### EBOOK

# Intelligent Connectivity: 5G and Its Cross-industry Use Cases

An in-depth overview of the 5G technology from the perspective of telecommunication companies, and how it will be used in connection with IoT and AI across industries



### Content

Introduction	3	Intelligent Connectivity: 5G Converged with AI and IoT	18
Explaining 5G	4	Cross-Industry Use Cases of 5G, IoT, and AI	19
Advantages of 5G over Other Generations of Networks	6	Banking and Finance	20
5G Technology Specification Requirements	7	Manufacturing	20
5G Spectrum Assets and Their Possible Applications	9	Media and Entertainment	21
The SMARTER project	11	Smart Cities	21
Enhanced mobile broadband (eMBB)	11	Transportation and Logistics	22
Massive machine-type communications (mMTC) or massive IoT ecosystem —	11	Oil, Gas, and Utilities	22
Ultra-reliable and low latency communications (URLLC)	11	Agriculture	23
Advanced Telecom Network and 5G Market Opportunities	13	Construction	23
Things to Consider When Choosing a 5G Provider	14	Healthcare	23
How to Switch to 5G Seamlessly	16	Conclusions	24
Monetization Opportunities for Telcos	17	Reference List	25
New revenue streams	17	About Infopulse	26
Cost reduction	17		
Improved customer experience	17		

### Introduction

Fifth-generation connectivity has been a buzzword for quite some time now. However, 2019 became the first year when 5G finally started standing up to expectations. Moving from R&D laboratories to the real world, it changes the possibilities of networks and underlying IT systems to bring the notion of intelligent connectivity to life.

Telcos are looking forward to promoting the expansion of 5G since massive investments are required to implement this technology. <u>McKinsey estimates the total cost of the initial 5G installations from \$700 to \$900 billion</u>.

At this cost, 5G will cover 25% of the global population by 2030, and it will only be available in developed areas like the USA, China, Europe, the UAE.

Still, forecasts look very promising: the number of 5G users worldwide will increase from under 200 million in 2019 to about 1.02 billion in 2023. Surveys also <u>state that</u> people are willing to pay more for the early adoption of 5G.

A high-speed, low-latency 5G network, combined with artificial intelligence (AI), can power billions of connected devices via the Internet of Things (IoT). The revolution in connectivity enables transformative changes across industries: from transportation and entertainment to healthcare and public services.

But it is not only about bandwidth and low latency: 5G will power advanced automation, wider adoption of robotics, mixed reality, and so on.

Let's tap into the peculiarities of 5G, the changes it introduces to both providers and adopters, and use cases that emerge from the powerful symbiosis of 5G, AI, and IoT.



•

## Explaining 5G

Mobile devices, more than any other technology, have been changing our lives for almost four decades. From the first-generation networks that enabled basic communication capabilities through our favorite rugged Nokia 3310 with 2G, and up to the broadband Internet with unified networks and protocols, mobile technology has been affecting the pace of global digitalization.

1G was launched forty years ago, and **new generations of mobile communication networks have been introduced approximately every ten years since then**. 4G, which we widely use these days, was launched in 2009 and has been evolving to power a plethora of mobile apps and enhance user experience.

In June 2018, <u>Ooredoo Qatar became the first telco to offer 5G services</u>. Later that year, more companies in the USA, South Korea, Europe, and the Middle East followed the lead. By the Q3 of 2019, fifty mobile operators launched commercial 5G services across all continents. Currently, 5G covers home or mobile broadband and a range of specific enterprise services on limited markets.





![](_page_4_Picture_9.jpeg)

### Advantages of 5G over Other Generations of Networks

From the technological side, 5G brings the capacity of up to 10 Gbps, which is about **ten times more than 4G networks are capable of today**, and the latency around forty times lower than 4G. In addition to this, 5G comes along with the implementation of highly useful technologies like:

- network slicing
- edge computing
- software-defined networks (SDN)
- <u>network functions virtualization (NFV)</u>
- service-based architecture
- cloud radio access network (C-RAN).

All of them are necessary to address new service requirements and build an agile and reliable infrastructure for 5G.

Low latency, high throughput, and other performance improvements provide network efficiency that will reduce the cost of the mobile network. **Advanced 4G has around 40 milliseconds of latency, while 5G operates with 1-millisecond latency.** It means that mission-critical apps and IoT devices will be able to respond instantly.

![](_page_5_Picture_12.jpeg)

![](_page_5_Picture_13.jpeg)

As for the speed of 5G, it has an average of 130-240 Mbps, with a possible peak of 1-10 Gbps. 4G's averages are around 32.5 Mbps. To make these numbers more perceivable, imagine that you can **download a full-HD movie in 4 to 40 seconds with 5G**.

Due to high capacity and reduced latency, 5G can connect and "smartify" many devices, prompting new markets and offers and changing the competitive landscape throughout dozens of industries.

#### 8 specification requirements to implement 5G network

The capacity of up to 10 Gbps (for peak data rate: downlink 20 Gbps, uplink 10 Gbps)

1 ms latency (4 ms for eMBB, 1 ms for URLLC, single-user, small packets)

Maximum aggregated spectrum bandwidth (at least 100 MHz, up to 1 GHz in higher frequency bands)

Mobility of up to 500 km/h

#### ak 5G Technology Specification Requirements

To enable a 5G network, telcos have to invest in changing their technologies both on hardware and software levels. They have to meet eight essential specification requirements for 5G network:

![](_page_6_Figure_12.jpeg)

![](_page_6_Picture_13.jpeg)

/

Telcos have to deploy specific network architecture and underlying technologies to ensure the level of reliability and availability needed for 5G. For that, mobile network providers implement the following technologies:

- network protocol extensions with almost real-time packet failover
- SDN routing
- network virtualization and cloud
- application-aware network traffic slicing
- cell towers that provide spatial and frequency redundancy

Since eliminating outages and dropped links is critical (imagine a connected car lagging in heavy traffic), telcos manage challenges like these with beamforming, network fast-failover, SDN technologies, and wireless packet retransmission protocol features.

5G technology is powering mission-critical services, so ensuring highly available network architecture with redundancy incorporated into every component is a vital requirement for 5G providers.

![](_page_7_Picture_11.jpeg)

![](_page_7_Picture_13.jpeg)

### 5G Spectrum Assets and Their Possible Applications

To understand how 5G works, it's essential to unpuzzle the notions of spectrum and frequencies.

For example, mmWaves can carry loads of data, while radio waves in lower bands can carry less data but for wider coverage. Therefore, **telcos can use higher** Every part of a spectrum has a range of radio wave frequencies, called bands, frequencies for areas or services that require more data and opt for low-band ranging from 3 kHz to 300 GHz. frequencies when it comes to providing 5G access to multiple devices via one Some of these frequency bands can be used for 5G data. Different companies use tower.

different parts of the spectrum, as these parts vary in speed of connection and distance they can cover.

Since the spectrum and the use of frequencies is a critical matter, the rights to use specific frequencies are regulated by governmental bodies all over the world. Wavelengths in and around the part of the band 30-300 GHz are called Separate parts of the spectrum are assigned or sold to companies or entire "millimeter waves" (mmWaves) and are a popular choice for 5G. Also, a part of industries: some frequencies are allocated for defense purposes, others are the UHF band is used for 5G, with a **frequency range from 300 MHz to 3 GHz**. reserved for medical devices. Some telcos are testing 5G technology in new mid-bands of 3.5–6 GHz as well.

![](_page_8_Picture_6.jpeg)

Different parts of the 5G spectrum are used for various purposes. So, a widely harmonized spectrum is a must for the 5G potential to come true.

![](_page_9_Figure_1.jpeg)

![](_page_9_Picture_4.jpeg)

### The SMARTER project

<u>3GPP</u>, a global organization that unites seven telecommunications standard development organizations, defined **three primary use cases for 5G**. They are a part of the SMARTER project (Study on New Services and Markets Technology Enablers), launched in 2015 and aimed at defining high-level use cases for 5G, as well as pinpointing functionality needed to enable them. All the use cases fall under these categories:

#### Enhanced mobile broadband (eMBB)

Covers data-driven use cases where high data rates across vast coverage areas are required. If we look beyond fast video downloads, 5G eMBB will be used to enable AR/VR real-time capabilities throughout an urban environment.

To introduce eMBB, telcos are changing network architecture by deploying small cells instead of traditional homogenous macro-cell architectures that proved to be inefficient in dense urban environments.

#### Massive machine-type communications (mMTC) or massive IoT ecosystem

Covers the need to support a large number of devices in a small area. High scalability and low power consumption of 5G will be industrially applied for remote maintenance, smart grids management, connected homes, real-time traffic management in the cities, and so on.

IoT devices have a diverse set of communication requirements, so a single wireless communication protocol will not be viable. 5G standards need to include adaptable protocol methods, so that both low-power and low-data devices could use the same network technology as high-data-rate and low-latency autonomous vehicles, for instance.

#### Ultra-reliable and low latency communications (URLLC)

Covers mission-critical applications (remote surgery, autonomous vehicles) that require advanced security and 99.999% reliability, with 1 ms latency communications.

To ensure such a level of reliability, telcos need to change handset, base station, and networking. This includes new waveforms, low latency hardware, and alternative network architecture types.

Gigabytes in a second <u>∕\_</u>∂ □ Smart Home Building Voice Smart City Massive machine type communications <u>Source</u>

### Primary 5G use cases

![](_page_11_Figure_4.jpeg)

![](_page_11_Picture_5.jpeg)

## Advanced Telecom Network and 5G Market Opportunities

Since various frequencies serve different goals, service providers have to understand the particular concerns and objectives of industries and enterprises, as well as take into account local regulations. Not only that, but telcos have to ensure that new technology can seamlessly integrate with existing enterprise systems.

Service management is no less important. While 5G will become a critical part of enterprises' networks and enable multiple new applications, network management across underlying technologies will get much more complicated. Choosing a provider and a platform will be an essential task for businesses to ensure efficient use of resources.

![](_page_12_Picture_5.jpeg)

#### Things to Consider When Choosing a 5G Provider

Traditionally, cellular network services are offered by operators, but with 5G, new players are entering the market. Since 5G goes with the native support of SDN/NFV and the network slicing technology and enables service-based architecture, nontelco tech vendors can slice a piece of the 5G service pie.

Some of the top drivers of 5G market research are Samsung, Huawei, Nokia, ZTE, Ericsson, Orange, Qualcomm, Verizon, and AT&T. With 5G predicted to generate billions through unrealized revenue streams, it comes as no surprise that top telcos are ready to invest in the research and promotion of this tech.

In Europe, T-Mobile has a parent company, Deutsche Telekom, with a T-Systems division that offers IoT and cloud solutions. This way, they build a market But let us not forget that telcos are not the only drivers of 5G technology. There are also data center OEMs, 5G infrastructure chips providers, device manufacturers, monopoly that covers several needs of enterprises at once. modem/IP suppliers, and other companies interested in 5G development.

![](_page_13_Picture_5.jpeg)

#### To get the most for their money, **businesses will look for partnerships**, acquisitions, and signed agreements between telco service providers and tech companies.

For example, <u>T-Mobile U.S. Inc. and Sprint Corp. merged</u> in 2018 to provide a mix of consumer and enterprise 5G services. More than that, each of the two companies has a couple of signed partnerships and acquisitions (e.g., Hatch, TVision Home). As far as infrastructure is concerned, they partnered with Ericsson, Nokia, Intel, and Samsung to launch 5G pilots on different bands.

![](_page_13_Picture_10.jpeg)

![](_page_14_Figure_1.jpeg)

![](_page_14_Figure_2.jpeg)

![](_page_14_Figure_3.jpeg)

<u>Source</u>

![](_page_14_Picture_7.jpeg)

![](_page_15_Picture_1.jpeg)

#### How to Switch to 5G Seamlessly

5G is designed to co-exist with 4G LTE networks, so if you want to implement it without altering existing services, careful planning is required. On top of that, 5G can't be deployed without doing some background work beforehand. For this, you'll need a <u>reliable partner of telecom providers</u> who can support you at any stage of the 5G network adoption.

To support 5G-based use cases, <u>Ericsson defines the following technologies</u> that telcos need to have ready and working:

- multi-standard 2G, 3G, and 4G networks
- category M1 (Cat-M1) and/or Narrowband IoT (NB-IoT) LTE-based technology
- VNF adapted to cloud delivery, based on stateless microservices
- automated procedures to onboard SDN functions from multiple vendors
- Massive Multiple Input, Multiple Output (MIMO) multi-antenna transmission technology
- network slicing to enable virtual networks on a shared infrastructure
- dynamic service orchestration
- predictive analytics.

![](_page_15_Picture_15.jpeg)

These are the basic requirements, though <u>the complete 5G experience will need</u> an even broader list of technologies that will involve not only telcos but also governmental bodies, hardware and software providers. The critical thing for operators is to take these technology steps one by one, balancing between costefficiency, investments, new revenue streams, and competitiveness.

### Monetization Opportunities for Telcos

The adoption of 5G requires considerable investments, and companies are ready to contribute to higher network density, additional spectrum, and advanced equipment. They believe that new service offerings, use cases, and revenue opportunities created by the next-gen network will pay off their initial investments.

The focus shifts from end-users who pay for connectivity to businesses that provide 5G-based services to other companies or their customers. A new business model takes the stage: **business-to-business-to-X** (where X is anything from a public agency to end-user).

All in all, telcos focus on three ways to return their investments:

#### New revenue streams

Extreme mobile broadband and fixed wireless access will deliver fast highbandwidth service to both consumers and businesses. Use cases include everything from VR/AR gaming to remote healthcare services. Real-time communication will enable the advanced responsiveness needed for autonomous driving, remote surgery, and more. Massive machine-type communication will be leveraging high scalability and low power consumption of <u>5G-connected IoT devices</u> and power smart factories and homes, remote maintenance, etc.

#### Cost reduction

5G will provide a thousand times more capacity and a hundred times higher speed, which will significantly reduce the unit cost per gigabyte of data traffic. Also, with the wider adoption of 5G, it will be possible to provide automated services of network planning and operations.

#### Improved customer experience

Consumers are willing to pay for ultra-low latency and near real-time response. Calling, streaming, gaming, interaction with connected devices, and many more will create a superior customer experience in homes, offices, shops, public institutions, cars, and so on. Through utilizing network slicing, telcos will be able to offer different network characteristics for different applications.

Depending on their goals, companies choose to concentrate either on horizontal or vertical services, i.e., provide connectivity only or create integrated 5G solutions for their customers. From this perspective, they will build their B2B2X models, with strong partnerships across verticals.

![](_page_16_Picture_16.jpeg)

## Intelligent Connectivity: 5G Converged with AI and IoT

5G will be a driver for a powerful combination of AI and IoT that will <u>accelerate</u> <u>the digital transformation</u> of the enterprise, industrial, governmental, and consumer markets. With 5G penetrating more fields and covering broader areas, intelligent connectivity is not an exaggeration anymore.

## Intelligent connectivity explains how the interconnection of 5G, IoT, and AI can speed up digitalization and enable new revolutionary services.

Data collected by various IoT devices from sensors to machines is processed and analyzed by AI and then delivered to users in an understandable form. Without 5G, the concept of intelligent connectivity couldn't be brought to life: lightning-fast, low-latency connectivity has always been the missing element in the IoT-AI-consumer chain. Up until now, that is.

![](_page_17_Picture_7.jpeg)

![](_page_18_Picture_1.jpeg)

#### Cross-Industry Use Cases of 5G, IoT, and AI

For businesses, intelligent connectivity means a plethora of use cases united by several common characteristics:

- the processes can be run remotely, even the critical ones;
- there's real-time control over processes and the possibility of immediate reaction;
- automation is powered by real-time data generation and analysis;
- edge computing is used where it's efficient;
- advanced level of security does not alter the performance.

While some use cases are still years ahead, others are being implemented right now. During 2018 and 2019, companies from different industries <u>carried 5G trials</u> all over the world: Huawei in Spain, Mobileye in Israel, Rakuten Mobile Network in Japan. The trials demonstrated the capabilities of the **5G technology to** support V2X networks, serve as a basis for "mobility-as-a-service" offering, maintain the work of delivery robots, optimize the functioning of assembly lines, and many more. Various industries find specific ways to apply 5G for optimizing their processes and creating new offerings.

![](_page_18_Picture_12.jpeg)

![](_page_18_Figure_13.jpeg)

#### Banking and Finance

Wearables are already becoming a popular tool for banking operations, but IoT adoption within the financial industry will experience a dramatic boost with 5G. Financial institutions will also be <u>relying more on AI</u> when it comes to customer services. We can expect the growing popularity of digital wallets, with cashless payments becoming the top choice among consumers.

Expensive purchases or applying for credit will become easier as well. With the help of multiple connected devices and AI-based analytical tools, financial institutions like ZestFinance (LA) or Scienaptic Systems (NYC) are able to provide credit scoring in record time. Additionally, 5G will endorse biometric security procedures and reduce the number of frauds. Stock market analysis can also reach unprecedented efficiency with advanced ML algorithms powered by big data and 5G, proves Kai Score, an AI-based stock ranker from Kavout.

#### Manufacturing

With 5G in the center of digital transformation, <u>AI and agile infrastructure</u> will be the key components of smart manufacturing.

Higher bandwidth and lower latency open the doors to wider adoption of robotics, big data analytics, AR/VR technology in design and engineering. This concerns not only the manufacturing process but also advanced support and personnel training. HD AR/VR requires about 100 Mbps to work smoothly, and

![](_page_19_Picture_11.jpeg)

![](_page_19_Picture_12.jpeg)

<u>some market leaders</u> like the logistics company DHL and the equipment developer Gabler are already deploying this technology for remote maintenance and employee training.

Besides this, 5G is empowering factory automation and industrial robots, bringing the reality of <u>Industry 4.0</u> closer.

#### Media and Entertainment

With digital advances, consumer expectations are rapidly growing as well. What's more, users are ready to pay for new and immersive media experiences **powered by 5G**. Live streaming, AR/VR-enhanced gaming, 360-degree videos from live events can be enabled by the cameras and drones connected to the nextgeneration network. In September 2019, <u>Huawei</u> showcased how the powerful combination of 5G, VR, and 8K video streaming can create immersive experiences.

The high bandwidth of 5G can wirelessly connect cameras across the city Telcos see the entertainment industry as the key business case for 5G shortand empower drones, building intelligent surveillance and security systems, term since it's easier to satisfy customer needs at the current stage of technology improving the work of emergency services, and border control. Sensors across development. While it will take some time to enhance factories to make them the city will also enable <u>V2X (vehicle-to-everything) communication</u>, bringing smart, superior experience in live streaming, video watching, and gaming is closer the concept of a driverless future. already here.

#### **Smart Cities**

The confluence of 5G, IoT, and advanced analytics will revolutionize city management, minimize operational costs, and increase public safety:

- traffic management systems,
- smart lighting,
- waste management,
- remote surveillance, and so on
- Smart buildings and smart parking are already implemented in cities like Los Angeles to improve efficiency and reduce energy bills. For example, <u>Coretrust</u> **<u>Capital Partners</u>** leverages 5G to make its LA tower into a smart building.

#### Transportation and Logistics

Being one of the early adopters of innovation, the automotive industry is wellprepared for 5G. AI-based driver assistance systems are already out there, waiting for better connectivity and an IoT-empowered urban infrastructure.

Intelligent connectivity leads to self-driving vehicles, increased level of safety on the roads, and efficiency in managing traffic flows. Driverless cars managed by AI will be delivering goods to remote regions, and <u>self-driving taxis</u>, like Google's Waymo, will be serving communities when cities are ready to support such levels of autonomy.

#### Oil, Gas, and Utilities

The utility industry is one of the fields that can benefit from the connection of 5G and IoT the most. Connected devices will empower energy monitoring and

![](_page_21_Picture_6.jpeg)

forecasting within <u>smart grids</u>. With the help of AI-based solutions and IoT networks, utility companies will be able to balance energy loads, even out the effects of electricity peaks, and manage energy demand efficiently. As for the oil and gas industry, currently, exploration relies on satellite communication, which is very expensive and provides voice connection only.

Infrastructure Networks, a US-based telco, is developing the first 5G-enabled drilling site, aiming to provide data services to two large-scale projects in the Permian Basin. This is going to be the first commercial use of 5G in the oil field.

5G will bring dramatic cost savings, the possibility to transfer large data sets, and video and Internet connectivity with increased range, even for offshore explorations.

#### Agriculture

From covering remote rural areas to monitoring the health and behavior of livestock via sensors, 5G is bringing new capabilities to agriculture and farming. Automation is another critical matter in this field since the growing global population demands more food, grown on less land.

Autonomous vehicles, drones to monitor crops, soil sensors, and automatic fertilizers are already being applied in the field. A <u>fully automated farm</u> – a joint venture by Harper Adams University in England and a farming company in York, produced crops without a single person stepping on the field.

**5G-powered smart farming uses data analytics and IoT** to make informed decisions on water management, livestock control, crop health sustention, etc., and the number of use cases will grow as the technology matures. Vertical farms are predicted to be the first adopters of 5G technology in agriculture. Construction

#### Construction

The industry is leveraging IoT devices for equipment tracking, predictive maintenance, quality monitoring, and so on. With 5G, remote construction sites will be covered by a cost-efficient and multi-functional network.

Since project delivery depends greatly on the effectiveness of data collection and analysis, intelligent connectivity will boost performance in the industry.

## Use cases include surveillance, hazard prediction, supply chain improvement, real-time monitoring, automation, and many more.

<u>Doosan</u> was the first equipment manufacturer to use 5G to control its 40-tonne crawler excavator remotely. The capability was demonstrated at the Bauma 2019 exhibition in Munich, Germany.

The global aim of 5G in construction is to build a connected, collaborative <u>BIM</u> (Building Information Modeling) model by applying AI, big data, VR/AR, and IoT devices like drones and sensors.

#### Healthcare

In the Austin Cancer Center, <u>5G from AT&T is enabling fast diagnosis</u> of patients right now. **Better input, real-time patient data management via multiple wearables, AR/VR, and 3D video are next to come.** Transferring large medical images will also be no problem with 5G. Improved educational practice and even robotic telesurgery are other use cases that will be possible with URLLC connectivity.

![](_page_22_Picture_15.jpeg)

![](_page_23_Picture_0.jpeg)

### Conclusions

As <u>5G will be the driver of changes</u> across multiple industries, telcos are looking forward to partnering with hardware and software vendors to provide allencompassing service offerings to businesses.

Transportation, construction, agriculture, and oil and gas are some of the industries that have a robust infrastructure and well-developed strategies to empower the convergence of 5G, AI, and IoT. Autonomous vehicles, smart factories and cities, remote diagnostics and telesurgery are only a few years away, and all this will become possible thanks to 5G.

The team of Infopulse experts will gladly consult you on all 5G network-related practices aimed at transforming your business. We can also assist you with the gradual transition from 4G network infrastructure to 5G having a good command of its critical technologies and the required procedures.

*Learn more about <u>Infopulse Telecom expertise</u>.* 

![](_page_24_Picture_0.jpeg)

### Reference List

https://www.prnewswire.com/news-releases/global-5g-ai-data-analytics-and-iotconvergence-industry-report-2020-2025---some-of-the-largest-market-opportunitieswill-be-aiot-market-data-as-a-service-300998640.html

https://www.ericsson.com/en/networks/trending/hot-topics/5g-spectrum-strategies-features-all-bands

https://www.forbes.com/sites/bobodonnell/2019/10/24/the-5g-landscape-part-2spectrum-and-devices/#364bbb0b51b8

https://www.gsma.com/iot/news/intelligent-connectivity-5g-ai-iot/

https://www.mckinsey.com/industries/technology-media-and-telecommunications/or insights/connected-world-an-evolution-in-connectivity-beyond-the-5G-revolution

https://venturebeat.com/2019/10/25/a-quick-5g-guide-separating-reality-from-hype/

https://inform.tmforum.org/insights/2020/01/unlocking-the-value-of-5g-for-consumer

https://www.ooredoo.qa/portal/OoredooQatar/supernet

	https://www.twi-global.com/technical-knowledge/faqs/what-is-5g
-	https://www.etsi.org/technologies/5g?jjj=1582713144198
<u>-to-</u>	https://www.a10networks.com/blog/5g-network-reliability-explained/
	https://www.3gpp.org/
	https://www.5gamericas.org/wp-content/uploads/2019/07/5G_Americas_URLLLC_ White_Paper_FinalupdateJW.pdf
<u>)ur-</u>	https://www.forbes.com/sites/moorinsights/2019/07/19/who-is-really-leading-in-mobil 5g-part-4-infrastructure-equipment-providers/#1b1c81eb9130
	https://www.greyb.com/companies-working-on-5g-technology/
<u>rs/</u>	https://www.ericsson.com/4a5daa/assets/local/networks/documents/5g-deployment- considerations.pdf

<u>le-</u>

\_\_\_\_

#### Contact us:

![](_page_25_Picture_2.jpeg)

#### Alla Oliinyk

Engagement Manager, Telecom Practice

- +380 (44) 585 25 00
- ► Alla.Oliinyk@infopulse.com
- UA: +38 044 585 25 00
  DE: +49 3222 109 52 35
  UK: +44 8455 280 080
  USA: +1 888 339 75 56
- ≥ info@infopulse.com

#### Follow us:

![](_page_25_Picture_10.jpeg)

#### www.infopulse.com

### About Infopulse

Infopulse, part of the leading Nordic digital services company TietoEVRY, is an international vendor of services in the areas of Software R&D, Application Management, Cloud & IT Operations, and Cybersecurity to SMEs and Fortune 100 companies across the globe. Founded in 1991,

![](_page_25_Picture_14.jpeg)

the company has a team of over 2,000 professionals and is represented in 7 countries across Europe and North America. Infopulse is a Global Outsourcing 100® company recognized by IAOP®.

![](_page_25_Picture_17.jpeg)