

Realtime-Teleradiology with VEPRO WEBstudio

With the VEPRO WEBstudio app, healthcare providers are given the opportunity to access all medical data - image, film, text and audio information from any location in real time - and to view and process this data with full PACS functionality with the help of any diagnostic devices – desktop or mobile.

The healthcare provider connects directly to the data network (server) in the hospital or in the data center via a secured and encrypted data line. The device becomes part of the common data network after the connection via WEBstudio. As a result, the user can be connected to the hospital's data as if they were locally based. The required bandwidth of the data line to the terminal should be >4 Mbit/user, so that a delay-free image display and image processing at the point of origin becomes possible.

During the entire teleradiological operating time which can be scheduled into a weekly calendar, the available bandwidth of the data line from the device to the data network (server) is automatically monitored by the WEBstudio app with several periodic interval measurements per hour. Several data files are transferred from the data server (source) to the diagnostic device (destination) where the required speed is measured and the available data bandwidth is determined, displayed and logged.

The quality of the data transmission and completeness of this data is also checked. In addition to automatic interval checking the user can manually check the currently available data bandwidth.

During the use of the system, the user is immediately informed about the following status changes in data speed or availability:

- Speed normal (> 4Mbit)
- Speed acceptable (1 to 4 Mbit)
- Speed bad (<1 Mbit)
- Data communication interrupted

All logs are stored over a period of 30 days and can be viewed or printed.

Image data is always transferred to a diagnostic device (Windows) without loss in its original quality and displayed in the same format on any device installed in the local data network.

By providing a stable data line with min. 4Mbit / download speed per user, a system availability > 98% is guaranteed.

The following laws, standards and guidelines are binding for teleradiological use:

Quality Assurance Policy (QS-RL)

http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Strahlenschutz/qualitaetssicherungs_richtlinie_bf.pdf

X- Ray regulation

https://www.gesetze-im-internet.de/r_v_1987/R%C3%B6V.pdf

E - DIN 6868-159:2016-05

(the requirements of the draft of this standard have already been taken into account in the following discussion))

Acceptance and constancy tests in teleradiology

The quality assurance guideline (QS-RL) stipulates the following quality assurance tests for use as a teleradiology system under section 6.2:

1. Acceptance test according to DIN 6868-159
2. Constancy tests (monthly)
3. Constancy tests (daily)

Acceptance verification

As image data sets are prepared for verification of the transmission speed and completeness, on one hand, image series with the most pictures are used per modality and on the other hand an image series of the most frequent examination region. The transmission time to the terminal must not exceed 900 seconds.

For an acceptance test with the VEPRO WEBstudio it must be taken into account that the classical data transmission from A to B, which is otherwise in the teleradiology and does not take place via physical file transfer but the image data in real time, is immediately displayed on the diagnostic device. Thus, this form of data provision is identical and nearly as fast as in the case of local image viewing and processing in the hospital.

In order to meet the formal requirements of the acceptance test, the following procedure is proposed:

1. Definition of the typical relevant studies / series from the PACS archive:
 - a) with the largest volume of data
 - b) the most frequently anticipated study region
(both are identical, one study is sufficient as a test image data set)
2. Storing these records (series) in a PACS storage and renaming / anonymizing patient data.
E.g. the name: "Sample data TR 1" and the study title: "CT Thorax 200 images"
3. Establish a WEBstudio connection at the device (teleradiology- / workstation) and direct display of the sample data set **in 100% zoom**
4. Manual measurement of the time period from the first call to the last picture display.
Preparation of measurements, e.g. for CT/MR image data:
 - a. Display of the first image
 - b. Switch over e.g. on a 2x4 or 4x4 grid (smallest image grid where image data sets are still displayed with 100% zoom)**
 - c. Press the PG DN - Picture ↓ key (scrolls all images of a grid) to the end of the image series
 - d. Open further series if needed and proceed as shown at b) until the last picture is displayed
 - e. The time result is documented.

Since the display is normally in the real-time range, the maximum possible period of 900 secs is never exceeded. The data display of a complete screen with several images at the same time, takes place with an available bandwidth of 4 Mbit/User usually <1 second.

A sample such as the form for acceptance test can be completed, is attached in the appendix.

Constancy tests

The quality assurance guideline provided in the last version certain facilitations for the daily / monthly consistency checks if data connections are also be used for other purposes outside of teleradiology:

When using a common PACS and data network, the constancy check must not be carried out after the acceptance test if:

- a) *The functionality of the data connection is ensured by means of technical measures such as network monitoring or connection protocols and continuous use of these data paths is also carried out in the operational environment (outside teleradiology).*

Realization by VEPRO WEBstudio:

Continuous network monitoring of the connection quality is ensured by the intermittent checking of the data rate and the checking of the completeness of the data transmission. The operating time to be logged is scheduled in a weekly calendar. All individual test results are documented according to the min. max. and average speed. The daily deviations or data interruptions are logged per working day.

- b) *Deviating from DIN 6868-159, the daily constancy test (functional ability test) can be dispensed if the teleradiologic route is used in daily routine work and the stability of the teleradiology system has been proved over a period of one month.*

Realization by VEPRO WEBstudio:

WEBstudio monitors and logs the stability of the teleradiology connection over a period of up to 30 days. This protocol can be printed and archived and serves as proof of stability.

- c) *Deviating from DIN 6868-159, section 7.2.2, the constancy check of the transmission time and completeness of the transmission can be omitted if these parameters are continuously checked and recorded.*

Realization by VEPRO WEBstudio:

This required check of the parameters is carried out continuously in the WEBstudio. The completeness of data packets is also validated by appropriate checks.

Result:

No daily constancy tests are necessary, as far as the requirements defined under a) to c) have been fulfilled.

- d) *Deviating from DIN 6868-159, it is not possible to check the physical image quality during the constancy check if the entry of the DICOM field for the loss-sustained data compression (DICOM tag (0028,2110)) is checked and logged every month.*

Realization by VEPRO WEBstudio:

Since the VEPRO WEBstudio always work with the original files at the location and the VEPRO PACS does not allow lossy compression, the DICOM tag 0028,2110 (lossy compression) always has the value "00" unchanged, which means that no loss-related data compression on the image data set is changed. Since this lossy data storage or transmission is technically not possible at all and is therefore always the same, it can be assumed that this logging can be dispensed with.

This DICOM tag value can be viewed at any time by the user in the DICOM image data.

Through the **lossless image transmission over the network and the continuous monitoring and the logging of the data completeness**, it is proofed that physical image quality on the diagnostic device is equal to the original quality at the location of the image data generation

Result:

In the case of teleradiological use of the VEPRO WEBstudio app, the monthly constancy check may be dispensed if the requirements listed under d) are met.

Pfungstadt, in July 2019

VEPRO Product Management

Attachment:

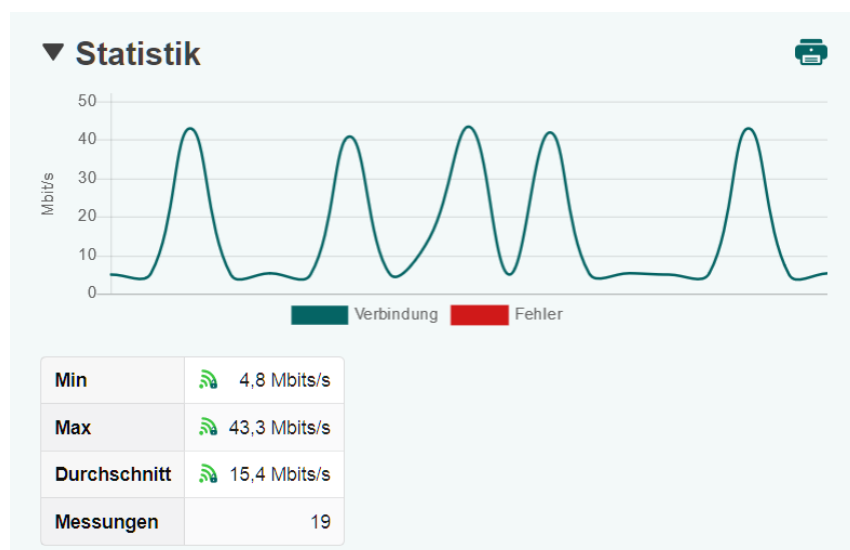
Configuration of weekly teleradiological operating time:

Wochenplaner

Montag	Dienstag	Mittwoch	Donnerstag	Freitag	Samstag	Sonntag
00:00	00:00	00:00	00:00	00:00	00:00	00:00
01:00	01:00	01:00	01:00	01:00	01:00	01:00
02:00	02:00	02:00	02:00	02:00	02:00	02:00
03:00	03:00	03:00	03:00	03:00	03:00	03:00
04:00	04:00	04:00	04:00	04:00	04:00	04:00
05:00	05:00	05:00	05:00	05:00	05:00	05:00
06:00	06:00	06:00	06:00	06:00	06:00	06:00
07:00	07:00	07:00	07:00	07:00	07:00	07:00
08:00	08:00	08:00	08:00	08:00	08:00	08:00
09:00	09:00	09:00	09:00	09:00	09:00	09:00
10:00	10:00	10:00	10:00	10:00	10:00	10:00
11:00	11:00	11:00	11:00	11:00	11:00	11:00
12:00	12:00	12:00	12:00	12:00	12:00	12:00
13:00	13:00	13:00	13:00	13:00	13:00	13:00
14:00	14:00	14:00	14:00	14:00	14:00	14:00
15:00	15:00	15:00	15:00	15:00	15:00	15:00
16:00	16:00	16:00	16:00	16:00	16:00	16:00
17:00	17:00	17:00	17:00	17:00	17:00	17:00
18:00	18:00	18:00	18:00	18:00	18:00	18:00
19:00	19:00	19:00	19:00	19:00	19:00	19:00
20:00	20:00	20:00	20:00	20:00	20:00	20:00
21:00	21:00	21:00	21:00	21:00	21:00	21:00
22:00	22:00	22:00	22:00	22:00	22:00	22:00
23:00	23:00	23:00	23:00	23:00	23:00	23:00

17:00-24:00 00:00-24:00

Overall statistics of all speed measurements:



Extract of detailed logging:

▼ Protokoll

Zeitpunkt	Mbit/s	Größe [MB]
16.9.2017, 19:55:55	5,2	0,5
16.9.2017, 19:45:52	4,8	0,5
16.9.2017, 19:35:36	42,9	27,2
16.9.2017, 18:58:51	5,2	0,5
16.9.2017, 18:48:49	5,1	0,5
16.9.2017, 18:38:47	5,3	0,5
16.9.2017, 18:28:44	5,4	0,5
16.9.2017, 18:18:38	41,8	32,4
16.9.2017, 18:18:26	4,8	0,5
16.9.2017, 18:08:22	43,3	31,2
16.9.2017, 18:08:00	14,3	21,6
16.9.2017, 18:07:46	5,0	0,5
16.9.2017, 17:57:42	40,8	23,5

Log print out for archiving:

Webstudio App - STAGING https://staging.webstudio.mymedihub.com/#/settings/webstudio/4900...

Konfiguration

Statistik

Min	1,7 Mbit/s
Max	43,3 Mbit/s
Durchschnitt	14,7 Mbit/s
Messungen	20

Protokoll

Zeitpunkt	Mbit/s	Größe [MB]
16.9.2017, 20:06:00	1,7	0,5
16.9.2017, 19:55:55	5,2	0,5
16.9.2017, 19:45:52	4,8	0,5
16.9.2017, 19:35:36	42,9	27,2
16.9.2017, 18:58:51	5,2	0,5
16.9.2017, 18:48:49	5,1	0,5
16.9.2017, 18:38:47	5,3	0,5
16.9.2017, 18:28:44	5,4	0,5
16.9.2017, 18:18:38	41,8	32,4
16.9.2017, 18:18:26	4,8	0,5
16.9.2017, 18:08:22	43,3	31,2
16.9.2017, 18:08:00	14,3	21,6
16.9.2017, 18:07:46	5,0	0,5
16.9.2017, 17:57:42	40,8	23,5
16.9.2017, 17:51:12	4,9	0,5
16.9.2017, 17:40:50	5,2	0,5
16.9.2017, 17:30:47	5,1	0,5
16.9.2017, 17:20:44	42,8	27,1
16.9.2017, 17:12:16	5,4	0,5
16.9.2017, 17:02:13	5,1	0,5

1 von 1 16.09.2017 20:12