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BSAM, QSAM, and BPAM Support of zHPF

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SHARE in Anaheim 2012

Thanks to the people that contributed to this line item and this presentation

- Lyle Merithew
- Sue Candelaria
- John Paveza
- Maya Kalavathibai
- Dale Riedy
- Harry Yudenfriend
- Aldo Paolo Dondi Diaz
- Yan Xu
- Lou Ricci
- Matthew Craig

Session objective

- Explain how BSAM, QSAM, and BPAM achieve better performance with zHPF architecture than with FICON architecture

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BSAM, QSAM, and BPAM (SAM) Support of zHPF

- BSAM - Basic Sequential Access Method
- QSAM - Queued Sequential Access Method
- BPAM - Basic Partitioned Access Method

- "Access methods are identified primarily by the data set organization" [z/OS DFSMS Using Data Sets, p.4]. BSAM and QSAM work with Physical Sequential data sets. And the BPAM zHPF support was implemented for sequentially accessing the member records of PDSs.

- BSAM, QSAM, and BPAM support of zHPF was implemented for sequential access (SAM) of non-Extended Format data records.

SAM Support of zHPF: Installation Pre-requisites

- zHPF is enabled system wide (UCBFCX bit of the UCB Common Extension is set to ON) via:
  - the option ZHPF=YES of the IECIOSxx member of PARMLIB, or
  - via the SETIOS ZHPF=YES command.

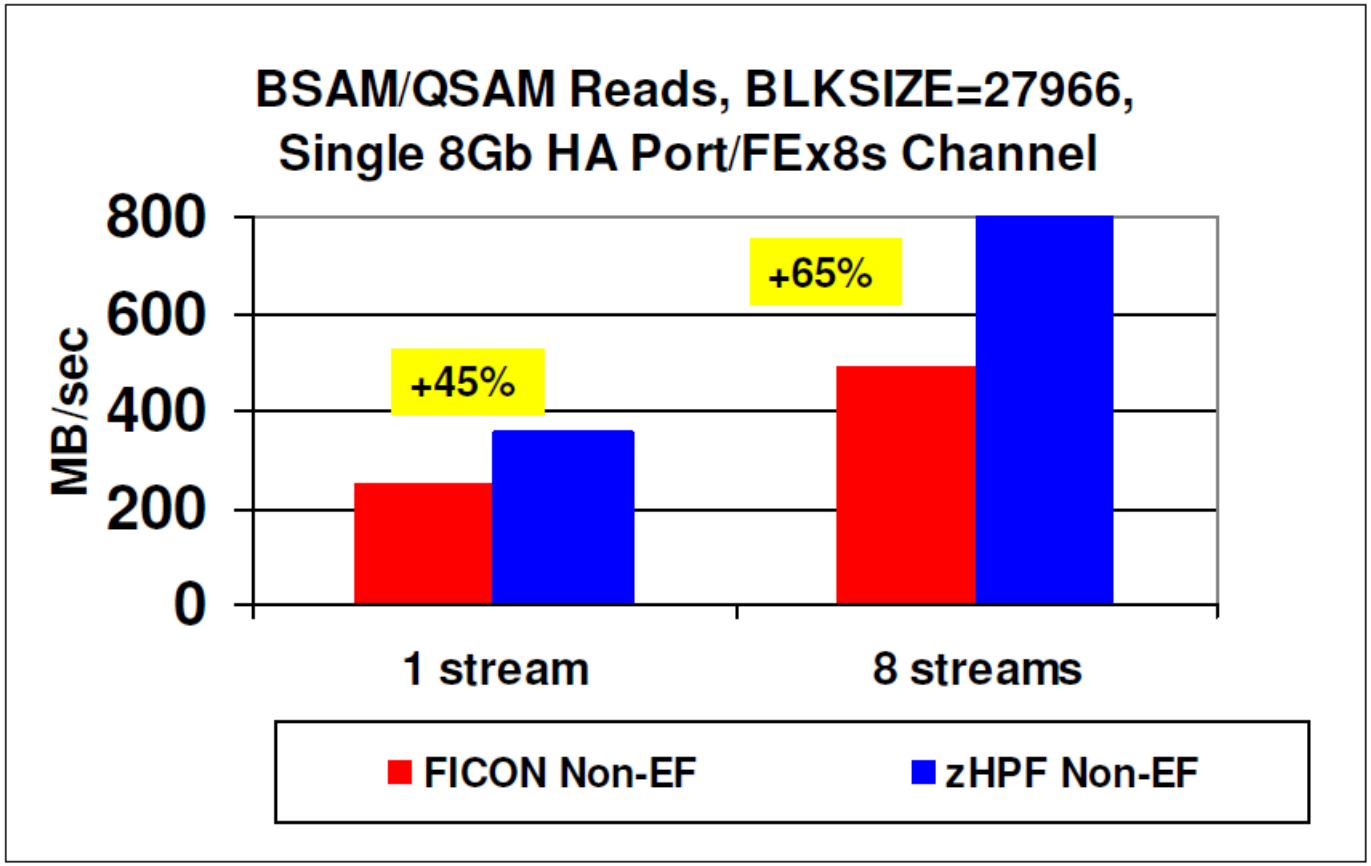
- zHPF is enabled for SAM (DFASAMHPF bit is set to ON) via:
  - the option SAM_USE_HPF(YES) of the IGDSMSxx member of PARMLIB, or
  - via the SETSMS SAM_USE_HPF=YES command.

SAM Support of zHPF: Hardware Dependencies

- DS8000 dependency: zHPF Phase 1 microcode level as specified in the Enterprise Disk Attachment Specification PCR 7030, FCR No.746 “zHPF Updates for QSAM/BSAM”:
  - Enterprise Disk DS8700 microcode Release 6.2 or
  - Enterprise Disk DS8800 microcode Release 6.2

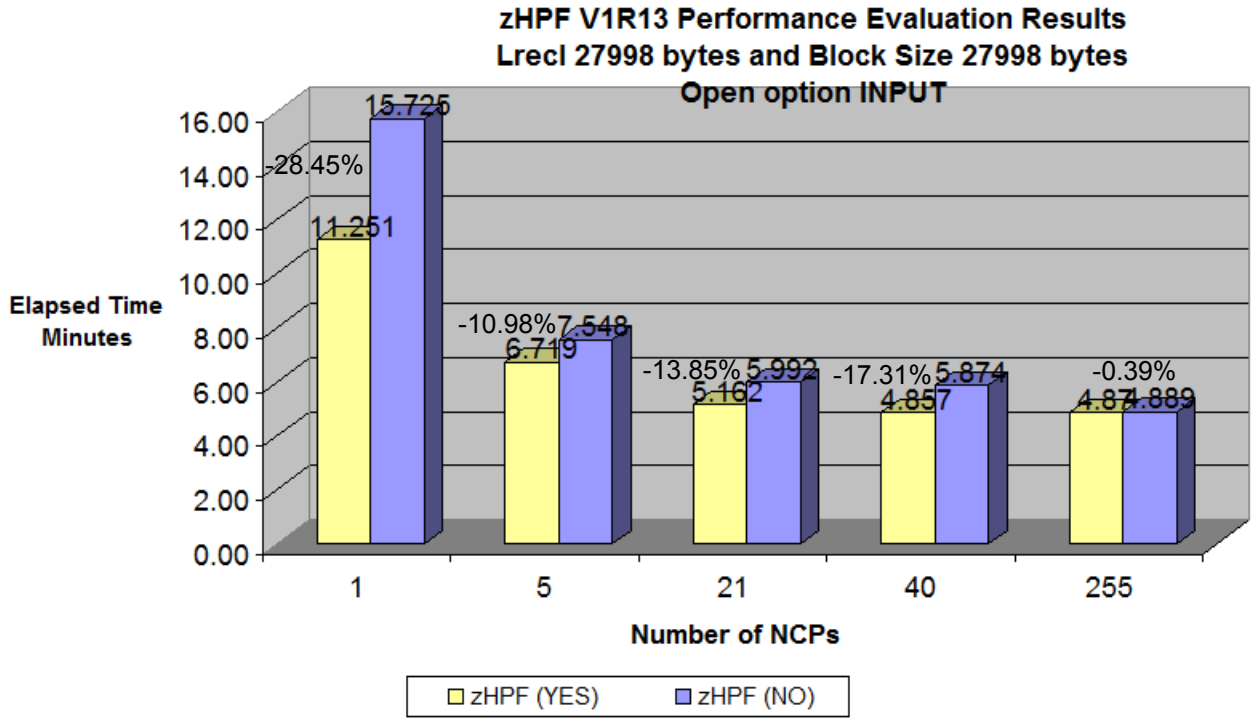
- Channel Subsystem dependency:
  - z10 and z196 GA-1: Required ODT fix for Y4164 provided in Bundle 6A in D93G:
    - Ficon Express8s level 0.20
    - Ficon Express8 level A.4E
    - Ficon Express4 level 5.4D
  - z196 GA-2: Required zHPF Incorrect Length Facility

Performance Slide #1: Bandwidth of BSAM/QSAM Reads



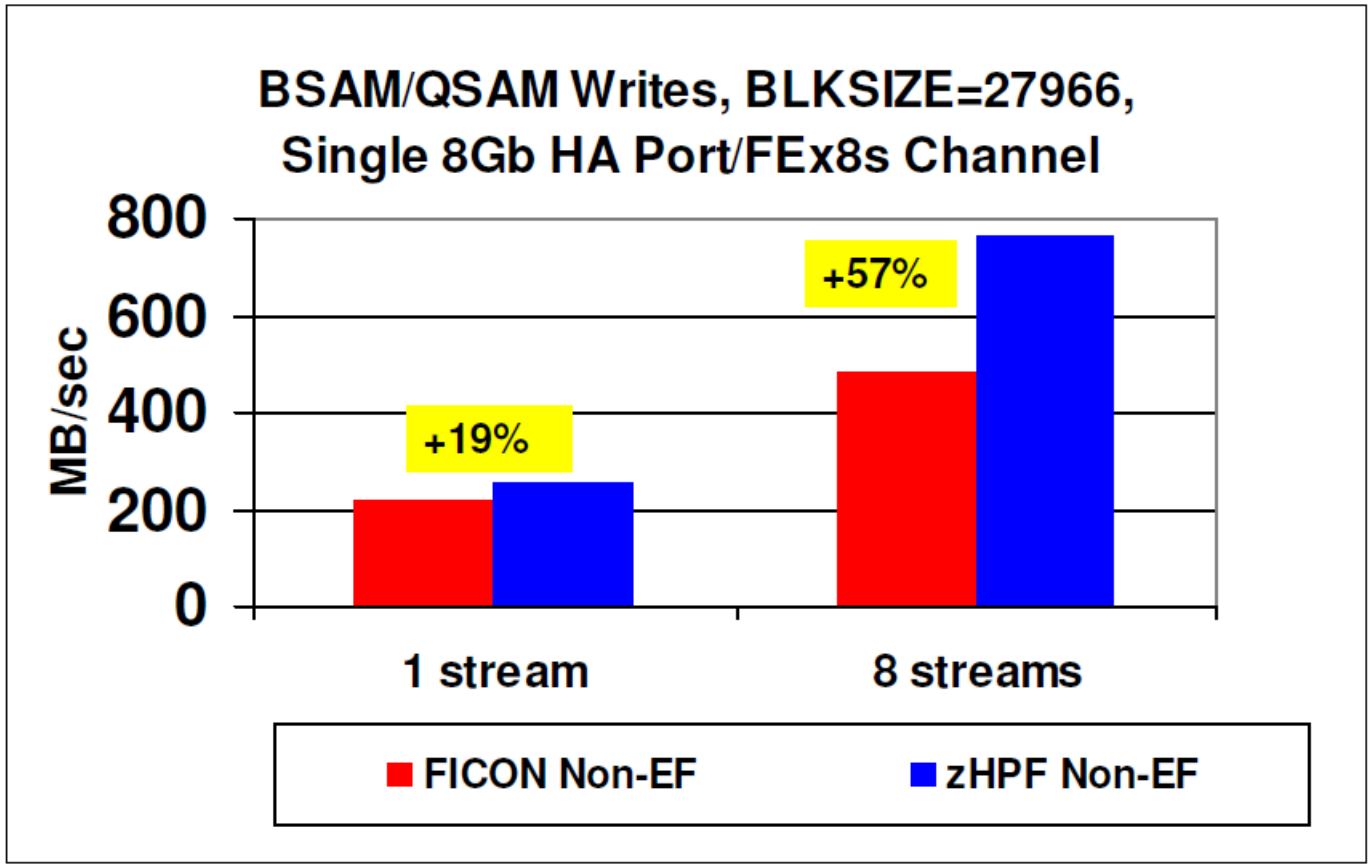
Yan Xu, Performance Analyst
IBM Systems & Technology Group, Systems Hardware Development

Performance Slide #2: Elapsed Time of BSAM Reads



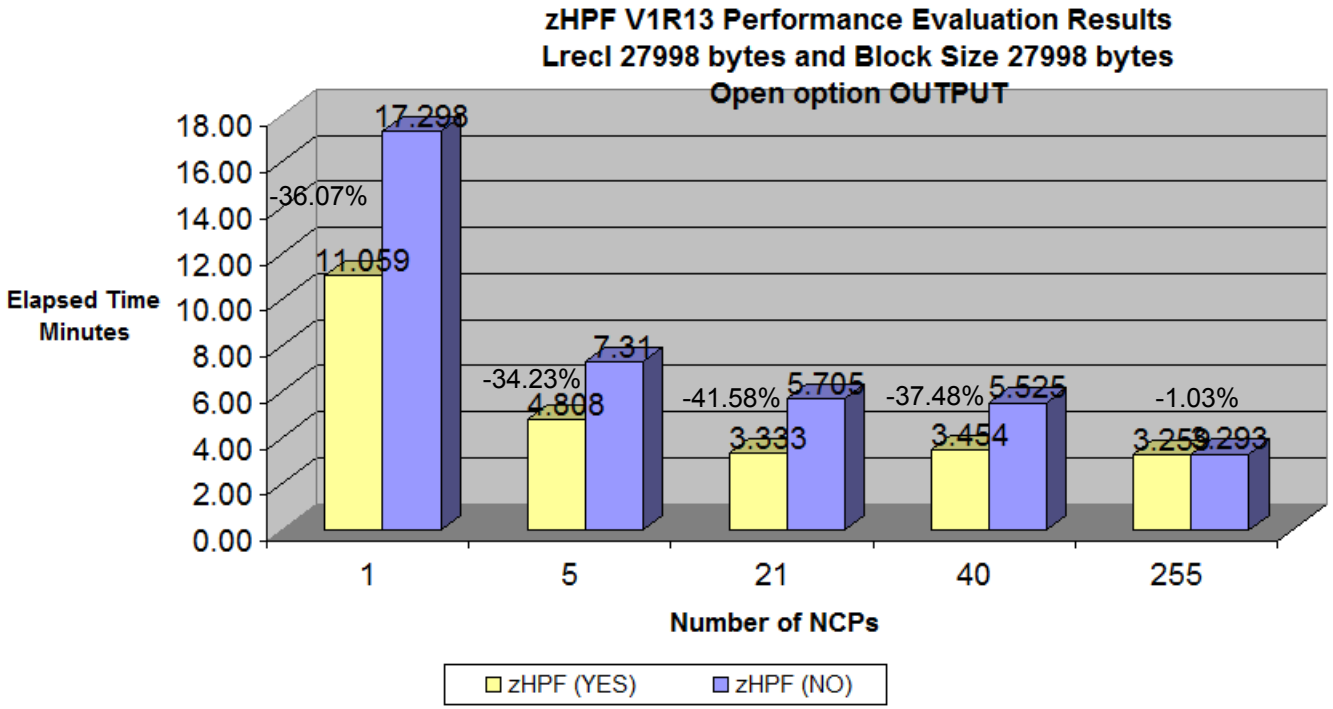
Aldo Paolo Dondi Diaz, Software Performance Analyst
IBM Systems & Technology Group, Systems Hardware Development

Performance Slide #3: Bandwidth of BSAM/QSAM Writes



Yan Xu, Performance Analyst
IBM Systems & Technology Group, Systems Hardware Development

Performance Slide #4: Elapsed Time of BSAM Writes



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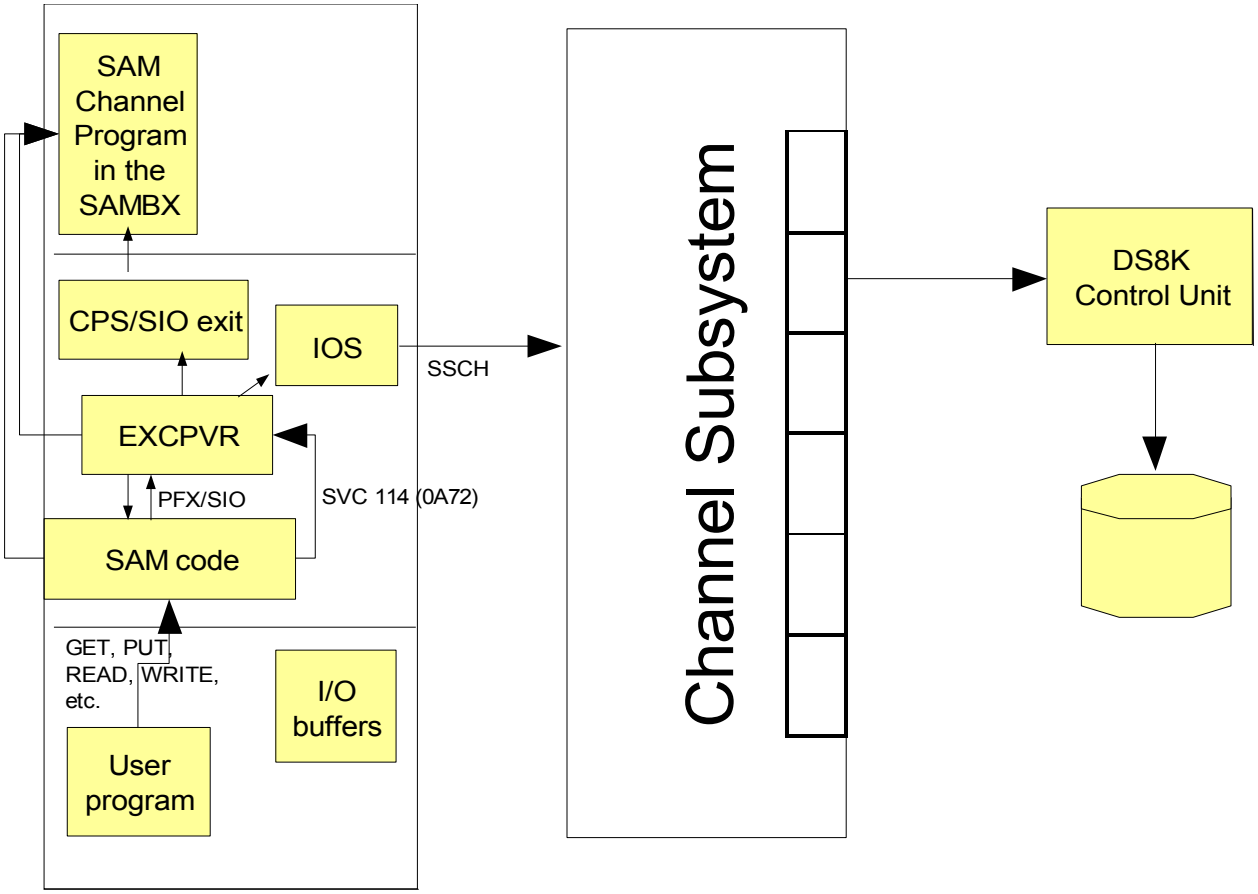
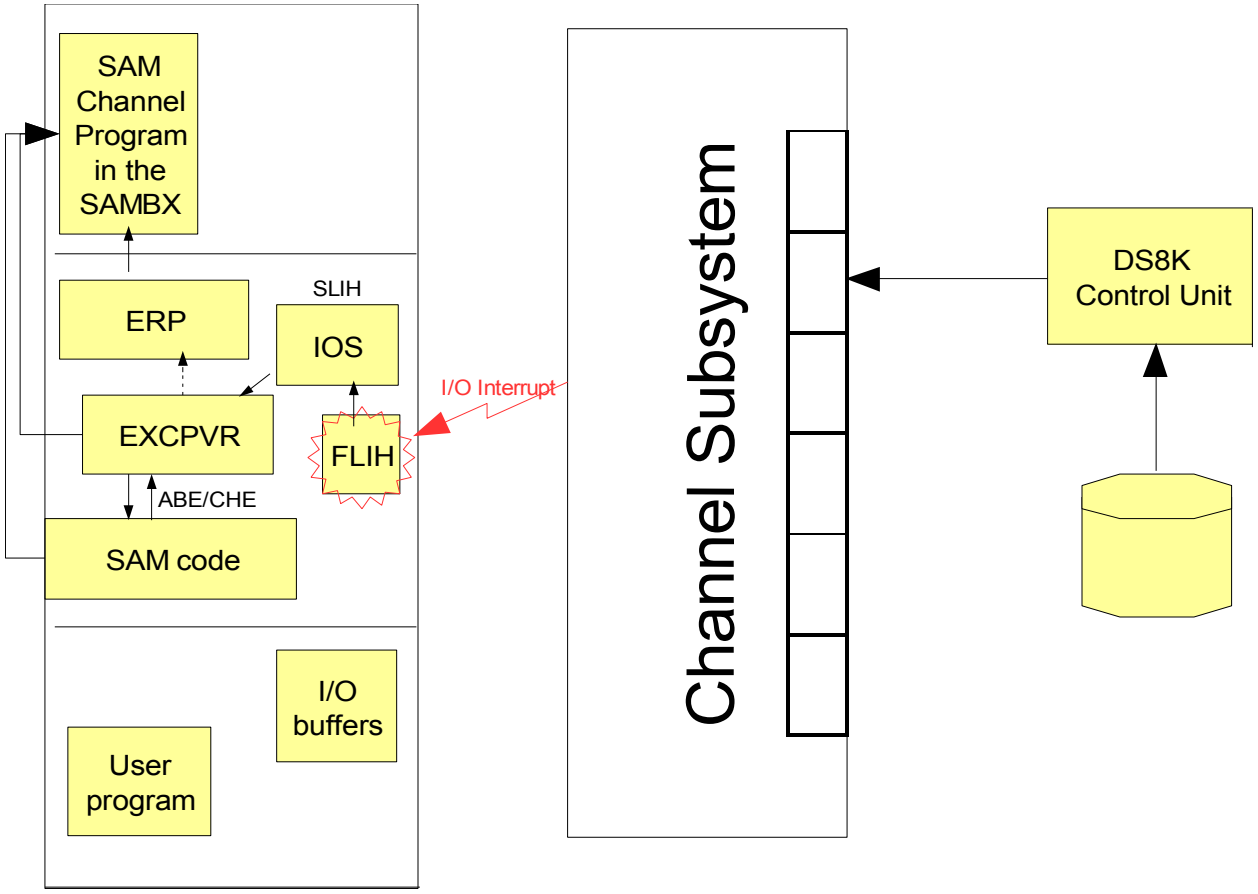
IBM Systems & Technology Group, Systems Hardware Development

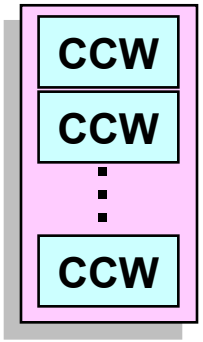
SAM I/O Execution Flow – Front End Processing



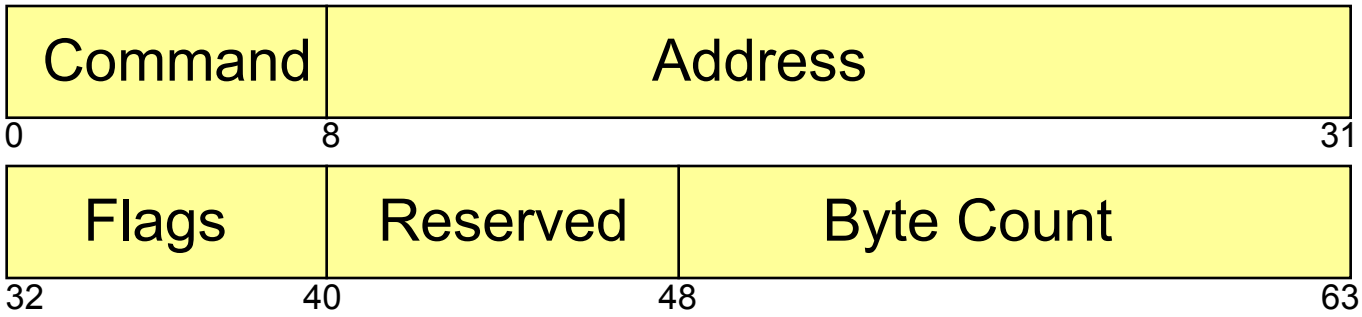
SAM I/O Execution Flow – Back End Processing



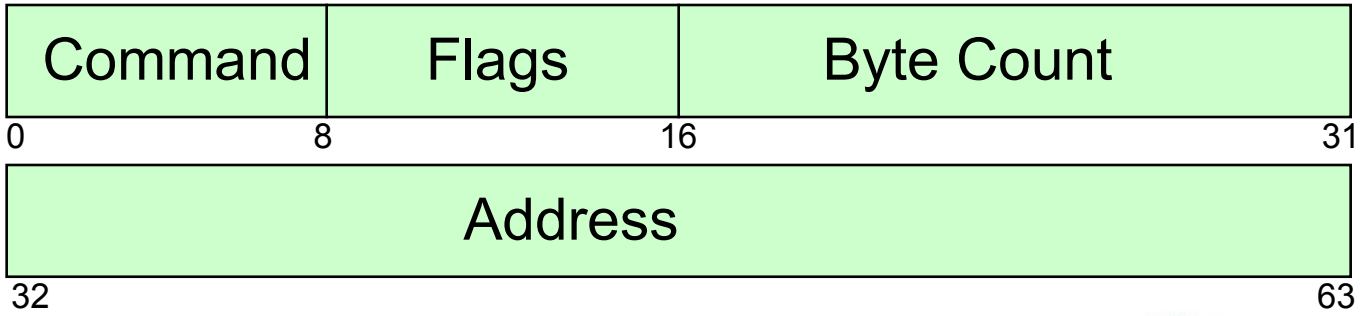
A CCW Channel Program – Command Mode ECKD



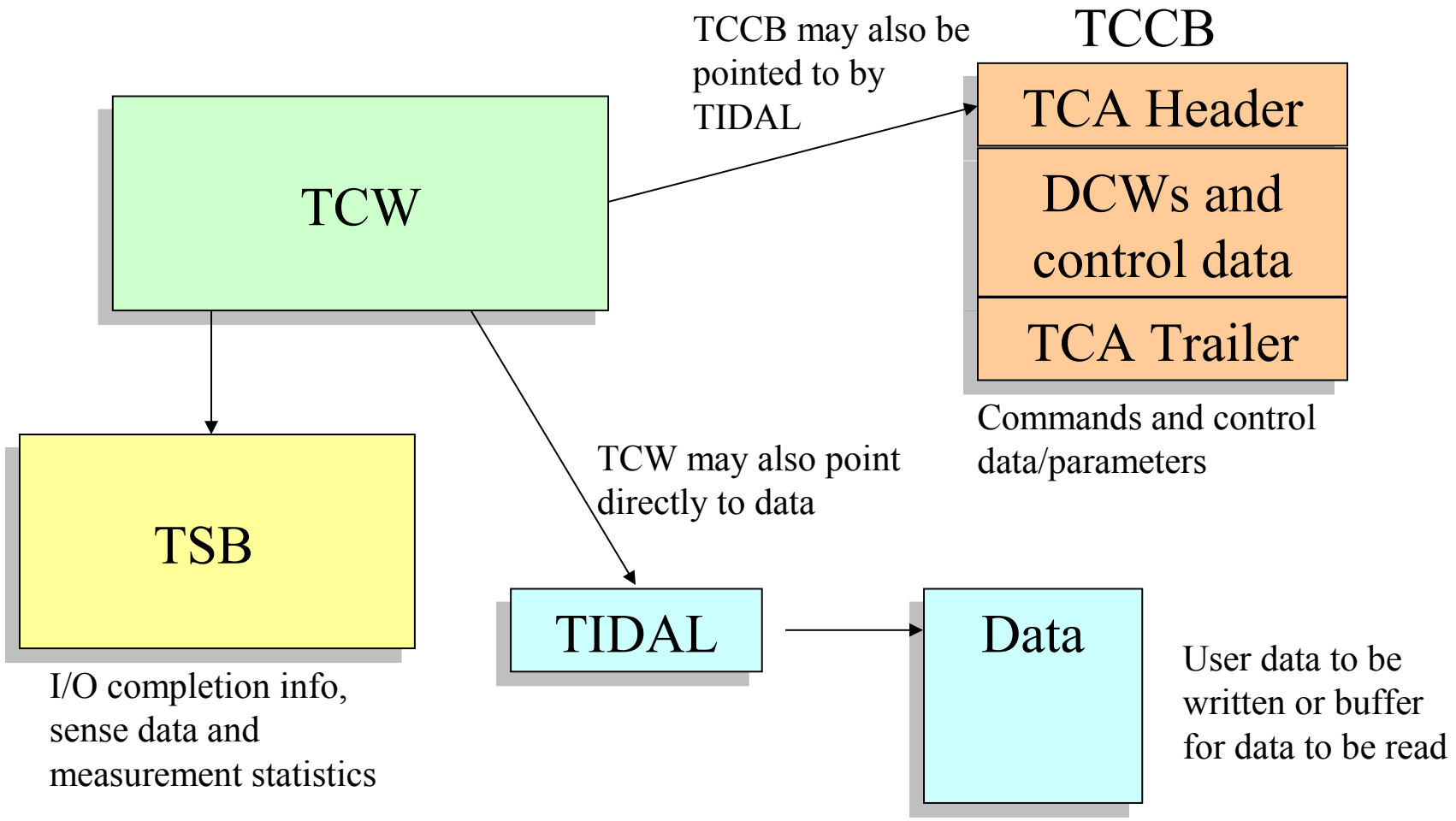
Format 0 CCW



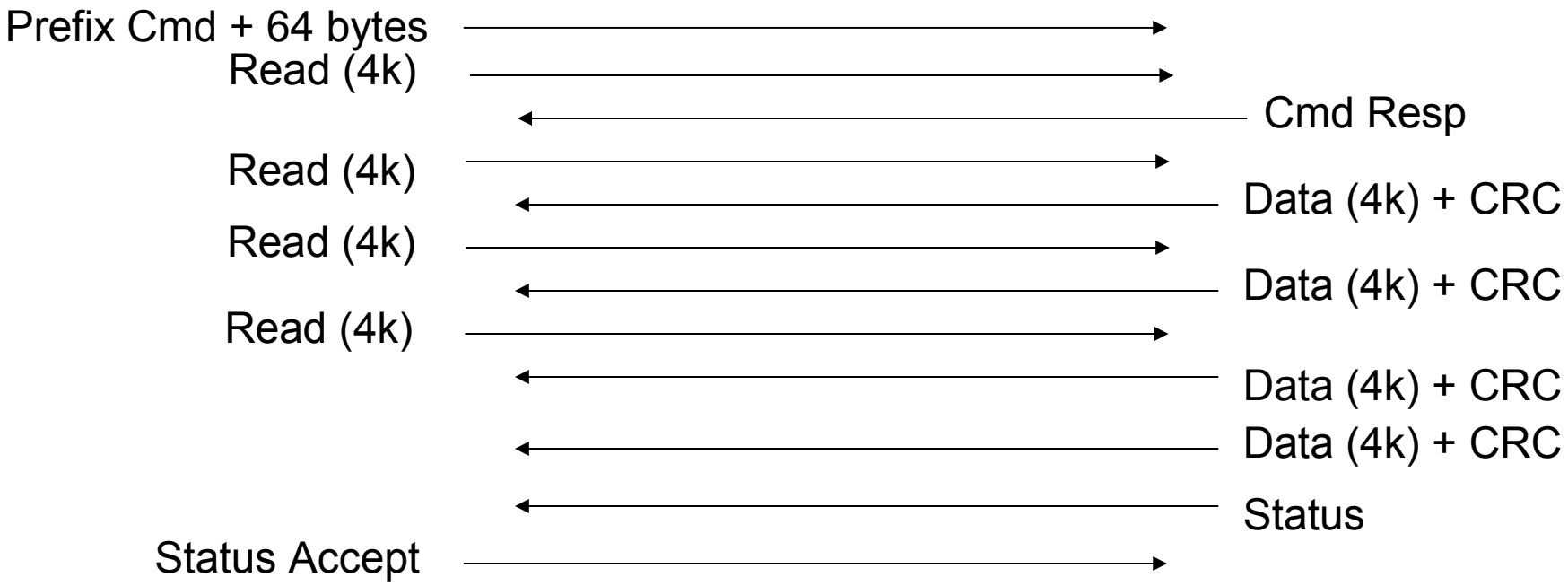
Format 1 CCW



A zHPF Channel Program – Transport Mode ECKD



A Command Mode FICON Exchange Pair

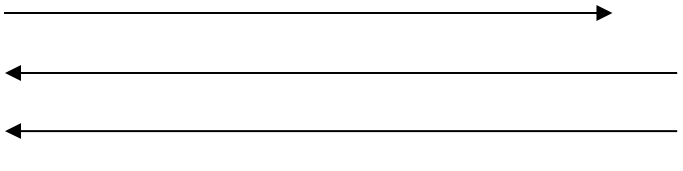


	Channel to Control Unit	Control Unit to Channel
Total Commands	5	N/A
Exchanges	1	1
Sequences	6	6
Frames	6	14
CRC Generate / Check	5	5

A Transport Mode Exchange (zHPF)

Prefix + 64 byes of prefix data +

Read (4k) 4 times (LRE Intent Count)

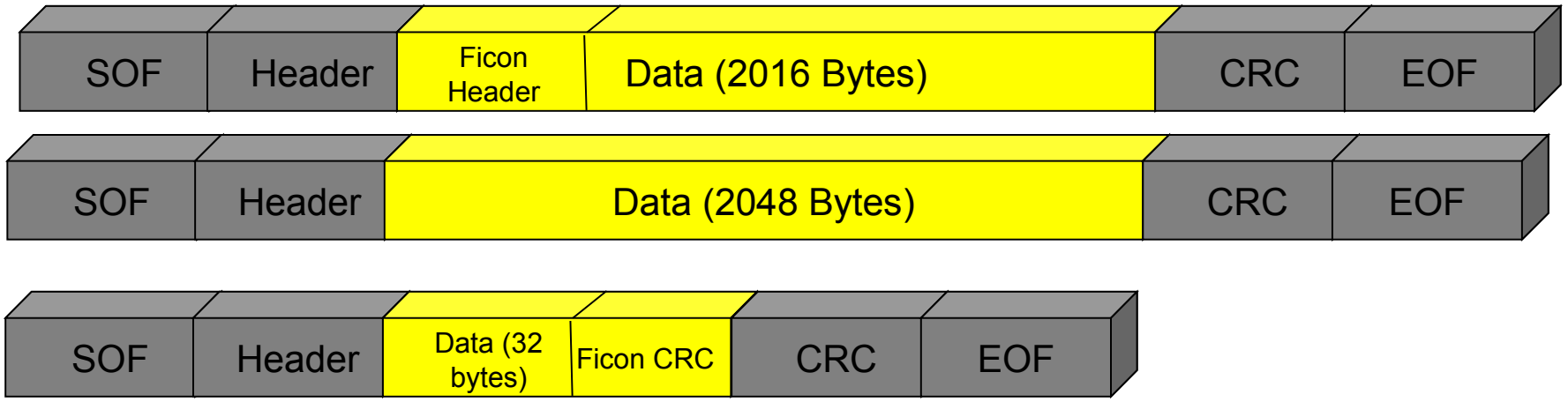


	Channel to Control Unit	Control Unit to Channel
Total Commands	2 or 5	N/A
Exchanges	1	1 (same one)
Sequences	1	2
Frames	1	10
CRC Generate / Check	1	1

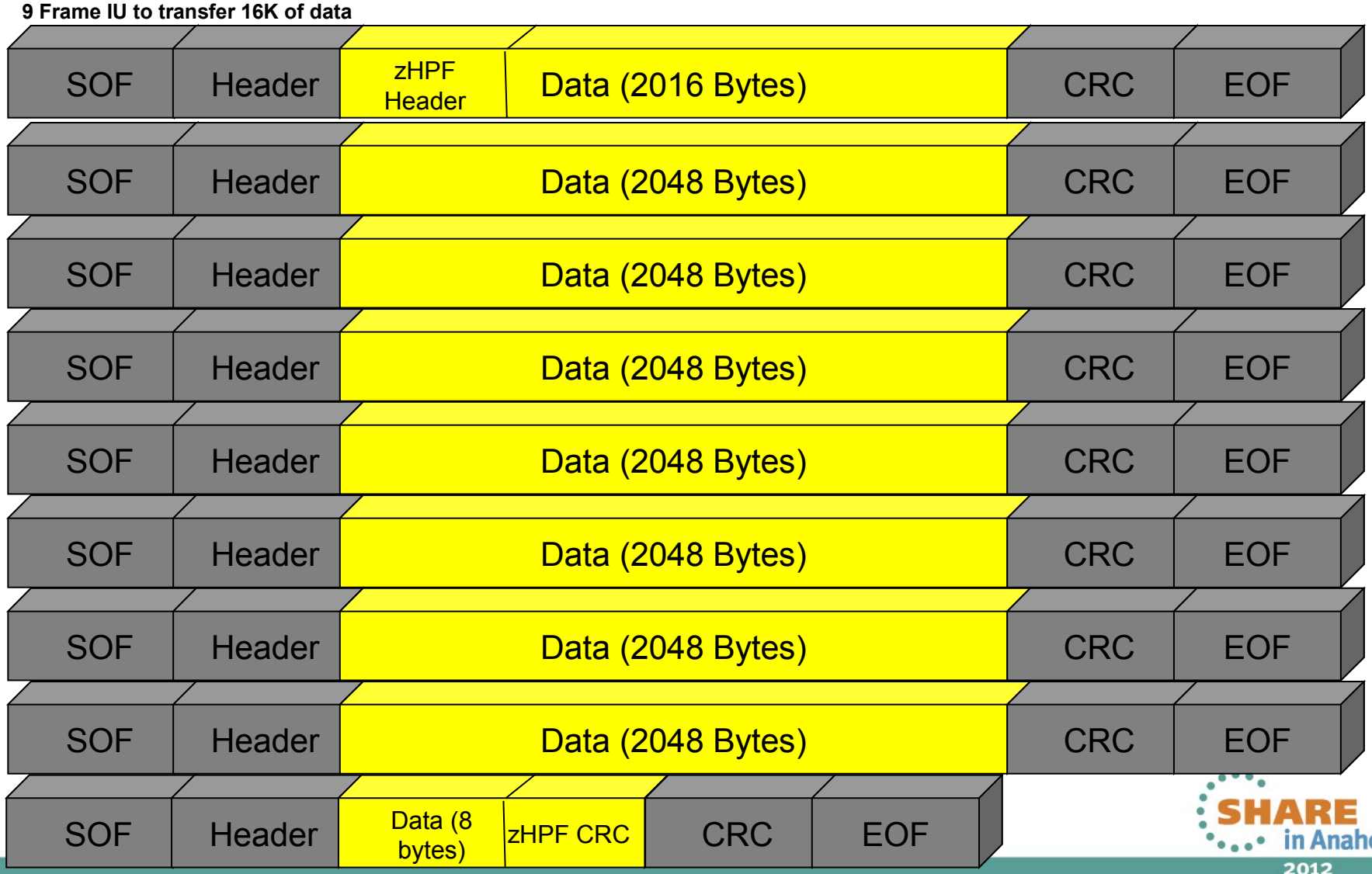
	Channel to CU in Ficon Mode	CU to Channel in Ficon Mode	Total	Channel To CU in zHPF Mode	CU to Channel in zHPF Mode	Total	% Reduction in zHPF Mode
Exchanges	1	1	2	1	1	1	50
Sequences	6	6	12	1	2	3	75
Frames	6	14	20	1	10	11	45
CRC Gen / Check	5	5	10	1	1	2	80

A Command Mode Information Unit (FICON IU)

3 Frame IU to transfer 4K of data



A Transport Mode Information Unit (FICON IU)



Conclusion

- BSAM, QSAM, and BPAM achieve better performance with zHPF architecture than with FICON architecture due to the characteristics of the zHPF architecture, which include:
  - Less number of exchanges and sequences (IUs) – less hardware resources, less ACC IUs
  - Different method of packaging commands (many frames vs. single frame) – different methods of processing the commands
  - Larger maximum IU payload size, less number of exchanges for larger blocks – FICON:8k vs. zHPF:64k
  - Less number of frames over the wire – less overall connect and transmit time

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Thank you

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