# INTELLIGENT CONNECTIVITY

## Smarter connections are enabling the hyperscale IoT reality

eseye

# INTELLIGENT CONNECTIVITY – Why smarter connections are making IoT a hyperscale reality

Bill Clinton's 1992 US presidential election campaign focused on the statement: "It's the economy, stupid!" as the topic that most worried voters and would get him into The White House if he handled it correctly. In IoT today, it's more a case of: "It's the connectivity, stupid!" which, if it's managed efficiently, will enable massive IoT to become a reality. Connectivity so far has been resolutely dumb, but a new intelligence is waiting in the wings, writes George Malim, the managing editor of IoT Now

It seems ridiculous that companies have had to buy plastic SIM cards from a chosen mobile network operator and then deal with the consequences of patchy coverage, roaming relationships with sub-par partners and inflexibility when it comes to contract durations and device locations. The tail, in the form of connectivity, has been wagging the dog, in the form of organisations' IoT business cases, causing pioneers to flounder in the intricacies of force-fitting the long-established consumer mobile connectivity to the new world of IoT. Mobile network operators have continued to talk their telecoms language, persist with their own traditional business model and do very little to accommodate the specific needs of IoT connectivity.

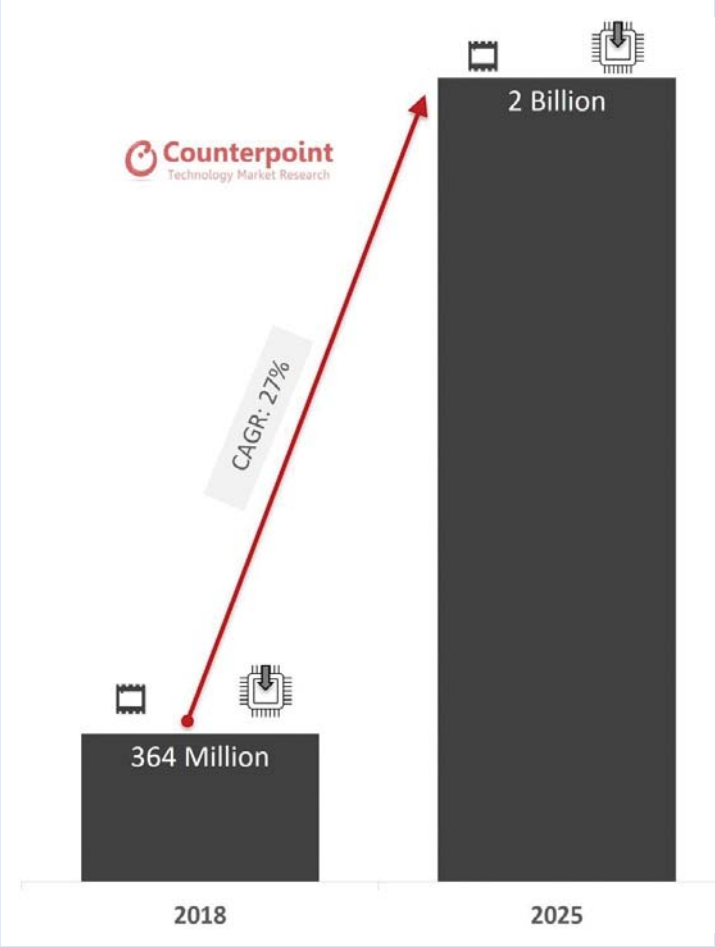
In reality, nobody engaging in IoT wants to become a connectivity expert and manage relationships with multiple network operators, across several different technologies and with different product variants required for each provider. Therefore, there's a strong opportunity for connectivity providers – not necessarily, but still possibly, the network operators – to become guides who abstract the complexities away from IoT organisations. Helping companies to access the most appropriate form of connectivity for a given app in a given location at a given quality can be done simply and quickly. It doesn't have to be a tedious, uphill grind of specification setting, contract wrangling and continuous monitoring.

## What is intelligent connectivity?

The term intelligent connectivity has been over-used across telecoms and IoT by event organisers, network operators, analysts and industry insiders as they grapple to differentiate a new wave of digitally-dominated economic activity from the days of dumb connectivity. A typical definition involves a blend of 5G, IoT, artificial intelligence, edge computing and cloud-based data processing but this is a red herring, that actually describes a connectivity-enabled, data-driven, digitally transformed world, not the intelligence of the connectivity itself.

A precise definition of intelligent connectivity is connectivity that is intelligent in itself. This means it is able to be automatically configured and can connect to the best available network at the most efficient cost and provide the optimum level of quality the application or device demands. This should be a global capability and the customer – both in terms of the IoT service provider and the end user – ▶

**Figure 1: Global eSIM-based* device shipments: 2018 vs. 2025 % growth**




Source: Counterpoint Research – Global eSIM Tracker and Forecast – 2018-2025
*includes all eSIM form-factors – hardware, soft/virtual and integrated

should be completely unaware of the connectivity other than that it exists and is performing as expected.

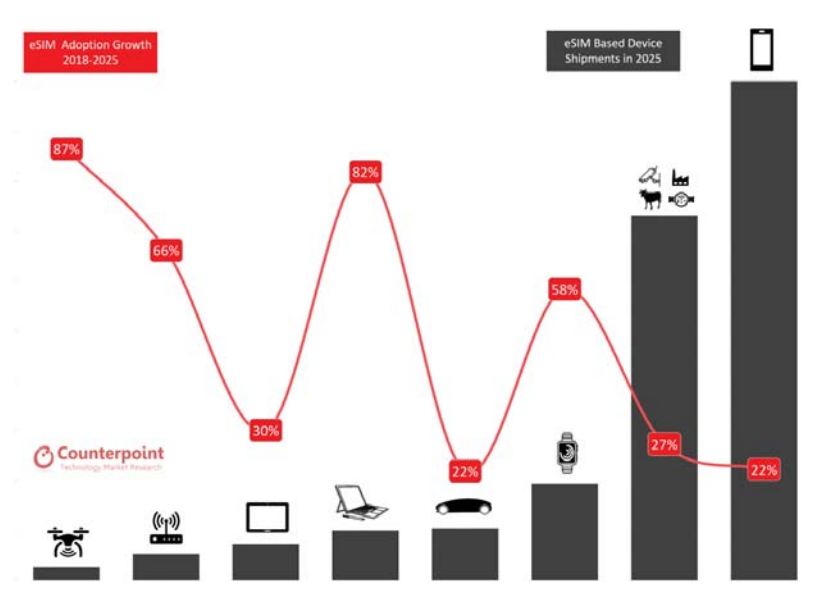
The absence of this capability has held back adoption of IoT to the extent that market predictions of there being 50 billion IoT connections by 2020 have reached only about 20% of that figure. It's a huge forecasting miss, and the complexities of dumb connectivity must shoulder a significant amount of the blame. With embedded SIM (eSIM) and embedded universal integrated circuit cards (eUICC) there is now the real possibility that devices can be shipped globally without the need for region, country or mobile network operator specific SIMs, enabling massive reduction in stock keeping unit (SKU) numbers and far less repeat engineering for product variants.

Juniper Research has reported that adoption of eSIMs will grow 350% over the next five years to exceed one billion eSIMs globally by 2024. The firm also projects that the total number of IoT connections will reach 83 billion by 2024, rising from 35 billion connections in 2020. This represents growth of 130% over the next four years and is evidence of the IoT sector getting back on track to hit the projections of a decade ago. eSIM adoption is underway and is expected to be adopted within smartphones, enterprise IoT and wearables, with integrated SIM (iSIM) technology following by 2025. Counterpoint Research estimates shipments of eSIM-based devices will reach almost two billion units by 2025, up from 364 million in 2018, according to the latest research from the company's Emerging Technology Opportunities Service. The findings also show that a majority of eSIM-based devices will have a hardware chip-based eSIM solution until 2025 and, after that, there will be a rise in the adoption of iSIM-based solutions.

Adoption of eSIMs in smartphones is expected to drive the major volume growth while other connected devices such as mobile hotspots, routers, connected PCs, drones and smartwatches will grow at a higher CAGR because of their relatively smaller base of adoption today. However, in terms of shipment volumes, smartphones and B2B IoT devices will lead.

Counterpoint expects we will see a shift in adoption to the GSMA compliant hardware-based eUICC for next five to six years alongside integrated SIM or iUICC within systems-on-a-chip (SoC) across different device categories, replacing the less secure proprietary soft eSIM solutions. While hardware-based eUICC will be popular across smartphones, automotive, iSIM or iUICC will be popular across IoT applications.

Figure 2. Global eSIM* based device shipments CAGR 2018 – 2025 %




Source: Counterpoint Research – Global eSIM Tracker and Forecast – 2014-2025
*includes all eSIM form-factors – hardware, soft/virtual and integrated

However, connectivity providers should not get carried away by the introduction of eSIM, eUICC and iSIM. These technologies are not, in themselves, the cure for the complexities of IoT connectivity provision. Instead they provide a useful step forward and disrupt the traditional mobile network operator's stranglehold on connectivity. Don't forget that in the old model, the odds were stacked in favour of a very small number of extremely large network operators who could claim to have global coverage and were able to build their own walled gardens of connectivity and set the rules for entering that.

## Orchestration for localisation

To get to truly intelligent connectivity, it's necessary to go a step beyond and enable the orchestration that allows for the localisation of connectivity to provide enormous flexibility and choice. Orchestration of coverage and capacity from multiple different network operators invisibly is a true demonstration of intelligent connectivity.

A good analogy is the airline industry. The traditional leaders, American Airlines, United, Emirates and British Airways decided on the routes and what planes would be used. Customers flew long-haul between large hubs determined by these airlines and then switched to smaller airlines to get to where they actually wanted to go.

Things started to change when airlines started to co-operate through alliances such as the Star Alliance. This levelled the playing field by allowing tier two airlines to offer routes customers wanted via code-sharing.

The same can be true with intelligent connectivity in IoT. The traditional model would, for example, see a provider of a connected healthcare device to the US market enter into a connectivity agreement with, typically, either AT&T or Verizon. Although each would claim excellent nationwide coverage, in reality coverage could be poor in remote rural areas but the healthcare company would have no flexibility to localise effectively. They'd need to, as a minimum, send a physical SIM out to the device user from an alternative operator or even send an engineer to install and configure new connectivity.

This inflexible model also provides no choice or adaptability when new technologies are introduced and constrains future innovation because the connectivity cannot be easily upgraded in support of a new offering.
In the international arena, the situation is even more complex. The large carriers claimed global coverage by bringing together their global networks plus a preferred roaming partner in countries that they did not operate in. This results in similar constraints for customers and gets them neither the best coverage nor the best deal, especially if their lead operator's partner is not the best network provider in the country. ▶

## Reduced risk

The arrival of eUICC creates an open standard by which connectivity can interoperate and be orchestrated for localisation. This is important for IoT organisations on several levels. At its most basic, it enables moving devices to shift location and even country without having to renegotiate for connectivity. That renegotiation could involve installation of a new physical SIM.

Orchestration for localisation means a coffee vending machine can be sited in a garage in Seoul and, if the location isn't successful, it can be moved with no fuss to another location where the best mobile network may be from another provider. The vending company doesn't have to worry about the connectivity, only its business case of making sure its machines go where there is high footfall of customers.

This capability also de-risks connectivity selection. If you know you can reconfigure device connectivity over-the-air using an eUICC bootstrap – the means by which eUICC initiates connection to networks - to switch operator, you know you are in control of your device. This is particularly important for devices with long life-spans that might be in the field for many years.

For these, having to make network selections today for a device that might still be active in 2030 is a significant worry. No one knows what the connectivity landscape may look like then and being tied to a connectivity contract from 2020 provides no flexibility to respond to changing market needs.

A further concern that intelligent connectivity addresses are the dynamics of the global economy. Different countries impose different regulations and these could render certain approaches to connectivity obsolete. By having one connectivity platform for IoT, organisations can manage these changes by switching operator to ensure an approved form of connectivity is utilised. In addition, they are insulated from geo-political shifts such as if one country has a conflict with another.

## The payback

Intelligent connectivity should act as a central nervous system for IoT that is able to implement end-to-end intelligence vertically through the application stack and horizontally across the globe. This is what IoT is demanding as it matures because business models are now more clearly understood.

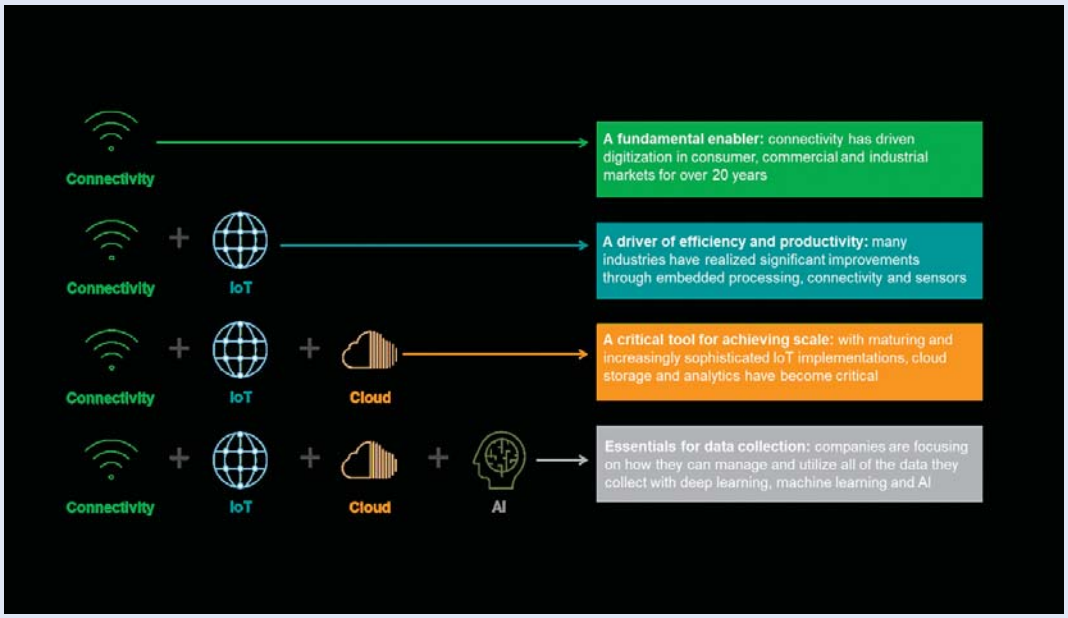
The market has changed from taking an attitude that a connected product could be sold for ten times more than an unconnected one, with the additional features enabled being charged for, to a model that is focused on business outcomes. This might involve a pump manufacturer charging for the delivery of clean water or a shift to a product-as-a-service business model for a health and beauty device manufacturer.

In these scenarios, organisations are far more concerned about the uptime of the service or device than the cost of the connectivity, so connectivity providers need to shift their model to take account of this. Global IoT cellular connectivity and hardware company, **Eseye**, has modelled the business impact of connectivity interruptions on an electric vehicle charging provider.

If that imperfect connectivity allows only 90% uptime, in one year the charging provider could lose US$10 million. That's based on a charging estate of 5,000 sites and one lost customer per day at each, resulting a US$2,000 loss for each charger each year.

This illustrates how the relatively low cost of connectivity pales into insignificance when stacked against the potential business impacts of poor connectivity. In addition, this does not take into account the savings and efficiencies that simple-to-manage connectivity achieves for an organisation's back end processes. In fact, the upfront cost of connectivity is now dwarfed by the value it enables and the savings it can achieve. ▶

Figure 3. Synergies of transformative technologies




Source: IHS Markit, 2019

**Figure 3** above shows the migration across different transformative technologies that are collaborating to address the evolving requirements of people, enterprises and industry. The addition of IoT to connectivity has yielded rich streams of data on the status, location and condition of connected devices and services which are now being monetised. The cloud is addressing the requirement to store and apply analytics to these large volumes of data. AI techniques, meanwhile, are starting to help manage this data and generate useful business insights from it.

The money at the heart of IoT comes from across these different layers of intelligence, traversing the SIM layer, the network connectivity layer, the platform layer and the interoperability and integration layer to enable and extract value. The end game is to have a broad catalogue of apps which can all access the same application programme interfaces (APIs) down to the SIM – the next big step for connectivity alliances is to sell not just connectivity but also the API integration that will truly open up the market place.

## Conclusion

As IoT is at long last poised to become a mass market phenomenon, it's important that connectivity providers recognise what this means to them. They are no longer in position to set the rules around connectivity and these will increasingly be set by the user organisations. This doesn't mean the users will understand everything and be familiar with all the acronyms, but it does mean they will know they can have flexibility to ensure their application or device gets the connectivity it wants when it needs it.

Peace of mind is a big driver for IoT organisations. They're not really concerned about the cost of dumb connectivity today – that's not the prize they're chasing – especially since many propositions are commoditised already. They're concerned they're in the right position in five to ten years' time, the devices they have invested in deploying are able to perform optimally and that connectivity presents no barrier to their business.

As **Figure 3** illustrates, connectivity is the foundation on which the digital economy is built but intelligent connectivity is at the heart of the IoT business model. Network operators also see this as an opportunity to participate but they recognise their vocabulary and business model must also change if they are to participate in the open, interconnected, integrated and global nervous system that makes up intelligent connectivity for IoT. ■