

???RAID HBA ??????????

IOP +IOC

- 1. ASIC IOP +IOC
- 2. FPGA ,CPLD ? IOP +ASIC IOC

ROC (Raid on Chop)

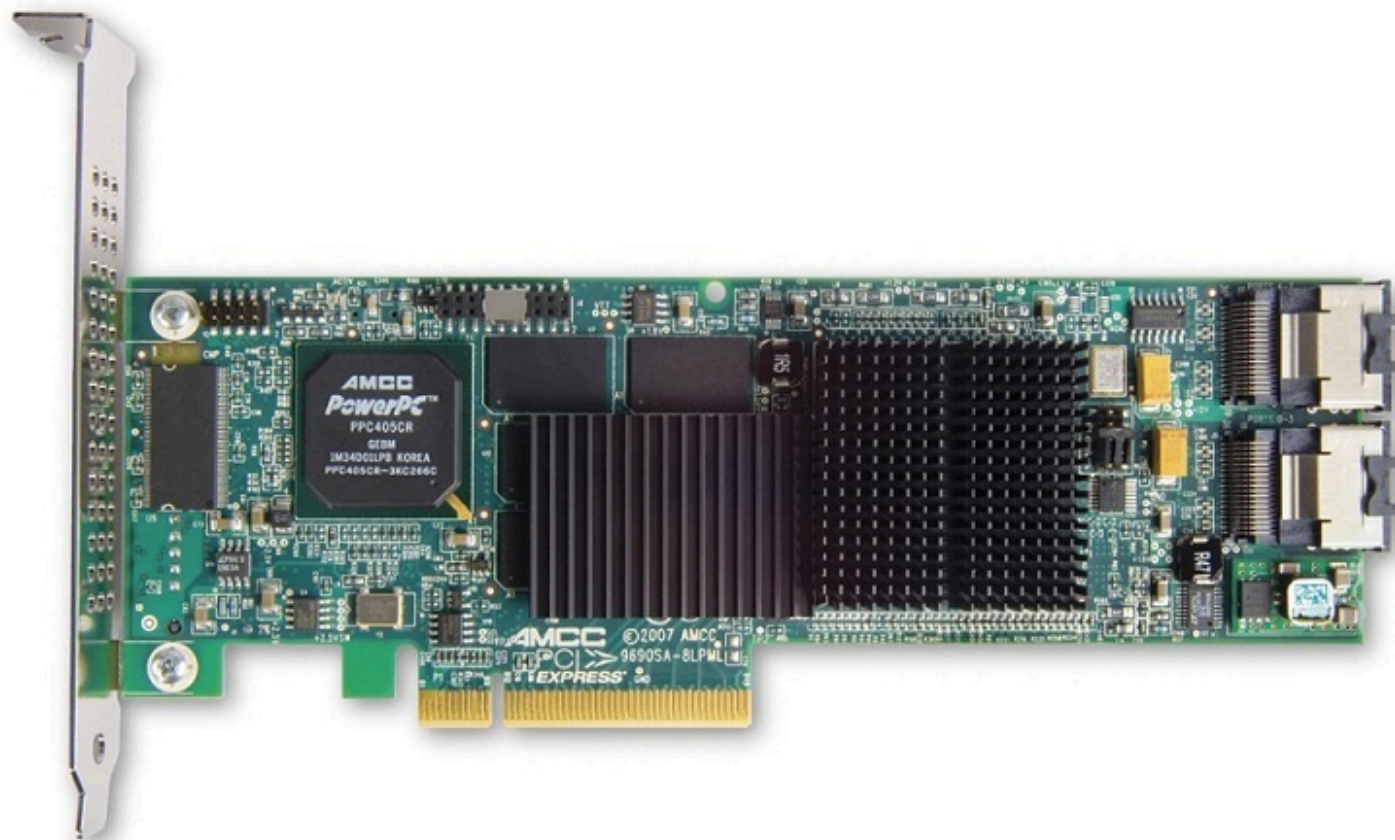
- 1. ASIC ?ROC
- 2. FPGA?ROC

ASIC (Application-specific Ic) ???Tape out????1000???? ????..) ,?????  
LSI ??Fabless SOC Designer ??????ASIC ??...

FPGA or CPLD ????????,?????????  
?????SSD Raid ,DRAM Raid.???FPGA??  
?????????????

?H???,????????? FPGA or CPLD,PH  
??FPGA ?SAS PHY ??????

?RAID Controller?????, ???????SAS/SATA HBA????RAID??(RAID 0, RAID 1, RAID 5, RAID 6,??????????..), ??  
RAID Controller???Storage???????????, ????????????(Array)????, ???Option ROM?????????????. ?????AMCC/  
3ware???9690SA-8i RAID Controller, ???Hardware RAID, ?PowerPC processor, ASIC XOR Accelerator?  
Emulex IOC?????StorSwitch?????. ?3ware???LSI?????. ??????????????, 3ware?????SATA???, ??SCSI??, ?????????  
???, ?????????...:



????????????flash, ??StorSwitch????????????, ??????????. ??PowerPC?processor-PPC405CR??266MHz??, ???  
 ?????????????I/O??, ?????, flow control, ?????RAID code??, AMCC??PowerPC????, ?????. ?????AMCC??  
 ?ASIC XOR??-G133 RAID engine, ?????DMA??(32?, StorSwitch????????)????Storage??, ??XOR?RAID 6????GF?  
 ?????, PPC405CR??G133 RAID engine????????IOP(I/O Processor)?. ??AMCC/3ware????????, Cache  
 Memory????AMCC ASIC XOR????, IOC????Emulex?IOC 500S, ???wide-port??.

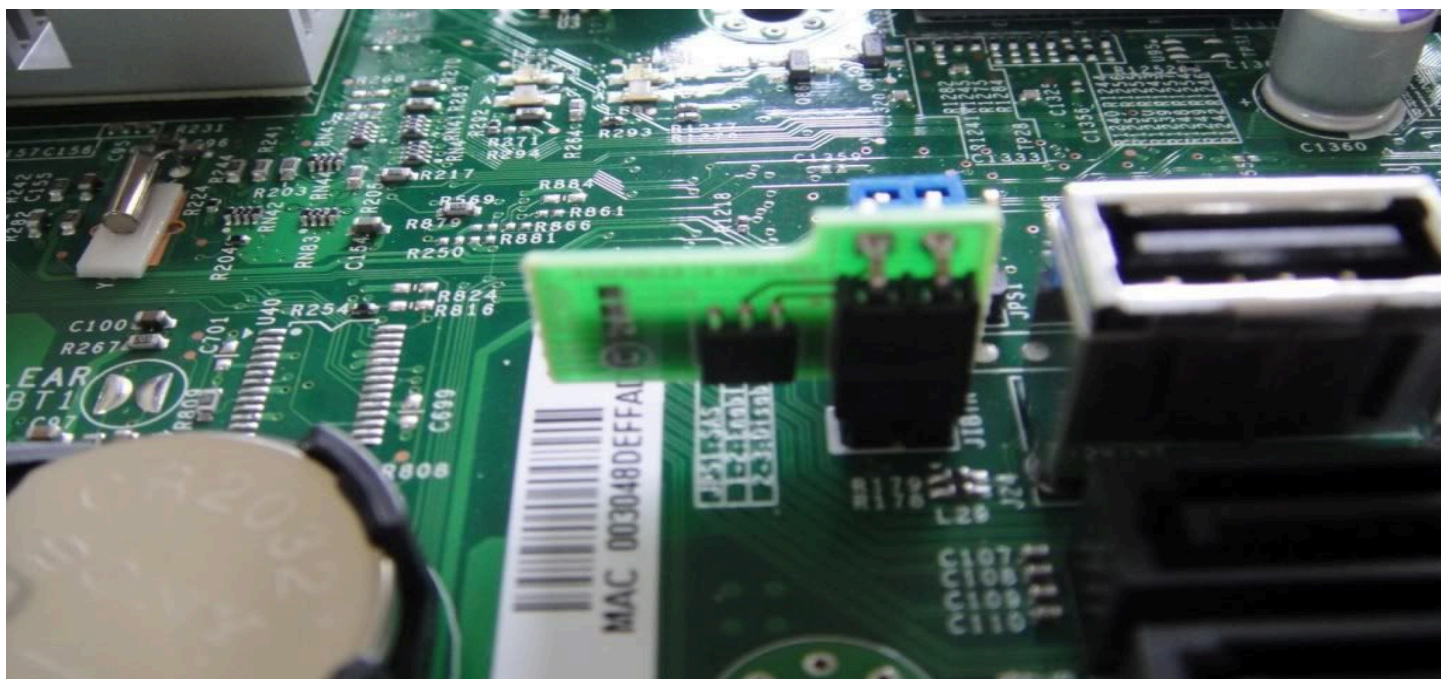
????4?Seagate?15k.6 146GB??RAID 5????, ?????????1GB/s????????, ?????bottleneck????host-bus????,  
 ?????????AMCC ASIC XOR????IOC 500S??PCI-X bus. ??, ?????????, ???3ware????, ?????, ??9550??  
 ?9650??, software?????????. ?????LSI?SAS 9211-8i?HBA, ???IT/IR??, ???Storage????, ?????????:



??HBA??LSISAS2008??, ?Hardware RAID??, ?????PowerPC-PPC440 at 533MHz?processor, LSISAS2008?????  
?6Gb/s??SAS 2.0??, ???????HBA, ROMB???. ???????RAID??, ?????????????LSISAS1068/E?, ??????(entry-  
level)??, ??????-LSISAS2108??, ?????????, ?????XOR??????, ?????????????Cache Memory, ???????, ??  
?RAID?????????. ?Intel??????, ?????????2MB?context RAM??????buffer; ??MSI-X??, IRQ x15, ??SMP/CMP??  
??, ??I/O????????.

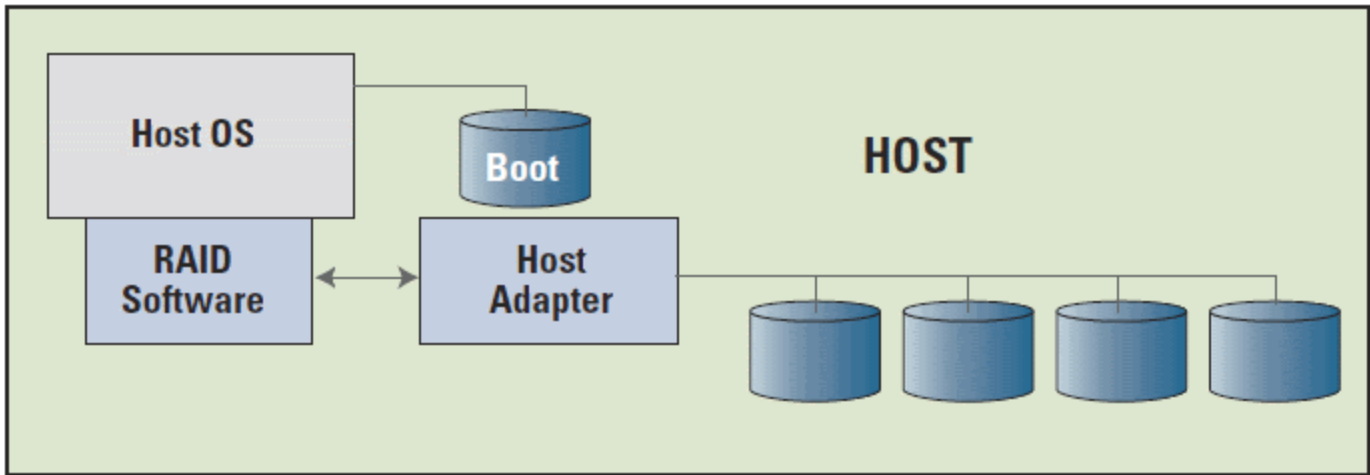
?HBA??, ??IT(Initiator and Target)??????SAS???? (thx ? ???????),

???IR(Integrated RAID)??????RAID????(RAID 0, RAID 1, RAID 10?RAID 1E), ?LSI??Fusion-MPT??, ??????  
(processor)????I/O????????RAID???. ??ROMB?????, ???RAID key????PCB??,?????:

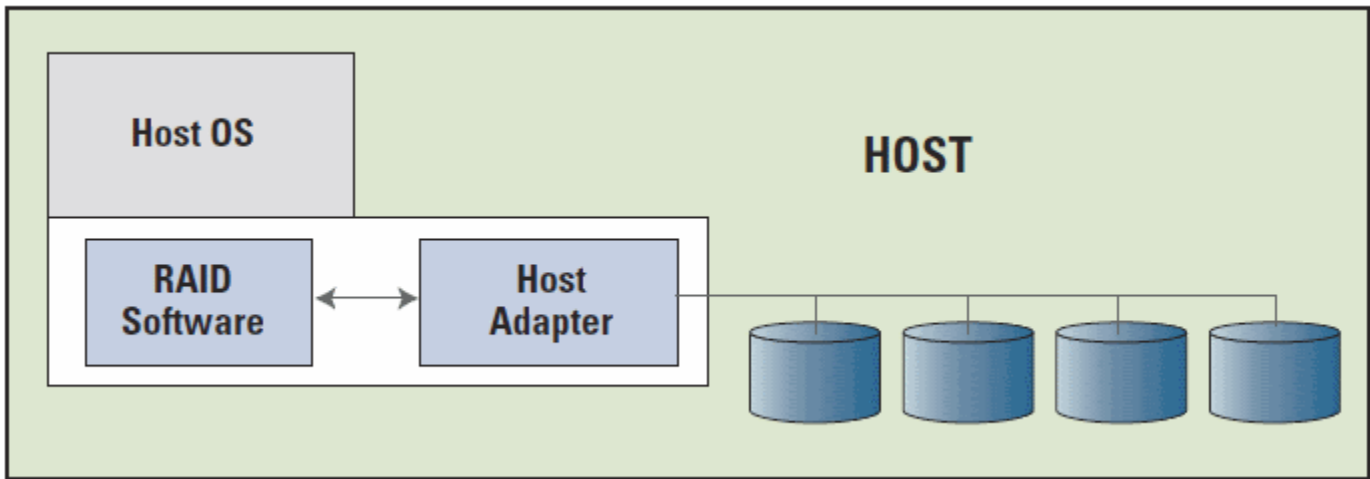


????????RAID 5??, ?????, ?????XOR????????????, ??RAID 5?????????.??RAID key????, BIOS?????

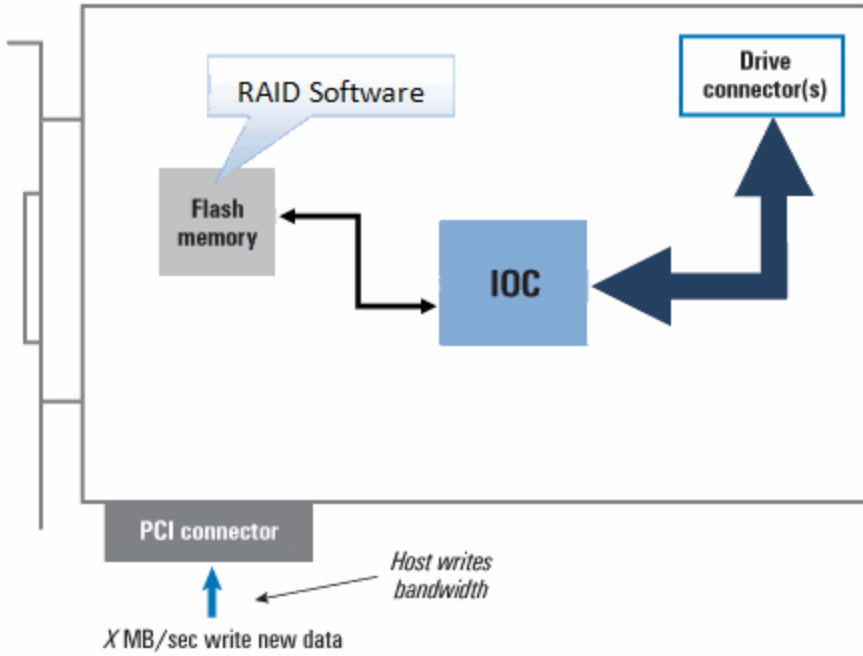




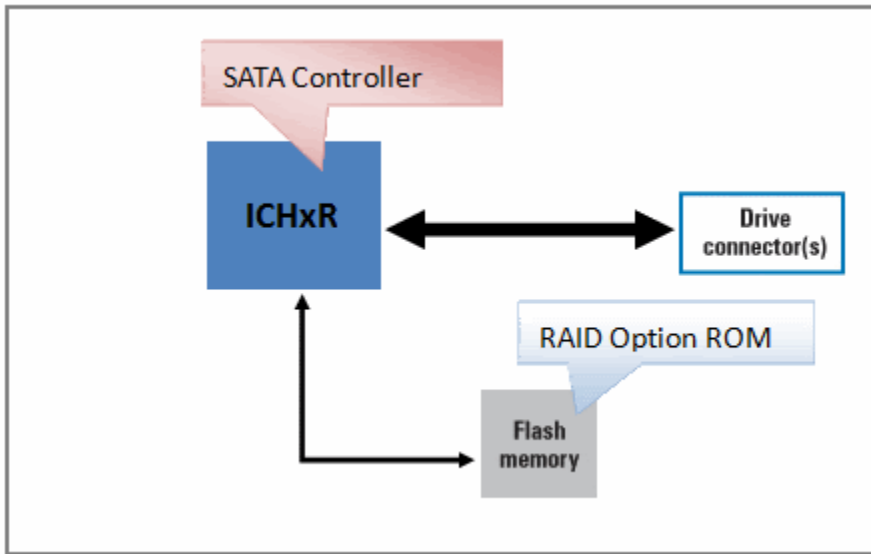
Pure Software Model????????????????????Hybrid Model – Hardware-Assisted Software RAID?????????  
 ?????SAS/SATA HBA with a RAID BIOS???RAID BIOS integrated onto the motherboard???Intel?ICHxR????  
 Hardware-Assisted Software RAID?????????RAID???(?RAID Option ROM??BIOS?)?RAID????????????????  
 ???Pure Software Model????????BIOS????????????????RAID????????????????GUI??RAID????????RAID?? ?IO????????  
 ?????????RAID 5????????????????



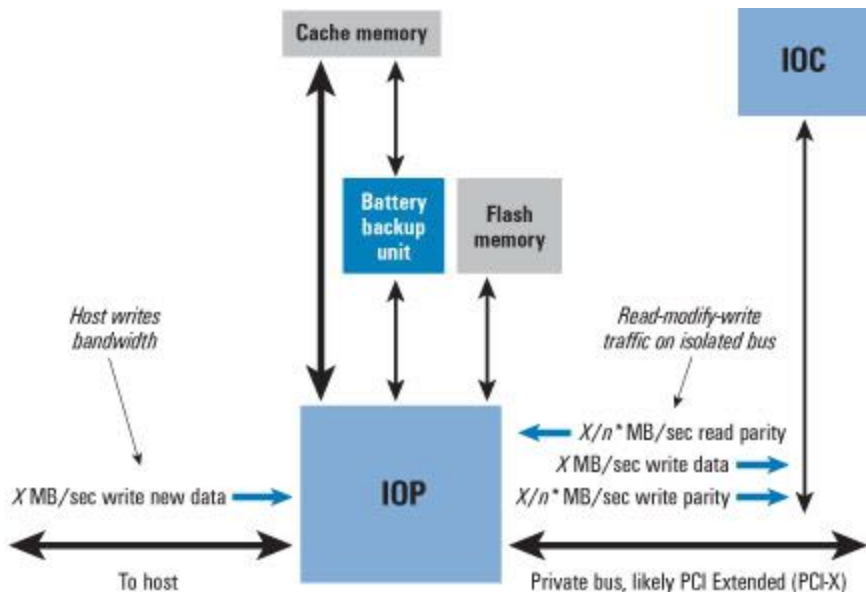
????????HBA with a RAID BIOS????RAID Software?HBA?????RAID Software?????RAID?????NVRAM????????  
 ?????????RAID???????????????????? (dedicated GUI and software to build and maintain the RAID)?  
 ??????DELL?????????HBA with a RAID BIOS???



?????????ICHxR??RAID????RAID Option ROM?????????System BIOS?????RAID Configuration Utility??RAID?

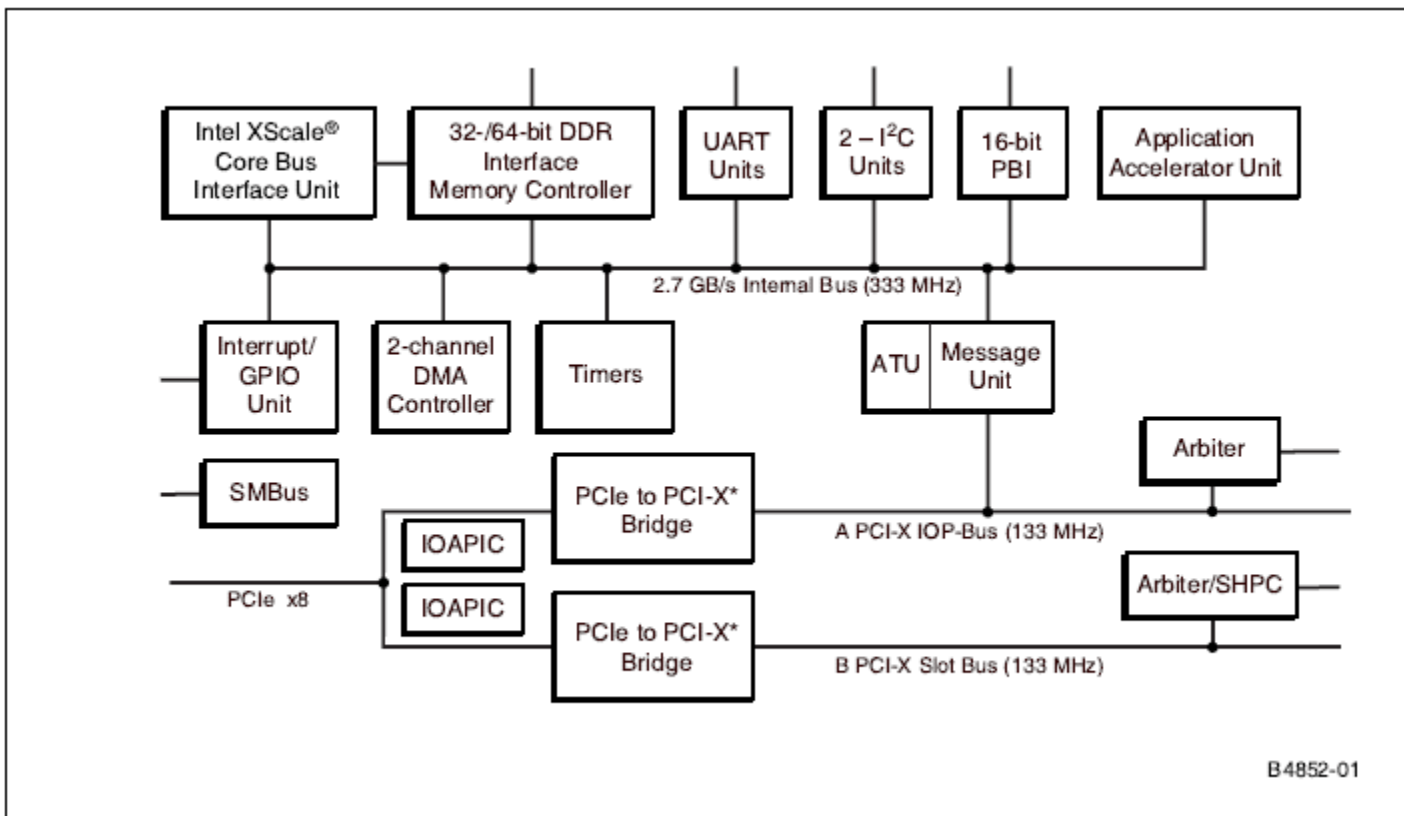


Software RAID?????Hardware RAID?????????????IOP+IOC(A Discrete RAID Controller Card)?????IOP?????????(? RAID 5)????????????????????(?????????????)??IOP?????????????????????Hardware RAID?????????????Software RAID? ?????DELL?IOP+IOC?????



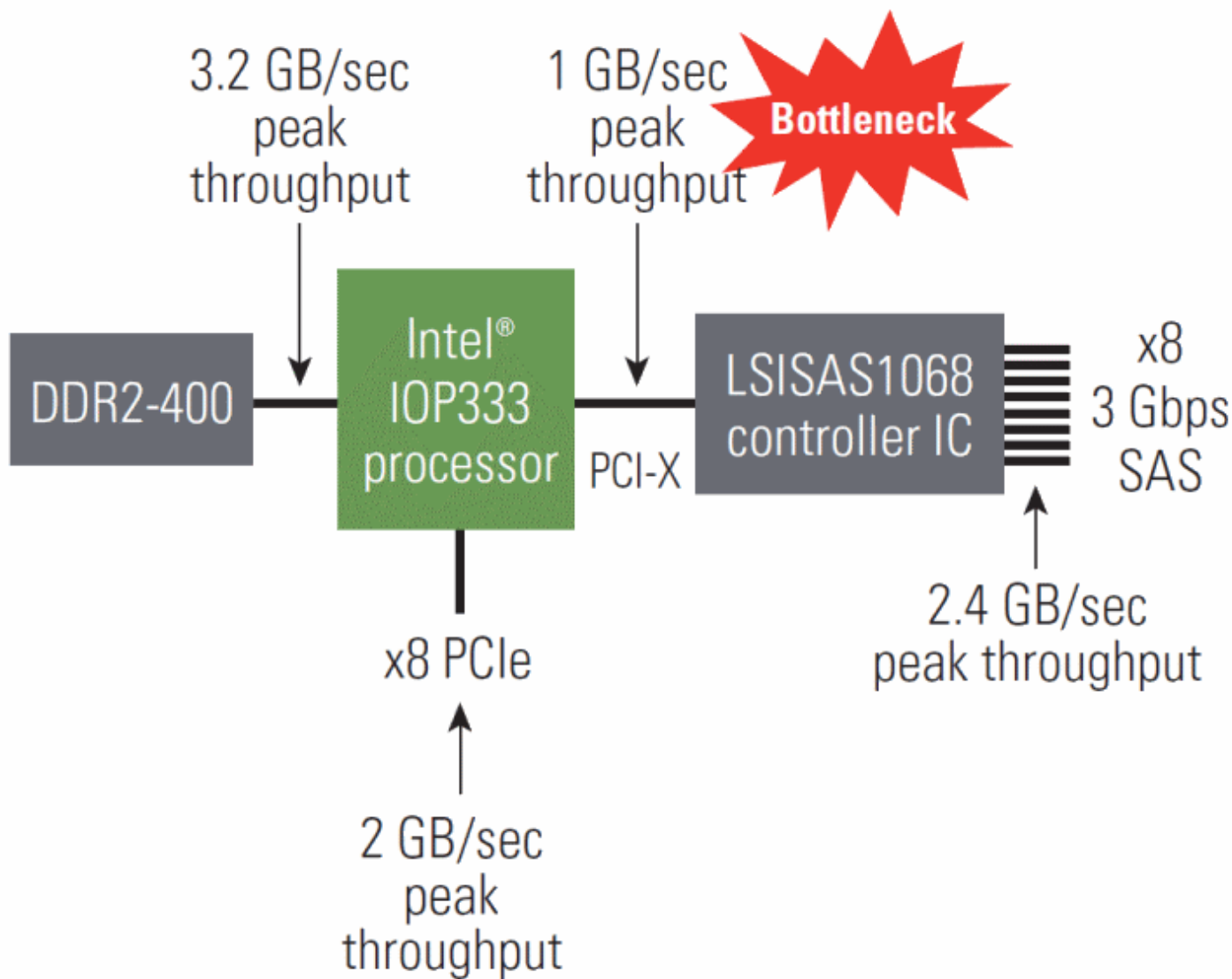
$n$  = number of disks in RAID array

????????Cache Memory????????Read/Write Cache?????I/O?????BBU????????????????????IOP+IOC????????  
 ?????Intel IOP333?????IOC????????RAID HBA????????IOP333?????



????AAU(Application Accelerator Unit)????????????RAID6????????IOP333????????????IOP?IOC????????  
 ??? PCI-X????????1GB/s????????????I/O????????????SAS 1.0????????narrow link???Storage????  
 3Gbps??wide port??4 narrow links?3Gbps x4=12Gbps=1.5GB/s x80%=1.2GB/s??1.2GB/s????????PCI-X????  
 ?????????wide port????????wide port x2????????PCI-X????????????DELL PERC 5????

# PERC 5 architecture



?????IOP333?IOC???IOC???LSI1068?????LSI1068???Host Bus???PCI-X?IOP333?LSI1068????????1GB/s???????  
Storage?????????????????????DELL PERC 5?





IOC?????LSI1068(????????)???SAS/SATA HBA?????????LSI 8344ELP?????????????????Connector?????????Cache  
Memory?????????????????



???????Adaptec???IOP333???4805SAS?



IOC???????Vitesse???AIC-9410W???????wide port x2(4 narrow links/per port)?

???????4800SAS?????IOP?IOP331?



IOP331???Host Bus?PCI-X????4805SAS?????

??3ware???StorSwitch????IOP+IOC????????????????????PPC?????????3ware? 9650SE-2LP?



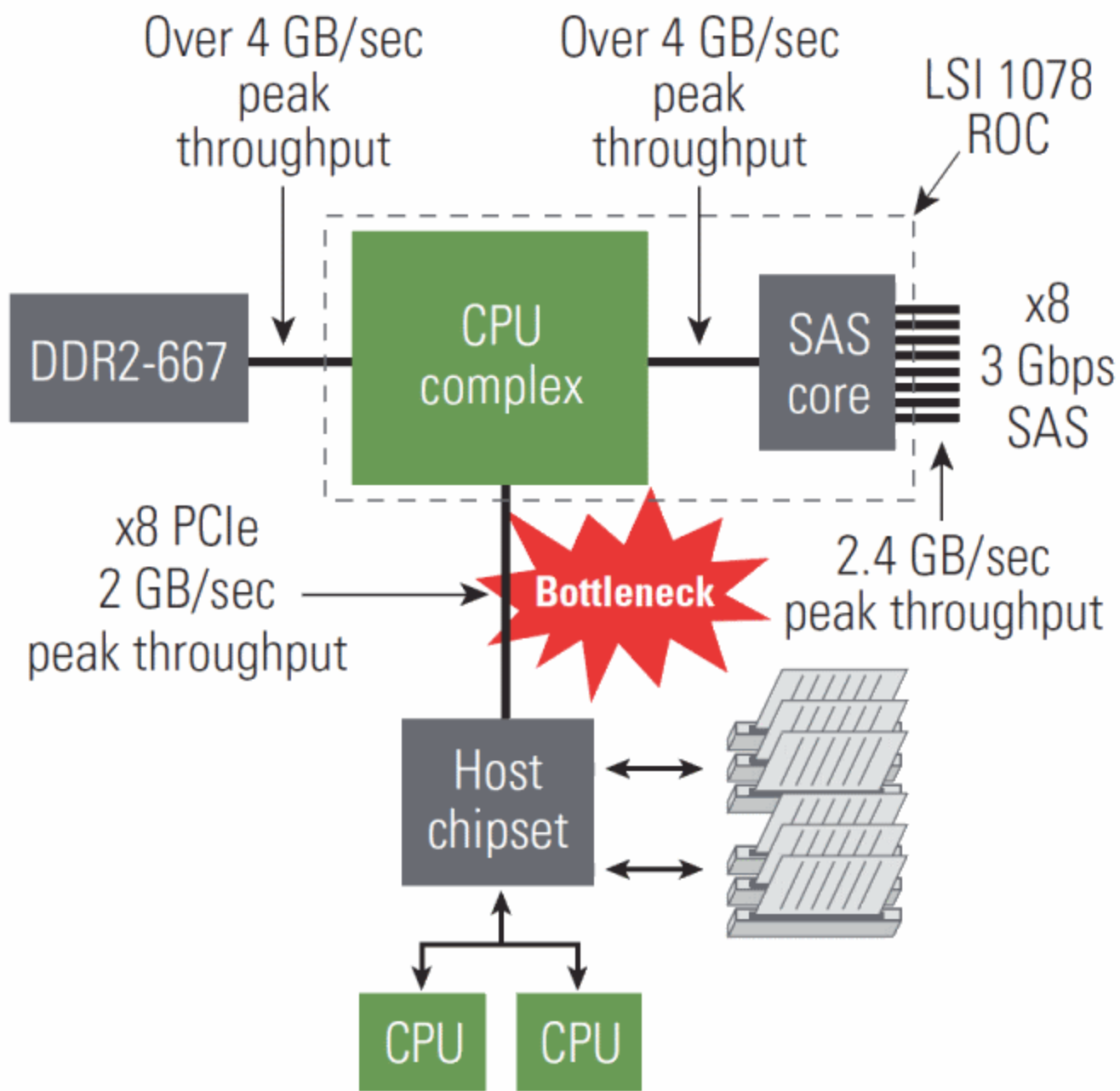




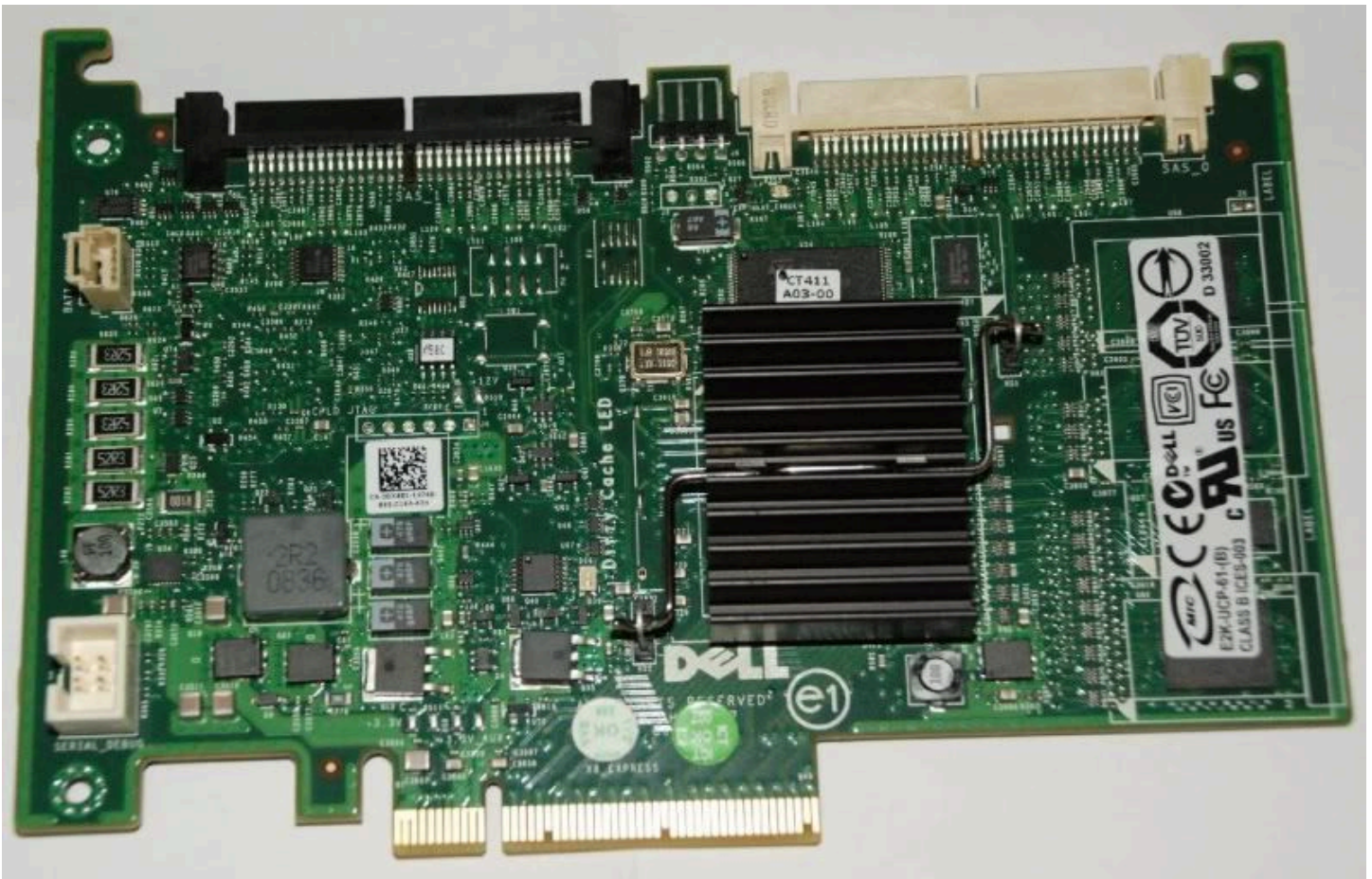
?????????2 wide ports?????????SAS Expander??(?????)?????wide port?????Storage?

Roc?????????LSI?1078????????????DELL?PERC 6??LSI1078????????????IOP333??PERC 5?????

# PERC 6 architecture



PERC 6????????????????LSI????????????????BBU????????????????LSI?BBU??????=?"???????? LSI 8888ELP(LSI1078)???



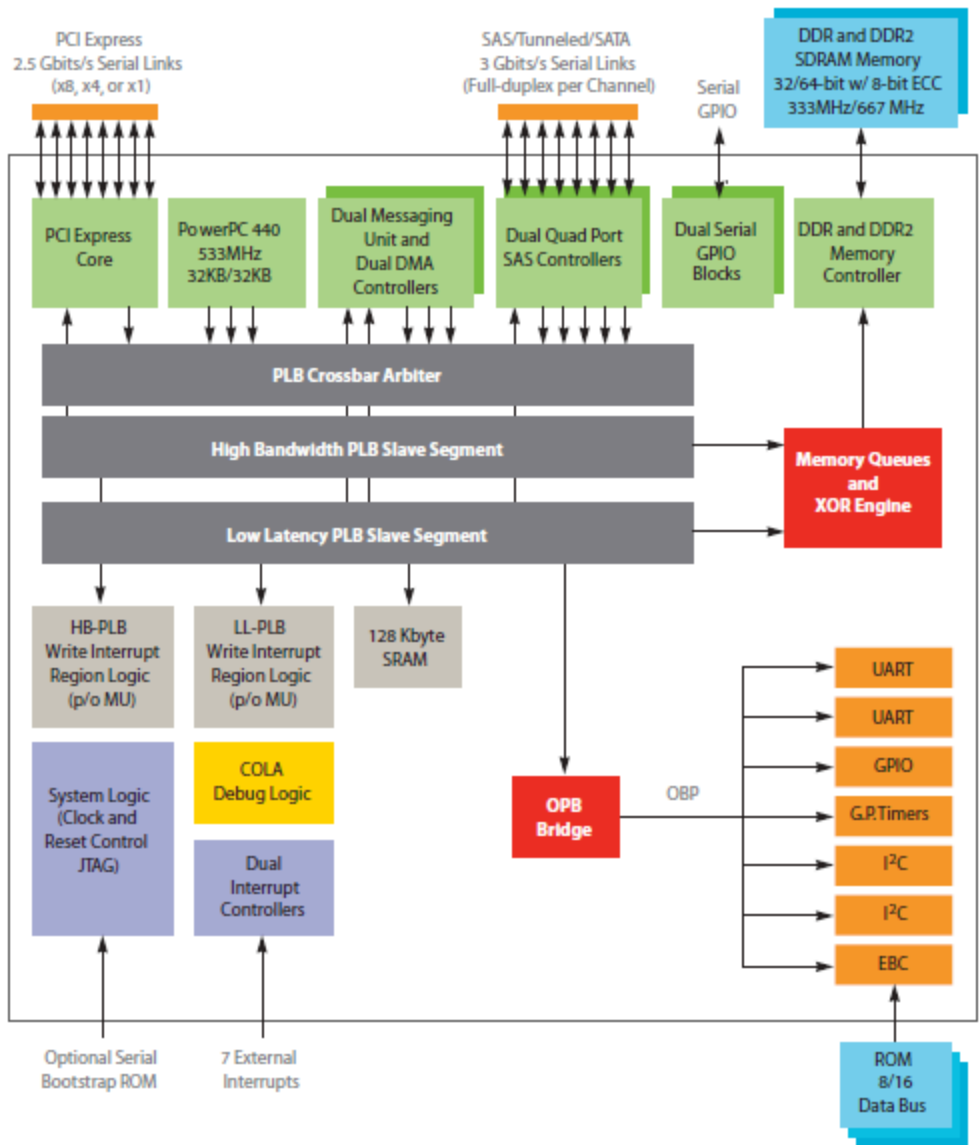
DELL PERC 6?Connector????????SFF-8484???256MB DDR2-667 Cache Memory????????SSD Guard(????LSI? firmware...)? ??????LSI Internal/External RAID????????MegaRAID 8888ELP?



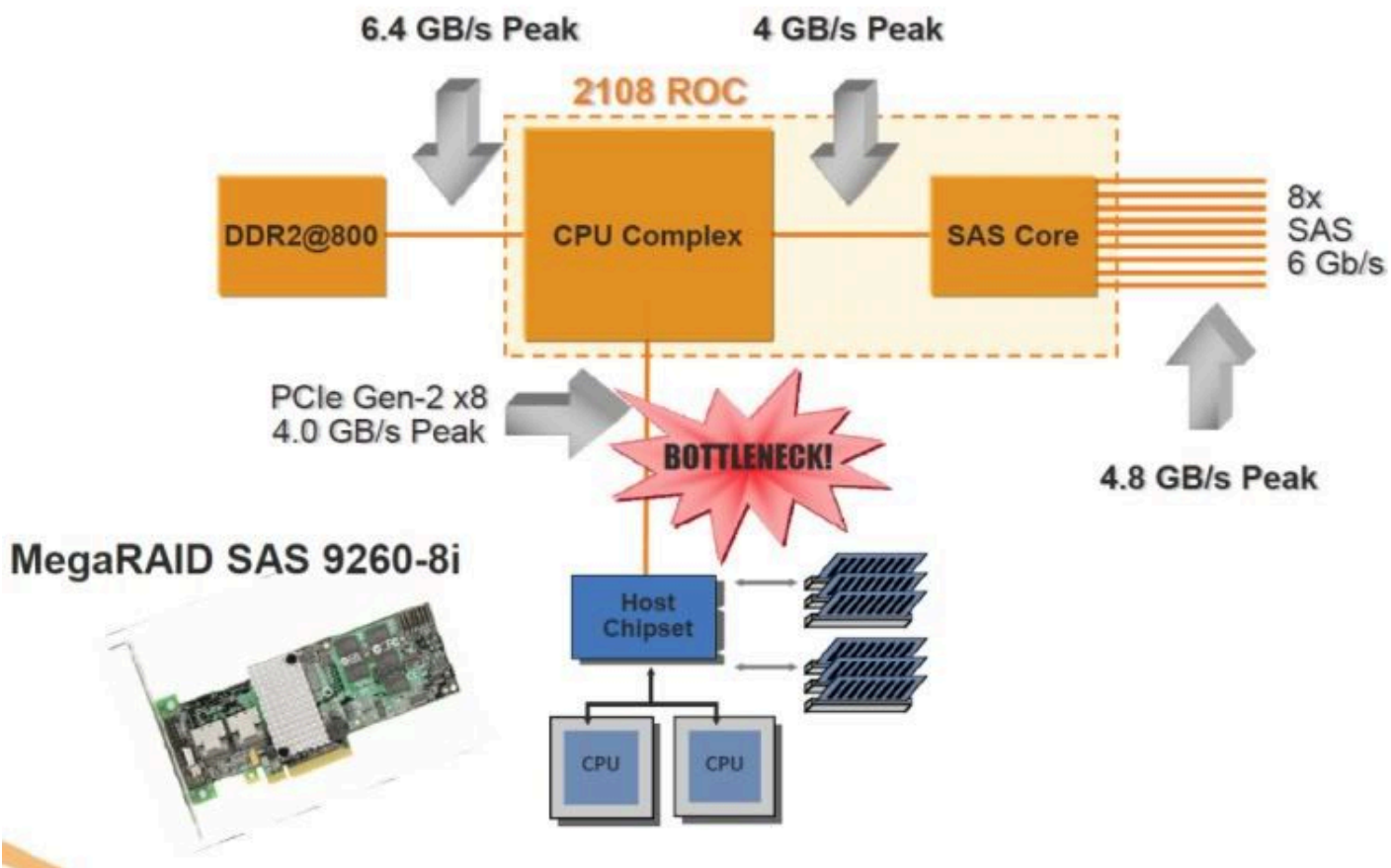
Connector?????????Internal SFF-8087 x2?External SFF-8088 x2???SAS Expander??????240?Storage?Cache  
Memory?????????1GB????????????????RAID??????LSI1078???????



Figure 1. LSI SAS1078 Controller Block Diagram



?????PPC440(@500MHz)?IOP????XOR Engine????????LSI1078????????Host Bus????????PCIe Gen1 x8????  
 ???2GB/s????????????????????LSI2108????????????PCIe Gen2 x8???4GB/s?Host Bus????????????????????  
 ??



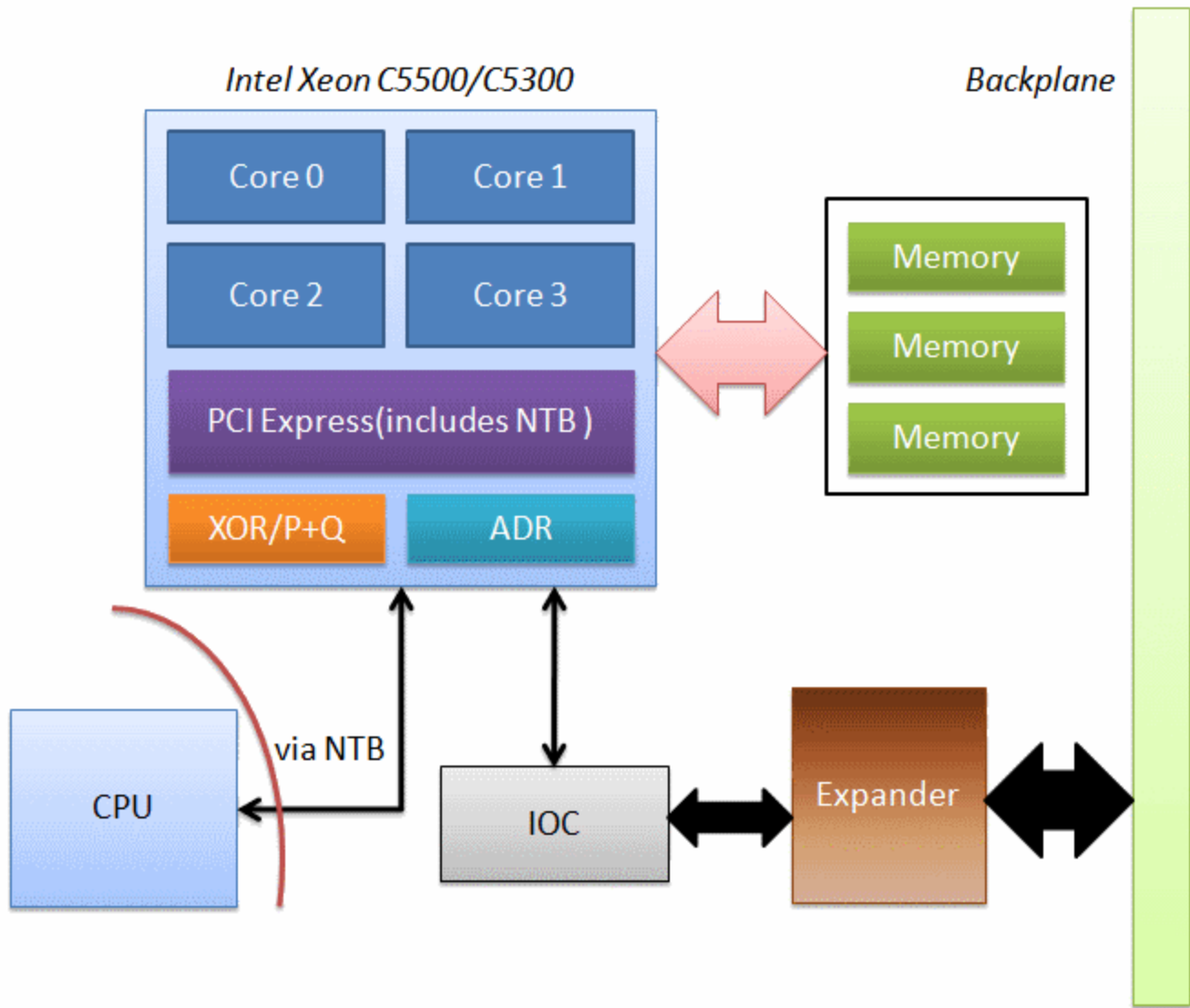
LSI2108???????PCle???????????PPC440???(@800MHz)?Cache Memory??????DDR2-800?????????????????LSI MegaRAID 9260-8i?



?????????????BBU?????????????BBU07??9k=."?????????????????OOXX??

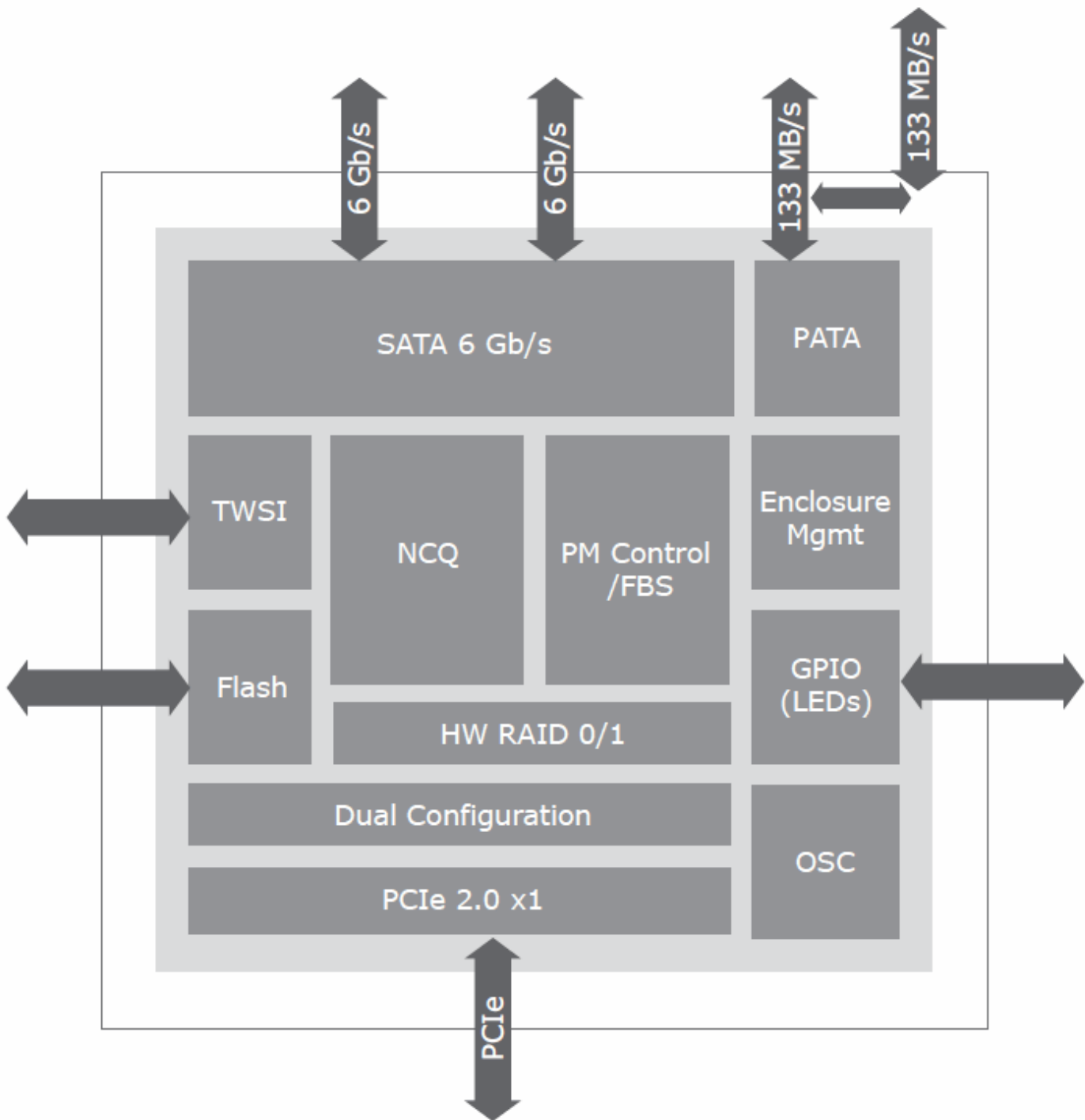
??Intel?LSI?????????RoC?????????????????????????????????????Marvell?88RC9580 ?PMC-Sierria?PM8011?

??Intel?????ARM???Xscale IOP?????Nahalem?????x86??(Xeon C5500/C3500[Jasper Forest])?????????????  
 HBA????SBB?????Backplane(with SAS Expander)?SBB???Backplane?????I/O?????????mini-SAS Port????  
 ?24Gbps??(?????????????)????????????x86 CPU???RAID 5/6?????????SATA/SAS????????????????SAS/  
 SATA HBA??(????LSI2008??IOC????)??x86????????????????????????????????????Linux???Windows?????  
 ?????????????????????SBB???????



??????Intel C5500/C3500[Jasper Forest]?????XOR/P+Q????????????RAID 5/RAID6?????????IOC????????????  
 ??????????LSI2008???SAS Expander????????SAS Expander??Backplane?Storage????(??AMC)?

???Intel????????Hardware RAID????????????RoC?????LSI/3ware?Marvell?Areca(??Marvell RoC)?  
 Promise(??PMC-Sierra RoC)??PMC-Sierra/Adaptec??...??  
 ?????????????SSD????????????RAID????????????LSI?????LSI??????????Advanced Software Options????????  
 SSD????????????License????????PMC-Sierra????Adaptec??? ???MaxIQ????????????????Marvell?????  
 88SE9128????????MaxIQ????????-HyperHDD, ?????????ARM-based?processor????CPU??I/O??, ?????  
 I/O??, ?????????IOC-based?Hardware RAID??, ?????????2 SATA ports, ?????????host-bus??, ?????PCIe  
 Gen2 lane x1, ??500MB????????



????SAS/SATA HBA?RAID HBA????????(?????????)????????RAID????????????????XD?