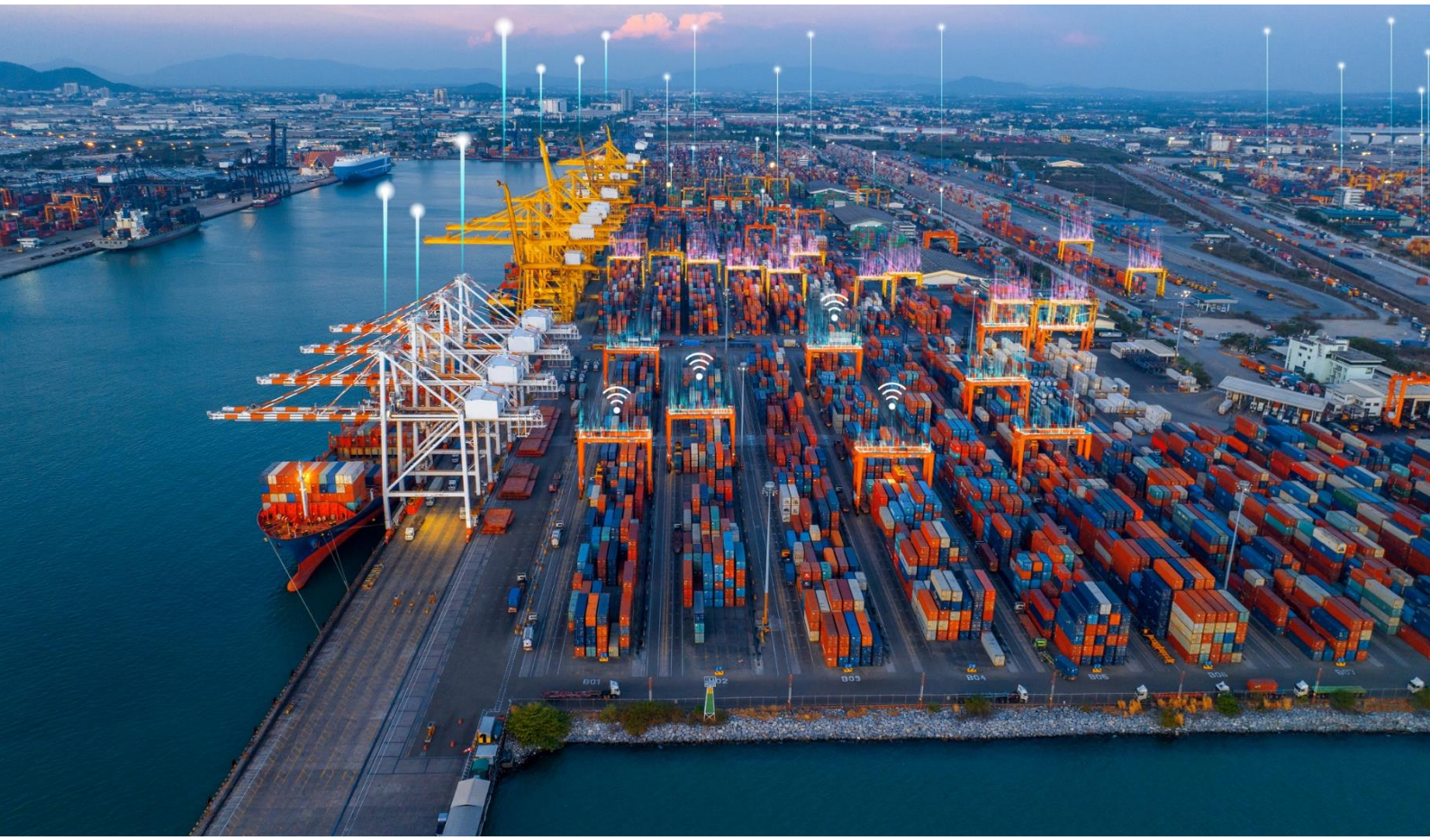

Different private networks deployment models

Not all private networks are made the same, and increasingly there is a range of different deployment models available to enterprises. This article will explore those models identified by STL Partners, including the newer models that we expect to drive demand and adoption at scale in future.

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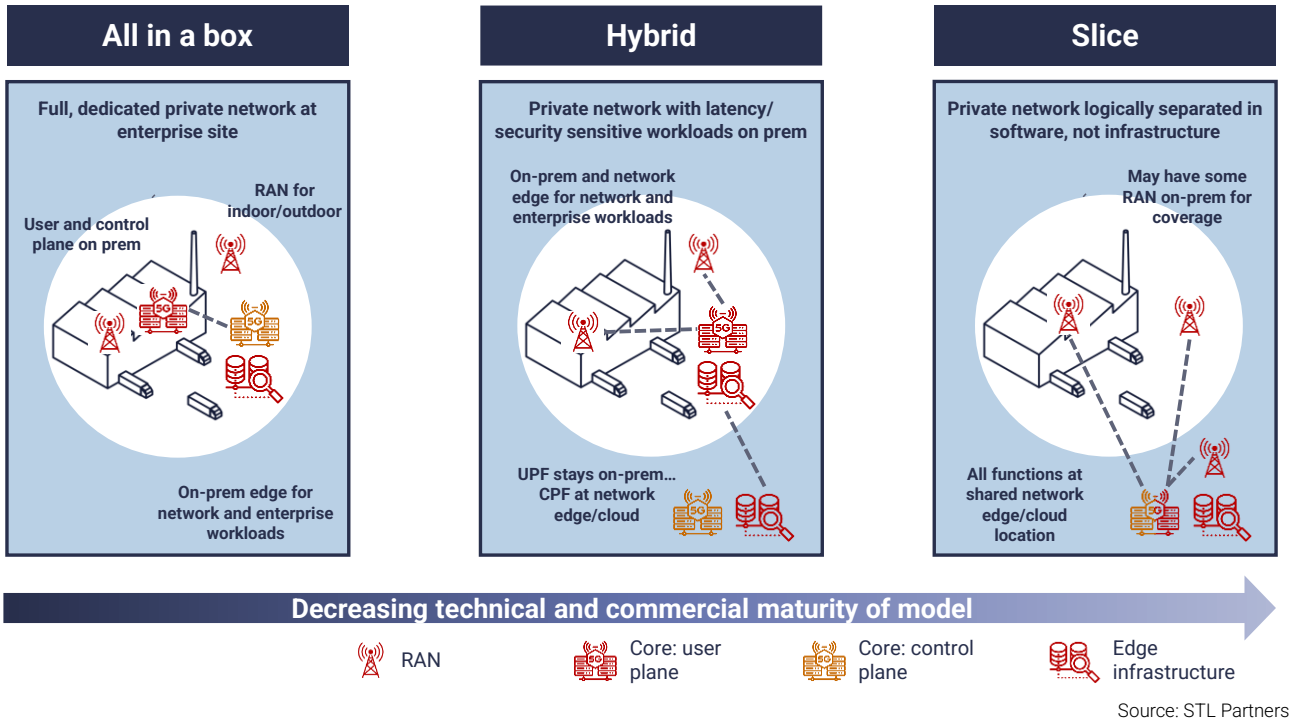
3 different deployment models

STL Parnters has identified 3 different deployment models for private networks (Figure 1):

1. All-in-a-box
2. Hybrid
3. Slice

This article will outline what each of these deployment models looks like from an architecture perspective, which customer profiles they most closely apply to, the benefits and drawbacks of the model, and any existing examples of live deployments.

Figure 1: STL Partners has identified 3 different deployment models for private networks



Source: STL Partners

All in a box

Architecture

The all-in-a-box model means that all of the network infrastructure is dedicated and on the enterprise customer's site. This means both the RAN and core infrastructure. There may be some applications leveraging the private network which run workloads off-premise, for example in the cloud or at the edge, but the entirety of the private network is on-site.

Benefits and drawbacks of deployment model

The benefits to adopting a private network in an all-in-a-box model is that you have full control over not only the infrastructure but also your enterprise data. This is extremely valuable for customers with higher security requirements.

Different private networks deployment models

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However, the downside to this model is that it is very expensive, both in the initial investment and installation costs, and in ongoing maintenance costs. It also takes time to install and get online, and requires a large amount of infrastructure which means it is impractical for temporary deployments.

Likely customer profiles

This is how all private networks up until the past year or so have been deployed. Early adopting industries such as mining, oil & gas, defence, manufacturing and energy which implemented private LTE solutions would have all been in this model, and up until recently most private 5G deployments have not strayed too far from these industries.

These were mainly customers with high CAPEX spending and of course experiencing the pain points that private networks solve for: low or no mobile coverage, applications in need of lower latency or higher bandwidth than public networks can satisfy, and a high need for data security.

Live deployments

There have been hundreds of private network deployments since the advent of private LTE, and over 400 deployments have been captured in STL Partners' Global Insights Tool.

Hybrid

Architecture

A hybrid private network would have some of the network infrastructure located off the customer premises. This would likely take the form of the control plane functions located elsewhere, whether in the public mobile core or at the edge, perhaps in 3rd party location, while the user plane functions would remain on the customer site. There would also be RAN infrastructure on the customer site.

Benefits and drawbacks of deployment model

The benefits of this model compared to the all-in-a-box model mostly come down to lower cost and ease of management. As there is less infrastructure on the customer site this requires a smaller investment in time and money to deploy it. Moreover, as you can control many elements of the network remotely it reduces the amount of maintenance that is required, while at the same time enterprises are able to retain full control of their own data. It also lends itself more to enterprises deploying private networks at multiple sites, as you can aggregate much of the network management across sites as opposed to having to manage a discrete private network at each site.

The drawbacks compared to the all-in-a-box model are that it requires some connection off the customer site, for particularly remote sites such as oil rigs this may be difficult. While cheaper than the all-in-a-box model the price point is still beyond the majority of enterprises.

Likely customer profiles

This model will likely open up a new slice customers, those in similar industries to before but perhaps unwilling to invest quite as much as is required for the all-in-a-box model. It will also appeal to customers who are managing multiple sites.

Live deployments

Deutsche Telekom recently launched what they believe to be a world-first architecture for a private network which fits the definition of a hybrid model. Their 'Campus network L" service combines a 5G core located within their network with a local user gateway, hence separating the control and user plane functions. This first deployment is at 3 ports owned by Eurogate in Hamburg, Bremerhaven, and Wilhelmshaven.

Different private networks deployment models

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Slice

Architecture

A private network slice means that the network is separating from the public network online in software terms, not in terms of infrastructure. This means that there is no dedicated infrastructure on the customer site, but rather the enterprise customer is allowed a virtual slice of the public network which is accessible only by them. The operator may choose to install some RAN infrastructure near or on the customer site to strengthen coverage, but this would not be for the exclusive use of the enterprise and would provide coverage to consumer subscribers near the cell.

Benefits and drawbacks of deployment model

This model allows private networks to be deployed for enterprises at a small fraction of the price of traditional private networks, including the hybrid model. They can also be spun up in a matter of seconds as opposed to weeks to install a physical private network. The network can also be spread across a far larger geographical area, as the RAN sites used are the public ones instead of needing to invest in and install new, dedicated sites. This enables use cases requiring high levels of mobility.

However, this model is only possible for enterprises if the public network satisfies certain conditions:

1. The operator has deployed a standalone 5G core. Slicing is only possible with a fully cloud-native mobile core, and currently there are few operators globally who have done this.
2. There is 5G coverage at the enterprise location. As the private network is running on the public mobile infrastructure, it may be the case that where the enterprise is located currently has poor 5G coverage. For many heavy industries they are by definition located away from population centres and therefore mobile operators have not invested in public coverage here. Even in populated areas there is complete, strong 5G coverage in relatively few cities globally.

As a result, there is significant investment required from mobile operators to make private networks available as a slice, this is compared to traditional private networks where the cost burden has fallen on the end-customer. As of yet, very few operators globally would currently be able to offer this service.

Likely customer profiles

This model would open up a very large number of new customers due to the significantly lower price point and faster deployment times. We can therefore expect smaller businesses with far lower ability to spend CAPEX potentially showing interest. There is therefore also an opportunity for temporary deployments such as for construction sites or events. As mentioned, slicing also lends itself far more to high mobility use cases and this appeals to enterprises within transport, smart cities, and emergency services among others.

Live deployments

While there have been many trials of network slicing, there are currently no live deployments of a private network being deployed via a slice. As outlined, for this to become a commercial offering mobile operators will need a 5G SA core and to be able to guarantee significant 5G coverage to enterprises, and this is far off for the majority of mobile operators globally. For those operators who are closer to being able to deliver this, they need to be able to guarantee coverage for enterprises before they see demand.

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