



CadLink

CadLink System Configuration

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CadLink Overview

CadLink is the information management system that stores patient records and reports, and manages user login and settings specific to the Cadwell applications:



Arc® EEG

Sierra® Summit EMG

Cascade® Surgical Studio IONM

CadLink uses a secure and encrypted proprietary database with file versioning and audit logs to track all user interaction. Utilities are included to allow for export and import of patient records, association of important documents, and manual archiving of data.

CadLink Server

The CadLink Server is used to connect multiple CadLink-enabled products together. Patient data and reports are moved to the CadLink Server for centralized storage and management. User settings are automatically synchronized and available to all systems on the network. Due to the file-based nature of the SQLite database, there is no “database server” maintenance required. One CadLink Server can support multiple Cadwell applications.

CadLink offers seamless, transparent information management between Cadwell applications and the people who interact with that information.

CadLink Server enables remote review and monitoring, and enables remote control of Arc® EEG studies. While connected to a CadLink Server, all recorded data is streamed to the server. If an acquisition system is off-line, it will sync when the connection with the server is reestablished. Acquisition systems are not required to remain connected throughout the study, if network connection is lost data will continue to be recorded locally until connection is restored. Once the network connection is restored data will continue to be streamed to the server including the data that was stored locally while offline.

Optional features include:

- Auto-Archiving, which allows custom parameters of time or file size to initiate automatic archiving, and includes email status updates of archive activity.
- CadSchedule, which permits users to schedule appointments and manage resources across hardware, personnel and locations.
- HL7 Interface to connect with your EMR, which patient demographics to be received and allows reports to be returned.
- Enterprise, which allows data storage support on your own MS SQL Server.

CadLink Dataflow

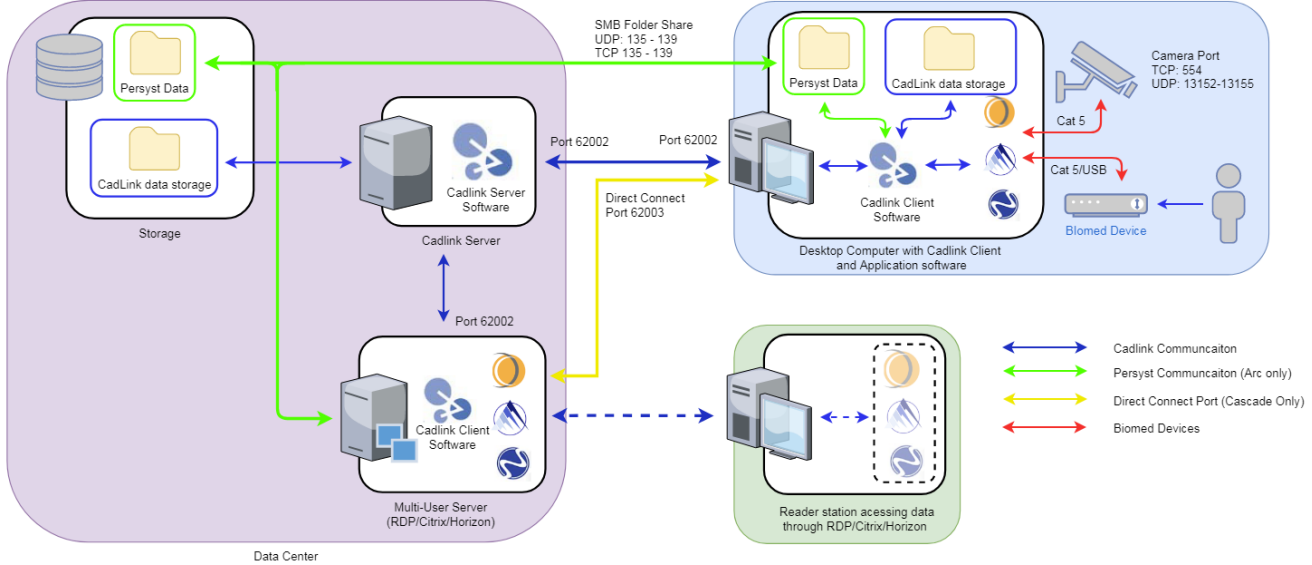
CadLink synchronizes to each workstation and reader station using “CadLink Client”, a small software package installed alongside the clinical software. Data is passed between the client and server using TCP 62002 (by default).

During data collection, patient data is written to the local hard drive of the PC and simultaneously sent to the server (if online and communicating with the server). At the server level, data will be received, processed, then stored to the short-term storage location defined in the CadLink server control panel. Once data collection has completed, CadLink will compare the local file with the copy on the server and delete the local copy from the workstation if the two match.

3
 Data is stored by the Cadlink server at the location designated. This can either be a network storage solution or an internal drive on the server. Data can be accessed by workstations or reader stations but remains in the data center.

2
 The data is checked against the server copy, then deleted from the local workstation. If no server is in use, data will remain on the workstation until deleted. Persyst EEG requires an additional shared folder and transfers data via SMB.

1
 BioMed device is attached to the patient for testing. Collected data is sent to the PC hard drive through the Cadlink Client software. If a Cadlink Server is also online, data is streamed to the server simultaneously.



TCP: Transmission Control Protocol
 UDP: User Datagram Protocol
 SMB: Server Message Block protocol

Minimum and Recommended Server Specifications

CadLink Server should be running at all times. It is recommended to have CadLink Server installed on a server-grade machine in a data center, but may be installed on a desktop computer if a server is not available. CadLink Server can run in a virtual environment. Additional storage space is required based on site policy for data retention. This storage space is not limited to the System partition or a single device; it may be on additional partitions or on a network accessible location from a NAS, SAN, or data server.

	Physical machine		Virtual machine	
	Minimum	Recommended	Minimum	Recommended
Operating System	Windows 7	Windows Server 2019	Windows Server 2008 R2 hosted on Windows Server 2008 R2	Windows Server 2019 hosted on Windows Server 2019
Processor	Quad Core Intel i5 6 th gen or newer	Quad Core Intel i7 6 th gen or newer	4 logical processors	8 or more logical processors
Hard Disk Drive	100 GB capacity, 10 GB free- space for application install and database. 250 GB additional storage space for patient records.	100 GB capacity, 20 GB free space for application install and database. 500 GB or more additional storage space for patient records.	Fixed size vhd of 40 gb capacity with 10 GB free-space for application Install and database. 250 GB additional storage for patient records in another vhd, physical drive, or network accessible storage.	Dynamically expanding vhd of 127 GB max capacity for application install and database. 500 GB or more additional storage space for patient records.
Memory (Ram)	4 GB	8 GB or more	4 GB	8 GB static or Dynamic with 4 GB available at startup.
Archive Device	Any Windows supported device	A long-term archive solution	A long-term archive solution	A long-term archive solution
Graphics	1024 x 768 resolution; 16 MB, 32-bit color depth	1024 x 768 resolution; 16 MB, 32-bit color depth	1024 x 768 resolution; 16 MB, 32-bit color depth	1024 x 768 resolution; 16 MB, 32-bit color depth
Network	100 Base-T Ethernet	Gigabit Ethernet	100 Base-T Ethernet	Gigabit Ethernet
Active Clients¹ Supported	10	25	20	30

¹ *Active Clients* are defined as clients that are currently performing a data intensive operation like recording, reviewing, or downloading an ambulatory Arc® EEG recording.

Network and Storage Requirements

Cadwell recommends a gigabit connection where available. A gigabit connection provides an available bandwidth of 1000 Mbps / 125 MBps. At a minimum, CadLink Server requires 8 Mbps bandwidth per client for data and database synchronization. Speeds below this level may cause less performant and/or unstable synchronization. Depending on the number of clients, number of channels, sampling rate, video quality, a much higher bandwidth may be required. At higher data rates, a 100 Mbps speed may be required.

When reviewing live data, 80 Mbps or higher is recommended from the workstations to the server. If wireless connections are used, a minimum of 802.11n is recommended for best performance.

Cadwell applications using CadLink Server can be successfully configured in a multi-hospital setting. CadLink is designed to allow users to review data from home, office, lab, or anywhere an internet connection can be made. It is important that your configuration suits your networking infrastructure. The two important connections are the network between the user systems accessing the data and the CadLink Server, and between the CadLink Server and the data storage location. If the data folders are using a network location, then the CadLink Server service needs to run under an account that has access to those locations.

Remote Connections via Citrix Server

There are a few ways to remote in and view recorded data from outside the hospital network. The preferred method is via a Citrix² portal. Cadwell applications can be published on Citrix and work well in that environment. The outside computer can read the data as if they were on the network inside the hospital.

Specifications for Citrix Server

- Cadwell applications and the CadLink Client can be run in a Citrix environment.
- The patient data is stored on the CadLink Server.
- The Citrix server should have a good network connection to the CadLink Server.
- If using Citrix Provisioning the CadLink Thin Client needs to be installed instead of the normal client, this will allow the provisioned system to run without any local databases.
- Anyone with the proper Citrix and Cadwell access rights can access the Citrix server and operate the review software from the remote PC.

Antivirus Software and Disk Encryption Software Applications

Cadwell encourages all customers to take necessary precautions to protect computer systems from malicious programs. We also want you to protect the privacy of your patient data. Firewalls must be properly configured or turned off so as not to interrupt data collection.

Though Cadwell applications have been successfully used with multiple antivirus and disk encryption applications, we cannot verify compatibility with all applications available in the marketplace.

Antivirus Tips

- ✓ Scheduled antivirus scans should not happen during a recording/data collection.
- ✓ Exclude product-specific files from scans
 - See product-specific configuration documents to determine required product-specific files.
- ✓ Exclude the following folders from scans, including their subfolders
 - C:\Cadwell
 - C:\ProgramData\Cadwell
 - C:\Program Files\Cadwell
 - CadLink's StreamingData folder (if changed from default)
 - CadLink's Databases folder (if changed from default)

- ✓ After loading any antivirus application or disk encryption:
 - Attempt to open a data file to verify the file opens correctly
 - Archive a record to verify it will archive correctly
 - If the system is a data collection system, start a recording to verify no conflicts appear
 - Generate a report and confirm that the length of time to generate is unchanged.
- ✓ Verify that encryption software does not adversely delay file access and overall Cadwell application performance. Verify that the Cadwell application records can be opened promptly and data navigation speed is adequate after installing encryption or AV software.
- ✓ Microsoft Word is utilized during report generation and creates a temporary file while generating the reports. If this file is scanned during report generation, that can increase report generation times.

² Though the Cadwell applications can be configured with Citrix, you may need to contact your Citrix provider if direct Citrix support and assistance is required.

Security Permission Requirements

CadLink Server

If the CadLink Server Service is running under the "LocalSystem" account, no permission changes are required.

If the CadLink Server Service is running under any other user account, that user **needs read/write access** to the following folders:

- C:\ProgramData\Cadwell\
- C:\ProgramData\Cadwell\CadLinkServerService\Data
- C:\ProgramData\Cadwell\CadLinkServerService\Databases
- C:\ProgramData\Cadwell\CadLinkServerService\StreamingData
- C:\ProgramData\Cadwell\CadLinkServerService\UpdateUtils

If Persyst data is being collected for Arc® EEG application users, the "External Data Share" must be specified. Arc® application users and the account under which the CadLink Server Service is running need read/write access to that share.

CadLink Client

The permissions on a local CadLink client system are by default set up upon install. We configure the folder paths provided in the installer to contain the local “Users” group with rights to read, write, and modify. Under normal situations this should cover the service and logged in user’s rights to access these locations. By default, “Domain Users” is added to a machine’s “Users” group when that machine is added to a domain. Because of this, any “Domain User” should be able to run the Cadwell applications without additional permission changes.

If the CadLink Client Service is running under the “LocalSystem” account, no permission changes are required. If the CadLink Client Service is running under any other user account, that user needs read/write access to the following folders:

- C:\ProgramData\Cadwell\
- C:\ProgramData\Cadwell\CadLinkClientService\Data
- C:\ProgramData\Cadwell\CadLinkClientService\Databases
- C:\ProgramData\Cadwell\CadLinkClientService\StreamingData
- C:\ProgramData\Cadwell\CadLinkClientService\UpdateUtils
- C:\ProgramData\Cadwell\CadLinkClientService\CadLinkExternalData

CadLink Disaster Recovery & Recommended Backup

Backing Up the Server's Database and Data Folders on a Client-Only Machine

It is recommended that backups are run from the CadLink Server when operating with multiple clients and a CadLink Server. See *369044-620 User Manual, CadLink Server* for details on backing up databases and data on the CadLink Server.

Periodic backups of the CadLink databases and the Data folder is recommended, please consult your IT Department or designated network support person on the best method to configure backups. It is also recommended that you keep a backup of archived data.

Cadwell recommends that you use the Windows Backup utility or another third-party backup program. You should schedule backups when network activity is low. The CadLink Client service does not need to be stopped in order to perform backups.

The folder that should be included in a backup is:

Folder Name	Default Location
CadLink External Data	C:\ProgramData\Cadwell\CadLinkClientService\CadLinkExternalData
Databases	C:\ProgramData\Cadwell\CadLinkServerService\Databases
Data	C:\ProgramData\Cadwell\CadLinkServerService\Data
Streaming Data	C:\ProgramData\Cadwell\CadLinkServerService\StreamingData

Note: It is highly recommended that a backup be performed before and after an upgrade of the CadLink Client software. The update utility will automatically create a backup of the database files to protect against loss of data.

Restoring the Client Database and Data folders.

In the event that you need to restore the CadLink Client databases and data files from a backup; follow these steps:

1. Stop the CadLink Client service.
2. Restore the Database, Data, StreamingData, and CadLinkExternalData folders to the appropriate location on the server. See the previous section for default folder locations.
3. Restart the CadLink Client service.

Note: the CadLink databases are versioned, so a backup made with CadLink 2.0 will not restore properly to a system with CadLink 2.1. It is suggested that you always make a backup before and after an upgrade of the CadLink Client software.

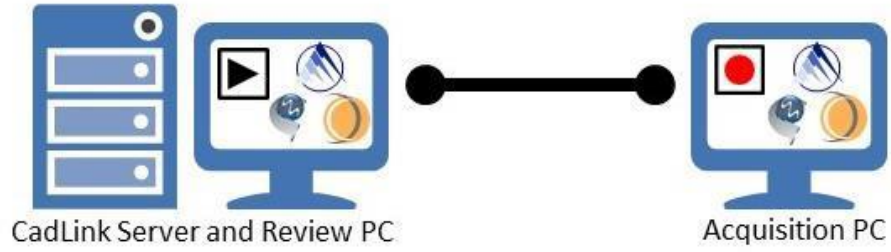
Please contact Cadwell Support if you have any questions about the Backup and Restore process.

Phone: (800) 245-3001 or (509) 735-6481

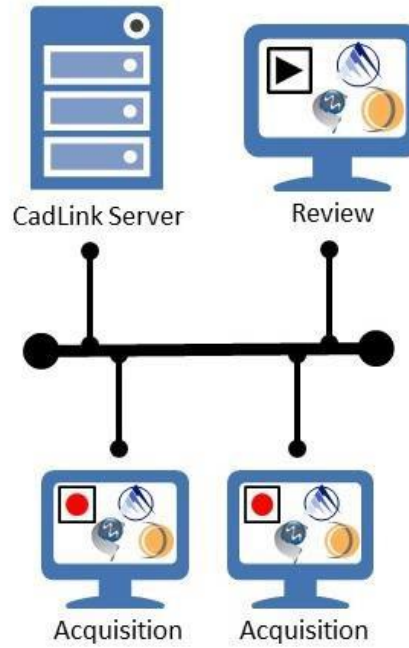
Support Hours: 6:30 am to 5:00 pm, Pacific Standard Time

CadLink Network Examples

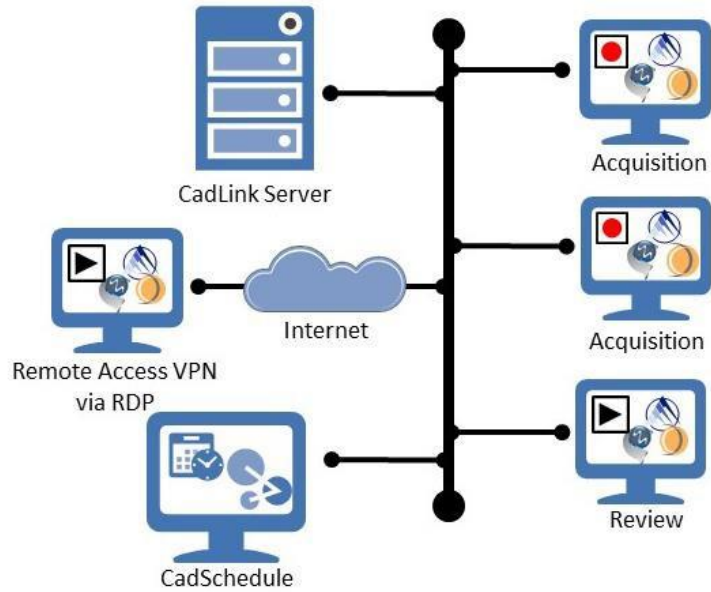
Simple Client and Reader/Server Combination



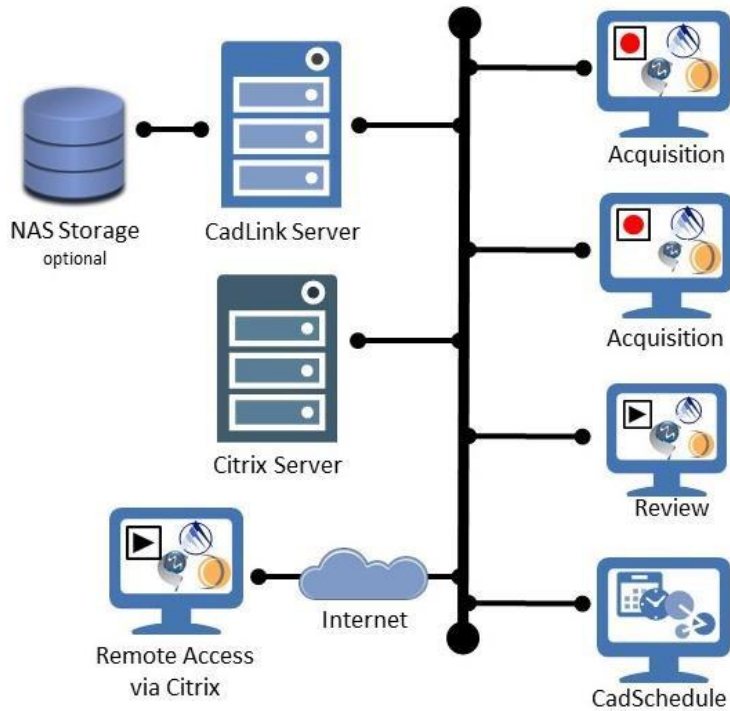
Dedicated Server and 3 Clients



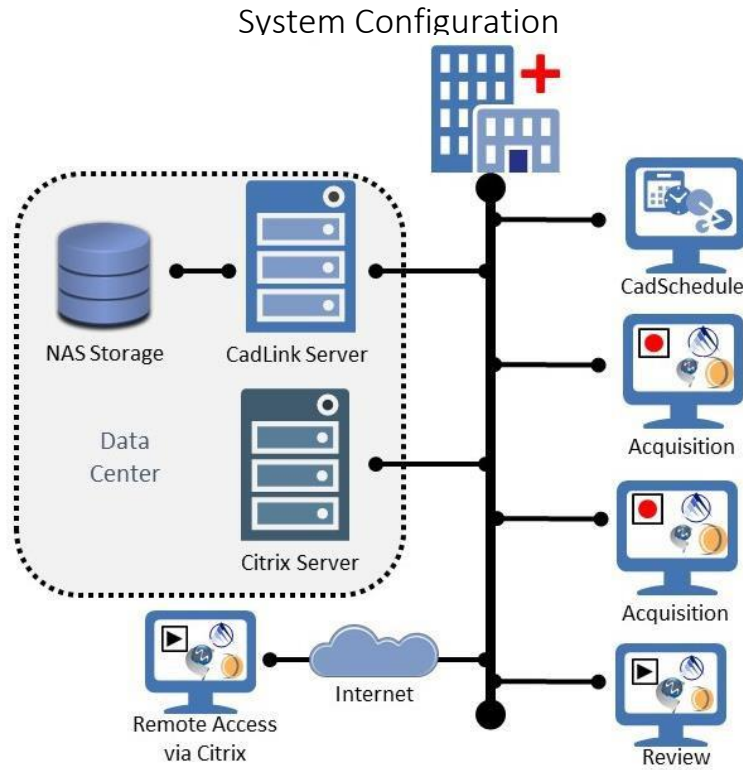
Dedicated Server and 5 Clients, Remote Access via VPN and RDP



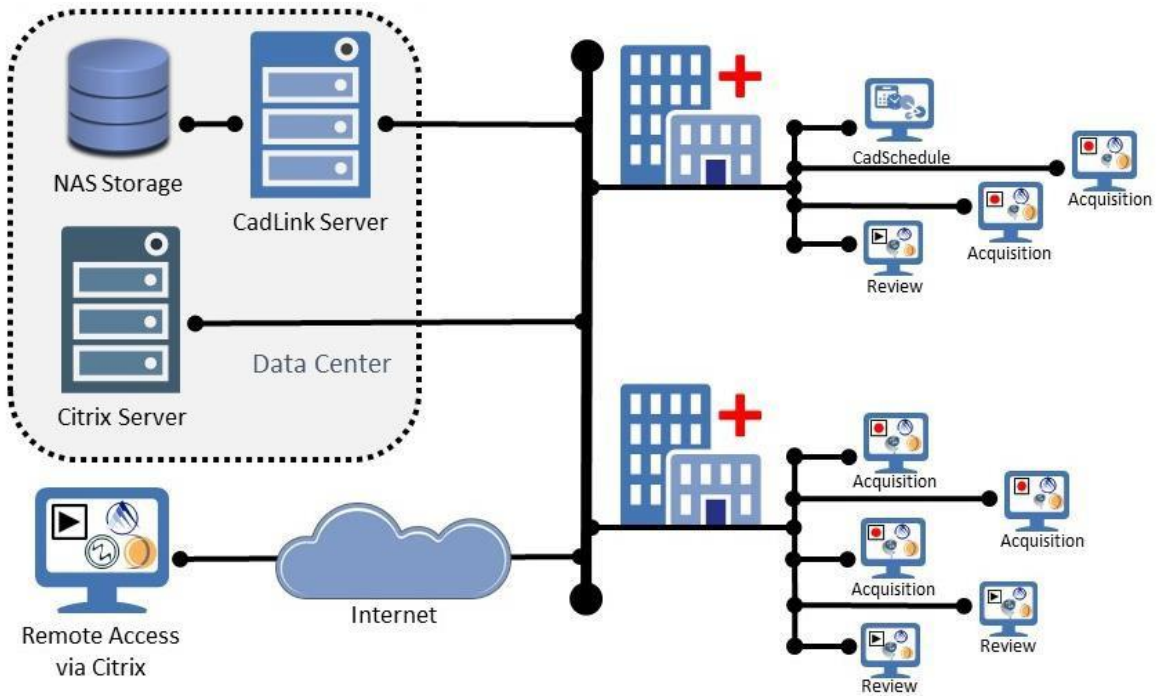
Large Clinic or Lab with 6 Clients, Remote Access via Citrix



Enterprise Network, Single Hospital



Enterprise Network, Multiple Hospitals



CadLink/Application Compatibility

Release Quarter	CadLink Version	Compatible with:		
		Arc	Summit	CSS
Q4 2012	1.0.4		1.0.4	
Q1 2014	2.0.55		1.1.143	
Q2 2015	2.1.52	1.0.83	2.0.X	
Q1 2016	3.0.35	2.0.75		3.1.120
Q3 2016	3.0.41	2.0.93		
Q4 2016	3.0.49	2.0.115		
Q2 2017	3.1.32	2.1.78/ 2.1.106	3.0.x	3.1.1198/ 3.1.1195
Q2 2017	4.0.17			3.2.1750
Q3 2017	4.1.15	2.1.78	3.0.x	3.3.190
Q3 2018	5.0.31	2.1.106	3.0.385	3.4.1379
Q4 2018	5.0.33	2.1.106	3.0.385/	3.4.1387/ 3.4.1411/ 3.4.1470
Q2 2019	5.1.12	2.2.167	3.0.385 / 3.1.522 / 3.1.537	3.4.1470
Q4 2019	5.2.22	2.2.167	3.1.537	3.5.1414