

IBM zHyperLink

z/OS zExpertenForum Bad Horn





Michael Großmann

IT Architekt
Mainframe

SVA System Vertrieb Alexander GmbH
Berliner Allee 44
40212 Düsseldorf

Mob +49-171-1917447
michael.grossmann@sva.de
www.sva.de

Sources and Trademarks

- This presentation was put together using the following sources
 - Share Presentation: zHyperLinks Introduction – A New Low Latency I/O Paradigm for IBM Z and DS8880
 - Harry Yudenfried, IBM Poughkeepsie
 - IBM PartnerWorld: IBM z14 GA2 Overview
 - Greg Hutchison, IBM WSC
 - Also, using all the Material mentioned in the „Reference and Documentation“ Slide

- This presentation contains trade-marked IBM products and technologies. Refer to the following Web site: <http://www.ibm.com/legal/copytrade.shtml>

IBM zHyperLink Reference Material & Documentation

- Redbook – Getting Started with IBM zHyperLink for z/OS
 - <http://www.redbooks.ibm.com/abstracts/redp5493.html?Open>
- Redbook – IBM Z Connectivity
 - <http://www.redbooks.ibm.com/abstracts/sg245444.html?Open>
- Articles
 - <https://www.ibm.com/blogs/systems/ibm-ds8880-zhyperlink-built-on-a-strong-foundation/>
 - <https://developer.ibm.com/storage/2017/05/02/ibm-ds8880-zhyperlinks-gift-keeps-giving/>
 - <https://developer.ibm.com/storage/2018/03/30/getting-started-ibm-zhyperlink-read-io/>

IBM zHyperLink

1 / IBM zHyperlink - Overview

2 / IBM zHyperWrite

3 / The new IBM zHyperlink

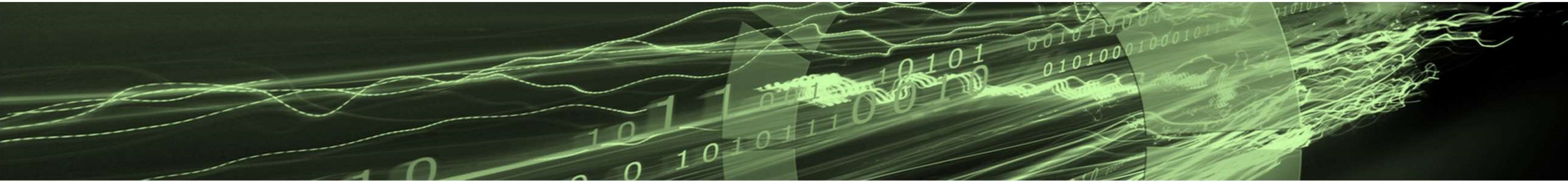
4 / zHyperLink – Phase 1 – „Read“
Support

5 / zHyperLink – Phase 2 – „Write“
Support

6 / zHyperlink – Cabeling and HCD
I/O Gen

7 / zHyperLink – z/OS Support and
(enhanced) Commands

Speed and Scale Getting to the Data



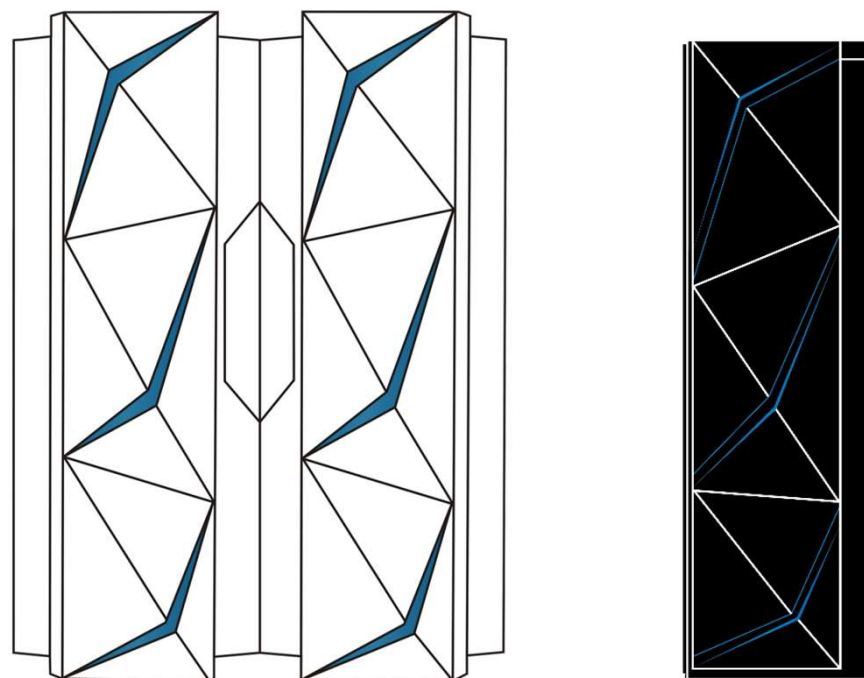
FICON Express16S+

- Up to **3x SIO/sec** for small data transfer I/O operations and **25% SIO/sec increase** with mix of large sequential read and write data transfer options
- **Batch Elapsed time improves 17%** running I/O intensive batch workloads versus same workload using FICON Express16S on a z13
- Provides **increased scalability** by increasing number of devices per channel without degrading performance

zHyperLink Express

- A new direct connect short distance link designed to **deliver low latency** connectivity between z14 and FICON® storage systems
- zHyperLink improves application response time, cutting I/O sensitive workload response time by **up to 50%** without requiring application changes⁴

.... But before – IBM zHyperWRITE
(nothing new here...)



zHyperWrite

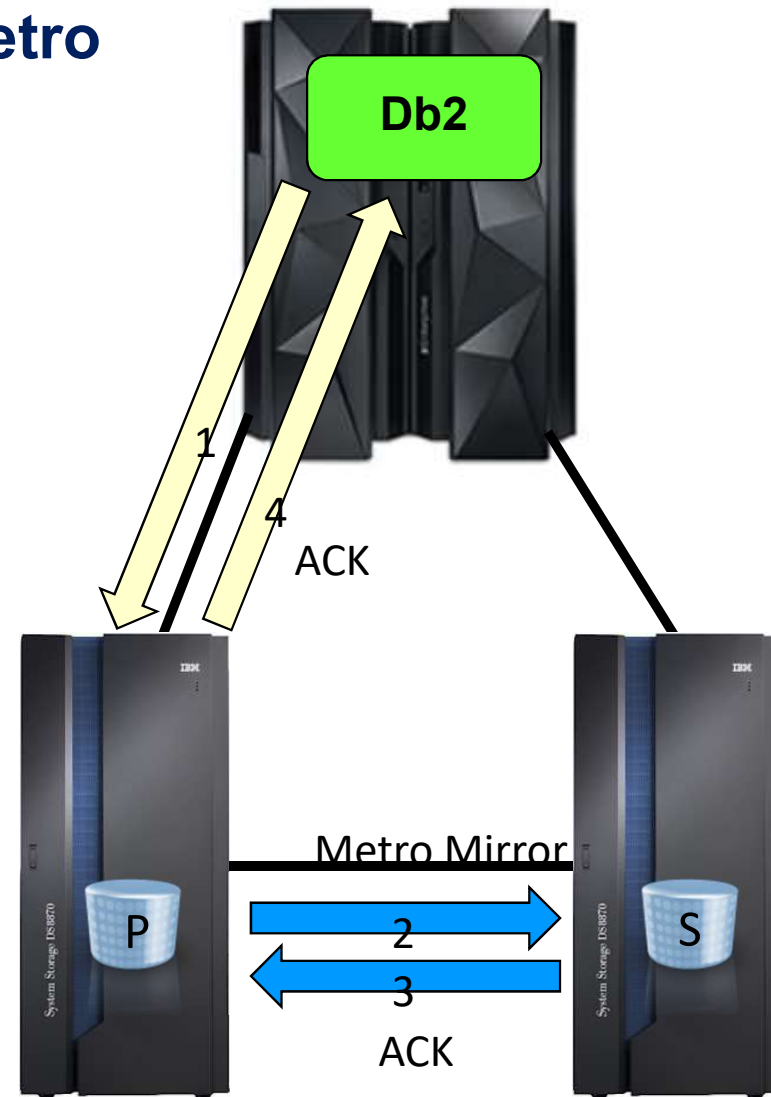
- New zHyperWrite function for Db2, z/OS and DS8870 with **GDPS** or **CSM (aka TPC-R) HyperSwap**
 - Leverages synergy of z/OS and DS8870 replication technologies
 - **Accelerates Db2 log writes** – decreasing log writes in IBM laboratory testing by up to 40%
 - zHyperWrite is better able to handle workload spikes
 - Improved DB2 transactional latency
 - Log throughput improvement
 - Requires:
 - z/OS zHyperWrite function in z/OS 2.1 with APARs OA45662, OA45125 and OA44973
 - Db2 version 10 or DB2 version 11 with SPE
 - IBM DS8870 with R7.4
 - z/OS and DB2 supported since end 2014
 - Used only in DS8870 Metro Mirror environments enabled for HyperSwap controlled by GDPS or TPC-R
 - Also provides support for the new multi-target PPRC environments (MM)



IBM Db2

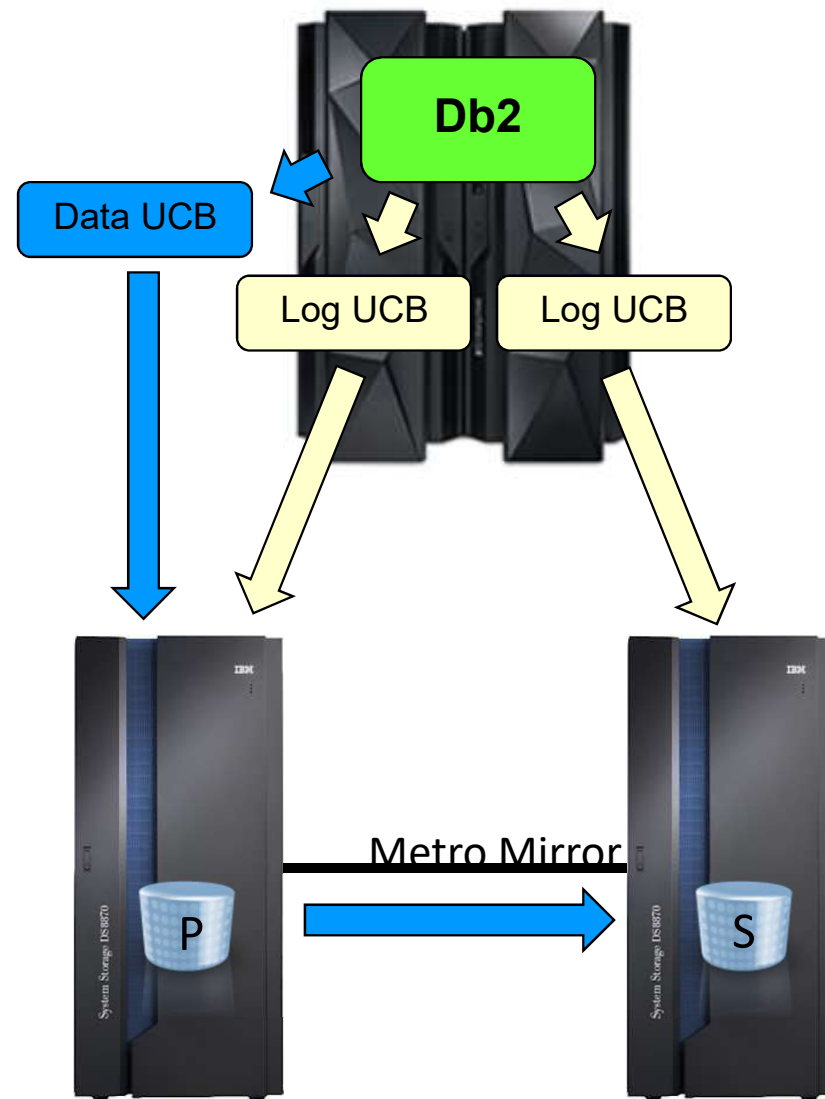
Traditional DB2 Log Write with Metro Mirror

1. Db2 log write to Metro Mirror primary
2. Write mirrored to secondary
3. Write acknowledged to primary
4. Write acknowledged to Db2



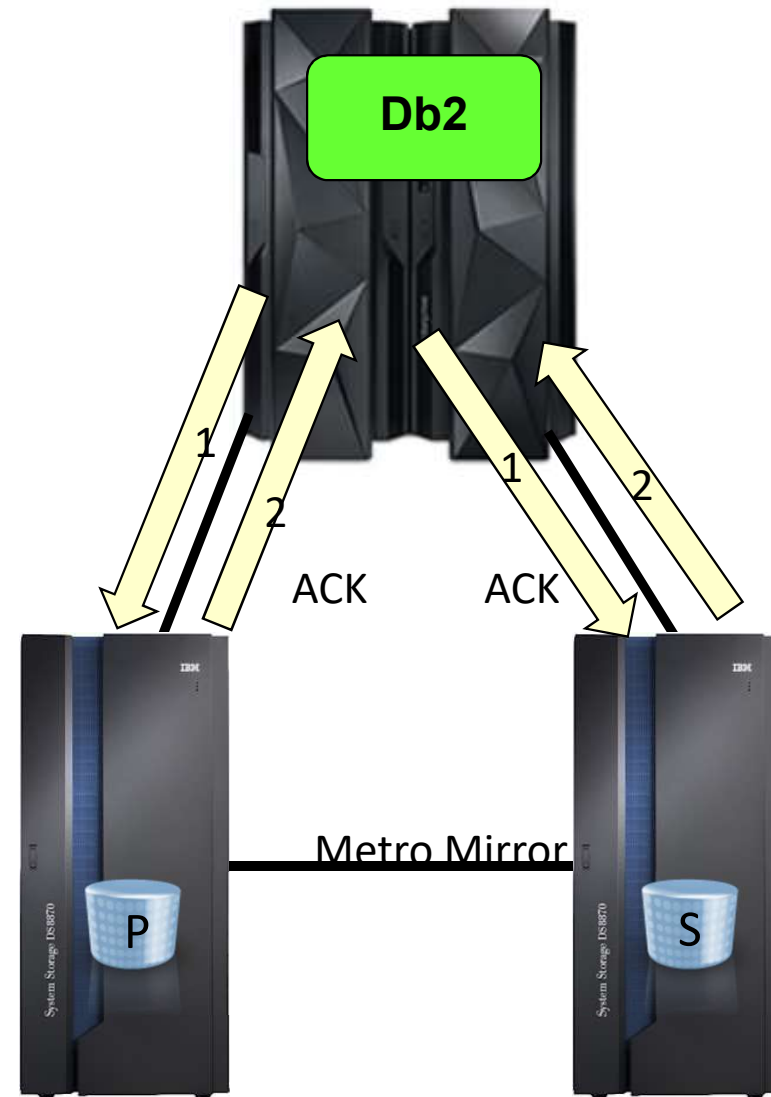
zHyperWrite

- Improved Db2 Log Write performance with DS8870 Metro Mirror
 - Reduces latency overhead compared to normal storage based synchronous mirroring
- Reduce write latency and improved log throughput
 - Up to 40% improvement in testing



Db2 Log Write with zHyperWrite

1. Db2 log write to Metro Mirror primary and secondary in parallel
2. Writes acknowledged to Db2
3. Metro Mirror does not mirror the data



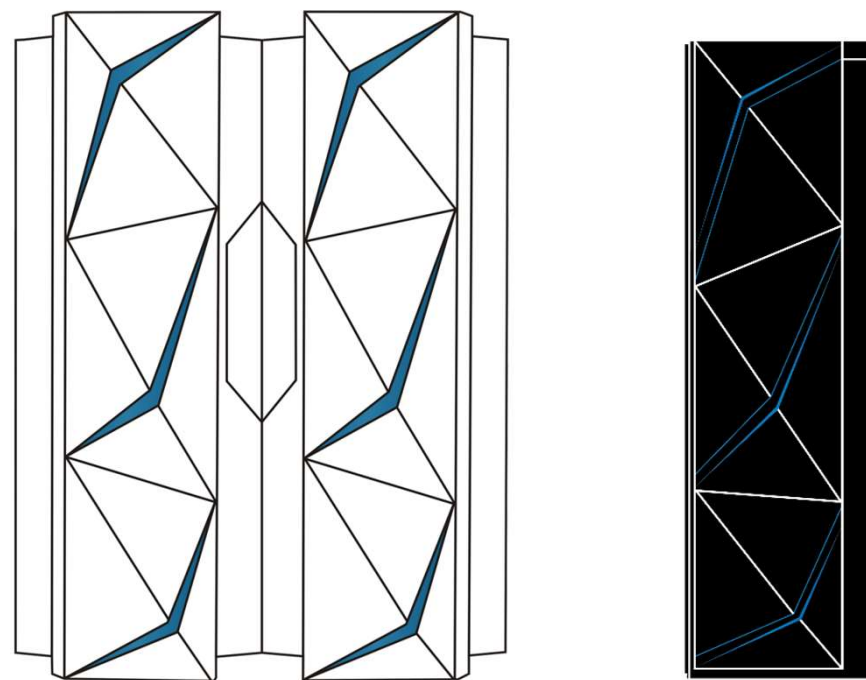
z/OS zHyperWrite Controls

- SETIOS command
 - SETIOS HYPERWRITE=YES
 - SETIOS HYPERWRITE=NO
- SET IOS=xx command, processes IECIOSxx parmlib member
 - HYPERWRITE=YES
 - HYPERWRITE=NO
- DISPLAY IOS, HYPERWRITE

```
IOS634I hh.mm.ss IOS SYSTEM OPTION
        HYPERWRITE IS ENABLED|DISABLED
```

IOSZPARZ updated to handle all of these scenarios

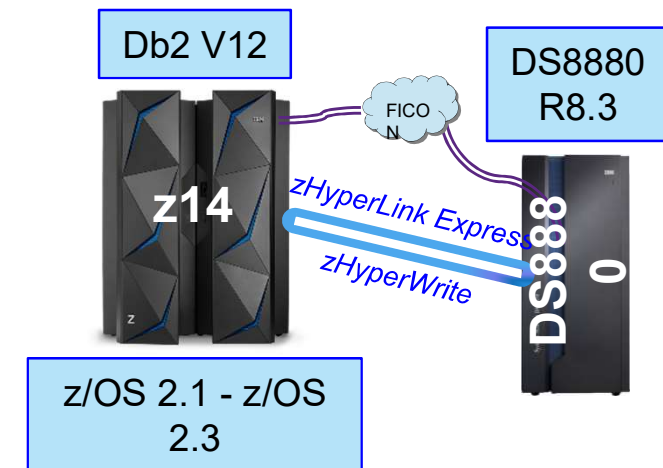
The new IBM zHyperlink



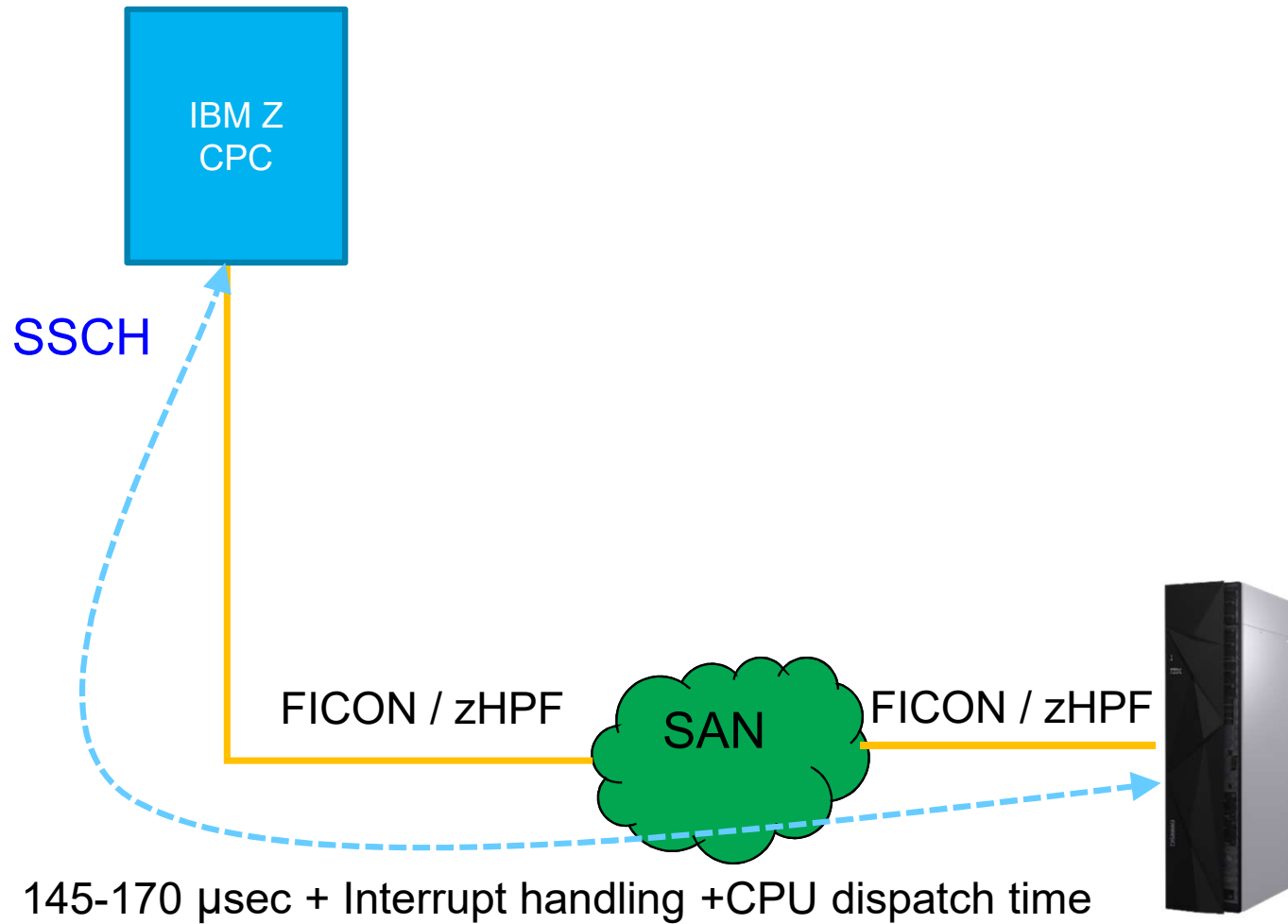
Speed matters: Performance innovation for IBM Z

Unleash your mainframe environment with DS8880 zHyperLink Express[®]

- zHyperLink will initially speed DB2 for z/OS transaction processing and later improve DB2 active Log throughput and VSAM applications.
- Feature Code: 0431
 - Min/Max, 0-16. Increment = 1 (2 ports)
 - Maximum of 16 features (32 ports)
 - Function ID Type = HYL
 - Up to 127 Virtual Functions (VFs) per PCHID
 - Point to point connection using PCIe Gen3
 - **Maximum distance: 150 meters**
- **Reach 7x faster read access** and **10x faster writes** of data with
- zHyperLink Express technology
- Designed to **accelerate DB2 for z/OS Log write** by up to 5x.
 - Significantly improve **DB2 transaction rate**.
- Reads fast enough to serve data to DB2 **without an undispatch during IOP**
 - Improved Application and Middleware scaling



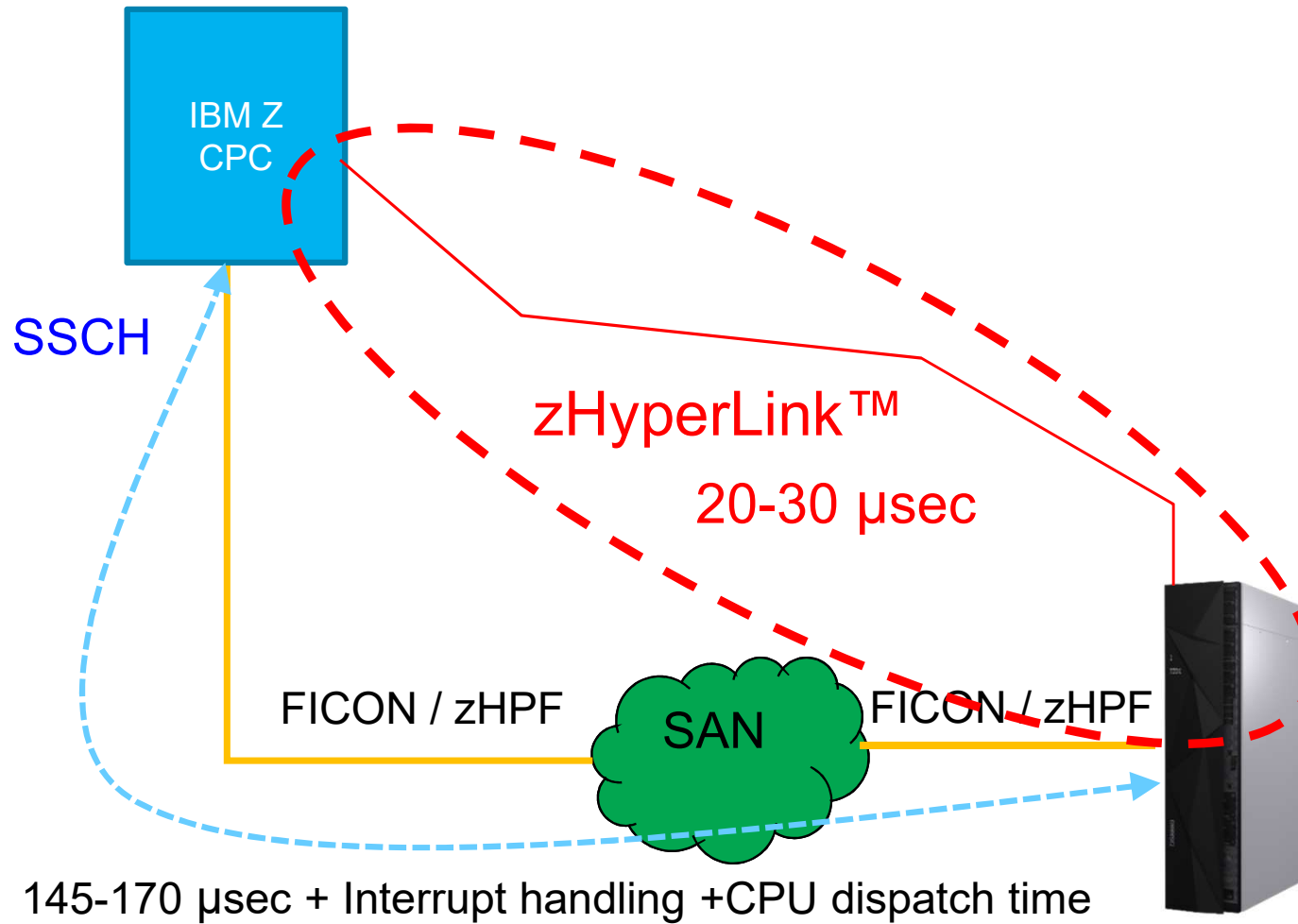
IBM Z - Today's I/O



Notes:

- Typically over 80% cache hit ratio on random reads.
- 100% cache hit on writes.

IBM Z - I/O with IBM zHyperLink



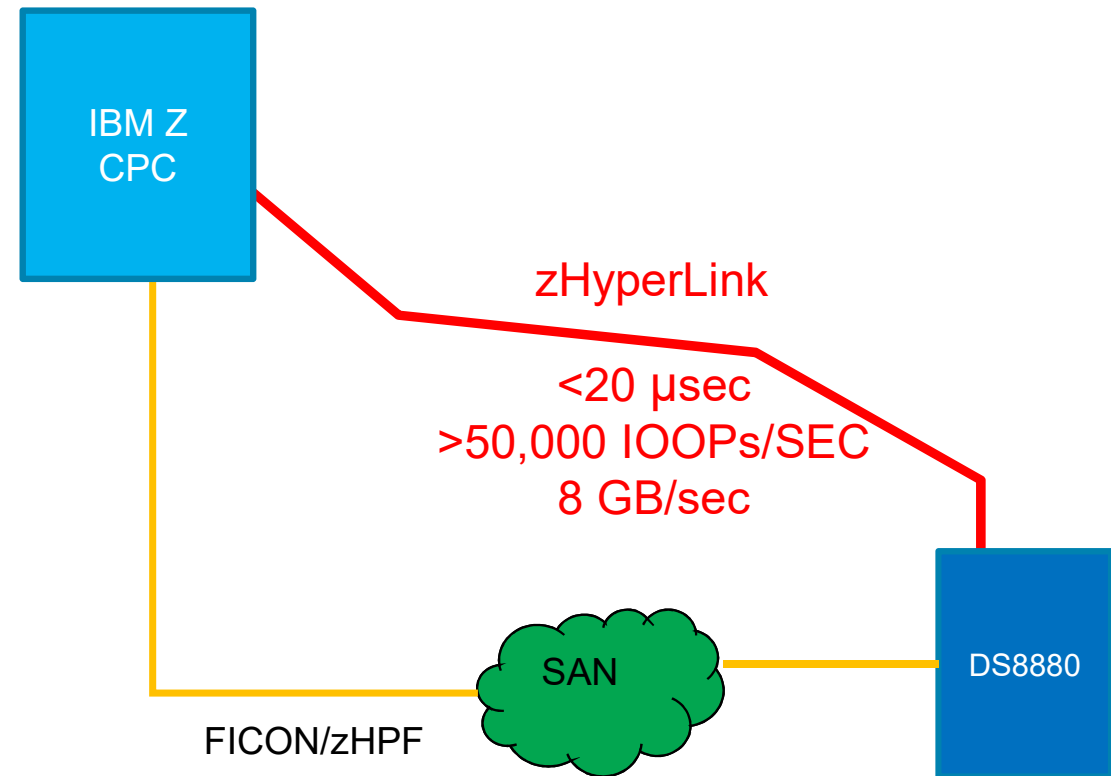
Notes:

- Typically over 80% cache hit ratio on random reads.
- 100% cache hit on writes.

How does IBM zHyperLink™ change the game?

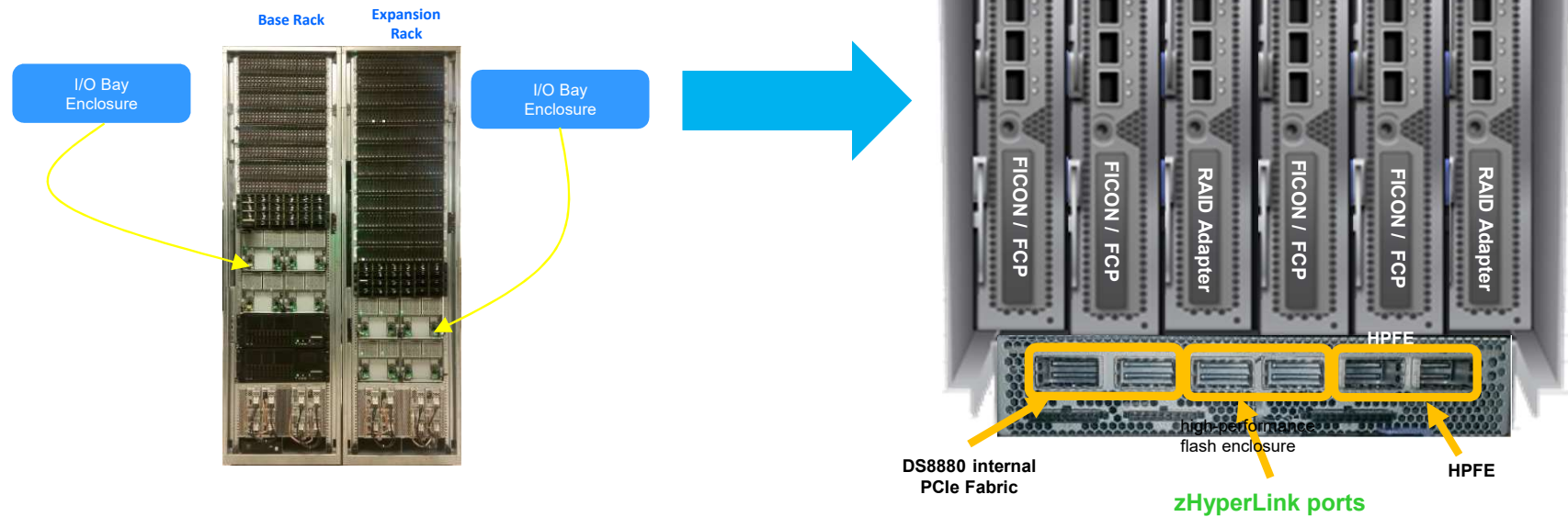
- zHyperLink™ is FAST enough the CPU can just wait for the data
 - No Un-dispatch of the running task
 - No CPU Queueing Delays to resume it
 - No host CPU cache disruption
 - Very small I/O service time
- Operating System and Middleware (e.g. DB2) are changed to keep running over an I/O
- Transparently gives DB2 apps fundamentally better latency than applications on platforms without zHyperLink
 - Excluding 100% in memory databases

- New industry I/O link for Mainframe



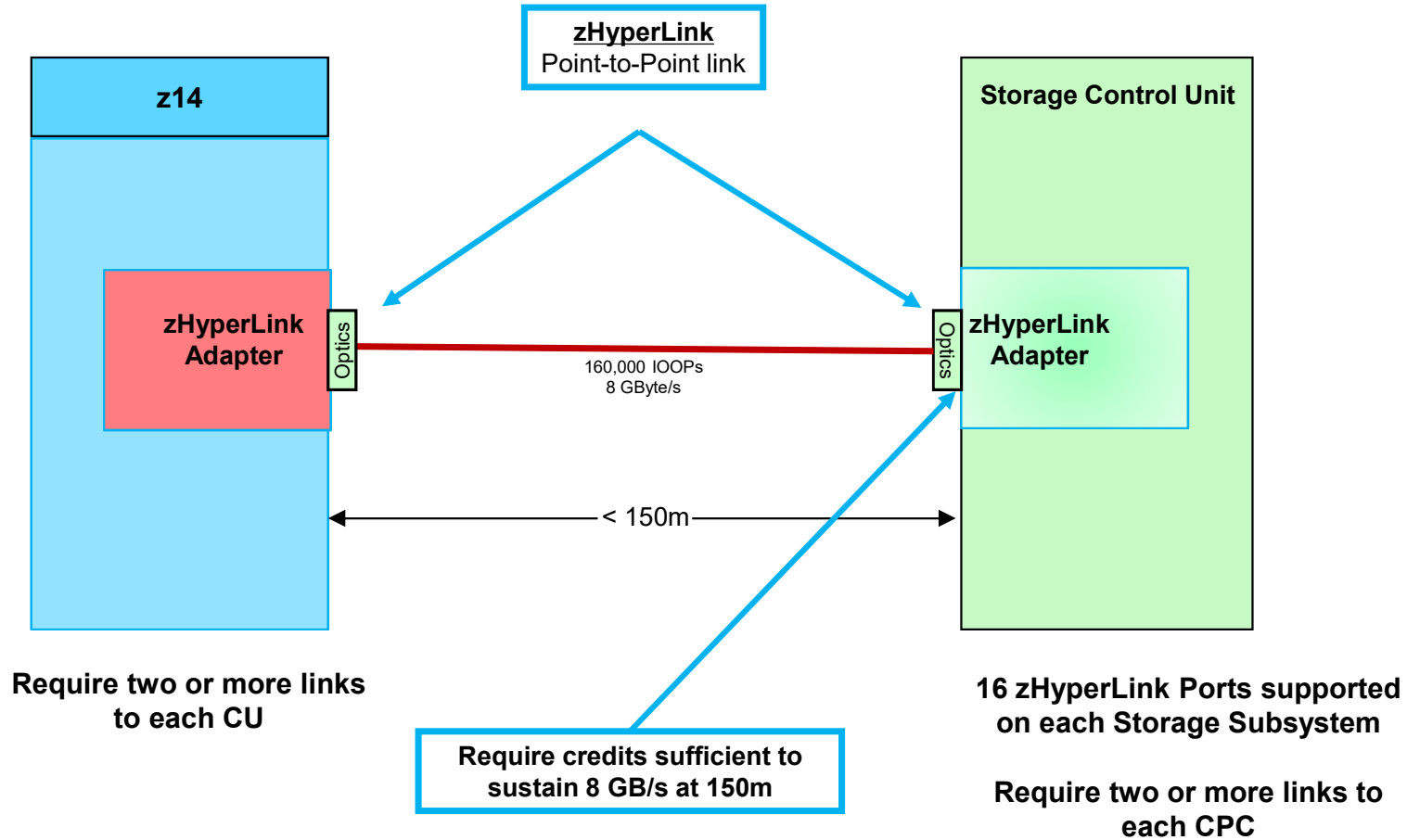
DS8880 zHyperLink™ Ports

The DS8880 I/O bay supports to six external interfaces using a CXP connector type.



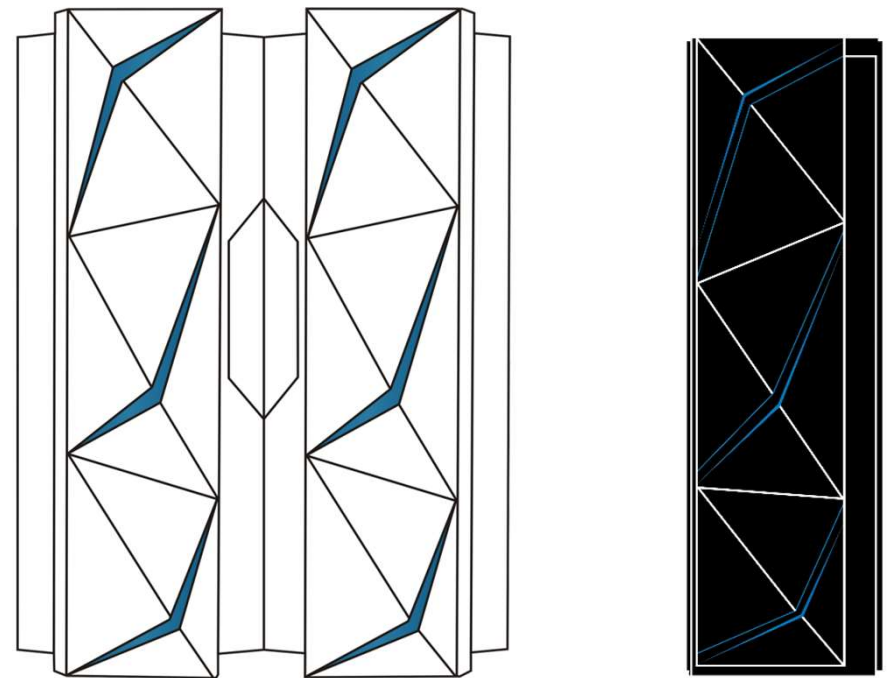
Investment Protection – DS8880 hardware shipping 4Q2016 (models 984, 985, 986 and 988), older DS8880's will be field upgradeable at GA

zHyperLink Physical Connectivity*



*Note: A standard FICON channel (CHPID type FC) is required for exploiting the zHyperLink Express feature

zHyperLink – Phase 1 – „Read“ Support



IBM zHyperlink Express

General Availability – December 8, 2017

Db2 read support (Batch and Transactions)
(IMS, CICS, etc. exploitation of zHyperLinks via Db2)
Db2 V12 and later

Statements of Direction

VSAM Read Support (Batch and Transactions)
(IMS, CICS, etc. exploitation of zHyperLinks via
VSAM)

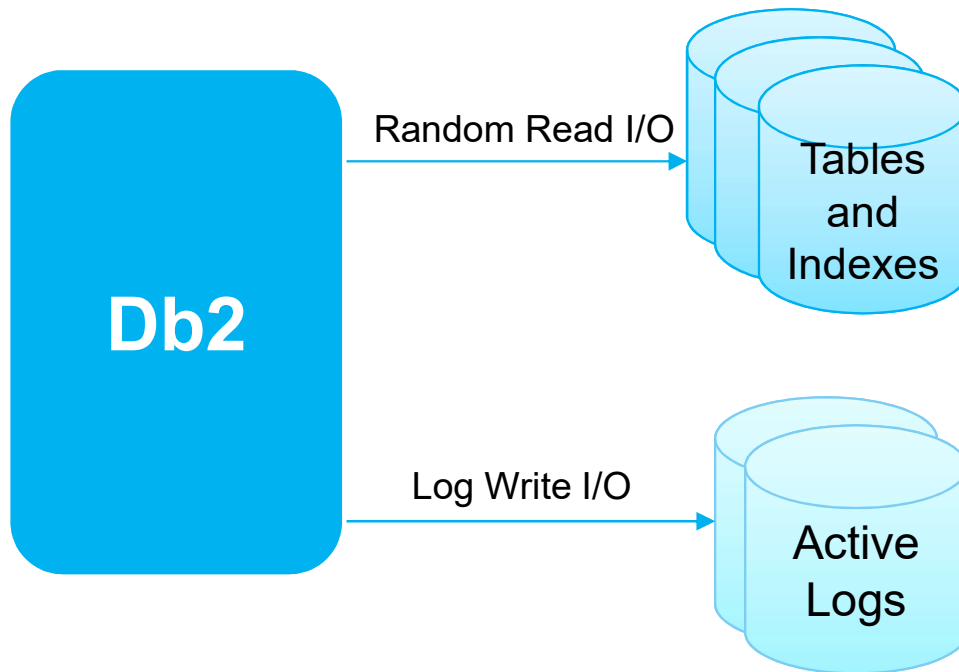
fulfilled – September 2018

Db2 Write Support

December 2018



zHyperLink and Db2 Exploitation



- **Phase 1** : Random data base read I/Os
 - Available since end of 2017
- **Phase 2** : Log Write I/Os
 - Target GA: Dezember 2018
 - Transparent from Db2 and applications
 - Controlled by z/OS or Db2 system parameters
 - New instrumentation

zHyperLink Phase 1

Prereqs

- H/W : z14, DS8K, zHyperLink link connection
- S/W updates : z/OS, DFSMS, Db2 (APAR PI82575)

Db2 synchronous DB read I/O

- Eligible I/O - 4K, 8K, 16K page size, and disk cache hit
- **Benefits:**
 - Improved [transaction response times, throughput and concurrency improvements](#) with no application changes
 - [Dramatic read I/O latency improvement, up to 7x faster](#) (based on preliminary measurements)
 - Additional value for modern workloads which tend to drive [more random data access as compared to traditional workloads](#)
- New Db2 Zparm: [ZHYPERSLINK](#)
- [New accounting and statistics](#) to report zHyperLink use
- Planning for zHyperlinks:
 - New [accounting fields](#) to report read I/O with DASD cache hit
 - [zBNA tool](#) : SMF 42-6 to indicate the data base I/O which are zHyperLink eligible

Software Deliveries

Fix Category: IBM.Function.zHyperLink

Exploitation for zHyperLink Express:

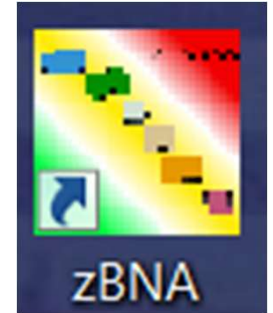
FMID	APAR	PTF	Comments
=====	=====	=====	=====
HBB7790	OA50653		BCP (IOS)
HDZ2210	OA53199		DFSMS (Media Mgr, Dev. Support)
	OA50681		DFSMS (Media Mgr, Dev. Support)
	OA53287		DFSMS (Catalog)
	OA53110		DFSMS (CMM)
	OA52329		DFSMS (LISTDATA)
HRM7790	OA52452		RMF

Exploitation support for other products:

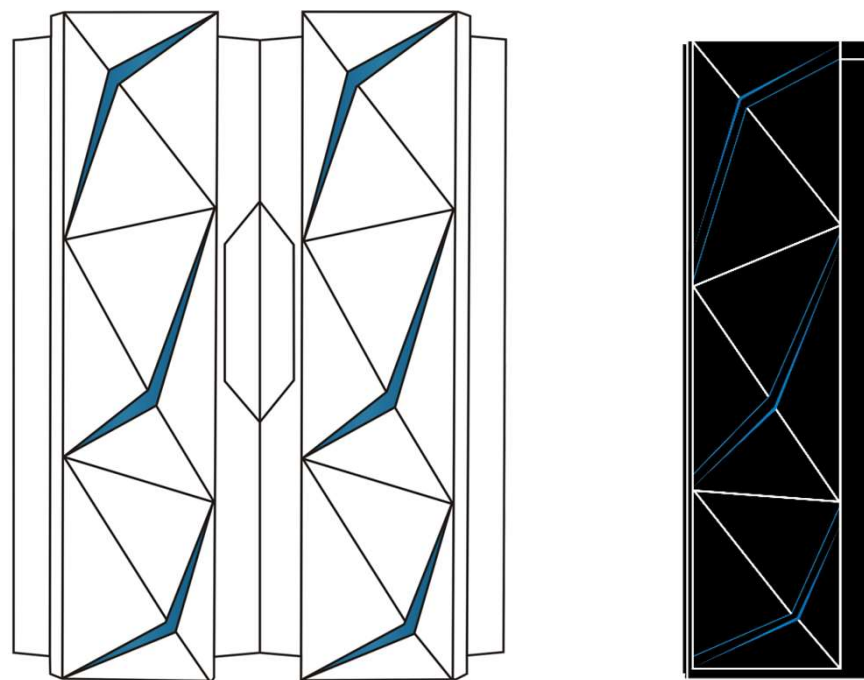
FMID	APAR	PTF	Comments
=====	=====	=====	=====
HDBCC10	PI82575		DB2 12 support - zHyperLink Exploitation
HDZ2210	OA52876		VSAM RLS zHyperlink Exploitation
	OA52941		VSAM zHyperlink Exploitation.
	OA52790		SMS zHyperlink Exploitation

IBM Z Batch Network Analyzer

- IBM Z Batch Network Analyzer
 - A no charge, “as is” tool to analyze batch windows
 - Available to Customers, Business Partners and IBMers
 - PC based, and provides graphical and text reports
 - Including Gantt charts and support for Alternate Processors
- Available from IBM Z WSC CPS Tools team
 - IBMers: <http://w3.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS5126>
 - BP's: https://www.ibm.com/partnerworld/wps/servlet/mem/ContentHandler/tech_PRS5133
 - Customers: <http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS5132>
- **zHyperLink Support**
 - Top Data Set Candidate List for zHyperLink
 - Able to filter the data by time
 - Ability to estimate the benefit of zHyperLinkactivities
- Generate customer reports with text and graphs to show zHyperLinkbenefit
- Provide support to aggregate zBNALPAR results into CPC level views
- A new version of CP3KEXTR and PTFs (APAR OA52133) will be required to perform this analysis



zHyperLink – Phase 2 – „Write“ Support



zHyperlink Support with IBM z14 GA2

z14 GA1 - Read Support

z14 GA2 – Write Support

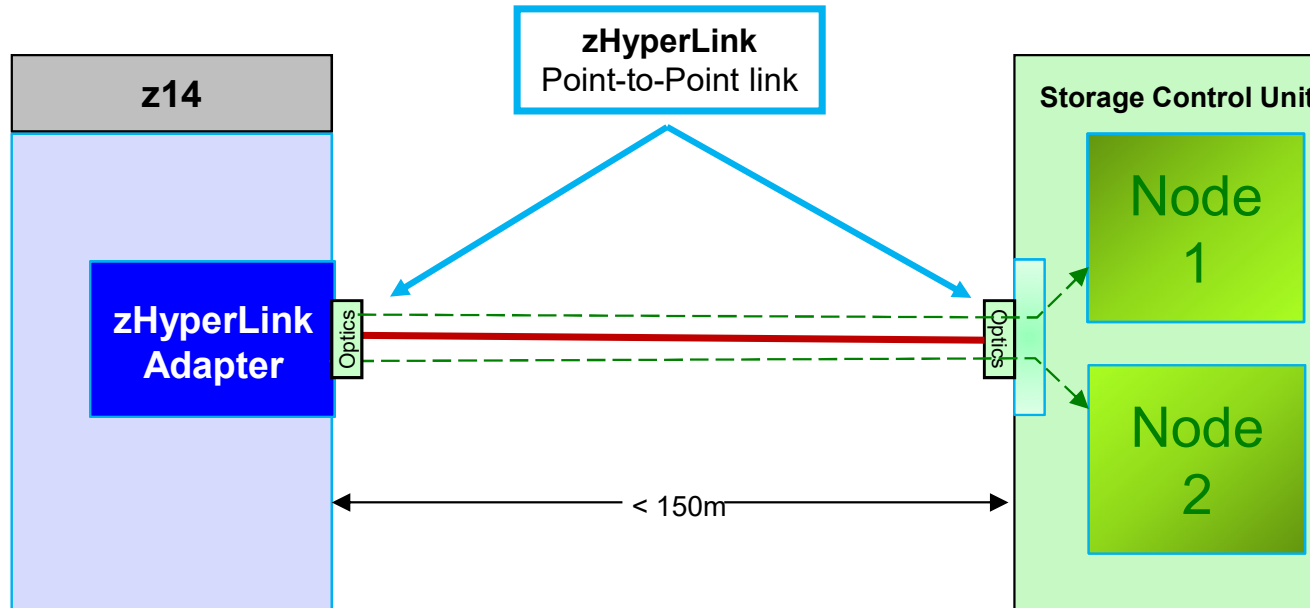
- Improved high Db2 insert workload
- Improved Db2 Commit duration
- Reduced lock hold times
- DS8K Rel. 8.5.1 (Available 12/2018)



Sizing and Controlling zHyperlink

- **Identify a data set or set of data sets to test, using the zBNA tool.**
 - IBM zCTS personnel in **Federal, US, and Canada only** can engage WSC z Systems Capacity Planning Services for help running a capacity planning, **zBNA**, or server consolidation study.
- **Issue a VARY SMS command for the specific data set to enable zHyperLink and see what the impact is. This change is not permanent. An IPL will reset it (or another VARY SMS command).**
 - **If happy with the results, then assign the data set to a storage class that supports zHyperLink or modify the existing storage class definition (assuming it doesn't have other data sets in the storage class where you don't want to use zHyperLink).**

zHyperlink – High Availability – Dual Writes / **Statement of Direction**



A synchronous write operation will move the data to two nodes of the storage subsystem for high availability. If there are more than two nodes, the storage subsystem will control which two nodes are written.

Prototype zHyperLink numbers* - 4K Read

Transfer Size	I/O Operation	Average RT (μsec)	IOPs
4K	zHPF Read	120	6,500
	zHyperLink Read	20	45,000
4K	zHPF Write	TBD	
	zHyperLink Write	TBD	

- z/OS I/O interrupt and dispatcher times vary depending on work load
- Comparison Assumptions
 - No dispatch latency included: response time - zHyperLink I/O 6 times better latency
 - Assume 50 usec dispatch latency to zHPF response time - zHyperLink I/O 8.5 times better latency
 - Assume 100 usec dispatch latency to zHPF response time - zHyperLink I/O 10 times better latency

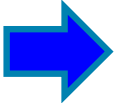

Disclaimer: This result was measured in a controlled environment running an I/O driver program under z/OS on a z14. The actual link latency that any user will experience may vary. Link latency only accounts for a portion of I/O latency as experienced by an application. It reflects part of the benefit that zHyperLink Express provides for z/OS, middleware, and client applications.

***Note: Does not include z/OS dispatcher overhead**

Sample DB2 Transactional Latency on z/OS with zHyperlink Express

Latency Breakdown for a simple transaction

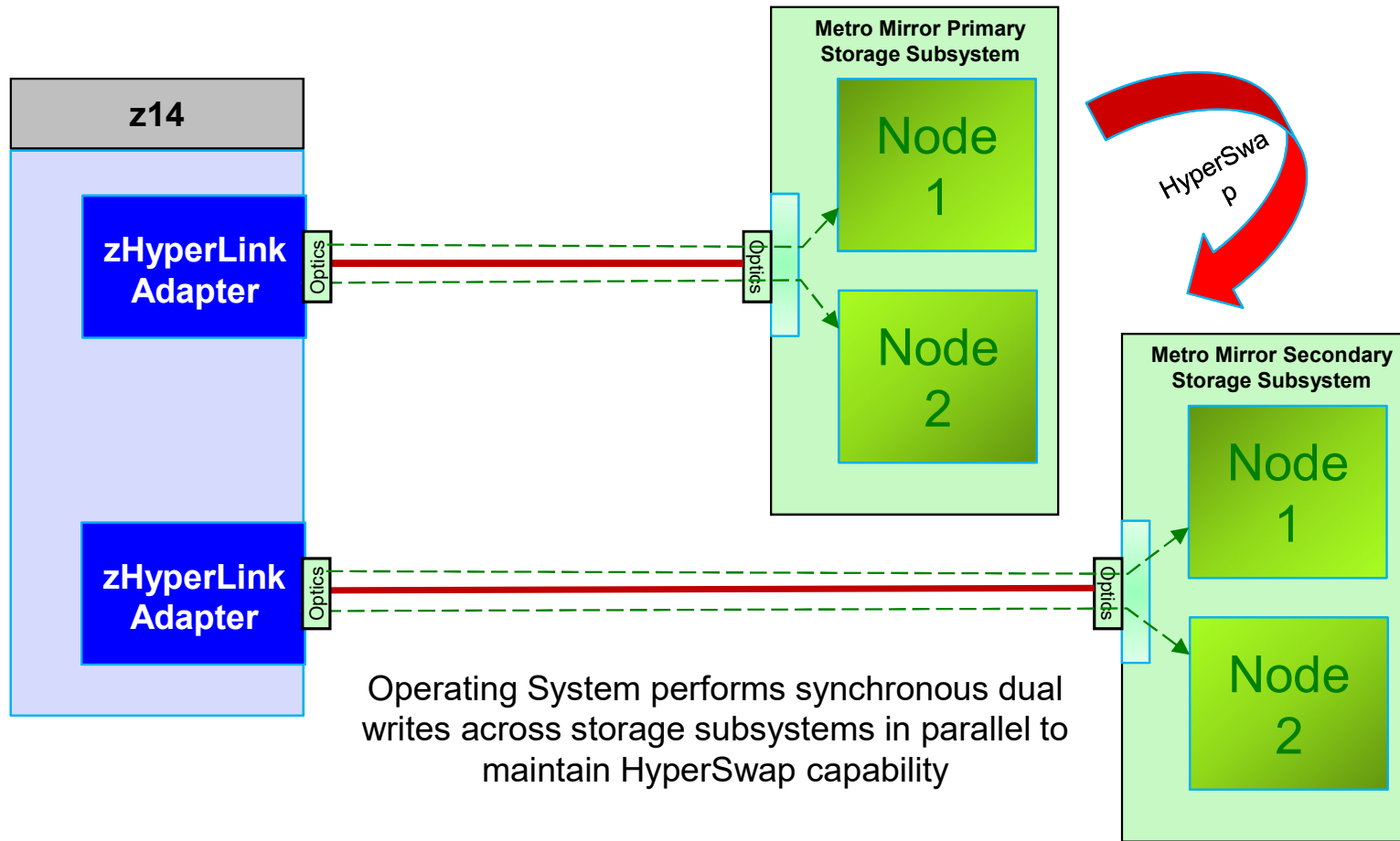
	Current	Projected with zHyperLink
DB2 Server CPU time:	5%	5%
Lock/Latch + Page Latch:	2-4%	1-2%
I/O service time	60-65%	5-7%
Dispatcher (CPU) Latency:	20-25%	5-10%
Network (TCP/IP):	4-6%	4-6%
Savings		80%

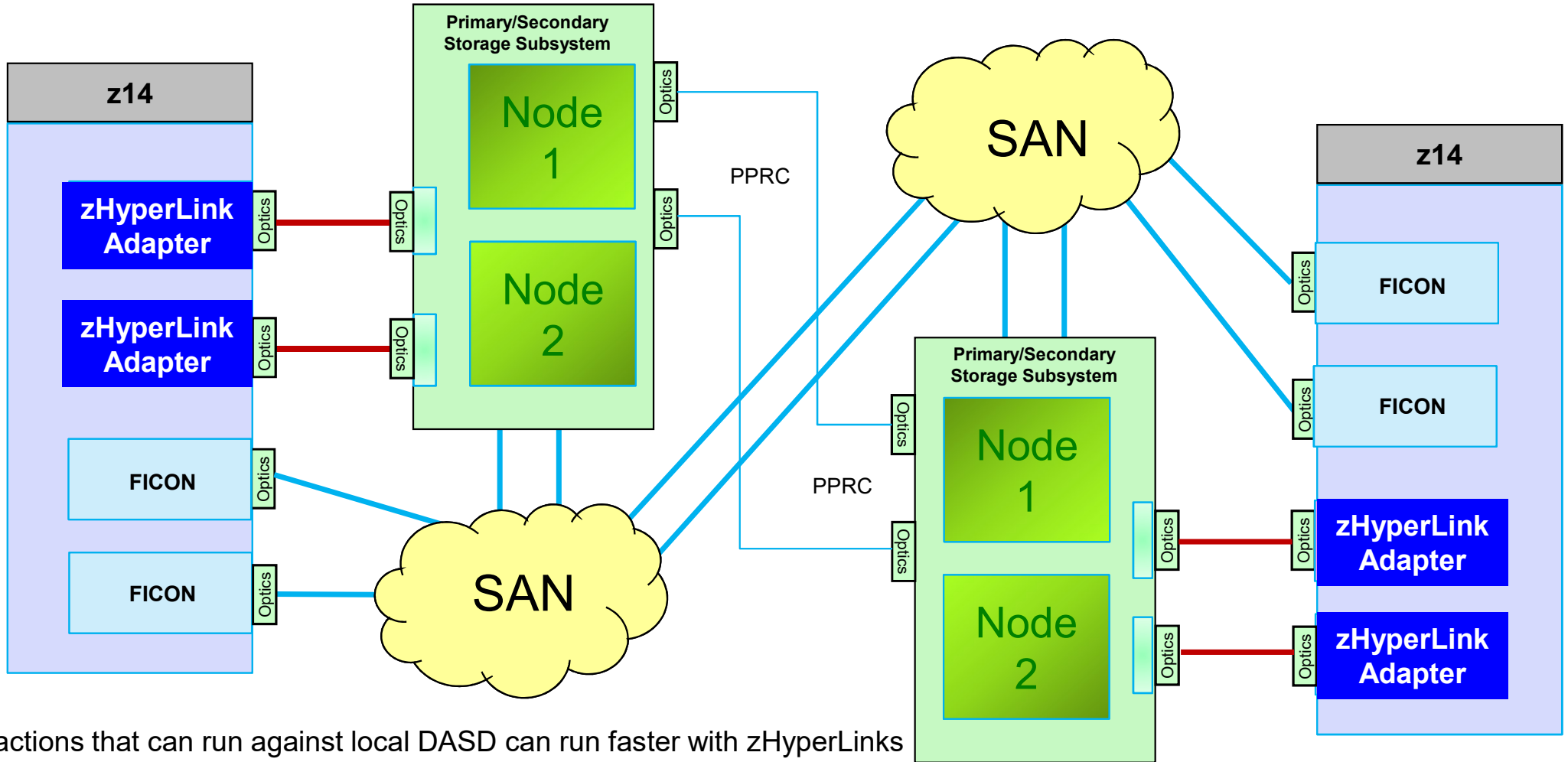
IBM zHyperLink Clarifications:

- Clarification of some potential confusion about zHyperLink Express and its usage with FICON Express features (FICON Express16S+, FICON Express16S & FICON Express8S).
 - zHyperLink Express is NOT a replacement for FICON Express features, it is complementary.
 - DB2 synchronous reads will be the initial exploiter of zHyperLinks. Additional exploitation will be announced and delivered in the future as the functions become available. (e.g. there are currently Statement of Directions for VSAM support and DB2 active log write support but no availability dates have been identified)
 - The z14 will optimize the system performance by utilizing both the zHyperLink and FICON Express features based on the specific middleware request and I/O operation characteristics.
 - IBM recommends that clients NOT change their FICON configurations (i.e. required number of FICON Express features or the use of a Storage Area Network (SAN)). zHyperLink Express is a short distance point to point connection that does not connect to a SAN.

zHyperlink – Continuous Availability – Synchronous zHyperWrite / Future

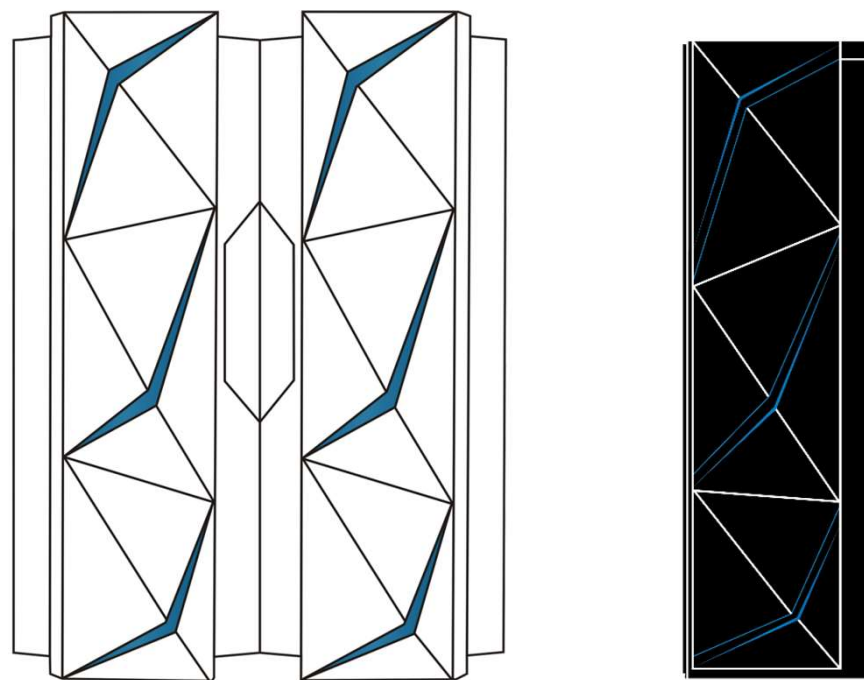


zHyperlink – Stretch Sysplex with Asymmetric Performance / Future



Transactions that can run against local DASD can run faster with zHyperLinks

zHyperlink Cabeling and HCD I/O Gen



zHyperLink Connectivity

- A standard FICON channel (CHPID type FC) is required for exploiting the zHyperLink Express feature
- A customer-supplied 24x MTP-MTP cable is required for each port of the zHyperLink Express feature. The cable is a single 24-fiber cable with Multi-fiber Termination Push-on (MTP) connectors.
- Internally, the single cable houses 12 fibers for transmit and 12 fibers for receive (Ports are 8x, similar to ICA SR).

- Two fiber type options are available with specifications supporting different distances
- for the zHyperLink Express:
 - 150m: OM4 50/125 micrometer multimode fiber optic cable with a fiber bandwidth @wavelength: 4.7 GHz-km @ 850 nm.
 - 100m: OM3 50/125 micrometer multimode fiber optic cable with a fiber bandwidth @wavelength: 2.0 GHz-km @ 850 nm.

zHyperLink Cable

(same used for ICA SR)



Part Number	Length meters (feet)
00JA683	1 m (3.28')
00JA684	2 m (6.56')
00JA685	3 m (9.84')
00JA686	5 m (16.40')
00JA687	8 m (26.24')
00LU282	10 m (32.80')
00LU283	13 m (42.65')
00JA688	15 m (49.21')
00LU669	20 m (65.61')
00LU284	40 m (131.23')
00LU285	80 m (262.36')
00LU286	120 m (393.78')
00LU287	150 m (492.12')

For more information, see IBM Z Planning for Fiber Optic Links ((FICON/FCP, Coupling Links, Open Systems Adapters, and zHyperLink Express), GA23-1408.

Defining zHyperLinks in the I/O Configuration

- Defined in the I/O configuration as a “Function”
 - Has a PFID, virtual function number, LPAR access and candidate list
 - Like zEDC, RoCE, SMC-direct (ISM)
- Up to 127 PFIDs/virtual functions may be defined for a single synch I/O link
 - Shareable by up to 127 LPARs or multiple PFIDs/virtual functions may be assigned to a single LPAR
 - Note: Individual PFID may be configured online to a single LPAR at a time
 - Max number of virtual functions is arbitrary. Unlike zEDC and RoCE, it’s not constrained by the firmware on the card (there is none)
- For each zHyperLink port, define up to 4 PFIDs per LPAR
 - For each link, the storage controller can handle up to 4 simultaneous requests (per node)
 - If the maximum number of requests is reached, new requests are rejected by z14 firmware (I390) with a PCI function busy response

HCD – Defining a zHyperLink

Add PCIe Function

CBDPPF10

Specify or revise the following values.

```

Processor ID . . . . . : S35
Function ID . . . . . 300_
Type . . . . . ZHYPERLINK +
Channel ID . . . . . 1C0 +
Port . . . . . 1 +
Virtual Function ID . . . . . 1__ +
Number of virtual functions . . 1
UID . . . . . _____

Description . . . . . _____
    
```

F1=Help F2=Split F3=Exit F4=Prompt F5=Reset F9=Swap
F12=Cancel

zHyperLink type

Two ports on card use the same physical channel id

Port number must be specified (1 or 2 on processor)

IOCP – zHyperLink Definition

- ***Function type is HYL***

```
FUNCTION TYPE=HYL,  
    PCHID=100,  
    PORT=1,  
    FID=200,  
    VF=19,  
    PART=(LP4)
```

```
FUNCTION TYPE=HYL,  
    PCHID=100,  
    PORT=2,  
    FID=201,  
    VF=127,  
    PART=((LP8),())
```

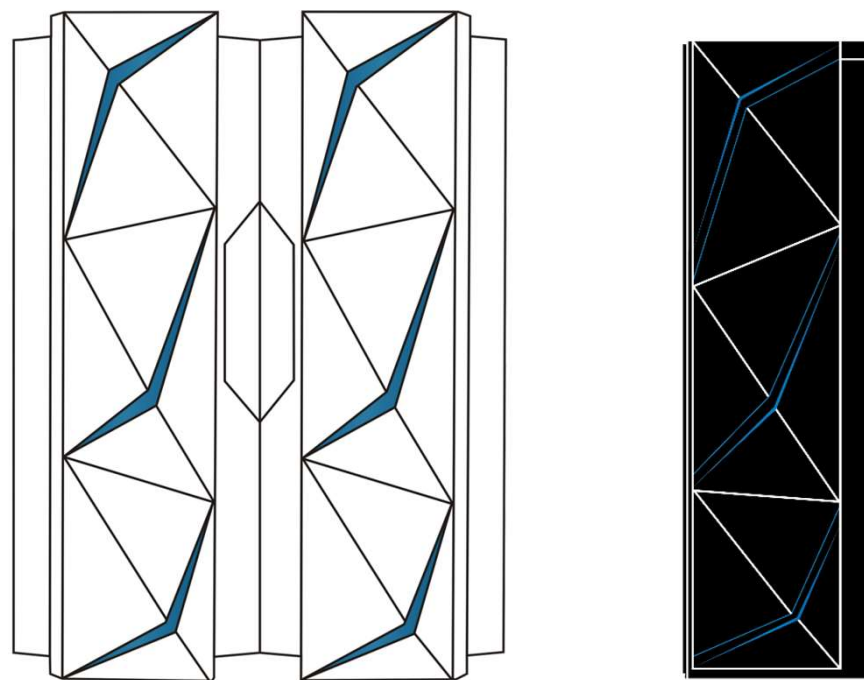
Define both ports on a zHyperLink card (same PCHID but different port numbers)

A Device is Enabled for zHyperLink Reads if...

- The processor supports zHyperLink
 - Store logical processor characteristics (SLPC) CLP instruction
 - z/OS will also disable if MACHMIG TX was specified in LOADxx to disable the transactional execution facility
- z/OS is enabled for zHyperLink reads
 - IECIOSxx or SETIOS ZHYPERLINK,OPER=READ or OPER=ALL
- The control unit supports zHyperLink read requests
 - Read feature codes has zHyperLink read capability set (byte 57, bit 0)
 - Returned in the DSE1 parameter list during path validation (IECVIOPM) and saved in the SSCB
- The world wide node name (WWNN) has been read for the control unit
 - Allows us to locate the links for the devices defined for the control unit
 - IOSVSCBX reads the WWNN and saves it in the SSCB
- There are usable zHyperLinks that are connected to the control unit

zHyperLink

z/OS Support and (enhanced) Commands



Parmlib and SETIOS Support

- New keyword in IECIOSxx and SETIOS to enable or disable zHyperLink
 - Separately disable reads vs writes
 - Maybe control other attributes of synch I/O in the future (e.g., max transfer size)
 - No device or LCU granularity
 - Default is NONE

```
IECIOSxx: ZHYPERLINK OPER=[ALL|READ|WRITE|NONE]
```

```
SETIOS ZHYPERLINK,OPER==[ALL|READ|WRITE|NONE]
```

```
D IOS,ZHYPERLINK
```

```
IOS634I hh.mm.ss IOS SYSTEM OPTION
```

```
ZHYPERLINK IS {ENABLED FOR READ AND WRITE OPERATIONS}
```

```
                  {ENABLED FOR [READ|WRITE] OPERATIONS}
```

```
                  {DISABLED}
```

```
                  {NOT SUPPORTED BY THE PROCESSOR}
```

D PCIE

D PCIE

```
IQP022I 11.29.11 DISPLAY PCIE 370
PCIE 0010 ACTIVE

PFID DEVICE TYPE NAME STATUS ASID JOBNAME CHID VFN PN
00004002 8GB zHyperLink ALLC 0017 IOSAS 01C0 0001 1
00004003 8GB zHyperLink ALLC 0017 IOSAS 01C0 0001 2
00004000 8GB zHyperLink ALLC 0017 IOSAS 027C 0001 1
00004001 8GB zHyperLink ALLC 0017 IOSAS 027C 0001 2
```

D PCIE,PFID=4000

```
IQP024I 11.30.23 DISPLAY PCIE 372
PCIE 0010 ACTIVE

PFID DEVICE TYPE NAME STATUS ASID JOBNAME CHID VFN PN
00004000 8GB zHyperLink ALLC 0017 IOSAS 027C 0001 1

CLIENT ASIDS: NONE

CU WWNN: 5005076307FFD2AD CU Link Id: 0080

S/W State: Allocated

Port State: Operational

CU Node Descriptor: 002107.981.IBM.75.0000000YZ981
```

D M=DEV Changes

```

IEE174I 16.10.51 DISPLAY M 652
DEVICE 08400      STATUS=ONLINE
CHP              3D    4D    3E    4E    3F    4F
ENTRY LINK ADDRESS 17B7 1888 17A5 1897 17C9 18A3
DEST LINK ADDRESS 1750 1753 17D4 17D1 1752 17D3
PATH ONLINE       Y     Y     Y     Y     N     N
CHP PHYSICALLY ONLINE Y     Y     Y     Y     Y     Y
PATH OPERATIONAL  Y     Y     Y     Y     Y     Y
MANAGED           N     N     N     N     N     N
CU NUMBER         8400 8400 8400 8400 8400 8400
INTERFACE ID           0501 0510 0401 0413 0320 0101
MAXIMUM MANAGED CHPID(S) ALLOWED: 0
DESTINATION CU LOGICAL ADDRESS = 50
SCP CU ND         = 002107.961.IBM.75.0000000BMN41.0502
SCP TOKEN NED     = 002107.900.IBM.75.0000000BMN41.5000
SCP DEVICE NED    = 002107.900.IBM.75.0000000BMN41.5000
WWNN                   = world-wide-node-name
HYPERPAV ALIASES CONFIGURED = 32
ZHYPERLINKS AVAILABLE = 8
FUNCTIONS ENABLED = MIDAW, ZHPF, XPAV, ZHYPERLINK

```

D M=DEV,ZHYPERLINK

New option to display the zHyperLink capabilities and why a device is not enabled for zHyperLink, New message id: IEE587I

```

IEE587I 16.10.51 DISPLAY M
652
DEVICE 08400      STATUS=ONLINE
DEVICE IS ENABLED FOR ZHYPERLINK
READ AND WRITE OPERATIONS ARE ENABLED

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D M=DEV Changes

- Interface ids
 - The interface ids are useful for determining whether CHPIDs share the same host adapter card (the first 3 digits represent the card)
 - The interface id line will be displayed if the device was online at some point in time or self description processing was performed for some other reason (e.g., offline device discovery or IOSODS).
 - If a D M=DEV(devno) command is issued and the particular path was never online to any device in the LCU, but other paths were online, the interface id will be displayed as “...”
 - If a D M=DEV(devno,(chpid)) command was issued in the above scenario, the interface id line would not be displayed
- WWNN
 - The WWNN will be displayed if the WWNN was read when a path first came online to the LCU
 - The current device must have been online at some point in time or self description processing must have been performed
- zHyperlinks available
 - If there are no zHyperlinks available, this line will not be displayed regardless of whether the device is enabled to use zHyperlinks.
 - A link is considered available (usable) if the PFID is online, the port is operational, and z/OS has allocated the PFID
 - Links where the PFID is offline, the port is not operational, or where z/OS failed to allocate the link are not included
- Functions enabled
 - If the device is enabled for zHyperlink reads and writes, then ZHYPERLINK is displayed
 - If the device is enabled for zHyperlink reads only, then ZHYPERLINK(R) is displayed
 - If the device is enabled for zHyperlink writes only, then ZHYPERLINK(W) is displayed

D M=CU Changes

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IEE174I 19.16.24 DISPLAY M 715
CONTROL UNIT 0700
CHP                43    44    45    20    65    75
ENTRY LINK ADDRESS B355 B353 B157 B051 .. ..
DEST LINK ADDRESS B37C B37D B17C B06B .. ..
CHP PHYSICALLY ONLINE Y    Y    Y    Y    Y    Y
...
ZHPF - CU INTERFACE Y    Y    Y    Y    Y    Y
INTERFACE ID          0501 0510 0401 0413 0320 0101
MAXIMUM MANAGED CHPID(S) ALLOWED = 0
DESTINATION CU LOGICAL ADDRESS = 07
CU ND              = 002107.000.IBM.PK.000000000003.0001
CU NED             = 002107.F20.IBM.PK.000000000003.0701
TOKEN NED          = 002107.900.IBM.PK.000000000003.0700
WWNN                = world-wide-node-name
FUNCTIONS ENABLED = ZHPF, ZHYPERLINK
DEFINED DEVICES
  00700,00710-00717
DEFINED PAV ALIASES
  00718,00719,10718
ZHYPERLINKS
PFID      PCHID Port LinkId S/W St      Port St
pfid     pchid p      link  sssssss pppppppp
pfid     pchid p      link  sssssss pppppppp

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Any Questions?

michael.grossmann@sva.de