

Technical Note

Guidelines for large VaiNet systems

What is a large VaiNet system?

A **standard** VaiNet system can contain up to 8 access points and up to 256 wireless data loggers on a single site. Standard systems can be deployed with minimal planning. The resulting system is extremely reliable and performs well in almost any environment, including sites that are challenging for wireless connections.

Systems with more than 8 access points on a single site are **large** VaiNet systems. Large systems can now be built by taking advantage of the **VaiNet network segmentation** feature. Segmentation improves the ability of VaiNet access points to share VaiNet radio channels and reduces the impact of interference on the physical radio layer. Systems with up to 32 access points and up to 1024 data loggers can be deployed on a single site as long as these updated guidelines for large systems are followed.

It is recommended to leave some unused connection capacity in each segment and not plan for a fully maxed out system. For more information on the benefits of having free capacity, see [Large system planning guidelines \(page 2\)](#).



Deployment of large systems should always be planned in detail. To ensure trouble-free operation, the operation of large systems should also be monitored after installation, so that any connectivity issues can be detected and corrected.

VaiNet segments explained

The VaiNet segmentation feature splits the local VaiNet radio network into segments. Each segment can have up to 8 access points, 1 for each VaiNet channel. Up to 4 segments can be created, identified using letters A–D.

Segmentation provides significant benefits for the building of larger VaiNet networks:

- Overlapping radio transmissions have been significantly reduced as each segment has a different timing offset for its VaiNet radio communication.
- The access point switching behavior of data loggers is more controlled. Data loggers only connect to access points of their home segment, and ignore the other segments.

Segment configuration is done on the access point using the web interface or the local touch interface. Starting with AP10 access point firmware version 5.0.0, there is a new **VaiNet segment** configuration parameter. This new setting is part of the VaiNet radio settings. The setting is mandatory, so every VaiNet network has at least one segment. The segment and channel combination of each access point must be unique on the site.

Figure 1 VaiNet segment setting in the AP10 touch interface



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Data loggers do not have a configurable segment setting, as their segment is automatically determined by the access point they use to join the system. When a data logger connects to an access point that is in installation mode, the segment of its connecting access point becomes its **home segment**. A data logger will not leave its home segment unless it is remotely released from the network or its physical **Release** button is pressed. For example, if a data logger is connected to access point B1 (VaiNet segment B, channel 1), it will only connect to other access points in the B segment if it loses its current access point connection.

If the segment setting of an access point is changed, all data loggers that are currently connected to it will lose their connection. They will automatically attempt to reconnect to any remaining access point in their home segment. They will not be transferred to the new segment of the access point.

To make sure all data loggers are assigned to the planned segment, the installation of data loggers in a large system should proceed one segment at a time.

Large system planning guidelines

Plan before you start

Before moving on to deploying a large VaiNet system, make sure you have a detailed **device installation plan**. From the point of view of network deployment, the plan should include the following information for VaiNet devices:

- Model, serial number, firmware version, and installation location of each device
- VaiNet segment and channel of each access point
- VaiNet segment of each data logger

Place each segment in its own physical area

In situations where the VaiNet radio traffic is high, the data transfer performance will be better if each segment is placed its own physical area. A typical example of such a situation is the recovery from a network outage when measurement data from data loggers is being backfilled to the viewLinc system.

Concrete walls, floors, and other heavy structures are natural radio barriers that can be utilized between segments where possible. Note that due to the long range of VaiNet, such structures will typically not entirely block the signals.

Maximize access point connectivity for data loggers

VaiNet data loggers will automatically reconnect if they lose their access point connection. To minimize the impact of any access point outages, place access points so that each data logger is in the range of more than one access point. Centrally placed open locations within the segment area are good options.

It is not necessary to consider the access point placement or VaiNet channel assignments between segments. As long as an access point has its own VaiNet channel within the VaiNet segment and a suitable location in relation to the data loggers it is planned to connect, all is well.

Leave some free connection capacity in each segment

As data loggers will not connect to access points outside their home segment, **free connection capacity is not shared between segments**. It is therefore best to avoid filling any segment to the maximum. If possible, each segment should have sufficient free capacity to reconnect the data loggers in case a single access point becomes unavailable. Unallocated capacity will also help to prevent problems that could be caused by access points filling up, possibly leaving the remaining capacity in the segment unreachable by some data loggers.

Add segments as necessary and consider future expansion

Standard systems of up to 8 access points only need to use the default segment A. This maximizes communication performance and makes the best use of connection capacity. If desired, standard-sized systems can optionally implement more than one segment, for example to limit data logger roaming between areas.

Large systems of more than 8 access points must use at least 2 segments. The number of segments you should have depends on the size of the system and its physical layout. It is a good idea to leave some room for expansion in each segment in case more data loggers or access points are needed later.

Examples of large VaiNet network layouts

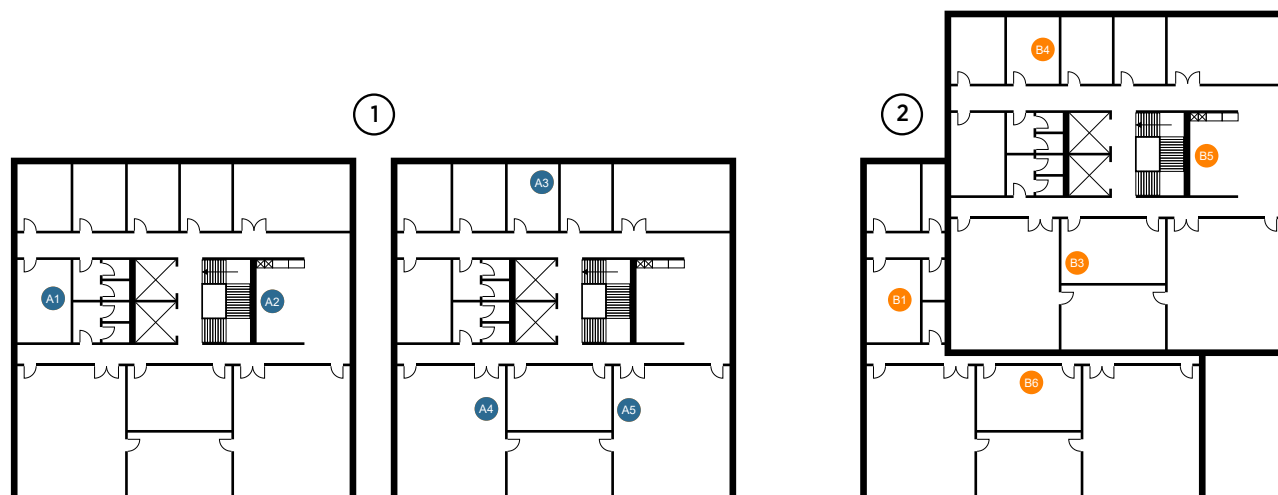


Figure 2 Large VaiNet system in separate buildings

- 1 Segment A spanning two separate buildings
- 2 Segment B spanning floors of a single building

Figure 2 (page 3) shows an example layout of access points on a site where a VaiNet network covers three separate buildings. A segment can cover as many buildings and floors as allowed by its capacity and range of the access points.

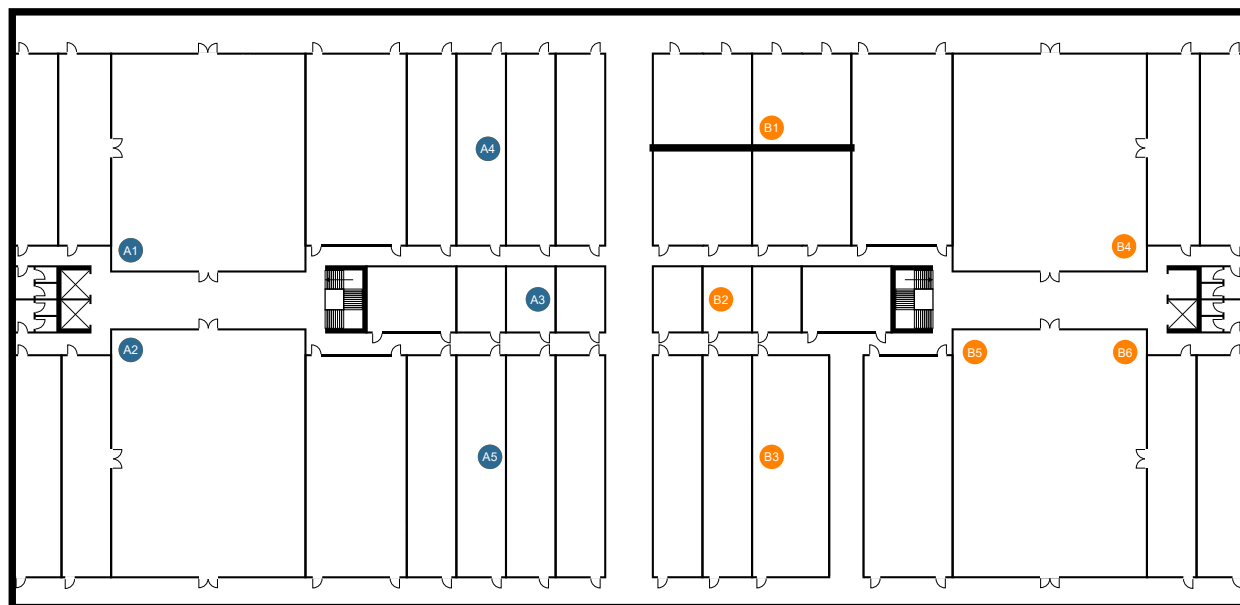


Figure 3 VaiNet network segments in a large building

Figure 3 (page 3) shows a single building with access points in 2 VaiNet network segments. Access points of the segments are placed on their own sides of the building and not mixed.

Overview of large VaiNet system installation

There are two main types of installations for a large VaiNet system:

- [Installing a completely new large VaiNet system \(page 5\)](#)
- [Expanding a standard system into a large VaiNet system \(page 5\)](#)

Before starting the installation, make sure that the devices to be installed have the required firmware. See [Software and firmware requirements for a large VaiNet system \(page 4\)](#).

To make sure that all data loggers are assigned to their planned segment, install the devices in the VaiNet network **one segment at a time**. Keep any uninstalled data loggers that belong to other segments turned off, otherwise they will also join the current segment if they are in range of any access points that are in installation mode. The installation order of the segments is not important for the end result, but starting with the default segment (A) is preferred for clarity.



It is normal for data transfers to be delayed during installation and up to 24 hours afterward. It is expected that some historical data alarms may be triggered in the system. If alarms related to a particular wireless data logger continue, it may indicate insufficient wireless connectivity between the data logger and available access points in its segment. Consider improving the connection by relocating the data logger or one of the access points.

Software and firmware requirements for a large VaiNet system

- **Access point firmware:** All AP10 access points on the site must have firmware version 5.0.0. or newer. When extending existing systems, previously installed access points on the site must be updated.
- **Data logger firmware:** RFL100 data loggers that are used in segment A can have any firmware version. This allows extending existing systems with new segments without having to update the firmware of previously installed data loggers.

RFL100 data loggers that are used in segments B–D must have firmware version 1.8.0 or newer.

- **viewLinc Enterprise Server:** VaiNet segments can be used with any viewLinc Enterprise Server version that supports VaiNet devices (version 5.0 and above).

Updating to version 5.2 is recommended for best usability as it features updated historical data alarms. The new alarms distinguish between **delayed historical data** that is currently being transferred and processed, and **unrecoverable historical data** that the system considers permanently unavailable. Large VaiNet systems may feature data transfer and processing delays during installation and after extended Ethernet network outages. However, these delays do not cause any unrecoverable data loss due to local memory buffers on the data loggers.



For general principles of VaiNet device firmware updates, firmware compatibility information, and instructions on how to minimize the impact of updating your viewLinc system, see [Updating VaiNet device firmware in a viewLinc system Technical Note \(M212867EN\)](#) available at docs.vaisala.com.

Installing a completely new large VaiNet system

- ▶ 1. Install the devices for the first segment (A):
 - a. Install all access points that belong to the current segment, and turn on the installation mode on the access points.
 - b. Install all wireless data loggers that belong to the current segment. They will connect to the access point that gives them the strongest connection, has spare capacity left, and has installation mode enabled.
- 

Enabling the **info mode** can speed up the joining process of the data logger. You can enable the info mode for 1 hour by pressing the small button next to the service port. For more information, see [RFL100 User Guide \(M211861EN\)](#).
- c. Log in to the viewLinc Enterprise Server as an administrator.
 - d. Accept the data loggers into the system.
 - e. Verify that all data loggers in the segment have been successfully connected and added to the device list in **Sites Manager > Hosts and Devices**.
 - f. Disable the installation mode on the access points in the current segment.
2. Install the devices of each remaining segment (B–D) in the same way as the first segment.
3. Verify that all access points and data loggers are listed in the device list of viewLinc Enterprise Server and are connected to an access point in the correct segment.

If you need to move a data logger to a different segment, see [Moving RFL100 to a different VaiNet segment \(page 6\)](#).



At the time of writing, you cannot directly see the current segment of a VaiNet device from viewLinc Enterprise Server. To verify the connected segment of a data logger, find it from the device list by serial number, and verify the segment of the access point it is connected to from your installation plan or from the web interface of the access point.

4. Monitor the status of system alarms and connected devices.

Expanding a standard system into a large VaiNet system

When expanding a standard system (8 access points or less) into a large system, you should plan to keep all existing VaiNet data loggers in segment A. This prevents the need to update the firmware of all existing data loggers, as existing data loggers support the A segment. The data loggers will automatically rejoin the updated access points in segment A without having to enable installation mode on the access points, or release the data loggers from the network.

- ▶ 1. Update your existing system so that it becomes segment A of the large system:
 - a. Update all existing access points to the required firmware level. See [Software and firmware requirements for a large VaiNet system \(page 4\)](#).

The updated access points retain their VaiNet channel setting. The firmware update assigns them to segment A as that is the default setting.



As you are updating the firmware of the access points, there will be a short period where access points with both old and new firmware are running on the site. This is OK and will not cause significant communication problems.

- b. If you need to add data loggers to Segment A, turn on the installation mode on the access points of segment A and continue with the next step. If no new data loggers are needed in Segment A, you are done with segment A and can move to [step 2](#).
- c. Install all new wireless data loggers for segment A.
- d. Log in to the viewLinc Enterprise Server as an administrator.
- e. Accept the new data loggers into the system.
- f. Verify that all new data loggers in the segment have been successfully connected and added to the device list in **Sites Manager > Hosts and Devices**.

2. Repeat the following steps for each additional segment, starting with segment B:
 - a. Install all access points that belong to the current segment, and turn on the installation mode on the access points.
 - b. Install all wireless data loggers that belong to the current segment. They will connect to the access point that gives them the strongest connection, has spare capacity left, and has installation mode enabled.
 - c. As administrator in viewLinc Enterprise Server, accept the data loggers into the system.
 - d. Verify that all data loggers in the segment have been successfully connected and added to the device list in **Sites Manager > Hosts and Devices**.
 - e. Disable the installation mode on the access points in the current segment.
3. Verify that all access points and data loggers are listed in the device list of viewLinc Enterprise Server and are connected to an access point in the correct segment.
 If you need to move a data logger to a different segment, see [Moving RFL100 to a different VaiNet segment \(page 6\)](#). If you intend to move previously installed data loggers to segments B–D, they must be updated to the required firmware level as they will not be able to connect to segments B–D otherwise. See [Software and firmware requirements for a large VaiNet system \(page 4\)](#).



At the time of writing, you cannot directly see the current segment of a VaiNet device from viewLinc Enterprise Server. To verify the connected segment of a data logger, find it from the device list by serial number, and verify the segment of the access point it is connected to from your installation plan.

4. Monitor the status of system alarms and connected devices.

Moving RFL100 to a different VaiNet segment

It may be necessary to change the segment of an RFL100 data logger to conform to your device installation plan, improve connectivity, or make room in a full segment. If there is no need to relocate devices physically, the move can be done remotely using the **Sites Manager** view of viewLinc Enterprise Server.



Moving a data logger to a different VaiNet segment using this procedure will not affect the linking of measurement channels to locations in viewLinc. All currently linked channels will remain linked, and no data will be lost. There is a break in data transfer as the data logger is rejoining the system through the new segment, after which pending data is transferred.

- ▶ 1. Log in to the viewLinc Enterprise Server as an administrator.
2. Navigate to **Sites Manager > Hosts and Devices**.
3. Enable installation mode on at least one access point that belongs to the target segment. Right-click on the access point in the device list of **Hosts and Devices** tab and select **Edit Properties**. The access point should have free connection capacity (currently connecting less than the maximum 32 data loggers) and it should be in range of the data logger that you want to connect to the target segment. If you want to move a large number of data loggers, it may be best to enable installation mode on all access points in the target segment.
4. Make sure installation mode is not enabled on any access point that is not assigned to the target segment.



Installation mode is automatically disabled after 8 hours.

5. Locate a data logger you want to move to the segment from the device list. Right-click it and select **Release Device from Access Point**.
 It will take some minutes for the release command to be delivered to the data logger, after which it will automatically start to listen for access points that are in installation mode. Data is not transferred from the data logger to viewLinc during this time. The data logger will rejoin the system through the new segment without having to be accepted again by the viewLinc administrator, and data transfer will automatically resume.
6. Release all other data loggers you want to move to the target segment.
7. Wait for the rejoining to be completed, and verify from the device list that all moved data loggers are now connected to an access point in the target segment.