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## z/OS Communications Server

### FTP enhancements

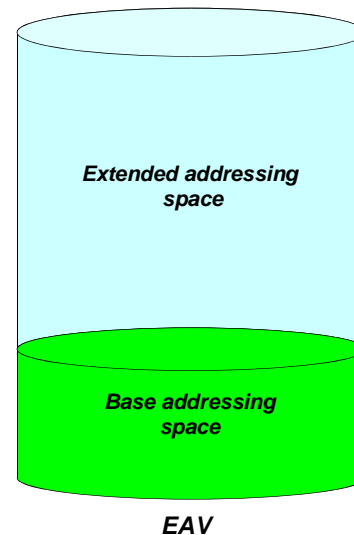


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This presentation describes the updates to FTP in z/OS® V1R13 Communications Server. These enhancements are enhanced FTP support for extended address volumes, FTP support for large-format data sets, and FTP support for password phrases.

## Background on extended address volumes

- An Extended Address Volume (EAV)
  - Exceeds 65,520 cylinders
  - Ranges up to 262,668 cylinders
- The base addressing space
  - Consists of the space below 65,536 cylinders
  - Any data set can reside there
- The extended addressing space (EAS)
  - Consists of the space beyond 65,536 cylinders
  - Only EAS-eligible data sets can reside there



z/OS V1R10 added support for DASD volumes having more than 65,520 cylinders. These are called extended address volumes (EAVs), and they can range up to 262,668 cylinders. An EAV is divided into base addressing space and extended addressing space (EAS). EAS-eligible datasets can reside anywhere, including in the base addressing space. Non-EAS-eligible data sets can only reside in the base addressing space.

## Extended address volume history

z/OS	DFSMS support	FTP support
V1R10	VSAM data sets	Not applicable
V1R11	SMS-managed physical sequential extended-format data sets	<ul style="list-style-type: none"> <li>• FTP configuration data sets</li> <li>• Send EAS-eligible data sets</li> <li>• Receive into <i>existing</i> EAS-eligible data set</li> <li>• Create EAS-eligible data set using SMS data class</li> <li>• Rename, delete, list EAS-eligible data sets</li> <li>• Report space statistics for EAVs on QDISK</li> </ul>
V1R12	<ul style="list-style-type: none"> <li>• Physical sequential data sets: basic and large format</li> <li>• PDS and library data sets</li> <li>• Catalogs, basic data sets</li> <li>• Non-SMS-managed data sets</li> </ul>	Same as V1R11
V1R13	Same as V1R12	<ul style="list-style-type: none"> <li>• Explicitly create EAS-eligible data sets using EATTR</li> <li>• Transfer to and from EAS-eligible data sets</li> <li>• Restart interrupted transfer</li> </ul>

In z/OS V1R10, DFSMS enabled VSAM data sets to be EAS eligible. FTP does not support VSAM data sets.

In z/OS V1R11, DFSMS enabled SMS-managed physical sequential extended-format data sets to be EAS eligible. Beginning in V1R11, FTP supports the use of EAS-eligible FTP configuration data sets and sending EAS-eligible data sets over FTP. It supports receiving into an existing EAS-eligible data set, or alternatively receiving into a new data set and specifying the DATACLASS configuration option to name an SMS data class with default attributes of EATTR=OPT. Finally, it provides miscellaneous support such as renaming, deleting and listing EAS-eligible data sets, and reporting space statistics for EAVs.

In z/OS V1R12, most types of data sets can be EAS eligible, and they need not be SMS managed. FTP support remains unchanged in V1R12.

In z/OS V1R13, FTP adds support for the new EAS-eligible data sets available since V1R12. FTP can explicitly allocate EAS-eligible data sets using the new EATTR configuration option, and can transfer to and from a wide range of data set types. These data set types include PDS and library members, physical sequential basic, large and extended formats, and GDG data sets. The data sets can be SMS-managed or not.

## Enhanced support for extended address volumes

- EATTR NO means the data set cannot have extended attributes
- EATTR OPT
  - Extended attributes are optional
  - Applicable if data set resides on an extended address volume
- EATTR SYSTEM
  - Use the EATTR value assigned to the SMS data class
  - If no data class is configured or no EATTR value is assigned, use the system EATTR value
  - Default

The new EATTR configuration option is used in various contexts to specify whether a new data set allocated by FTP can have extended attributes, and therefore whether the data set can reside in the EAS of an EAV. The three possible values are NO, OPT and SYSTEM.

Coding NO means new data sets do not possess extended attributes and are not eligible to reside in the EAS.

Coding OPT means new data sets have extended attributes only if the volume they reside on is an EAV volume.

The default value is SYSTEM, which causes FTP to allocate data sets the way it does in prior releases. If you configure an SMS data class that specifies the EATTR value, the new data set is allocated with the EATTR value from the data class. If you have not configured a data class that specifies the EATTR value, FTP will allow the data set to be allocated with the system value.

The EATTR configuration option can be used in FTP.DATA for both FTP client and FTP server. It can be used as an option to the LOCSITE subcommand to override the FTP client EATTR setting. It can be used as an option to the SITE subcommand to override the FTP server EATTR setting. The LOCSITE and SITE values can be displayed using the LOCSTAT and STAT subcommands.

When used on LOCSITE or SITE commands, you should use an equals character instead of a space after EATTR.

## Diagnosing enhanced support for EAVs

- SETSMS USEEAV(YES)?
- MVS console messages and console log
- FTP client messages
- FTP server replies
- FTP trace and extended trace
  - DEBUG FSC(5),FLO
  - DUMP 21
  - IP Diagnosis Guide
    - “Diagnosing FTP server problems with traces”
    - “Diagnosing FTP client problems with traces”

A very easy mistake to make when trying to allocate an EAS-eligible data set on an EAV is to forget to specify SETSMS USEEAV(YES) when you configure z/OS. You can code USEEAV(YES) in the IGDSMSxx PARMLIB member, or you can set it with the operator command **SETSMS USEEAV(YES)**.

Check the console log for messages if you have trouble accessing EAS-eligible data sets. Issue the MVS operator command SETSMS USEEAV(YES) if the console log indicates you have not configured USEEAV(YES).

If this does not rectify your problem, obtain FTP traces as documented in the *IP Diagnosis Guide*. The sections listed on this page tell you how to enable and capture the FTP trace. The FLO option assists the service team, should you need to call the IBM service center for assistance.

The extended trace option DUMP 21 provides details of the parameters passed to dynamic allocation services when FTP attempts to create a new data set. This information will assist the IBM service team.

## Additional considerations for enhanced support for EAVs

- Other FTP clients
  - QUOTE STAT
  - QUOTE XSTA (EATTR
  - QUOTE SITE EATTR=OPT
  - QUOTE SITE EATTR=NO
  - QUOTE SITE EATTR=SYSTEM
  - QUOTE HELP SITE
- TSO HOMETEST cannot access FTP.DATA in the EAS of an EAV
- Other applications might not support EAV volumes

FTP clients other than the z/OS V1R13 Communications Server FTP client might not drive the FTP server command in the same way. However, you can configure the FTP server to allocate EAS eligible data sets from any FTP client that supports the QUOTE subcommand or its equivalent, as shown on this slide. The QUOTE subcommand forwards its arguments to the server without processing them locally in any way.

You can allocate FTP.DATA as an EAS-eligible data set, but TSO HOMETEST does not support FTP.DATA when it is EAS eligible.

Although z/OS Communications Server FTP now supports EAV volumes, your other applications might not support EAV volumes. You must see DFSMS documentation and vendor documentation to evaluate your other applications. This slide lists the DFSMS publications that provide information about using EAV volumes.

## Background on large-format data sets

	BASIC format	LARGE format	Extended format
<b>DSNTYPE parameter value</b>	BASIC	LARGE	EXTPREF EXTREQ
<b>Maximum tracks per volume</b>	65,535	16,777,215	As many as largest DASD volume
<b>Maximum extents per volume</b>	16	16	123
<b>Why choose this format?</b>	Maximum compatibility	Can be much larger than basic format	<ul style="list-style-type: none"> <li>• Can be much larger than basic format</li> <li>• Can be striped, compressed format or any combination</li> </ul>

Physical sequential basic-format data sets are the type of data set z/OS Communications Server FTP allocates when you store into a nonexistent MVS data set (as opposed to storing into the z/OS UNIX® file system). Physical sequential data sets can be basic format, large format, or extended format.

This chart summarizes characteristics of each format. The DSNTYPE name indicates what value to specify on the DSNTYPE JCL parameter or TSO ALLOCATE parameter.

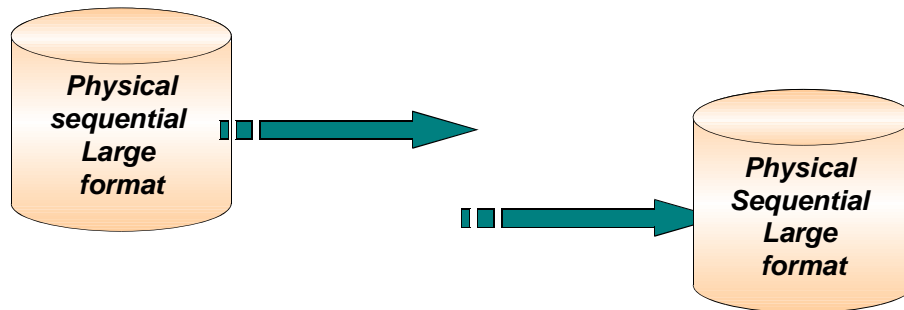
BASIC format is the oldest and is supported by most elements of z/OS and the applications that run on MVS.

LARGE format allows for increased capacity, although large-format data sets do not actually have to be large in size. Large-format data sets can be either SMS-managed or not. z/OS V1R12 Communications Server FTP does not support large-format data sets.

Extended format can be much larger than LARGE format. z/OS V1R12 Communications Server FTP supports transfer to and from existing physical sequential extended format data sets, and allocation of physical sequential extended format data sets through an SMS data class.

## Support for large-format data sets

- Large-format data sets
  - File Transfer
  - Configuration options
  - Block mode restart of interrupted file transfer
  - Configuration data sets
- Transfer to and from z/OS UNIX files larger than two GB



z/OS V1R13 Communications Server FTP introduces support for large-format physical sequential data sets in conjunction with new V1R13 Language Environment support. In z/OS V1R13, you can transfer to and from existing large-format physical sequential data sets and configure FTP to allocate new data sets as large-format data sets. You can also resume a failed block or compressed mode transfer to or from a physical sequential large-format data set. Finally, although configuration data sets do not need to be all that large, you can use physical sequential large-format data sets for that purpose if you want to.

Additionally, support is added to transfer to and from z/OS UNIX files larger than two gigabytes.



## Configuring support for large-format data sets: DSNTYPE

- BASIC
  - Allocate physical sequential data sets as basic-format physical sequential data sets
- LARGE
  - Allocate physical sequential data sets as large-format physical sequential data sets
- SYSTEM
  - Let the system select the format of new physical sequential data sets; this is the default

The new DSNTYPE configuration option can be used in various contexts to specify the data set name type for a new physical sequential data set allocated by FTP. The possible values are BASIC, LARGE and SYSTEM. Coding BASIC or LARGE causes new physical sequential data sets to be allocated using BASIC or LARGE format. The default is SYSTEM. If you code DSNTYPE SYSTEM or allow it to default to this value, FTP will allocate physical sequential data sets the way it always has. Therefore, if you have configured FTP with an SMS data class that specifies DSNTYPE, the new data set will use the DSNTYPE value from the SMS data class. Otherwise, the system default value will apply to new physical sequential data set allocations.

The DSNTYPE configuration option can be used in FTP.DATA for both FTP client and FTP server. DSNTYPE is also an option to the LOCSITE subcommand to override the FTP client DSNTYPE setting and an option to the SITE command to override the FTP server DSNTYPE setting. The LOCSITE value can be displayed using the LOCSTAT subcommand, and the SITE value using the STAT subcommand.

When used on LOCSITE or SITE commands, you should use an equals character instead of a space after DSNTYPE.

Regardless of the DSNTYPE setting, you can rename, delete and list large-format data sets.

## Diagnosing support for large-format data sets

- FTP client messages
- FTP server replies
- MVS console messages and console log
- FTP trace and extended trace
  - DEBUG FSC, FLO
  - DUMP 21
  - *z/OS Communications Server: IP Diagnosis Guide*
    - “Diagnosing FTP server problems with traces”
    - “Diagnosing FTP client problems with traces”

If you have problems allocating physical sequential large format data sets, the FTP client messages and server replies will help you identify whether the failure originates at the client host or the server host.

Once you have determined this, inspect the MVS console and console log on the failing host for messages related to the failure. For allocation and access failures related to your security product, this is often enough information to help you correct the problem.

If you need more information, enable the FTP trace option FSC at the failing host. The sections of the *z/OS Communications Server: IP Diagnosis Guide* listed on this slide tell you how to enable and capture the trace. The FLO option assists the service team, should you need to call the IBM service center for assistance.

The extended trace option DUMP 21 provides details of the parameters passed to dynamic allocation services when FTP attempts to create a new data set. This information will assist the IBM service team.

## Additional considerations for large-format data sets

- Other FTP clients
  - QUOTE STAT
  - QUOTE XSTA (DSNTYPE
  - QUOTE SITE DSNTYPE=BASIC
  - QUOTE SITE DSNTYPE=LARGE
  - QUOTE SITE DSNTYPE=SYSTEM
  - QUOTE HELP SITE
- Other applications might not support large format data sets

FTP clients other than the z/OS V1R13 Communications Server FTP client might not drive FTP server commands in the same way. However, you can configure the FTP server to allocate large-format data sets from any FTP client that supports the QUOTE subcommand or its equivalent, as shown on this slide. The QUOTE subcommand forwards its arguments to the server without processing them locally in any way.

Although z/OS V1R13 Communications Server FTP now supports physical sequential large format data sets, your other applications might not support them. You must see DFSMS documentation and vendor documentation to evaluate your other applications.

## Password phrases: background

- Password
  - One to eight characters
  - Limited range of characters allowed (for example, no blanks in the password)
- Password phrase
  - Nine to one hundred characters
  - Can contain any characters allowed in the EBCDIC 1047 code page
  - Must contain at least two alphabetic characters (case sensitive)
  - Must contain at least two non-alphabetic characters (numeric, punctuation, special, blank)
  - Cannot have more than two consecutive identical characters or NUL character
  - Every user ID with a password phrase also has a password

By V1R10, z/OS RACF® had introduced and improved support for password phrases. A password phrase is optional when defining a user ID. Any user ID that is assigned a password phrase also has a password. Some elements of z/OS support the use of either a password phrase or a password.

A traditional password is limited to eight characters, but a password phrase can contain up to one hundred characters. It can also include spaces, punctuation marks, and is always case sensitive, even if RACF is configured for NOMIXEDCASE. Several additional rules for password phrases are listed on this slide.

## FTP server

- Accept password phrases on the PASS command
- Support changing password phrases on PASS command
- Pass password phrase to FTCHKPWD

<b><i>Length</i></b>	<b><i>Password or password phrase</i></b>
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Beginning in z/OS V1R13, the Communications Server FTP server accepts password phrases in addition to passwords.

If you provide a password phrase on the PASS subcommand, it is used to authenticate you.

The FTP server supports changing the password phrase on the PASS subcommand. However, you can only change a password phrase to another password phrase, and you can change a password only to another password. You cannot change a password to a password phrase, and you cannot change a password phrase to a password.

The interface to the FTCHKPWD FTP user exit is changed to pass an additional parameter. Because password phrases are longer than eight bytes, the existing password parameter is not long enough to pass the full passphrase. The new parameter is set to either the password or the password phrase. The first two bytes of this parameter are the length of the password or password phrase that follows. You can inspect the length field to determine which is which: passwords are up to eight characters, and password phrases are nine to one hundred characters in length. Note that when the connection is secured with TLS or Kerberos, logging in with a password is not always necessary. When the server doesn't require a password, the password is set to EBCDIC blanks, and the password phrase will have a length of zero. Additionally, if you log in as the anonymous user and have not coded a user ID on the ANONYMOUS statement in FTP.DATA, both the password and the password phrase are set to a single asterisk.

## FTP server restrictions

- Excluded characters
  - carriage return (<CR>) or line feed (<LF>)
  - forward slash (/) or colon (:)
  - leading or trailing blanks
  - Interpret as command (IAC or X'FF') and telnet characters
- Anonymous user ID
  - You can assign a password phrase to the anonymous user ID
  - You cannot specify a password phrase when configuring the server for anonymous FTP:
    - FTP daemon start option
    - ANONYMOUS statement in FTP.DATA

z/OS V1R13 Communications Server FTP server restricts the allowed characters for password phrases. If you assign these characters to a password phrase, you cannot use that password phrase to log into the FTP server. These characters have special meaning to the FTP server in some circumstances.

FTP has many configuration options for anonymous FTP, and some configurations require you to enter a password when logging in anonymously. When the server replies to a USER anonymous command with a “331 please enter password”, you can specify either a password or password phrase on the PASS command. However, you cannot explicitly configure a password phrase for anonymous login. The only way to allow password phrases for anonymous login is to assign a password phrase to the anonymous user id.

## FTP client and FTP client API

- NAME (user ID) prompt

```
220-FTP 21:27 on 2010-02-09.  
220 Connec+ will close if idle for more than 5 minutes.  
NAME (via USER2):  
user1 '1 secret password'
```

- PASSWORD prompt
- USER subcommand

```
Command:  
user user1 "user1 secret password"
```

- PASS subcommand

You can type multiple-token passwords at the FTP client name prompt, password prompt, USER subcommand, or PASS subcommand by enclosing them in single or double quotation marks.

(The PASS subcommand is typically only used by applications using the FTP client API.)

All multiple-token password support described on this slide is not new in z/OS V1R13.

## FTP client guidelines

- Enclose password phrases with blanks in quotation marks

```
'My multi-token password'  
"My multi-token password"
```

- Do not mix single and double quotation marks in a password phrase

```
My cat's mother said "meow"
```

- Unrestricted characters: @ # \$ - { . ( ) \* % +
- If you code user data, and either the data contains blanks or the password phrase contains blanks, enclose both in quotation marks

```
"Mypasswørd:My user data"  
'my multi-token password:userdata'
```

You must enter single or double quotation marks to enclose multi-token password phrases. If the password phrase itself contains a quotation mark, use the other style of quotation mark to enclose the password phrase. However, do not use quotation marks if they are not required. Password phrases containing only letters, numerals, or the unrestricted characters listed on the slide do not require quotation marks.

Also, you cannot mix single and double quotation marks within a password phrase.

When entering user data, and the data or the password phrase contains blanks, enclose them both in quotation marks.



## Diagnosis

- Ensure your SAF product supports password phrases
- Check that you entered the correct case
- Try an alternate means of login

If you have a password phrase you cannot log in with but which you think is correct, you should perform these steps. First, ensure that your SAF product supports password phrases and be aware of your SAF product's password phrase restrictions. For example, RACF has additional restrictions on characters that must be included and how many repeated characters are allowed. Second, check that you entered the correct case; password phrases are always case sensitive. Finally, try an alternate means of login to verify your password phrase, such as TSO or an alternate FTP client.

## Diagnosis tips for FTP

- Check that no forbidden characters are used, including leading or trailing spaces
- Check how single and double quotations marks are used
- Check the code pages between the client and the server
- Check if you have an FTCHKPWD user exit that has restrictions
- Be aware of your FTP client's password restrictions

For FTP, you should also check that your password phrase does not include characters disallowed by FTP, including leading or trailing spaces. Also, check that you are making proper use of single and double quotation marks. Because FTP translates password phrases to ASCII or UTF-8 for transmission, you should check that your code pages are consistent between your client and the server. Finally, you should check your FTCHKPWD exit and your FTP client to see if they are enforcing any restrictions.

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## Things to think about

- FTP
  - Ensure your FTCHKPWD user exit can process the new parameter
  - For z/OS FTP client in batch mode, the password phrase and optional user data must fit on a single line of the batch file
  - Using only printable characters will reduce the likelihood of code page issues

For FTP, even if you do not intend to use password phrases, you should verify your FTCHKPWD user exit can handle the additional parameter. When using the z/OS FTP client in batch mode, note that the password phrase and optional user data must fit on a single line of the batch file. Finally, you can reduce the likelihood of code-page issues if you use only printable characters in your password phrases.

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