



NOKIA



smartcity
wrocław

Wrocław, Poland's thousand-year-old city of the future

Smart city innovations
to make historic city
more vibrant, livable
and sustainable

Wrocław, Poland, is a major center of learning and innovation as well as an important cultural hub in Eastern Europe. Home to an impressive assemblage of historical landmarks and a UNESCO World Heritage Site, Wrocław is an attractive tourist destination, with a rich and complex history going back more than a thousand years.

While embracing and celebrating its past, the city is also very clearly focused on its future. An intellectual powerhouse boasting a student population of more than 130,000 and serving as home to the world-renowned University of Wrocław, the city has produced 9 Nobel Prize laureates, contributing to its reputation as one of the smartest cities in Europe.

A significant digital transformation

In a move that's likely to cement this reputation, the city has embarked on a significant digital transformation of a range of essential public services across the spectrum of civic engagement. The city is using advanced networking technologies and innovative municipal and citizen applications, to create a dynamic city platform that makes the services they offer residents and businesses more effective, efficient and responsive to better address their unique needs.

At the heart of this transformation is a state-of-the-art 'smart city' platform designed to digitalize and enhance all municipal services and more effectively support both mission- and business-critical applications. Ultimately, the city is looking to more effectively deliver connected care for aging citizens, introduce smarter public transport to enhance mobility, and bolster the city's ability to prevent and respond to crises, while supporting more robust sustainability, education and economic development efforts.

Driven by Wrocław's visionary leadership and municipal government, this initiative also draws on an expansive ecosystem of businesses – both global and local – as well as a vibrant entrepreneurial community that has grown up around the University of Wrocław and associated institutions. As Poland's second largest business center, Wrocław hosts R&D and manufacturing operations for many multi-national companies in industries including transportation, consumer appliances, chemicals, electronics, pharmaceuticals and more. It also features a fast-developing high-tech community incorporating both established companies and start-ups.

“When I think about the objectives and challenges ahead of us, I truly believe it is technology that will help us overcome our challenges and find the right solutions... Now we are creating a real strategy and a platform that will help us build out that long-term strategy.”

**Jakub Mazur, Vice President,
City of Wrocław**

Challenges

- Adjust to a demographic imbalance between a growing, aging population and a shrinking percentage of younger workers, a common dynamic in developed countries
- Entice graduates from the city's prestigious universities to remain in Wrocław to pursue their careers and build their lives and families
- Develop a world class urban transport system that reduces traffic congestion, pollution and associated carbon footprint
- Keep ahead of a fast-evolving and increasingly complex global security environment with emerging, non-traditional threats including cyber-crime and terrorism
- Strengthen coordination between 'knowledge economy' contributors, such as universities, research institutions, and entrepreneurs and local and global companies
- Build on promising, relatively untapped opportunities for small and medium enterprises, and local traditional artisans
- Adapt to the the impact of climate change while contributing to the city environment sustainability plan

The solution

- 'City as a Platform' strategy to rapidly introduce new 'citizen-centric' services and applications using a common, high-performance infrastructure and unified, real-time visibility and management of all smart city assets and services
- Common Internet of Things (IoT) device, application and data management software to support multiple government departments and use cases simultaneously
- A 'connected care' system to better support 'aging in place' and improve access to healthcare services and other basic needs for all citizens

- A modernized, intelligent transportation system (ITS) that facilitates the efficient movement of people and goods while reducing congestion, pollution and carbon footprint
- Enhanced emergency response capabilities and stronger coordination between traditionally independent agencies
- A rich, tightly coupled ecosystem of educational institutions, start-ups, multinational and regional corporations and social entrepreneurs to propagate knowledge and securely share data

Benefits

- Improves access to existing services and supports rapid design and delivery of new services based on citizen needs
- Enhances government efficiency and increases overall responsiveness to the demands and expectations of city residents
- Provides a 'single pane of glass' view of the performance of Wrocław smart city applications and operations, and eliminates cumbersome multi-vendor, point-to-point integration
- Utilizes common enablers and analytics across applications and departments, simplifying application management and increasing efficiency
- Delivers local and real-time applications at the edge using multi-access edge computing (MEC) to provide improved performance and responsiveness
- Combines data sovereignty with flexible compute and storage to create more tailored services while maintaining data privacy and security
- Provides an ideal environment for 'bottom-up' innovation, collaboration and information and resource sharing across government agencies, educational institutions and local enterprises

A city that 'works' for all of its citizens

Like many cities around the world, Wrocław is in the midst of a major demographic shift. Wrocław's overall population is aging. At the same time there is a relative reduction in the number of younger people entering the workforce. The natural result is fewer people contributing to the tax base, and a reduced pool of care-givers to look after the needs of aging residents. This dynamic is certain to place an added burden on local institutions, particularly in terms of health, wellness and mobility services.

At the same time, in comparison to cities of similar size, Wrocław is a relatively young city, due in large part to its out-sized student population. But like many university towns, following graduation many students leave to seek their fortunes elsewhere. To help counter this trend, the city is seeking to build a dynamic economy that can help it retain graduates and attract other young professionals to further contribute to the vibrancy of the community, and improve the overall livability for all residents.

Wrocław has some fundamental strengths in this area upon which it can build, including a relatively robust economy, a growing traditional arts community, as well as renowned entertainment and tourism centers.

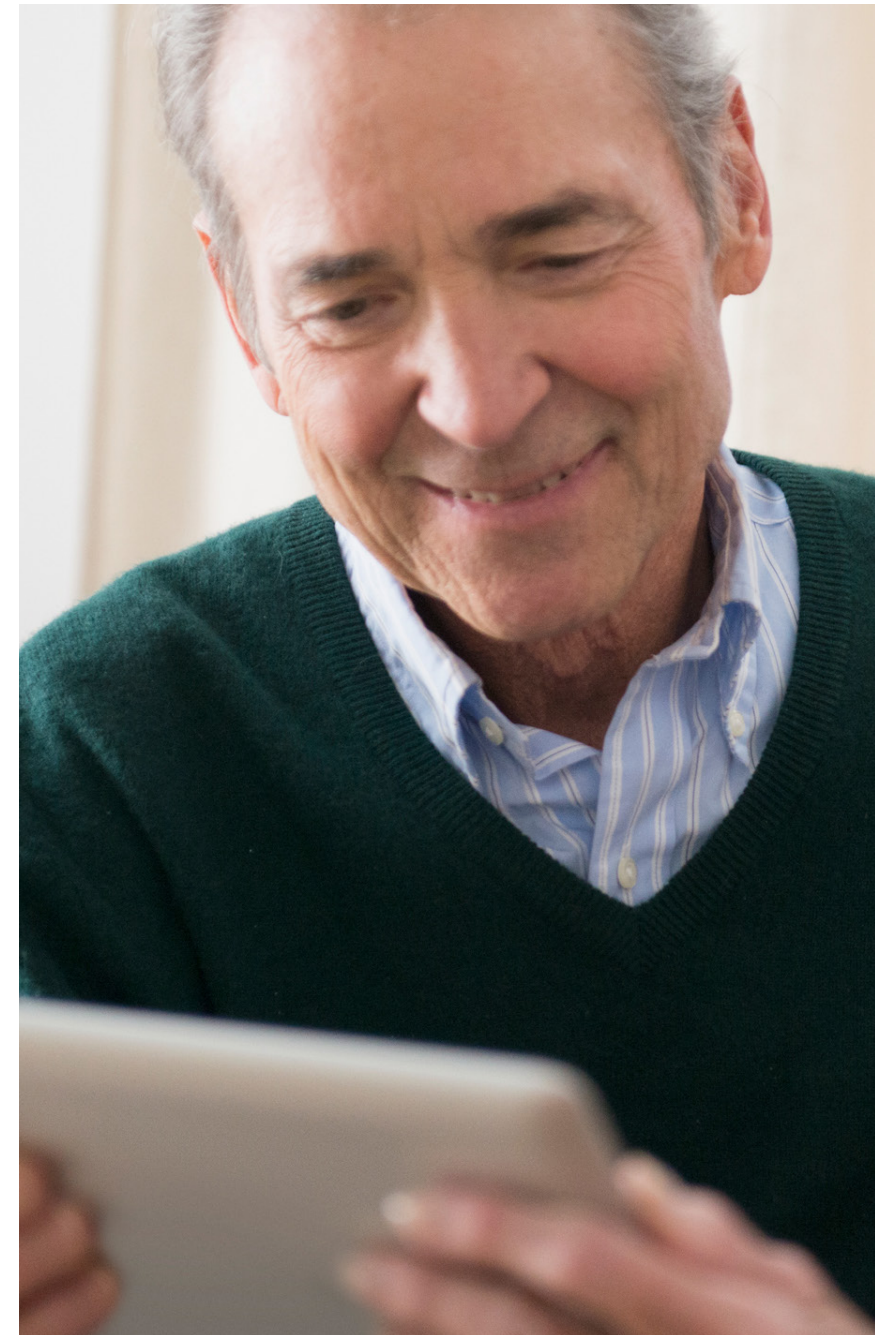
The city is looking to leverage these strengths and use technology to build stronger interconnections so they can deliver public services that are more tailored to the needs of citizens and the distinct culture of their city. In short, build 'citizen-centric' services.

"We strive to ensure, that the implementation of modern technologies results in a fast, efficient and truly effective change of the current situation... We base our activities on the needs of our residents. They determine the areas in which we are compelled to act. They also point us towards the areas of most urgent need."

Jakub Mazur, Vice President, City of Wrocław

What does this look like, in practice?

Imagine solutions that can enable older city residents to age in place gracefully, ideally in their own homes, with easy access to fundamental healthcare, wellness and social services. To make this possible, Wrocław is working to establish a network of home health workers and telemedicine resources to address basic, day-to-day medical needs. They are introducing drop-in or daycare centers for vibrant social engagement activities and general well-being check-ins, coupled with longer-term residential treatment for those in need of more involved medical care and/or hands-on support.



Getting around

Wrocław recognizes the need for a smart public transit system that provides convenient transportation for all city residents, including more supportive options for older adults. Such a system could also help to reduce traffic congestion throughout the city, minimize fuel consumption and emissions, reducing the city's overall carbon footprint and making all city operations more sustainable.

Smart, dynamic infrastructure of this kind requires resources, and so a strong economic foundation is a must-have for any smart city. As the leading industrial and business center in the region, Wrocław has many of the pieces in place to foster a thriving knowledge economy, including the presence of a notable number of large domestic and international companies, a promising community of small- and medium-sized businesses and a growing cadre of traditional artisans that help maintain the local character and culture of the region.

Growing from within

Wrocław is also host to a substantial emerging start-up scene, built largely around the city's educational institutions and drawing on growing entrepreneurial momentum. For the regional economy to truly prosper, however, the city needs a way to more effectively orchestrate and manage these somewhat disparate efforts to create a more harmonious collaborative environment.

The city seeks to tie together educational institutions, government agencies and businesses to promote knowledge sharing, provide a framework for governance of data access across institutions that can create opportunities for connected learning, all while preserving residents' privacy and security.

Security and safety in the digital age

The most critical responsibility of any government is to look after the safety and security of its citizens. As non-traditional threats such as terrorism and cyberattacks come to dominate the threat landscape, Wrocław needs a platform that allows it to enhance its situational awareness and response capabilities to account for these new dangers and mitigate them more quickly.

Wrocław is looking to enhance its security and crisis management (SCM) systems, to better address today's security environment. Among the city's priorities is upgrading public safety video and audio monitoring systems used to follow activity in public spaces, and expand the use of video analytics capabilities to more effectively identify unusual events that may demand further attention. In addition, the public safety alert systems can be fully integrated with other infrastructure such as monitoring systems to speed response and address disruptive events. Efforts to capture, aggregate and analyze data from the growing number of IoT devices and sensors in the city, which track things such as water levels in flood-prone areas, is also an important priority.

The city also seeks to establish more seamless communication and collaboration between different government departments, particularly when it comes to responding to emergencies and addressing critical public safety challenges.

Finally information security and data privacy technologies and processes also have an important role in protecting the sensitive data (city and individual citizen) that will be generated by new digital services.



Wrocław and Nokia – committed to success

Nokia has a significant presence in Poland, and a strong commitment to Wrocław, where the company and its employees are important participants in the local high-tech economy. Wrocław is an important telecommunications R&D hub for Nokia's latest 5G technologies, and is also host to Nokia's European Software and Engineering lab, which can emulate a huge variety of networking environments for the testing of a wide range of applications and devices. Together, the city and Nokia's R&D teams have already implemented smaller-scale, proof-of-concept city projects in areas including transportation infrastructure, connected bus shelters and more.

Nokia brings Wrocław a legacy of long-standing commercial relationships with regional communications service providers, government agencies and large enterprises throughout Poland. Nokia also collaborates closely with Polish universities, implementing joint innovation projects and recruiting local interns and university graduates.

“We believe that we are simply a city that wants to be smart and that we have shown a unique determination to collaborate with Nokia. This works because Nokia also has very strong links to our city, and this cooperation can only have a positive result for both parties involved.”

Jakub Mazur, Vice President, City of Wrocław

The city as a platform approach

Through engagements with many cities in the midst of their smart city transformations, Nokia has observed that in order to capture the full benefits of these initiatives, these cities need to move beyond point deployments of individual services and applications to a more connected, cohesive approach. The city as a platform strategy employs proven technologies like 5G, Industrial IoT (IIoT), analytics and machine learning to enable the creation of intelligent and integrated city platforms that can support the introduction of a variety of applications, use cases and business models, leading to true city innovation.

As important, Nokia's City as a Platform strategy is based on an open, standards-based approach known as the [Future X for Smart Cities architecture](#), which enables the easy integration of best-in-class partners across the broad range of technologies, services and applications. This helps ensure that the city can establish an ecosystem of global collaborators and local partners best qualified to address their unique requirements. It also offers a modular, smart city approach that will enable Wrocław to develop and test out an initial set of high-priority use cases, and then introduce new services or capabilities gradually as circumstances demand, and resources allow.

“Our collaboration with the city of Wrocław will create a platform to drive inspirational new services and really improve the lives of the citizens of this city.”

Chris Johnson, President, Global Enterprise, Nokia

Digital value platforms, data and the IoT

Critical to any smart city project is the ability to bring all the essential elements together in a harmonious whole. Much of the initial activity around Wrocław's smart city evolution is in the consulting and services realm. Nokia's Global Services organization brings a wealth of knowledge and hard-won experience to the challenge of designing, engineering, integrating and managing all aspects of the project.

From a technology standpoint, one of the central elements of Wrocław's smart city initiative is the implementation of Nokia's Integrated Operations Center (IOC). The Nokia IOC provides a unified, real-time view into, and management of, all smart city assets and services. This will provide the foundation for the coordination of data and delivery of services to city residents, initially in the area of connected care for the elderly and disabled.

Because of the variety of devices, information and applications required to make smart city services a reality, Nokia will also provide common Internet of Things (IoT) device, application and data management



“What Nokia brings fundamentally is the city as a platform, which is the architecture and the components with the core being the connectivity platform, along with added elements like ‘automated intelligence’ which covers the analytics, the integrated operations center that provides a way of presenting data and the ability to connect IOT devices. It also includes the fiber and other optical elements that allow us to connect government infrastructures and transfer information,”

Suparno Banerjee,
Head of Public Sector, Nokia.

software. This will support multiple city departments and agencies simultaneously and enable integration across services and devices from third parties, such as home monitoring systems and remote health technologies including diagnostic appliances and bio-metric sensors. With best-in-class data ingestion, analytics, governance systems and processes, critical data can be made available to the authorized organizations, while ensuring its integrity and privacy.

High performance network foundation

As the city moves toward even more sophisticated, high-bandwidth, low-latency services, Nokia can provide the needed infrastructure to support truly high-performance networking, from FTTx and 5G access equipment for blazingly fast broadband services, to MEC platforms that enable real-time compute and data access closer to where citizens and businesses will use it for optimal application performance.

Welcome to Wrocław, the city of the future

One key benefit of the city as a platform approach is that it will simplify management of smart city applications and operations by offering a 'single pane of glass' view of service performance. Traditionally, networking equipment and software products each had their management systems which needed to be monitored independently. By bringing all elements under a single management system and dashboard, it becomes possible to eliminate many of the challenges associated with complex, multi-vendor deployments.

This common platform approach also extends to sharing data and applications across agencies, departments and third-party partners. Providing a consistent set of enablers and analytics tools increases operational efficiency and supports more seamless collaboration.

Another strength of Nokia's city as a platform approach is its ability to ensure that data sovereignty, security and privacy is respected, while still taking advantage of a cloud architecture to support the data sharing, flexible compute and storage needed to create more tailored, responsive services.

The Future X for Smart Cities architecture also offers advantages over more proprietary strategies. Because it is based on clear industry standards, it is easier to integrate new networking capabilities and/or capacity to scale the system to accommodate new applications or use cases. Similarly, its modular design supports the rapid introduction of capabilities such as MEC to strengthen the delivery of local and real-time applications at the edge. It also integrates connectivity through owned assets or third parties, such as local communications service providers, all of which serve to provide improved performance and responsiveness.

Ultimately, Wrocław will offer an ideal environment for 'bottom-up' innovation through collaboration and information and resource sharing across government agencies, educational institutions, industries and enterprises of all kinds.

["Here in Wrocław we have an inspirational mayor and his team that are really focused on how they want to plan out the next 5, 10 even 20 years into the future to really develop Wrocław as one of the most advanced cities in the world," Johnson added.](#)



Wrocław's vision for connected care

Wrocław faces a challenge that is increasingly common in most of the developed world. As improved nutrition, medical care and other advancements have extended the average life-span of city residents, slowing population growth is creating an imbalance. There are more aging adults requiring some level of support in their later years, and fewer people to provide those needed services. Additionally, the increasing costs associated with delivering 'traditional' care services to more and more people will become untenable over time.

In Wrocław today, numerous elderly and individuals with mobility challenges are being cared for in their homes, but with little or no broadband connectivity in their residences. This means opportunities for telemedicine are limited. There are day care centers in operation, providing on-site care for aging adults and disabled citizens, but capacity is limited, and these centers lack capabilities for any remote medical intervention or provision of wellness content or services. For those with more intensive nursing or support needs, the city has a central care facility, but again capacity is limited and already under pressure from increasing demand.

Each of these facilities operates essentially independently, and with no direct links to the other components of this care ecosystem. Even transportation presents a significant bottleneck to service; getting people to and from these centers presents a daunting challenge that will only grow as the population ages.

As a result, Wrocław needs to move toward a completely transformed model for care for their aging and disabled citizens who require support. What the city envisions is a continuum of connected care services, whether in-home, at a day care center or within the city's central care facility.

A critical first step toward this vision is to bring broadband connectivity to the home, ideally through a direct fiber connection, but potentially utilizing other FTTx schemes or even 5G for last-mile links. This will allow the placement of medical and other wellness devices at home, especially for higher risk individuals. This connectivity can then be used for more foundational programs for wellness and engagement, such as running interactive programs to gauge and improve mental acuity in those suffering from dementia.

Similarly, high-bandwidth connections can be created between homes and day care centers, enabling more frequent monitoring and check-ins to reduce isolation, more effectively coordinate care and transport, and provide telemedicine services. This will make it easier to share limited care practitioners and resources.

Finally, strong digital links can be established between the central care facility, which has the highest concentration of qualified care givers, and the homes of high-risk and high-need individuals, to enable more effective and comfortable in-home care, relieving pressure on the central care facility, where residential capacity is overburdened.

Surrounding this connected network of facilities- and home-based care would be an ecosystem of providers, from Wrocław community health programs, specialized mobility and transportation services, volunteer organizations, educational institutions and family care givers, all linked securely through a common system that can gather, compile and share critical data as needed according to pre-defined privacy and governance rules and processes.

Ultimately, the goal is to establish a system that can deliver in-home support services, coordination and scheduling of healthcare and adjacent on-site services, with tight links to the more acute-care resources available in the city. Ideally, these services can adapt to the unique needs of the recipient as their situation changes over time.

Employing the city as a platform approach, this elderly and disabled care infrastructure can become a foundation on which new services can be introduced, leveraging the innovation capacity of local industry, universities, start-ups and citizens and community groups.

For more on Nokia solutions for smart cities, please visit:
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As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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