Reference Number: S2E-19-0146_5

Setup Manual for GR-server

Model Name Dual Polarization Weather Radar

Type WR2120/WR110

Instruction Number

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Prepared by	System Solutions Business Unit	
Approved by	Reviewed by	Person in charge
		

Furuno Electric Co., Ltd.

INDEX

HISTORY OF MODIFICATIONS

Rev. No.	Contents of revision				
	When? dd/mm/yyyy	Where? Section No. and page	What? What you modified?	Why? Why you modified?	Who? Who modified?
1	24/09/2019		New version.		T.Takaki
2	11/11/2019		Modification for CentOS 8.		T.Takaki
3	20/01/2020	Section 7, page 18	Configure the dynamic private port.	To fix the FTP error in DPU	T.Takaki
4	20/02/2020	Page 5, 14, 18-19	CentOS is updated to 8.1. FTP is changed to passive mode.	To fix the FTP error in DPU completely	T.Takaki
4	11/03/2020	Page 24	6. References Added URLs for reference.		T.Takaki
4	31/03/2020	Page 13-14	2.4.Setup the file manager (4) To configure automatic startup of the file manager	It would be very beneficial in case of power-off issues and any other unplanned restarts.	T.Takaki
5	11/10/2022	Section 2.5	Recommended settings /etc/hosts	It's recommendable as FTP server.	T.Takaki
5	11/10/2022	Section 4.2	Recommended settings (1) The number of sweep decimation (2) Invalidity MP Noise data	To append descriptions for frequently asked questions	T.Takaki
5	11/10/2022	Section 4.3	Trouble shooting FTP transfer - passive mode rejected	To fix the FTP error in DPU	T.Takaki

1 Outline

This document describes the procedure to setup a server for GR2Analyst.

The following configuration is recommendable for GR-server.

Server Machine: DELL PowerEdge T30 Mini Tower Server

https://www.dell.com/en-us/work/shop/povw/poweredge-t30

Main memory should be 8 GB or more.

OS: **Cent OS 8** (Linux)

One example of network configuration is described in Fig 1-1.

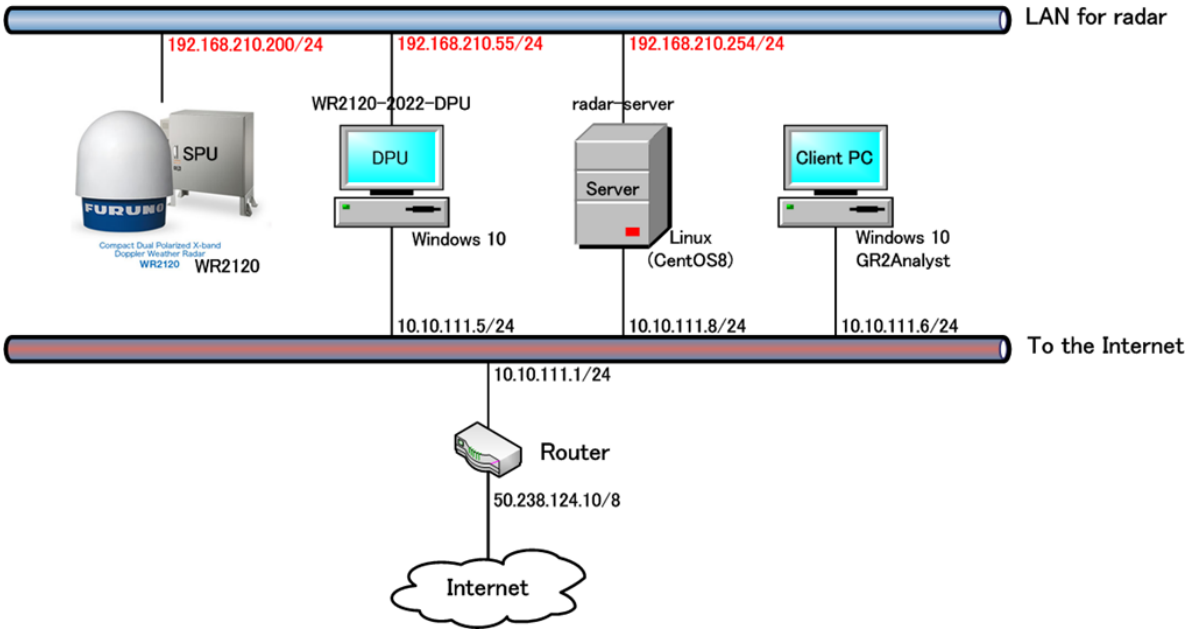


Fig 1-1 One example of network configuration of WR2120.

2 Setup server

2.1 Install Linux

The following version is recommended.

CentOS Linux release 8.1.1911 (Core)

I strongly recommend that you keep using this stable version. The automatic update of OS might lead to unforeseeable errors.

When installing, select the **developer's** option including desktop GUI.

The approximate radar data estimated storage size is as follows.

NEXRAD level 2 converted file and unzipped file per one radar system:

- 1.1 GB / 1 hour
- 27 GB / 1 day
- 820 GB / 1 month

Recommended hard drive size, 4TB or larger

CentOS8 Installation Settings

Basic Environment

- Server with GUI

Add-Ons for Selected Environment

- Development Tools

Create "root" and "User" account, see examples below. One example of account information is described below.

For a general user. **Note**: Input user name, it will be created on system reboot.

User : radar (use this name)

Password : radar1234 (create unique password)

For an administrator

User : root (use this name)

Password : !rms_2019_NAME (create unique password)

Notes:

License Agreement must be accepted (check box) before "Finish Configuration" available.

The "root" login is hidden for security, click "Not listed?" to access "root" login.

2.2 Setup FTP server

This section describes the procedures to setup FTP server, vsftpd.

Ensure server is connected to the Internet before starting the following procedures.

Use Linux "**Terminal**" program for the following procedures. Click "Activities" and box with ">_"

Note: character **"#"** denotes "root" login, character **"$"** denotes normal "user" login

(1) Installation

Login as "root" user and type the following command.

```
# yum install vsftpd ftp -y
```

(2) Configuration (Edit file using file manager or use terminal program command below to modify)

Login as "root" user and type the command below to edit the configuration file, /etc/vsftpd/vsftpd.conf.

```
# vi /etc/vsftpd/vsftpd.conf
```

The following items should be modified. In some cases, delete the # on top or left of each comment line to activate. Note: "#" symbol disables text line(s).

```
anonymous_enable=NO
ascii_upload_enable=YES
ascii_download_enable=YES
ftpd_banner=Welcome to FTP service.
use_localtime=YES
```

(3) To enable the service and restart the FTP server

Login as "root" user and type the following command using Terminal program.

```
# systemctl enable vsftpd
# systemctl start vsftpd
```

(4) Enable "passive mode (Edit file using file manager or use terminal program command below to modify)

Edit the configuration file, /etc/vsftpd/vsftpd.conf to enable "passive mode".

```
# vi /etc/vsftpd/vsftpd.conf
```

The following items should be modified or appended.

```
listen=YES
listen_ipv6=NO
pasv_enable=YES
pasv_address=[fixed IP address of this PC]
pasv_min_port=60001
pasv_max_port=60010
```

(5) Port settings for passive mode

Login as “root” user and type the following command to reserve ports, 60001-60010. (Note: spaces and double dashes are required as shown in command text)

```
# firewall-cmd --zone=public --add-port=60001-60010/tcp --permanent
# firewall-cmd --reload
```

(6) The chroot settings (Edit file using file manager or use terminal program command below to modify)

(a) Edit the configuration file, /etc/vsftpd/vsftpd.conf so that chroot is configured.

```
# vi /etc/vsftpd/vsftpd.conf
```

The following items should be modified or appended.

```
# enable chroot for local users
chroot_local_user=YES
chroot_list_enable=YES
chroot_list_file=/etc/vsftpd/chroot_list
# define a local root
local_root=/home/radar/DATA/Input
allow_writeable_chroot=YES
```

(b) IMPORTANT: **Create an empty file, /etc/vsftpd/chroot_list. .** Use Terminal program and type command below.

```
# touch /etc/vsftpd/chroot_list
```

(7) Configure the firewall

Login in as “root” user and type the following command so that port-no 21 is allowed.

```
# firewall-cmd --permanent --add-port=21/tcp
# firewall-cmd --reload
```

(8) Restart the vsftpd

Login as “root” user and type the following command.

```
# systemctl restart vsftpd.service
```

2.3 Setup Web server

This section describes the procedures to setup httpd, Apache.

Make sure that the server is connected to the Internet before starting the following procedures.

Use Linux "**Terminal**" program for the following procedures. Click "Activities" and box with ">_"

Note: character **"#"** denotes "root" login, character **"$"** denotes normal "user" login

(1) Installation

Login as "root" user and type the following command.

```
# yum install -y httpd
# systemctl enable httpd
# systemctl restart httpd
```

(2) Configure firewall and permission

Login as "root" user and type the following command so that port for http service is opened.

```
# firewall-cmd --add-service=http --permanent
# firewall-cmd --reload
```

(3) To enable the access to the user directory

Login as "root" user and type the following command so that user directory ~/public_html is accessible.

```
# setsebool -P httpd_read_user_content on
```

Edit the configuration file, **/etc/httpd/conf.d/userdir.conf** using file manager or terminal program command below to modify so that the user directory is accessible.

```
# vi /etc/httpd/conf.d/userdir.conf
```

Before modification:

```
UserDir disabled
#UserDir public_html
```

After modification: Note location of "#" symbol

```
#UserDir disabled
UserDir public_html
```

(4) Configure the home directory permission

Login as “root” user and type the following command. Correct if “radar” was previously set as normal user.

```
# chmod 711 /home/$[username]
```

Example: # chmod 711 /home/**radar**

(5) Configure the user directory for html

Login as, 'radar' user. Type the following command as 'radar' user so that permission is changed.

```
$ mkdir /home/radar/public_html
$ chmod 755 /home/radar/public_html
```

Note that both owner and group of directory 'public_html' should be 'radar'.

(6) Configure the SELinux setting

Login as “root” and type the following command so that httpd_enable_homedirs (Boolean) is enabled by SELinux.

```
# setsebool -P httpd_enable_homedirs 1
```

To make sure that the setting is correct, type the command shown below.

```
# getsebool -a | grep http
```

(7) Change the DocumentRoot

Edit the configuration file, **/etc/httpd/conf/httpd.conf** so that DocumentRoot is changed to user's directory.

vi /etc/httpd/conf/httpd.conf

Before modifications:

```
# User/Group: The name (or #number) of the user/group to run httpd as.
User apache
Group apache
# ServerName gives the name and port that the server uses to identify itself.
ServerName www.example.com:80
# DocumentRoot: The directory out of which you will serve your documents.
DocumentRoot "/var/www/html"
# Relax access to content within /var/www.
<Directory "/var/www">
    AllowOverride None
    # Allow open access:
    Require all granted
# Further relax access to the default document root:
<Directory "/var/www/html">
   Options Indexes FollowSymLinks
```

After modifications: Note: ServerName will be different, assigned by server/network administrator

```
# User/Group: The name (or #number) of the user/group to run httpd as.
User radar
Group radar
# ServerName gives the name and port that the server uses to identify itself.
ServerName 50.238.124.10:80
# DocumentRoot: The directory out of which you will serve your documents.
DocumentRoot "/home/radar/public_html"
# Relax access to content within /var/www.
<Directory "/home/radar">
    AllowOverride None
    # Allow open access:
    Require all granted
```

```
# Further relax access to the default document root:
<Directory "/home/radar/public_html">
    Options FollowSymLinks
```

(8) Restart httpd

Login as “root” user and type the following command.

```
# systemctl restart httpd
```

2.4 Setup the file manager

This section describes the procedures to setup the file manager.

(1) Installation

The installer file NEXRAD.tar.gz is send to you via uploader PrimeDrive or email.

Put the file in the home directory, /home/radar. And type the following command by 'radar' so that all the shell scripts and directories are extracted.

```
$ cd
$ gzip -d NEXRAD.tar.gz
$ tar oxvf NEXRAD.tar
```

(2) The definition of ICAO is as follows.

```
ICAO radar identifier
   FUSA      # FUSA Denton Office, MD
   XUNT      # University of North Texas (XUNT), CASA, TX
   FECI      # Furuno INT Center, Nishinomiya, Japan
```

(3) The directory tree is as follows.

```
-Shell script
${HOME}/
   NEXRAD_shell/
      FM_GR.sh      // The shell script for file management

- Input
${HOME}/
   DATA/
      Input/
        FUSA/
           *.msg31.gz     // Moved to the output directory
        XUNT/
        FECI/

-Output
${HOME}/
   public_html/
      Output/
         grlevel2.cfg   // The list of ICAO Radar Identifier
         FUSA/
```

```
    dir.list      // The list of size end name of all the files in this directory
    *.msg31
  XUNT/
  FECI/
```

(4) To configure automatic startup of the file manager

Automatic startup would be very beneficial in case of power-off issues and any other unplanned restarts.

(a) A new service, FM_GR.service

Create a new Unit-file, FM_GR.service in /etc/systemd/system, as indicated below.

```
# cd /etc/systemd/system
# cat FM_GR.service
```

```
[Unit]
Description = Daemon for Gibson-Ridge application

[Service]
ExecStart = /usr/bin/bash /home/radar/NEXRAD_shell/FM_GR.sh
Restart = always
Type = simple
User = radar

[Install]
WantedBy = multi-user.target
```

(b) Launch FM_GR.service

Reload the Unit-file indicated above.

```
# cd /etc/systemd/system
# systemctl reload FM_GR
```

Enable the FM_GR.service.

```
# systemctl enable FM_GR
```

Make sure that the setting is correct.

```
# systemctl list-unit-files -t service | grep FM_GR
```

```
FM_GR.service    enabled
```

Launch FM_GR.service.

```
# systemctl start FM_GR
```

Check the logs, **but the service would be denied at this point**.

That's why configuration of SElinux is needed as described below.

```
# systemctl status FM_GR
```

(c) Configure SELinux

Configure SELinux so that execution of the service is allowed.

```
# ausearch -c '(FM_GR.sh)' --raw | audit2allow -M my-FM_GR
# semodule -i my-FM_GR.pp
```

Make sure that the setting is correct.

```
# semodule -lfull | grep FM_GR
```

```
400     my-FM_GR        pp
```

(d) Restart FM_GR.service

```
# systemctl restart FM_GR
```

Check the logs and make sure the service is **active (running)**.

```
# systemctl status FM_GR
```

(e) Reboot the server

After rebooting the server, make sure the service is **active (running)**.

```
# systemctl status FM_GR
```

2.5 Recommended settings

(1) /etc/hosts

The hostnames of FURUNO devices should be appended to /etc/hosts of the server.

ex) /etc/hosts for WR2120 network

```
127.0.0.1     localhost localhost.localdomain localhost4
localhost4.localdomain4
::1           localhost localhost.localdomain localhost6
localhost6.localdomain6

#
# Records for WR2120, appended by FURUNO on 30 Aug 2022.
#

192.168.210.200  spu_1
192.168.210.55   dpu_1
192.168.210.254  radar-server_1
10.10.111.5      dpu_2
10.10.111.8      radar-server_2
```

3 Connection to the server

This section describes a connection test from a client PC to the server.

(1) To make sure FTP connection from a client PC

- Make sure that a client PC can connect to the FTP server by using the FTP client application such as FileZilla (Fig 3-1).
- From a security point of view, a passive FTP connection from a client PC is recommendable.

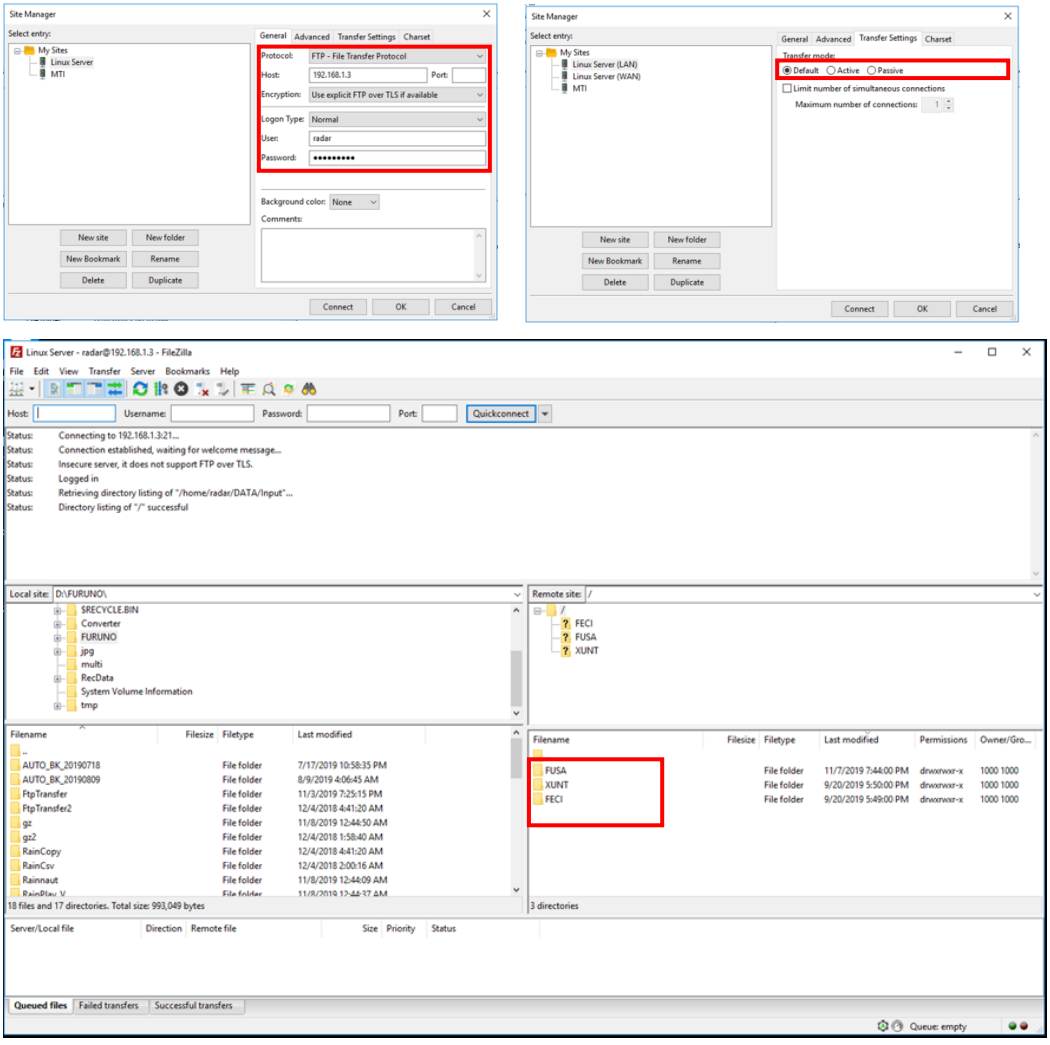


Fig 3-1 One example of connection from DPU to the server via FileZilla.

(2) To ensure HTTP connection from a client PC

Type the following URL in the client PC web browser to ensure the server is accessible from the client PC (Fig 3-2).

http://${server URL}/Output

Example: http://50.238.124.10/Output

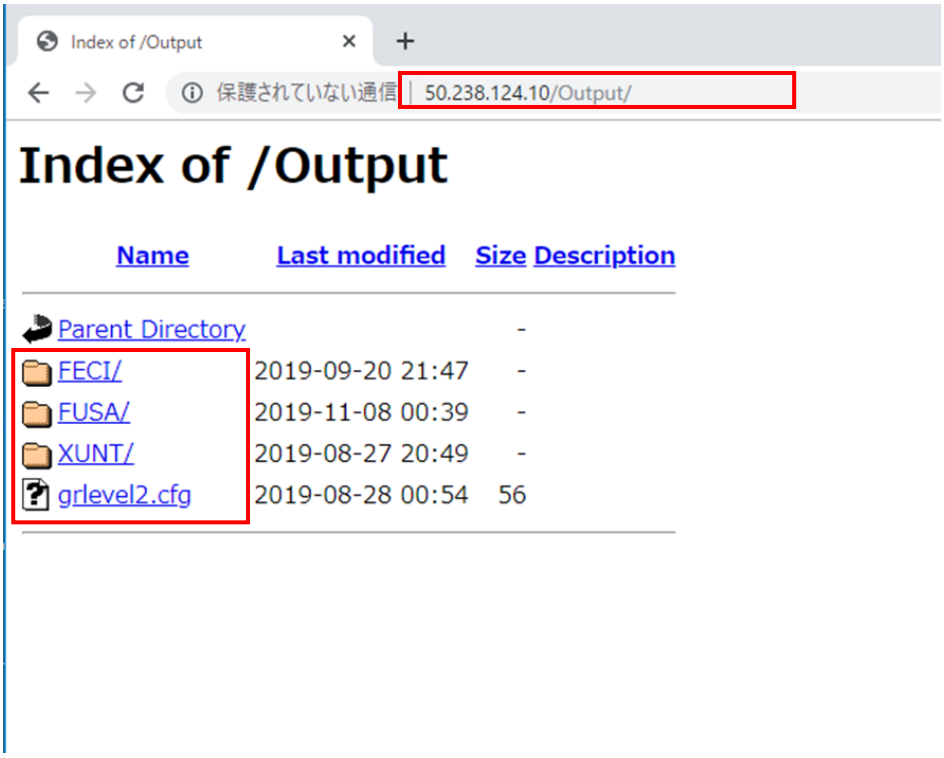


Fig 3-2 One example of connection from a client PC to the server via Google Chrome.

4 Setup DPU

4.1 Launch the data converter on DPU

This section describes how to launch the data converter on DPU of WR2120.

Please refer to chapter 5.2.4 Data Converter in Operator's Manual for WR2120.

(1) C:¥Users¥radar¥Furuno¥WR_transfer¥INIT.BAT (partial)

To enable the data converter, modify as shown below.

```
・・・
@REM     Set Enable(1) / Disable(0)    of Data Conversion
SET CNV_SW=1
・・・
```

(2) C:¥Users¥radar¥Furuno¥WR_transfer¥AUTO_CONVERTER_FTP.BAT (partial)

To enable the file transfer, modify as shown below.

```
・・・
@REM ****************************************************************
@REM    FTP settings
@REM ****************************************************************
SET FTPTRANSFER=%APLDIR%¥WR_Transfer¥bin
SET FTPOUT=/FUSA
SET FTPINI=%FTPTRANSFER%¥FTP_Converter.INI

@rem Is FTP enabled ? (true/false)
SET ENABLE_FTP=true

@rem Are data files deleted after FTP ? (true/false)
SET FTP_DEL=true
・・・
```

(3) C:¥Users¥radar¥Furuno¥SCN2NEXRAD_Converter¥config.txt (partial)

Define the ICAO Radar Identifier of the radar site.

```
・・・
% Abbreviated name based on ICAO radar
% (ICAO: International Civil Aviation Organization)
ICAO='FUSA';
```

(4) C:¥Users¥radar¥Furuno¥WR_transfer¥bin¥FTP_Converter.INI

To customize the file transfer configuration, modify as shown below.

From a security point of view, a passive FTP connection from a client PC is recommended.

```
[FTP]
FTPSERVER=192.168.1.3
USER=radar
PASSWORD=radar2871
PASSIVEMODE=1
CONNECT_TIMEOUT=30
TRANS_TIMEOUT=60
LOGDIR=D:¥Converter¥Output
ERRDIR= D:¥Converter¥Output
```

4.2 Recommended settings

The following settings are recommended so as to utilize the data converter for NEXRAD level 2.

(1) The number of sweep decimation

See the following section in OME of WR2120.

2.4. Advanced Setting

2.4.1. Setting

Scan > Sweep decimation mode: Auto -> Manual

Scan > Sweep decimation value: X

The number of sweep decimation should be changed from Auto to Manual=X.

X should be decided so that the number of azimuths is less than 1200 and the resolution of azimuth is bigger than 0.3 deg.

*** How to calculate the number of sweep decimation

Sweeps are made at intervals equal to the PRF divided by the number of sweep decimations.

For example, if the PRF is 1500 Hz, the sweep decimation is 62, and it takes 30 seconds for one round of the antenna. Then the number of sweeps is approximately 725.

1500 Hz x 30 s / 62 = 725.8

Note that since WR2120 is Dual-PRF, the average PRF of the two PRFs must be used in the calculation.

(2) Invalidity MP Noise data

See the following section in OME of WR2120.

2.4.2. Advanced Setting

12) Signal processing

Invalidity MP Noise data: OFF -> ON

4.3 Trouble shooting

(1) FTP transfer - passive mode rejected

Very occasionally the FTP transfer with passive mode might be rejected due to a certain firewall configuration. In that case, take the following measure to avoid the issue. This case actually applied to WR2120 in FUSA, Denton.

Note that this measure is not usually recommendable, so to speak plan-B.

(a) Turn off the passive mode

FTP transfer PassiveMode: ON ->OFF

C:¥Users¥radar¥Furuno¥WR_transfer¥bin¥

[FTP_Converter.INI]

Before) PassiveMode=1

After) PassiveMode=0

(b) The dynamic private port

The dynamic private port of DPU (Windows) should be the same as that of the Server (Linux).

DPU/Windows: 49152 - 65535 should be changed to 49152 - 60999

Server/Linux: 32768 - 60999

In order to change the private port of DPU to 49152 - 60999, **run the following command as administrator.**

> netsh int ipv4 set dynamicport tcp start=49152 num=11848

To make sure if the setting is valid, run the following command.

> netsh int ipv4 show dynamicport tcp

[Command Prompt]

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:¥Windows¥system32>netsh int ipv4 set dynamicport tcp start=49152 num=11848
Ok.


C:¥Windows¥system32>netsh int ipv4 show dynamicport tcp

Protocol tcp Dynamic Port Range
---------------------------------
Start Port      : 49152
Number of Ports : 11848


C:¥Windows¥system32>
```

5 Configure GR2Analyst

This section describes configurations for the Gibson Ridge GR2Analyst application.

(1) Setup "customradars.gis" file

This is a configuration file for ICAO radar identifiers. To register new radar sites, append ICAO radar identifiers to this file.

After all radar sites are registered, save and then drag-and-drop file onto GR2Analyst to add the radar identifiers.

```
xunt, xunt,     33.25355,   -97.15204,     224.00,      29, TX, CASA/Denton
fusa, fusa,     38.86949,   -75.81616,      36.40,      29, MD, FUSA/Denton
feci, feci,     34.71360,   135.33520,     28.00,       1, JP, INT/Nishinomiya
```

Definition of each parameter is as follows:

```
fusa, fusa,     38.86949,   -75.81616,      36.40,      29, MD, FUSA/Denton
(1)   (2)         (3)         (4)           (5)        (6) (7)    (8)
```

(1)(2) An abbreviated name based on ICAO radar, a valid four character string.
(3) Latitude, degrees.
(4) Longitude, degrees.
(5) Altitude, meters.
(6) Identifier,“29”
(7) An abbreviated name of a state. For example, MD = Maryland, TX = Texas.
(8) A name of a radar site, a character string.

(2) Setup the polling configuration (Fig 5-1)

- Go to Menu > File > Configure polling...
- Click [Add] button (1) and type URL of the server, and then click [OK] button.

  Example: http://50.238.124.10/Output

(Note: Keep "https://mesonet-nexrad.agron.iastate.edu/level2/raw" site if NEXRAD radar access desired

- Select the URL (2) and click [Move Up] button (3) to raise the priority.
- Select the URL (2) and click [Refresh] button (4) to reload the information.
- Click [OK] button (5) to close the window.
- Restart the application.

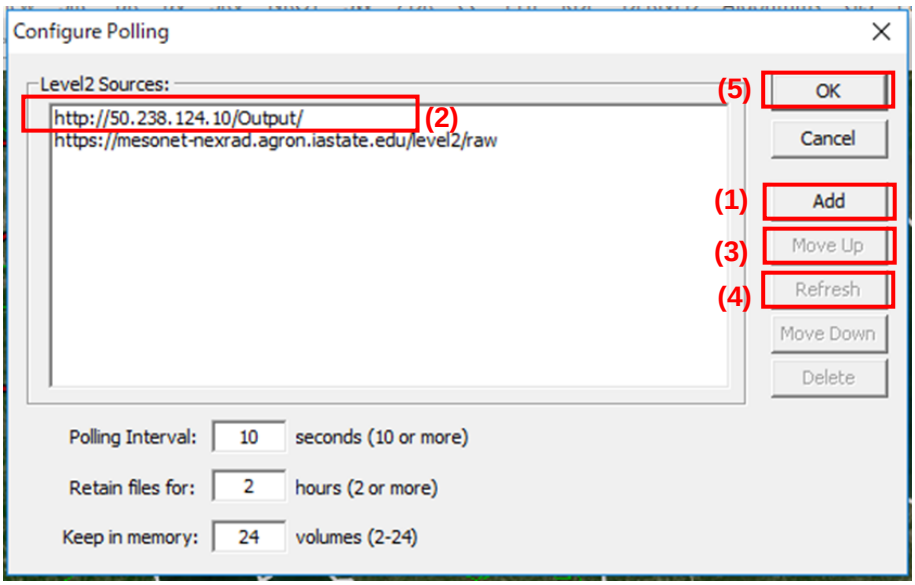


Fig 5-1 To configure polling.

(3) Start polling

- Start polling by pressing the polling button surrounded by the red line in Fig 5-2.

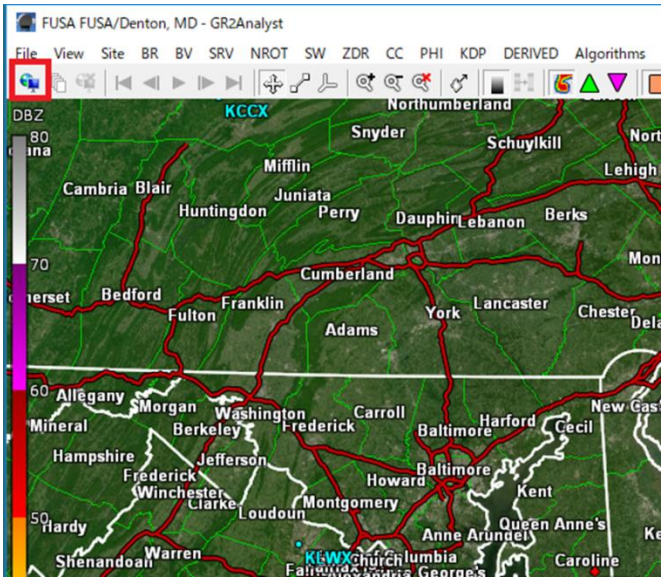


Fig 5-2 To start polling.

(4) Connected to the radar site

- GR2Analyst is connected to the radar site (Fig 5-3).

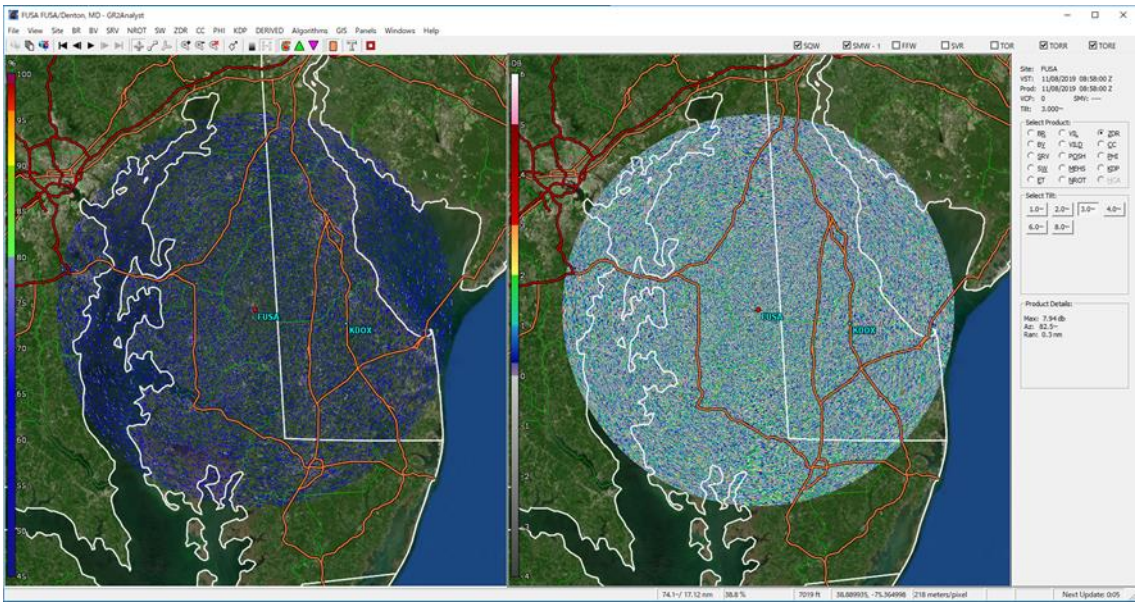


Fig 5-3 One example of GR2Analyst display.

(5) GR2Analyst can be further configured to automatically start with favorite radar. Animation speed and other settings can also be saved. See GR2Analyst manual for detailed setup instructions.

6 References

- AllisonHouse
  https://www.allisonhouse.com/pages/integrations/gibson-ridge
- GR2Analyst
  http://www.grlevelx.com/gr2analyst_2/
- Operational Manual
  https://www.weather.gov/media/top/GR%20for%20Dummies%202.70.pdf
- Color Tables
  http://almanydesigns.com/grx/
- GRLevelX Tools
  http://www.redteamwx.com/grlevelx.html

7 Appendix

(1) Configuration files on the server

${DocumentRoot} is defined as a root directory of web server.
ex) /home/radar/public_html/Output

[grlevel2.cfg]
Put the following file, grlevel2.cfg in ${DocumentRoot}. To register new radar sites, append ICAO radar identifiers to this file.

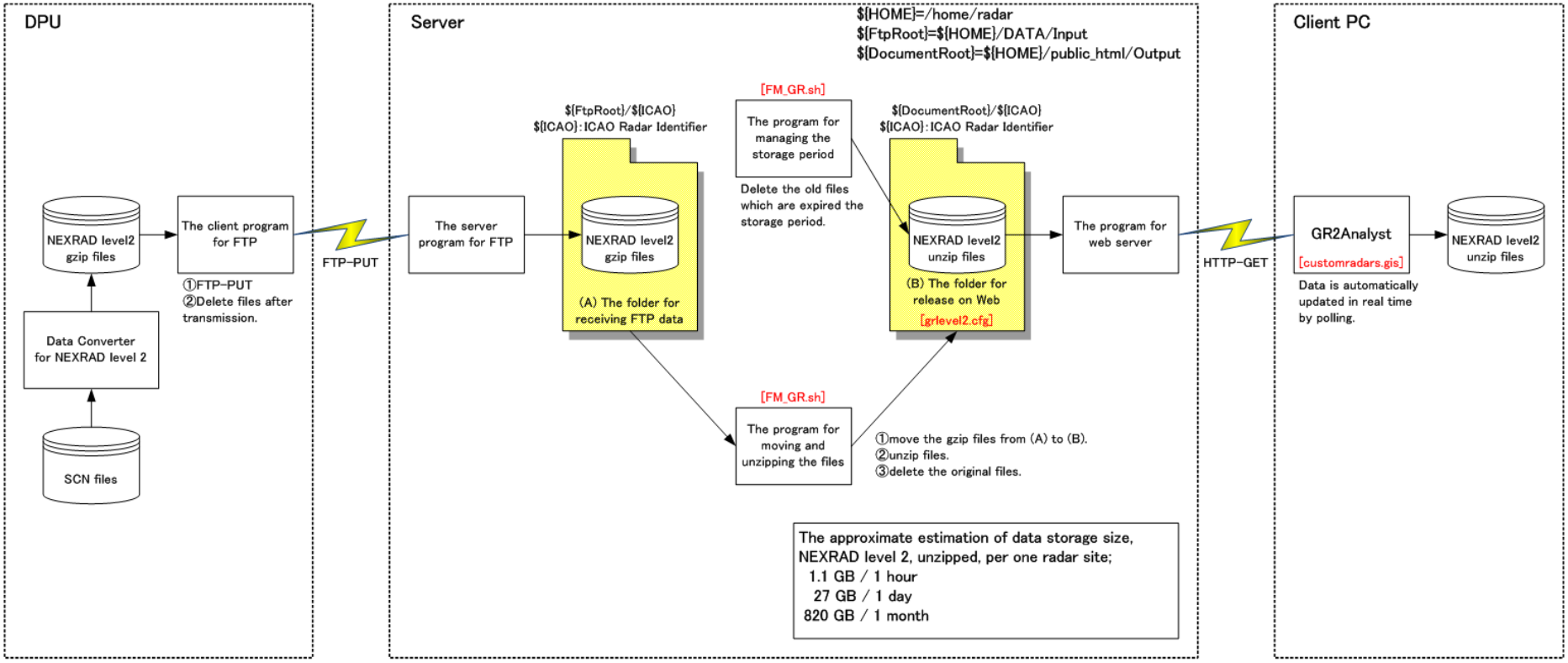
```
ListFile: dir.list
Site: XUNT
Site: FUSA
Site: FECI
```

[FM_GR.sh] (partial)
This file has been already put in the ${HOME}/NEXRAD_shell. To register new radar sites, append ICAO radar identifiers to this file.

```
#-------------------------------------------------------------------------------
#     File manager for Web server of Gibson Ridge
#     Created on 23 Aug 2019.
#-------------------------------------------------------------------------------
#!/bin/bash

icao=(
   FUSA        # FUSA Denton Office, MD
   XUNT        # University of North Texas (XUNT), CASA, TX
   FECI        # Furuno INT Center, Nishinomiya, Japan
)
 . . . .
```

(2) Outline of data flow for Gibson-Ridge applications



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