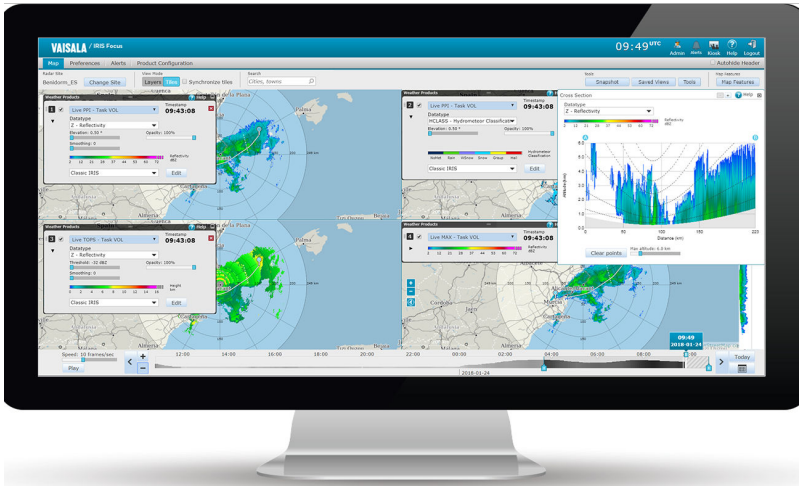
M211850EN-F

Administrator Guide

IRIS Focus

Version 5.0



VAISALA

PUBLISHED BY

Vaisala Oyj
Vanha Nurmijärventie 21, FI-01670 Vantaa, Finland
P.O. Box 26, FI-00421 Helsinki, Finland
+358 9 8949 1

Visit our Internet pages at www.vaisala.com.

Table of Contents

List of Figures

List of Tables

1. About This Document

1.1 Version Information

This document provides information for installing, operating, and maintaining IRIS Focus software.

Table 1 Document Versions

Document Code	Date	Description
M211850EN-F	August 2018	This document. Sixth version of this document.
M211850EN-E	December 2017	Fifth version of this document.
M211850EN-D	February 2017	Fourth version of this document.

1.2 Related Documents

Table 2 Related Documents

Document Code	Name
M211850EN	*IRIS Focus Administrator Guide*
M211849EN	*IRIS Focus User Guide*
M211904EN	*IRIS Focus Release Notes*

1.3 Trademarks

HydroClass™ is a trademark of Vaisala Oyj.

IRIS™ is a trademark of Vaisala Oyj.

All other product or company names that may be mentioned in this publication are trade names, trademarks, or registered trademarks of their respective owners.

1.4 Documentation Conventions

WARNING! Warning alerts you to a serious hazard. If you do not read and follow instructions carefully at this point, there is a risk of injury or even death.

CAUTION! Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

Note highlights important information on using the product.

Tip gives information for using the product more efficiently.

Lists tools needed to perform the task.

Indicates that you need to take some notes during the task.

2. IRIS Focus Overview

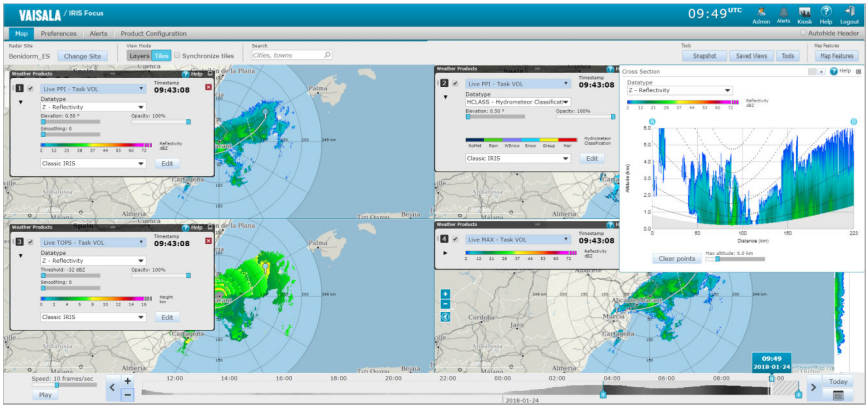


Figure 1 IRIS Focus Main View

IRIS Focus provides user-friendly, browser-based tools for viewing and analyzing weather data received from weather radars.

Weather data is overlaid on a geographical map that is centered on a selected radar site or site composite. Data is gathered from a single weather radar or a network of radar sites.

With the zoomable animation timeline, users can easily visualize and animate current, nowcasted, or historical data.

Nowcasting performs advection calculations on motion data from radar products to predict weather movement and severity up to, for example, 2 hours in the future.

Significant weather events such as hail, wind shear, or heavy rain are automatically detected when they enter an area of interest.

Radar Products

The displayed data consists of radar products. Radar products are raw signal data from a radar receiver processed to provide information about current weather conditions.

Radar products measure information such as radar signal reflectivity or rain intensity for analysis by meteorologists.

On-demand radar products	On-demand products are based on raw data from the IRIS back-end. IRIS Focus reads raw volume data and generates radar products in real-time. On-demand products provide control over the presentation of weather data in the IRIS Focus user interface. For example, users can change the reflectivity threshold of a selected radar product on the fly. IRIS Focus users can create composites of on-demand products by selecting multiple radar sites from the radar site selector.
IRIS Analysis radar products	IRIS Analysis radar products are configured and produced in IRIS Analysis and displayed by IRIS Focus on request.

More Information

- On-demand Radar Products (page 19)
- IRIS Analysis Radar Products (page 21)

2.1 IRIS Product Family

IRIS provides an intuitive user experience for professional users, such as meteorologists and analysts. It is closely integrated with Vaisala weather radar systems, where IRIS Focus forms the visualization front-end and other IRIS components handle radar control, radar product generation, and data distribution.

IRIS Focus runs on a web server that users can connect to in an enterprise intranet or from an external location or the Internet. Network connections between IRIS Focus and the data processing back-end go through a socket server, a custom protocol over TCP/IP that delivers radar data from the IRIS back-end services to IRIS Focus. IRIS Focus polls the server for data and displays it on screen using the browser.

The following figure shows a setup where IRIS Focus is used as part of a complete Vaisala weather radar network consisting of 2 radar sites.

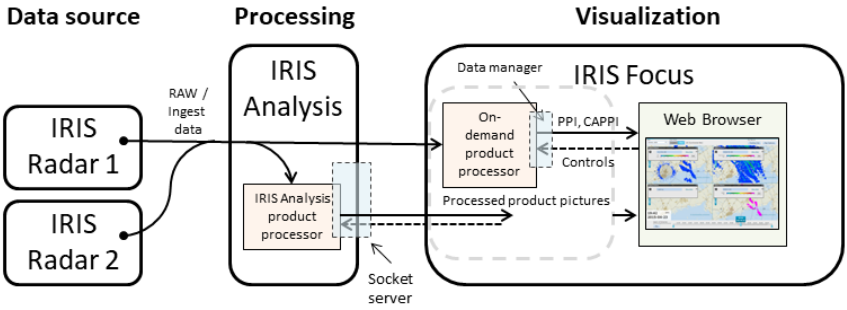


Figure 2 IRIS Focus Data Flow

In this case, IRIS Analysis and IRIS Radar can be considered back-end services for the IRIS Focus front-end interface. IRIS Focus communicates with IRIS Analysis through a secure socket server connection.

The components have the following functions:

- *IRIS Radar* - Operates the radar site and stores data gathered from the radar signals in RAW format.
- *IRIS Analysis* - Receives RAW data from IRIS Radar through secure connection and processes it into displayable radar products.
- *IRIS Focus* - Polls pre-configured radar products from IRIS Analysis and displays them on the web interface and generates on-demand radar products from RAW data.

2.2 Licensing

IRIS Focus requires a software license to run. To activate the license, you need a product key.

Vaisala delivers the product key when you purchase the software.

If you have purchased the software and you have not received the product key, please contact Vaisala.

For server deliveries, Vaisala activates the product key in the factory and a Vaisala representative sends you the key for future reference.

The license is mapped to the hardware of your IRIS Focus server. If your hardware configuration changes and you need to re-install IRIS Focus, you must request a replacement license from your Vaisala representative.

License Options

The IRIS Focus license includes the following:

- **IRIS Focus Light**
  IRIS Focus Light has an unlimited number of seats and provides access to the map view. If the license is missing, users cannot log in while admins can log in but cannot access the map view.
- **IRIS Focus**
  The IRIS Focus license is required to use IRIS Focus features and products.
  IRIS Focus licensing is based on a floating seat pool.
- **Nowcasting**
  The optional nowcasting feature requires a separate license in addition to an IRIS Focus license.

IRIS Focus Seat-based License

IRIS Focus licenses are available in different configurations. To increase your seat count, you must replace the current license with a new one by contacting your Vaisala representative.

The seat count defines how many users can access IRIS Focus at the same time. When a user logs in, they occupy a seat. When a user logs out, the seat is released and the next user can take it. If a user logs in when all the licenses are reserved, the user is shown IRIS Focus Light until an IRIS Focus license is released.

Nowcasting is only available to users with an IRIS Focus seat.

Seat counts within a workstation are browser-based. For one license reservation, users may view IRIS Focus in as many instances or tabs of one browser, such as Firefox®, as they like. If a user opens IRIS Focus in a different browser, such as Google Chrome™, they reserve one license for each browser.

More Information

- Managing Users (page 72)

3. Requirements

3.1 IRIS Focus Hardware Requirements

Minimum Hardware Requirements

- Modern 4-core CPU (Intel Xeon E5 series or similar)
- 16GB RAM
- 1 TB HDD
- 1280 x 800 minimum screen resolution

Recommended Hardware Requirements

- Modern 8-core CPU (Intel Xeon E5 series or similar)
- 32GB RAM
- 2x 1 SAS TB HDD in RAID 1 configuration
- 1920 x 1200 screen resolution

The pre-installed IRIS Focus system delivery option uses the Dell PowerEdge R440 rack server unit, which meets the recommended hardware setup. See the Dell product data sheet for full specifications.

The hardware capacity directly affects the performance of IRIS Focus. Multiple users can be logged in to IRIS Focus, and each user can have multiple weather and terrain layers rendered on screen at the same time. Each weather and terrain layer requires some resources from the system.

For optimal performance, Vaisala recommends running IRIS Focus on a dedicated hardware server and not in a virtualized environment.

3.2 Software Requirements

IRIS Focus supports current Internet Explorer®, Mozilla Firefox®, and Google Chrome™ browsers.

Before installing IRIS Focus, your environment must meet the following software requirements.

IRIS Network

IRIS network, such as an IRIS Analysis instance must be configured correctly to make data from at least one radar site available for IRIS Focus.

CentOS 7.x

CentOS 7.1 or later DVD/ISO image mounted on your server (offline installation) or a functional internet connection (online installation).

The installation script verifies the version of several core system packages during the installation and updates them from the mounted media or Internet.

IRIS Analysis

The IRIS Analysis server set up provides radar products through a proprietary socket server connection. The socket server connection is enabled if at least one radar is connected to your IRIS Analysis server, and the IRIS Analysis server has IRIS software version 8.13.6 or newer installed. No further configuration is needed.

The map projection in the IRIS Focus web application depends on having a single radar or a group of radar sites to act as a center point to for map rendering.

In most IRIS Focus configurations, the radar product generator is an IRIS Analysis server that has been set up earlier on the radar site. For more information, please contact Vaisala.

For information on configuring IRIS Analysis, see *IRIS and RDA Software Installation Guide*.

Before beginning the IRIS Focus installation, make sure you know the hostname of your socket server.

Data Manager

Radar volume data is fetched from the data manager interface and processed into live radar products in the IRIS Focus application.

The data manager does not need to be active during installation.

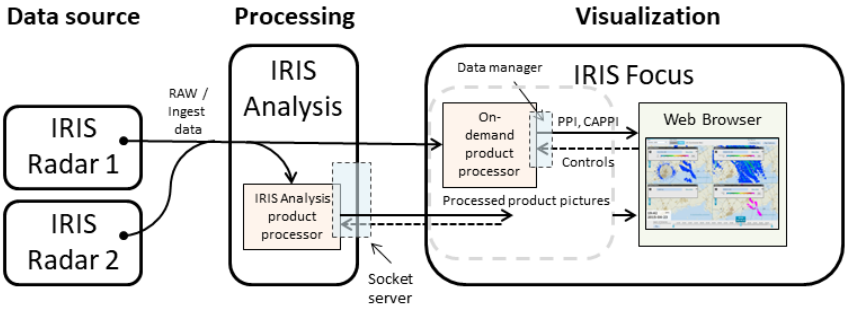


Figure 3 Generating Live IRIS Products

More Information

- Setting up Data Manager (page 42)

3.3 Network Requirements

Table 3 IRIS Network Requirements

Item	Specification	
Communication from IRIS Analysis to IRIS Focus		
Network data transfer	>100 Mbit/s (1000 Mbit/s recommended)	
Communication from IRIS Focus to IRIS Analysis		
Single user (1 seat)	Network Data Transfer	> 450 kbit/s
	Latency	~150 ms
Multiple simultaneous users	5 seats	> 2.5 Mbit/s
	10 seats	> 5 Mbit/s
	20 seats	> 10 Mbit/s

3.4 Data Manager Disk Space Requirements

The amount of radar data generated depends on a number of variables, including, for example:

- Size of the RAW files as determined by factors such as radar scan strategy, range, number of recorded data, and the amount of precipitation
- Number of radars in the network
- Amount of disk space reserved for the partition where data manager stores the data

Use the following formula to calculate the approximate disk space required for data manager to store data collected over a certain time period

```
totalDiskSpace GB = 400+ (scanSize GB * numberOfRadars * (1440/
scanIntervalMinutes) * daysOfData)
```

Table 4 Approximate Required Disk Space Examples for an IRIS RAW File of 0.01 GB

Scan Interval (minutes)	Number of Radars	Days of Data				
		30 Days	60 Days	1 Year	5 Years	10 Years
5	1	100 GB	500 GB	1 TB	5 TB	10 TB
10	1	50 GB	250 GB	500 GB	2.5 TB	5 TB
5	2	100 GB	1 TB	2 TB	10 TB	20 TB
10	2	100 GB	500 GB	1 TB	5 TB	10 TB
5	5	500 GB	2.5 TB	5 TB	25 TB	50 TB

Scan Interval (minutes)	Number of Radars	Days of Data				
		30 Days	60 Days	1 Year	5 Years	10 Years
10	5	200 GB	1.3 TB	2.6 TB	13 TB	26 TB
5	10	1 TB	5 TB	10 TB	50 TB	100 TB
10	10	500 GB	2.5 TB	5 TB	25 TB	50 TB

More Information

- Data Manager (page 80)

4. IRIS Focus Architecture

IRIS Focus reads data in the formats produced by weather radar signal processors.

Usually this data is relayed to IRIS Focus through the signal processing and analysis component, IRIS Analysis, either as pregenerated radar products or as radar scan source data files which are processed and displayed as radar products by IRIS Focus.

IRIS Focus only accepts a single data source as its socket server. IRIS Analysis can be connected to an unlimited number of radar sites and relay their radar products to IRIS Focus.

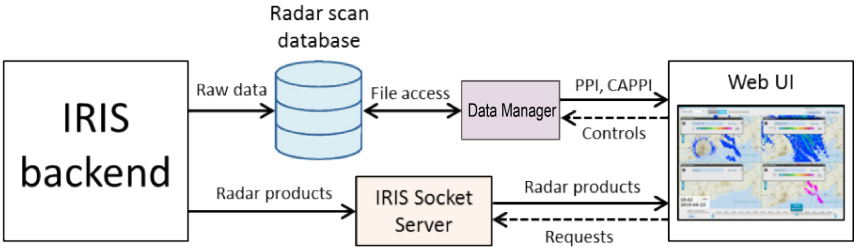


Figure 4 IRIS Focus Architecture

Each radar product is displayed on top of a map view, which is rendered by a GeoServer instance that is installed during the IRIS Focus installation. The map terrain and detail layers are always on the background, and the radar products are drawn on top of them. The user can change the order of radar product layers in real-time.

Most radar products have editable color scales. Color scales are stored as JSON objects on the IRIS Focus server and can be reused.

4.1 Map Layers

The background map and the weather data visualizations from the radar products are drawn as individual layers and then combined to form an overview of current weather conditions around the radar site.

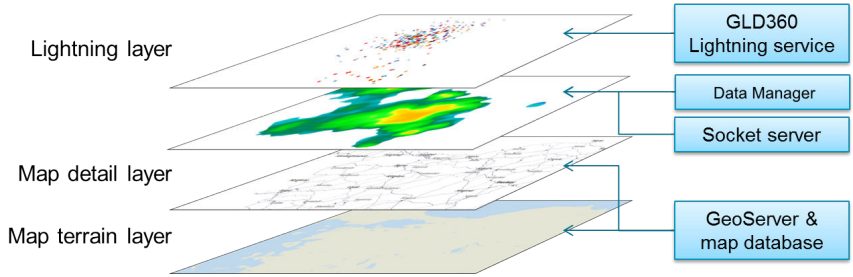


Figure 5 IRIS Focus Product Data Layers

Base Layers

The background (also known as base) consists of a number of non-interactive layers. At the bottom is a terrain map that can be enhanced with additional layers containing roads, province boundaries, and other similar terrain features.

Radar Product Layers

The interactive radar product layers (1 to 4) are drawn on top of the background layers.

4.2 GeoServer and Maps

The map engine in IRIS Focus uses GeoServer architecture. When reading data from a single radar site, GeoServer renders the map using Azimuthal Equidistant projection, which means that all directions and distances are correct when measured from the point of origin, which is the radar site in this case. When reading data from a composite of multiple radar sites, Web Mercator projection is used.

The terrain data in IRIS Focus consists of a detailed vector map of Earth, separated into multiple layers. The base map content is licensed from the collaborative OpenStreetMap project, which provides all vector shapefiles for the base terrain.

Figure 6 Base Map From GeoServer

To save system resources, the shapefiles are combined into different map detail levels that are rendered as a single layer where possible. For example, selecting the **Full detail** map level does not draw separate layers for terrain, roads, map labels, and other map features. Instead, all the content has been precompiled into a single layer in the IRIS Focus map package and then drawn on screen.

When a user opens the map view in IRIS Focus, GeoServer processes the vector data in the current view area into 256x256 PNG tiles that are displayed in the browser window. New tiles are calculated and generated every time the user pans or zooms on the map, so moving on the map may feel a bit sluggish in the beginning. To improve performance, GeoServer runs a caching component called GeoWebCache that stores the tiles for faster retrieval in the future.

GeoServer has a management web interface that runs at `http://localhost:34180/geoserver`. The default management account name is admin and the password can be found in the file `/etc/vaisala/radarsw/configuration/gis-override.ini`. The password is generated automatically during IRIS Focus installation.

The base map data is stored in a postgreSQL database, which also stores all web application data.

4.3 On-demand Radar Products

When displaying on-demand (Live) radar products, IRIS Focus fetches raw radar measurement data from the back-end and processes it in real-time. This provides hands-on control over the radar product parameters.

The full raw radar volume data is stored for 48 hours and can be used for on-demand product generation later.

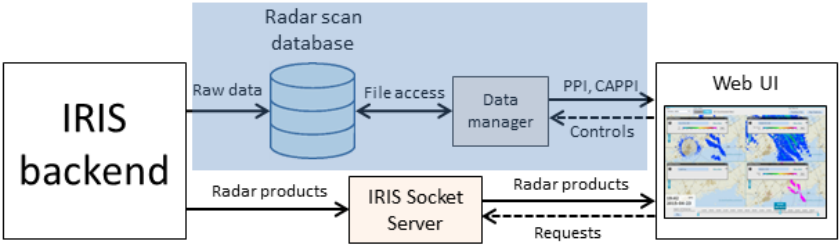


Figure 7 On-demand Product Components

Data for on-demand products comes from the **RAW** format files produced by the IRIS backend.

IRIS Focus reads the **RAW** data through the data manager.

When you select an on-demand (Live) radar product in IRIS Focus, the web application accesses the database and fetches the required data, not only for the current situation but for the whole recorded segment. The data is then processed and displayed live in IRIS Focus.

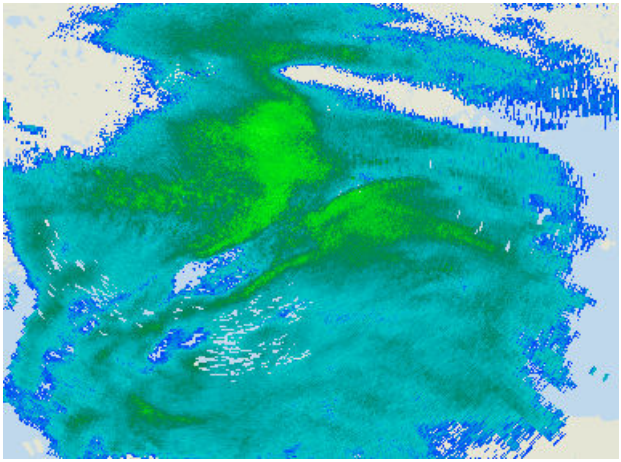


Figure 8 Radar Product Visualized

More Information

- Data Manager (page 80)

4.4 IRIS Analysis Radar Products

IRIS Analysis radar products are generated by signal processing components in IRIS Analysis. IRIS Focus reads the list of products, and allows you to select which one to display on the IRIS Focus map view.

The radar products and their settings are pre-configured, and only displayed in IRIS Focus. They cannot be edited in the IRIS Focus map view.

There is no upper limit to the number of pre-configured radar products that IRIS Focus can have.

The raw volume data is not stored for later processing. All the information that is not used in radar product generation is lost.

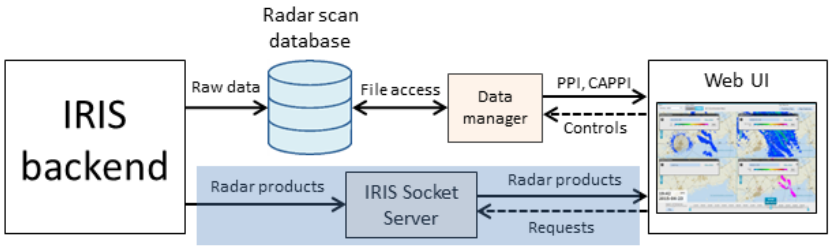


Figure 9 IRIS Analysis Product Data Flow to IRIS Focus

The radar products are rasterized into 2D bitmap images, based on the back-end signal processing settings. The images are sent to the IRIS Focus web user interface through the IRIS Socket Server interface. The Socket Server uses TCP port 30735 to communicate with IRIS Focus.

When you select a pre-configured product in IRIS Focus, IRIS Focus polls the Socket Server and loads the image.

The resolution of pre-configured radar products is limited by the capacity of the processing module that produces them. For example, IRIS Analysis has the following limitations:

- Max number of **bins** in any **ray** at any time: 4200
- Max number of **rays** in a sweep: 1024
- Max number of **moments** recorded in a **sweep**: 16
- Max number of **sweeps** per **scan**: 40

For information on setting up IRIS Analysis products, see *IRIS Product and Display Guide*.

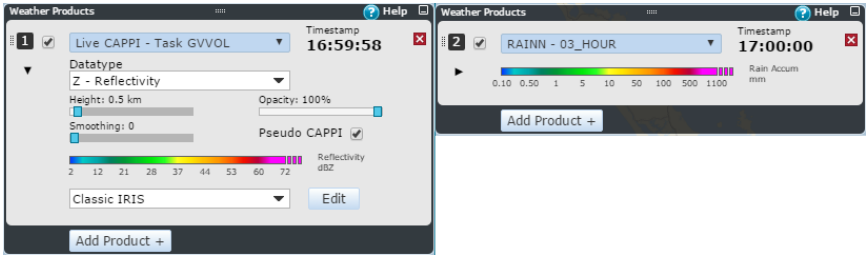


Figure 10 On-demand and IRIS Analysis Product Settings

4.5 Lightning Layer

Vaisala offers an optional subscription service for the Vaisala Global Lightning Dataset GLD360. GLD360 is a dedicated data stream that measures lightning strikes from the surface of the Earth, and its data is generated outside IRIS Focus.

GLD360 can be integrated with IRIS Focus and included as an additional selectable lightning layer in the web UI. From the user's perspective, the lightning layer is similar to other weather product layers.

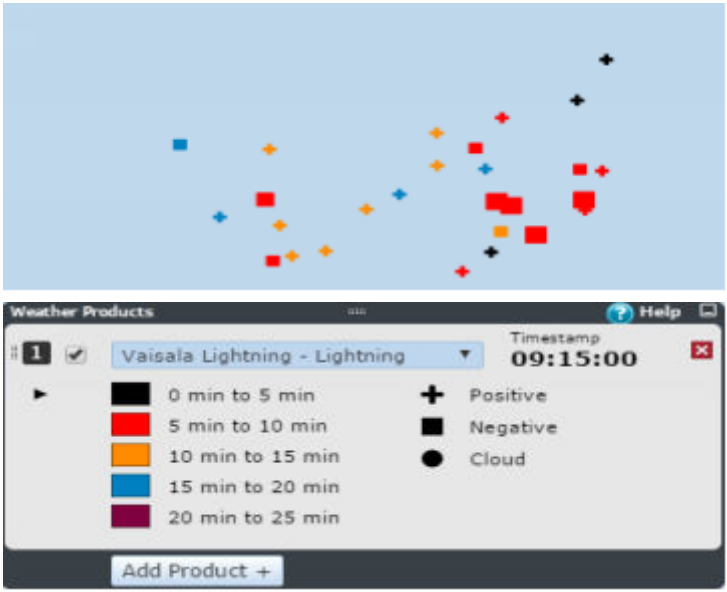


Figure 11 Lightning Layer and Controls

To take the lightning layer into use, IRIS Focus server must be online and your organization must have an active subscription for GLD360. For information on subscribing to the GLD360, contact Vaisala Lightning Data Services.

More Information

- Enabling Lightning Layer (page 62)

4.6 Web Application

IRIS Focus supports current Internet Explorer®, Mozilla Firefox®, and Google Chrome™ browsers.

It only accepts HTTPS connections. All requests to the standard HTTP port are redirected to the HTTPS port 443.

All application settings are stored in a PostgreSQL database on the IRIS Focus server.

Map and terrain data are stored in the same database.

More Information

- Certificates (page 89)
- Encryption (page 89)
- Installing a CA Certificate (page 85)

5. Installation

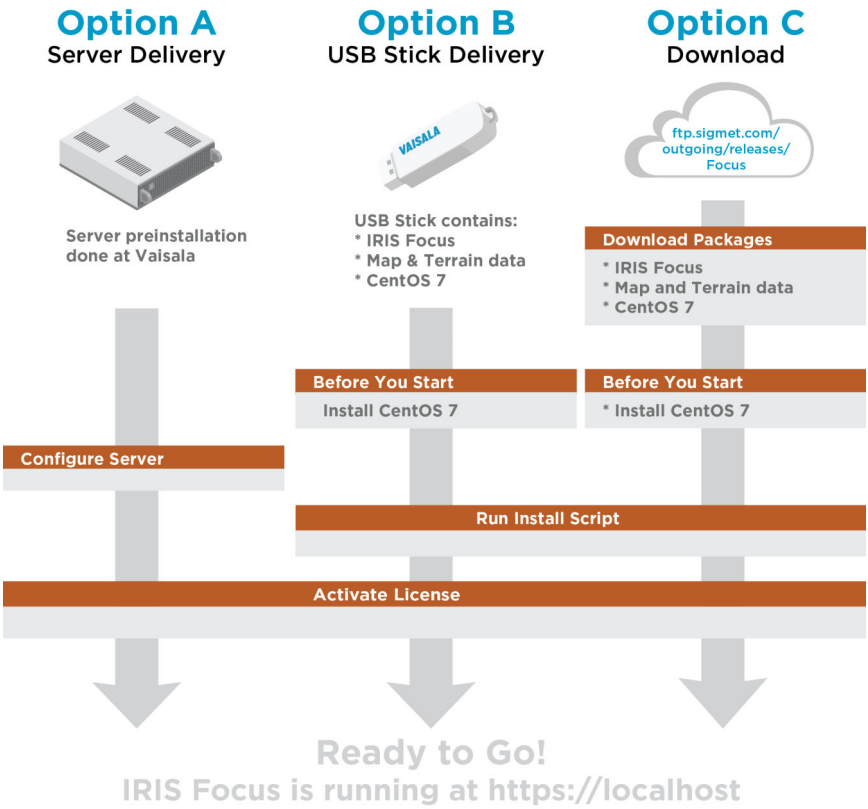


Figure 12 IRIS Focus Delivery Options

Option A Pre-installed system delivery from Vaisala. The "turnkey" option. Place an order and wait for delivery by Vaisala.

Option B Preconfigured USB stick containing the CentOS operating system and all required files for installing IRIS Focus.

Option C Downloadable installation packages. Download the required packages to install IRIS Focus on your server.

5.1 Downloading Installation Packages

1. Connect to Vaisala Sigmet server (ftp://ftp.sigmet.com) using an FTP client. The host server allows read access for anonymous FTP connections.

2. Navigate to */outgoing/releases/Focus/<latest version>*
3. Download the following files:

The files are very large. Use a download tool such as CrossFTP that allows resuming downloads to fetch the packages.

   a. IRIS Focus web application package: *Vaisala_IRIS_installer-<latest version>.tar*
   b. Maps directory: *vaisala-iris-maps-v2.zip*
   c. Terrain data directory: *vaisala-iris-terrain-v2.zip*
4. If you require the Centos installation image, download it from: ftp://ftp.sigmet.com/outgoing/releases/CentOS/7.4/CentOS-7-x86_64-DVD-1708.iso

You can skip the CentOS installation image if you already have an appropriately configured CentOS installed.

5.1.1 Verifying MD5 hashes

Each file has an associated *md5sum* file located in the same download directory.

After downloading the file(s), verify their integrity by checking each file's MD5 hash against the one provided at the installation site.

1. Do one of the following:
   - In CentOS – Use the pre-installed **md5sum** command line tool: **md5sum [filename]**
   - In Microsoft Windows – Use the pre-installed **CertUtil** utility: **certutil -hashfile [filename] MD5**
2. Check that the hashes match completely with the reference hashes at the download source
   If you see any discrepancies, the downloaded file is likely corrupted.
3. If you see any discrepencies in the hashes, download the mismatching file again.

5.2 Prerequisites for Installation

Before installing IRIS Focus, make sure your environment meets the necessary hardware and software requirements.

More Information

- IRIS Focus Hardware Requirements (page 13)
- Software Requirements (page 13)

5.3 Installing CentOS

A prerequisite for installing IRIS Focus is that CentOS is installed on your intended IRIS Focus system.

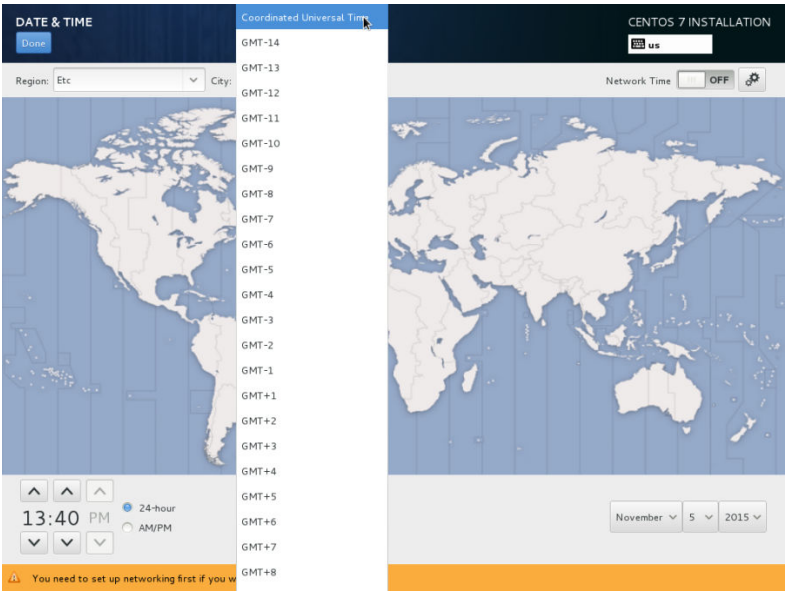
This version of IRIS Focus has been tested with CentOS 7.4. We expect IRIS Focus to also work with later versions of CentOS 7.x.

If you do not have a CentOS system running, select an installation image from Vaisala Sigmet server (ftp://ftp.sigmet.com/outgoing/releases/centos), and see instructions at Tecmint Linux Guides (http://www.tecmint.com/centos-7-3-installation/) on how to perform a CentOS installation.

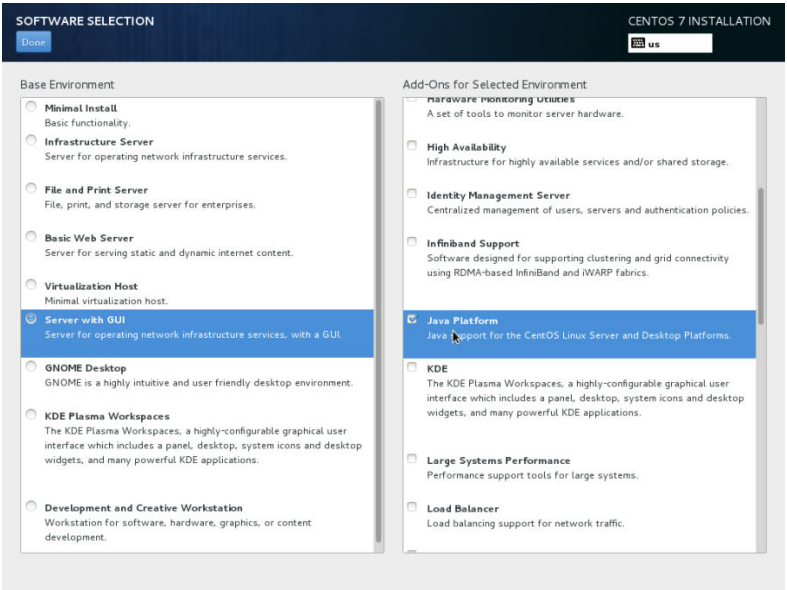
Install CentOS according to the instructions, with the following changes.

1. Select your installation language.

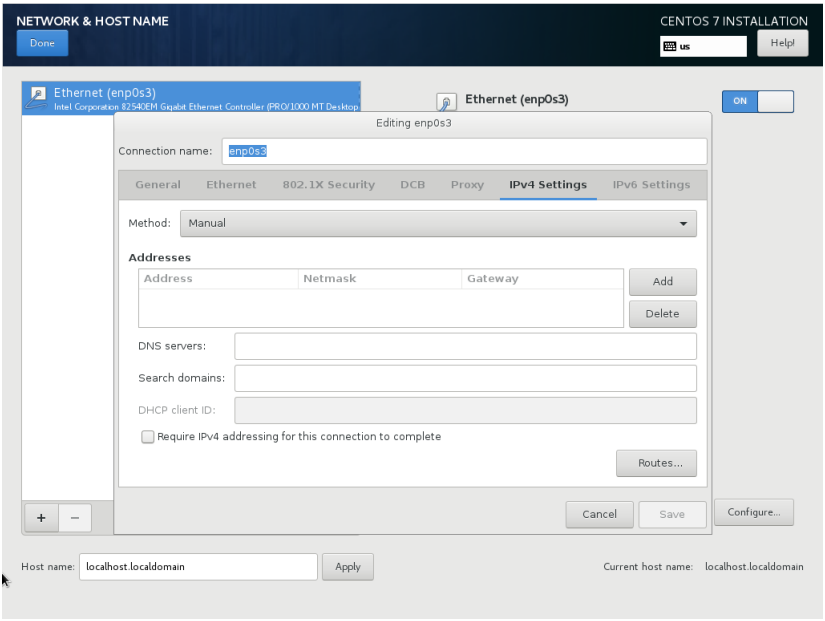
2. In **DATE & TIME**, set the system clock to Coordinated Universal Time (UTC) by choosing the following values:
   - Region: **Etc**
   - City: **Coordinated Universal Time**



3. In **SOFTWARE SELECTION**, set the server type by selecting the following software installation options:
   - Base Environment type: **Server with GUI**
   - Add-ons: **Java Platform**

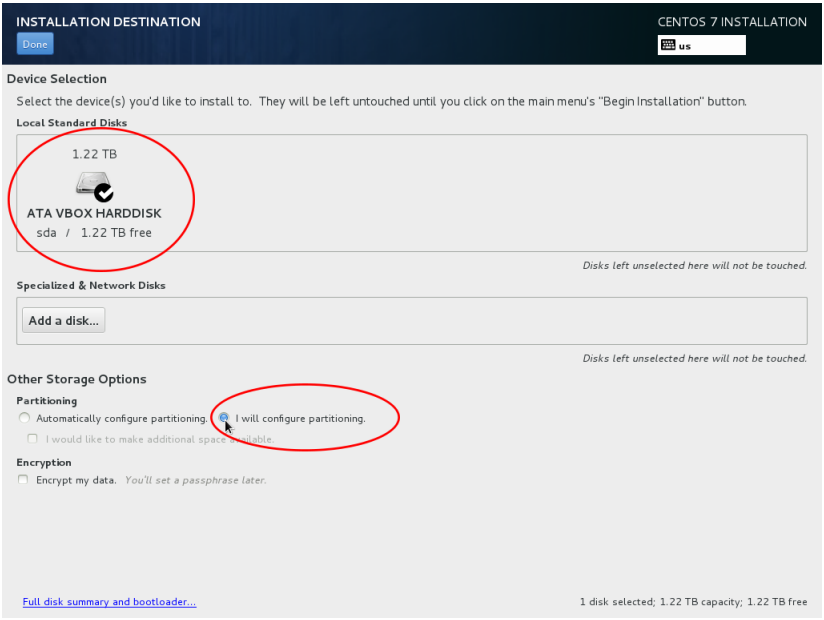


4. In the CentOS installation screen, select **NETWORK & HOSTNAME**.

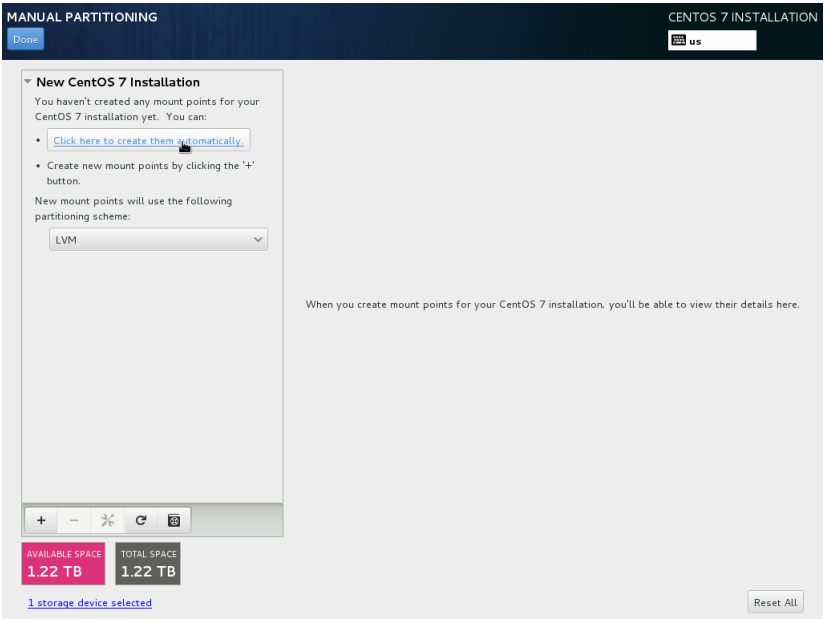


   a. Turn the network **ON**.
   b. Select **Configure**.
   c. In the **General** tab, select **Automatically connect to the network when it is available**.
   d. In the **IPv4 Settings** tab, select **Method > Manual**.
   e. In the **IPv4 Settings** tab, select **Add** to add your network IP address, Netmask, Gateway, and DNS servers.
   f. Select **Save**.
   g. In **Host name**, type a name for this server.
   h. Select **Apply**.

5. In **INSTALLATION DESTINATION**, start manual partitioning:
   a. Select the hard disk.
   b. Select **I will configure partitioning**.
   c. Select **Done**.

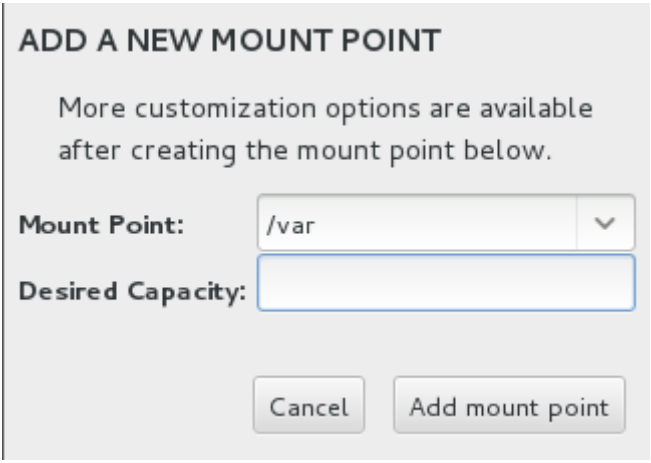


6. Select **Click here to create them automatically**.



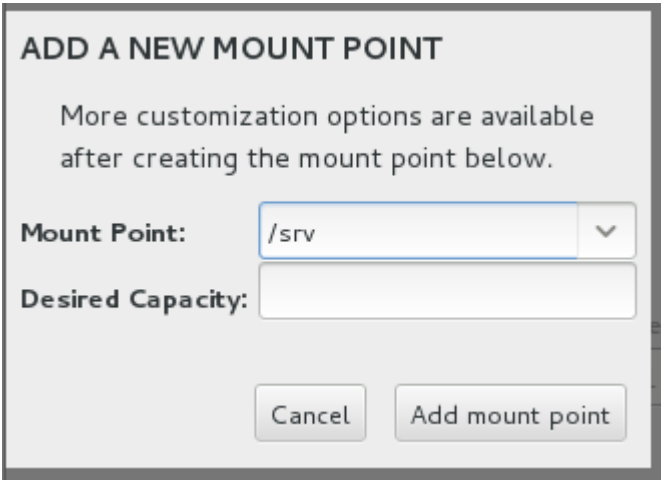
7. Create the **/home** partition.
   a. Select the plus (**+**) icon.
      The **ADD A NEW MOUNT POINT** dialog appears.
   b. Under **Desired Capacity**, set the size of the home partition (*/home*) by typing **`50 GiB`**.
   c. Select **Update Settings**.

8. Create the */var* partition:
   a. Select the plus (**+**) icon.
   The **ADD A NEW MOUNT POINT** dialog appears.



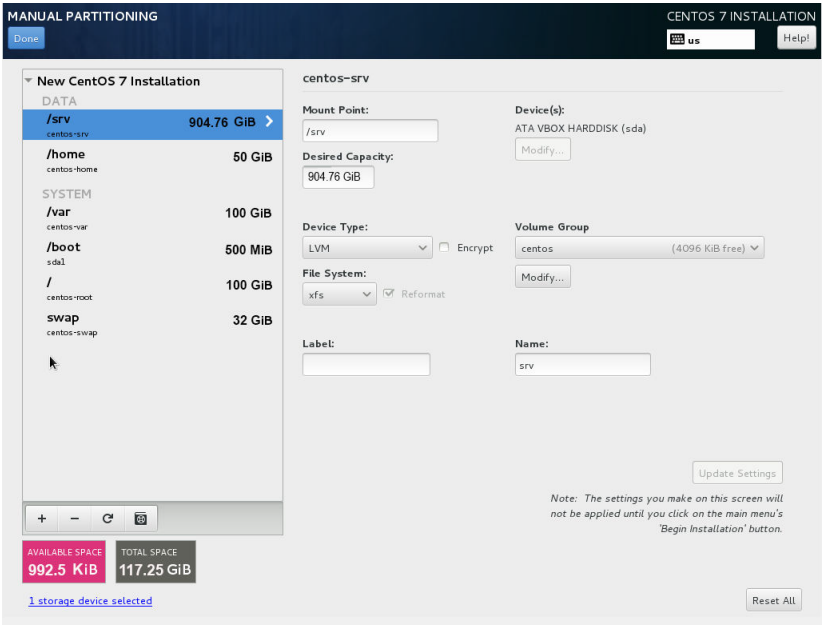
   b. In **Mount Point**, type */var*
   c. Under **Desired Capacity**, set the size of the */var* partition by typing **100 GiB**.
   d. Select **Add mount point**.
9. Select **/boot**.
   a. Under **Desired Capacity**, set the size of the */boot* partition by typing **500 MiB**.
   b. Select **Update Settings**.
10. Select **/**.
   a. Under **Desired Capacity**, set the size of the root partition (/) by typing **100 GiB**.
   b. Select **Update Settings**.
11. Select **swap**.
   a. Under **Desired Capacity**, set the size of the swap partition by typing **32 GiB**.
   b. Select **Update Settings**.

12. Create the `/srv` partition:
    a. Select the plus (**+**) icon.
    The **ADD A NEW MOUNT POINT** dialog appears.



    b. In **Mount Point**, type `/srv`
    c. Under **Desired Capacity**, use the remainder of the server space for the `/srv` partition by typing **9999999**.
    The user interface fills in the available server space.
    d. Select **Add mount point**.
13. Select **Done**.

14. Check that the partitions are defined as follows:



15. Select **Done > Accept Changes**.
16. Select **Begin Installation**.

5.3.1 Setting the Root Password

The default password is `xxxxxxxx`.

When you have started the CentOS installation, configure the `root` and one non-`root` user account.

1. Select **ROOT PASSWORD**.
   The **Root Password** window opens.
2. Enter your root password.
   Check the password strength meter. While Vaisala recommends a strong password, the software does not stop you from entering a weak one.
3. In the confirm text box, re-enter your root password.
4. In the upper left hand corner, select **Done** to return to the main configuration page.
   If your password is weak, you are prompted to select **Done** a second time.

5.3.2 Creating CentOS User Accounts and Finalizing the Installation

1. Select **USER CREATION**.
2. Create an account with the following properties:
   - User name: `radarop`
   - Password: `[chosen password]`

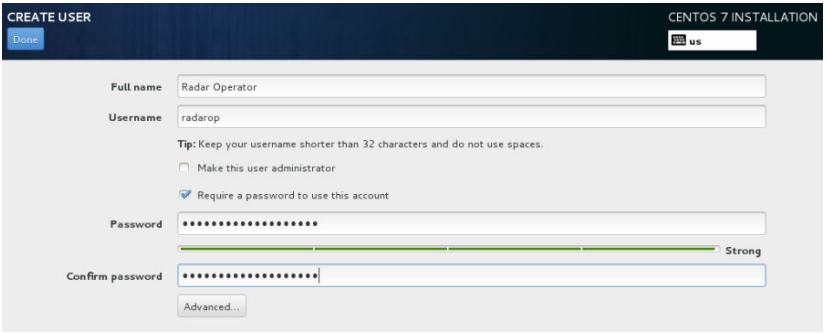


Figure 13 Creating User Accounts

3. In the upper left hand corner, select **Done** to return to the main configuration page.
   If your password is weak, you are prompted to select **Done** a second time.
   The installation continues for a few minutes.
4. When prompted, select **Reboot**.
5. Select **LICENSE INFORMATION**.
   Accept the license agreement.
6. Select **Done**.
7. Select **FINISH CONFIGURATION**.

The CentOS installation is now complete. You are ready to install IRIS Focus.

5.4 Upgrading Existing CentOS 7 Setups

If you have an existing CentOS 7 system running, you do not have to install a new system from scratch. Updating the necessary packages to support IRIS Focus is enough.

Take a backup of the system before upgrading so that you can restore it in case anything goes wrong.

More Information

- Backing-up System Configuration (page 86)

5.4.1 Online CentOS 7 Upgrade

If the server is online, upgrade it to the required CentOS 7.x level.

1. Login as **root**.
2. Enter the following commands:
   a. To clean the yum package manager cache directory: **yum clean all**
   b. To list the lists packages that will be updated: **yum check-update**
   c. To download and install the packages: **yum update**
   This takes some time depending on the number of packages and network speed.
3. Reboot the system.

5.4.2 Offline CentOS 7 Upgrade

Use a USB stick with CentOS 7.x on it or a mounted CentOS 7.x ISO to upgrade a system offline.

1. Login as root.
2. Modify the file */etc/yum.repos.d/CentOS-Base.repo* and comment out all lines under the **[base]** repository by entering a # mark at the beginning of each line.
3. Add the following lines under the **[base]** repository:

```
[base]
name=CentOS- Base-Offline
baseurl=file:///mnt/<name_of_your_centos_image_mount_point>
enabled=1
gpgcheck=0
```

Make sure **file://** is before the mount point in this file.
If you use an auto-mounted USB stick, use the **lsblk** command to find the mount point.

4. Enter the following commands:
   a. To clean the yum package manager cache directory: **yum clean all**
   b. To list the lists packages that will be updated: **yum check-update**
   c. To download and install the packages: **yum update**
   This takes some time depending on the number of packages and network speed.
5. Reboot the system.

5.5 Installing IRIS Focus from a USB Stick

The IRIS Focus installation USB contains the following file structure:

```
Focus_install
----------vaisala-iris-maps-v2
-----vaisala-iris-terrain-v2
-----Vaisala_IRIS_installer-4.0.tar
-----documentation
```

To install IRIS Focus from the USB stick, you must copy the files to the CentOS server and prepare the files for installation.

1. Reboot the system.
2. Login as **`root`**.
3. Insert the USB stick.
   If it is already plugged-in, remove and re-insert the stick.
4. In the pop-up dialog, select **Open With Files**.
5. Right -click a blank area and select **Open in Terminal**.
6. In the terminal, type **pwd** and press **ENTER**.
   The result is usually `/run/media/root/IRIS`.
7. Copy the *`Focus_install`* directory to the CentOS server:

   ```
   mkdir /Focus_install
   cp –r /run/media/root/IRIS/Focus_install/* /Focus_install
   ```

8. Change to the */Focus_install* directory and unpack the tar file:

   ```
   cd /Focus_install
   tar –xvf Vaisala_IRIS_installer-4.0.tar
   ```

9. Change to the */Focus_install/vaisala-iris-terrain-v2* directory:

   ```
   cd /Focus_install/vaisala-iris-terrain-v2
   ```

   a. Join the fileparts:

   ```
   cat vaisala-iris-terrain-v2-part* > vaisala-iris-terrain-v2.zip
   ```

   b. Unzip the resulting terrain zip file:

   ```
   unzip vaisala-iris-terrain-v2.zip
   ```

   c. Remove the extra files:

   ```
   rm –rf vaisala-iris-terrain-v2-part*
   rm –rf vaisala-iris-terrain-v2.zip
   ```

10. Run the IRIS Focus installation script:

```
/Focus_install/release/rsw-installer --online --gis-db-dump vaisala-iris-
maps-v2 --terrain-dir vaisala-iris-terrain-v2 -s <hostname or IP of IRIS
analysis socket server>
```

5.6 Installing IRIS Focus Components

The script automatically installs all necessary services, user accounts, and modules required to run IRIS Focus. The services start automatically.

Table 5 IRIS Focus Services

Service	Description
`monit`	Monitoring tool for Unix systems and processes.
`HAProxy`	Encodes outgoing traffic with HTTPS encryption.
`vaisala-radarsw-webapp`	IRIS Focus web application.
`vaisala-radarsw-geoserver`	Map engine for caching and generating base map layers.
`vaisala-radarsw-nowcast-server`	Nowcasting server.
`vaisala-radarsw-data-manager-service`	Data manager application.
`vaisala-radarsw-data-manager-input-service`	Listener for incoming IRIS `RAW` files.
`vaisala-radarsw-warn-reader`	Listener for incoming **WARN** products from IRIS Analysis.

Table 6 IRIS Focus Users

User	Description
`radardm`	Restricted user account for running the data manager application.
`radardminput`	Restricted user account for running the data manager input service.
`radargeo`	Restricted user account for running the GeoServer map engine.
`radarweb`	Restricted user account for running the IRIS Focus web application.

User	Description
`warnreader`	Restricted user account for running the warn reader service.

1. Make sure you have a CentOS 7 server system set up, and that you have received the IRIS Focus installation files either as a USB delivery or as a download.
2. Make sure you have the IRIS Focus application installer, map data package, and terrain data package available.
   These are required because all IRIS Focus components are installed at the same time.
3. Mount the CentOS 7 USB stick or DVD.
   Although CentOS 7 is already set up, the IRIS Focus installer relies on some packages that are provided by the CentOS repository.
4. Login as **`root`**.
5. Unpack the contents of the IRIS Focus installation file on the server, for example to the */root/IRIS* directory.
   These files occupy approximately 40 Gb of space unpacked.
6. Navigate to the directory where you downloaded the files.
7. Launch the **`./rsw-installer`** script.
   The install script requires the following parameters:

```
./rsw-installer --offline --gis-db-dump [maps directory] --terrain-dir
[terrain directory] -s [socket server hostname]
```

   - **`--gis-db-dump`** – location for the map data
   - **`--terrain-dir`** – location for the terrain data
   - **`-s`** – hostname of the socket server that provides radar product data from IRIS Analysis

If the computer is connected to the internet, you can run the installer with the **`--online`** flag.
This fetches any additionally required CentOS 7 packages from the internet.

The install process can take a significant amount of time, especially as the application database is first populated with map data.
Do not abort the installation if you do not see progress in a single step for up to 1 hour.

More Information

- Security Settings (page 89)
- Uninstalling IRIS Focus (page 97)

5.7 Running OS Hardening Scripts

When the IRIS Focus installation is complete, run the OS hardening scripts.

Table 7 Hardened Areas

Hardened Area
Install AIDE (Advanced Intrusion Detection Environment)
Restrict core dumps
Set permissions for `grub` configuration
Set default Message of the Day
Configure Chrony NTP
Configure TCP Wrappers
Strengthen log file permissions
Strengthen `Cron` configuration
Lockout for failed login attempts
Password suffiency
Strengthen file permissions
Enable SSH issue banner
Disable IPv6
Remove support for unneeded file system types: `cramfs`, `freevxfs`, `jffs2`, `hfs`, `hfsplus`, `squashfs`, `udf`, `vfat`, `dccp`,`sctp`, `rds`, `tipc`, `cups`, `avahi-daemon`

1. Navigate to the directory where you downloaded the installation files.
2. Type the command:

   ```
   ./rsw-harden-os
   ```

   The command executes the bash scripts in the */release/security-scripts* directory.

5.8 Configuring IRIS for IRIS Focus

5.8.1 Setting or Changing the Socket Server

1. If needed, use the following commands to set or change the socket server:

```
/etc/vaisala/radarsw/configuration/bin/configure-iris-host
<socket_server_host_name>
rsw-basemap-site-setup --socket-server <socket_server_host_name>
service vaisala-radarsw-webapp restart
```

5.8.2 Activating the Socket Server in IRIS Radar

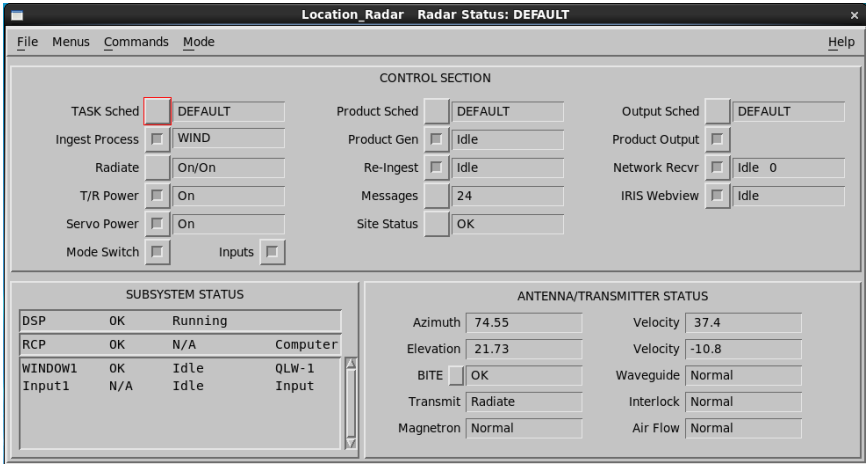


Figure 14 IRIS Radar Status Menu

If your system is running IRIS Focus server, you must enable the **IRIS Webview** option in IRIS Radar. For more information, see *IRIS Radar User Guide*.

1. Make sure IRIS has started.
2. In IRIS Radar, select **Menus > Radar Status**.
3. Enable Select **IRIS Webview**.
   When enabled, the field shows the status of the server process, as **Idle**, **Running**, or **Stopped**.

5.8.3 Setting up Data Manager

The data manager service runs on the IRIS Focus server that receives radar scan volume data, stored in **RAW** file format, from the IRIS Analysis server and generates live radar products from the data in real-time.

During installation, IRIS Focus sets up all necessary services, databases, and user accounts for processing data. IRIS Focus features such as live products and dynamic composites require **RAW** files.

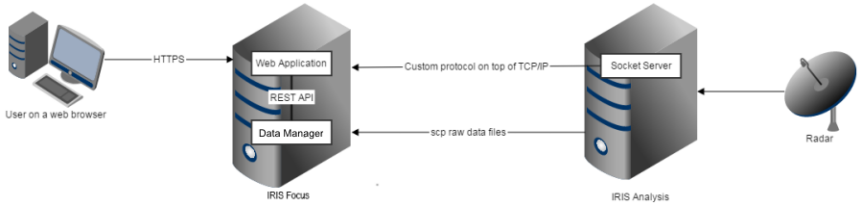


Figure 15 Radar Data Delivery Paths

More Information

- Data Manager (page 80)
- Data Manager Does Not Work as Expected (page 91)

5.8.3.1 Setting up Data Manager on IRIS Analysis Server

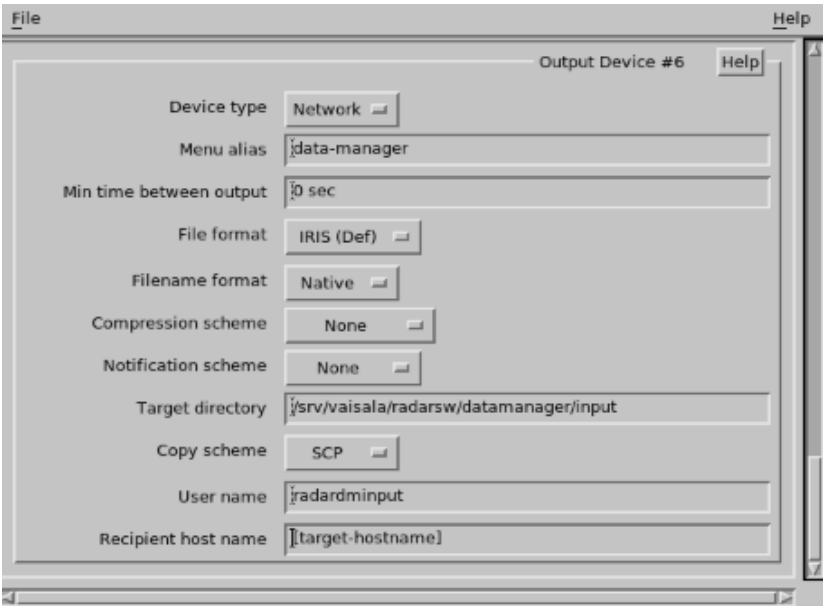
To configure IRIS Analysis to send **RAW** files to IRIS Focus, you must set the target location on the IRIS Focus server as a network output device in IRIS Analysis.

The target location on IRIS Focus server is the following directory, which is owned by the **radardminput** user:

```
/srv/vaisala/radarsw/datamanager/input
```

1. Log in to the IRIS Analysis server as **radarop**.
2. In the terminal window, type: **setup&**
   The IRIS **Setup** utility opens
3. Select **Output**.
4. Create a new output device:
   a. In **Number of output devices**, increase the number of output devices by 1.
   b. Press **ENTER**.
   A new configurable output device is added to the end of the **Output Device** list.

5. In the configuration pane for the new output device, configure the new output device with the following settings:

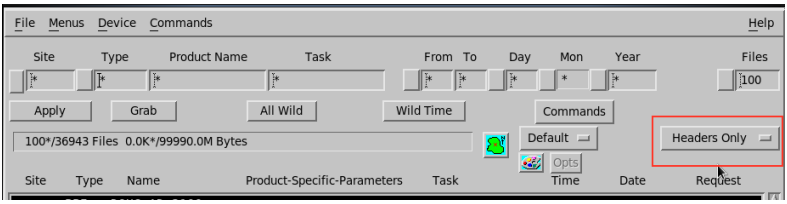


   a. **Device type**: **Network**
   b. **Filename format**: **Native**
   c. **Target directory**: */srv/vaisala/radarsw/datamanager/input*
   d. **User name**: `radardminput`
   e. Host name: `[IRIS Focus server]`
   f. Select **File > Save**.
   g. Select **File > Exit**.

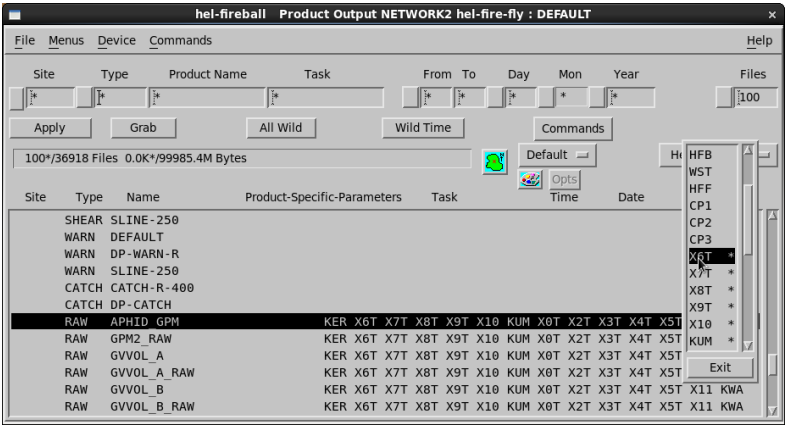
6. Restart IRIS:

```
service iris start
systemctl start/stop iris.service
```

7. In the terminal window, type: **`iris &`**
   a. Select **Menus > Product Output > Device**.
   b. Select the device you configured in the **Setup** utility.
   c. In the drop down box on the far right of the window, select **Headers Only**.



   d. In the product list, select any `RAW` product.
   e. Right-click the far right of the product name and select a radar site.
   If needed, deselect any radar sites you do not want to include in the device configuration.



   f. Select **Apply**.
   g. Select **File > Save As**.
   Define a name for the new **Product Output** or use the `DEFAULT` option.
   h. Select **OK**.
   i. Select **Close**.

8. Copy the **radarop** ssh key from the IRIS Analysis server to the IRIS Focus server:

```
$ scp /root/.ssh/id_dsa.pub/
      <focus_hostname>:/var/lib/radardminput/.ssh/socket-server-key
```

9. Log in to the **root** account with the **su** command.
   When prompted, type the **root** password.
10. Launch a one-time SSH connection to the IRIS Focus server.

```
ssh [IRIS Focus server IP address]
```

    This saves IRIS Focus server's hostname in the **known_hosts** file on the IRIS Analysis server.

5.8.3.2 Setting Up Data Manager on IRIS Focus Server

RAW files on the IRIS Analysis server are handled by the local **root** user and **RAW** files on the IRIS Focus server by the local **radardminput** user.

You must add the IRIS Analysis **root** account's public SSH key to the IRIS Focus **radardminput** accepted keys list.

1. Log in to the IRIS Focus server as **root**.
2. If it does not exist already, create the following ***.ssh*** file:

```
# mkdir -m 700 /var/lib/radardminput/.ssh
# chown radardminput:radarsw /var/lib/radardminput/.ssh
```

3. Add the socket server key to the authorized SSH key store of the **radardminput** user:
   This enables file transfer from the IRIS Analysis root account to IRIS Focus **radardminput** user.
   a. Type:

```
# cd /var/lib/radardminput/.ssh
# ls
```

   b. If the *authorized_keys* file does not yet exist, type:

```
# mv socket-server-key authorized_keys
# chown radardminput:radarsw authorized_keys
# chmod 644 authorized_keys
```

   c. If *authorized_keys* file already exists, type:

```
# cat socket-server-key >> authorized_keys
# rm socket-server-key
```

4. Check that the **RAW** files appear in the */srv/vaisala/radarsw/datamanager/input* directory on the IRIS Focus server.
   A data manager updater service records metadata of the files in a **PostgreSQL** database, which is accessed by the IRIS Focus web UI when it generates on-demand (live) radar products from the data.

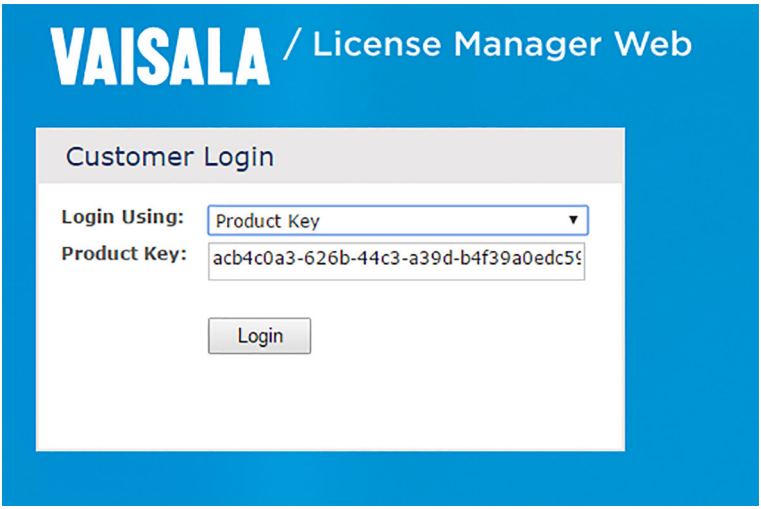
5.9 Verifying IRIS Focus Installation

1. Restart the server.
   IRIS Focus web application is set to launch automatically when the server starts.
   Check that the web user interface is running at the default HTTPS port, and the following default user accounts have been created in IRIS Focus during installation:
   - Username: **admin** / password: **admin123**
   - Username: **user** / password: **user123**
2. Access the IRIS Focus web UI by opening a browser on the IRIS Focus server and navigating to *https://localhost*.
   You should see the login screen for IRIS Focus web application.
3. Log in with the default IRIS Focus user account.
   Make sure the application loads, and the map view is displayed.
4. Verify that **Tracking Tool** and **Cross Section** buttons are visible in the application UI.
   This verifies that IRIS Focus features are enabled.
5. Enable the grid lines by selecting **Map Features Lat/lon grid**.
   Depending on where the map view is centered, you should see slightly distorted grid lines that are leading away from the equator. This verifies that the map projection is correct.

6. Confirm that data manager is running:
   a. Select **Weather Products > Add Product**.
   b. Add a new Live **PPI** or Live **CAPPI** product.
   c. Make sure you see weather data from the selected time on the screen.

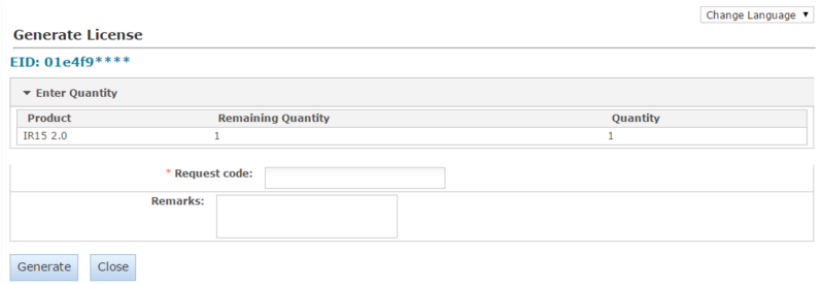
5.10 Activating License – Online

1. Login as **`root`**.
2. Run the **`rsw-show-machine-code`** command on the IRIS Focus server to get the locking code specific to the server hardware.
3. Go to Vaisala License Manager Web at https://licensing.vaisala.com and select **Product Code** in the **Login Using** field.

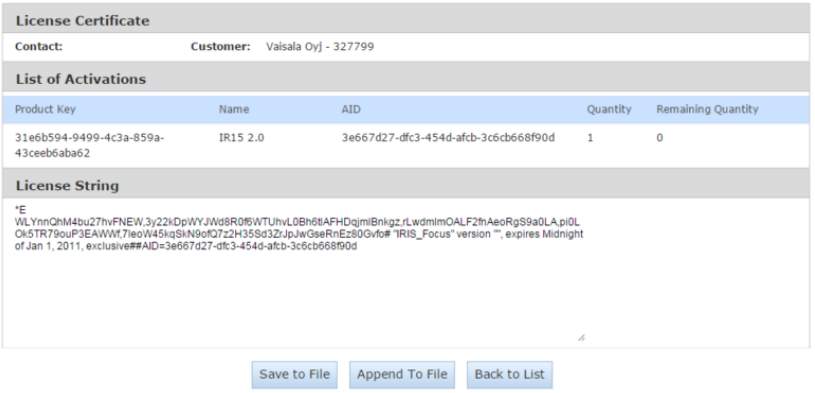


4. Enter your product code and select **Login**.

5. Enter the locking code in the **Request Code** field.



6. Select **Generate**.
   A popup window with the license string opens.



7. Select **Save to File** to save the license string to a file on disk.
   The file is saved by default with the name *`lservrc`*.

Alternatively, use an SSH client to copy and paste the license string to a *`.txt`* file on the server.

8. Install the license with the **`rsw-install-license <location-of-the-license-file>`**command.

9. Restart IRIS Focus services with the following command:

```
service vaisala-radarsw-webapp restart
```

10. Log in to IRIS Focus using an administrator account.
11. Select **Admin > System > Licensing Management** to view information about the license (seats, end date, and start date).

More Information

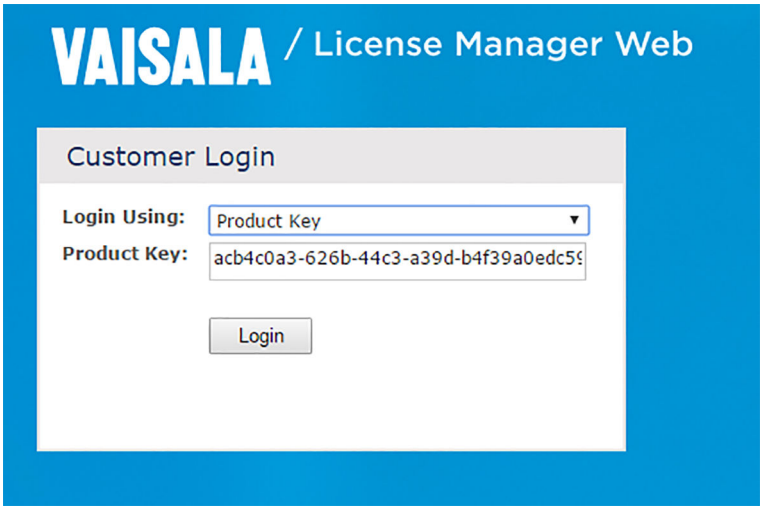
- Licensing (page 11)

5.11 Activating License – Offline

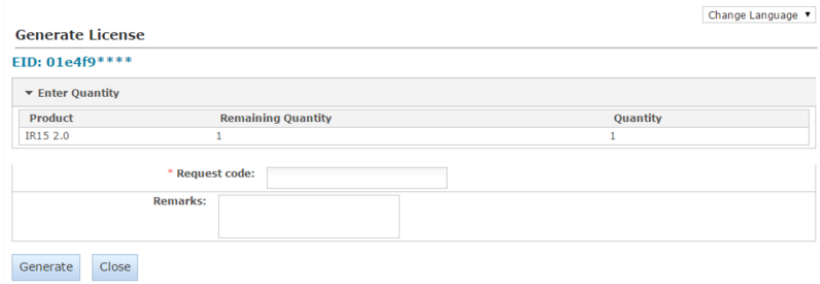
If the server running IRIS Focus is not connected to internet, you must activate the license by entering the IRIS Focus server locking code in **Vaisala License Manager Web** using an online computer. Then transfer the license file to the IRIS Focus server.

1. Run `rsw-show-machine-code > [filename]` command on the IRIS Focus server to get the product code specific to the server hardware.
   This stores the product code string in a file.
2. Copy the file to a removable media, such as a USB stick, and transfer it to the online computer.

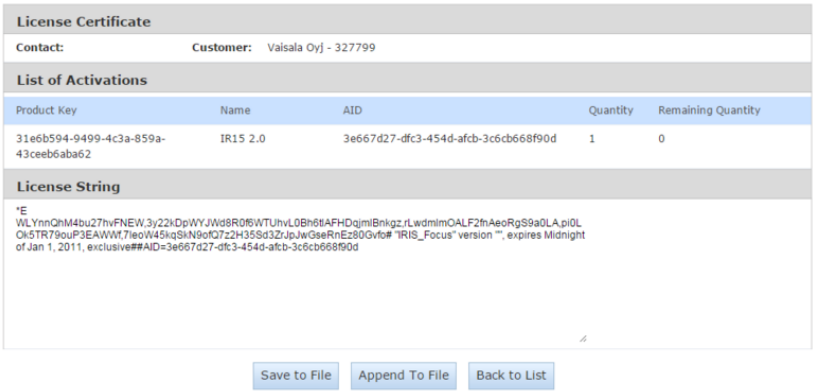
3. Go to Vaisala License Manager Web at https://licensing.vaisala.com and select **Product Code** in the **Login Using** field.



4. Enter your product code and select **Login**.
5. Enter the locking code in the **Request Code** field.



6. Select **Generate**.
   A popup window with the license string opens.



7. Select **Save to File** to save the license string to a file on disk.
   The file is saved by default with the name *`lservrc`*.

> Alternatively, use an SSH client to copy and paste the license string to a *`.txt`* file on the server.

8. Copy the license file to a removable media and transport the file to the IRIS Focus server.
9. Install the license with the **`rsw-install-license <location-of-the-license-file>`**command.
10. Restart IRIS Focus services with the following command:

```
service vaisala-radarsw-webapp restart
```

More Information

- Licensing (page 11)

6. Configuration

6.1 Adding/Removing Radars

When new radar sites are added or removed as data sources on the IRIS Analysis server, radar settings on the IRIS Focus server must be re-syncronized. Settings requiring updates include updating the radar site location in GeoServer and calculating new map projections.

1. Run radar site setup script: **`rsw-basemap-site-setup --socket-server [socket_server_host_name]`**
2. Restart the IRIS Focus web application service: **`service vaisala-radarsw-webapp restart`**

6.2 Configuring Composites

IRIS Focus administrators can set up and manage pre-defined composites.

Configuring pre-defined composites provides more control over settings such as the combining algorithm and **Max Time Span**.

IRIS Analysis Composites are set up in IRIS Analysis as IRIS **COMP** products and sent to IRIS Focus much like other pre-configured products.

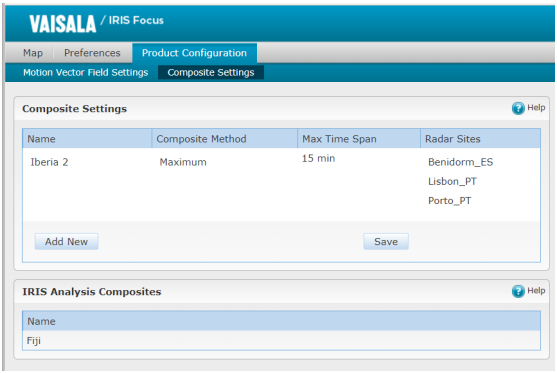


Figure 16 Composite Settings

6.2.1 Setting-up Pre-defined Composites

1. Log in to IRIS Focus as **`admin`**.
2. Select **Product Configuration > Composite Settings**.
3. Select **Add New**.

4. Give the composite site a name.
5. Under **Composite Method**, select the algorithm applied to overlapping data.
   See IRIS Focus Composite Methods (page 53).
6. Define the **Max Time Span** for the composite.
   See Max Time Span (page 54).
7. Under **Radar Sites**, select the sites you want to include in the composite.
8. Select **Save**.

6.2.2 Editing Pre-defined Composites

1. Log in to IRIS Focus as **admin**.
2. Select **Product Configuration > Composite Settings**.
3. Select a composite on the list.
4. Adjust the composite method or time interval as needed.
5. Under **Radar Sites**, select the sites you want to include in the composite.
6. To remove a site from the composite, select the **X** next to the site you want to remove.
7. Select **Save**.

6.2.3 Deleting Pre-defined Composites

1. Log in to IRIS Focus as **admin**.
2. Select **Product Configuration > Composite Settings**.
3. Select a composite on the list and then select **Delete**.
4. Select **Save**.

6.2.4 IRIS Focus Composite Methods

For regions where radars overlap, you can select one of the following methods for combining radar data:

- *Maximum*
  Maximum uses the maximum value to combine the data. This is the most common setting.
- *Average*
  Average uses the average of the available data. This is a poor choice if you are trying to cover blocked regions.

IRIS Analysis supports an expanded set of composite methods. For more information, see *IRIS Product and Display Guide*.

6.2.5 Max Time Span

Max Time Span is the maximum time (minutes) allowed between the newest and oldest points of data. When new data is processed, points that are older than the specified time span are removed.

The following example shows **Max Time Span** for composite radar radar data:

- Each radar has a different task schedule with tasks 5, 7, and 10 minutes apart.
- **Max Time Span** the composite calculations is set to 10 minutes.
- Over time, the composite calculation uses **Max Time Span** value when considering which tasks are available within the time span 'window'.

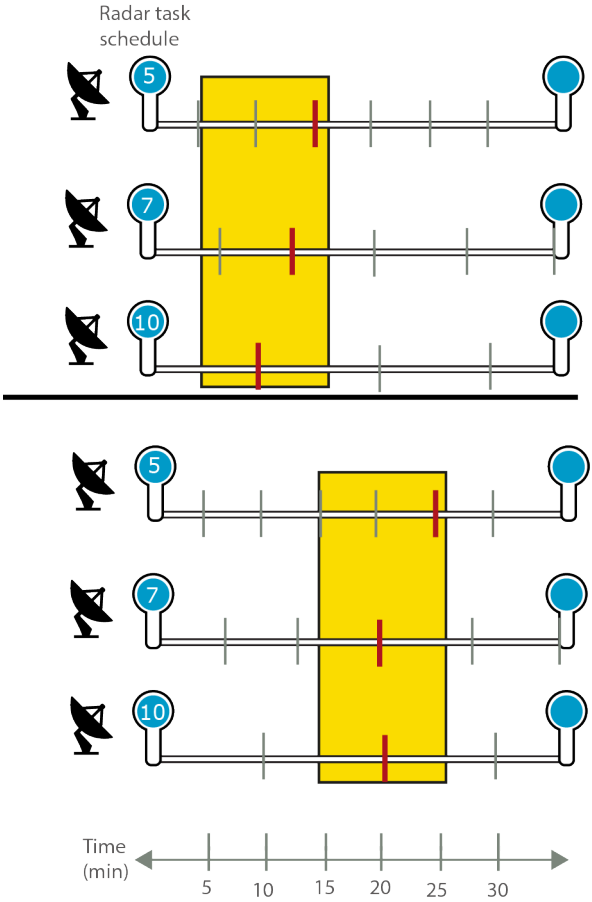


Figure 17 10 minute **Max Time Span**

6.2.6 Viewing a List of IRIS Analysis Composites

IRIS Analysis Composites are set up in IRIS Analysis as IRIS **COMP** products and sent to IRIS Focus much like other pre-configured products.

1. Log in to IRIS Focus as `admin`.
2. Select **Product Configuration > Composite Settings**.
3. Scroll down to the **IRIS Analysis Composites** pane.

6.3 Configuring Nowcasting

Nowcasting is enabled by default. However, during installation or later, you can adjust the nowcasting configuration.

For information on using nowcasting, see *IRIS Focus User Guide*.

Configuring IRIS Focus for nowcasting includes:

- Enabling nowcasting in the IRIS Focus web application and the nowcasting server.
- Configuring MVF and nowcasting criteria.
- Fine-tune the algorithms.
  Most users do not need to adjust the nowcasting algorithms.

More Information

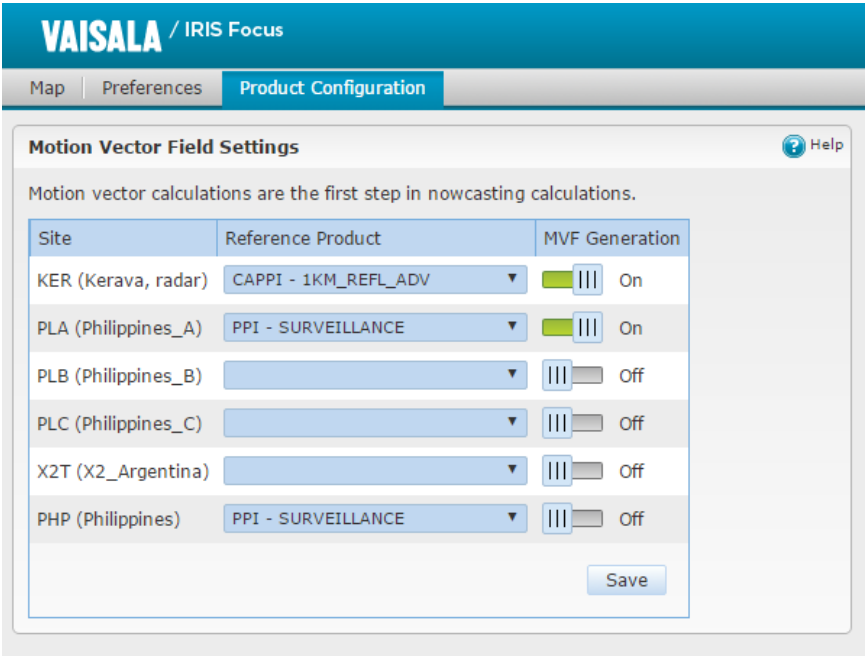
- Configuring MVF (page 55)
- nowcast.ini (page 100)

6.3.1 Configuring MVF

To use nowcasting, for each radar site you must enable motion vector field (**MVF**) generation and pre-configure the **MVF** product to define a product type and product name.

IRIS Focus generates one **MVF** product per site. If meteorological conditions vary across your radar sites, you may wish to use different products for each radar site.

For information on radar products and product codes, see *IRIS Focus User Guide*.



1. Log in to IRIS Focus as **admin**.
2. Select **Product Configuration > Motion Vector Field Settings**.
3. For each radar site, select whether **MVF** generation is enabled for that site.
   To minimize performance problems, do not enable **MVF** generation for sites that do not need the nowcasting feature.
4. For the sites with **MVF** generation enabled, select the product used to create **MVF** products.
   The product can be of any data type except V and PHIDP.

   Minimize performance problems by avoiding:
   - Products that generate too much data, for example, those with large resolutions.
     Vaisala recommends using a **CAPPI** at 2km height at with a 480x480 resolution.
   - Generating the **MVF** product too frequently.
     Vaisala recommends using products that are configured to be created no less than 10 minutes apart.

   For more information on pre-configuring products, see *IRIS Radar User Guide* and *IRIS Product and Display Guide*.

5. Select **Save**.

More Information

- Configuring Nowcasting (page 55)
- File Locations (page 98)
- vsoweb-override.ini (page 102)

6.3.2 Enabling the Nowcast Server

You must have a nowcasting license to use nowcasting in IRIS Focus.
See Licensing (page 11).

After a default installation, the nowcast server is running by default.

When troubleshooting nowcasting, check that the nowcasting is enabled and that the nowcast server is running.

If you change the configuration, you must restart the nowcast server.

1. Login as **root**.
2. Go to */etc/vaisala/radarsw/configuration/vsoweb-override.ini*.
3. In the [NOWCAST] section of the **vsoweb-override.ini** file, check that the nowcast server is enabled:

```
nowcast.mvf.run: true
```

4. Check the nowcast server URL:

```
nowcast.http.server.url = http://localhost:34480/api/v1/mvf/
```

If you have not changed **vsoweb-override.ini**, you do not need to restart the **vaisala-radarsw-webapp** server.
The nowcast server is running by default. If you have not changed **nowcast.ini**, you do not need to restart the nowcast server.

5. Restart the **vaisala-radarsw-webapp** service by typing:

```
service vaisala-radarsw-webapp restart
```

6. Start the nowcast server by typing:

```
service vaisala-radarsw-nowcast-server start
```

   a. To verify that the server starts, type:

```
systemctl status vaisala-radarsw-nowcast-server.service
```

   b. Check for the status:

```
Active: active (running)
```

6.3.3 Starting the Nowcast Server

1. Login as **root**.
2. Start the nowcast server by typing:

```
service vaisala-radarsw-nowcast-server start
```

   a. To verify that the server starts, type:

```
systemctl status vaisala-radarsw-nowcast-server.service
```

   b. Check for the status:

```
Active: active (running)
```

6.3.4 Stopping the Nowcast Server

1. Login as **root**.
2. Stop the nowcast server by typing:

```
service vaisala-radarsw-nowcast-server stop
```

6.3.5 Restarting the Nowcast Server

1. Login as **root**.

2. Restart the nowcast server by typing:

```
service vaisala-radarsw-nowcast-server restart
```

6.4 Scheduling Image Exports from IRIS Focus

If you want to share interesting weather events on, for example, your website, use a **REST POST** method to schedule image exports from IRIS Focus saved views.

> **CAUTION!** Depending on setup of the target website, the image export can be a bit slow. Take this into account when planning your export volumes and schedules.

1. In the IRIS Focus **Map** view, set-up the view you want to save.
   For example, you can save the settings for:
   - **Weather Products**
   - Map tools such as the cross-section and tracking tools
   - Zoom level
2. Select **Saved Views > Save**.
3. Name the view and select **Save**.
   The new view is added to the **Saved Views** list for your future use.
4. Configure your web server to access the IRIS Focus image export service:

```
@Request: POST <your IRIS Focus URL>/imageExport/getImage
@Produces: "image/png"
```

5. Configure the following parameters:

Paramter	Description
`username`	IRIS Focus user name for the image export user. For security reasons, Vaisala recommends that you configure a specific user for exporting images or encrypt your login details.
`password`	IRIS Focus password for the image export user.
`time`	Time, in the format: `2018-01-18T17:55:23.000Z`
`widthPx`	Width of the exported image, in pixels.
`heightPx`	Height of the exported image, in pixels.
`savedViewName`	The name of the saved view you created in step 3.
`savedViewUser`	Optional value. Used if you configure a specific user for exporting images (recommended).

6. Instead of step 4 and step 5, you can run the export from the command line by creating a script and setting-up a **cron** job. For example:
   a. Create a Python script for the image export such as the following:

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
```

```
from requests_futures.sessions import FuturesSession
import datetime
```

```
APP_URL = "your_url_here"
IMAGE_EXPORT_LOC = "/imageExport/getImage"
FILE_PATH = "/path/to/image.png"
USERNAME = "username_here"
PASSWORD = "password_here"
TIME = datetime.datetime.utcnow().isoformat()
WIDTH = "1000"
HEIGHT = "700"
VIEW = "view_name_here"
```

```
def main():
    session = FuturesSession()

    req_params = {"username": USERNAME, "password": PASSWORD, "time":
TIME, "savedViewName": VIEW, "widthPx": WIDTH, "heightPx": HEIGHT}

    future_one = session.post(APP_URL + IMAGE_EXPORT_LOC,
params=req_params)

    # wait for the request to complete, if it hasn't already
    res = future_one.result()
    print('{0}  response status: {1}'.format(TIME, res.status_code))

    if res.status_code == 200:
      with open(FILE_PATH, 'wb') as f:
          f.write(res.content)

if __name__ == '__main__':
    main()
```

   Although the example **image-export.py** script saves only one snapshot, you can edit it to loop a set number of times and get multiple snapshots at a time.

   b. Type **crontab -e** in the terminal and add, for example, the following line to the *crontab* file (add your own paths and arguments).

```
*/15 * * * * /usr/bin/python
        /path/to/script/image-export.py >> /path/to/log/export.log 2>&1
```

   This executes the **image-export.py** script every 15 minutes and saves a single snapshot as a PNG file to the server.

6.5 Importing Historical Data to IRIS Focus

You can import historical data into IRIS Focus to use the same IRIS Focus visualization and analytical tools available for current data.

To import the data, use one of the following import methods:

- Transfer **RAW** product data from IRIS Analysis on the IRIS back-end to the IRIS Focus machine. See IRIS Focus Architecture (page 17).
- Import a data archive by sending a collection of IRIS **RAW** products over the network using an SCP command. See the following steps.

1. Set up public key authentication for the machine you are copying from:
   On the **_my.iris.focus.server** machine, add the key from the source machine to the **radardminput** user's *~/.ssh/authorized_keys* file .
2. Use SCP to copy all the files from */storage/raw/archive/* to the IRIS Focus Server. For example:

   ```
   find "/storage/raw/archive" -type f -exec scp {}
   radardminput@my.iris.focus.server:/srv/vaisala/radarsw/datamanager/input;
   ```

   The Data Manager input service expects only IRIS **RAW** files. Make sure you do not copy a directory or zip file.

3. To monitor the data import, or troubleshoot if the data does not appear on the IRIS Focus web interface, check the Data Manager input service log:

   ```
   journalctl -u vaisala-radarsw-data-manager-input-service -f
   ```

The Data Manager input service imports the files to Data Manager for use in IRIS Focus.

6.6 Enabling Lightning Layer

To take the lightning layer into use, IRIS Focus server must be online and your organization must have an active subscription for GLD360. For information on subscribing to the GLD360, contact Vaisala Lightning Data Services.

1. Log on to the IRIS Focus server as root.
2. Type the command:
   rsw-lightning-configure -r [admin username] -p [admin password] -s https://storm.vaisala.com/geolegends/ltg_combined_25.sld

3. Edit the configuration file *vsoweb-override.ini:nano /etc/vaisala/radarsw/configuration/vsoweb-override.ini* to contain a reference to the Vaisala GLD360 URL you received:

```
lightning.wms.url = [URL from GLD360]
```

4. Restart the IRIS Focus web application service:
service vaisala-radarsw-webapp restart

More Information

- Lightning Layer (page 22)

7. Upgrade

7.1 Upgrading IRIS Focus 4.0 to IRIS Focus 5.0

The following instructions assume you are upgrading from IRIS Focus 4.0 to IRIS Focus 5.0.

If you have previous versions of IRIS Focus, you must upgrade through each previous version before you can upgrade to IRIS Focus 5.0.

IRIS Focus 5.0 requires a new license. If you do not yet have a license, please contact your Vaisala sales representative.

CAUTION! This procedure deletes the contents of the data manager database. Make sure you back-up the database before you begin. The database will repopulate when you begin to run data after the upgrade.

1. Login as **`root`**.
2. Backup the system configuration.
   See Making a Manual Back-up (page 86).
3. Insert the upgrade USB stick.
4. Copy the file *`Vaisala_IRIS_installer-5.0.tar`* from the USB stick to the server's hard disk drive, for example to the *`/root`* directory.
5. Change to the directory created in the previous step:

   ```
   cd Vaisala-IRIS-Focus-v5.0.0--xx
   ```

6. Run the upgrade script.
   Online upgrade:

   ```
   ./rsw-upgrade --online
   ```

   Offline upgrade:

   ```
   ./rsw-upgrade --offline
   ```

   To view installation command line options, run: **`./rsw-upgrade -h`**

7. Verify the upgrade by running: **`rpm -qa | grep vaisala`**
   Check that the **`rpm`** name is version 5.0.
8. Activate the IRIS Focus license.
   Depending upon whether or not your server is connected to the internet, see:
   - Activating License – Online (page 47)
   - Activating License – Offline (page 49)

7.2 Preparing to Upgrade to IRIS Focus 3.0 to IRIS Focus 4.0

1. Verify the size of the `/srv` and `/var` partitions:

   ```
   df -h | grep /srv
   df -h | grep /var
   ```

   Take note of the displayed disk sizes.
   For example `/srv = 900G`, `/var = 30G`

2. Back up `/srv`:
   a. Log in as **`root`**.
   b. Change directory:

      ```
      cd /home
      ```

   c. Make sure that there is enough space on /home for the contents of `/srv`.
   d. If needed, clear space on a partition or mount a separate hard disk to make the backup.
   e. Compress the `/srv` directory into a `tar` file. c

      ```
      tar -zcvf srv.tar /srv
      ```

3. Stop services:

   ```
   systemctl stop monit; systemctl stop vaisala-radarsw-*
   ```

   The following services are stopped:

   ```
   {webapp, warn-reader, scan-http-service, scan-updater-service, nowcast-
   server, geoserver}
   ```

4. Unmount the filesystem on the `/srv` partition:

   ```
   umount <srv-mount-point>
   ```

   Run the command **`lvdisplay | grep /srv`** to show the mountpoint for `/srv`. For example `/dev/centos/srv` .

5. Remove the `/srv` logical volume:

   ```
   lvremove <srv-mount-point>
   ```

6. Create a new `/srv` logical volume:

   ```
   lvcreate -L 830G -n srv <volume group name>
   ```

   Replace 830 G with an amount 75 GB less than the original `/srv` value.
   The **`<volume group name>`** is, for example **`centos`** in **`/dev/centos/srv <srv-mount-point>`**.
   a. Select **`y`** to wipe the **`xfs`** signature.

7. Create `xfs` filesystem on the newly created volume:

```
mkfs.xfs <srv-mount-point>
```

8. Mount the filesystem:

```
mount <srv-mount-point> /srv
```

9. Put the files back to `/srv`:

```
tar -xf srv.tar -C /
```

10. Increase the `/var` volume:

```
lvextend -L100G <srv-mount-point-of-var>
```

For example: `/dev/centos/var`

11. Increase the file system on `/var`:

```
xfs_growfs /var
```

This increases the file system to the maximum space available on volume.

12. Verify that the paritions have the desired sizes:

```
df -h
```

13. Restart the following services:

```
systemctl start monit
systemctl start vaisala-radarsw-*
```

7.3 Upgrading IRIS Focus 3.0 to IRIS Focus 4.0

The following instructions assume you are upgrading from IRIS Focus 3.0 to IRIS Focus 4.0.

If you have previous versions of IRIS Focus, you must upgrade through each previous version before you can upgrade to IRIS Focus 4.0.

IRIS Focus 4.0 requires a new license. If you do not yet have a license, please contact your Vaisala sales representative.

1. Login as **root**.
2. Backup the system configuration.
   See Making a Manual Back-up (page 86).
3. Download the following files:

   The files are very large. Use a download tool such as CrossFTP that allows resuming downloads to fetch the packages.

   a. IRIS Focus web application package: *Vaisala_IRIS_installer-<latest version>.tar*
   b. Maps directory: *vaisala-iris-maps-v2.zip*
   c. Terrain data directory: *vaisala-iris-terrain-v2.zip*
4. Insert the upgrade USB stick.
5. Copy the file *Vaisala_IRIS_installer-4.0.tar* from the USB stick to the server's hard disk drive, for example to the */root* directory.
6. Extract the following files:

```
tar -xvf Vaisala_IRIS_installer-4.0.tar
unzip vaisala-iris-maps-v2.zip
unzip vaisala-iris-terrain-v2.zip
```

7. Change to the directory created in the previous step:

```
cd Vaisala-IRIS-Focus-v4.0.0--xx
```

8. Run the upgrade script.
   Online upgrade:

   ```
   ./rsw-upgrade --gis-db-dump [maps directory] --terrain-dir [terrain
   directory] --online
   ```

   Offline upgrade:

   ```
   ./rsw-upgrade --gis-db-dump [maps directory] --terrain-dir [terrain
   directory] --offline
   ```

   When running the-upgrade script, replace `[maps directory]` and `[terrain directory]` with the correct paths.

   To view installation command line options, run: **`./rsw-upgrade -h`**

9. Verify the upgrade by running: **`rpm -qa | grep vaisala`**
   Check that the **`rpm`** name is version 4.0.
10. Activate the IRIS Focus license.
    Depending upon whether or not your server is connected to the internet, see:
    - Activating License – Online (page 47)
    - Activating License – Offline (page 49)

7.4 Upgrading IRIS Focus 2.1 to IRIS Focus 3.0

The following instructions assume you are upgrading from IRIS Focus 2.1 to IRIS Focus 3.0.

If you have IRIS Focus 2.0, you must upgrade to IRIS Focus 2.1 before you can upgrade to IRIS Focus 3.0.

IRIS Focus 3.0 requires a new license. If you do not yet have a license, please contact your Vaisala sales representative.

1. Login as **`root`**.
2. Backup the system configuration.
   See Making a Manual Back-up (page 86).
3. Insert the upgrade USB stick.
4. Copy the file ***`Vaisala_IRIS_installer-3.0.tar`*** from the USB stick to the server's hard disk drive, for example to the **`/root`** directory.

5. Extract the file: *tar -xvf Vaisala_IRIS_installer-3.0.tar*
6. Change to the directory created in the previous step:
   cd Vaisala-IRIS-Focus-v3.0.0--xx
7. Depending on whether you are performing an online or an offline ugrade, run one of the following:Run: **./rsw-upgrade**

```
./rsw-upgrade --online
```

```
./rsw-upgrade --offline
```

To view installation command line options, run: **./rsw-upgrade -h**

8. Verify the upgrade by running: **rpm -qa | grep vaisala**
   Check that the rpm name is version 3.0.
9. Activate the IRIS Focus license.
   Depending upon whether or not your server is connected to the internet, see:
   - Activating License – Online (page 47)
   - Activating License – Offline (page 49)

7.5 Upgrading IRIS Focus 2.0 to IRIS Focus 2.1

The following instructions assume you are upgrading from IRIS Focus 2.0 to IRIS Focus 2.1

IRIS Focus 2.1.0 requires a new license. If you do not yet have a license, please contact your Vaisala sales representative.

1. Login as **root**.
2. Backup the system configuration.
   See Making a Manual Back-up (page 86).
3. Insert the upgrade USB stick.
4. Copy the file *Vaisala_IRIS_installer-2.1.tar* from the USB stick to the server's hard disk drive, for example to the */root* directory.
5. Extract the file: *tar -xvf Vaisala_IRIS_installer-2.1.tar*
6. Change to the directory created in the previous step:
   cd Vaisala-IRIS-Focus-v2.1.0--55

7. Run: **`./rsw-upgrade`**

To view installation command line options, run: **`./rsw-upgrade -h`**

8. Verify the upgrade by running: **`rpm -qa | grep vaisala`**
   Check that the rpm name is version 2.1.
9. Activate the IRIS Focus license.
   Depending upon whether or not your server is connected to the internet, see:
   - Activating License – Online (page 47)
   - Activating License – Offline (page 49)

8. System Administration

8.1 Managing Users

Access to IRIS Focus features depends on the roles enabled for each user account. Each user account belongs to one or more organizations.

For example, the administration features are available to user accounts with the **administrator** role.

Table 8 IRIS Focus User Roles

Role	Description
administrator	Can access administration features. Users with an **administrator** role must belong to the **root** organization.
focus	Can access the full IRIS Focus feature set.
poweruser	Can access the full IRIS Focus feature set. Can create organization-level event criteria and places of interest that are visible to all users in an organization.
user	Can access the limited set of features available with IRIS Focus Light.
kiosk	Can only access the non-interactive, full-screen Kiosk mode.

To enable all IRIS Focus features for an account, set both **user** and **focus** roles for that account.

Seat Allocation and Restrictions

Each logged-in user account with a **focus** role reserves one IRIS Focus seat from the license pool. When the user logs out, the seat is released.

A user account that has **user** or **administrator** role, or another role without a **focus** role, enters IRIS Focus Light, which has a map view with limited features and does not provide access to features such as cross-section or on-demand radar products.

If a user with a **focus** role logs in and there are no IRIS Focus seats available, the user enters IRIS Focus Light. When a seat is available, the user is provided with an opportunity to switch to IRIS Focus.

To avoid reserving an IRIS Focus license when performing administration tasks, the default administrator account does not have the **focus** role.

More Information

- Licensing (page 11)

8.1.1 Managing User Accounts

1. Log in with an *administrator* account.
2. Select **Admin** in the upper right corner.
3. Select **Users** to add, edit, or delete users.

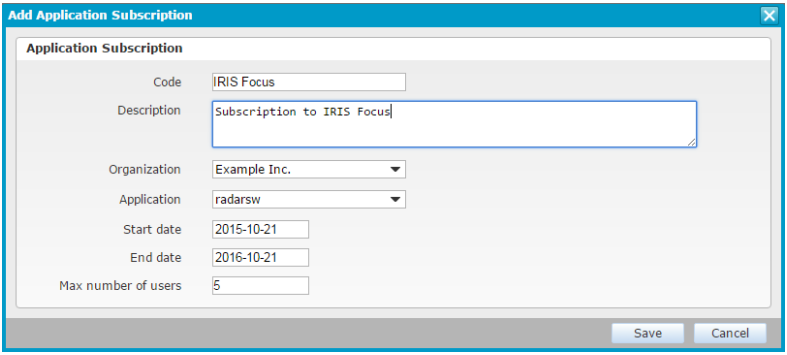
8.1.2 Creating User Accounts After First Install

After a fresh installation, create the user accounts.

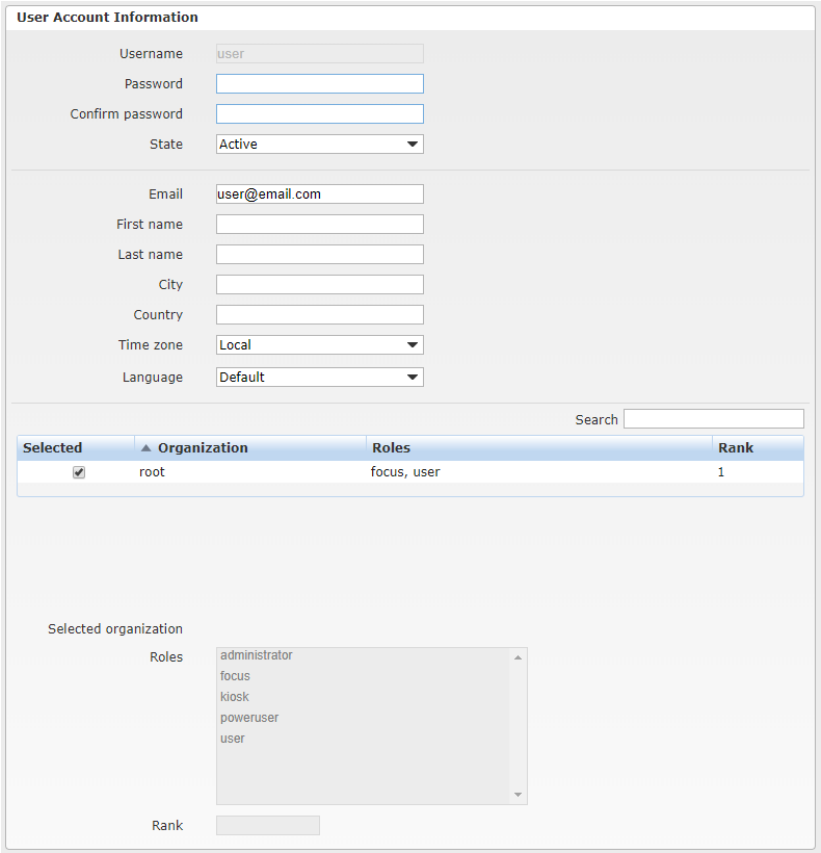
1. Log in to IRIS Focus as `admin`.
2. Select **Admin > Organizations**.
3. Choose which organization you want to create your users in:
   - Use the default `root` organization.
   - If you require more control over license seat allocation, create a new organization in the **Organizations** tab.

> Users with an `administrator` role must belong to the `root` organization.

4. In the **Application Subscriptions** tab, subscribe the organization to a license pool.
   a. Select the `radarsw` organization.
   b. Enter the validity period.
   c. Enter the maximum allocated users (licenses).



5. To add users to the organization, select **Admin > Users > Add New User**.



a. Add user details.

b. Select an organization for user.
If a user account belongs to multiple organizations, the user roles are applied according to the organization that has the highest **Rank**.

6. Assign roles to the user.

To avoid reserving an IRIS Focus license when performing administration tasks, the default administrator account does not have the `focus` role.

   a. In the organization list panel, make sure the organization is highlighted.
   b. In the **Roles** panel, select the role.
      To assign multiple roles to a user account, press **SHIFT**+**CTRL** and select roles from the list.
   c. To enable IRIS Focus features for a user account, select both the `user` and `focus` roles.
   d. To enable advanced IRIS Focus features such as creating event criteria and organization-level places of interest for an account, select the `poweruser` role.

8.1.3 Removing User Accounts

1. Login as `admin`.
2. Select **Admin > User > Users**.
3. Select a user and then **Delete**.
   The user is no longer listed as a user in IRIS Focus. However, the user name of the deleted account remains in the system database. This keeps log files intact, as references to deleted users remain in the audit logs.
   IRIS Focus does not allow you to create a new user with the same username as an existing one. This applies even when the account has been removed earlier, because the account name remains in the database.

8.2 Managing Organizations

Each user account belongs to one or more organizations. You can use organizations to manage:

- Subscriptions to selected software to a selected number of users.
- License availability for subgroups with separate license pools.
- Events and places of interest created by a *poweruser*.

Users with an `administrator` role must belong to the `root` organization.

8.3 Map Management

The standard installation of IRIS Focus includes a complete world map that is suitable for most scenarios.

The map consists of separate layers that are further separated into base layers and non-base layers. One base layer and one non-base layer are always rendered on the screen. Typically, base maps contain the underlying terrain and the non-base layers contain additional details that can be displayed on top of the base map.

Map data is served to the IRIS Focus web interface by GeoServer map server using Web Map Service (WMS) protocol. To improve performance, instead of calling for new map data each time the map view changes, the maps are cached in pre-rendered PNG tiles using GeoWebCache.

Administrators can add custom map layers or edit existing layers.

IRIS Focus users can view map layers in the **Map** view by selecting **Map Features**.

8.3.1 Working with Map Layers

1. Login as **admin**.
2. Select **Admin > Map > Map Layers**.
   The **Map Layers** view lists the available map data layers. Each layer has the following properties:
   - **Base layer** - Enable to set this layer as a base layer
   - **Title** - Layer name
   - **Type** - WMS layers
   - **URL** - Address for the WMS server
   - **Layer** - Title of the layer on the server
3. To add a new layer, select **Add New Layer**.
   a. Type the layer information, including **Title**, **URL**, and **Layer**.
   b. Define map layer properties such as:
      - **Transparent** - Enable to use PNG or GIF alpha channel for transparency
      - **MIME type** - Select image type
4. To edit a layer, select **Edit** for that layer and make your changes
   The **Map Layer Information** window for that layer opens.
5. Select **Save**.

More Information

- Map Layer Configuration Options (page 99)

8.3.2 Map View Context

The **Map View Contexts** view lists all defined maps.

Only the default TheMap context is available.

You perform all map layer customization in the default **TheMap** context, you do not create new map contexts for custom map layers.

- To set which layers are enabled and which are disabled for users in the map view, edit **TheMap**.
- To set the order in which multiple map layers are rendered on screen, change the **Z level** of map layers.
  The lowest number is rendered first, and higher numbers rendered on top of that.

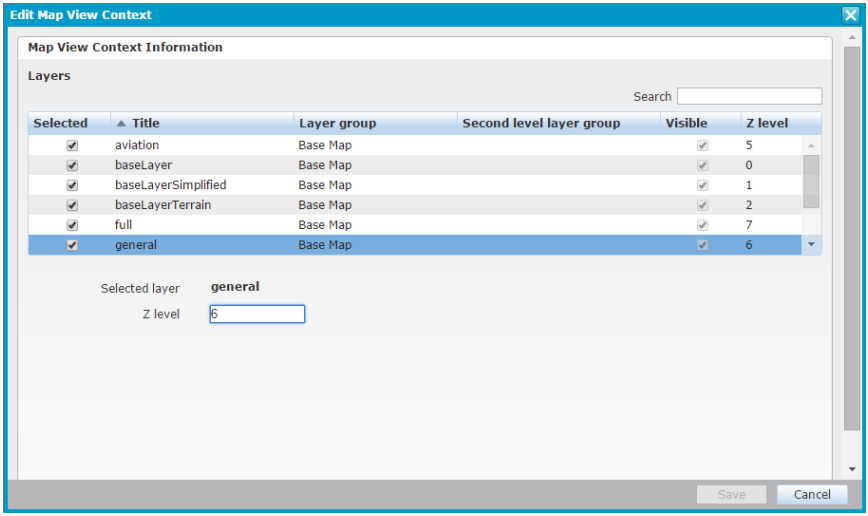


Figure 18 Editing the Map Context

8.3.3 Adding External Map Layers

You can import an external map layer such as a shapefile into Geoserver for IRIS Focus to display on the map.

1. Make sure you have a shapefile (*.shp*) available.
   For an example resource with shapefiles available for download, see the WGS84 projection examples at:
   http://openstreetmapdata.com/data/coastlines
2. Copy the shapefile to the server.
3. Login to the server as `radarop`.
4. Open the file: */etc/vaisala/radarsw/configuration/gis-override.ini*
5. Copy the `geoserver.admin.password` .
   This password is autogenerated during installation.

6. Using a browser, login to IRIS Focus Geoserver at:
   http://<IRIS_Focus_server_name>:34180/geoserver/web/
   Login using the username **admin** and the password you copied earlier.

   Depending on your own network configuration you may need to do this at the server, over a remote console, or by using your local browser.

7. Add a new **Store**:
   a. Select **Stores > Add New Store**.
   b. Choose the data source: **Shapefile - ESRI(tm) Shapefiles (*.shp)**
   c. Select the following (the following list shows example values).
      - **Workspace**: `Vaisala`
      - **Data Source Name**: `coastlines`
      - **Description**: leave blank
      - **Shapefile location**: browse to the shapefile
        For example: `\files\lines.shp`
   d. Leave the other fields as default.
   e. Select **Save**.
8. Publish the layer:
   a. Check that the **New Layer** menu opens.
   b. If the **New Layer** menu does not open automatically, select **Layers > Add New Layer**.
   c. In the **Add layer from** list, find the new layer.
   d. Select **Publish**.

   The **Edit Layer** menu shows the new layer name. For example, `vaisala:coastlines`.
9. In the **Edit Layer** menu:
   a. Leave all inputs as they are except:
      - **Name**: `coastlines`
      - **Title**: `coastlines`
      - **Coordinate Reference Systems > Declared SRS**
      - Select **Find** and search for `4326 (WSG 84)`.
   b. To fill the bounding boxes, select **Compute from data** and **Compute from native bounds**.
   c. Select **Save**.
10. Select **Layer Groups**.
    a. Select an existing layer group (for example, `vai_full_en`) and then select **Add Layer**.
    b. Find the new layer and add it.
       The layer is now listed in the **Layers** table.
    c. Select **Save**.

11. Login to IRIS Focus as a user.
12. To confirm that the new layer is visible, select **Map Features > Map Detail > Full Detail**.

8.4 systemd

systemd and its logging daemon **journald** are CentOS 7 components that manage system services.

systemd manages more functionality than its predecessors, and some of the mechanisms, such as accessing certain log files, have changed.

In CentOS 7, system logs are not directly accessible as files. Instead, they are read with the **journalctl** command.

8.5 Monit

Monit is a watchdog tool for monitoring Unix systems and processes. IRIS Focus uses Monit to automatically restart the application or a related process or service if it becomes unstable.

If you do maintenance work that requires you to take the application down, you must first stop Monit before proceeding further, and restart it after maintenance.

In the command line, the Monit service is called **monit**.

8.6 HAProxy

HAProxy is a proxying tool that IRIS Focus uses for traffic forwarding within the system and HTTPS encryption for outgoing traffic.

In the command line, the HAProxy service is called **haproxy**.

More Information

- Encryption (page 89)

8.7 IRIS Focus Web Application

This is the main web UI of the IRIS Focus system.

In the command line, the IRIS Focus web application service is called **vaisala-radarsw-webapp**

8.8 GeoServer

GeoServer is used for caching and generating the base map layers.

In the command line, the GeoServer service is called `vaisala-radarsw-geoserver`

8.9 Data Manager

Data manager is the HTTP/REST interface that provides raw data for on-demand (Live) radar products.

Table 9 Data Manager Services

Service	Description
`vaisala-radarsw-data-manager`	Listener.
`vaisala-radarsw-data-manager-input-service`	HTTP server for live radar products that are queried from the IRIS Focus web application.

More Information

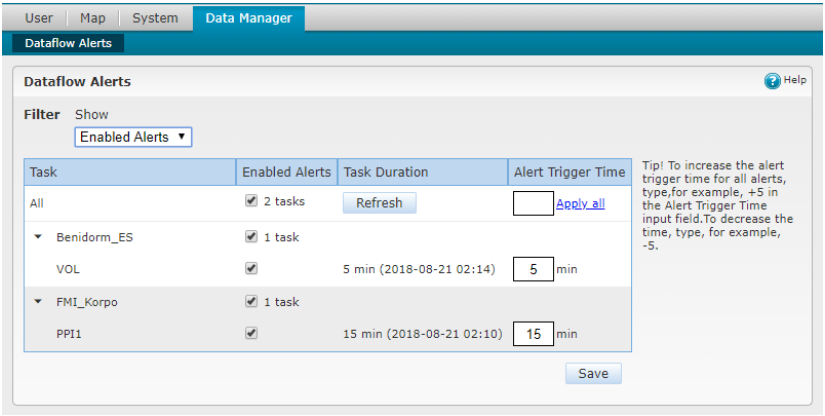
- Data Manager Disk Space Requirements (page 15)
- Setting up Data Manager (page 42)
- Setting-up Dataflow Alerts (page 80)
- Viewing Dataflow Alerts (page 82)
- On-demand Radar Products (page 19)

8.9.1 Setting-up Dataflow Alerts

Enable and set-up data flow alerts to monitor the flow of radar data to IRIS Focus through Data Manager.

1. Run the radar system for some time to allow the Data Manager database to populate.
2. Log in to IRIS Focus as **`admin`**.

3. Select **Admin > Data Manager > Data Flow Alerts**.
   The **Data Flow Alerts** page opens.



Task
Radar task associated with the dataflow.

Enabled Alerts
If selected, IRIS Focus generates an alert if the dataflow for that task is interrupted.

Task Interval
Shows the interval between task run times. (minutes).
Data Manager re-calculates the frequency automatically each time you open the **Data Flow Alerts** page. To refresh the times manually, select **Refresh**.
The timestamp shows the last detected date for received data.

Alert Trigger Time
The time (minutes) after which IRIS Focus generates an alert if the dataflow is interrupted.

4. To receive alerts about interruptions to the flow of task data:
   a. In the **Enabled Alerts** column, select the check box.
   b. In the **Alert Trigger Time** column, set a time that is higher than the expected data flow interval.
   c. To manage all enabled alerts in the same way, use the input filed at the top of the **Alert Trigger Time** column and then select **Apply all**:
      - To set the same trigger time for all alerts, type a number in the input field.
      - To increase the alert trigger time for all alerts, type, for example, +5 in the input field. To decrease the time, type, for example, -5.
      - To set a trigger time that is the same as detected interval between task run times for all alerts, leave the input field blank.
5. Select **Save**.

More Information

- Data Manager (page 80)

8.9.2 Viewing Dataflow Alerts

If there is a break in the flow of radar product data, IRIS Focus sends a dataflow alert.

1. On the right side of the main menu, select **Alerts > Techincal**.
2. In the **Alerts** panel, acknowledge the alert.
   The acknowledgement records who has seen the alert and when.
   Acknowledging alerts has no effect on the alert status.

More Information

- Data Manager (page 80)

8.9.3 Setting Up Data Manager Housekeeping Service

When Data Manager exceeds its allocated disk space, the background housekeeping service begins to delete volume scans, starting from the oldest.

Data Manager disk space is allocated during installation, but can be modified later on.

1. Login as **`root`**.
2. Go to */etc/vaisala/radarsw/data-manager/data-manager-override.properties*.
3. The disk space allocation for Data Manager is configured during installation. If you wish to change the allocation later on, use the **`datamanager.volumeDir.maxSizeMB`** parameter. For example:

   ```
   datamanager.volumeDir.maxSizeMB = 1000
   ```

4. Define how often housekeeping checks for disk overusage (milliseconds).

   ```
   datamanager.housekeeping.fixedRate.ms = 60000
   ```

   Vaisala recommends running this check once a day.
   While this checks runs, other operations on Data Manager slow down.
5. Define the delay for when housekeeping first runs after Data Manager has been started or restarted (milliseconds).

   ```
   datamanager.housekeeping.fixedDelay.ms = 60000
   ```

6. Restart Data Manager:

```
systemctl restart vaisala-radarsw-data-manager
```

8.9.4 Running Data Manager Clear Data Script

Use the **`rsw-data-manager-clear-data`** script if the Data Manager data storage becomes corrupt or if there is a need to remove all data from Data Manager.

CAUTION! Running the script deletes all radar data from IRIS Focus, including Nowcasting configurations, pre-defined composite configurations, and RAW radar data.

1. Run the script:

```
DM_RESET=yes rsw-data-manager-clear-data
```

If there is a lot of RAW radar data in Data Manager, it may take some time to run the script.

CAUTION! Do not interrupt the script execution.

When the script is complete, Data Manager restarts automatically and you can continue using IRIS Focus.

8.10 Stopping, Starting, and Restarting Services

In CentOS 7, services are stopped, started, and restarted with the **`service [servicename] stop / start / restart`** command.

To use the **`service`** command, you must be a logged in as the root user.

The following example shows how to stop, start and restart the IRIS Focus web application service. Note that the Monit service starts along with the web application.

Stopping the service

- **`service monit stop`**
- **`service vaisala-radarsw-webapp stop`**

Starting the service

- **`service vaisala-radarsw-webapp start`**
- **`service monit start`**

Restarting the service

- **`service vaisala-radarsw-webapp restart`**

8.11 Logging

IRIS Focus log files are stored in directory */var/log/vaisala/radarsw/webapp*, which contains:

- Application error log: *`webapp.log`*
- Information about application performance: *`webapp-metrics.log`*

Older logs are rolled over to separate files and zipped automatically in **`.gz`** files. No log files are deleted automatically.

The logging configuration file is in */etc/vaisala/radarsw/configuration/logback.xml*.

8.11.1 Reading System Service Logs

When diagnosing issues with the IRIS Focus server, you may need to access the log files from system services using the CentOS 7 Journal tool:

```
journalctl -u [service-name] -l -f --no-pager
```

Some useful options for **`journalctl`** are:

- **`-u`** for showing log entries for a given service
- **`-n`** for showing only a given number of recent log lines
- **`-f`** for following new log entries being logged
- **`--no-pager`** for not using a pager program such as less for the output
- **`-l`** to print out full log lines and not ellipsize (shorten) them.

For more information, type **`man journalctl`** in CentOS 7, or *Using the Journal* at RHEL System Administrators Guide (https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/System_Administrators_Guide/s1-Using_the_Journal.html)

8.11.2 Reading Nowcast Server Logs

The nowcast server logs are useful when diagnosing issues with the nowcast server.

1. Check the status of the nowcast server by typing:

   ```
   service vaisala-radarsw-nowcast-server status
   ```

2. Check the logs by typing:

   ```
   journalctl -f
   ```

8.12 Installing a CA Certificate

The web application comes with a temporary, self-signed SSL certificate that secures the connection between the IRIS Focus server and the user's web browser.

Consider acquiring and using a trusted certificate from a certificate authority (CA), especially if you plan to offer access to IRIS Focus outside your organization.

1. Acquire a certificate that has been signed by a trusted authority.
   This is usually done by an IT department or an external organization, who purchase the certificate from an external certificate authority (CA).
2. Back-up your current configuration by running:

   ```
   run /usr/vaisala/radarsw/backup/bin/do-backups
   ```

   This backs up all the configuration files as a *.tar* file to */srv/vaisala/radarsw/backup/configuration*.
3. Go to the default certificate folder:
   /etc/vaisala/radarsw/webapp-proxy/certificates/cert.pem
   a. Back up the file locally by running:

      ```
      cp /etc/vaisala/radarsw/webapp-proxy/certificates/cert.pem /etc/vaisala/
      radarsw/webapp-proxy/certificates/cert.pem.bkp
      ```

   b. Replace the certificate in the file with the new, signed certificate.

More Information

- Web Application (page 23)
- Certificates (page 89)

8.13 Backing-up System Configuration

IRIS Focus is backed up automatically using a daily configuration and database backup job that are run at 02:30 AM server time. On factory settings, the server uses UTC as the time zone.

Automatic Back-up

Backup is done by the cron job `/etc/cron.d/vaisala-radarsw-backup-cron` that launches the `/usr/vaisala/radarsw/backup/bin/do-backups` script.

The backup script stores the server configuration and application settings database. The created backup files are zipped and stored in the following directories:

- `/srv/vaisala/radarsw/backup/configuration`
- `/srv/vaisala/radarsw/backup/database`

Backups are kept for 180 days, after which they are deleted. Each backup file includes a timestamp in the format: `radarsw-configuration-2015-09-21 02-30-01.tar.gz`

8.13.1 Making a Manual Back-up

1. Log in as **root**.
2. Run: **/usr/vaisala/radarsw/backup/bin/do-backups**
3. Check that new files are created in the following directories:
   - */srv/vaisala/radarsw/backup/configuration/radarsw-configuration-<timestamp>.tar.gz*
   - */srv/vaisala/radarsw/backup/database/database-<timestamp>.gz*

8.14 Restoring from Backup

1. Login as **root**.
2. Stop the Monit service:

   ```
   service monit stop
   ```

3. Stop the IRIS Focus web application:

   ```
   service vaisala-radarsw-webapp stop
   ```

4. Take a backup of the current configuration:

   ```
   /usr/vaisala/radarsw/backup/bin/do-backups
   ```

5. Drop the current database with the rsw-db-tool utility:

```
rsw-db-tool drop-db
```

6. Recreate an empty database:

```
rsw-db-tool create-db
```

7. Switch to the database user account postgres:

```
su - postgres
```

8. Restore the database contents from a backup file by reading the file contents into the standard output stream and inserting them in the IRIS Focus database **wxdb2**:

```
gzip --decompress --to-stdout /srv/vaisala/radarsw/backup/database/
database-<timestamp>.gz | psql --set ON_ERROR_STOP=on --single-transaction
wxdb2
```

9. Exit the postgres user shell:

```
exit
```

10. Start the IRIS Focus web application and Monit service:

```
service vaisala-radarsw-webapp
start service monit start
```

8.15 Server Management Software

If you are running server management software on your IRIS Focus server, make sure the management software's settings do not interfere with your intended network settings.

For example, in Dell PowerEdge servers, the integrated Dell Remote Access Controller (iDrac) sets a default static IP address for the server when it is first deployed.

On Vaisala preconfigured IRIS Focus systems, iDrac is disabled by default.

8.16 Licensing on Server Restart

Active sessions and their licenses are not stored when the IRIS Focus server is shut down.

When the server restarts, the licensing seats are allocated from scratch to users who log in. The total number of seats in the license pool is unaffected.

More Information

- Licensing (page 11)

8.17 Licensing on Systems with Mirrored HDDs (RAID 1 or RAID 5)

IRIS Focus licenses are mapped, among other parameters, to hard disk IDs. Removing or replacing one hard disk in a RAID array can cause unexpected behavior. When doing so, renew your license. Contact your Vaisala customer representatives for further instructions.

More Information

- Licensing (page 11)

8.18 Reactivating the License After Server Upgrade

The product key in the IRIS Focus license is server-specific. If you upgrade your server, you must request a new service key and activate the new license.

1. Contact Vaisala and request a new server key.
2. Set-up your new server by performing the steps in the following sections:
   a. Installing CentOS (page 26).
   b. Installing IRIS Focus Components (page 38).
   c. Setting up Data Manager (page 42).
   d. Verifying IRIS Focus Installation (page 46).
3. Reactivate the license.
   Depending upon whether or not your server is connected to the internet, see:
   - Activating License – Online (page 47)
   - Activating License – Offline (page 49)

9. Security

9.1 Encryption

Communication between the browser and the web application is encrypted.

Other data traffic within the IRIS Focus application server is unencrypted.

IRIS Focus uses Jetty as web server software, and HAProxy for handling HTTPS encryption. SSL encryption has been disabled in HAProxy, and only TLS encryption is supported.

More Information

- Web Application (page 23)
- HAProxy (page 79)

9.2 Certificates

The web application comes with a temporary, self-signed SSL certificate that secures the connection between the IRIS Focus server and the user's web browser.

Although the browser displays a security warning in the browser when you try to access the web application, you can use the application normally even with the warning.

Consider acquiring and using a trusted certificate from a certificate authority (CA), especially if you plan to offer access to IRIS Focus outside your organization.

More Information

- Web Application (page 23)
- Installing a CA Certificate (page 85)

9.3 Security Settings

The IRIS Focus server has a pre-configured firewall.

Ports for SSH access (22), HTTP (80), and HTTPS (443) are intentionally open:

- Use SSH for configuration
- HTTP port is for redirecting to HTTPS
  The application is always used over HTTPS

The server requires access to HTTP and HTTPS for end users. If the system is accessed through the internet, you should restrict internet access to the SSH port from the internet to improve system security.

The firewall is configured through the CentOS firewall system. See https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Security_Guide/sec-Using_Firewalls.html.

More Information

- Installing IRIS Focus Components (page 38)

10. Troubleshooting

10.1 Data Manager Does Not Work as Expected

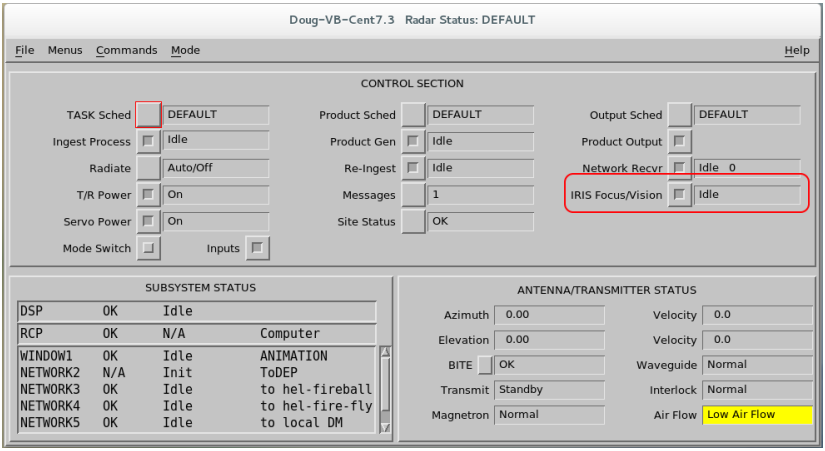
When running correctly, Data Manager and the socket server run continuously.

In some cases, IRIS Focus may be unable to request IRIS Analysis products from the IRIS Analysis machine through the socket server or IRIS Analysis may be unable to send **RAW** products to IRIS Focus. In such cases, try the following solutions.

1. Try shutting down the firewall on the socket server machine:

```
service firewall stop
```

2. Check the product configuration in IRIS Analysis and consider the following:
   - To generate correct centers in IRIS Focus for IRIS Analysis products, IRIS Analysis must create 1 product for each site on the IRIS Analysis server.
   - The IRIS socket server has a limit of 1000 products that can be received by IRIS Focus, so the socket server provides only the 1000 most recent products.
     For example, if IRIS Analysis creates a new product every 15 minutes, IRIS Focus visualizes only the last 10 days of data. (*4 products/hour * 24 hours * 10 days*).
   - **RAW** products are only needed for the IRIS Focus Data Manager
3. In the IRIS Analysis **Radar Status** menu, make sure **IRIS Focus/Vision** is toggled on. The toggle button turns on/off the socket server.



4. To check the delivery of **RAW** files, make sure Data Manager **radarinput** is setup correctly on the IRIS Focus server:
   a. On the IRIS Analysis machine, login as **root**.
   b. Type: **-- ssh radardminput@the-focus-machine-hostname.com date**
   c. Make sure the data and time are returned from the IRIS Focus machine without having to type a password.
   d. Check the security keys and permissions:
      - */var/lib/radardminput/.ssh/authorized_keys* must be correct
      - Permissions must be set to **chmod 644 ./authorized_keys**
5. Reboot the IRIS Analysis and/or the IRIS Focus servers.

More Information

- Setting up Data Manager (page 42)

10.2 Data Manager Housekeeping Not Working As Expected

Use the **rsw-data-manager-clear-data** script if the Data Manager data storage becomes corrupt or if there is a need to remove all data from Data Manager.

CAUTION! Running the script deletes all radar data from IRIS Focus, including Nowcasting configurations, pre-defined composite configurations, and RAW radar data.

See Running Data Manager Clear Data Script (page 83).

10.3 Lightning Layer Empty

If the lightning layer exists in your IRIS Focus application but you do not see any lightning strikes, verify the following requirements:

1. Check that lightning strikes have occurred at the time of observation
2. Check that the configuration file */etc/vaisala/radarsw/configuration/vsoweb-override.ini* contains the following line:

```
lightning.wms.url = [URL received from Vaisala]
```

3. Check that your subscription to Vaisala AviCast GLD360 service is active.

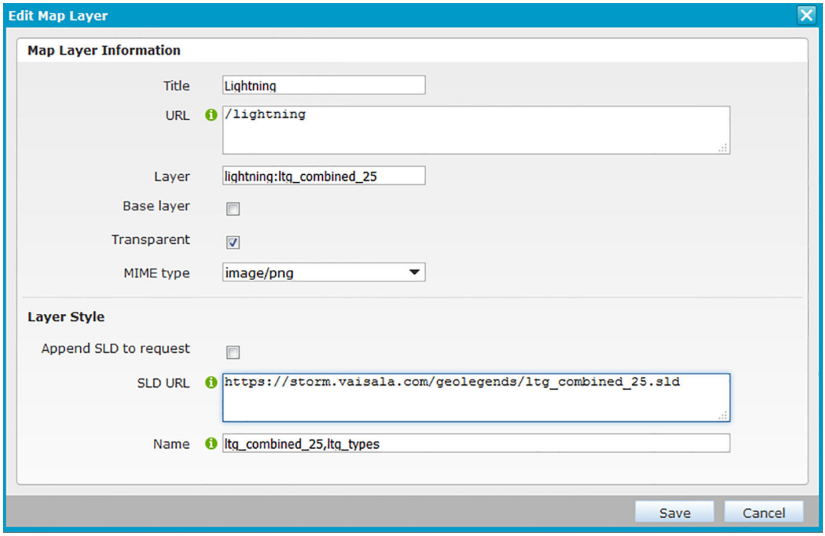
> If you modify the configuration file, you must restart the vaisala-radarsw-webapp service with the **`service vaisala-radarsw-webapp restart`** command.

10.4 Lightning Layer Missing

If you have subscribed to Vaisala AviCast GLD360 lightning detection service, and you do not see the lightning layer in the IRIS Focus user interface after running the **`rsw-lightning-configure`** script, add the lightning layer manually.

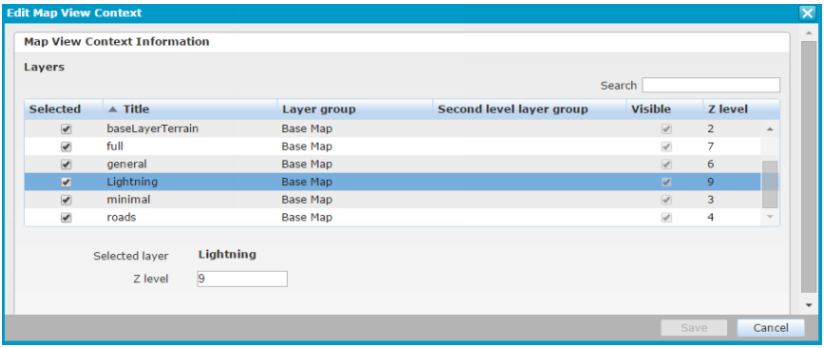
1. Log in to IRIS Focus with an administrator account and select **Admin**.
2. Select **Map > Map Layers**.
3. Select **Add New Layer**.

4. In **Map Layer Information**, enter the following values on the layer properties:



   a. **URL**: `/lightning`
   b. **Layer**: `lightning:ltg_combined_25`
   c. **Transparent**: Checkbox selected
   d. **SLD URL**: https://storm.vaisala.com/geolegends/ltg_combined_25.sld
   e. **Name**: `ltg_combined_25.ltg_type`
5. Select **Save**.
6. Select **Map > Map View Contexts**
7. Edit the default map context **TheMap**.

8. Select the newly created lightning layer and set its **Z level** higher than all base map layers in the map context.
   Z level defines the drawing order of the layers on the map. Higher values are always drawn on top.



In the web application, the new layer is listed at the bottom of the radar product selection list.

10.5 Nowcasting is Unavailable

If you cannot see nowcasting features on your display, it is likely because you either do not have a license or because nowcasting is disabled.

1. Check that you have a nowcasting license.
   a. You must have an IRIS Focus seat to use nowcasting. If you see the IRIS Vision display, wait until an IRIS Focus seat is available and try again.
   b. Login to IRIS Focus as an administrator.
   c. Select **Admin > Licensing Management**.
2. Check that MVF is configured for your site.
3. Login as **`root`**.
4. Go to */etc/vaisala/radarsw/configuration/vsoweb-override.ini*.

5. In the `[NOWCAST]` section of the `vsoweb-override.ini` file, check that MVF creation is enabled in IRIS Focus:

```
[NOWCAST]
nowcast.mvf.run = true
```

By default, MVF generation is enabled (`true`).

6. Restart the `vaisala-radarsw-webapp` service by typing:

```
service vaisala-radarsw-webapp restart
```

7. Start the nowcast server by typing:

```
service vaisala-radarsw-nowcast-server start
```

   a. To verify that the server starts, type:

```
systemctl status vaisala-radarsw-nowcast-server.service
```

   b. Check for the status:

```
Active: active (running)
```

More Information

- Configuring MVF (page 55)
- Licensing (page 11)

10.6 Taking a Snapshot Gives Server Error

If, when taking a snapshot or requesting an image via URL, the server times out or gives server error, there may be a problem with the `image-export` user account.

1. Check that the application log shows the error:

```
Login failed for username image-export
```

2. Login as **`admin`**.

3. Check that the `image-export` user password matches the password listed in *`vsoweb-override.ini`*.

10.7 Online Help Does Not Display Correctly in Internet Explorer

If you run the software in Internet Explorer with the compatibility view enabled, the online help may not display correctly.

To fix the problem, turn off the **Display intranet sites in Compatibility view** setting.

1. To display the Internet Explorer menu, press **ALT**.
2. Select **Tools > Compatibility View settings**.
3. Unselect **Display intranet sites in Compatibility view**.
4. You may need manage the list under **Websites you've added to Compatibility View**:
   a. Highlight the website address you want to remove.
   b. Select **Remove**.

10.8 Uninstalling IRIS Focus

Use this procedure to recover from a failed installation that is stuck in a state where it cannot be resumed.

CAUTION! The `rsw-uninstaller` script completely removes IRIS Focus, including all data and configurations.

CAUTION! The `rsw-uninstaller` script removes `Postgres` and all databases.
If you share the system with other software that uses `PostgreSQL`, do not run the script -- it also removes `PostgreSQL` databases not related to IRIS Focus.

1. Navigate to the directory containing the IRIS Focus installation files.
2. Run: **`./rsw-uninstaller`**
   When prompted, confirm that you want to run the script.
   The script removes all users, configurations, and data from the system so that you can rerun the installation.

More Information

- Installing IRIS Focus Components (page 38)

Appendix A. File Locations

Table 10 IRIS Focus Application and Configuration Files

File or Directory	Description
/etc/vaisala/radarsw/configuration • *gis-override.ini* GeoServer database settings. • *logback.xml* Logging level settings. • *radar_centers.properties* List of stored radar site center points.	Configuration files for IRIS Focus module settings. The files listed here are the most important. **CAUTION!** Some settings have a default config file and an override file. For example: • *gis-config.ini* • *gis-override.ini* When needed, edit the override file.
/etc/vaisala/radarsw/configuration/vsoweb-override.ini	Connection settings for socket server, lightning layers, nowcasting and so on.
/etc/vaisala/radarsw/nowcast/nowcast.ini	Configuration files for the nowcast server.
/usr/vaisala/radarsw/configuration	Configuration files for helper applications used in IRIS Focus maintenance.
/var/lib/radarweb	Home directory of the **radarweb** user. The IRIS Focus Web Application is deployed here.
/var/lib/radardm	Home directory of the **radardm** user.
/var/lib/radardminput	Home directory of the **radardminput** user.
/srv/vaisala/radarsw/datamanager/input	Files sent from an IRIS Analysis machine are copied here. The data manager input service processes files copied here.
/srv/vaisala/radarsw/datamanager/storage	This is where data manager stores polar or **RAW** data.
/var/lib/warnreader	Configuration files for events and alerts.
/var/log/vaisala/radarsw	Log files from IRIS Focus web application

Appendix B. Map Layer Configuration Options

Table 11 Map Layer Configuration Options

Option	Description	WMS Layer Only
Map Layer Information	Defines basic map settings such as the title and the URL address of the Web Map Service (WMS).	--
Title	Title of the layer. Visible in the Layer Selector	--
Type	• `wms`: generic GIS services such as base maps or raster-type forecast data • `google`: Google base maps. • `marker`: observations from stations configured using the JX source service on the map.	--
URL	Address of the WMS service.	✔
Layer	Name of the layer in the map server. If using GeoServer, usually `workspace:layer`.	--
Base layer	Select if the layer is a base map.	--
Transparent	Select for WMS to request a transparent background for the layer.	✔
Request as Tiles	Use if the map layer should be requested as tiles. Usually selected for base maps.	✔
MIME type	Map image type. Change if the service does not support the default *`image/png`*.	✔
Default opacity	Not used in IRIS Focus.	--
Layer query settings		--
Supported Coordinate Reference Systems	Select supported coordinate reference systems for the layer.	--
Time Support	Configure for layers using time dimensions.	✔
Coverage	Maximum bounding box for the layer.	✔
Layer style	For advanced configurations, add SLD (Styled Layer Descriptor) parameters.	--

More Information

- Working with Map Layers (page 76)

Appendix C. Nowcasting Configuration Files

C.1. nowcast.ini

The following example shows the *nowcast.ini* configuration file for configuring the nowcasting HTTP server.

```
; Algorithm to use.
correlator=trec
```

TREC

```
[trec]
; Number of decimals to keep in data when converting to integers.
; Range:  [0 ; 3]. Default: 2.
input_precision=2
```

```
; The value in image that declares a missing/invalid value.
; Default: -999.0.
missing_value=-999.0
```

```
; The value in image that declares a not-scanned pixel, outside the aperture
area.
; Default: -900.0.
not_scanned_value=-900.0
```

```
; Minimum measurement aperture coverage (%) in correlation region.
; Range:  [0.0 ; 1.0]. Default: 0.60.
aperture_coverage_threshold=0.60
```

```
; Minimum signal value for the pixel to be 'active' and used.
; Default: 10.0.
signal_threshold=10.0
```

```
; Feature box size.
; Range:  > 0 Default: 14
field_feature_box_width=14
```

```
; Amount of skip when calculating field values.
; Range:  > 0.  Default: 1 (no skip).
field_feature_box_spacing=1
```

```
; Minimum fraction (%) of active pixels in feature box needed to trigger
correlation analysis.
; Range:  [0.0 ; 1.0] Default: 0.10
field_signal_coverage_threshold=0.10
```

```
; Minimum allowable cross-correlation coefficient.
; Range:  [0.0 ; 1.0] Default: 0.55
correlation_threshold=0.55
```

```
; Maximum storm movement between images, search region radius.
; Range:  > 0  Default: 15
speed_limit=15
```

```
; Spatial smoothing factor, exp(-d/decay). Used for spreading effect
; of local motion vector to its surroundings.
; Range:  >= 0 (0 == no spatial smoothing) Default: 6
field_spatial_decay=6
```

```
; Spatial filtering flag. Whether to discard points that differ from global
average.
; Range:  0 == NO; 1 == GLOBAL; 2 == LOCAL . Default: 1(GLOBAL)
field_use_spatial_filtering=1
```

```
; Feature box size for local spatial thresholding (applied only when using
local spatial thresholding).
; Range:  > 0   Default: 9
field_spatial_filtering_box_width=9
```

```
; Maximum allowed direction difference from mean motion (applied only when
using spatial filtering).
; Range: [0 ; 180]  Default: 90
field_spatial_direction_threshold=90
```

```
; Maximum allowed speed (mgt*mean_motion) above mean motion (applied only when
using global spatial filtering).
; Range:  >= 1.0  Default: 3.0
field_spatial_magnitude_threshold=3.0
```

```
; Global vector weight applied to local values.
; Range:  [0.0 ; 1.0] (0.0 = no global weighting). Default: 0.25
field_global_weight=0.25
```

```
; Method for temporal smoothing.
; Range: 0 == NO_TEMPORAL_SMOOTHING; 1 == HISTORY_WEIGHTING; 2 ==
CHANGE_WEIGHTING.
; Default: 1(HISTORY_WEIGHTING)
temporal_smoothing_method=1
```

```
; History weight factor (applied when temporal smoothing is made by using
HISTORY_WEIGHTING).
; Range:  ]0.0 ; 1.0]  Default: 0.25
temporal_smoothing_history_weight=0.25
```

```
; Change weight factor (applied when temporal smoothing is made by using
CHANGE_WEIGHTING).
; Range:  ]0.0 ; 1.0] Default: 0.33
temporal_smoothing_change_weight=0.33
```

More Information

- Configuring Nowcasting (page 55)

C.2. vsoweb-override.ini

The *vsoweb-override.ini* configuration file contains setting for managing the **MVF** (motion vector field) product and advection used in nowcasting.

Vaisala has carefully chosen good defaults for the nowcasting configuration. The raster product, such as **PPI**, **CAPPI**, of any intensity moments like Z, R, KDP, or **rhoHV** that is used as an input for MVF generation should have:

- As little as possible of ground clutter and the near-radar clear air or particulates (such as dust) returns.
- The bounding box not smaller than any other raster product produced from this site's data.

Because the two conditions are contradictory, the easiest way to satisfy first condition is to use a true (not pseudo) **CAPPI** product with a height of 1.5 ... 2km , but the longest range (biggest bounding box) product is a raster product generated from the survey scans, which usually consist of just one **PPI** scan and cannot be used to generate true **CAPPI** products. You must balance these two conditions.

If there are not enough valid products to generate an MVF request, the iteration is skipped and the system waits for the next product to arrive from IRIS.

Basic Settings

nowcast.mvf.run defines if MVF generation is enabled in IRIS Focus. By default, MVF generation is enabled (**true**).

```
[NOWCAST]
nowcast.mvf.run = true
```

The nowcast server URL dentifies where the nowcast HTTP server runs. The default value is for a fully local installation, which is the default installation configuration.

```
nowcast.http.server.url = http://localhost:34480/api/v1/mvf/
```

The *netCDF* directory stores MVF generation requests and responses to the Nowcast HTTP Server in netCDF format as well as internal representations of MVF serialized to disk. This directory is cleaned periodically by default.

```
nowcast.netcdf.dir = /srv/vaisala/radarsw/product/nowcast/
```

Advanced Settings

nowcast.mvf.request.num.rasters defines the number of products sent to the nowcast server for generating the MVF. Default is 2.

```
nowcast.mvf.request.num.rasters = 2
```

nowcast.mvf.product.age.limit.minutes defines the maximum number of minutes (5 ... 1000) the system goes back in time to find valid products (of the type used to define MVF generation for a site) to use in generating the MVF. Default is 100.

```
nowcast.mvf.product.age.limit.minutes = 100
```

nowcast.mvf.max.gap.minutes defines the maximum acceptable gap in minutes (1 ... 1000) between products for MVF generation. Default is 30.

MVF is a shift in pixels per time interval between frames of the product which was used to generate MVF. The interval between advected products may be different from the interval between advected frames. For example, if MVF was generated from the product which was available every 5 minutes but the interval between advected frames has to be 10 minutes, the MVF shift should be doubled. That MVF scaling is taken into account by a scaling shift in every iteration.

```
nowcast.mvf.max.gap.minutes = 30
```

nowcast.product.times.age.limit.minutes defines the time range for calculating advected product times (2 ... 2880 mininutes. 2880 is the entire two-day range). Default is 100

Advected product times must be evenly spaced (due to the calculation). The time is derived by dividing the last number of minutes defined in this property by **n** products found in that period.

The spacing is used as the time gap between advected products. In most cases, set this value to match the value in **nowcast.mvf.product.age.limit.minutes**.

```
nowcast.product.times.age.limit.minutes = 100
```

`nowcast.advection.mvf.age.limit.minutes` is the maximum number of minutes to go back in time to find an MVF when generating advected products. If an MVF is not found in the time span given, the iteration is skipped and Focus waits for the next product to arrive from IRIS. Range: 5 ... 1000 minutes. Default is 30.

```
nowcast.advection.mvf.age.limit.minutes=30
```

`nowcast.advection.time.span.minutes` defines the time limit when extending nowcasted products into the future (minutes). The normal range is 1 ... 3 hours. Default is 120.

You can raise the time span to up to 6 hours but this is not recommended as accuracy decreases as time extends into the future.

```
nowcast.advection.time.span.minutes=120
```

More Information

- Configuring MVF (page 55)

Glossary

advection
The transfer of a property of the atmosphere, such as heat, cold, or humidity, by the horizontal movement of an air mass. Advection calculations are used to perform some of the nowcasting calculations.

alarm
An alarm is an alert of highest severity.

alert
Alert is a state that requires user intervention or recognition. Different types of alerts include alarms, warning, and informational alerts.

area of interest
An area of interest is a geographical area that is monitored for certain weather events. If the system detects a weather event in an area of interest, it generates an alert.

bin
A single sample of weather data detected at a known direction, altitude, and distance from the radar site. The radial size of a bin depends on decreases with distance, so bins further from the radar site cover a larger area than nearby bins.

composite
Composites combine data (for example, a group of **CAPPI**, **VIL**, **PPI**, or **TOPS** products) from many radars in one image.

data manager
The raw volume data from the radar signal processor is stored in the data manager, which makes the data available to the IRIS Focus user interface. Through the data manager, IRIS Focus can read raw volume data and generate on-demand radar products in real-time.

dynamic composite
A radar composite of on-demand products created by selecting multiple radar sites on the fly. The combining criteria are based on standardized settings.

event
Event is a record of a momentary change of state or an occurrence produced by a source or some other entity. An event can indicate an error or a warning or can be just for information.

hydrometeor
A particle of condensed water vapor in the atmosphere. Rain, snow, and hail are examples of hydrometeors.

Max Time Span
Max Time Span is the maximum time (minutes) allowed between the newest and oldest points of data. When new data is processed, points that are older than the specified time span are removed. Used in, for example, composites of radar data.

MSL
Mean sea level. An average level for the surface of the sea or ocean.

NDOP product
Dual-Doppler velocity product. Combines the velocity measurements from 2 or more radars to get the wind direction and speed.

nowcasting
Weather forecasting up to the next 2 hours.

NWP
Numerical weather prediction

on-demand product
On-demand products are based on raw data from the IRIS back-end. IRIS Focus reads raw volume data and generate radar products in real-time. Users can manipulate product criteria in the user interface in real time.

pin
Pins on a map indicate points of interest with reference points and labels.

place of interest
A location on the map that is either a single point (pin) or a larger area. See area of interest (page 105) and pin (page 106).

pre-configured products
Pre-configured products are products with default settings used for advanced data visualization such as nowcasting, warnings, or multilayer products.

pre-defined composite
A pre-defined radar composite with customized settings such as the combining algorithm.

PRF
Pulse Repetition Frequency measured in Hz (pulses per second). When measuring PRF, a *pulse* contains transmit, receive, and dead time phases. PRF affects *range folding* and *velocity folding* detection. Normal PRF values for Doppler radars are up to 1000 Hz. Vaisala radars generally operate around 400-700 Hz. In Vaisala IRIS products, PRF limits the area displayed in radar images and the maximum measurable wind speed.

product
Radar products are raw signal data from a radar receiver processed to provide information about current weather conditions. Radar products are calculated from ingest files that are collected during the execution of radar tasks. Products may be data, pictures, or text. For example, **PPI** and **RHI**.

pulse
A short burst transmission signal sent by the radar, used to measure the weather activity in atmosphere. The reflection measurements from a pulse are sorted into bins.

radar product
See product (page 106).

range folding
Radar signal echoes from outside the radar maximum range that are incorrectly displayed within the radar measurement area. Also called range aliasing.

RAW product
Spherical coordinate data product obtained directly from the raw ingest data. The data are stored in compressed format so they can be recorded on tape or sent to a workstation for further processing.

ray
A group of pulses processed together according to configuration rules. See also pulse (page 106).

signal processor
A programmable device for digitizing and processing video signals from the radar receiver.

sweep
A collection of pulses at a constant elevation as the radar rotates around its axis 360°. After a sweep, the radar usually changes its elevation and starts a new sweep. Each sweep typically contains the same number of bins independent of the elevation.

task
A set of instructions to the radar and signal processing systems including, but not limited to, the scan type (PPI or RHI), PRF, pulse width, signal processing data types, time and range averaging criteria. For example, a PPI volume scan at multiple elevation angles or an RHI at a single azimuth. Also called radar task.

velocity folding
Erroneous readings due to particles in the measurement area exceeding the maximum velocity detection threshold of the radar system. The measured velocity "wraps around" to the other end of the scale, resulting in discontinuous readings. Also called velocity aliasing.

volume
Complete set of raw measurement data collected from sweeps, that is used to calculate a model of the atmosphere. The maximum volume is half of a sphere (from 0° elevation upwards), but other shapes are more typical.

warning
A warning is an alert of medium severity.

Index

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.
Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Technical Support

Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information:

- Product name, model, and serial number
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see www.vaisala.com/support.

Recycling

Recycle all applicable material.

Follow the statutory regulations for disposing of the product and packaging.

VAISALA

www.vaisala.com