Delivering intelligent, connected healthcare
A new model for healthcare

With aging populations, pressure to reduce costs and more informed and demanding patients, healthcare organizations are facing multiple challenges. Digital technologies present new opportunities and solutions such as finding operational efficiencies through automation of tasks and improving patient outcomes with predictive diagnostics. Advances in medical sensors are opening the possibility of remote monitoring. Shared access to medical records between healthcare services holds the promise of more informed decisions by clinicians. Digital technology, cloud and healthcare networks are transforming the healthcare organization into one that is more aware, collaborative and patient-centric.

All of this signals a small revolution in healthcare using technology to provide more precise, effective care for patients, while advancing management and operations with greater situational awareness and intelligence. At the heart of this intelligent, connected healthcare model is an intelligent high-performing network that can move everything from sensor data to large 2D and 3D medical imaging files. It needs to provide private cloud capabilities for data, as well as distributed low-latency edge clouds to support such innovative technologies as remote and robot-assisted surgeries. Analytics and machine learning provide real-time information to improve operational performance, diagnostics and augmented decision making by personnel. This intelligent, connected infrastructure will allow hospitals, clinics and partner organizations to collaborate, share and innovate to deliver tomorrow’s healthcare.

Nokia and healthcare

Nokia is a global leader innovating the technologies at the heart of our connected world. We understand that smart, dynamic networks will be the foundation for improving health and creating better care for everyone. The Nokia Bell Labs Future X architecture provides a connected, digital platform that supports and fosters new applications and services for improved diagnostics, more efficient operations, and more accessible, higher quality care.

Building this dynamic, connected platform is essential to fully developing the potential of digital technologies for better healthcare. We call this the Future X architecture for intelligent, connected healthcare. We are committed to helping our healthcare partners in their digital transformation and, in this way, realize a more secure, sustainable and effective healthcare system for all.
Healthcare challenges and opportunities

The number of older persons, worldwide, is growing faster than the population increases of any other age group. Largely due to improvements in healthcare, it is ironically putting more demand on our healthcare systems as chronic conditions, more typical of the elderly, now account for a disproportionate 75 percent of US healthcare spending.

At the same time, patients are becoming increasingly informed and are demanding care services that are more value-based and consultative. Patient-centric care requires greater integration and transparency between healthcare deliverers, but has been shown to improve outcomes. Personalized care plans, health coaching and patient education are new but effective roles for care providers and have proven effective at engaging patients in their own care.

Operationally, manual processes still largely characterize many healthcare facilities, which generally lag behind other industries in implementing productivity-enhancing IT. As with other industries, digital transformation of workflows and the automation of many operational processes can lower costs and improve the efficiency of personnel. Today nurses and care team members spend close to half their time away from patients taking care of operational tasks that could be reduced with an aware and adaptive IT infrastructure, workflow redesign and automation.

Digitalization is also affecting treatment and care management. Telemedicine is opening up the field of remote care, especially for the management of chronic conditions. Advances in medical sensors offer the possibility of remote patient monitoring (RPM) with smart wearables and embedded sensors in artificial hips and knees, pacemakers and hearing aids.

Advanced analytics and machine-learning programs, embedded in decision-support software, can be employed to augment physician care with data-driven insights from sensors, gene sequencing and digital diagnostic procedures. Correlations can be drawn and tested against the data from thousands of patients to predict and diagnose disease with a high degree of accuracy, often over 90 percent.

Globally healthcare IoT to reach $410 billion by 2022.¹

50% of caregiver time spent away from patients doing routine tasks

¹ Grand View Research, IoT Healthcare market report, May 2016
Unfortunately, the assembly of relevant data for a patient can be difficult. Trapped in data silos, there is a need for a community healthcare data and analytics architecture to support clinically integrated networks (CINs). This will not only make possible a 360° view of the patient but, as well, provide broad access to patient data and historical information while managing the delicate issues around transparency, security and patient rights.

Although currently lagging other industries in the adoption of digital technologies, healthcare is poised for change. It will result in more personalized, valued care by increasing the time caregivers spend with on-site patients, while involving many patients in their own home care using remote monitoring to ensure they are supported. Networks will have to securely handle multiple health teams, locations, devices and the massive volumes of health data, including medical imaging and genome sequences.

At the heart of this intelligent, connected healthcare model, analytics and machine learning will provide predictive and real-time information to improve performance and augment the decision making of medical personnel.

At the University of Michigan, the shift from paper to electronic health records reduces the cost of outpatient care by 3%. These researchers estimated this as $5.14 in savings per patient each month.¹

Healthcare data is expected to grow from 153 exabytes in 2013 to 2,314 exabytes by 2020.²
Real-time healthcare systems are complex with multiple sub-systems: electronic records and imaging, management of IoT sensors and devices, as well as non-medical IT systems. Most of these applications have requirements for network connectivity, data storage and processing, as well as analytics and machine learning. The Nokia Future X architecture for healthcare is to provide an intelligent, dynamic communications and cloud-based infrastructure at its foundation, with an upper layer to handle digital operations, device management and cognitive analytics, which can be exposed as a rights-managed, secure platform for all applications and services to leverage where appropriate.

At the deepest level of the Future X architecture lies a dedicated high-performance network, both wireless and wired, making every kind of communication and information exchange possible. Built with a dynamic mesh fabric around a highly scalable IP/optical core, it uses wired or wireless access to connect with people, sensors, machines, video monitors and
remote devices, all securely and with the highest reliability.

Cloud technology is essential to the Future X architecture, ensuring the flexibility, scalability and universal availability of both data and intelligence. Placed throughout the network fabric, local and distributed edge clouds ensure the ultra-low latencies required for critical machine communications such as remote and robotic surgery. Cloud-native, software-defined networks dynamically allocate capacity when and wherever it’s needed — whether to support data transfers of multiple genome sequences, medical imaging files, or batch analytics processing.

Built into the Future X architecture are data processing capabilities and analytics, including machine learning and artificial intelligence systems. These ensure that, out of the ocean of data from patients, connected agencies and partners, remote devices and sensors, relevant and actionable insights can enable better diagnoses, treatments and outcomes. Analytics, operational systems and device management provide an open, digital value platform that can be harnessed by any kind of medical application.

At Nokia, we believe this Future X architecture will help healthcare players to launch their digital transformation, creating new levels of intelligence, responsiveness and efficiency. With it, they will better be able to address their many challenges and provide better healthcare to us all.

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Use cases for healthcare:

Networks for real-time healthcare systems (RTHS)
The RTHS is a new technical and operational model that requires healthcare organizations to connect and communicate more effectively. It relies on aware and adaptive technologies that use real-time information to transform care delivery. It can sense the need for change and adjust processes and treatments, provide patient monitoring, streamline workflows and accelerate innovation.

A traditional IT architecture can mean that information is scattered across multiple data repositories, in multiple data centers, with networks that make it difficult to gather, analyze and provide valuable insights for patient care. The Nokia Future X architecture is ideal for RTHS networks going above and beyond the typical network by providing optimal security, reliability, resiliency and scalability.

The internet of medical things (IoMT)
The IoMT is providing patients and care providers with a multitude of ways to deploy and monitor health management processes inside and outside of the healthcare system. But with this expansion in devices and sensors, healthcare providers need to manage these devices, collect data securely and respect patient privacy.

The Nokia Intelligent Management Platform for All Connected Things (IMPACT) platform handles every aspect of machine-to-machine (M2M) connections – data collection, event processing, device management, data contextualization, data analytics, end-to-end security and applications enablement – for any device, any protocol and across any application.

“The IoMT might be the silver bullet for our communities to address a burdened healthcare system that will only be under more stress as our population continues to age.”
- Forbes

1 Source: Bernard Marr, Contributor, “Why The Internet Of Medical Things (IoMT) Will Start To Transform Healthcare In 2018” Forbes, Jan 25, 2018
UPMC, a $19 billion world-renowned non-profit health care provider and insurer based in Pittsburgh, PA, began the evolution of its technology systems transformation to support electronic health records, high-resolution digital imaging and telemedicine. One of its goals was to upgrade newly acquired health systems and hospitals to UPMC-grade clinical workflows. To extend their network infrastructure, applications, and digital tools they turned to Nokia, which also connected its data centers and created a private cloud.

Adopting a private cloud infrastructure leveraging software-defined networking and virtualized network services, UPMC delivers IT as a service from its data center to hospitals within the network, whether they are in New York, Maryland, Pennsylvania or overseas. They store and share more than 3 million digital images each year. Automation now enables rapid provisioning and application deployment, while the network’s MPLS control plane segregates and manages voice, video, and data services. This allows for prioritization and independent handling of sensitive data like payment card and patient information traffic.

UPMC’s network has also allowed the health system to delve into the IoMT, bringing a wider array of connected devices and sensors into its network. These include wearables that monitor patients after outpatient procedures. UPMC has also been able to deploy video services for telemedicine, reducing patient and physician travel between sites.

“Our network is the most critical, most important layer of our technology. It's how we share, communicate, and collaborate. We needed high availability, resilience, and reliability—collaborating with Nokia enabled UPMC to deliver on these goals, furthering patient care.”

Chris Carmody, Senior Vice President of Infrastructure, UPMC
As a leader in healthcare IT, we believe that the Future X architecture is the best starting point for achieving intelligent and connected customer-focused healthcare. Nokia is well placed to support healthcare deliverers with more than 20 years of experience in the sector and the most complete portfolio of products and services to support your digital transformation and delivery of real-time care.

Complementing our full portfolio of healthcare solutions, Nokia also contributes its professional services to help you leverage your technology platforms for significant transformation and growth. Bell Labs Consulting will help you with planning for the future and understanding the business case benefits of new technologies using a structured methodology for establishing quantifiable outcomes for your healthcare system.

networks.nokia.com/industries/healthcare
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We create the technology to connect the world. Powered by the research and innovation of Nokia Bell Labs, we serve communications service providers, governments, large enterprises and consumers, with the industry’s most complete, end-to-end portfolio of products, services and licensing.

From the enabling infrastructure for 5G and the Internet of Things, to emerging applications in virtual reality and digital health, we are shaping the future of technology to transform the human experience.

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