

IDC White Paper

Sponsored by: Verne Global

Anders Elbak

May 2017



The Benefits of Colocation in Iceland



Executive Summary

Nordic organisations are increasingly adopting third-party hosting and colocation services when optimising and transforming the IT infrastructure to support digital business transformation initiatives. IDC research shows that the number of organisations using colocation services will grow by 50% as digital transformation becomes more deeply integrated into the corporate strategy.

Many IT decision makers do not thoroughly assess the physical location of the datacentres — or are at least limited in their scope of locations being assessed. IDC believes you should be more thorough in the assessment and more open to more alternative locations, as it can significantly reduce the operational cost and the organisation's carbon dioxide footprint, without compromising the performance, user experience or operational risk.

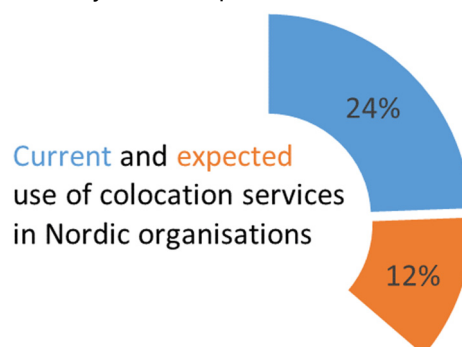
This white paper explains why Iceland is a highly regarded location for operating a datacentre or running infrastructure in a colocation facility. Its key advantages are:

- With year round average monthly temperatures between -1°C and 10°C, the Icelandic climate is ideal for free air cooling even through the summer months, which results in significant saving on power cost.
- The power production is 100% based on renewable hydro- and geo-thermal power, which is cheap, highly available, abundant and predictable.
- Iceland has good fibre connections to mainland Europe and North America, and EU rules and regulations on cybersecurity and data protection are directly applicable in Iceland, meaning that the services delivered from the datacentre are compliant, secure and highly available.
- Iceland has a highly competitive business environment with low corporate tax, a flexible labour market and the lowest labour cost in the Nordic region.
- Iceland is very safe with low crime rates, low risk of terrorism and — contrary to many beliefs — low risk of natural disasters.

Efficiency and Innovation Focus Drives Nordic Organisations Toward Cloud and Colocation

Organisations are increasingly embracing new infrastructure hosting and deployment models. There is a clear shift away from on-premise datacentres to cloud and hosting services.

This is also the case in the Nordic countries where the number of organisations that use colocation services is set to grow significantly over the next few years. According to a January 2017 IDC survey of IT decision makers in 200 Nordic organisations, 24% currently use colocation and a further 12% expect to start using it.



Source: IDC Nordic CxO Survey, January 2017 (n = 200)

The main reason for reassessing the datacentre strategy is that many organisations find that the current infrastructure setup inhibits IT in meeting the requirements for supporting business transformation and keeping cost on a tight rein.

Most organisations that turn to colocation do it for efficiency benefits caused by the third-party providers' economies of scale in terms of both technology and people. Colocation also offers an attractive alternative to building a new datacentre for capacity expansion. By reducing the total IT workload being supported by the on-premise datacentre, colocation enables organisations to reduce the total number of employees in the datacentre, which can result in significant cost savings and/or improved IT efficiency.

Although cost savings is a significant driver, colocation also helps IT organisations become more agile and better able to support the business. Rather than the organisation reducing the number of employees, it can redeploy them for more strategic initiatives. Moreover, not having to build the datacentre facilities allows companies to deploy new IT solutions quicker and expand faster and further than if inhibited by the internal datacentre's physical boundaries.

Most importantly though colocation helps organisations in digital transformation, which is a significant part of the business strategy for most organisations with the aim of optimising the business and enhancing customer engagement.

Initially colocation is often considered for workloads that organisations would like to shift from the on-premise datacentre but for some reason are not suited for public cloud deployment.

However, colocation offers additional benefits that will increasingly drive more organisations to adopt it. The third-party colocation datacentre will become the core of many organisations' hybrid IT infrastructure and a hub for industry clouds, leveraging dedicated connectivity to cloud and other service providers' infrastructure and overall robust connectivity, which is essential in the evolving digital economy.

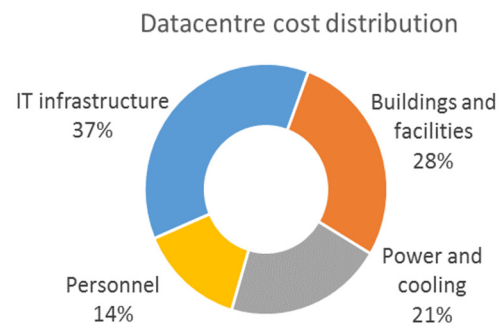
Selecting the Right Location for the Datacentre

When selecting an infrastructure services provider, organisations focus on price, SLAs and capabilities. While these are of course essential, IDC believes organisations should also assess the specific location of the datacentre(s) used by the service provider.

An organisation building a new datacentre will evaluate the possible locations. For some organisations, this is a comprehensive process of assessing multiple countries for different datacentre designs, but often it is a much simpler procedure of weighing a few available construction sites against one another. However, regardless of scope, there are a number of assessment criteria that can be grouped into three categories.

Cost

Cost of course is key when assessing the best location for a datacentre. More than a third of the overall cost comes from power, cooling and personnel, meaning that variations in cost are highly dependent on climate, electricity prices, employment costs and corporate tax levels.



Source: IDC Datacentre Survey, n = 406

Quality

To ensure the necessary quality of service the datacentre must have high availability and reliability, which translates into high-speed connectivity with no — or very few — interruptions in connectivity and power supply. This requires access to a good communications infrastructure with high bandwidth and/or low latency depending on workload, as well as a solid power supply and access to skilled staff.

Risk

There are many different aspects to risk assessment. IT security and data protection levels need to be trustworthy, but it is also paramount to evaluate the possible changes over the lifetime of the datacentre or hosting service contract. Datacentre-related decisions are long-term decisions, and it is essential that the capacity is available, the service scalable and the operations environment predictable. This includes everything from cost to political stability to risk of natural disasters.

All Nordic countries are proactively seeking datacentre investments, and we already see large international cloud and service providers establishing and expanding datacentre capacity in the region.

Overall, the Nordic region is a good choice for a datacentre, as the connectivity is good, free air cooling is possible, power is low cost, reliable and clean, education levels are high, data protection and privacy are key priorities, and the region is both politically and economically stable, as well as a low risk region in terms of terrorism, crime and natural disasters.

Iceland's Advantages as Datacentre Location

While all Nordic countries are suitable as datacentre locations, Iceland has some specific characteristics that translate into advantages related to cost, quality and risk.

Cost

IDC's latest datacentre survey shows that on average 21% of total datacentre costs are for power and cooling. Iceland's energy prices and climate, which is ideal for free air cooling, mean that the cost for power and cooling is significantly lower in Iceland than in most other countries.

Energy Prices

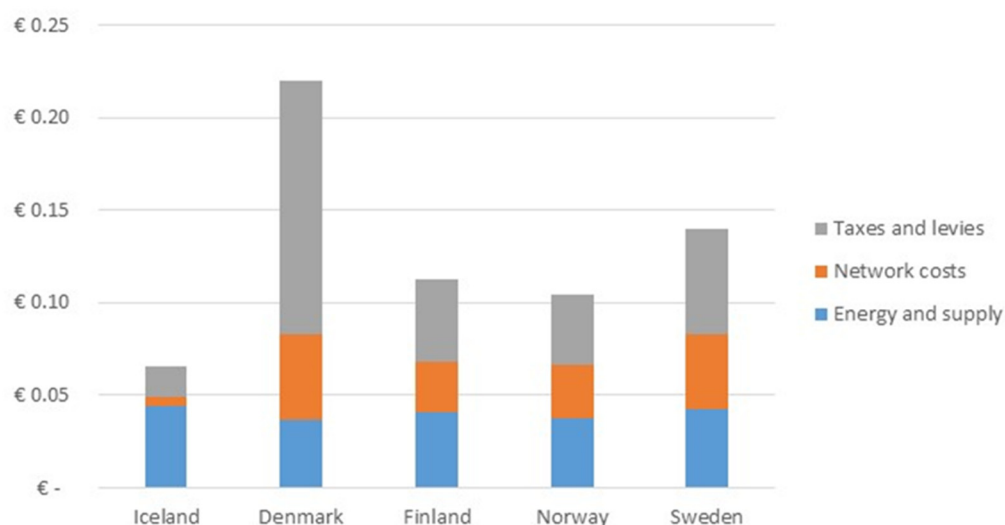
Energy costs and taxation vary by geography, consumption and industry. Figure 1 shows the energy costs for large industrial consumers in the Nordic countries. The price a large datacentre pays is likely to be lower as it often negotiates discounts individually and receives various tax deductions.

- In Denmark, datacentre providers can partially deduct the levies so they do not actually pay the full €0.22 per Kwh, but Denmark still has the highest energy cost.
- Sweden recently decided to significantly cut taxation on datacentres, so power costs are on a par with or even lower than in Iceland.

An essential takeaway is that actual energy prices are largely determined by tax levels and depend on political agendas. If the political winds change and become less in favour of datacentres, taxes could be raised and could significantly increase the total cost of operating a datacentre.

In Iceland, datacentre operators can set up long-term energy price treaties and ensure cost predictability for up to 15 years.

Figure 1
2015 Electricity Prices for Large Industrial Consumers (15,000+ Kwh), €/Kwh



Source: IDC and Eurostat, 2017

Climate

Rainfall, humidity and wind all have an impact on datacentre performance and efficiency, but temperature is the most important factor. All the Nordic countries have a relatively cold climate, which makes free air cooling feasible for lengthy periods of the year, depending on the exact cooling technologies used and the preferred temperature in the datacentre.

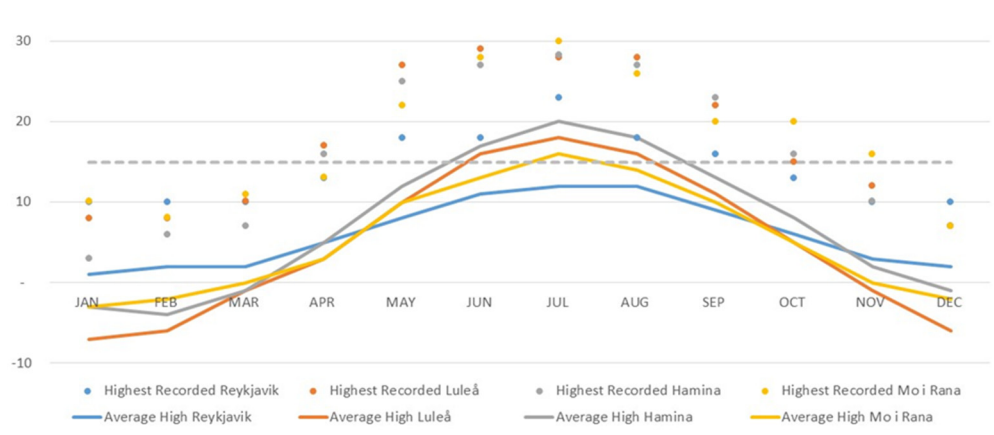
The closest thing to an industry-standard recommendation comes from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), which recommends that supply air temperatures for the servers should be between 18°C and 27°C with the least risk of system failure at 20°C. This means that datacentres can run entirely on free air cooling when the outside temperature is below 15°C.

It should be emphasised that too-low temperatures are not good either. Severe cold weather means that the cooling (and now heating) systems become more complex with more components and controls, to be able to ensure optimal operating temperature and humidity within the ASHRAE recommendations.

Consequently, the ideal climate for free air cooling is a cool summer and mild winter.

Figure 2

High Monthly Average and Highest Recorded Temperatures in Selected Nordic Locations (Celsius)



Source: IDC and Weatherbase, 2017 (average and maximum temperatures for 20+ years)

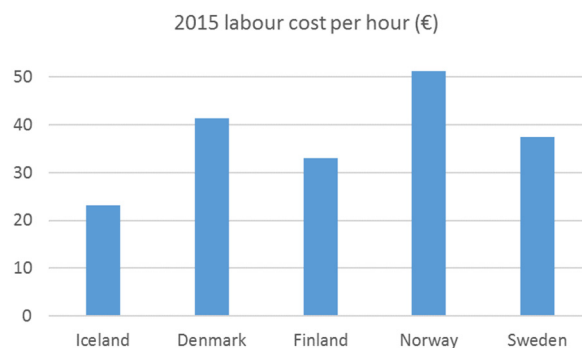
Comparing some of the northernmost locations for datacentre facilities in Finland (Hamina), Norway (Mo i Rana) and Sweden (Luleå), Reykjavik is the coldest from May to September — and so can rely more on direct free air cooling during summer time.

Moreover, Reykjavik is warmest from October to April, and therefore has the most suitable climate for datacentre operations.

As free air cooling is possible the entire year round in Iceland, datacentres can save up to 50% of electricity consumption. In addition, construction and maintenance costs can be reduced, as the datacentre may not need to install mechanical chillers or air conditioners.

Labour Cost and Corporate Tax

Personnel cost makes up 14% of total datacentre cost. By international standards, staffing is expensive in the Nordics. However, the average hourly labour cost (wages, social security, etc.) in Iceland is by far the lowest in the Nordic region and even below the European average. Iceland also offers good value. According to World Economics Forum's Global Competitiveness Index, it has the fourth most efficient labour market in Europe. This is mainly due to high productivity levels and very flexible practices for hiring or letting people go.



Source: IDC and Eurostat, 2017

Iceland — together with Finland — also has the lowest corporate tax level in the Nordics at 20% (Denmark and Sweden have 22% and Norway has 25%).

Quality

Datacentres in Iceland are able to deliver great quality of service, due to robust and abundant power supply, which is 100% renewable, and high-capacity connectivity to Europe and North America.

Power Supply

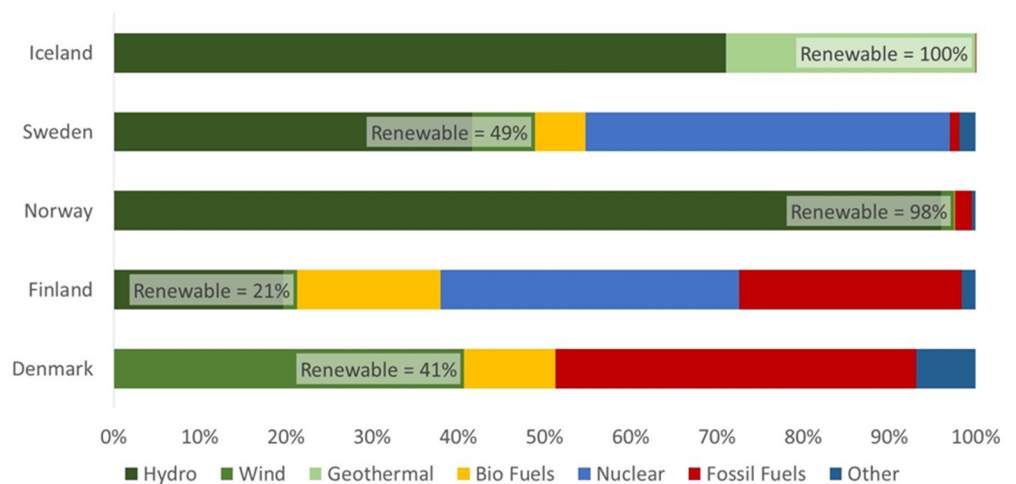
The low electricity cost has already been discussed, but the power supply is also a key differentiator in terms of quality of services. The supply needs to be stable, abundant and preferably green. Companies are increasingly looking to reduce their carbon dioxide footprint, and shifting the infrastructure to a location that relies on CO₂ neutral energy is a quick way of doing this.

The share of renewable energy is high in the Nordics at 40% on average compared to just 12% in the rest of Europe. However, as Figure 3 shows, it fluctuates significantly between the Nordic countries. Norway, Iceland and Sweden all have significant hydro power, but Iceland is unique in that it has geothermal sources that complement hydro power and ensure 100% clean renewable energy production in the country.

It should be noted that Finland and Sweden are both net importers of electricity, meaning that they are dependent on the international energy market. Norway on the other hand is a large electricity exporter. Denmark is also a net exporter, but has substantial imports and exports — primarily because the wind power efficiency fluctuates significantly.

There are international discussions about implementing carbon taxes. Regardless of how and when this is done, Iceland with its CO₂ neutral energy will experience the least impact — if any at all.

Figure 3
Electricity Production by Energy Source 2014 (% of GWh Produced)



Source: IDC and International Energy Agency, 2017

The Icelandic power grid is not connected to mainland Europe and consequently cannot import or export energy that cannot be transported by ship (solid fuel and oil). This means Iceland is immune to energy price fluctuations and that the only way to sell the surplus energy is to attract energy consuming companies to the country — in the form of datacentres, for example. In addition, Iceland is not affected by a knock-on effect from outages in other countries, which for example have happened in Denmark. Its unconnected grid also means that the availability and prices are highly predictable.

Iceland also has one of the most stable energy grids in the world. It is fully redundant and has been well maintained and modernised, which means that power outages are very rare.

Connectivity

Connectivity of course is paramount for a datacentre, and adequate bandwidth and limited latency are necessary to ensure performance. The specific requirements vary with the specific workloads, but proximity to internet exchanges and the fibre channel backbone is key for good connectivity.

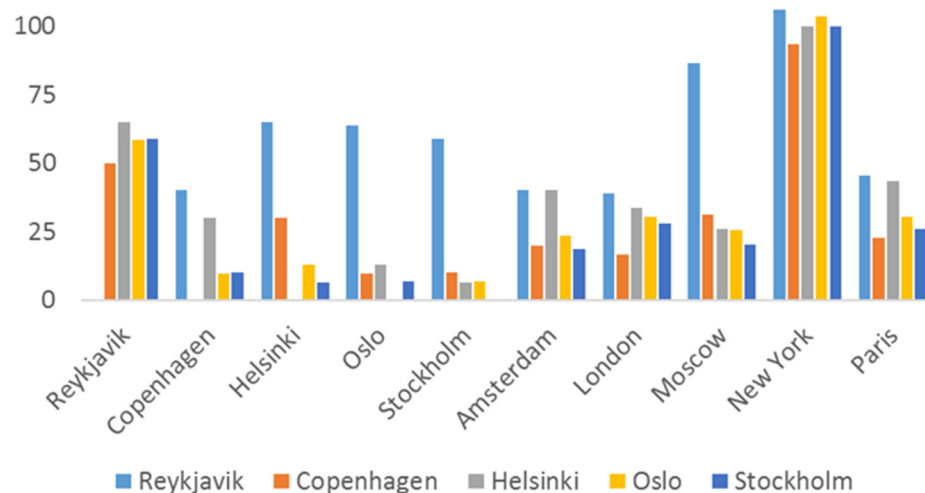
The Nordic region is well connected to the rest of Western Europe and North America with high-capacity redundant cables. Despite its remote location, Iceland is well connected. It connects to mainland Europe via Denmark and Scotland, and, unlike the other Nordic countries, direct to North America. The submarine optical cables connecting Iceland are:

- Farice-1 (11Tb/sec) to Dunnet Bay, Scotland
- Danice (34Tb/sec) to Blåbjerg, Denmark
- Greenland Connect (1.9Tb/sec) to Milton, Canada (this connection is being upgraded to 12.8Tb/sec).

Network latency — the time it takes for data to travel from one point to another — is important for the overall performance and user experience of an application. Latency is determined by the physical distance between two nodes, but also the type of connection, routing patterns, etc. The internal network structure, server and storage configurations, and application characteristics also have a significant influence on performance.

Figure 4 shows the latency between the Nordic capitals and selected cities. The latency is measured as minimum ping time measured hourly over a two-week period — the fastest round-trip time for messages sent from an originating host to a destination computer and echoed back to the source.

Figure 4
Minimum Ping Times (March 21 to April 4, 2017)



Source: IDC and Wondernetwork, 2017

When comparing latency for Amsterdam, London, New York and Paris, there are virtually no differences between Reykjavik and the other Nordic capitals. Iceland's remote location inherently has an impact on latency compared to that between the other Nordic capitals, but the latency is less than 50ms and for most applications this has little or no impact on the experience.

Applications like VoIP and video communication and gaming require low latency, but even for these, 100ms is considered imperceptible for a human being. However, some applications — such as trading applications in the financial sector — need real-time communications and every millisecond of latency is critical. Also, websites and ecommerce sites are sensitive to latency, especially if the sites are accessed by mobile devices, as WiFi or mobile carrier networks already introduce latency.

Most enterprise applications can easily be hosted in Iceland without latency problems, and there are even applications and workloads that are virtually immune to latency. This includes compute-intensive workloads like graphical rendering or advanced forecasting models.

Public organisations in particular are already taking advantage of this and have installed supercomputers in Iceland. This includes the Nordic research institutes' shared supercomputer "Garder" and the Danish Meteorological Institute's newest supercomputer. Both projects are driven by significant cost reductions, which allows the organisations to invest in much more powerful computers for the same budget.

Another key aspect of connectivity that is not directly related to the location but rather the individual colocation provider is dedicated connectivity to cloud and communication service providers.

Skills Availability

Whether an organisation decides to have its own personnel managing the infrastructure or rely on third-party services providers, it is essential that there is access to the skills needed.

Although Iceland has a small population, skills are generally available, as both the educational level and technology readiness are high. This is supported by several international assessment reports and indexes. For example, the ITU ranks Iceland second in the global ICT Development Index for 2017 — surpassed only by South Korea.

Risk Assessment

Overall, Iceland has a very low risk profile. This was highlighted in Cushman & Wakefield's 2016 Data Centre Risk Index, which compared 37 countries globally and named Iceland as the country with the lowest risk in terms of datacentre location.

As already emphasised, the power supply in Iceland is very dependable, electricity cost is very predictable and companies can engage in 15-year fixed-price contracts — significantly reducing risk related to long-term cost.

Specifically, for datacentre operations, IT security, privacy, data protection and compliance are very important. Though Iceland is not part of the European Union, it is part of EFTA and hence the European Economic Area and the European Single Market, as well as IT security regulations such as the GDPR (which comes into effect in May 2018).

Despite Iceland's location on the mid-Atlantic ridge and tectonic activity, the risk from significant earthquakes and volcanic disruptions is low. Iceland was recently assessed by the United Nations' World Risk Report as the sixth-safest country in the world in terms of natural disasters. The reasons are that it is well equipped to cope with natural disasters, buildings and infrastructure are designed to withstand some tremors, and most volcanic eruptions and earthquakes are small and happen in remote locations far away from Reykjavik, where datacentres are typically located.

Iceland made headlines in 2008–2009 when the economy collapsed. In subsequent years, the economy has recovered substantially, and while there is still a high government debt, the government budgets are healthy and the economic risk is generally considered low. Many international organisations mitigate the risk of currency fluctuations by signing contracts in euros instead of the Icelandic krona.

Although most infrastructure administration can be handled remotely, the datacentre must be accessible. Iceland is often perceived as very remote and difficult to reach. Flight times from other Nordic countries are only about three hours, however, and there are direct daily flights from most larger European cities. Reykjavik has the shortest flight time of any European city to North America, making Iceland an ideal location for organisations expanding from North America into Europe or from Europe into North America.

About Verne Global

Verne Global owns and operates a 44-acre datacentre campus near Keflavik, Iceland. As a strategic location between the world's two largest datacentre markets, Europe and North America, Verne Global is addressing two key issues facing today's data revolution — power pricing and availability. Verne Global offers datacentre decision makers an affordable, 100% carbon neutral power solution with a high level of pricing predictability, a range of server density options and efficiency without extra expense by using natural cooling.

The logo for Verne Global, consisting of the words "VERNE GLOBAL" in a bold, sans-serif font, enclosed within a thin black rectangular border.

The company's location, 100% renewable power consumption, the datacentre design and the customer focus make Verne Global an obvious choice for forward thinkers across the world's most advanced industries. More information at verneglobal.com.

IDC Nordic

Bredgade 23 A 3.
1260 Copenhagen K,
Denmark
45.39.16.2222
Twitter: @IDC
idc-community.com
www.idc.com

Copyright and Restrictions:

Any IDC information or reference to IDC that is to be used in advertising, press releases or promotional materials requires prior written approval from IDC. For permission requests contact the Custom Solutions information line at 508-988-7610 or permissions@idc.com. Translation and/or localisation of this document require an additional license from IDC. For more information on IDC visit www.idc.com. For more information on IDC Custom Solutions, visit http://www.idc.com/prodserv/custom_solutions/index.jsp.

Global Headquarters: 5 Speen Street Framingham, MA 01701
USA P.508.872.8200
F.508.935.4015 www.idc.com.

Copyright 2017 IDC.
Reproduction is forbidden unless authorised. All rights reserved.

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research and events company.