# Web UI System of TWAREN High-Speed Data Transfer Network

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## ABSTRACT

This paper demonstrates the construction of a Web UI system of Data Transfer Network (DTN) on TWAREN. On the hardware aspect, via the TWAREN backbone, we connect 6 access nodes for high-speed data transfer through dedicated broadband lines. On the software aspect, we adopt widely-used tools, such as Fast Data Transfer (FDT) and GridFTP so that effective utilization of network bandwidth can be yielded. We also develop a Web UI system for users instead of Command Line Interface (CLI). Using the proposed system, which can be easily studied and operated, users can share research data more efficiently and effectively.

## INTRODUCTION

The Taiwan Advanced Research and Education Network (TWAREN)[1] is a high-speed network backbone for research and education in Taiwan. The infrastructure of TWAREN is shown in Fig. 1. There are 5 core nodes, connected with 100 Gbps optical fibers, while 12 GigaPop nodes, connecting with 50 Gbps optical fibers.

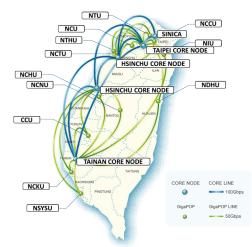
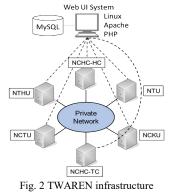


Fig. 1 TWAREN infrastructure

In this paper, we would like to construct a Data Transfer Network using the backbone of TWAREN among 6 selected nodes, such as NTU, NTHU, NCTU, NCKU, Hshinchu core node (HC), and Taichung Core node (TC).

As shown in Fig. 2, The Web UI system is a client-server architecture, including the Linux OS, the Apache server, the MySQL database, and the PHP web pages. In general, PHP web pages use system calls to communicate with the OS the perform related operations. However, since the PHP system call functions cannot control remote functions, we use the SSH functions instead.



Since both FDT[2] and GridFTP[3] can support SSH connections, it is suitable for the proposed system to integrate these tools for high-speed data transferring.

#### THE PROPOSED SYSTEM

For the sake of usability, we develop a user-end application for users. Considering the convenience distributing and the updating the application, we develop a Web UI instead of a stand-alone application. The architecture is demonstrated in Fig. 3.

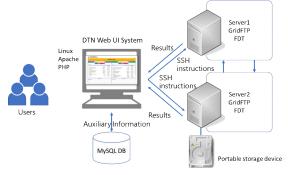


Fig. 3 Web UI DTN system architecture



Fig. 4 Main page of the DTN Web-UI system

All users should inquire a user account for logging to the proposed system. After the user successfully login to the system, the system will redirect to the main page, as shown in Fig. 4. This page is divided into left and right portions so that users can connect to two DTN servers simultaneously. For each portion, there are 3 frames, such as server list, file list, and transferring status frames in the top-down direction.

In the file list frame, users can click the drop-down list to select the DTN server to connect, as shown in Fig. 5.

	NCHC-HC ~	GO
	Please select a site	GO
Please specify the site to co	NCHC-HC	
Flease specify the site to co	NCHC-TC	
	DTN-HC	
	DTN-TC	
	DTN-NTU	
	DTN-NTHU	
	DTN-NCTU	
	DTN-NCKU	

Fig. 5 the DTN server list in Drop-down form

Next, the middle frames are the file lists. As shown in Fig. 6, the left portion shows the file list of the DTN server in Hsinchu, while the right portion shows the file list of the DTN server in Taichung. There are four labels, such as File list, Transfer, Delete, and Logout labels with hyperlinks to perform related functions.

		DTN W	eb System		
NCHC-HC Please select a path	√ 60 √ 60		NCHC-TC Please select a path	<ul><li>✓ 60</li><li>✓ 60</li></ul>	
File list Tra	nster Delete Logout		File list Trans	ter Delete Logout	
File Name	File Size File Type	Last modified	File Nome	File Size File Type	
	4096	Nov 25 11:25		4096	Dec 19 16:06
-	4096	Nov 30 2015		4096	Sep 22 2016
Brocade_Basic-21040519.pdf	2399905 pdf	Ad 27 16:28	2018-02-26-06-43-14.057-V8xx5VC-32065.log	186 log	Feb 26 2018
Cent05-7-x86_64-0V0-1511.1x0	4323570304 iso	Aug 16 16:22	2018-02-26-07-32-42.075-V8cx5VC-2855.log	186 log	Feb 25 2018
Desktop	4096	Oct 4 16:52	Cent05-7-x86_64-0ND-1511.iso	4329570304 iso	Dec 19 16:06
Downloads	4096	Sep 1 2016	Desktop	4096	Jul 30 09:03
Fastiron_08000a_AdminGuide.pdf	2672877 pdf	Ad 27 16:28	Downloads	4096	Jun 7 2018
Fastiron_08020_S0NGside.pdf	621018 pdf	Ad 27 16:28	Fastiron_08000a_AdminGuide.pdf	2672877 pdf	Aug 27 11:33
fastron-08060-schipulde.pdf	839256 pdf	Ad 27 16:28	Fastiran_08020_SDNGuide.pdf	621018 pdf	Aug 27 11:33
li notijar	808369 jar	Sep 1 2016	a fastron 08060 sdaguide.pdf	839256 pdf	Aug 27 11:55
Floodigte 0.9	4096	Aug 8 2017	II) tatijar	BOBSED jar	Aug 16 16:24
globus-toolkit-repo_latest_all.deb	7764 deb	Aun 1 2018	Roodlight-0.9	4096	Aug 8 2017
log.tet	440 txt	Sep 1 2016	globus-toolkit-repo_latest_all.deb	7764 deb	Jun 7 2018
i) nche	268	Sep 11 16:24	google-chrome-stable_current_amd54.deb	54087952 deb	Jul 24 04:21
onos_brocade	4096	Sep 11 16:28	GridFTPTutorialHandout.pdf	77132 pdf	Jul 27 16:30
i testaha	21 php	Mar 29 2018	i h.tot	29051 txt	Dec 4 15:08
			installingGT.pdf	75825 per	Jul 27 16:30
			<b>0</b> 000	4096	Mar 12 2018
			in matte	0	14126.17/26
	tatus of site1			atus of site2	
Task List			Clear Task List		

Fig. 6 The snapshot of the Web UI system connected to 2 DTN servers

	NCHC-HC		✓ GO	
	Please select a path		✓ GO	
	File list Tra	nsfer Delete Log	out	
to transfer file(s	;)			
File Name		File Size	File Type	Last modified
		4096		Nov 25 11:25
-		4096		Nov 30 2015
Brocade_Basic-	21040519.pdf	2399905	pdf	Jul 27 16:28
CentOS-7-x86_6	4-DVD-1511.iso	4329570304	iso	Aug 16 16:22
Desktop		4096		Oct 4 16:52
Downloads		4096		Sep 1 2016
Fastiron_08000	a_AdminGuide.pdf	2672877	pdf	Jul 27 16:28
Fastiron_08020	_SDNGuide.pdf	621018	pdf	Jul 27 16:28
fastiron-08060-	sdnguide.pdf	839256	pdf	Jul 27 16:28
] fdt.jar		808569	jar	Sep 1 2016
Floodlight-0.9		4096		Aug 8 2017
globus-toolkit-r	epo_latest_all.deb	7764	deb	Jun 1 2018
log.txt		440	txt	Sep 1 2016
nchc		268		Sep 11 16:24
onos_brocade		4096		Sep 11 16:28
test.php		21	php	Mar 29 2018

Fig. 7 Transferring Process of multiple items

As shown in Fig.7, after clicking the "Transfer" label, the checkboxes of all items will appear for users to select. When Users check the items, and click the "Transfer" button, the selected items can be transferred to the other server.

As shown in Fig. 8, the transferring status frame

demonstrates the transferring percentage of current amount.

Status of site2
Clear Task List CentOS-7-x86_64-DVD-1511.iso:100%[4329570304 of 4329570304
FastIron_08000a_AdminGuide.pdf:100%[2672877 of 2672877]
FastIron_08020_SDNGuide.pdf:100%[621018 of 621018]
fastiron-08060-sdnguide.pdf:100%[839256 of 839256]

Fig. 8 Status frame

#### **PERFORMANCE TESTING**

#### A. Paper Identification Line

In this section, we mainly test the performance between Taichung and HsinChu. This connection is the experimental connection with 1G bandwidth. We transfer the .iso file of CentOS with file size 4,329,570,304 bytes.

16/08 1	7:31:32	Net In:	941.483	8 Mb/s	Avg:	941.483	Mb/s							
16/08 1	7:31:37	Net In:	928.429	Mb/s	Avg:	934.862	Mb/s							
	7:31:42					935.044								
	7:31:47					936.644								
	7:31:52													
	7:31:57													
	7:32:02													
	2018 5:									un			_	
	ControlT													FINIS
16/08 1	7:32:07	Net In:	8.023 M	lb/s	Avg:	822.052	Mb/s	100.00	% (	00s	)			
	Fig	. 9 T	ransf	errin	g tim	ie usi	ng	Fast	D۶	ıta	Tra	nsf	er	
	<u> </u>				<u> </u>	N	0	_	D۶	ita	Tra	nsf	er	_
	@TC-NOD				<u> </u>	N	0	_	D۶	ita	Tra	nsf	er	
DVD-15	@TC-NOD 11.iso	E:~\$ ti			-сору -	vb sshf	0	_	D۶	ita	Tra	insf	er	
Source	@TC-NOD 11.iso : sshftp	E:~\$ ti ://	me glob		<u> </u>	vb sshf	0	_	Dε	ita	Tra	insf	er	
Source Dest:	@TC-NOD 11.iso : sshftp file:/	E:~\$ ti :// //home/	me glob	us-url	-сору -	vb sshf	0	_	Da	ita	Tra	insf	er	
Source Dest:	@TC-NOD 11.iso : sshftp	E:~\$ ti :// //home/	me glob	us-url	-сору -	vb sshf	0	_	Da	<u>ita</u>	Tra	insf	er	
Source Dest: Cent	@TC-NOD 11.iso : sshftp file:/	E:~\$ ti :// //home/ _64-DVD	me glob -1511.i	us-url / so	-copy - /ho	vb sshf me/	tp://	,				insf	er	
Source Dest: Cent	@TC-NOD 11.iso : sshftp file:/ OS-7-x86	E:~\$ ti :// //home/ _64-DVD bytes	me glob -1511.i	us-url / so	-copy - /ho	vb sshf me/	tp://	,				insf	er	
Source Dest: Cent 430	@TC-NOD 11.iso : sshftp file:/ 0S-7-x86 0210176	E:~\$ ti :// //home/ _64-DVD bytes 57s	me glob -1511.i	us-url / so	-copy - /ho	vb sshf me/	tp://	,				insf	er	

The transferring time for the same file using FDT and GridFTP are shown in Fig. 9 and Fig. 10 respectively. The former takes 35 seconds, while the latter takes 28 seconds. Both tools can yield the transfer rate of about 100MB/s.

### CONCLUSIONS

This paper demonstrates the construction of a visualized Web-UI system of the DTN of TWAREN. On the hardware aspect, we connect 6 TWAREN nodes via dedicated Optical Fibers. On the software aspect, we adopt two high-speed transfer tools, such as Fast Data Transfer and Grid FTP, to make the bandwidth usage more effectively. We also demonstrate the developed Web UI system to help users use this system in a user-friendly way. Experiments show that both FDT and Grid FTP perform well when transferring data. In the future, we will continue constructing the whole system, and determine the optimal parameters to yield maximal benefits of the DTN system.

- [1] TaiWan Advanced Research and Education Network (TWAREN), <u>http://www.twaren.net/english/</u>
- [2] Fast Data Transfer FDT, http://monalisa.cern.ch/FDT/
- [3] GT 6.0 GridFTP, http://toolkit.globus.org/toolkit/docs/latest-stable/gridftp/