

# INTERNET OF THINKING

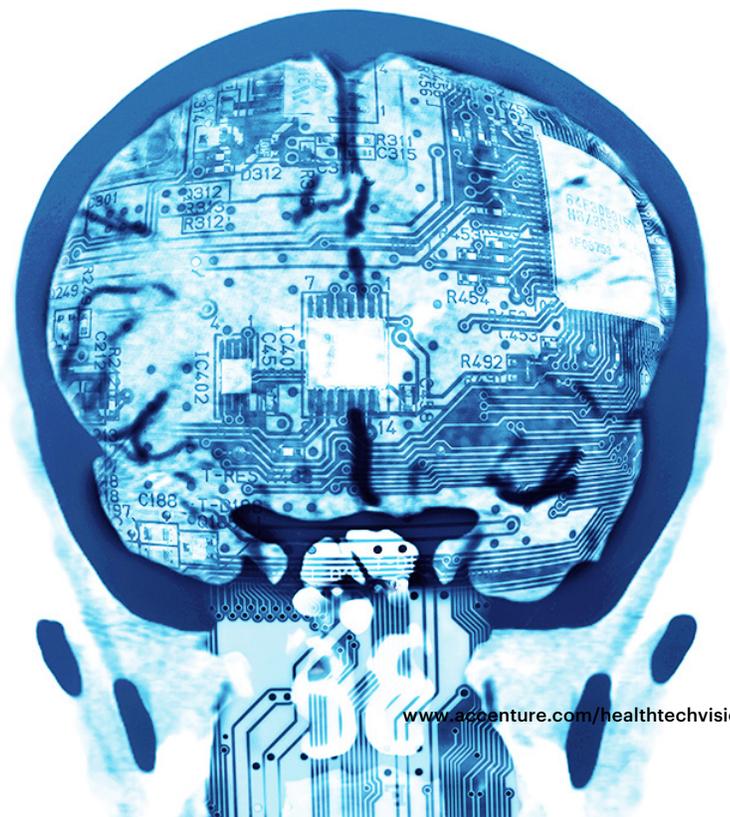
## Creating Intelligent Distributed Systems

**From ICU hospital rooms that automatically manage patient fluids, to self-maintaining equipment, more healthcare organizations are developing intelligent environments that include a mix of robotics, extended reality, artificial intelligence and connected devices.**

However, the technical infrastructure to support this new hyperconnected environment has not evolved at the same pace.

The enterprise infrastructures that are common today in healthcare aren't built to support the instant insights and actions needed to create intelligent solutions at scale. Current infrastructures are designed around a few basic assumptions: there is enough bandwidth to support any remote application, there is infinite

storage available in the cloud and hardware will continue to have enough computing power. But the demand for immediate response times—especially in healthcare's physical world—defies this approach.



## Companies can no longer make the same assumptions around bandwidth, remote storage and compute.

BANDWIDTH	STORAGE	COMPUTE
<p><b>Assumption:</b> AI techniques will be the primary method of significant discoveries in life sciences.</p> <p><b>Reality:</b> As companies depend on more, and larger, amounts of data, bandwidth is becoming a hard limit, particularly while waiting for 5G.</p>	<p><b>Assumption:</b> The cloud provides unlimited, cheap storage.</p> <p><b>Reality:</b> Storing data is cheap, but creating it is even cheaper. An autonomous car is expected to create 3.6TB of data for every hour of driving, or 1 GB per second.</p>	<p><b>Assumption:</b> Hardware will continue to get increasingly more powerful.</p> <p><b>Reality:</b> Shrinking transistors are reaching physical limits. Performance is still increasing, but how companies achieve it is changing.</p>

The future demands an overhaul of existing infrastructures. To overcome the challenges, healthcare organizations can pursue three strategies: embed intelligent tools everywhere, balance the cloud versus the edge and leverage custom hardware. Reimagining enterprise infrastructure unleashes new opportunities for healthcare organizations willing to see “the edge” as a strategic asset in delivering intelligent environments. Embedding a business into the surrounding world begins with an IT architecture transformation—building the capabilities to power intelligent actions everywhere.

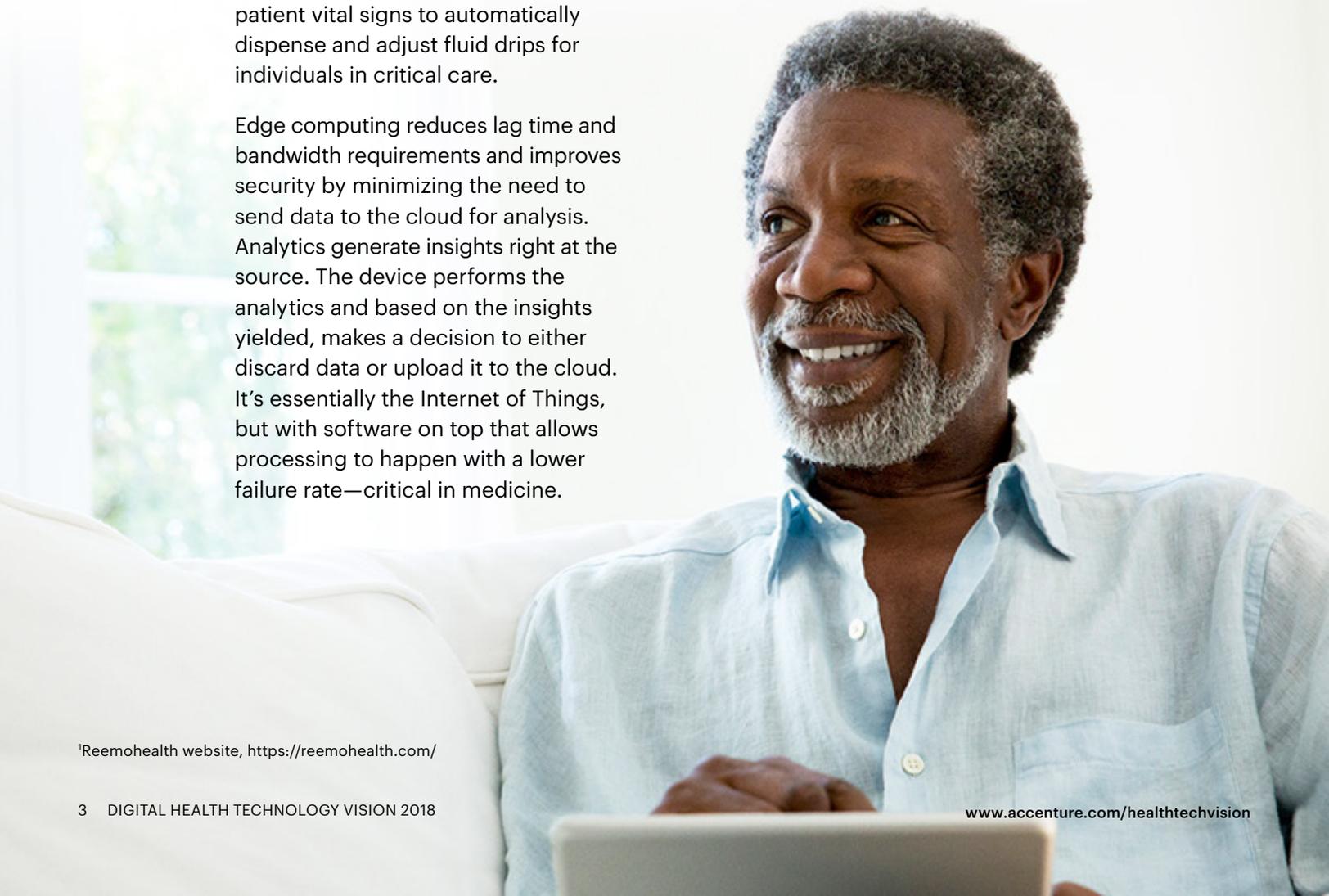
## Healthcare on the edge

To deliver intelligence everywhere, healthcare organizations must be able to analyze and act on data where it is generated. There isn't time to wait for connectivity or the cloud—decisions must be made in an instant. This means bringing processing to the edge. Many health executives (82 percent) agree that edge architecture will speed the maturity of many technologies.

Edge solutions process and store data “nearby” on devices. For instance, [Autonomous Healthcare](#) (formerly AreteX Systems) uses machine learning tools housed on medical equipment and devices to monitor patient vital signs to automatically dispense and adjust fluid drips for individuals in critical care.

Edge computing reduces lag time and bandwidth requirements and improves security by minimizing the need to send data to the cloud for analysis. Analytics generate insights right at the source. The device performs the analytics and based on the insights yielded, makes a decision to either discard data or upload it to the cloud. It's essentially the Internet of Things, but with software on top that allows processing to happen with a lower failure rate—critical in medicine.

Consider the impact the edge can have on improving quality of life and independence for the elderly. Connected homes with smart sensors, coupled with wearable technology for health monitoring, can perform passive sensing and active coaching. For instance, an [Alexa-like device](#)<sup>1</sup> could alert a patient of an elevated heart rate (detected on a wearable) and advise them to sit down and rest. In more acute cases, the technology would alert a caretaker or healthcare provider to intervene. The technology is liberating for the patient, and potentially lifesaving.



<sup>1</sup>Reemohealth website, <https://reemohealth.com/>

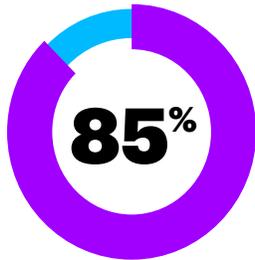
## Getting to the edge

Digital and physical worlds continue to blur in healthcare, emphasizing the need for a stronger, more flexible backbone: extended infrastructure. Extending does not mean ripping and replacing. Moreover, it's adapting the infrastructure so that healthcare businesses can seize the full potential of AI, robotics and other emerging technologies without overburdening bandwidth.

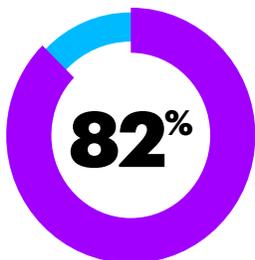
Improvements in processing power and energy efficiency at the edge make instant actions possible, which

can save lives in healthcare. The edge allows organizations to implement the technologies they want and need because they have the right level of processing power on hand.

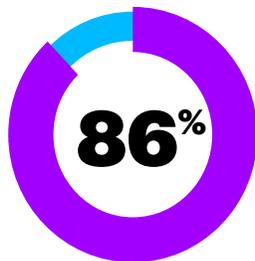
In the next wave of healthcare innovation, the edge will become a critical part of infrastructure. Companies must determine what should be processed and stored at the edge. Businesses will find their unique balance for dividing processing tasks among the cloud and the edge, and everywhere in between.



**85%** of health executives agree that generating real-time insights from the volumes of data expected in the future will require computing at the edge, where data is generated.



**82%** of health executives agree that to support real-time insights and actions, organizations need a renewed focus on custom hardware and hardware accelerators.



**86%** of health executives agree that enterprises must balance cloud and edge computing to maximize technology infrastructure agility and enable intelligence everywhere.

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# INFORMATION AND ACTION IN AN INSTANT

**Imagine a seizure patient with an implanted device that does real-time analytics on her brainwaves, monitoring for unusual activity.**

Within milliseconds of sensing the beginning of a seizure, the device delivers pulses designed to stop it—without needing to consult an external system about what it should do, or waiting for any input from the patient. In fact, the patient doesn't even know it's happening. All of the action happens on the device itself. This isn't a hypothetical scenario, but a real treatment option in use today. After [NeuroPace's](#) neurostimulation device is surgically implanted in a patient's skull, it invisibly and autonomously monitors for and prevents seizures, [reducing incidence by 44 percent after just the first year.](#)<sup>2</sup> This real-time management of a critical medical condition is an example of what's possible with intelligent environments: combinations of real-time sensing and computing that deliver instant action.

## More on this topic

[Invest Today to Grow Tomorrow: Accenture 2017 Internet of Health Things Survey](#)

[Healthcare's Future Arrives Early at HealthTech Innovation Challenge](#)

[Perspectives: In Hot Pursuit of Innovation](#)

<sup>2</sup>"Epilepsy Breakthrough: Silicon Valley Firm's Implant Helps Stop Brain Seizures," Mercury News, April 10, 2017

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## FOR MORE INFORMATION



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