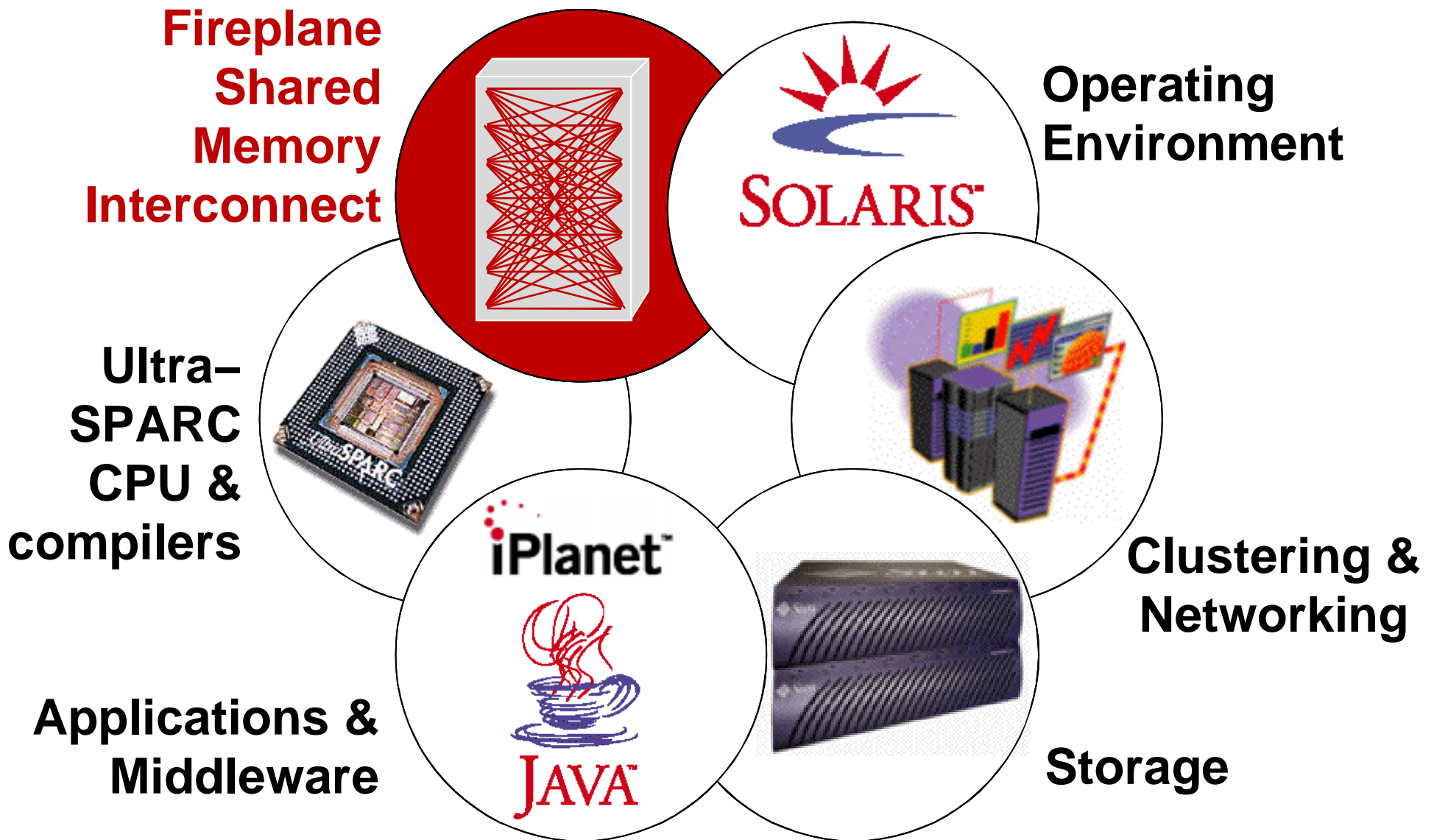




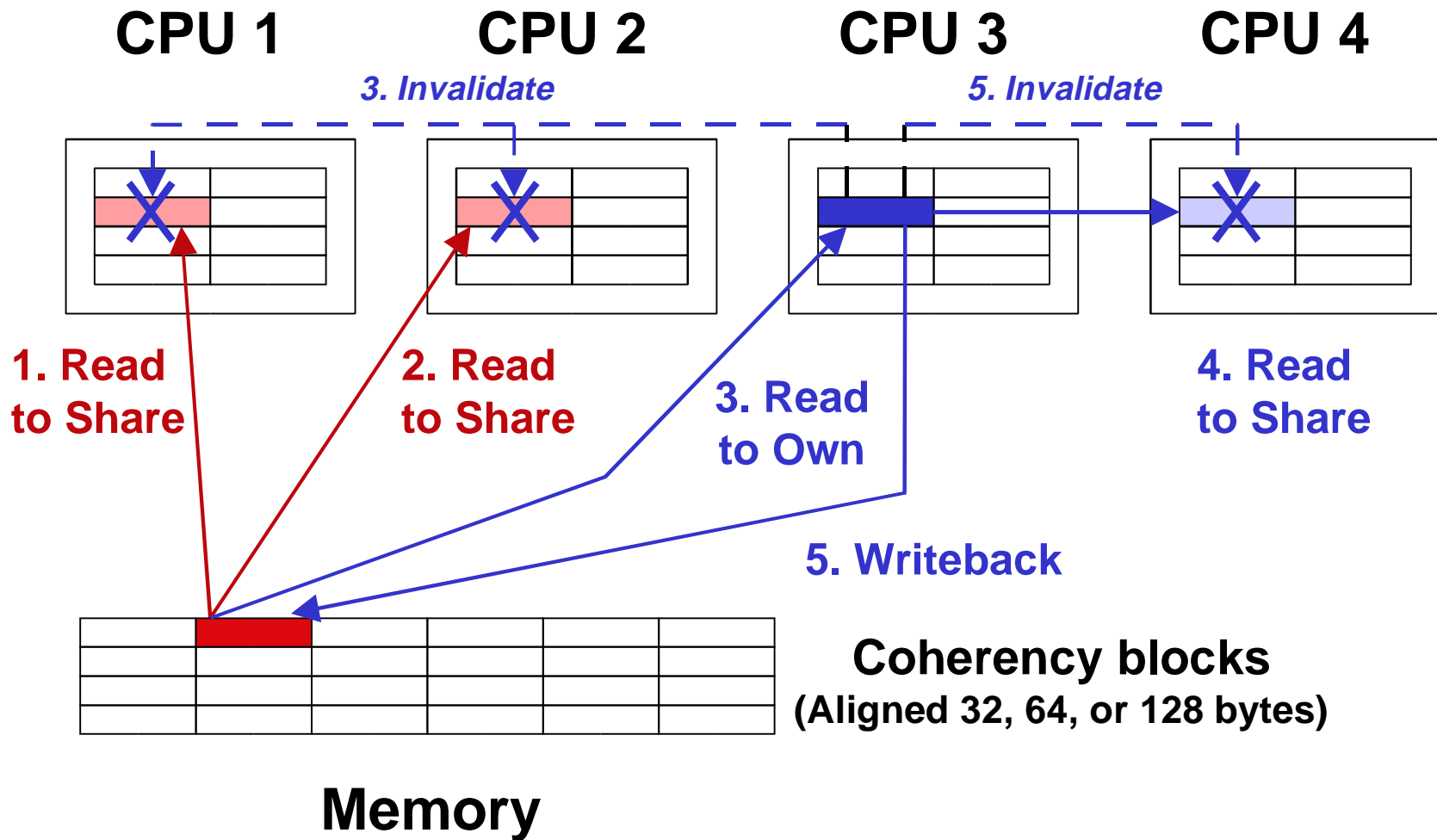
Frederic Vecoven
Sun Microsystems

SunFire range of servers

System Components

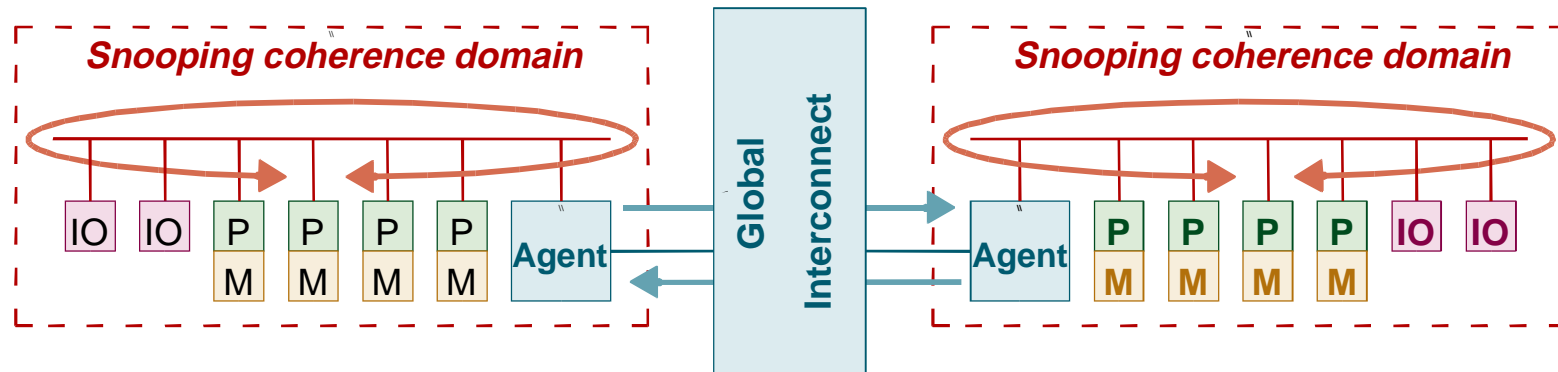


Cache Coherency Basics



Cache Coherency Types

1. Broadcast (snoopy) coherency



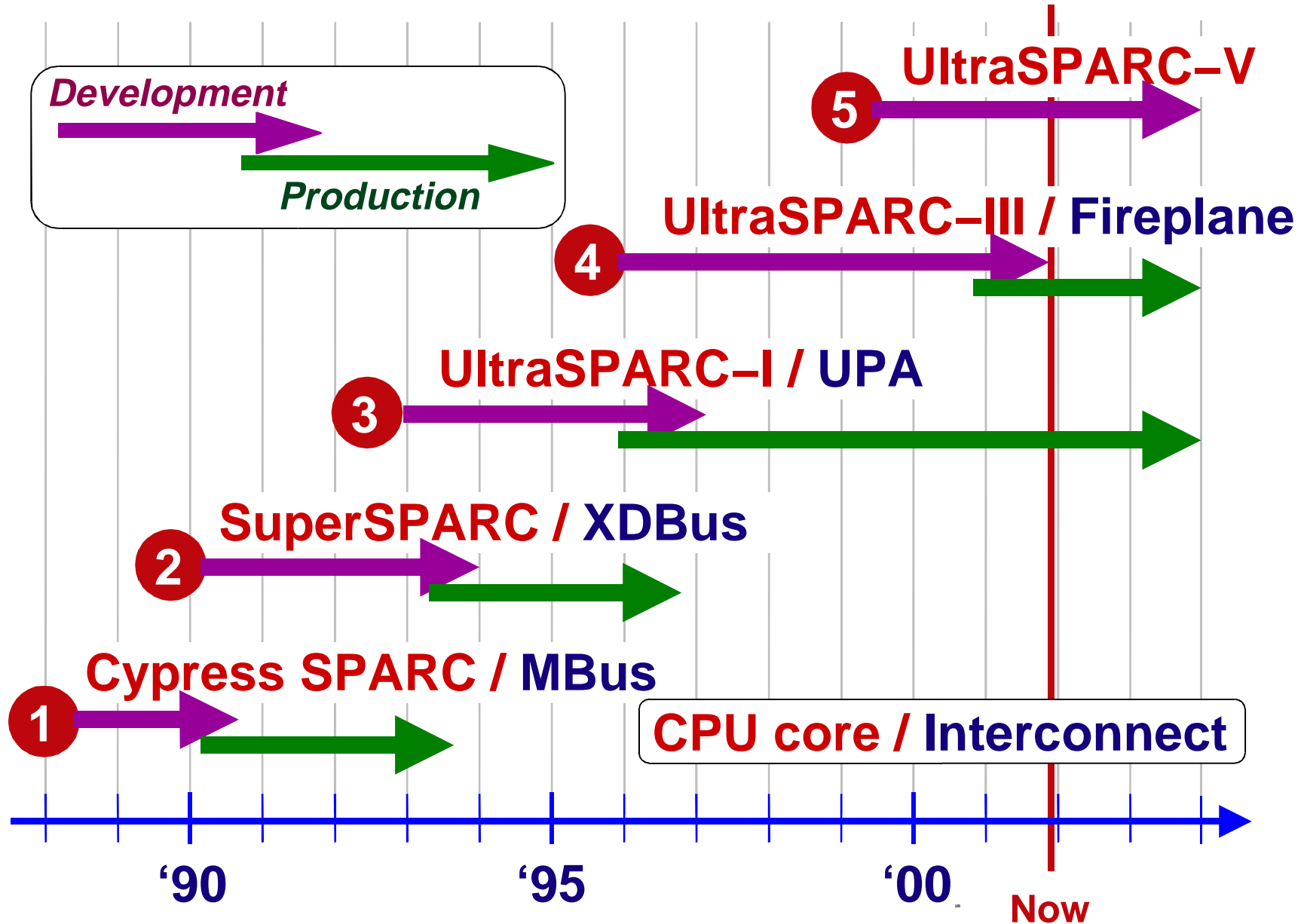
P Processor

M Memory

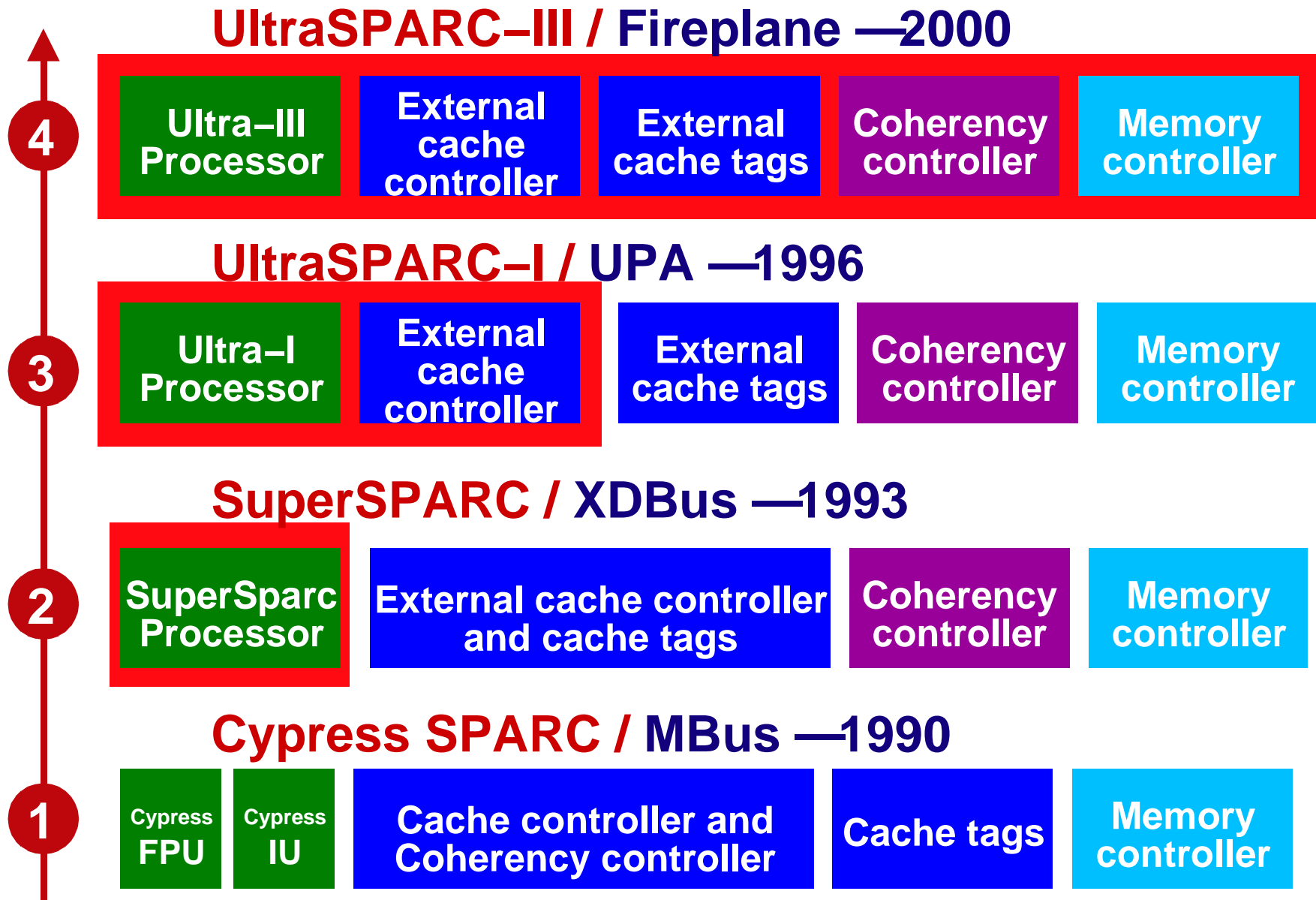
IO I/O controller

2. Point-to-point (directory) coherency

Sun Generation Timeline



Increasing CPU Integration



Generation 1: MBus

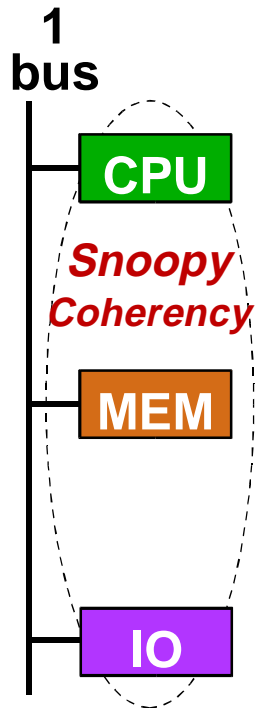
1

MBus

Cypress

SPARC

1990



0.1 GBps

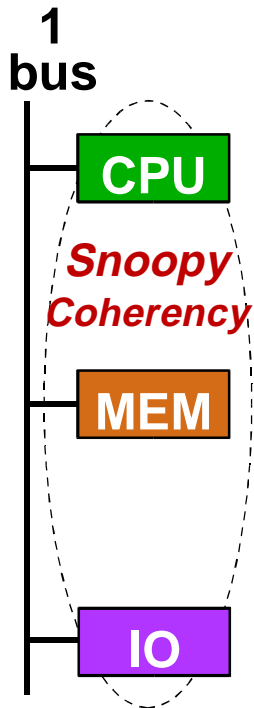
4 CPUs

Generation 2: XDBus

1

MBus

Cypress
SPARC
1990

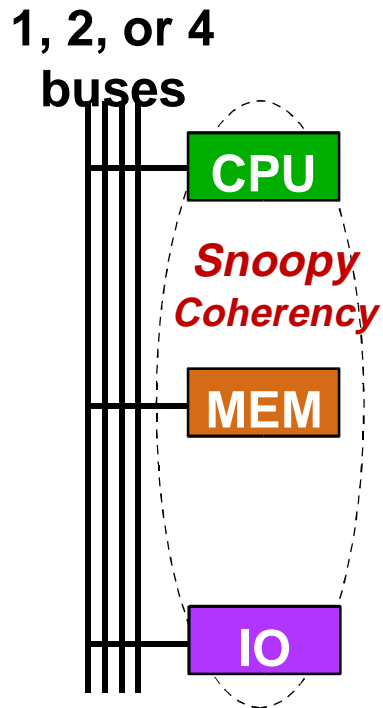


0.1 GBps
4 CPUs

2

XDBus

SuperSPARC
1993



1.28 GBps
64 CPUs

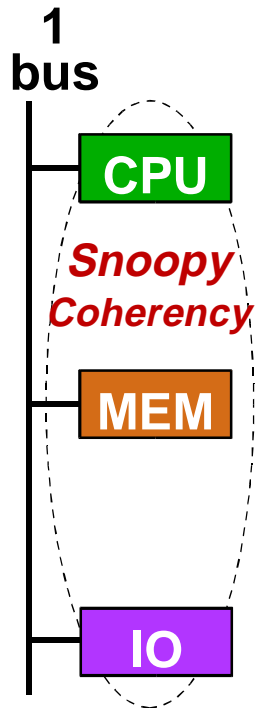
Generation 3: UPA

1

MBus

Cypress
SPARC

1990



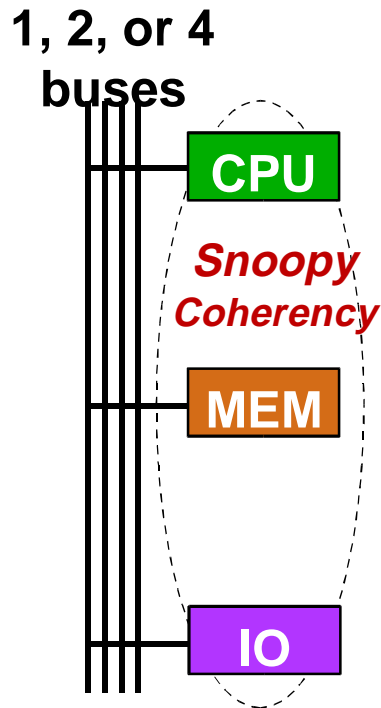
0.1 GBps
4 CPUs

2

XDBus

SuperSPARC

1993



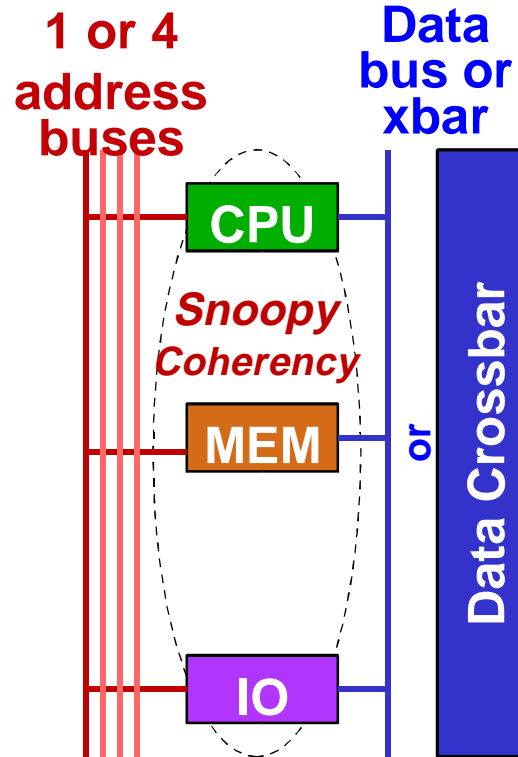
1.28 GBps
64 CPUs

3

UPA

UltraSPARC-I/II

1996



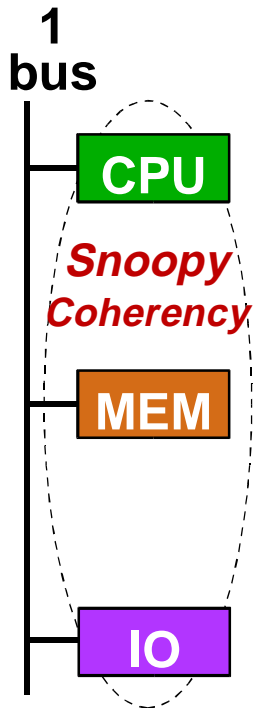
12.8 GBps
64 CPUs

Generation 4: Fireplane

1

MBus

Cypress
SPARC
1993

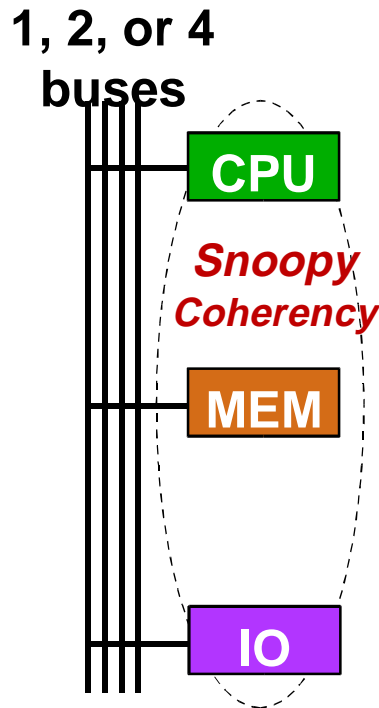


0.1 GBps
4 CPUs

2

XDBus

SuperSPARC
1993

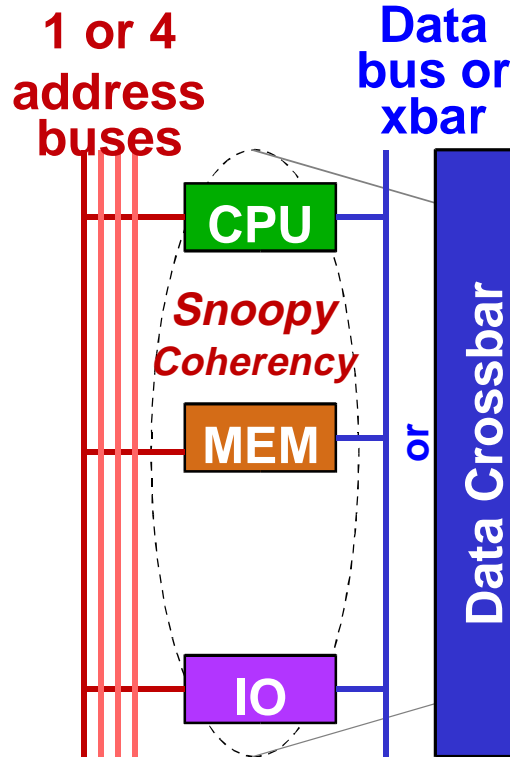


1.28 GBps
64 CPUs

3

UPA

UltraSPARC-III
1996

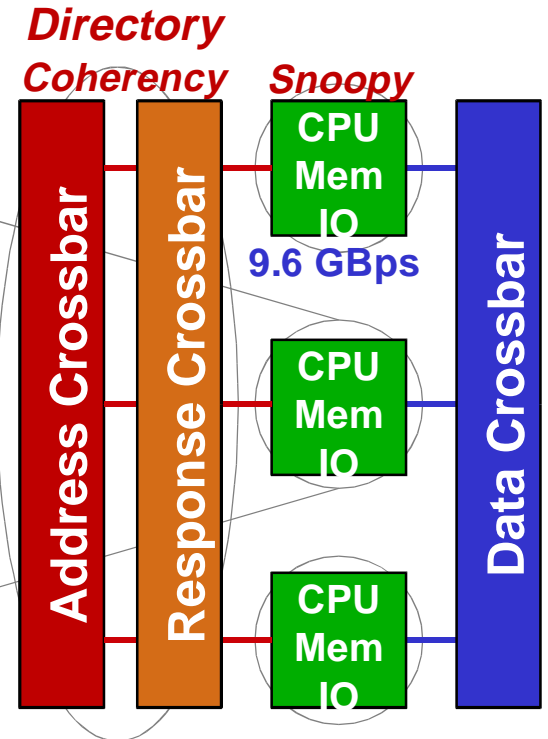


12.8 GBps
64 CPUs

4

Fireplane

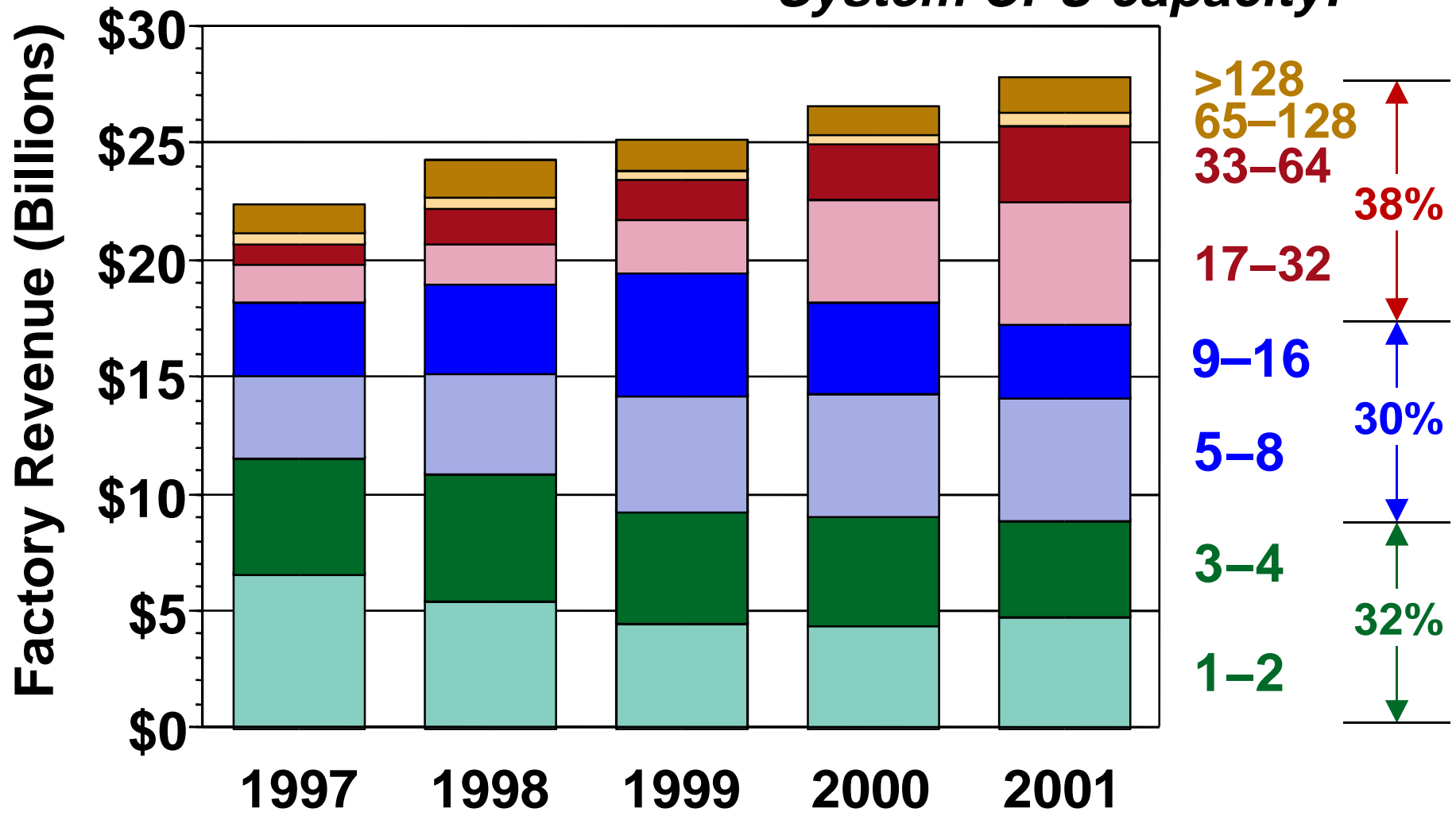
UltraSPARC-III
2000



43 /172 GBps
72-106 CPUs

Worldwide Unix Server Market

System CPU capacity:



Years are 4 quarters ending June 30
 Source: IDC Sept 01

Year

Sun Fire Servers



Solaris on SPARC on Fireplane Interconnect

280R

- 2 CPUs
- 8 GB RAM
- 4 PCI slots

V880

- 8 CPUs
- 32 GB RAM
- 9 PCI slots

3800-6800

- 8-24 CPUs
- 64-192 GB RAM
- 16-32 PCI or 12-16 cPCI slots
- 1 to 4 domains

15K

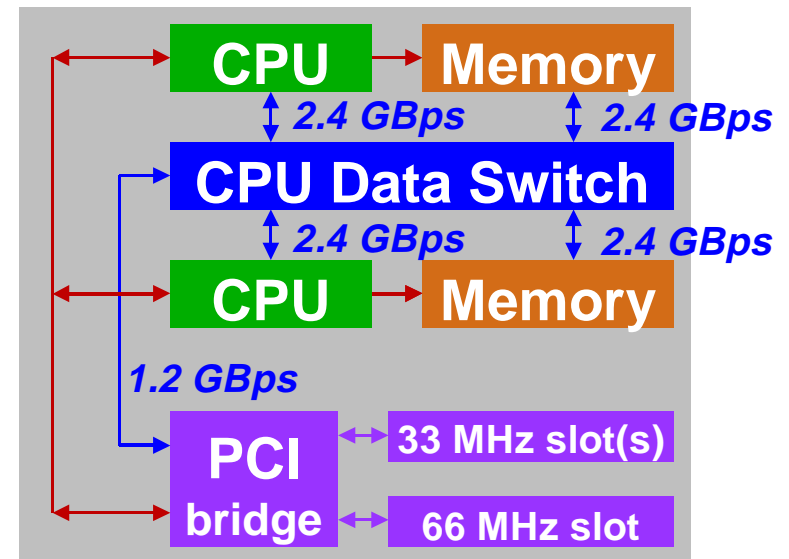
- 72-106 CPUs
- 576 GB RAM
- Up to 72 hot-swap PCI slots
- 1 to 18 domains

1-level Fireplane: Small Server

Level 0

Workstation or Small server

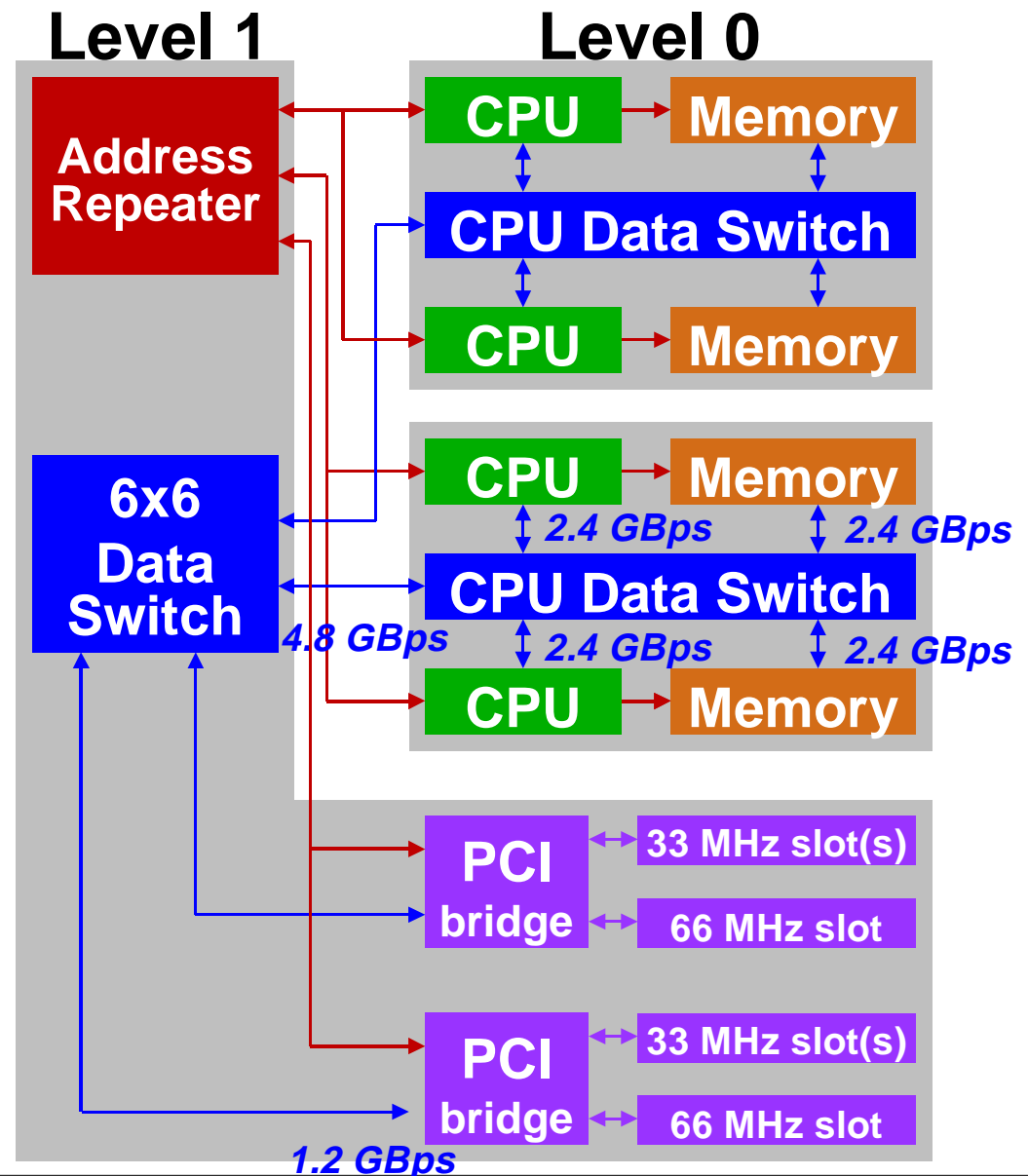
- CPU/Memory pair
- PCI bridge



2-level Fireplane: Workgroup

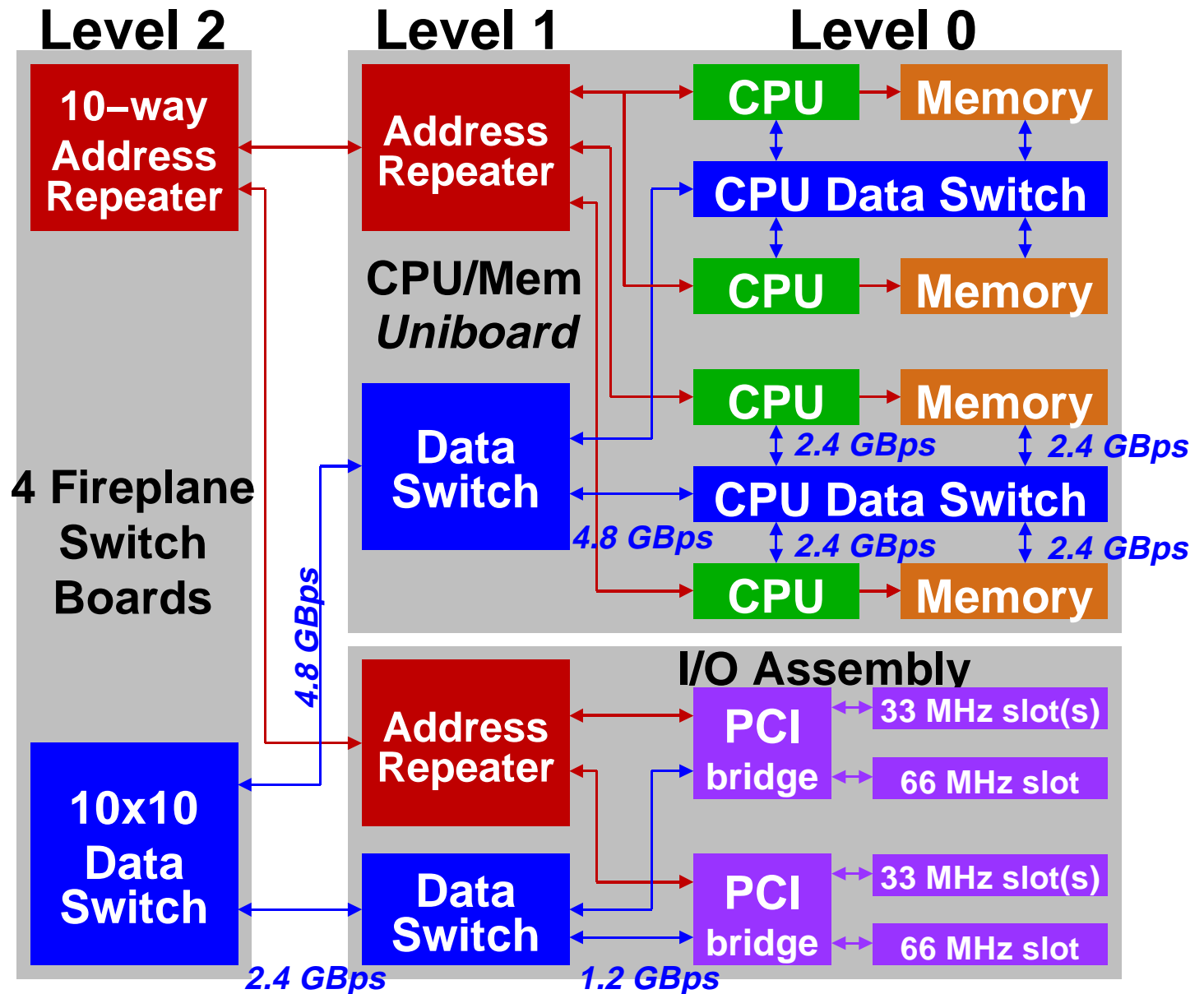
Workgroup server

- 4 Dual-CPU/
Memory boards
- 2 PCI bridges

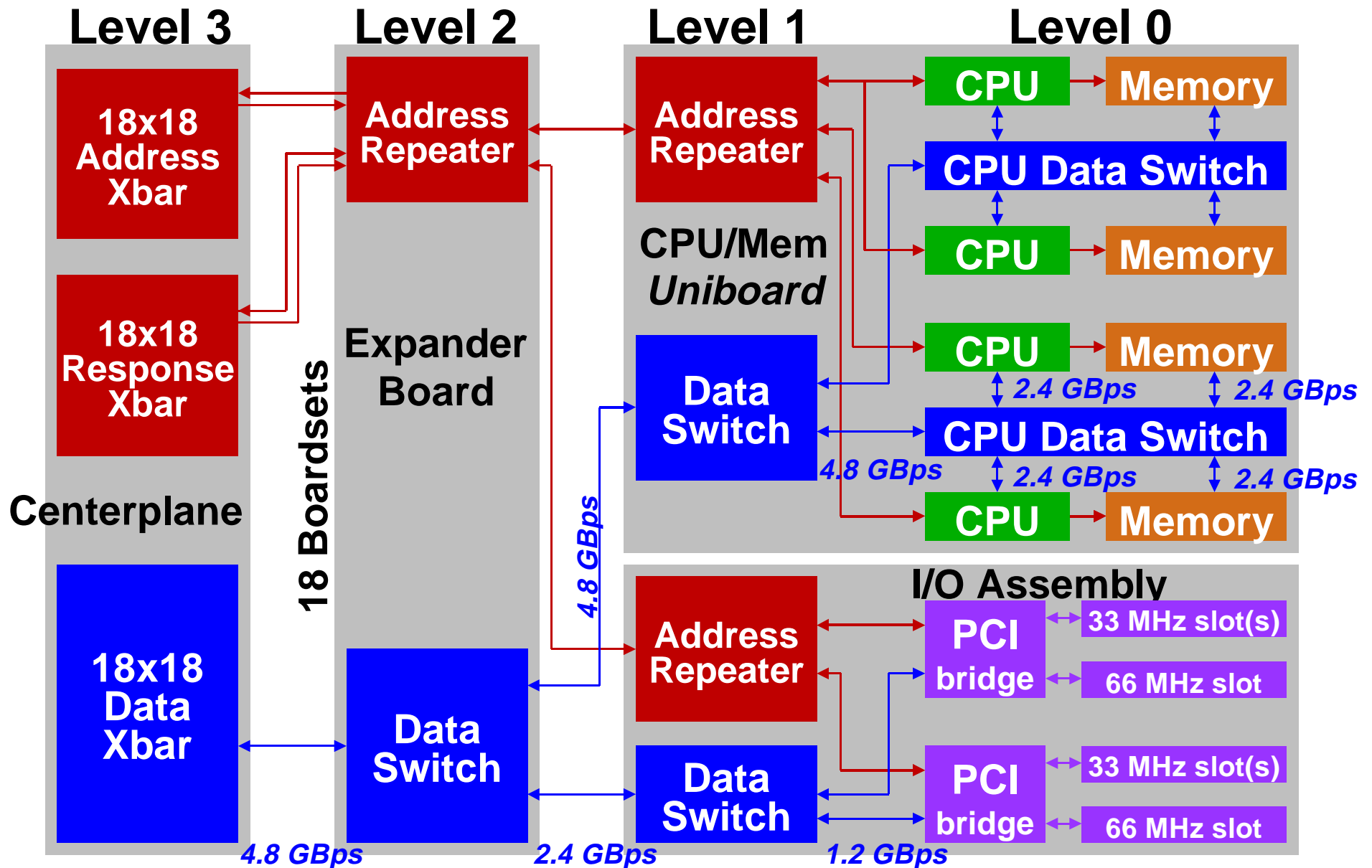


3-level Fireplane: Mid-size

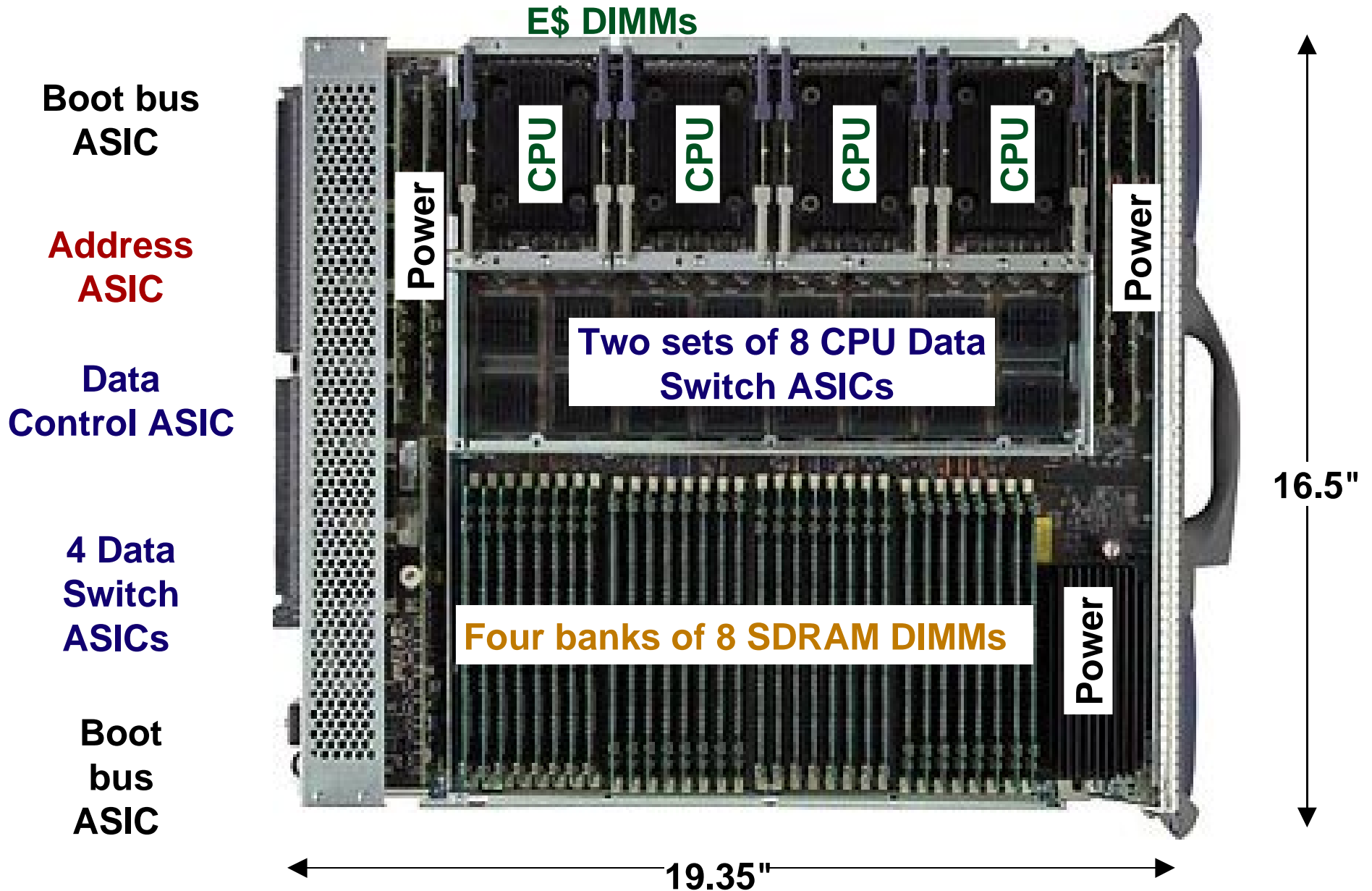
6 Uniboards
4 I/O boards



4-level Fireplane: Large Server



CPU/Memory Uniboard



I/O Assemblies

4 slot cPCI



6 slot cPCI



8 slot PCI

4 slot hot-swap PCI

Mid Range Cabinets

3 x Sun Fire 3800



3 x (8 CPUs + 12cPCI slots)

Sun Fire 4800/4810



12 CPUs + 16 PCI slots



Sun Fire 6800



24 CPUs + 32 PCI slots

High-end Cabinet

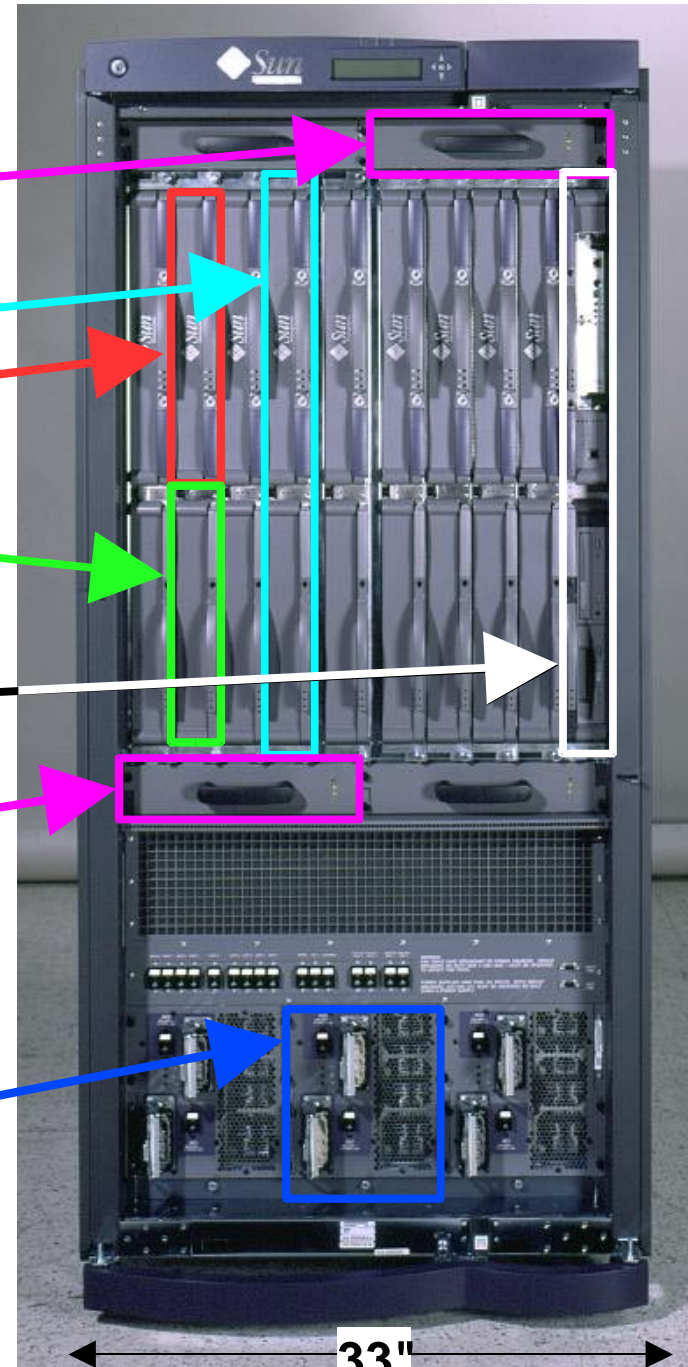
4 Fan Trays

18 Boardsets with
18 CPU-Memory Boards
and 18 I/O or
Dual CPU Boards

2 System Controllers

4 Fan Trays

Six Dual Input 4 KW
AC to 48 volt DC
Power Supplies

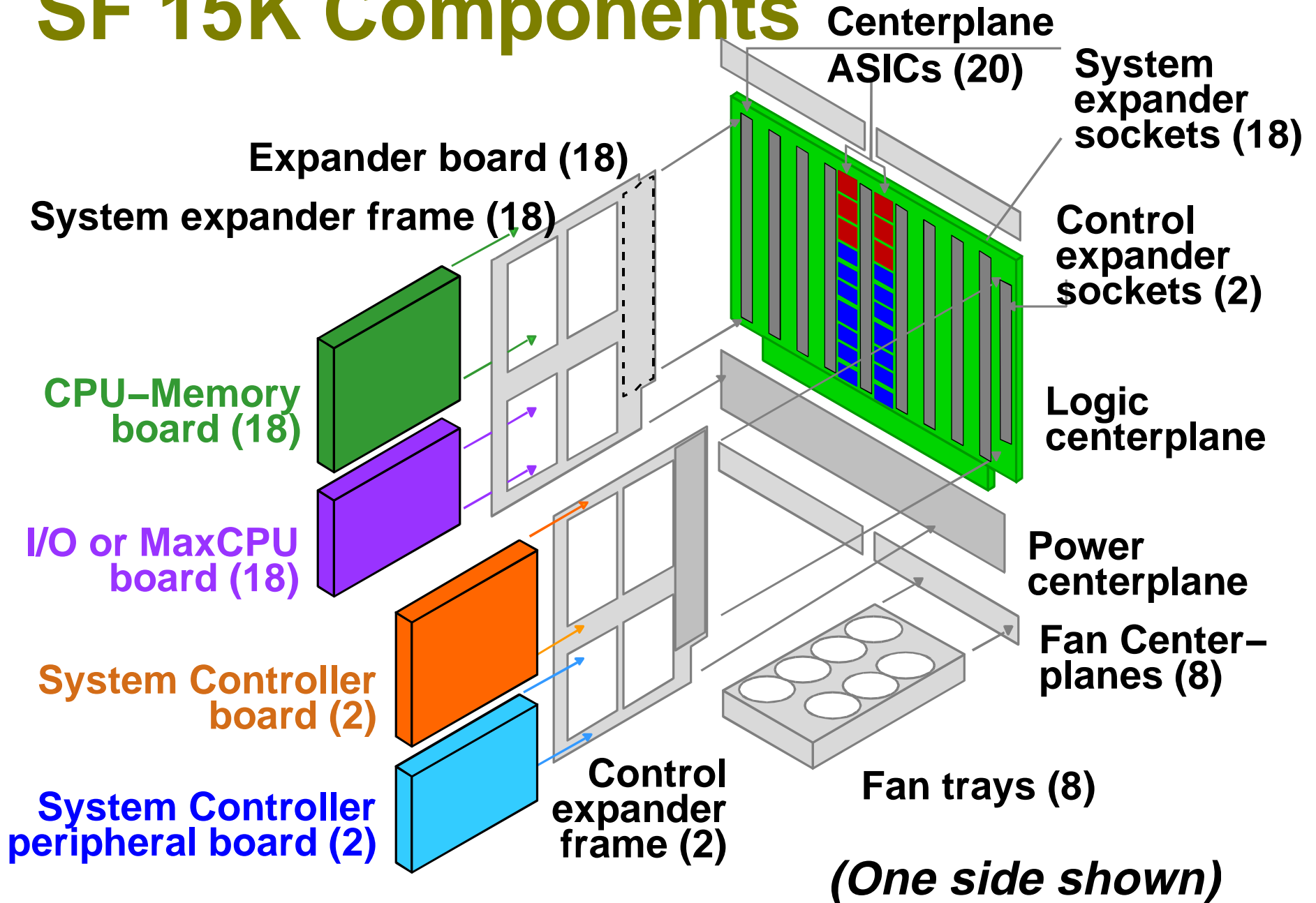


75"

33"

65"

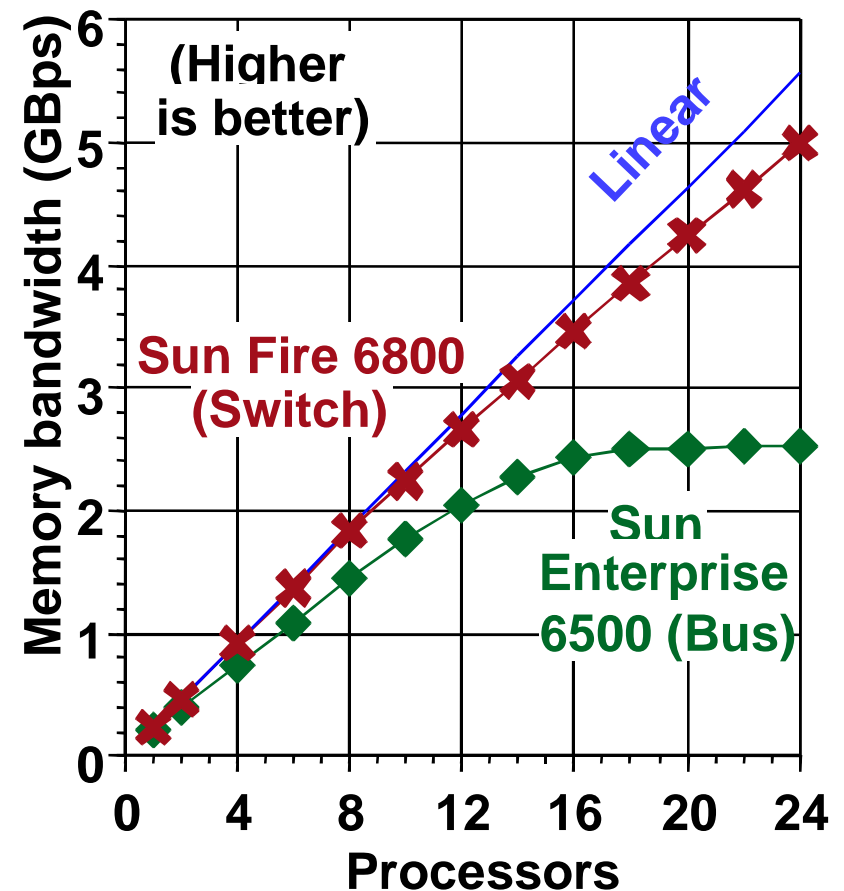
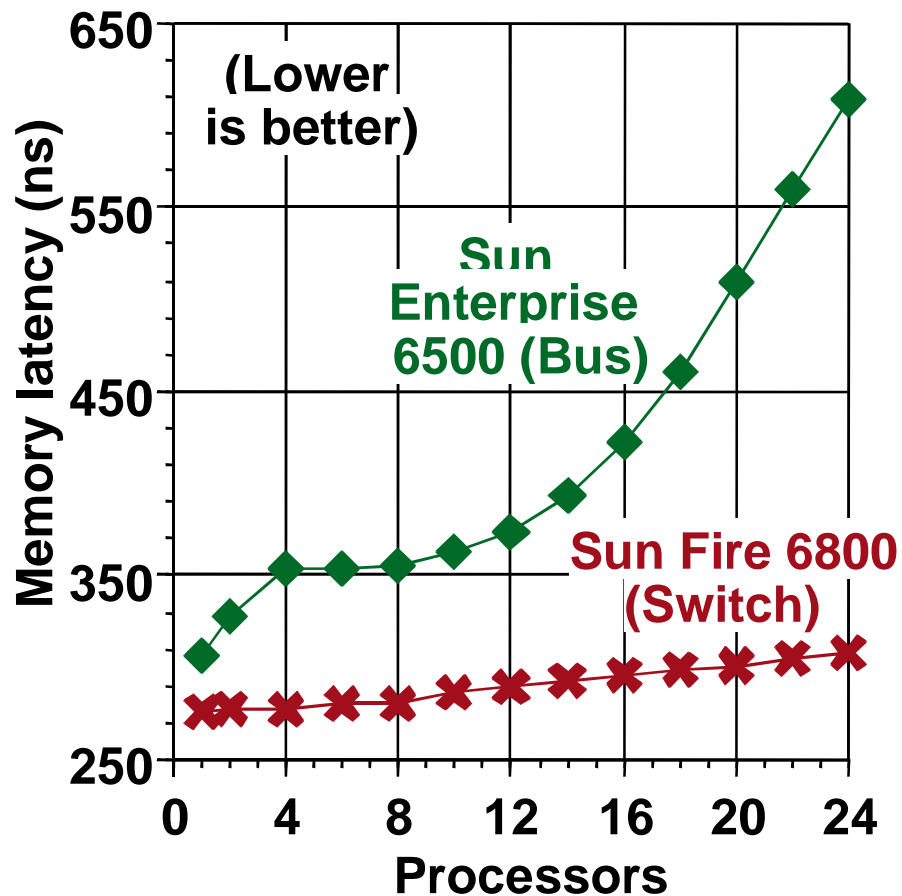
SF 15K Components



Mid-range Micro Benchmark

Parallel pointer-chasing

UPA to Fireplane Generation

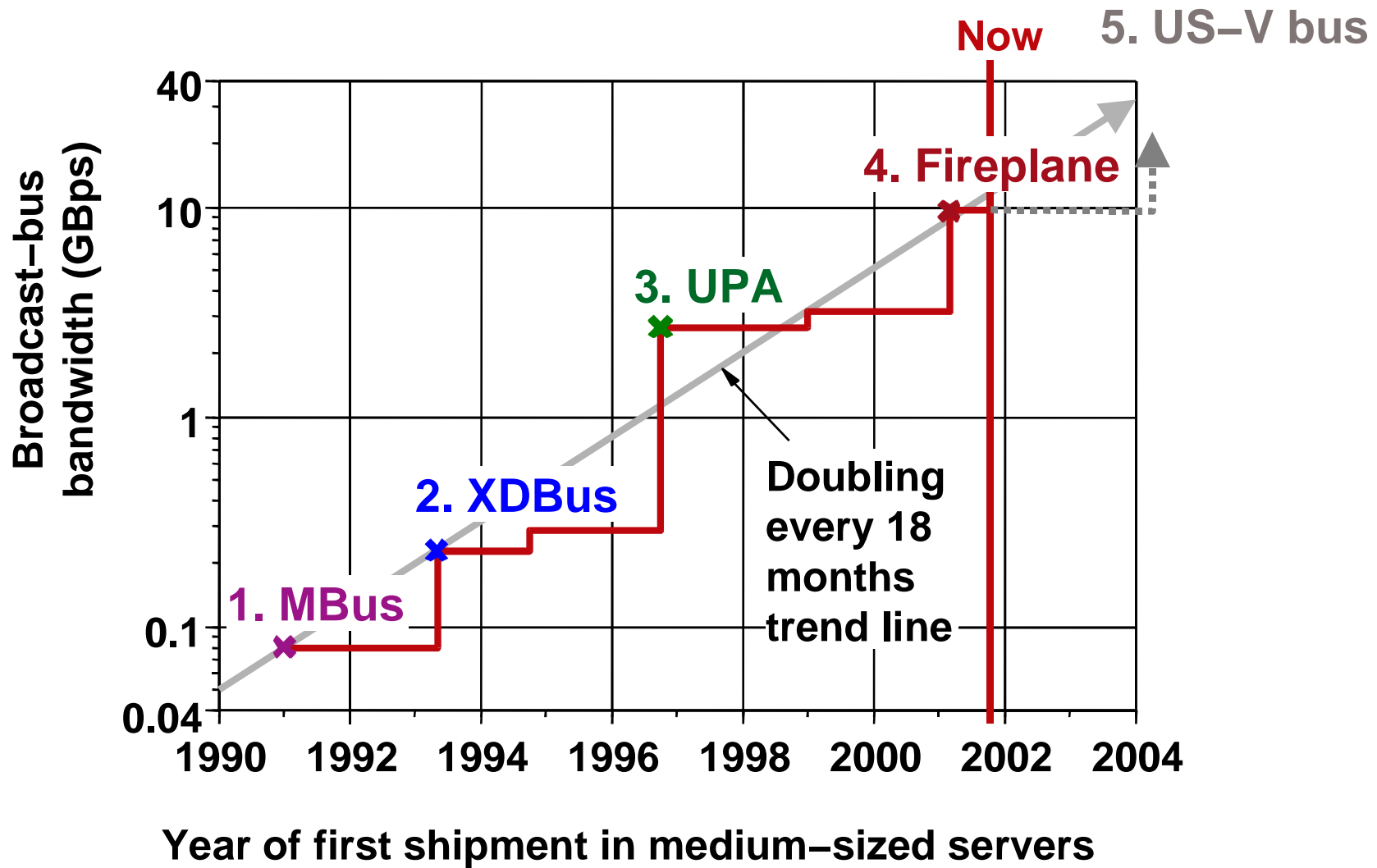


Sun Interconnect Generations



	1	2	3	4
	MBus	XDBus	UPA	Fireplane
Year (in mid-size servers)	1991	1993	1996	2001
System clock (MHz)	40	50–55	83–100	150
Coherency type	Broadcast			Broadcast & point-to-point
Packet switching	Circuit	Packet switched		
Address & Data	Together		Separate	
Coherency block (bytes)	32	64		
Clocks/snoop	16	11	2	1
Address bus BW (GBps)	0.08	0.3	3.0	9.6
# Address buses	1	4	4	18
Max data B/W (GBps)	0.08	1.3	12.8	172
Datapath width (bytes)	8		16	32
Wiring	Bused		Mid: Bused High: Switched	Switched

Sun Snooping Bandwidth Progress



Snoopy Bandwidth Progress

