SIEMENS Healthineers

Trendy vývoje digitální radiografie a systémů PACS v lékařství

Přehled technických novinek z pohledu společnosti Siemens

ČVUT FBMI, Kladno 2022

Roman Hanus

25.11.2022

Trochu historie…

1970s – Plain Film

https://images.app.goo.gl/LDGdGPqJftHPyq8H6

2000s - PACS

2004 - PACS
https://pubs.rsna.org/doi/10.1148/rg.242035089

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Trochu historie… Siemens

PACS

MagicStore

SUN Fire V 440
OS Solaris

NAS Plasmon
Deep archive

Diag. prac. stanice

MagicView 1000

SUN Blade 2000
OS Solaris

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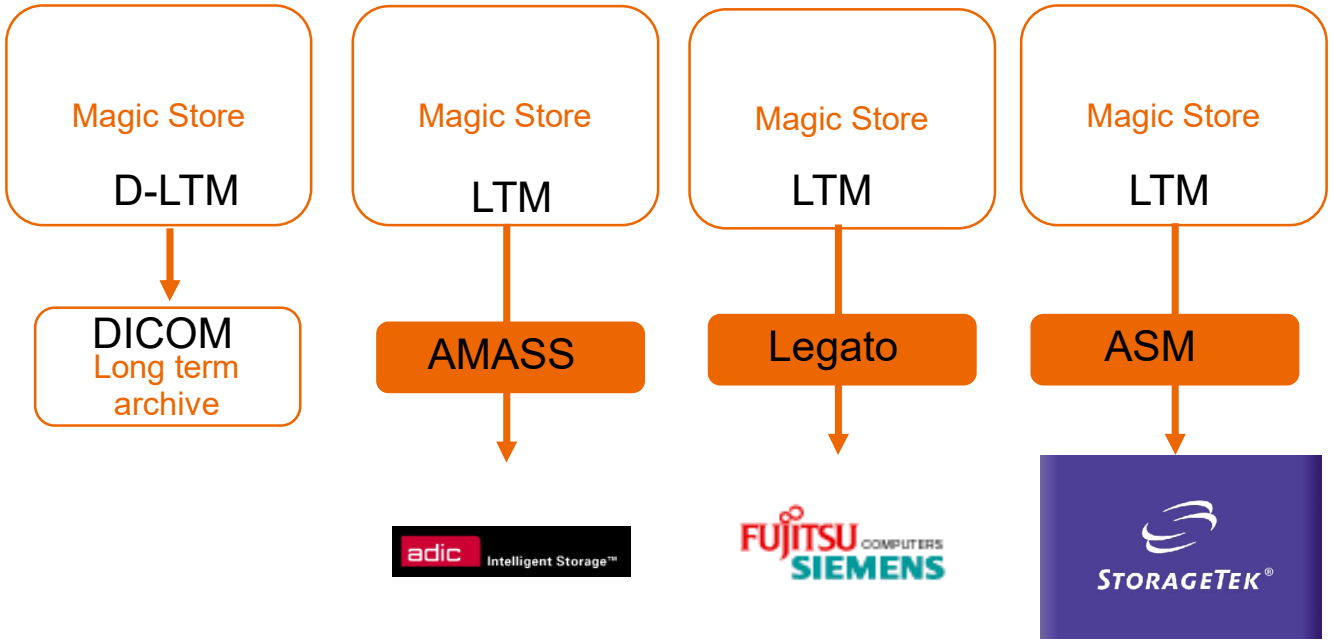
Postupný přechod k diskovým polím…

SIENET MagicStore V50
advanced long term archiving
flexible concepts



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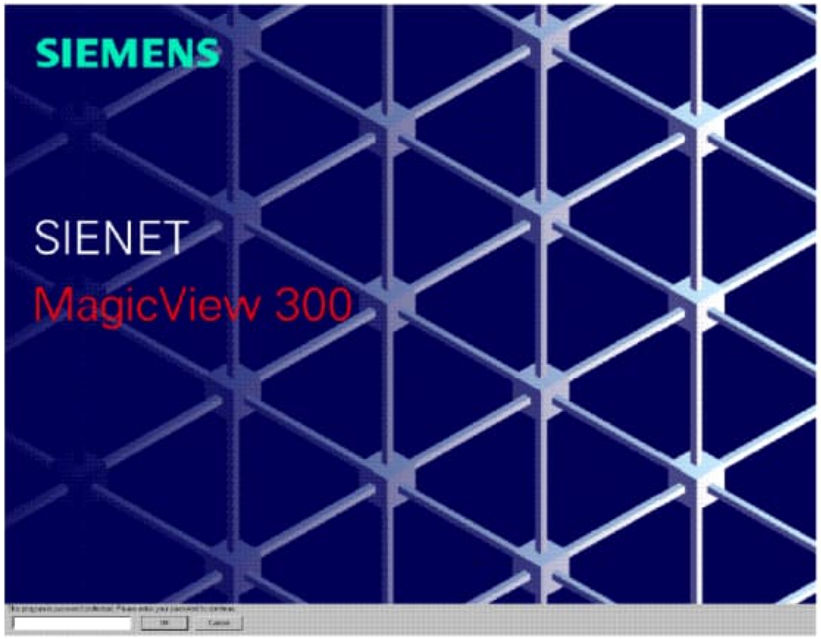
S postupným přechodem na OS Windows (jednotlivé verze) následují samostatné diagnostické pracovní stanice…

MV50 → MV300 (WinNT / XP) → Sienet Sky → Syngo.plaza (Win7 / 10) – vždy samostatná DB



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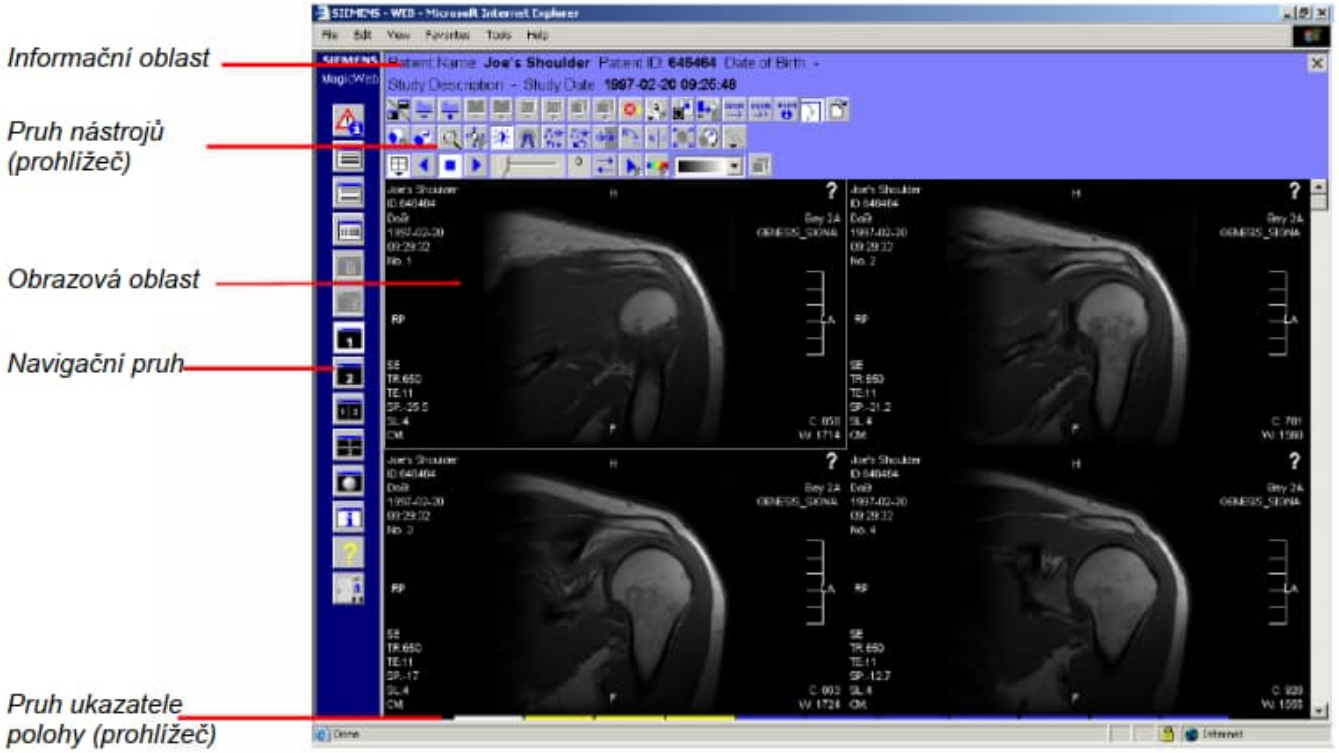
Jak zpřístupnit náhled na radiologické snímky jednotlivým klinikům?

MagicWeb (Visage Imaging)



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PACS pro kardiologii

Acom.net → syngo.Dynamics

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Reading and reporting for the entire Cardiovascular service line

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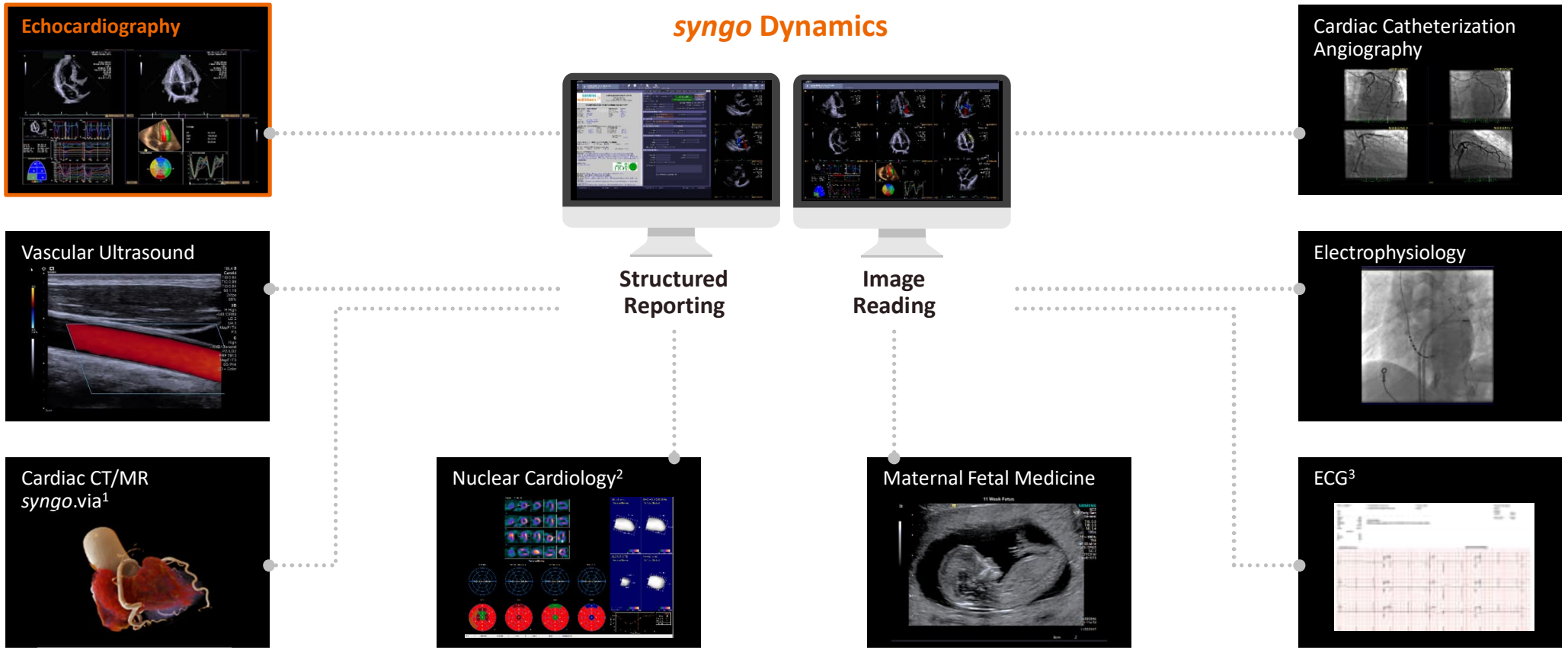

1 syngo.via can be used as a standalone device or together with a variety of *syngo*.via-based software options, which are medical devices in their own right.
2 Requires Corridor4DM
3 Ability to launch 3rd party ECG application with context from *syngo* Dynamics

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Easily compare 3 studies side-by-side, across modalities

SHS exclusive

SIEMENS Healthineers

Convenient image reading

Get whole picture
Images, reports, and advanced applications on up to three monitors

Compare with two prior studies
Compare images, measurements and reports to two prior studies for more informed decision making

If monitors are used for diagnostic purposes, country specific regulations may apply. It is the customers responsibility to ensure that client; monitors are compatible with graphic cards and graphic drivers. It is also his/her responsibility to use suitable monitors for diagnostic purposes.

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[1] Cinematic VRT is recommended for communication, education, and publication purposes and not intended for diagnostic reading.

Advanced Visualization

Přechod od klasických pracovních stanic k řešení server-klient…

A DECADE OF EXPANDING PRECISION MEDICINE

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syngo.via Advanced Visualization provides intelligent tools to simplify routine & sub-specialty reading

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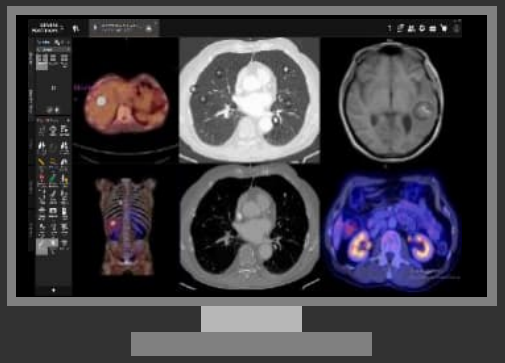
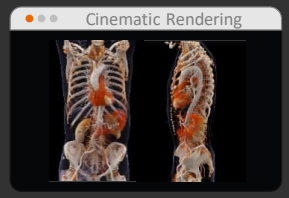
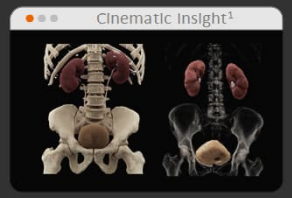
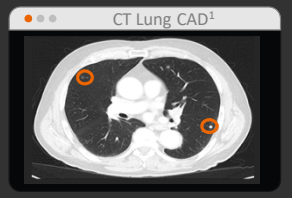


Simplifying Routine Reading

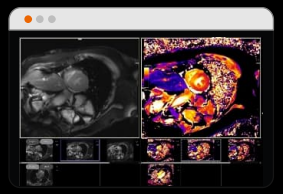




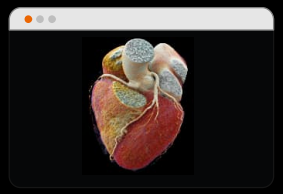


And many more …

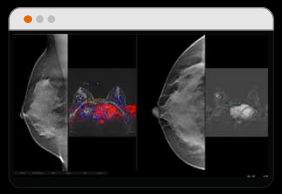
Empowering Sub-Specialty Reading – Highlights with *syngo*.via VB70



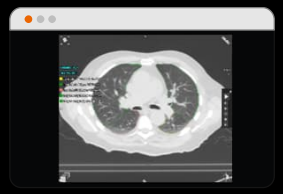
Magnetic Resonance



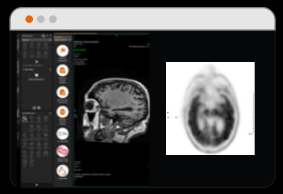
Computed Tomography



Breast Care



Radiation Therapy



Molecular Imaging

[1] Optional license required.
syngo.via is not commercially available in all countries. Due to regulatory reasons its future availability cannot be guaranteed.

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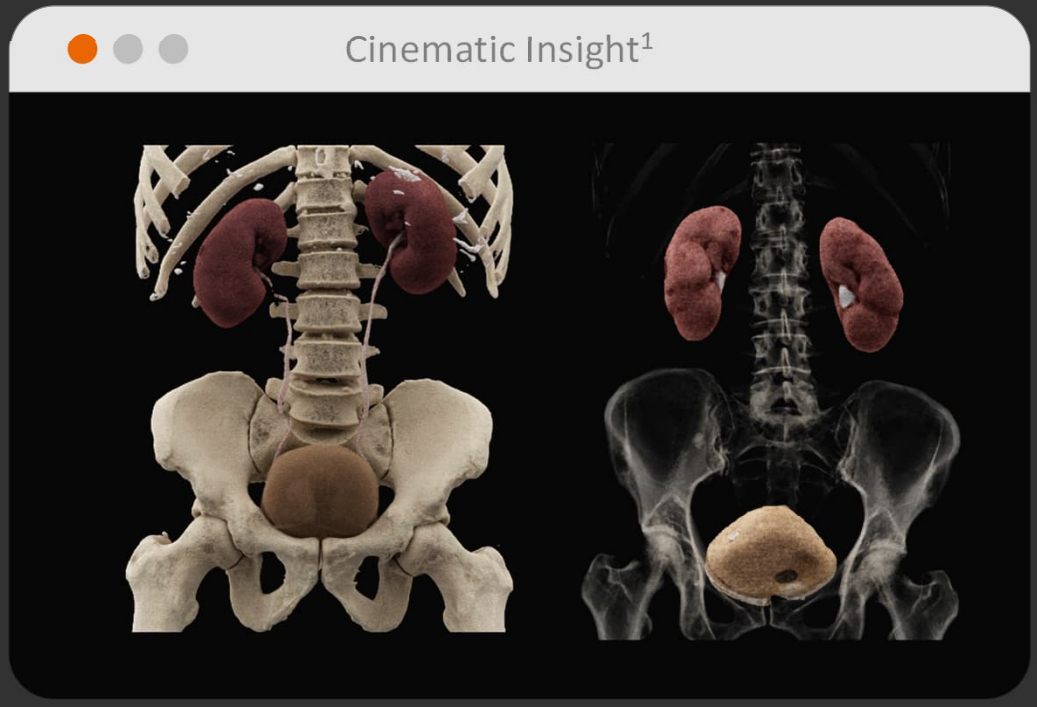
Improved Communication & Education with Cinematic Insight[1]



Optimized & separated visualization for different organs and tissues

Enhance Cinematic Rendering with special presets for specific anatomical regions and organs that automatically generate high-quality, **segmented**, photorealistic 3D images

1 “Cinematic Insight” which is an option to syngo.via, is not commercially available in all countries and its future availability cannot be guaranteed due to regulatory reasons. An additional license is required.
syngo.via is not commercially available in all countries. Due to regulatory reasons its future availability cannot be guaranteed.

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Real-time Cinematic Rendering with Microsoft HoloLens 2

SIEMENS Healthineers

- Cinematic Rendering combined with Microsoft HoloLens 2
- Blend interactive holograms with the real medical world
- Exceptionally realistic and natural visualization with photorealistic, real-time Cinematic Rendering[1].

[1] The product is in prototype state and not intended for medical use. Its future availability cannot be ensured.

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Real-time Cinematic Rendering with HoloLens 2
Easy-to-understand functionalities

SIEMENS Healthineers

Multi-User[1]

Depth

Zoom

Grab

Pan

Cinematic Rendering image quality

Rotate

Slice through

Interact with the images by

- **enlarging** them
- **zooming** in
- **rotating** them
- using **gestures**
- **slicing** through
- **eye** gaze

[1] This feature is under development

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Real-time Cinematic Rendering with HoloLens 2
Benefits at a glance

- **Enhances the education and training** of medical staff
- **Improves referrer & patient communication** with easy-to-grasp clinical images

Future potential fields:

- **Assists surgeons** in choosing the right surgical strategy
- **Increases the precision** of surgical procedures

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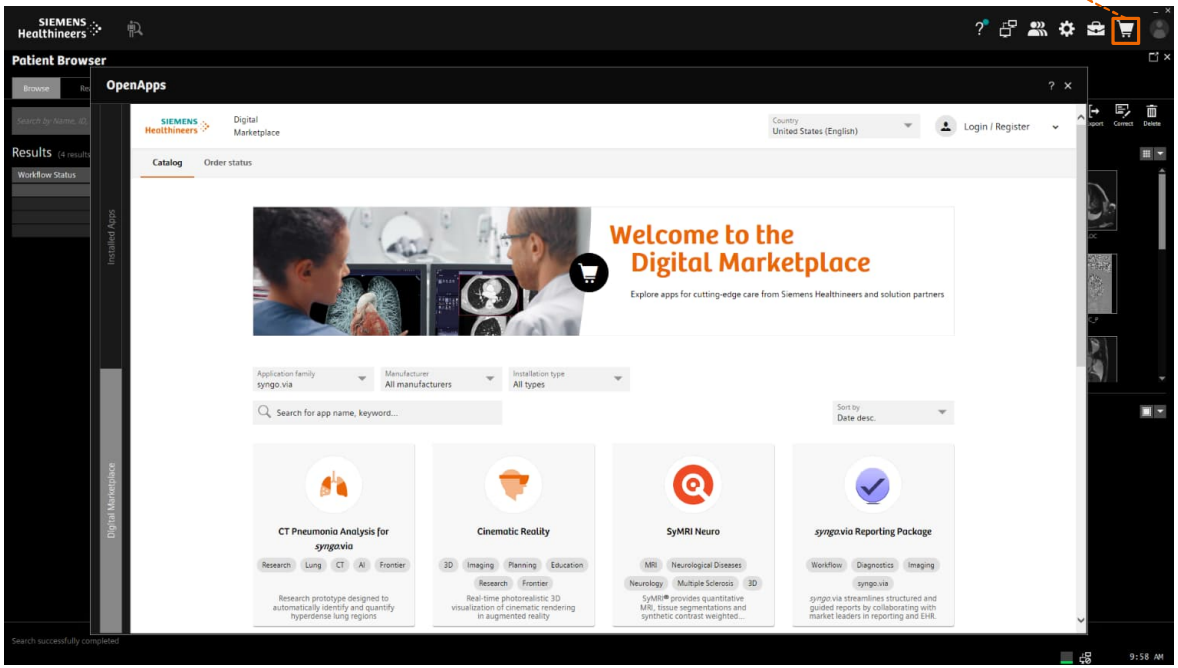
The Digital Marketplace
Immediate access with your *syngo*.via client

- Access the Digital Marketplace directly from any *syngo*.via client
- Browse the entire application portfolio and trial for **90 days** with **instant access**
  - Trial download only takes a few minutes
  - After download, the installation automatically starts
  - The partner will consequently contact you with an offer
- Pricing and other contract related questions will be handled directly by the legal manufacturer of the individual application



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Using software industry as our guide – drive a clear story

Company	Microsoft	SIEMENS Healthineers
Platform	Microsoft Graph Modern data platform	teamplay digital health platform
Enterprise Value	Microsoft 365	Syngo Carbon
Collaborate & Consolidate	Microsoft Teams	Syngo Carbon the core software
Product		

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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syngo.via OpenApps

Innovation at Your Fingertips!

Powered by the Digital Marketplace

The SHS Digital Marketplace

Innovation at Your Fingertips!

Continually updated with exciting content and free trials!

Cloud-Based Partners

On-Premise Partners *syngo*.via OpenApps

syngo.via Frontier Research Applications
(not for clinical use)

SHS Applications
(AI-Rad Companion, teamplay, syngo, e.g.)

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Your gateway to innovation: *syngo*.via OpenApps

Customer Benefits

Increase your clinical capabilities
Access, download, and trial an ever-growing variety of apps from Siemens Healthineers and our partners

No additional hardware investments
syngo.via OpenApps uses your existing *syngo*.via hardware, additional purchases from the 3rd-party vendor are not necessary

Your secure home to innovation
IT security scanned and integrated into *syngo*.via by Siemens Healthineers for you

© Siemens Healthcare GmbH, 2021

Let’s Shape the future of Imaging. Together.

Our partner portfolio on *syngo*.via OpenApps

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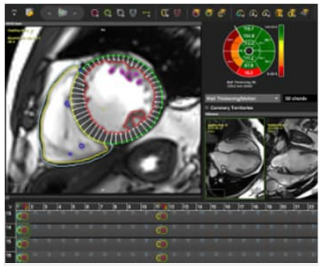

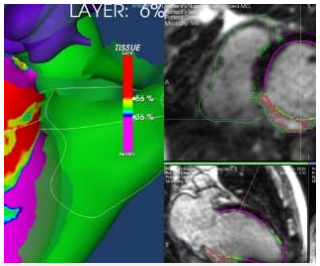

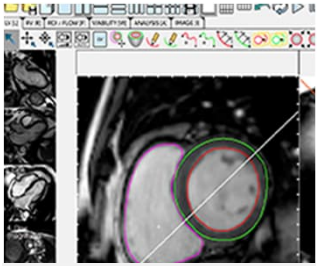

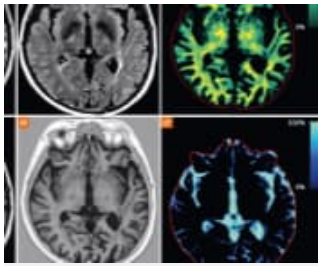

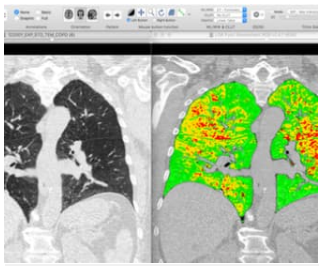

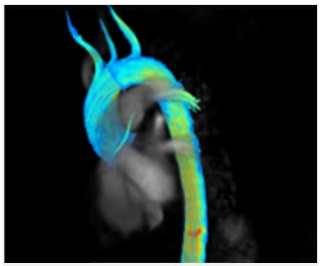

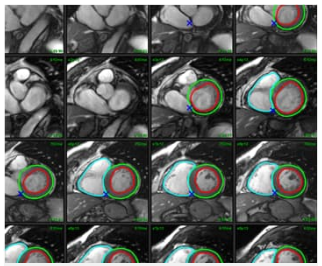

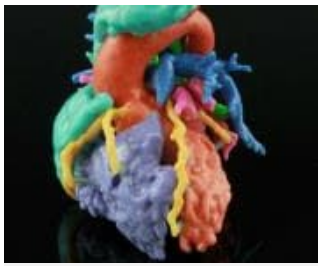

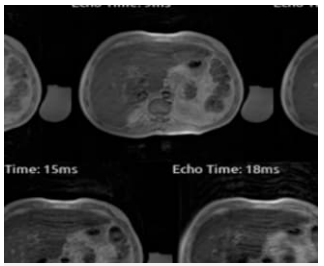

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syngo.via OpenApps App-Map

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Cardio

Pie Medical CAAS MR Solutions
Quantify and visualize disease hemodynamics

Pie Medical CAAS Workstation
angiographic workstation for PCI procedures

3mensio Vascular
Pre-op assessment and planning tool for EVAR/TEVAR

3mensio Structural Heart
Planning tool for TAVI, Mitral, Tricuspid, LAA and RVOT

Circle cmr42
Diagnose complex cardiovascular diseases

NeoSoft
Full suit of CMR analysis featuring a virtual assistant

Medviso
Comprehensive strain analysis in Segment CMR

ADAS 3D
Image analysis for electro-physiologists

Neuro

SyMRI Neuro
Automatic segmentation of brain tissue, measurement of myelin volumes

Cercare
AI-driven perfusion and stroke progression analysis

Onco

Mint Medical mint Lesion
Track lesions on multiple image series & imaging modalities

Internal Organs

FerrySmart
Liver Iron Concentration Quantification

Imbio Lung Texture Analysis
Quantitative CT Imaging for Cardiothoracic Health

General / Overarching

Materialise Mimics inPrint
3D printed anatomic models

Orthopedics

Hectec MediCAD
Pre-operative surgery planning w/ implant database

Materialise Mimics inPrint
3D printed anatomic models

IBL KOALA
Standardize, automate and simplify knee osteoarthritis

XRay | MR | CT

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Preoperative digital planning – mediCAD® Classic on *syngo*.via OpenApps

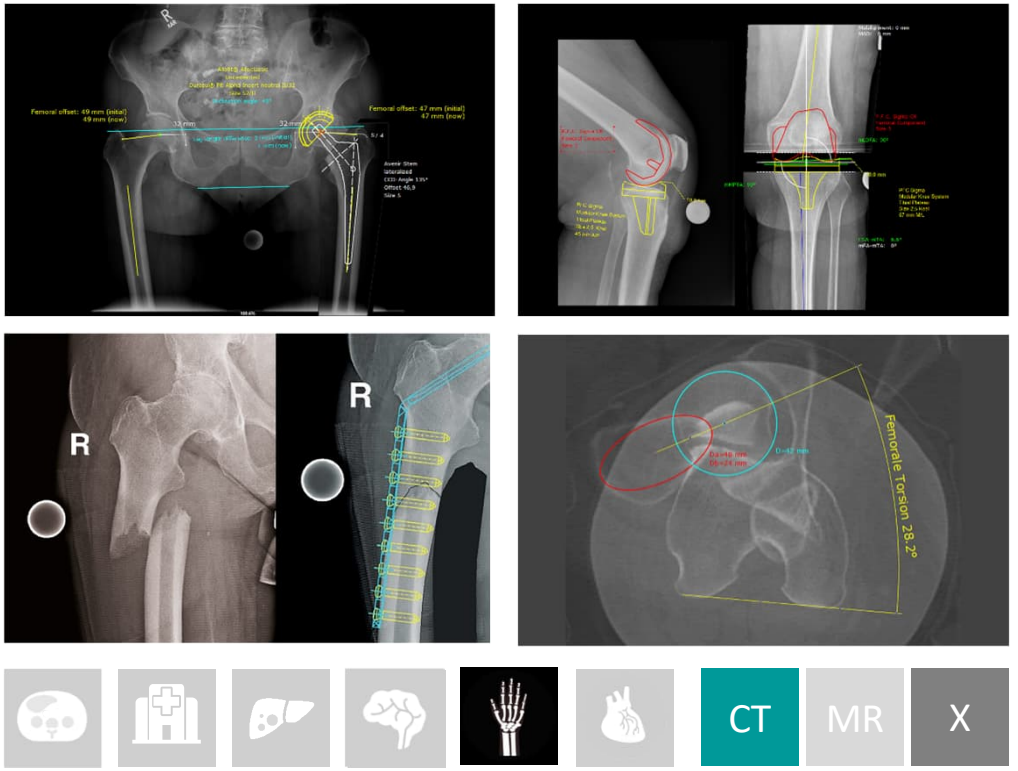
SIEMENS Healthineers

mediCAD®
The Orthopedic Solution

Preoperative planning and postoperative control
Modular design with custom functions for hip, knee, osteotomies, osteotomies by Dror Paley, upper extremities, trauma, and foot

Time Savings
Time saving of up to 90% over conventional planning including PACS integration

Large implant database
Access to more than 130 international implant manufacturers with more than 500,000 templates. Updated 3 times a year.



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Fast and Accurate Image Analysis for the Electrophysiologist
ADAS 3D – VT & AF modules on *syngo*.via OpenApps

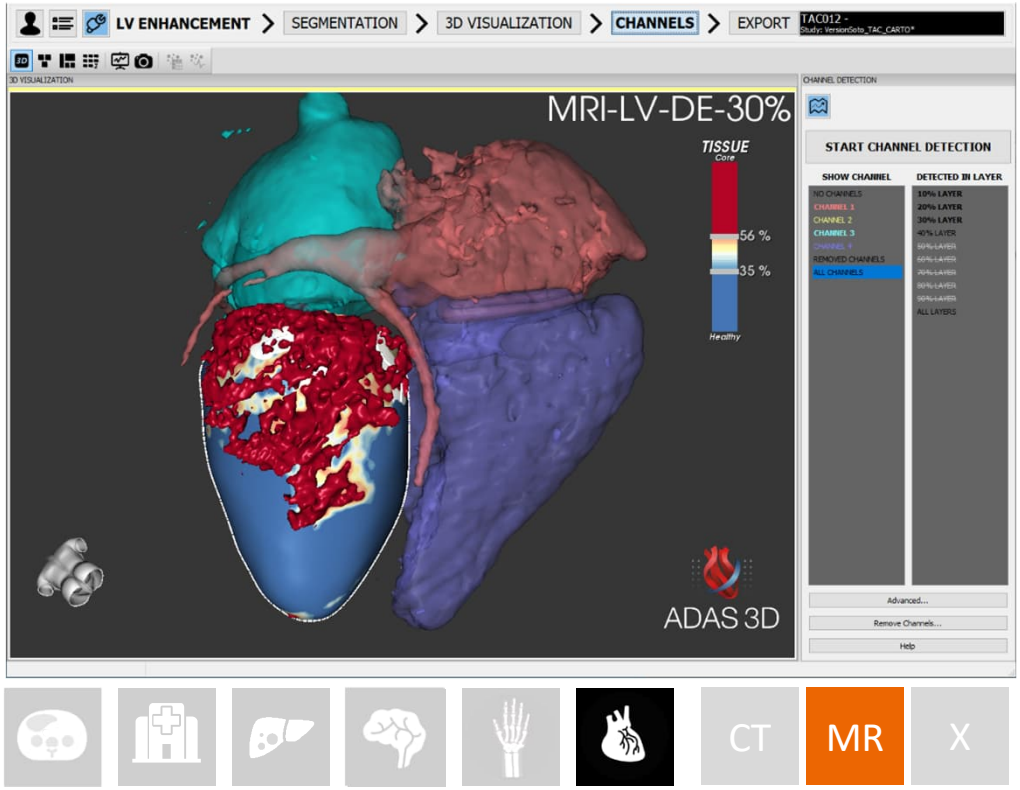
SIEMENS Healthineers

ADAS 3D MEDICAL

Analysis of Delayed-Enhancement MRI
Helps Electrophysiologists understand, visualize, and quantify the structure of the fibrotic tissue (the source of arrhythmia) to treat the patient

Planning and Guidance of Arrhythmia Treatment
Creates easy-to-understand 3D models of the atrium and ventricle (through transmural layers from endo to epi), with tissue characterization

Analysis for Ventricular Tachycardia from MRI
Automatically analyses the 3D structure of the Left Ventricle (LV) and detects border-zone corridors responsible for re-entrant circuits



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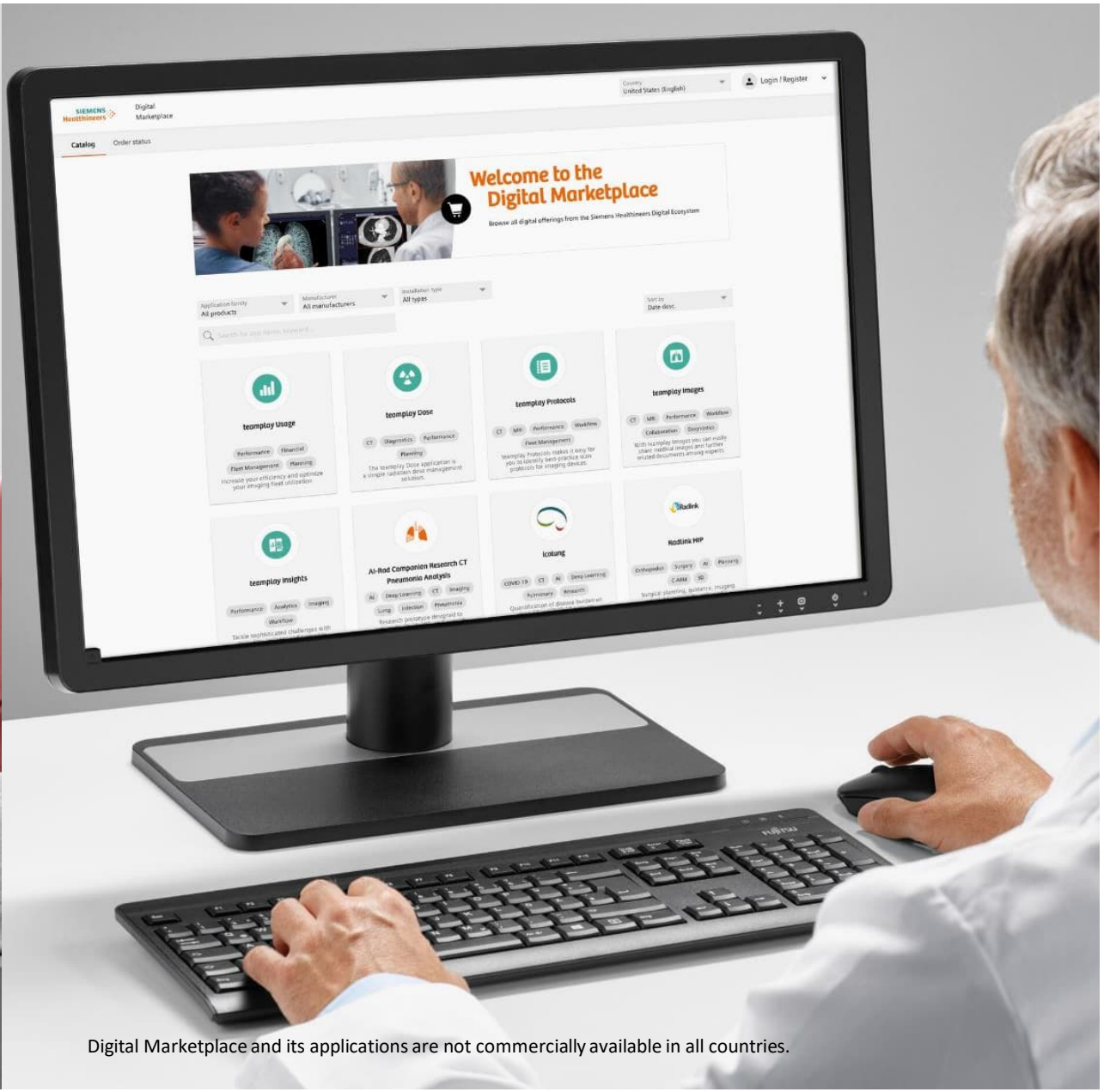

Digital Marketplace

Digital Marketplace and its applications are not commercially available in all countries.

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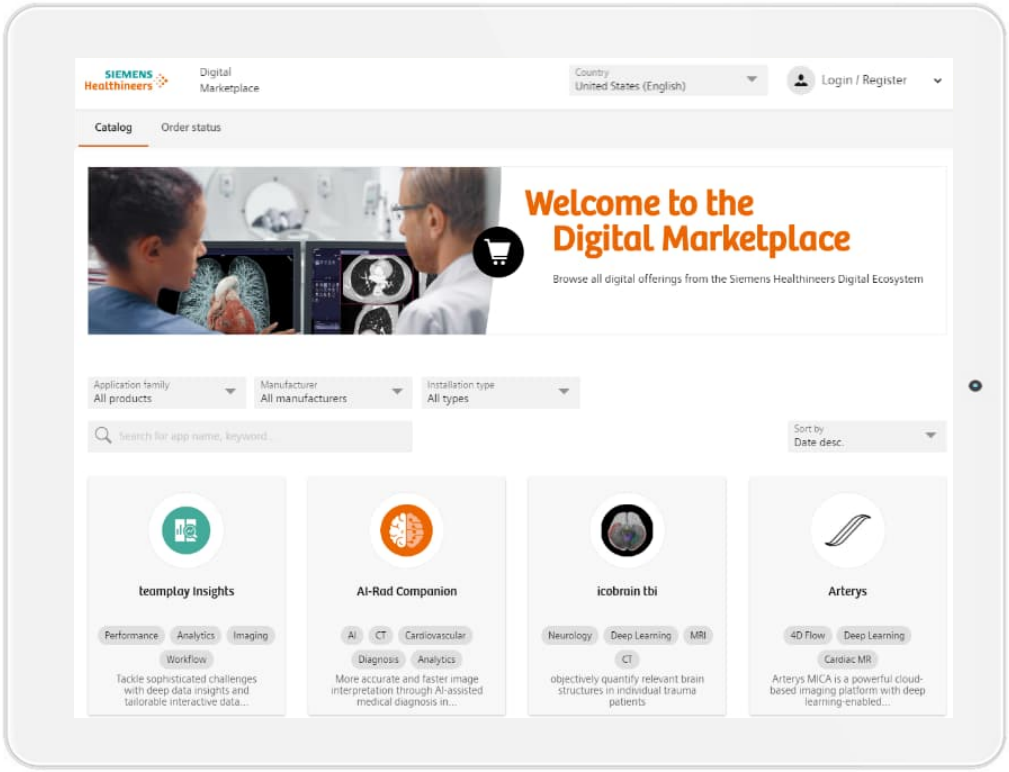
A powerful marketplace to access innovations and solutions in digital health and AI



Connect to a single entry point to digital offerings from Siemens Healthineers and solution partners – empowering end-to-end digital operations

One stop access

Explore, request demos, trials or quotations

Easy deployment

Builds on flexible, scalable deployment

Curated apps

Partner apps curated and pre-vetted

Access to innovation

An ever-growing portfolio of apps

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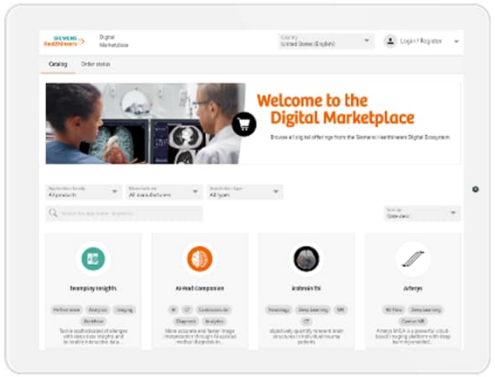
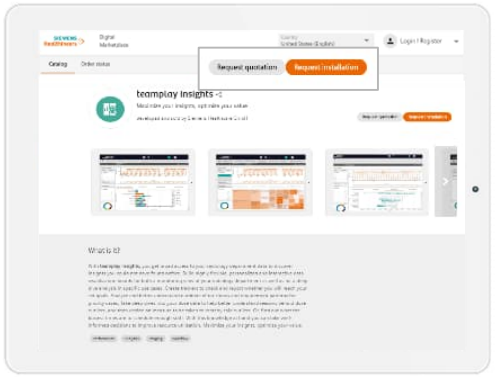
One Digital Marketplace for easy access and integration of digital solutions into clinical routine

SIEMENS Healthineers

1 2 3 4





Access
Easy access to a broad selection of decision support software and innovations in AI

Explore
Get more information on single applications, request quotations, demos or trials and make your own experience

Deploy
Easily deploy our (integrated) digital solutions into your clinical infrastructure

Use
Use our digital solutions in your daily routine – all in a secured environment with certified data privacy

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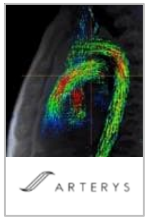
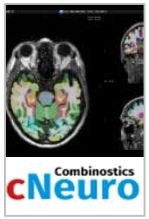
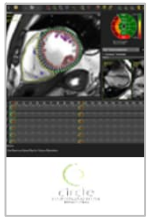
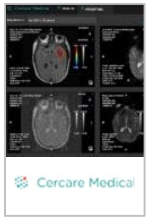
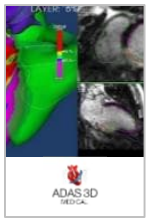
State-of-the-art applications from Siemens Healthineers and our solution partners

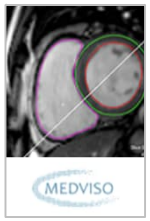


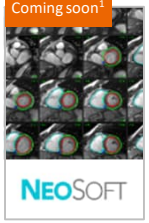


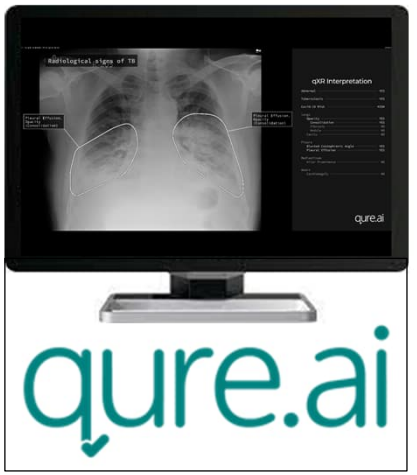












AI-powered

Apps for **clinical use** or dedicated to **performance management**	**More than 30% AI-powered applications**	More than **75 applications** from Siemens Healthineers and curated partners	Within **6 different clinical specialties**

[1] Applications are not available in all countries. Please check applications availability in your country.

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AI-Rad Companion

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AI-Rad Companion

Aktuálně 5 aplikací dostupných v Digital Marketplace

Brain MR - inteligentní SW pro morfometrickou analýzu mozkových struktur využívající prvky umělé inteligence

Chest CT - inteligentní SW pro vyhledávaní a interpretaci patologických stavů v oblasti hrudníku z CT scanů

Chest X-ray - inteligentní SW pro vyhledávaní a interpretaci patologických stavů v oblasti hrudníku z rentgenových snímků hrudníku

Organs RT - inteligentní SW umožňující automatickou segmentaci orgánů včetně kritických struktur a tvorbu ozařovacích plánů radioterapie

Prostate MR - inteligentní SW pro vyhledávaní a interpretaci ložiskových procesů v prostatě, SW pro plánování biopsie prostaty

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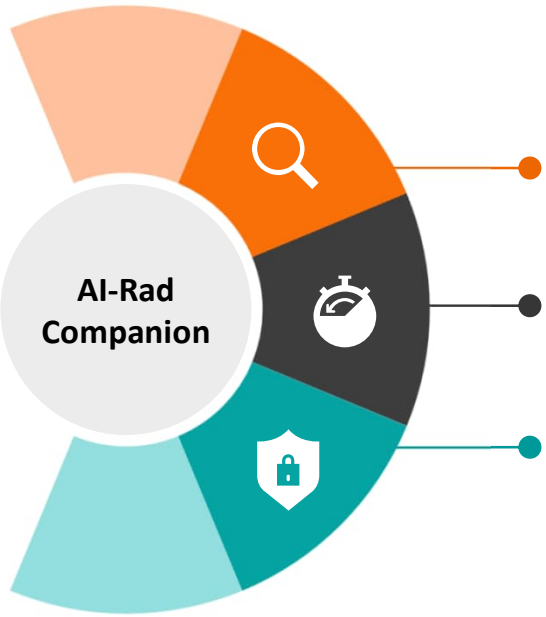
The AI-Rad Companion helps you to alleviate the challenges associated with more complex tasks and cases



Multi-organ diagnostic decision support system
helping to improve your diagnostic accuracy

Seamlessly integrated image quantification speeding up routine workflows
and reducing turnaround time

State-of-the-art algorithm improvement paired with security by design
based on teamplay digital health platform

Multi-modality coverage
for CT[1], MR[1], X-ray[1,2]

Multiple body regions and organs
e.g., Chest[1], Brain[1], Prostate[1]

Automation through advanced functionalities
e.g., Segmentation, Measurement

Seamless workflow integration
with PACS Notifier[1]

1 AI-Rad Companion consists of several products that are (medical) devices in their own right, and products under development. AI-Rad Companion is not commercially available in all countries. Future availability cannot be ensured. **2** AI-Rad Companion Chest X-ray is not commercially available in the United States and other countries, and its future availability cannot be ensured.

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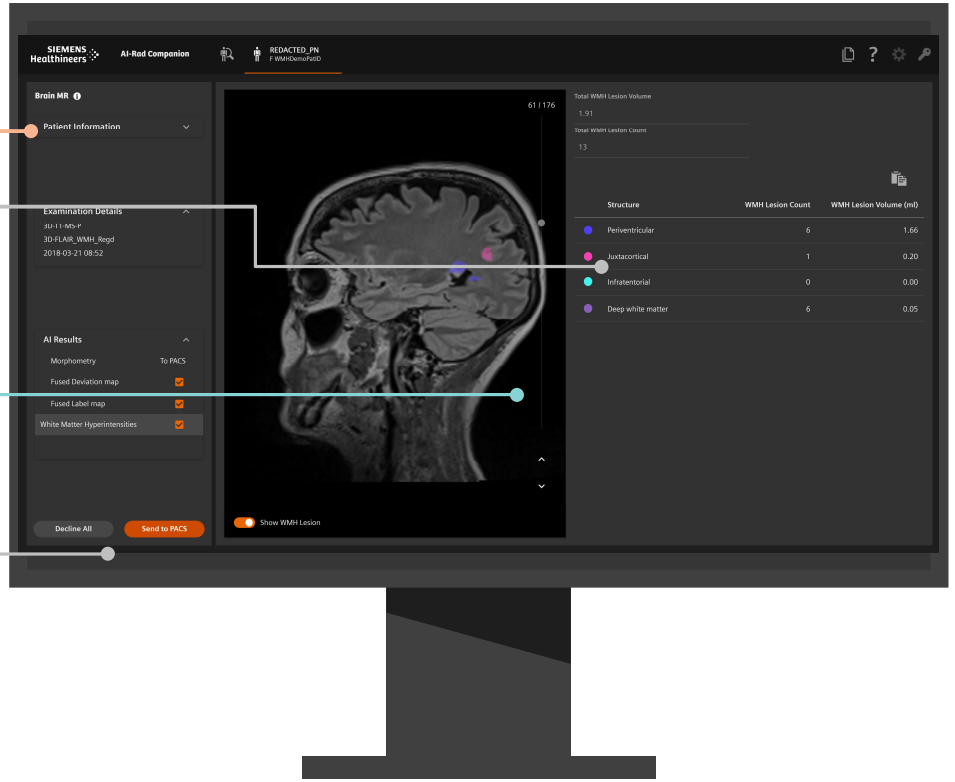
The confirmation screen of the AI-Rad Companion
Everything stays under your control

If desired, all the results of every patient can be verified

The overview shows where the findings are located

Scroll through the outcomes and check the results
of the AI-Rad Companion

Accept or decline the finding.
With one click all accepted results will be pushed to the PACS



Confirmation screen of AI-Rad Companion Brain MR

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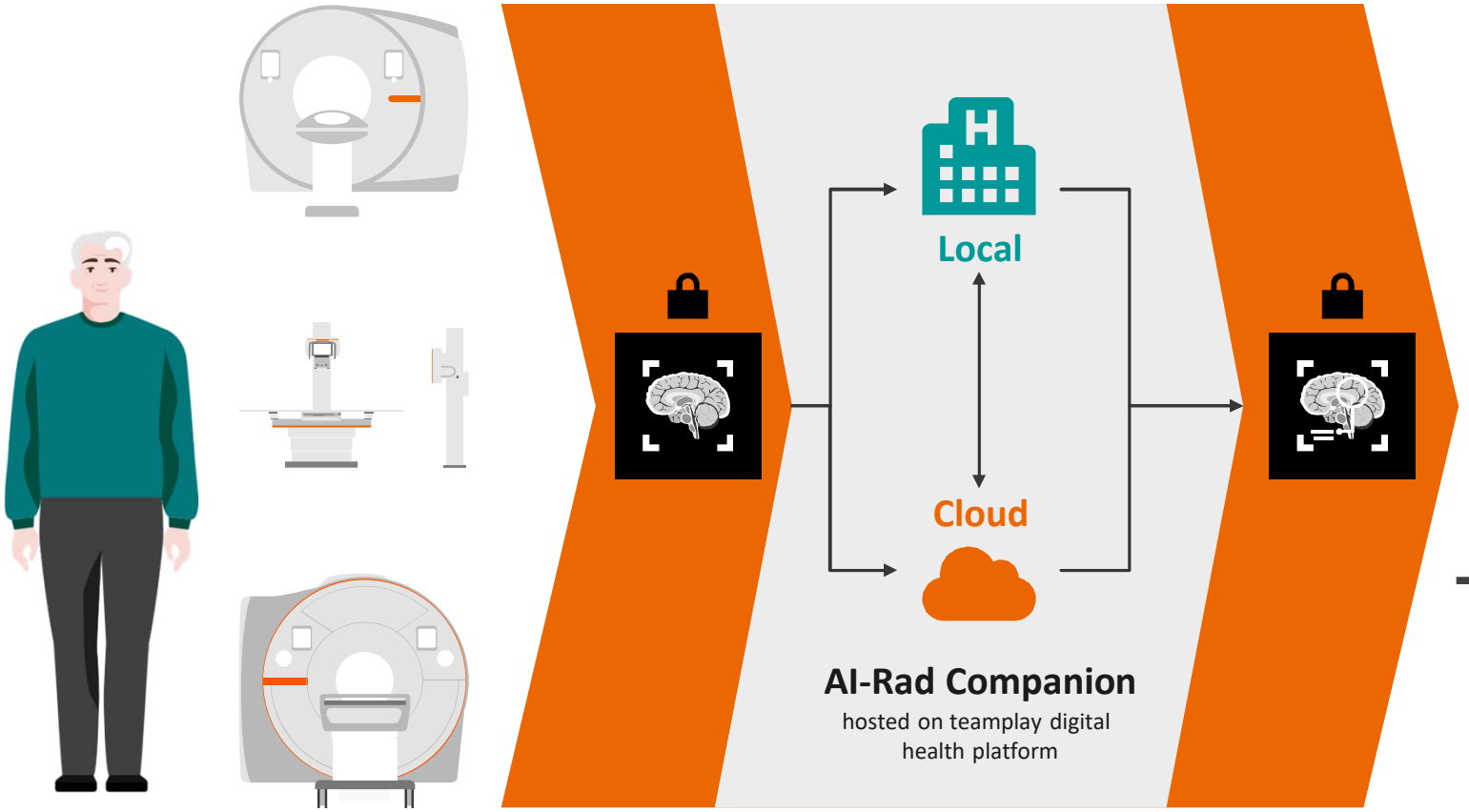
AI-Rad Companion, seamlessly integrates into your hospital environment – and your workflows



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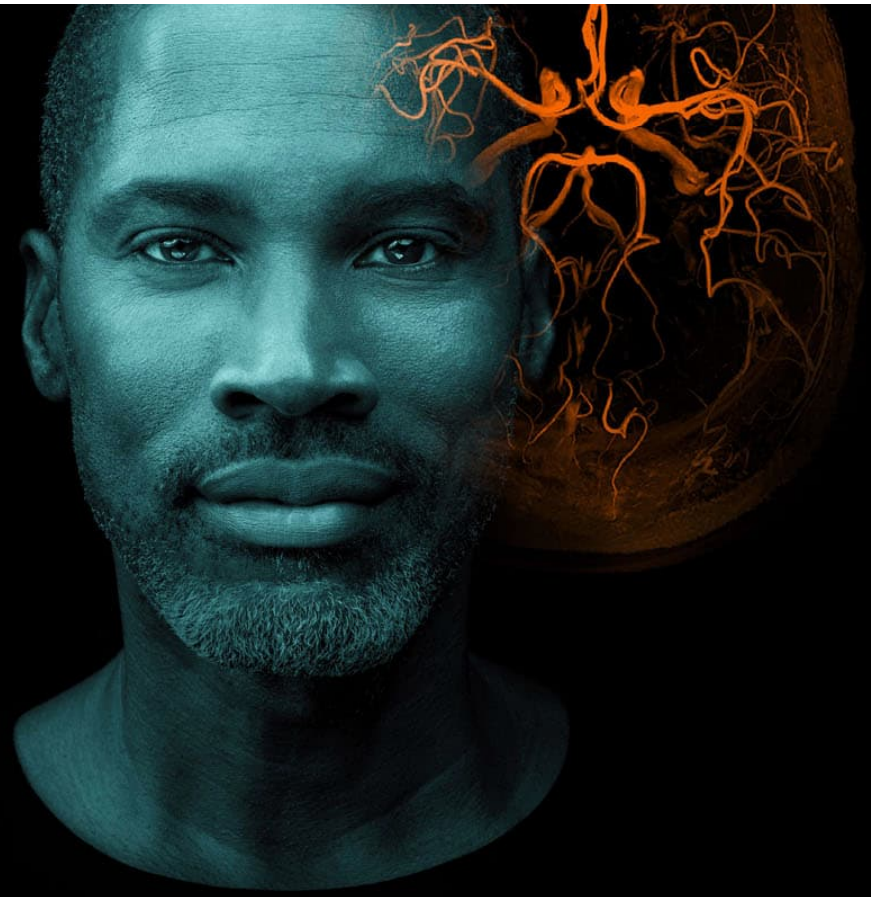
teamplay digital health platform

The enabler of your digital transformation



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teamplay digital health platform enables digital transformation by empowering connectedness

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Application layer

Solutions from Siemens Healthineers and curated partners in three areas

- teamplay Usage
- teamplay Dose
- teamplay Protocols
- teamplay Insights
- teamplay Fleet
- teamplay X-ray Dashboard
- teamplay Mammo Dashboard
- teamplay Images

Platform layer

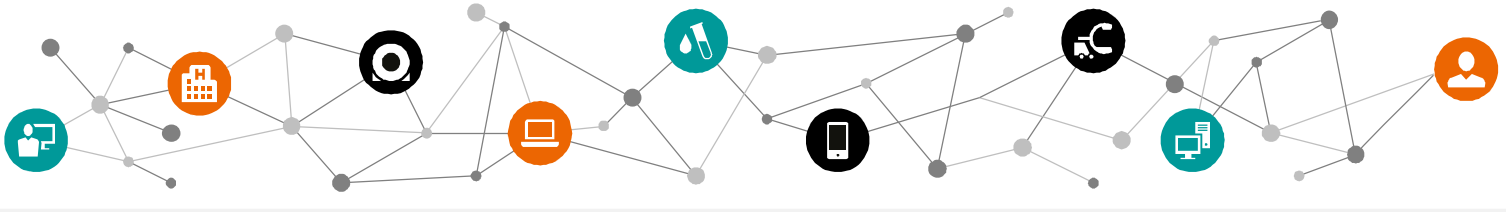
More than **6,500** connected institutions in more than **75** countries

teamplay digital health platform

The enabler of healthcare providers' digital transformation

Secured access and connectivity to different interoperability standards

Data layer



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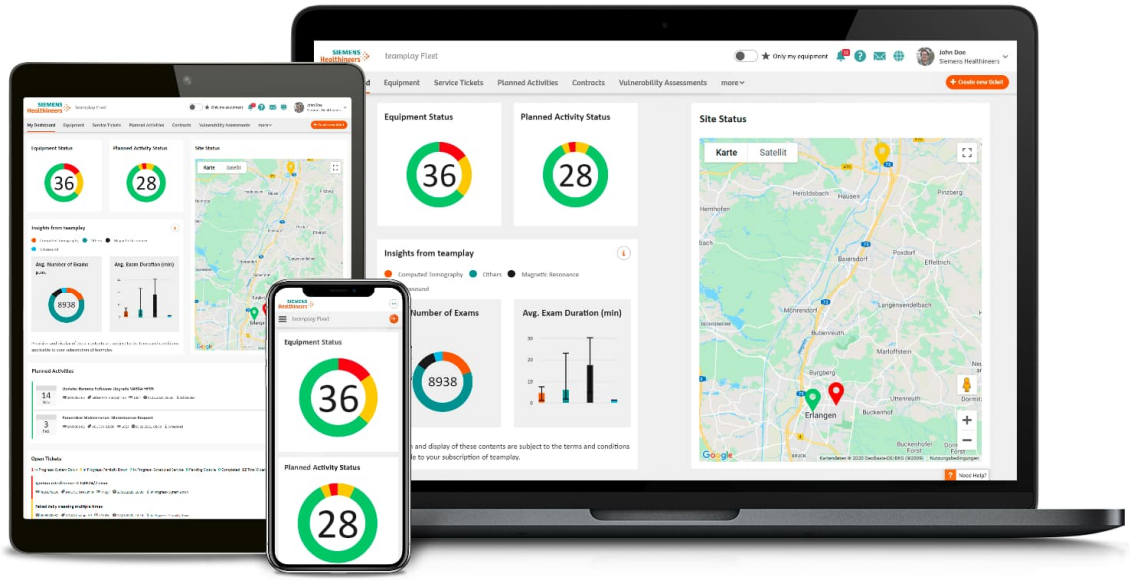

teamplay Fleet

teamplay Fleet is a teamplay digital health platform solution that enables you to streamline the management of your fleet from Siemens Healthineers and to optimize your asset performance holistically, 24/7, and from any browser capable device.

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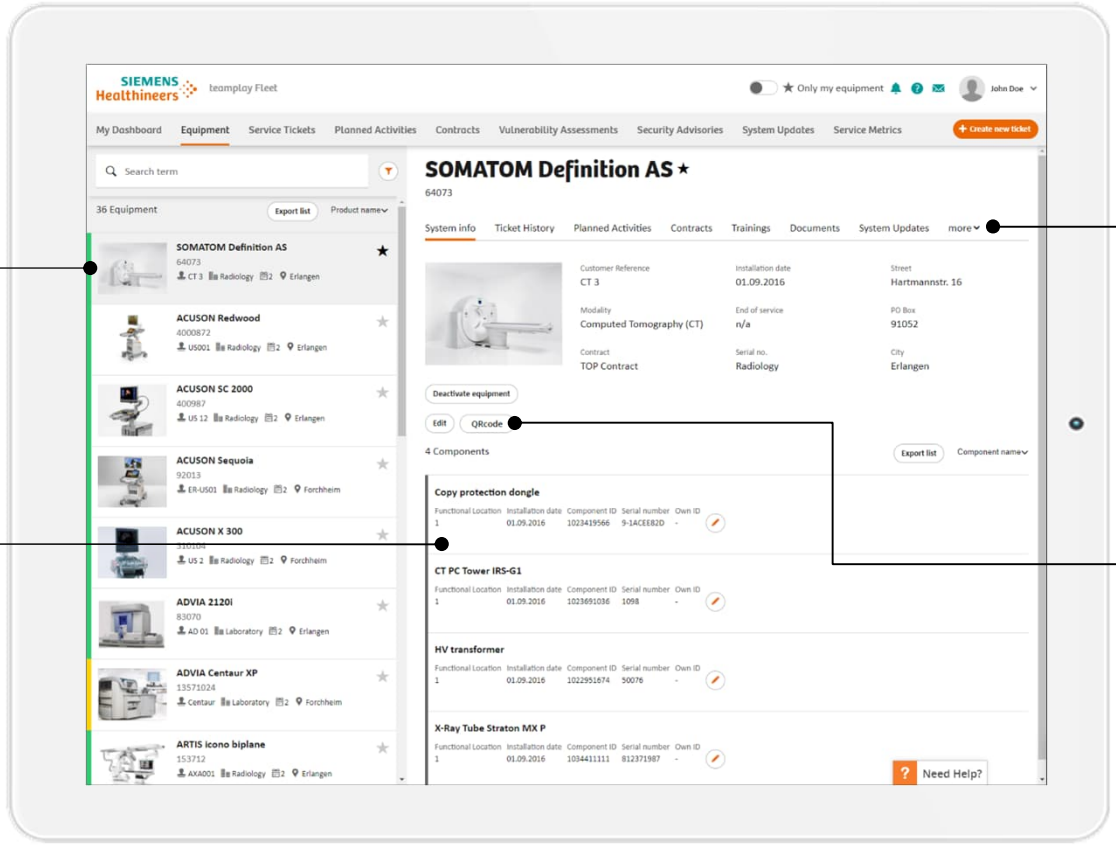
Save time by having the equipment data you need at hand with specific information for individual pieces of equipment

Access any of your equipment from Siemens Healthineers, including imaging, laboratory, and software solutions

View equipment-specific details, such as installation date, software version, or equipment components



1

2

3 **Easily find more equipment-related information,** such as documents, online training courses provided by PEPconnect, service contract information, and more

4 **Instantly access your equipment via QR-codes** in combination with our teamplay Fleet application for mobile devices

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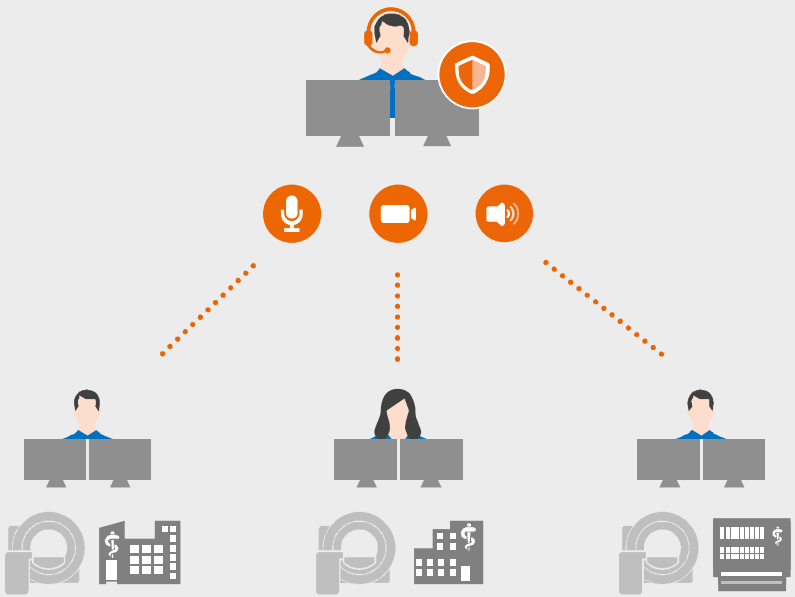
syngo Virtual Cockpit: Your software for remote scanning assistance



***syngo* Virtual Cockpit** enables you to provide comprehensive scanning assistance to imaging personnel – regardless of their physical location.

Core features:

- Real-time knowledge sharing across teams and sites
- Live video, audio, and chat functions
- One experienced technologist can collaborate with up to three scanning workplaces simultaneously
- For MR, MR-PET and CT scanners from Siemens Healthineers

syngo Virtual Cockpit is not yet commercially available in all countries. Its future availability cannot be guaranteed. Prerequisite: Expert-i-enabled modality from Siemens Healthineers.

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Naše základní myšlenka

Účelem každého zdravotního systému je dosáhnout lepšího zdraví pacientů a péče.

To je důvod, proč je naším úkolem zmocnit všechny a vše, co se této mise účastní. A proto musíme vycházet vstříc lékařům, IT specialistům, ekonomům i pacientům stejnou měrou.

Klíčová otázka tedy zní:

Co je to za základní potřebu, která je všechny spojuje?

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Znalost

Pokud víte více, pak můžete dělat lepší rozhodnutí – a tím zlepšit péči o pacienty

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Příklad pacienta s nádorem plic

Každý pacient musí absolvovat různé testy a vyšetření na různých odděleních. Pacient s nádorem plic má kontakt s nejméně šesti odděleními, která o něm generují více zpráv a dat.

- Zpráva z ambulance
- Test funkce plic v pneumologii
- CT plic v radiologii
- PET CT pro stanovení stádia nádoru v nukleární medicíně
- Biopsie plic v chirurgii hrudníku
- Histologie v patologii
- Nádorové markery v laboratoři

Pokud data nejsou propojená a použitelná – přenos znalostí se stává obtížným.

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Poskytovatelé zdravotní péče čelí výzvám na cestě pacienta. Znalosti nejsou optimalizovány.

Složitost

IT prostředí je často roztříštěné

Počet systémů, o které je třeba se postarat, je důvodem vysokých nákladů

Jsou zapotřebí drahé nástroje, které umožní systémům spolu „mluvit“

Nedůslednost

Data jsou uložena v datových skladech a nemusí být vždy dostupná

Různé nástroje mají různé uživatelské rozhraní, které není snadné používat

Data jsou v systému „spravována“ kolem oddělení, nikoli kolem pacienta

Nejistota

Počet případů se v posledních letech zvýšil

Není jisté, zda jsou k dispozici všechna data pacienta

Proprietární

Oddělení pracují v různých strukturách

Informace jsou uloženy ve volném formátu bez struktury

Nástroje jsou uzavřeny – data nejsou snadno dostupná

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Aby tyto bolestivé body byly ještě bolestivější…

Všichni víme, že neustále se zvyšující objem dat ve zdravotnictví ztěžuje výběr relevantních dat pro rozhodování.

Meziroční nárůst údajů o zdravotní péči je asi 48%[1].

Už jste někdy hledali určitý obrázek přítele ve své rychle rostoucí soukromé fotogalerii? Už teď je náročné mít všechny své obrázky na jednom místě, ale je to téměř nemožné, pokud máte obrázky uložené na více zařízeních.

To se děje ve zdravotnických zařízeních.

48% [1]

[1] Stanford Medicine 2017 Health Trends Report

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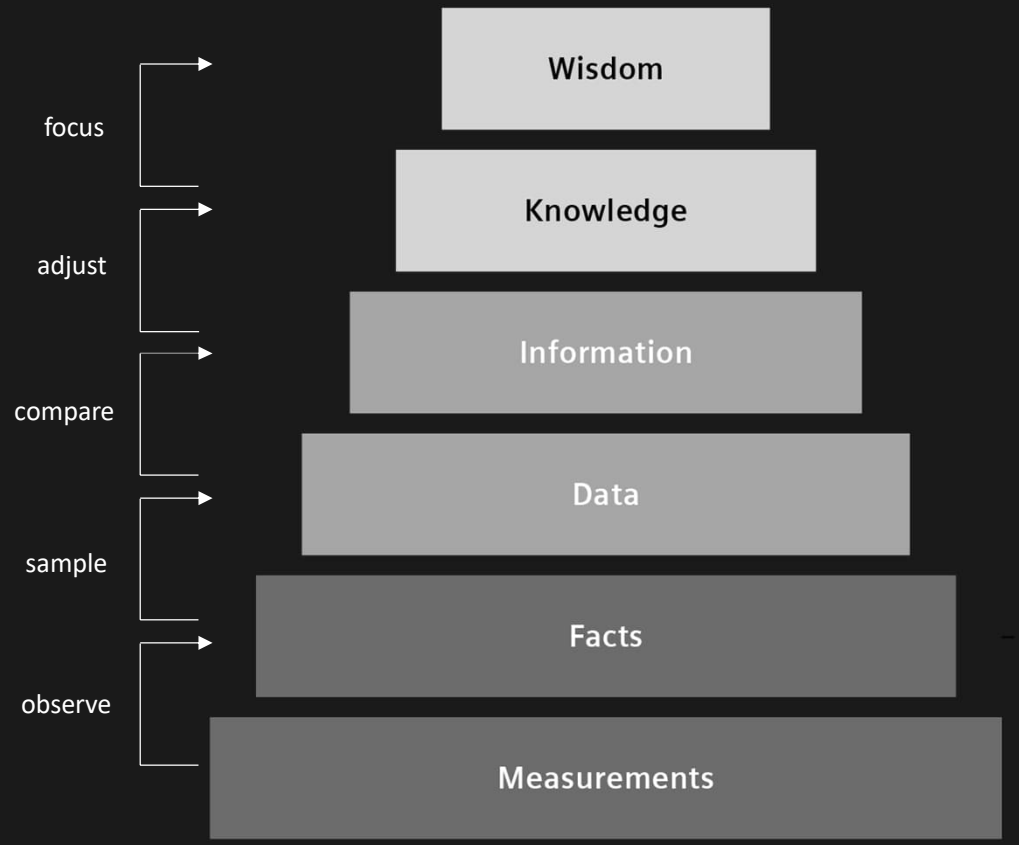
Kde je moudrost, kterou jsme ztratili ve vědění? Kde jsou znalosti, které jsme ztratili v informacích?

T.S. Eliot



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To vše je součástí systému

	Todays PACS	Future Systems
Picture	Image driven (DICOM)	Data driven
Archiving	Data storage	Processing data (Actionable)
Communication	Unstructured	Semantic (Open Patient Data Model)
System	Hardware	Software

PACS is at a dead end

1970s – Plain Film

https://images.app.goo.gl/LDGdGPqJftHPyq8H6

2000s - PACS

2004 - PACS
https://pubs.rsna.org/doi/10.1148/rg.242035089

Today

?

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PACS is at a dead end

1970s – Plain Film

https://images.app.goo.gl/LDGdGPqJftHPyq8H6

2000s - PACS

2004 - PACS
https://pubs.rsna.org/doi/10.1148/rg.242035089

Today

ODIS

Outcome Driven Imaging System

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Syngo Carbon

The connecting element that gives rise to knowledge

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

Syngo Carbon

Siemens Healthineers Syngo Carbon přináší znalosti tím, že poskytuje vysoce efektivní, vysoce kvalitní a optimalizované klinické prostředí, které otevírá širokou škálu možností v interpretaci snímků, reportování, implementaci umělé inteligence, správě dat, archivaci a migraci, včetně jedinečného přístupu k inovačním platformám, open source a funkcím třetích stran a nejaktuálnější dostupný software.

Syngo Carbon je nový druh, který daleko přesahuje systémy PACS.

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Syngo Carbon One Image and Data Management (IDM) Utilizing the Siemens Healthineers Open Patient Data Model

The Open Patient Data Model organizes data consistently around the patient, in just one place, regardless whether the patient changes departments

The Image and Data Management functionality to tag data for powerful follow up methods included in the Results Engine, supporting increased quality of actionable reported results

In simple words:

All data in one spot, always on, always available.

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Syngo Carbon One Data Model Result Engine
Turning data into actionable results

Image Reading
Smart tools and assistance for
improved image interpretation

Reporting
From narrative-only
to discrete actionable information

- Generate diagnostic knowledge – match findings into clinical guidelines
  (e.g. RSNA - RadLex guideline)
- Realtime data transfer:
  less errors, no redundancy
- Structured and machine readable

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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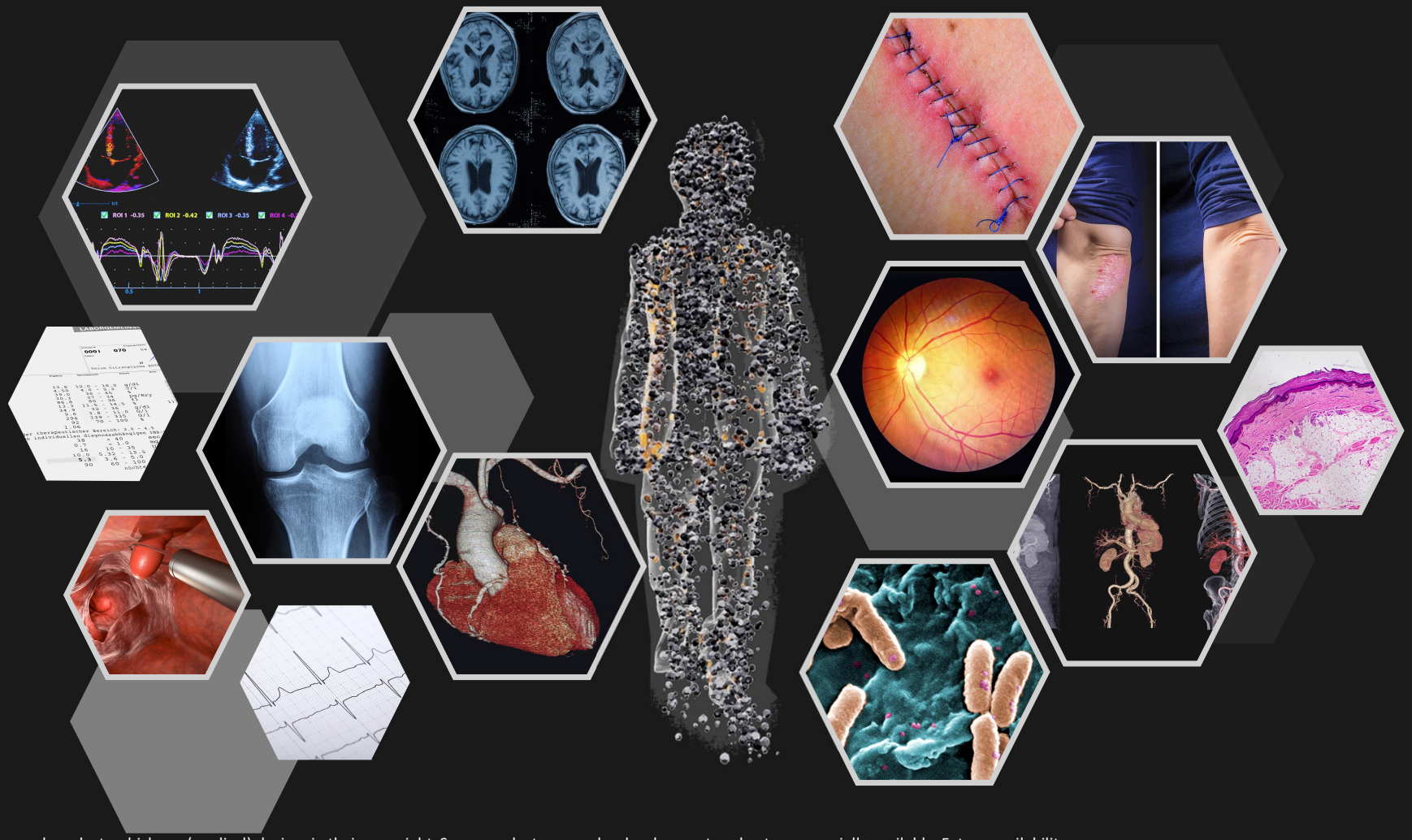

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Syngo Carbon connects all imaging disciplines into one, enables access to all data, and ensures users can just use it, for improved quality leading to improved clinical outcome

Syngo Carbon
The connecting element that gives rise to knowledge

Syngo Carbon brings the entire portfolio together into a singular software solution

- It brings all imaging data together into one combined frontend or reading environment
- It automatically detects existing imaging data relevant to a patient‘s diagnosis
- It integrates AI results, generates diagnostic and therapeutically relevant report elements, making them truly actionable
- It fully integrates and scales, flexibly, across the IT landscape and secures our customers investment for the future

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Syngo Carbon – Many into one

One Workspace
- Harmonized User Interface
- 2D/3D Reading
- Cinematic Visualization
- Clinical demo (Collaboration)

Artificial Intelligence
- Automation
- Computer Aided Detection
- AI-Rad Companion
- Similar Patient Search

Innovation & Research
- Digital Marketplace
- Research
- Pneumonia

Advanced Visualization
- Ologies
- 3D/4D reading
- Pre-processing

Access clinical information
- EMR
- Patient Jacket
- Non-DICOM

Actionable Reporting
- Actionable results
- Smart Reporting
- (Nuance PowerScribe One)
- Structured reporting

Decision to Image	Scanning	Acquisition	Processing	Reasoning	Reporting	Communication

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Syngo Carbon

enabled by teamplay digital health platform

Access all areas

- Remote Scanning
- Patient Access
- Physician Access
- Encounter-based Imaging
- Open Image and Data Management

Just use it

- Actionable Reporting
- Advanced Visualization
- Dynamics Visualization
- Artificial Intelligence
- Archiving

Many into one

- Core
  - One Workspace
  - Image & Data Manager
- Workflow
- Interoperability
- Innovation and Research
- Dose/Usage/Protocol Management

Services

- IT Care Plan
- Personal Education Service
- teamplay Fleet
- Data Migration

Syngo Carbon consists of several products (see slide 28) which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Syngo Carbon allows you to Access All Areas From Point-of-Care to the Patient

Syngo Carbon consists of several products which are (medical) devices in their own right. Some products are under development and not commercially available. Future availability cannot be ensured.

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Jaké jsou tedy Trendy vývoje digitální radiografie a systémů PACS v lékařství z pohledu společnosti Siemens?

- **SW řešení nabízející komplexnost a škálovatelnost**
- **SW řešení využívající AI**
- **SW řešení využívající cloudová úložiště**
- **SaaS – Software as a Service**

Více na následujících odkazech:

https://www.siemens-healthineers.com/cz
https://marketplace.teamplay.siemens-healthineers.com/apps
https://www.siemens-healthineers.com/medical-imaging-it/about/syngo-carbon-story

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Děkuji za pozornost.

Roman Hanus

25.11.2022