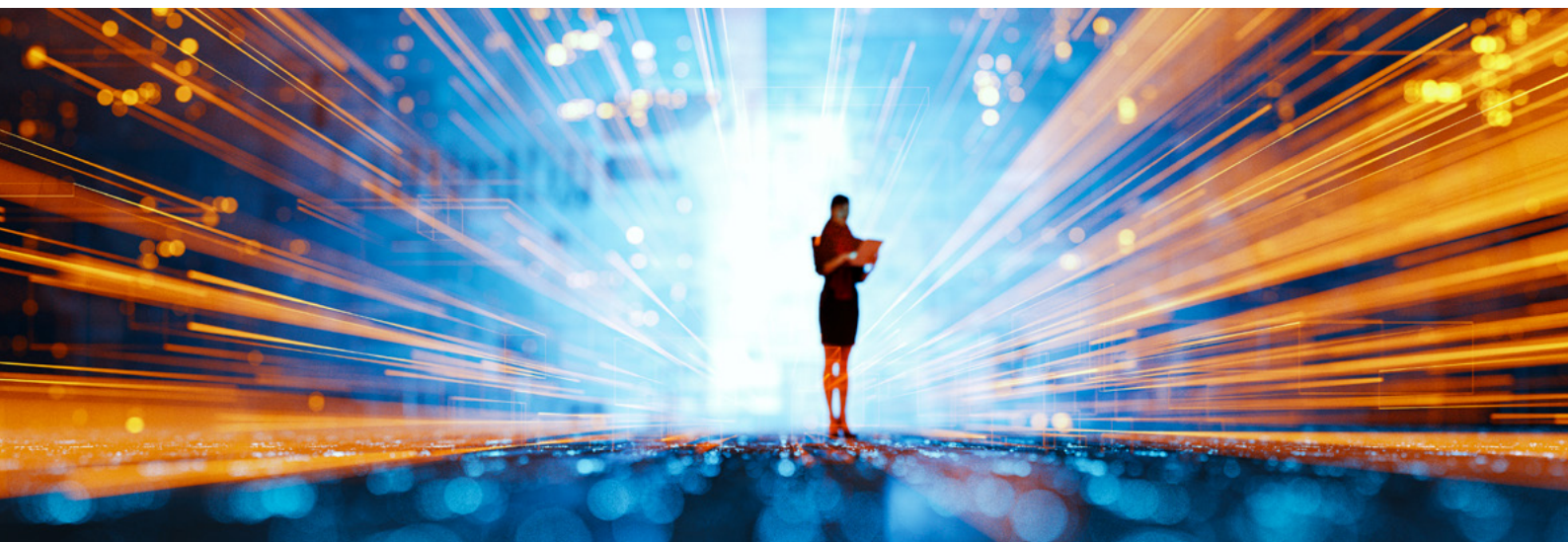
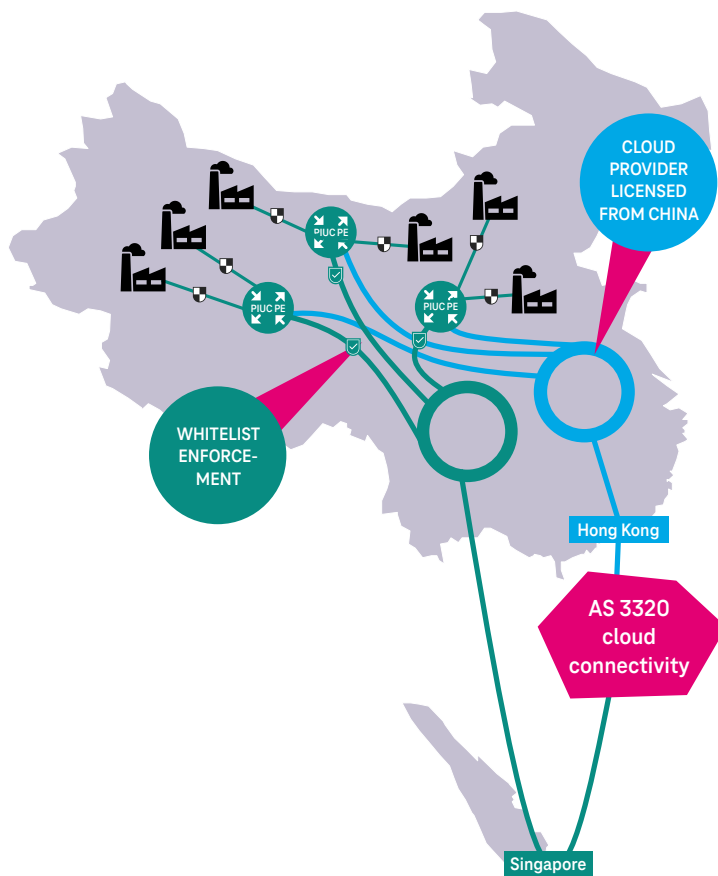
Companies active in China face unique challenges with respect to connectivity to and from their Chinese branches, other locations, and clouds. Internet connections passing through the Great Firewall of China may result in extremely poor network performance. Lost connections, poor throughput, and high latency make it difficult to get work done over the internet.

In addition, traffic that uses conventional tunneling technologies such as IPsec is often blocked, even if it complies with Chinese regulations. The background is that, according to Chinese regulations, encrypted IPsec tunnels may only cross the Chinese border if they carry enterprise traffic. Compliance with this law is strictly monitored. Violations consistently result in penalties.

Premium Internet Underlay is the completely legal way to avoid these problems entirely. PIU uses the secure, high-performance Teridion Liquid Network to transmit your business data across the border using Chinese cloud provider backbones. CPE managed by Deutsche Telekom recognizes non-compliant data, which it refuses to route through the Great Firewall.

### Benefits

- **Stable**  
Fast connections with availability and performance SLAs
- **Compliant**  
Complies fully with Chinese regulations
- **From a single source**  
End-to-end managed solution from Deutsche Telekom



# The connectivity in detail

What exactly do connections to public and private clouds look like with Premium Internet Underlay? How are sites connected?

Internet traffic from a **site to the public cloud** (such as Zscaler, Office 365, Salesforce, etc.) is transmitted by the PIU CPE over the last mile through an IPsec tunnel to the entry TCR (Teridion Cloud Router). From there, it is forwarded to the closest TCR in the data center where the applications are hosted. Each site is assigned two entry TCRs to ensure redundancy.

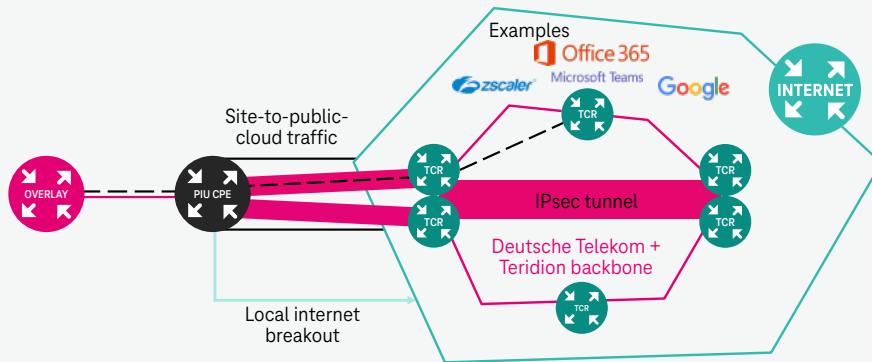


Illustration: Site-to-public-cloud traffic

The PIU CPE sends traffic **from a site to the private cloud** first through an IPsec tunnel over the last mile to the entry TCR. From there, it travels along the best-performing path, chosen in real time, to the exit TCR. Finally, it travels from the exit TCR through

an IPsec tunnel across the last mile, ending at a virtual gateway to the private cloud. Each site is assigned two entry TCRs to establish redundancy.

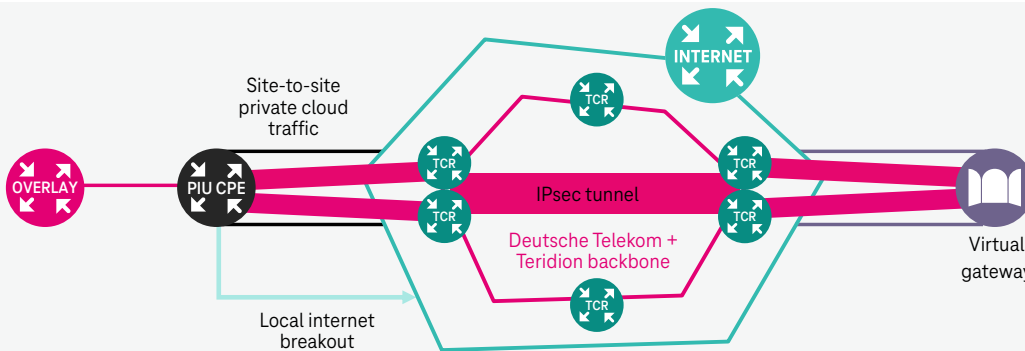


Illustration: Site-to-private-cloud traffic

The PIU CPE uses an IPsec tunnel to transmit **site-to-site** traffic across the last mile to the entry TCR. From there, it travels along the best-performing path, chosen in real time, to the exit TCR. From the exit TCR, the data again uses an IPsec tunnel across

the last mile to reach the PIU CPE of the receiving site. Regular internet traffic is routed through the local internet. Each site is assigned two entry TCRs to ensure redundancy.

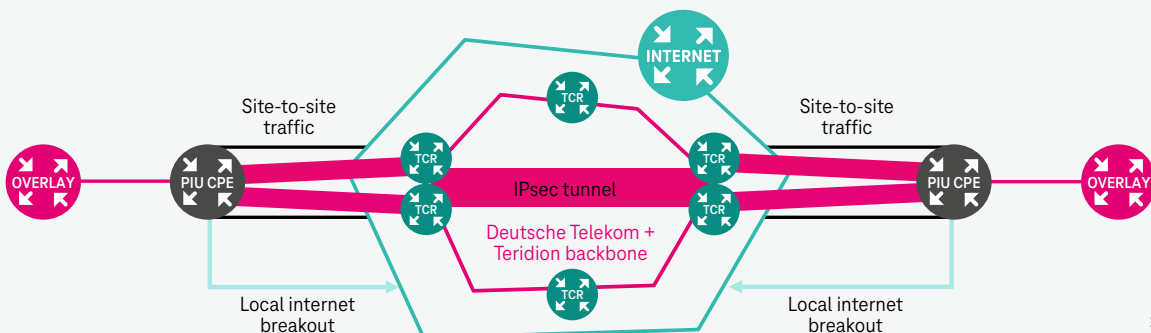
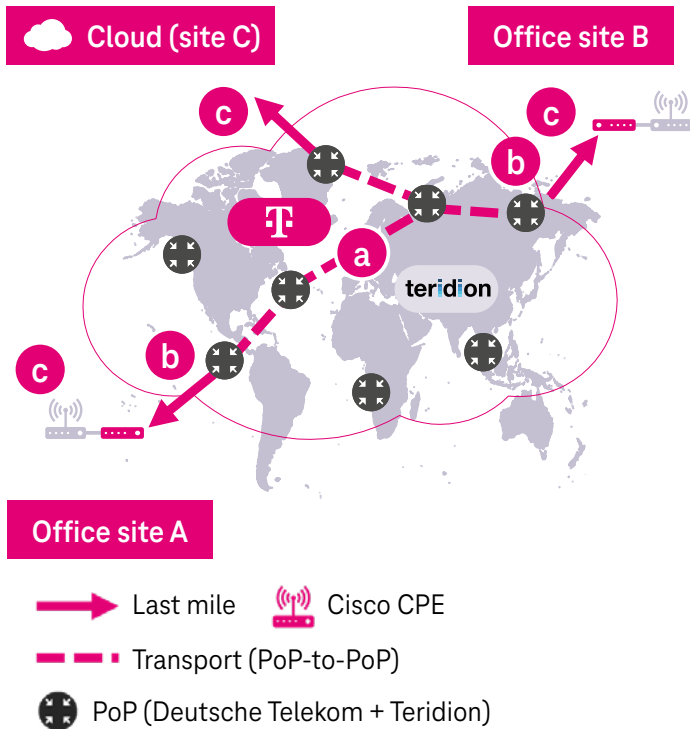


Illustration: Site-to-site traffic

# PIU designs

Premium Internet Underlay can be used with any existing internet connection. In the following, we describe several options that can be used to design network architectures.

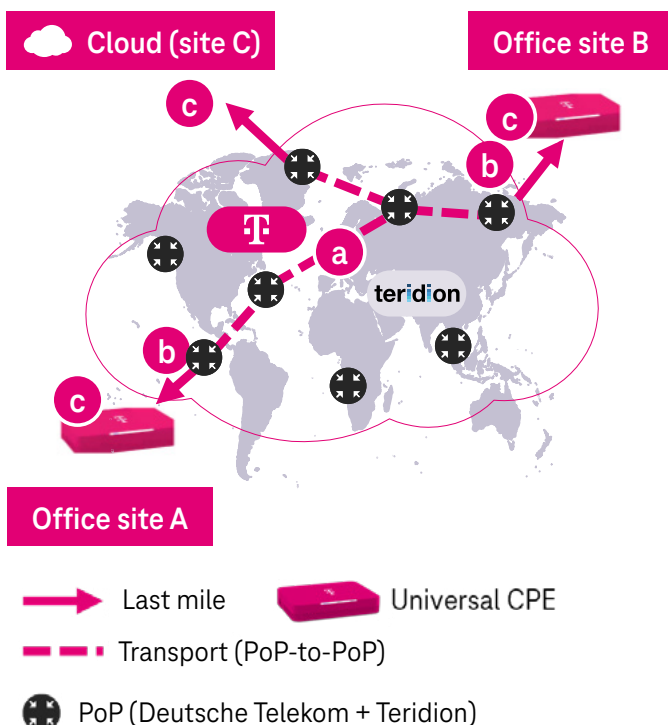
## PIU Standard



PIU Standard is Telekom's end-to-end managed complete solution, which includes internet access, Cisco CPE, and transport. For global coverage, Telekom's IP network is combined with the backbone of Teridion, our global cloud connectivity partner, and the service of specially selected ISPs. PIU Standard offers service SLAs and Performance SLAs on packet loss and round trip delay.

- a** PIU Standard e2e managed PIU (Deutsche Telekom + Teridion PoP)
- b** Deutsche Telekom Premium DIA for the last mile
- c** Cisco CPE managed by Deutsche Telekom

## PIU Universal CPE



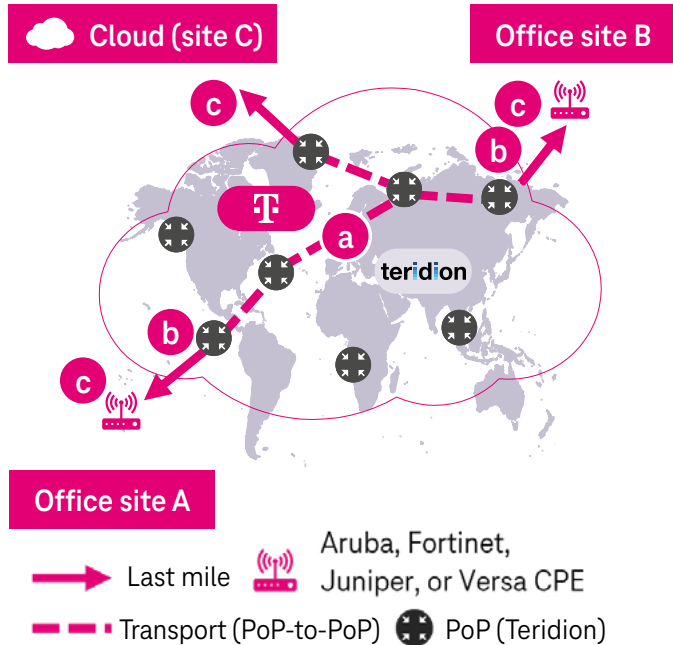
In the future, Deutsche Telekom will offer universal CPE devices as an alternative to the Cisco CPE. Telekom's universal CPE device consolidates and virtualizes all network functions in a single device (e.g. SD-WAN, firewall, route optimization). This means that the universal CPE can be used as single-box design at the customer site and its functionality can be expanded as required. PIU uCPE offers overlay-specific SLAs as well as service and performance SLAs for the underlay.

- a** PIU Universal CPE (Deutsche Telekom + Teridion PoP)
- b** Deutsche Telekom (Premium) DIA for the last mile
- c** uCPE managed by Telekom





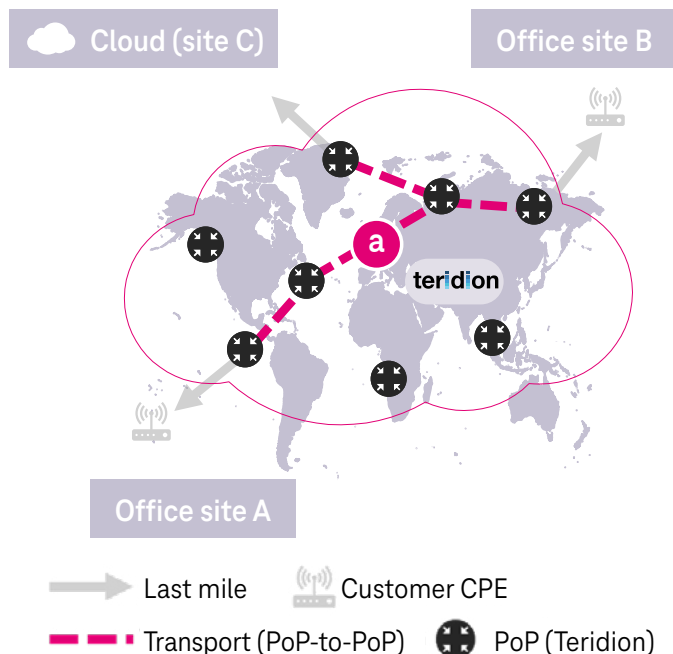
## PIU SD



As an alternative to Cisco CPE or universal CPE, Premium Internet Underlay can be provided with the SD-WAN CPE from leading providers such as Aruba, Fortinet, Juniper SSR, or Versa. PIU SD offers overlay-specific SLAs as well as service and performance SLAs for the underlay. A customer-owned connection can also be served upon request, but without guaranteeing specific access SLAs.

- a** PIU SD e2e managed PIU (Teridion PoP)
- b** Deutsche Telekom (Premium) DIA for the last mile
- c** Aruba, Fortinet, Juniper, or Versa CPE managed by Deutsche Telekom

## PIU Light



Existing internet connections or CPEs can be used for PIU. The only requirements are that the equipment needs to support IPsec or generic rerouting encapsulation (GRE) for the connection to the Teridion nodes, and it needs to let you manage it. It doesn't matter whether the existing internet connections are from Deutsche Telekom or not. There are no restrictions regarding the DIA, which means that broadband connections such as asymmetrical FTTH can be used. This type of PIU setup is quick to implement since it doesn't require any extra hardware. For this reason, we also use it to deploy our Proof of Concept (PoC). PIU Light offers PoP-to-PoP guaranteed performance SLAs on packet loss and latency. Access to the last mile, however, is the customer's responsibility.

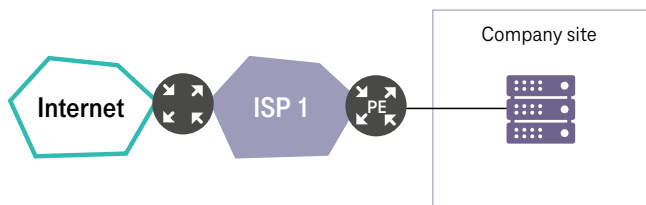
- a** PIU Light PoP-to-PoP PIU (Teridion PoP)
  - Access to the last mile from the customer
  - Customer's own CPE at their sites



# PIU access types

## I. Single access

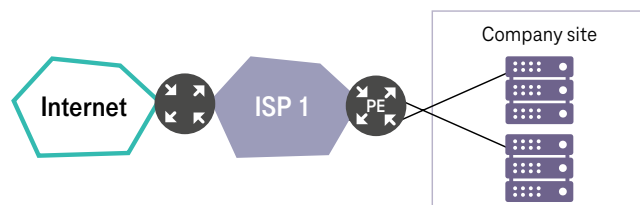
- Non-redundant network infrastructure: **all components** — access via single CPE, one internet connection, the transport share — **have no redundancy**
- The internet connection is a dedicated internet connection with a symmetric transmission rate
- End-to-end managed solution from Deutsche Telekom



## II. Dual access

Future release

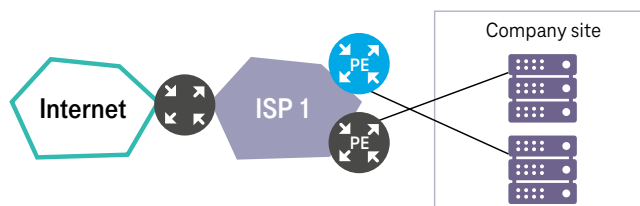
- Two active connections, each with
  - One CPE
  - One internet connection and
  - One transport share
- Separately implemented SD-WAN overlay failover mechanisms are supported **in the event that a component fails**
- In most cases, internet access is not implemented using edge disjoint paths or separate routing from company site to network nodes



## III. Dual Plus access

Future release

- Two active connections, each with
  - One CPE
  - One internet connection
  - One transport share
- The two internet connections are connected with **different** internet service provider PoPs to increase the availability of the internet service (in contrast to dual access)
- Support for separately implemented SD-WAN overlay failover mechanisms when a component goes down
- Internet access is not usually implemented with separate routing from the company site to the network nodes



PE = Provider Edge Router  = CPE

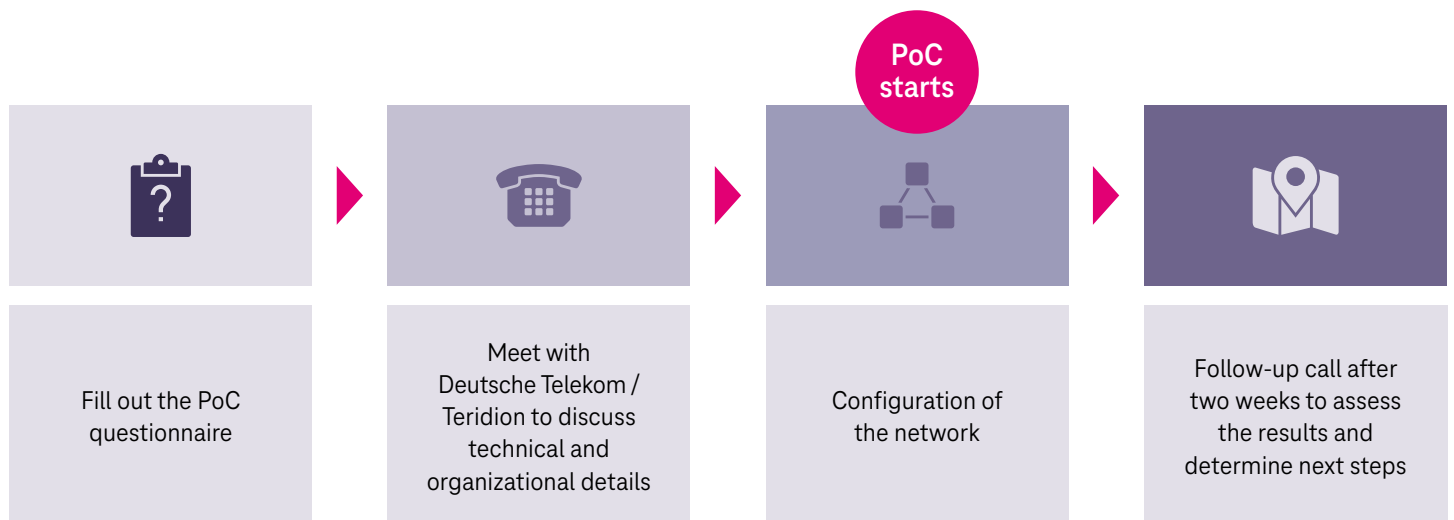
# Try PIU for yourself

Want to put our Premium Internet Underlay to the test? We'd be delighted to provide a quick and easy-to-set-up proof of concept at no cost to you.

For the PoC, we deploy PIU Light, which uses your existing hardware and internet connections. This allows us to implement the

PoC for you very quickly and with little effort required on your part. Upon consultation with you, we configure the tunnels — and the PoC is ready to go.

You can test our PoC for two weeks at no cost to you. During this time, we provide support for instance to fine-tune the configuration and resolve any issues that may arise.



## Request your PoC

Get in touch today!

### Contact

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