

Secure healthcare via Cloud Computing: a case study

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Impact of Brain Illness on People

The three most burdensome neurological disorders in the US are **stroke, dementia, and migraine**

Worldwide, stroke is the
the
#1 cause of life-long disability
#2 cause of death

Stroke survival is dependent on time to treatment. Median time between symptom onset and start of treatment is
4.5 hours

Every hour of delay results in
11 months of healthy life lost
Victims of a stroke have a
30% probability of a second stroke

NovaSignal: Transforming Brain Health

Our mission is to
become the
5th vital sign

NovaSignal's AI-driven
platform is
**transforming the
way brain illness
is diagnosed**

We are building
the
**world's largest
collection of cerebral
blood flow data**



Stroke

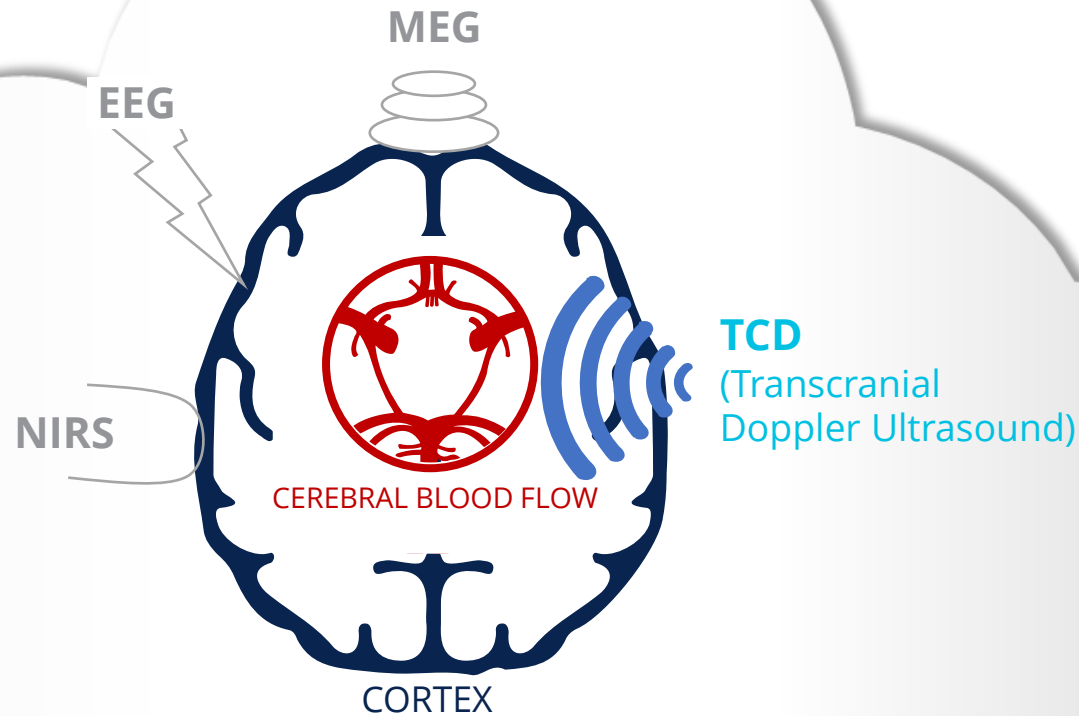
Traumatic
Brain
Injury

Dementia

Migraine

Parkinson's

NovaSignal: Democratizing TCD



Stroke is an interruption of blood flow to the brain.

The only technology capable of measuring blood flow in the brain is TCD.

NovaSignal has autonomized TCD through robotics, AI, and cloud computing.

NovaGuide is a robotic, AI-driven TCD system

that uniquely penetrates the skull to access cerebral blood flow through the arteries of the brain.

NIRS, EEG, and other technologies are limited to changes on the surface of the brain.

Cloud Computing according to NIST

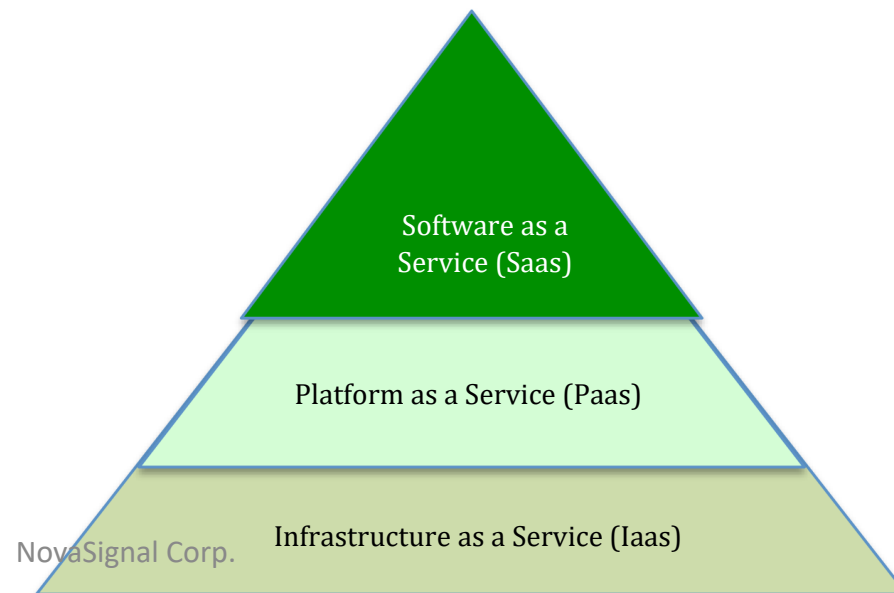
Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”

Type of Cloud Services:₁

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

Type of Clouds:

- Public
- Private
- Hybrid

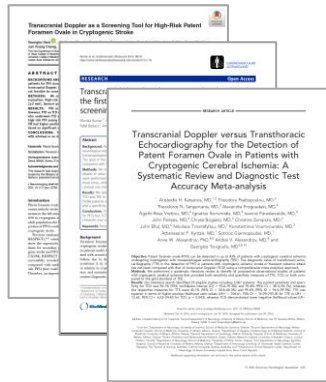


The NovaSignal Platform

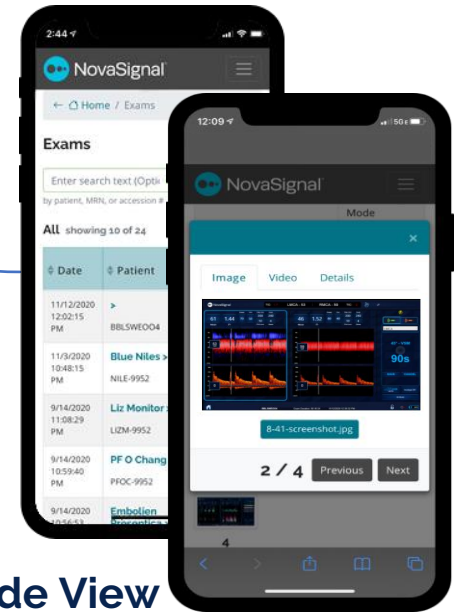
The only accurate, low-cost, portable and non-invasive solution for the diagnosis of stroke.
NovaSignal enables all hospitals and clinics to rapidly and accurately diagnosis stroke and other neurological illnesses.



NovaGuide
collects cerebral
blood flow data

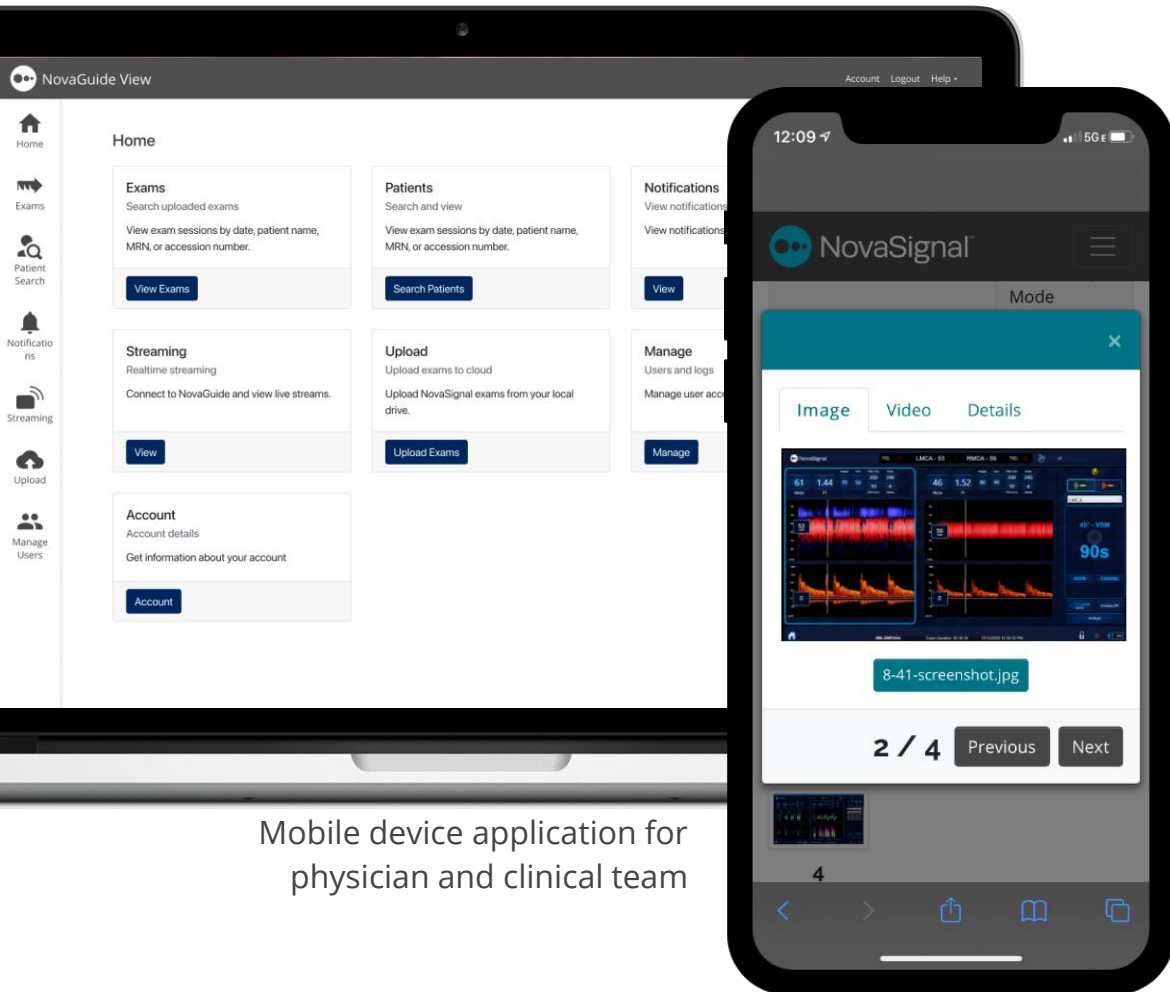


Evidence
for diagnosis of
vasospasm, shunting in
the heart and lungs, and
presence of emboli



NovaGuide View
provides access to
patient assessment
anywhere, anytime

NovaGuide View: Diagnostics, Clinician Alert & Predictive Insights



Mobile device application for physician and clinical team

Features:

1. Data is extracted from the NovaGuide and delivered remotely in real-time
2. Data is stored in the hospital's secure private cloud
3. Data is combined with NovaSignal's proprietary dataset for predictive analytics
4. Notification is sent real-time to clinical team for rapid response
5. Exam report pushed to the physician for EMR submission

Critical Services and Value Delivered:

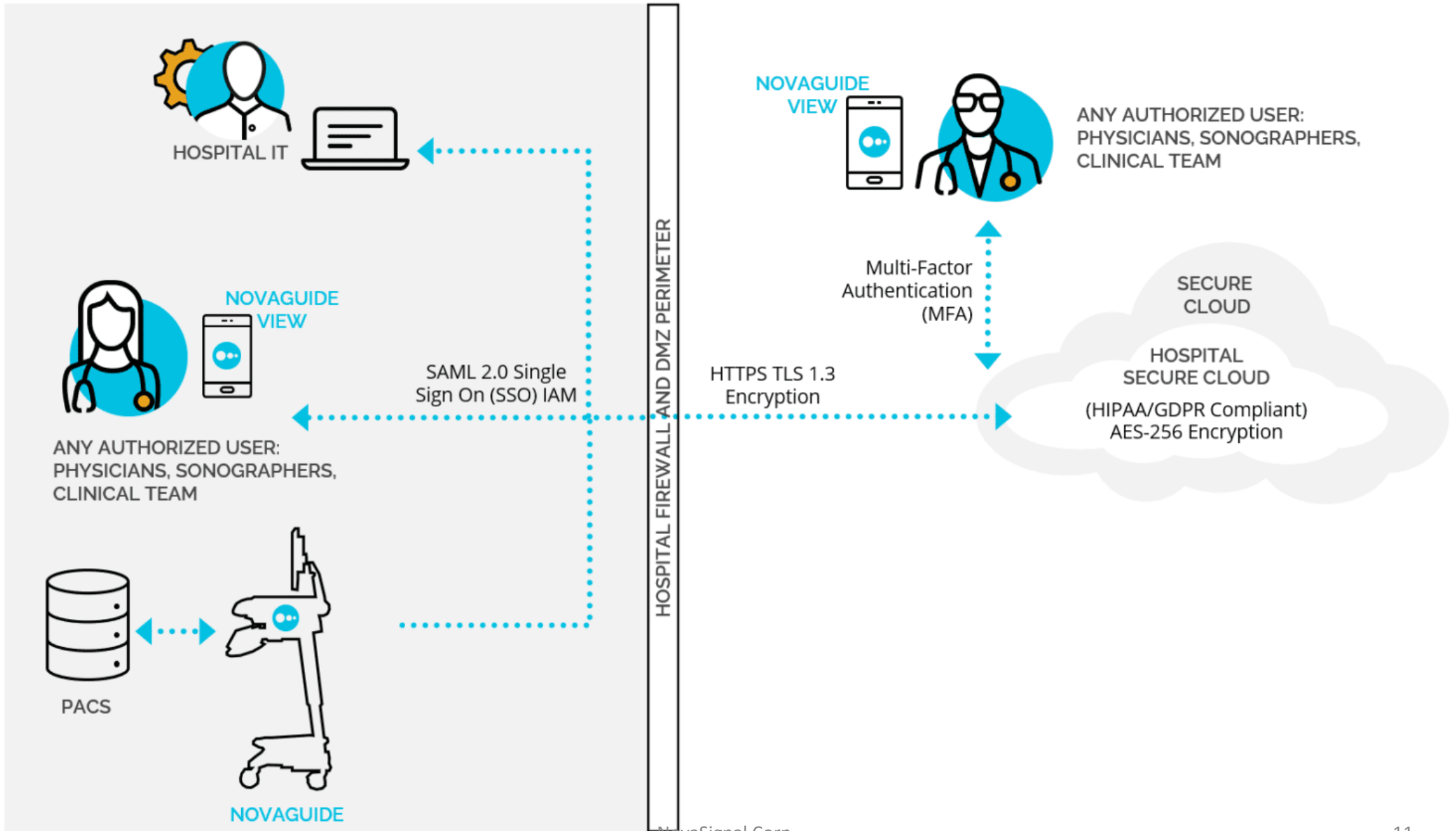
- Remote access to full audio and video exam files for diagnosis
- Real-time remote monitoring in Neuro-ICU and OR by extended clinical team
- Tele-Medicine service, addressing expert shortage
- Patient retention across the hospital network through remotely shared resources and experts
- Patient's clinical progress trended through data analytics

Security Considerations for Edge Computing

1. Identity Authentication
2. Access Authorization (Different for different roles)
3. Denial of Service Attacks (Uptime and Availability)
4. Data Theft (Confidentiality)
5. Data Integrity and Falsification
6. Invasion of Privacy (HIPPA Compliance for medical data)
7. Activity Monitoring (Logging for audits)

End-to-End Security and Compliance Controls

Certification	NovaGuide View's Private Cloud network invokes SOC2 Type 2 compliant services https://cloud.google.com/security/compliance/soc-2 https://cloud.google.com/security/compliance
Encryption	RSA 2048-asymmetric keys for signature and verification
Transportation	HTTPS using TLS v1.3
Authentication	Username and password using Google, Microsoft Azure, or application-specific single sign-on
Authorization	Hospital IT management provides specific upload/list/read/delete permissions to individual user accounts
Logging	User access is monitored and recorded in HIPAA-compliant logs, which are saved for 7 years
Residuals	Cookies are not stored by NovaGuide View on any local viewing device
Pen testing	Only authorized NovaGuide devices can upload an exam; full stack, end-to-end pen testing is performed to prevent man-in-the-middle attack



Summary

- As world's population lives longer, brain health becomes more vital
- Need new solutions to assess brain disease and democratize them
- Secure Cloud is needed to make access anytime, anywhere possible
- NovaSignal has implemented an end-to-end secure solution in Cloud