OpenRad Cloud
by Biotronics3D

Enterprise Remote Reporting
the easy way

CE
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OpenRad Cloud is powered by Biotronics3D's 3Dnet (TM).

OpenRad Cloud

Your cloud-computing solution for medical imaging

OpenRad Cloud (by Biotronics3D) is much more than just a PACS. It is a cloud-native medical imaging offering through which physicians can share, analyse, visualise images and collaborate with colleagues online.

OpenRad Cloud (by Biotronics3D) enables healthcare professionals to access their work at anytime and anyplace using a zero-footprint client—free of the previous necessity to restrict themselves to certain desktops.

By combining server-based rendering technologies with a feature-rich multimodality web viewer and progressive streaming, OpenRad Cloud (by Biotronics3D) delivers unprecedented visualisation performance of large datasets even using modest hardware as the heavy work is performed server-side. The web client is platform independent and can run on Windows, MacOS, iOS or Android operating systems.

OpenRad Cloud

The Platform

OpenRad Cloud (by Biotronics3D) is a best of breed solution that integrates a patient and referrer portal, a PACS and RIS, 3D native functionality and advanced visualisation applications such as CT Colonography, CT Lung Analysis, Automated CT Vessel Tracking, CT Calcium Scoring, CBCT Dental, DCE-MRI Perfusion, Breast MR, MRI ADC Modelling, and PET/CT Registration. It can scale from a single user to a multi-hospital enterprise solution supporting millions of exams.

It includes a dedicated teleradiology module to support sub-specialty reporting, automatic resource load balancing and an enterprise worklist. Uniquely, the whole solution is multi-tenanted yet built on a single database platform and deployed on the Microsoft Azure Cloud or similar. At a user level it can be accessed on any device via a hyper-fast true zero-footprint application. Being zero-footprint, the user only streams pixels, no data is transferred to the client—meaning the solution is both totally secure and incredibly fast.

Who is it for?

It is built for hospital chains, single hospitals, clinics, teleradiology service providers, imaging centres, reporting radiologists and many more in both the public and private sector. It is for clinicians and administrators who want a single cloud-based solution to support their end-to-end imaging workflow that is fast, easy to use and can be accessed via any device with a web browser from anywhere.

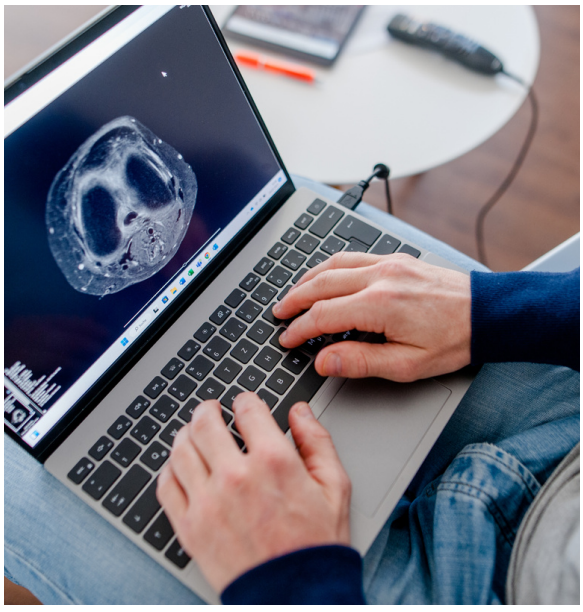
Why is it different?

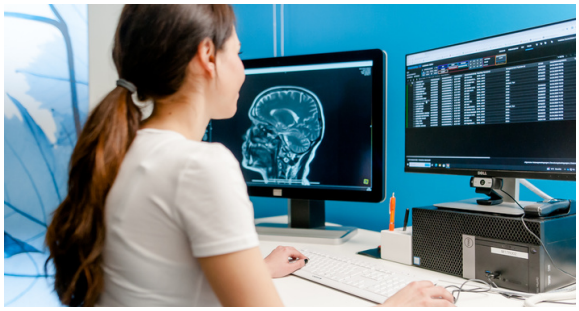
As OpenRad Cloud (by Biotronics3D) is a SaaS solution, there is no upfront investment in software or infrastructure and the solution is sold as a service via a single cost per exam model. It is also incredibly fast and far more comprehensive than any other product currently available. There is no limit to the number of users we can support and it does everything a hospital, clinic and reporting radiologist needs via a single pane of glass.

OpenRad Cloud (by Biotronics3D) is 100% a cloud-native zero-footprint platform. We design and scale our offer based purely on how many exams you need to report. Finally, we consider OpenRad Cloud (by Biotronics3D) to be a community imaging platform as resources, workload and access are truly democratic and can be adapted according to your needs. And because it is 100% cloud-hosted, once you chose to become part of our community, you can be live and reporting in a matter of hours.

Advanced Visualisation

- Web-based, zero-footprint visualisation software accessible by anyone connected to OpenRad's web server via intranet or internet over standard HTTP or a secure HTTPS (SSL) connection
- Advanced post-processing tools, including 3D package (MPR, MIP, VRT) & dedicated clinical modules
- Zero-footprint web portal for radiologists, clinicians & patients with instant access to images, visualisation tools & reports
- The portal is accessible even on mobile devices, such as tablet PCs and smart phones, without downloading and installing software.
- HL7 & RIS/PACS desktop integrations
- Collaboration tools: Share a study with a colleague by sending a web link via email, involve colleagues in a case via the internal chat.
- Unlimited online 24/7 customer support with immediate response to service tickets





Technology

OpenRad Cloud (by Biotronics3D) is a modern cloud-based solution built on Microsoft technologies.

The core system relies on five components:
1) web server
2) database server
3) pre-processing (volumiser) service
4) rendering engine
5) DICOM/HL7 service

Each of these components can run on different physical or virtual machines to optimise performance.

OpenRad Cloud (by Biotronics3D) uses Microsoft Internet Information Server (IIS) as its web server. Users authentication, images or other information are sent securely over HTTPS.

The system can be set up in a grid configuration to support multi-site organisations and to provide high availability of data using a single access point for users.

The rendering engine module includes proprietary algorithms for advanced image processing, server-based rendering, and progressive streaming.

OpenRad Cloud (by Biotronics3D) can be accessed via a HTML5 interface.

Interoperability

Our system fully supports the IHE profiles together with DICOM 3.0 and HL7 V2 standards.

Our Gateway, a proprietary software node, can be configured to operate with multiple DICOM and HL7 systems. Regardless of vendor or physical location, these systems can be integrated and consolidated to facilitate an automated and safe workflow.

The Gateway directly provides DICOM modality worklists to modalities, responds to query/retrieve requests and manages manual or automatic routing of studies to various DICOM nodes.

Analytics

Our custom analytics are a tailored, web-based service designed to help imaging centres to gain insightful view of their data.

Receive periodic feeds related to users activity, modality workload to improve effectiveness of your business and make better-informed decisions.

Security

OpenRad Cloud (by Biotronics3D) supports the current industry standards for security: HIPAA, UK DoH, IHE. Internet communication is protected with minimum 128-bit SSL encryption—with a security certificate on the server.

System access is permitted only by entering a valid username and password.

Administration

OpenRad Cloud (by Biotronics3D) includes an administrative module, accessible from anywhere in a web browser.

The admin module is visible only to users with an admin role assigned and includes:

- Open & manage user accounts (or group of users)
- Create & manage worklists
- Create & manage folders
- Add/edit/remove DICOM nodes or film printers
- Define report templates

User administration supports Active Directory integration using the LDAP protocol.

Language Support

The Graphical User Interface is available in the following languages: English, German, French, Spanish, Portuguese, Romanian, Hungarian, Serbian, Russian, Ukrainian, Greek, Italian, Lithuanian, Polish, Turkish & Georgian

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Main Modules

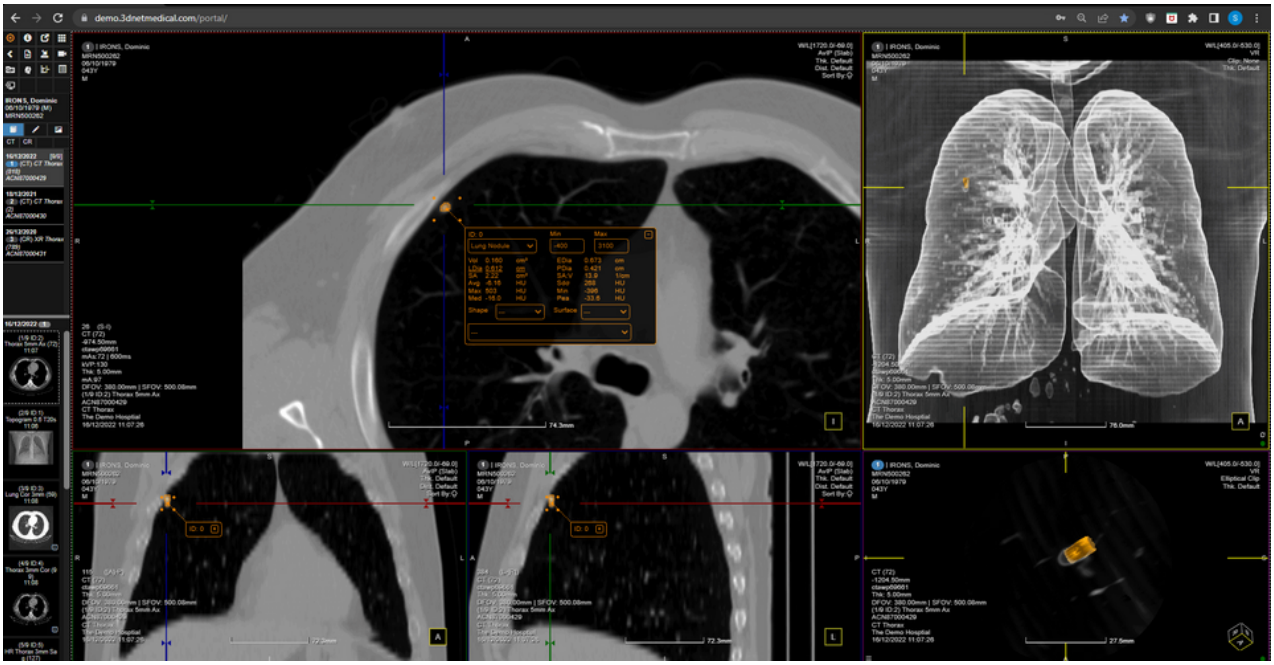
MODULE	DESCRIPTION
OpenRad Cloud's Core System	• IIS web server • MSSQL database • Volumiser service • Server-based rendering engine • DICOM/HL7 service
OpenRad Cloud's Gateway	• DICOM communication service: C-Store (SCU/SCP), multiframe image storage, query/retrieve (SCU/SCP), C-Find, C-Move, C-Get, Echo, storage commitment • HL7 interface for connecting with other systems with support for ORM, ORU, ADT messages
OpenRad Cloud's General Visualisation Module	• Measurements & annotations • Window/Level with pre-sets for CT • Comparative mode & sync navigation • Hanging protocols • Zoom, pan, invert, flip, cine mode • MPR, MIP, VRT
OpenRad Cloud's Advanced Clinical Modules	• CT Colonography • CT Lung • CT Vessel • CT Calcium Scoring • CBCT Dental • DCE-MRI Perfusion • Breast MRI • MRI ADC Modeling • PET/CT Registration

OpenRad Cloud

Main Modules

OpenRad Cloud by Biotronics3D

MODULE	DESCRIPTION
OpenRad Cloud's DICOM Printing Tool	Advanced film printing tool
OpenRad Cloud's DICOM Modality Worklist Service	HL7 to DICOM convertor delivers patient and exam information from the RIS directly to the modalities.
OpenRad Cloud's Analytics	Business intelligence tool (in development): Qualitative & quantitative reports & metrics from the PACS database related to the medical imaging centre activities & performances



OpenRad Cloud

General Visualisation Modules

Workflow Features:

- Highly configurable hanging protocols
- Assign a study with a user (manual and automatic) and create user-specific worklists.
- Route studies to folders using various pre-defined roles.
- Built-in text editor for reporting.
- Suspend a study with possibility to preserve the state—the analysis can be resumed from where it was left.
- Import and attach documents or images to a study.
- Supported formats: PDF, JPEG, BMP, TIFF, PNG
- Export images as JPG, BMP, or PNG.
- Lossless & lossy image compression
- Add text notes to a study.
- HL7 interface & RIS/PACS desktop integration
- User notifications (e.g., when a study is ready for reporting)

Operations with Series:

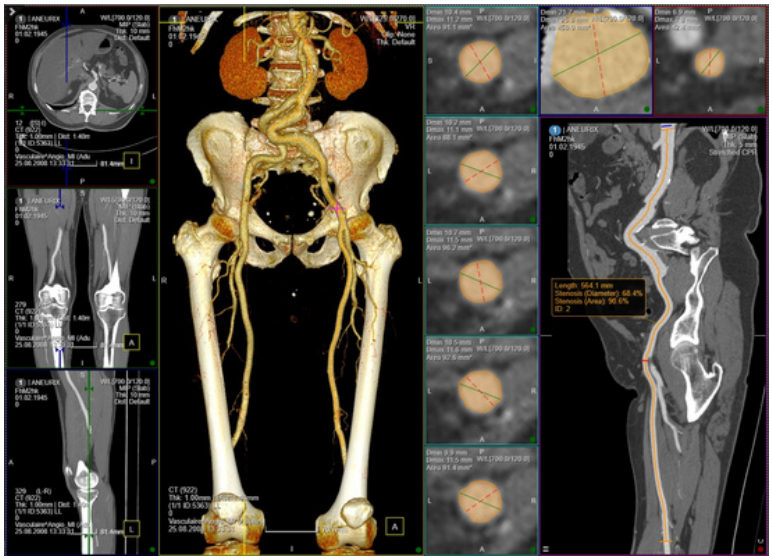
- Study panel shows thumbnails of all the series of the loaded study together with a list of all other studies of a patient.
- Button for displaying only the original series (thin slices), only the reconstructions or only the localisers.
- Add series to the viewing area using Drag&Drop from the study panel.
- Swap series between two viewports using Drag&Drop.
- Remove series from the viewport or remove the entire viewport.
- Double click to maximise a viewport and display one-up.
- Keyboard or mouse driven image series navigation
- Cross-sectional reference lines (e.g., Sagittal vs. Axial)
- Synchronous scrolling
- Cursor cross-snap shows axial, sagittal & coronal slices corresponding to the current cursor position in the active viewport.
- Pre-configured & customisable viewing layouts
- Comparative mode with side by side, synchronous visualisation of two or more series 2D

2D Image Processing:

- Pixel calibration
- One hand mouse operation using viewport hot areas for common manipulation tools: Window/level, zoom, pan, scroll
- 90 degrees clockwise & counter-clockwise image rotation
- Horizontal & vertical flip
- Image invert
- Image histogram
- Zoom, fit-to-window, zoom 1:1, magnifying glass
- Free rotation for volumetric series
- Measurements: Ruler, angle, Cobb angle, circle, polygon, polyline
- Hounsfield units probing & display, including ROI densities with statistics
- Annotations: Arrow, free text
- Window/level pre-sets for various organs & tissues
- Edge enhancement, noise reduction, Gamma filter
- Cine display with speed & direction controls

3D Image Processing:

- Interactive Multiplanar Reformats (MPR)
- Batch MPR: Reformat data to a new series with different slice thickness and new orientation.
- Curved Planar Reformats (CPR)
- Maximum Intensity Projection (MIP, MinIP, AvIP)
- Sliding slab MIP
- Volume Rendering (VR)
- Pre-defined VR transfer functions
- Free sculpting tool in VR & MIP mode
- Clipping tool with pre-defined shapes



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Advanced Clinical Modules

CT Colonography:

- Automatic centreline extraction & segmentation of the colon
- Endoluminal fly-thru & simultaneous display of prone & supine acquisitions
- Polyp measurement tools: Record videoclips & generate colonoscopy reports

CT Lung:

- One-click volumetric segmentation of pulmonary nodules
- Automatic measurements of HU, volume, area & diameters
- Side-by-side current-prior study comparison & nodule growing rate report

CT Calcium Scoring:

One-click segmentation of the coronaries & full quantitative scoring: Volume, Agatston score, max HU, Av HU & plaque data

DCE-MRI Perfusion:

Pharmaco-kinetic (PK) modelling to estimate kinetic parameters associated with the passage of the contrast agent, such as transfer & rate constants, extracellular space—which correlate to pathological findings of micro-vessel density growth factor

CT Vessel:

- Two-click centreline extraction & segmentation of blood vessels
- Curved planar reformats
- One-click automatic bone & CT table removal
- Display of vessel cross sectional diameters
- Stenosis analysis

PET/CT Fusion:

- Automatic PET/CT image registration
- One click lesion segmentation & SUV calculation
- Customisable view layouts, including MPR & 3D MIP

Mammography:

- Customisable hanging protocols
- Automatic back-to-back alignment
- Synchronised zoom & window/level
- Zoom with chest wall justification
- Invert tissue
- Measurement tools

CBCT Dental:

- Fast generation of curvilinear reformats by marking points along the arch of the jaw
- Generation of panoramic & paraxial views
- Distance, angle & ROI measurement tools
- Nerve tracking

OpenRad Cloud

Solution Design

Our system fully supports the IHE profile together with DICOM 3.0 and HL7 standard. Our Gateway, a proprietary software node, can be configured with multiple DICOM and HL7 systems. Regardless of vendor or physical location, these systems can be integrated and consolidated to facilitate an automated workflow. The Gateway provides direct DICOM Modality Worklists to modalities, responds to query/retrieve requests, or manages manual or automatic routing of studies to various DICOM targets.

- DICOM communication service: C-Store (SCU/SCP), multi-frame image storage, Query/Retrieve (SCU/SCP), C-Find, C-Move, C-Get, Echo, Storage Commitment
- HL7 interfaces for connecting with other systems with support for ORM, ORU, ADT messages

Cross Site & Subspeciality Reporting

The OpenRad Cloud platform supports cross-site community-based reporting. Based on the specific modules and the chosen solution architecture, we can support a multi-site or multi-tenant environment. Via a top-level organisational structure, we can establish a dynamic subspeciality and auto load balanced reporting model.

Each site can (if required) have its own tenant on the cloud and we provide hyper-fast access to studies via true thin-client streaming. The reporting application is device-agnostic, so the radiologist can use any device that can run a HTML 5 browser (PC, Mac, tablet. etc.).

Furthermore, the client includes integrated advanced visualisation and can support AI and 3D volume rendering for speciality reads. Via our dedicated teleradiology module we can provide, customisable and automatic load balancing, and personalised and enterprise worklist.

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Cross Site & Subspeciality Reporting

Studies can be allocated to a worklist based on user availability or subspeciality. Individual sites or a multi-site organisation can use the built-in rules engine to set priorities on reads. Once an exam is ingested to the platform the study will need never need to leave the cloud. Via integrated business intelligence (BI) the platform tracks activity for cross-organisation billing. Although optional, our HL7 compliant RIS provides enterprise-wise patients and procedures management, paperless forms which can include the patient's signature, and a modern scheduling system that optimises the modalities workload. Incredible scalability means there is no limit to the number of supported tenants or reporters, and the platform is totally secure as all data transferred is encrypted. Your benefits:

- A cloud-based platform, single sign-on, without any frustrating software installs or a need for on-site data storage: Via the zero-footprint client, all data is accessible to your reporters, other clinicians, and collaborators securely and from any location.
- Go live immediately: No equipment to purchase or install, no complicated VPNs or managing firewalls.
- Extremely low initial cost, no long-term contract, no per user fees
- Pay per study for only what you use.
- User-friendly: Very little user training required after set-up.
- We deliver massive datasets and examinations within one second and at clinical quality, combined with all the advanced tools your radiologists need. All within a secure framework with GDPR, HIPPAA compliance, CE.
- Access to the OpenRad community of users to outsource reporting & manage peak of demands
- Easy to integrate with your customers' systems: Get their examinations and send back the results to them. We automate the process for you, so you only focus on delivering clinical excellence.
- Comes with a built-in full reporting system and fully customisable Peer Review workflow
- Intelligent study share, multi-site management, rule-based automatic study assignments & statistical analysis of your work

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Health Portals for Patients & Referrers

PATIENT PORTAL

Liberate your patients through the OpenRad's health portal, a paperless system for patients to keep a record of their medical information, view their imaging examinations and much more. If allowed, patients can request appointments at any of your clinics at their convenience and collaborate better with your doctors.

OpenRad's Patient Portal implements a personalised timeline, where patients can track their health progress from diagnosis to recovery—having the ability to upload relevant information along the way, which is then transformed into an easily manageable timeline. Save on time, costs, and resources through the Patient Portal where patients can access their health information in a secure and encrypted way whenever they need and wherever they go.

REFERRER PORTAL

OpenRad's Referrer Portal enables doctors and other prescribers to directly book studies from the comfort of their office. The process is easy, fast and still rigorous, following the booking and scheduling rules in a RIS-style fashion. The referrer, in fact, will be able to answer the questionnaires set by the organisation and include scanned documents, as if they were within the organisation premises.

Moreover, the Referrer Portal allows you to communicate and provide medical images as well as reports to your patients securely, whilst improving efficiency overall. Save on time, costs, resources and eliminate the tiring process of CD burning.

Enabling an efficient communication between referrer, patient and healthcare provider, moving forward all together to achieve great clinical outcomes in a timely fashion. Take advantage of OpenRad's platform and increase your competitiveness through offering this unique and patient-centred service.

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Deployment Models

MODEL 1: PUBLIC CLOUD

Datacentre infrastructure is owned and support services are delivered by OpenRad. OpenRad manages the provisioning and maintenance of the technology stack. OpenRad provides full 24/7 technical support and comprehensive user training. Costs are spread across a number of users, each operating a low-cost, pay-monthly approach to the provisioning of services.

For whom?	Ideal for small to medium hospitals! Why?: • No capital investment • Utility billing • Inexpensive, turnkey set-up • Incremental scalability • Meet fluctuating demand • Hardware, application & bandwidth costs covered
Pros	• Infrastructure, software, security, and compliance managed by OpenRad. • Great level of efficiency for shared resources • Provides the best economies of scale. • Single provider ensures rapid resolution of issues. • Incurred costs are based on what resources are used.
Cons	• Security & reliability outside of your control • Limited custom configuration • Bound by general SLAs

OpenRad Cloud

Deployment Models

MODEL 2 : PRIVATE CLOUD

Choice of datacentre infrastructure ownership and hosting as well as support services. Option of deploying a dedicated technology stack within OpenRad's datacentre environment or within another datacentre of choice. Option that OpenRad or 3rd party provides extensive user training, maintenance services and first line of support. Costs for the provision of OpenRad Cloud (by Biotronics3D) software, technology stack, consultancy services, hosting, support, and necessary 3rd party applications.

For whom?	Ideal for large enterprises! Why?: • Keeping assets within the firewall to ensure security & compliance • Maintain control over data regulation and governance. • Consolidate a large chunk of infrastructure duplicated across the network.
Pros	• Services & infrastructure maintained as a private network. • Gain benefits of cloud architecture without giving up the control of your data. • Can be used in conjunction with the OpenRad Public Cloud to offer a robust disaster recovery solution.
Cons	• Can be expensive. • Requires purchasing and maintenance of all software and infrastructure.

OpenRad Cloud

Deployment Models

MODEL 3 : HYBRID CLOUD

Deployment uses primary datacentre and local cluster nodes.
Option of a public or private cloud deployment or combination of both, for the primary datacentre and local cluster nodes to best leverage what each has to offer and build a solution perfectly matched to your business needs. Option over hardware provision, maintenance, extensive user training, and support.

For whom?	Ideal for medium to large distributed networks! Why?: • Customise the computer, storage, and networking components to best suit your requirements. • Maintain components within private datacentre deployment and/or use the OpenRad Public Cloud for resources in the short-term. • Maintain control and security over network.
Pros	• Best of both worlds. • Achieve a highly flexible, highly agile, and highly cost-effective solution. By spreading things out over a hybrid cloud, you keep each aspect of your business in the most efficient environment possible. • Keep patient data secured within private cloud environment while utilising the public cloud as needed.
Cons	• More complex than public or private clouds. • Nodes tailored to site—takes longer to implement.

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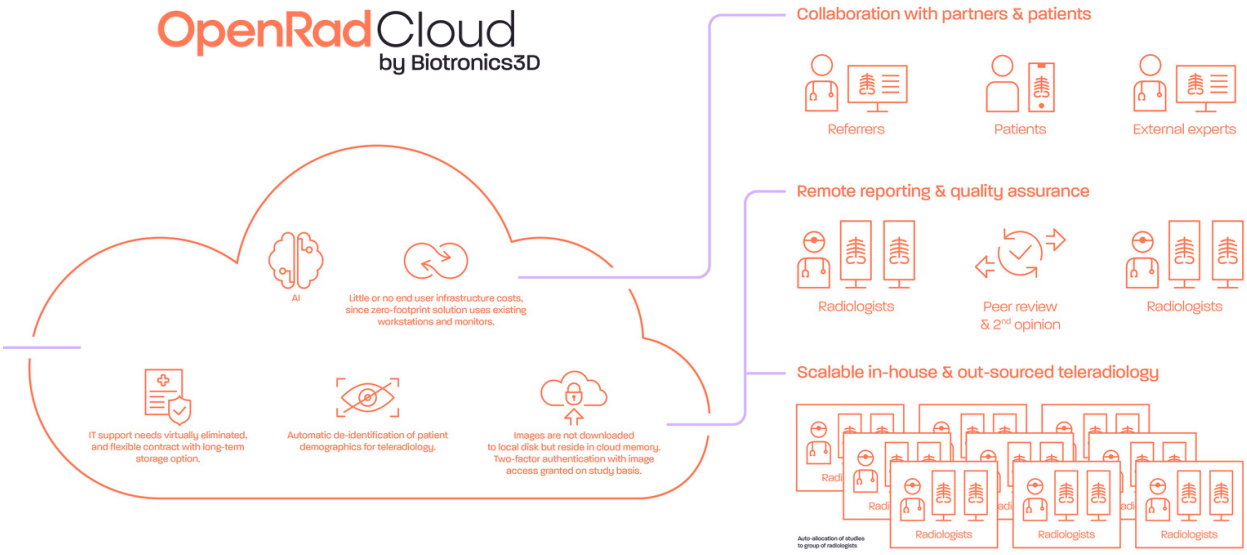
Typical Configuration & Data Flow



OpenRad Cloud

Operational optimisation, business scaling & rapid access to new features—based on a fully managed one-cloud solution

Secure remote image sharing & reporting workflow, including peer review

OpenRad Cloud

Business Value Proposition

User Centric

Once connected to OpenRad Cloud (by Biotronics3D), members can seamlessly store and access any patient data and diagnostic images—from any location. In effect any device that can access the internet becomes a valuable tool in the clinical workflow.

Collaborative & Powerful

Our cloud service connects thousands of healthcare professionals with access to information-rich content which can be shared with other members in a multidisciplinary environment. Patients also can participate in this service. Combined, this creates wealth of clinical power, impossible to achieve with traditional models based on single computers.

Secure & Reliable

We guarantee that your confidential information remains safe and secure. Whatever the preferred deployment model, OpenRad provides full technical support to ensure full integration with the existing environment, including third party DICOM and HL7 systems. Once deployed, OpenRad also offers an array of flexible support and training options to ensure rapid resolution of any issues as well as end-user satisfaction.

Zero Risk

Without the need to purchase hardware, software licenses or implementation services, you are able to get OpenRad's cloud-computing arrangement off the ground in record time and for a fraction of the cost of an on-premise solution. Because our cloud offering follows a utility model in which monthly service costs are based on consumption, you only pay a monthly membership, for as long as you want to use it, by simply subscribing to one of our affordable monthly payment plans.

Assurance

Since the launch of 3Dnet [now: OpenRad Cloud (by Biotronics3D)] in 2010, we have consistently exceeded our targets for reliance, uptime and availability. Today, 22 NHS trusts and 89 private healthcare facilities in the UK use OpenRad's Public Cloud to support managing, archiving, visualisation, remote review, and reporting of diagnostic images. We are proud to state that over this period, OpenRad Cloud (by Biotronics3D) has held a 98% retention rate of customers.

Why OpenRad Cloud?

For healthcare professionals and patients globally, OpenRad Cloud (by Biotronics3D) innovates the international market of medical imaging by delivering a cloud-based Software-as-a-Service solution that enables secure access to images and advanced visualisation tools from any location and any device connected to the internet.

Our cloud service creates a wealth of clinical power impossible to achieve with the traditional models based on the traditional architecture. It gives you the potential to build a predictable and profitable business in the healthcare sector by harnessing OpenRad's unique technology, market expertise, and outstanding support.

With our industry-leading cloud-computing solution for medical imaging you have the most robust service portfolio to meet any needs and make your organisation even more successful.

About OpenRad

Enterprise Cloud Reporting the easy way

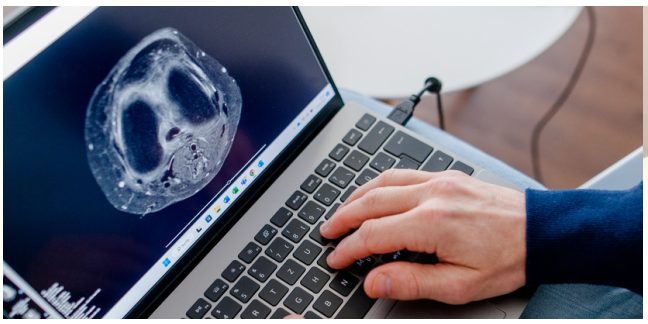
Located in London and Berlin, OpenRad delivers innovative radiology solutions for static and mobile diagnostic imaging centres worldwide—amongst them hospitals, clinics, doctor's surgeries and trailers. OpenRad aims to empower healthcare professionals and the wider research community by connecting people, technology and data.

OpenRad can fully digitalise workflow processes within radiological diagnostics and across multidisciplinary teams. Its zero-footprint and SaaS based solutions speed up implementation, increase centre utilisation, provide remote access, and reduce cost of ownership.

OpenRad's Enterprise Edition enables cloud-based reporting, teleradiology and collaborative workflows across companies:

- Maximise reporting productivity & accuracy throughout the workflow—from referrer to radiologist to patient communication
- Secure remote image access & reporting, including peer review
- Manage complex reporting workflows across multiple sites, legal entities & system boundaries
- Enterprise operational scaling with rapid access to new features based on a one-cloud solution
- Smart management of modality fleets

Our solutions: OpenRad Cloud (by Biotronics3D) is our all-in-one cloud-based enterprise reporting platform. OpenRad Cube (by Visbion) is our mobile image management solution.



350+

clinics working with
OpenRad Cloud

55,000

doctors, patients & other clinical staff
are currently using OpenRad Cloud

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OpenRad Cloud (by Biotronics3D) is based on the product 3Dnet manufactured by Biotronics3D.

3Dnet

MD: Class IIa Medical Device

CE-certified: CE2797 | GDPR-compliant | No FDA clearance

UDI: (01) 0506075720003 (21) 2.1520220802.23280
Serial number: 2.1520220802.23280

EU MDR Certificate: MDR 724463 R000
Registration with MHRA: Biotronics3D Account No. 0000017323 | Device Ref. No. Z110603

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Date of manufacture: 20220802

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