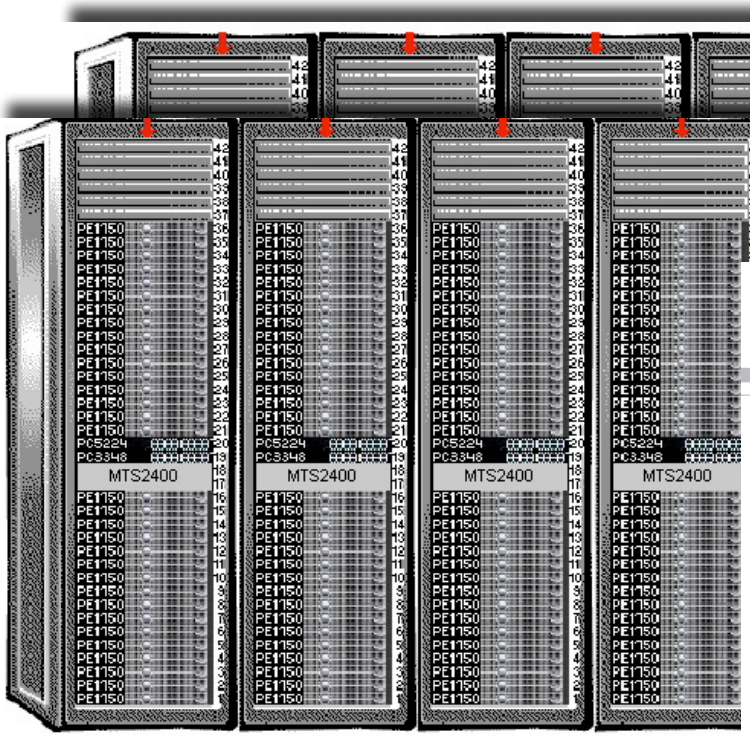
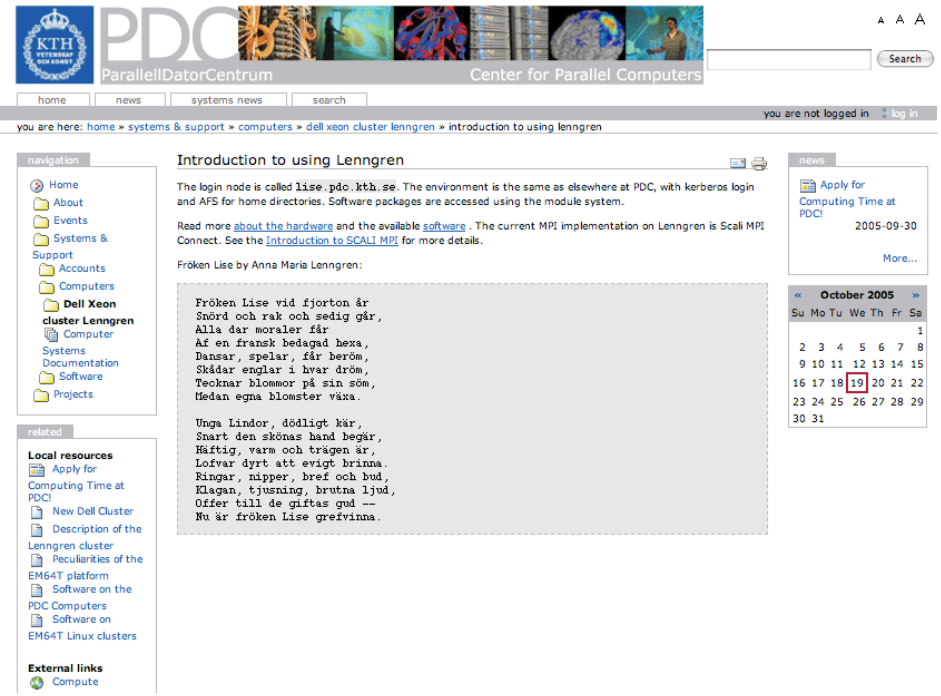
Eight Months with Lenngren





Parallelldatorcentrum

Per Öster per@pdc.kth.se

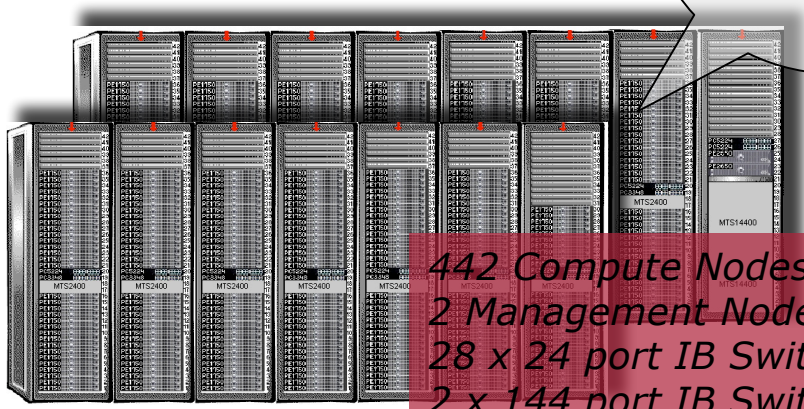
PDC

Kungl Tekniska Högskolan

Computing resources

HP Itanium2 Cluster25

180 processors
0.6 Tflop/s
0.5 Tbyte memory



442 Compute Nodes
2 Management Nodes
28 x 24 port IB Switche
2 x 144 port IB Switche
14 x 1 Gbit switches
100 Mbit management

Power: 154kW

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12 processor sgi Origin 2000 used as graphics engine for the VR-CUBE

Linux-Lab PC Cluster
16 processors IBM PIII

IBM SP (KALLSUP2)
Computer for research and education at KTH, 32 processors

Stockholm Bioinformatics Centre
+350 nodes (P4 and Athlon)

SWEGRID
100 nodes (Intel P4)

Claimed (and questioned) at LCSC 2004 October 19

User Performance Increase

Machine	Nodes	Available Batch Nodes	"1/3" Rule	Actual Job Size
Strindberg	154	130	43	32
Lucidor	90	85	28	16
New Dell Cluster	444	300	100	64

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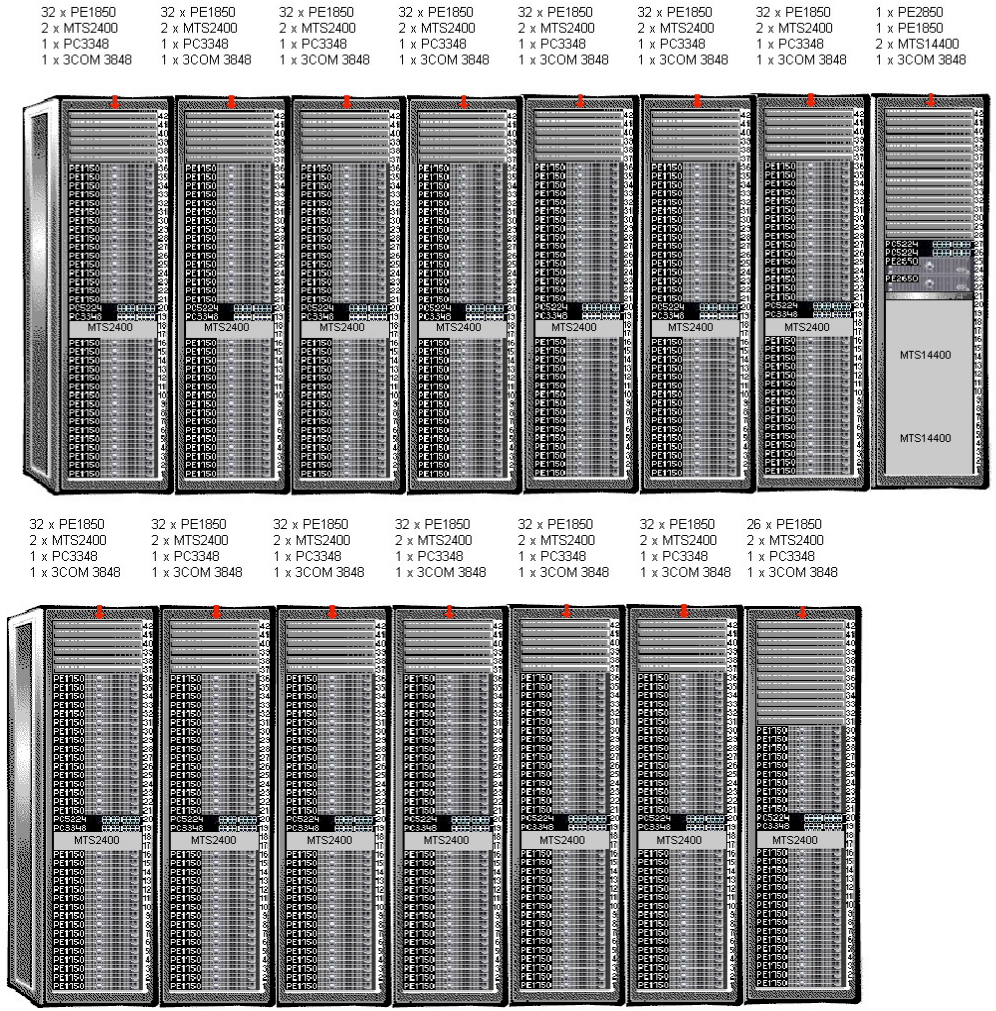
Machine	Actual Job Size	TPP/Node (GFlop/s)	Memory/Node (GByte)	Typical TPP/Job (GFlop/s)	Typical Memory/ob (GByt
Strindberg	32	0.64	0.25	7	3
Lucidor	16	7.2	6	38	32
New Dell Cluster	64	13.6	8	290	171

Cluster Configuration



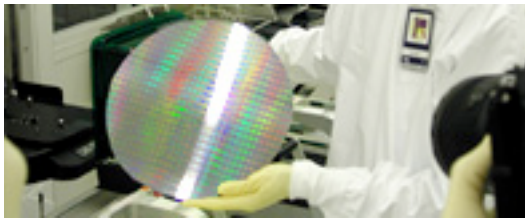
- 442 Compute Nodes
- 2 Management Nodes
- 28 x 24 port IB Switches
- 2 x 144 port IB Switches
- 14 Gbit switches
- 100 Mbit management l

- Power: 154kW

Parallelldatorcentrum

CPUs

- Intel 3.4 GHz Xeon EM64T (Extended Memory 64 Technology)
- TPP 6.8 Gflop/s
- 90 nm technology 300 mm wafers
- 800 MHz system bus
- DDR2 Memory
- Streaming SIMD Extension 3 (SSE3)
  - 8 more Streaming SIMD registers
  - (and 8 more general purpose registers)



Parallelldatorcentrum

Nodes

- Dell 1850 server
- 2 x 3.4 GHz Xeon EM64T
- 1MB L2 Cache
- 8 GB DDR2

- 36 GB 10’ rpm SCSI disk

- Intel 7520 Chipset
  PCI-Express 4x, 8x
  DDR2 (BW: 6.4GB/s)

- 2 x 1 Gbit integrated Intel NIC’s

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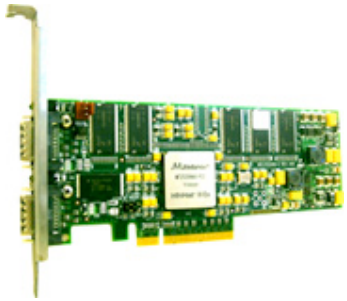
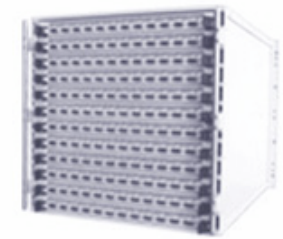
Interconnect

- PCI Express 8x HCA
- 4 links (4x) 10Mbit/s



- Bandwidth: 919 Mbyte/s
- Latency: 3.6μs

  (Switch 1hop. Benchmarking Jens Simon, Paderborn)



- 2 x 120 Port Switches
- 28 x 24 Port Switches

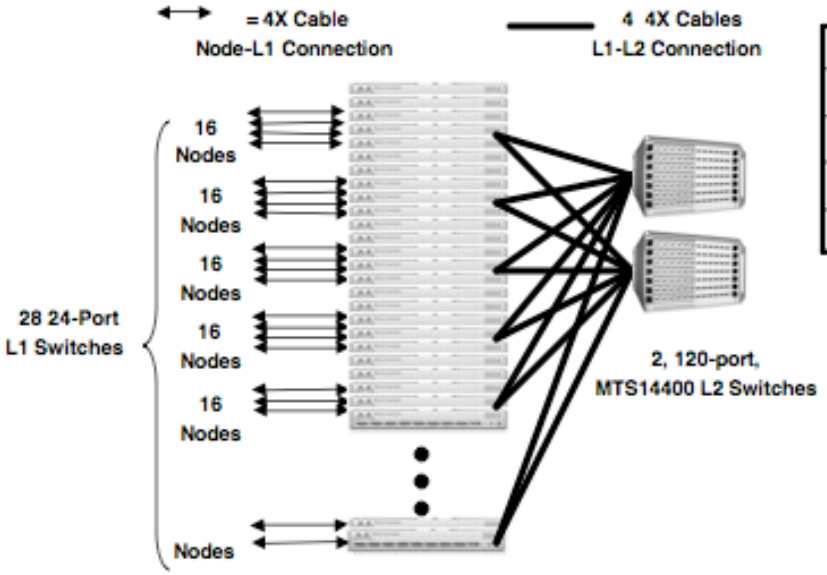
Parallelldatorcentrum

Mellanox Technologies

Interconnect

442-Node Cluster half CBB

- 442-port fabric with MTS2400 L1 Switches and MTS14400 L2 Switches
- 442 Servers with InfiniHost HCA
- Ultra-low latency: only 5-hops worst case
- In-band Switch Management from single remote host



Qty	Description	Part Number
28	MTS2400 24-Port Switch	MTS2400-24
2	120-Port MTS14400	MTS14400-120
442	InfiniHost HCA	
666	*4X Copper Cable	multiple vendors

*Cable lengths are estimated. Customer must calculate true lengths based on individual installation.

Mellanox Technologies Confidential

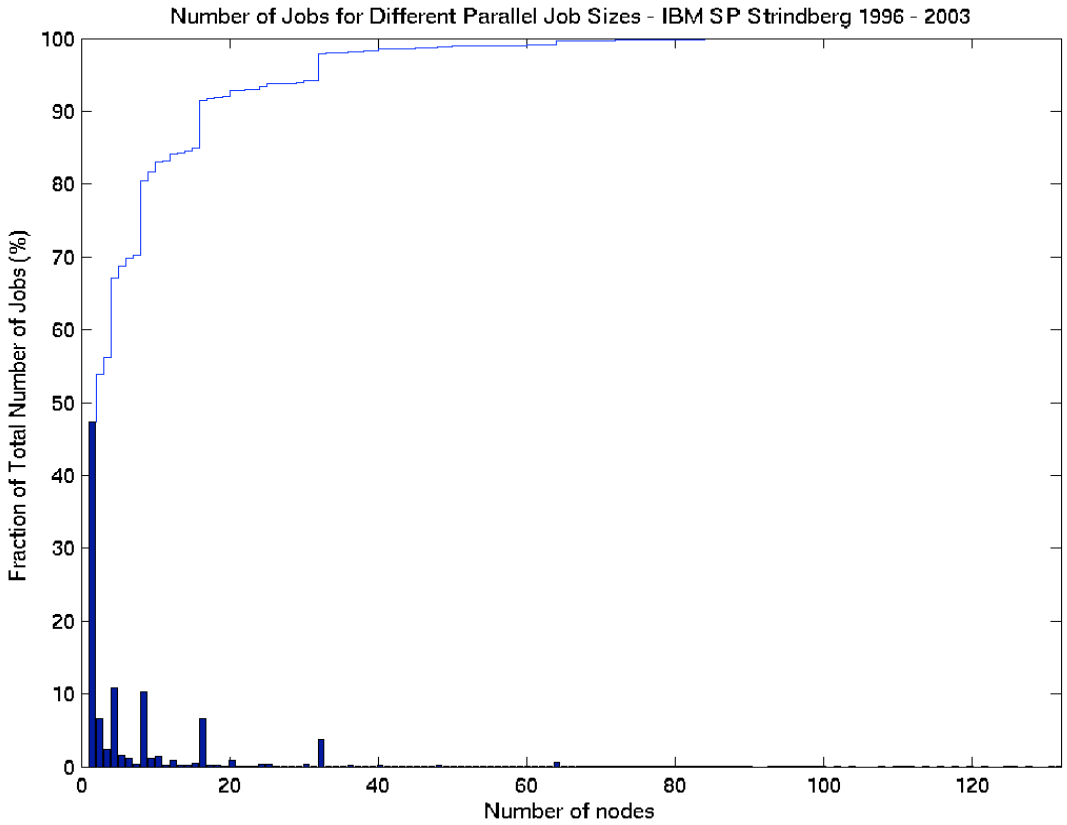
The Lot

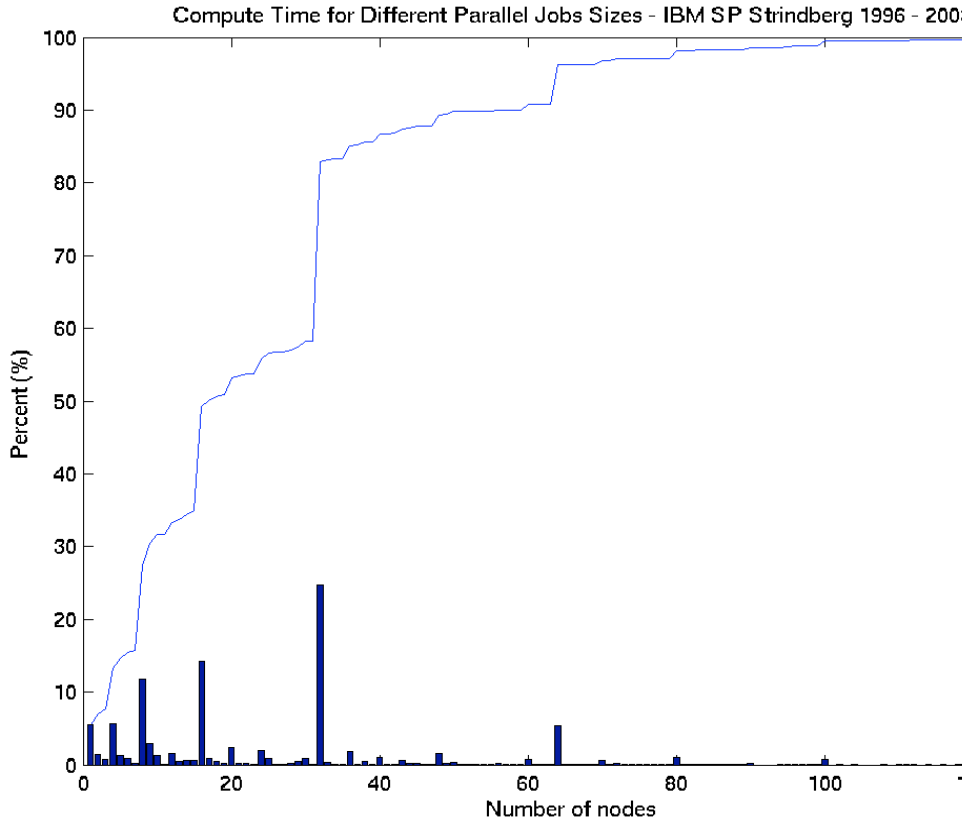
- 442 Compute nodes (+2 other)
- TPP: 6 TFlop
- Aggregate memory: 3.5TByte
- 288 000 US$/Tflop (all included)

Parallelldatorcentrum

IBM SP Strindberg – Job distributior

Mostly 0.64 Gflops nodes with 0.256 GB

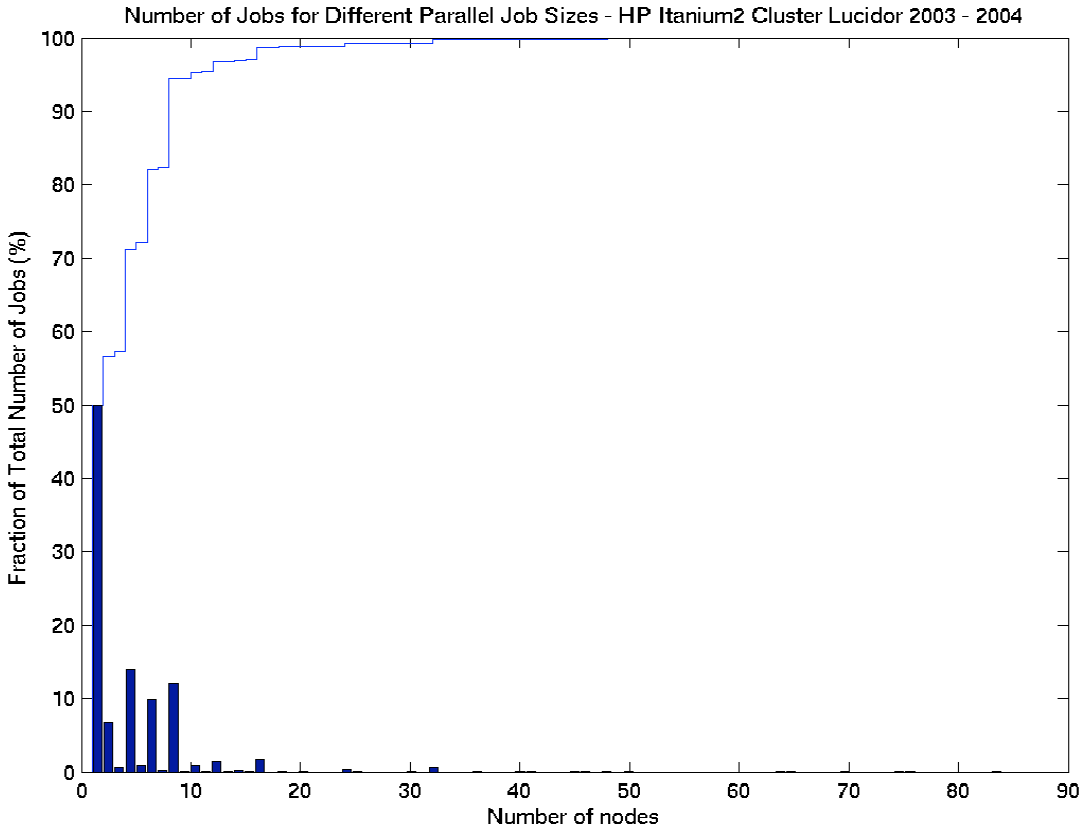


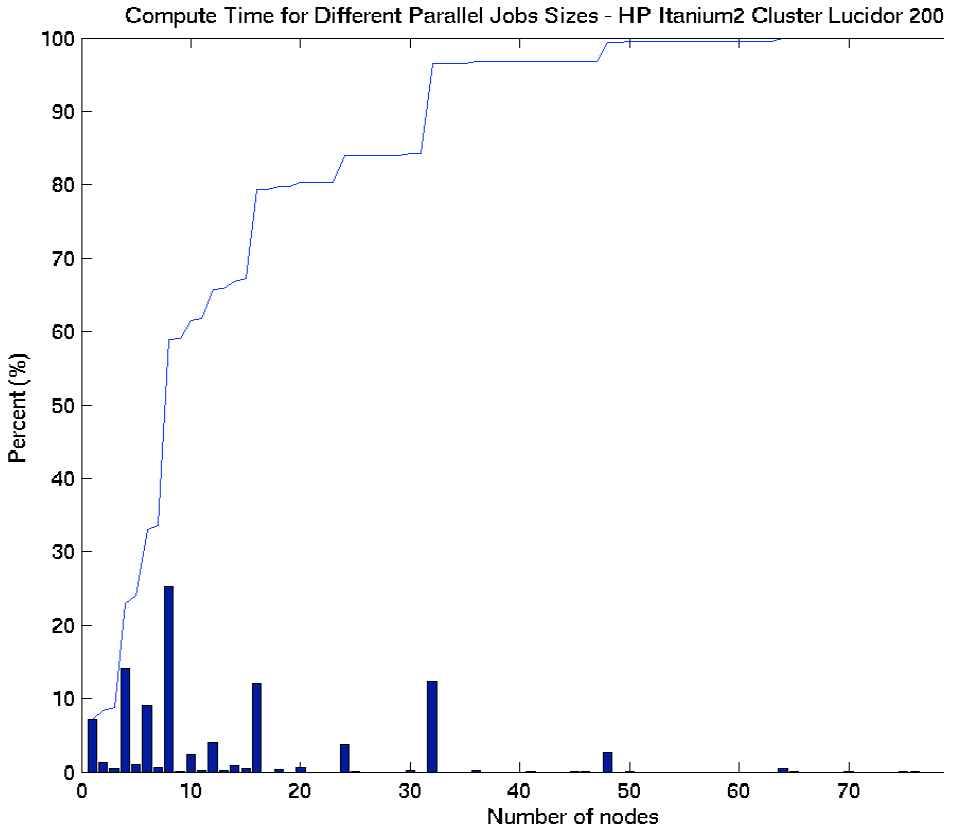


"Typical" job ~1/3rd of nodes available

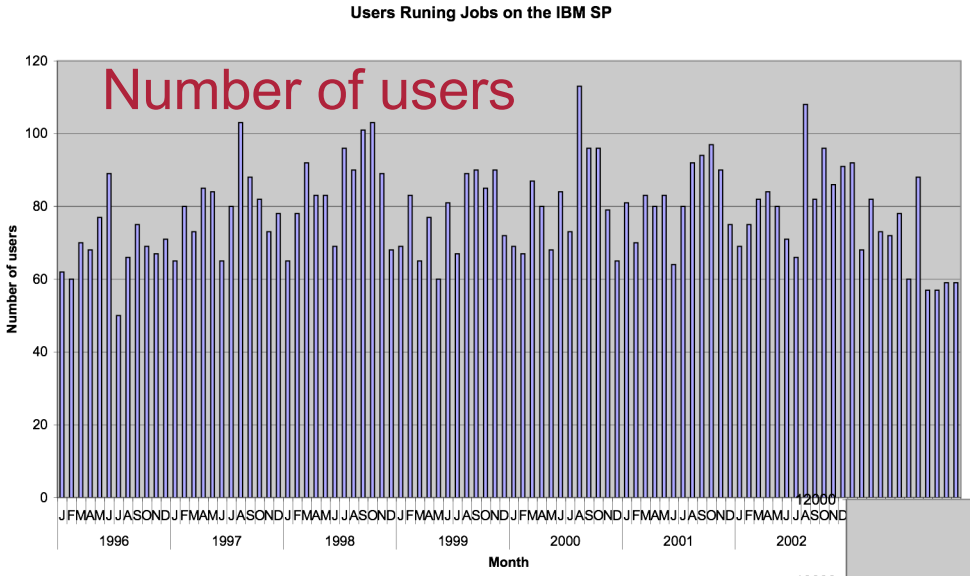
HP Itanium2 Cluster – Job distribution

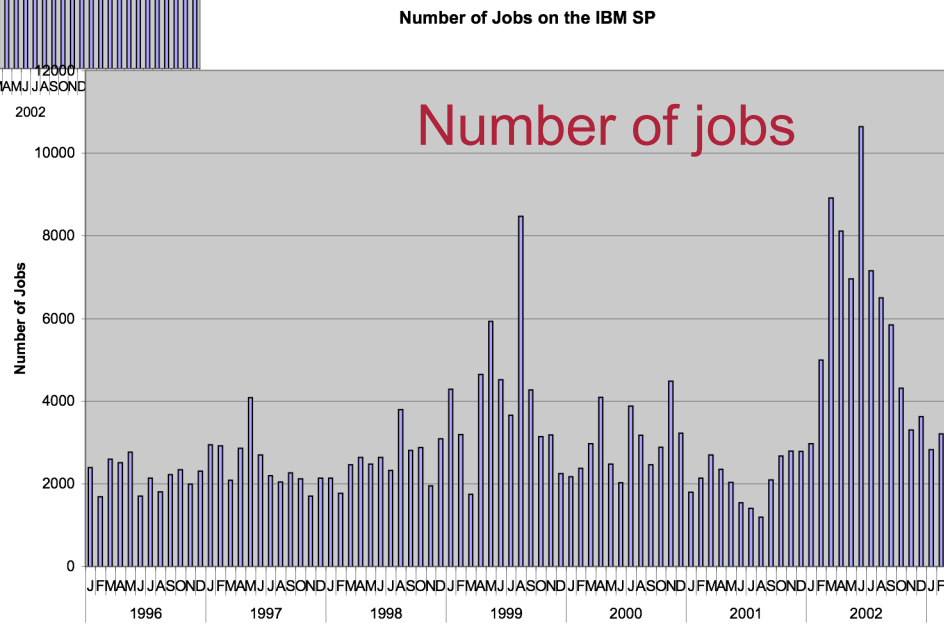
7.2 GFlops 6 GB nodes





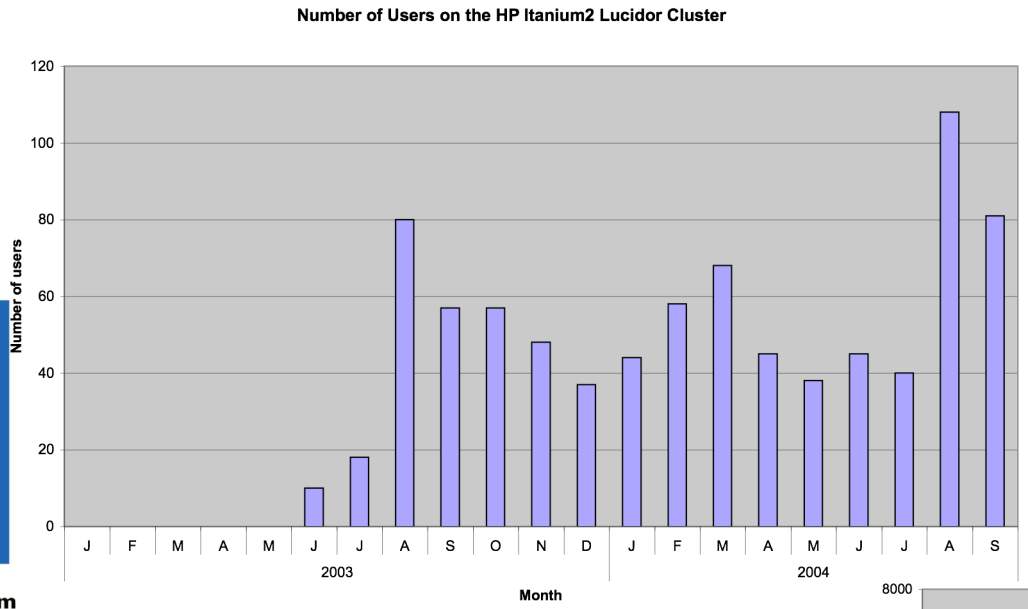
IBM SP Strindberg Usage

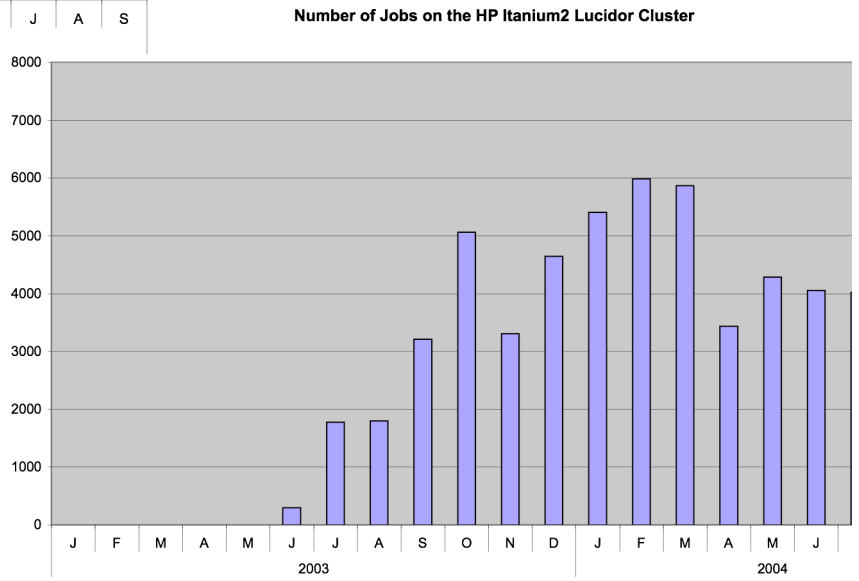




Parallelldatorcentrum

HP Itanium2 Usage





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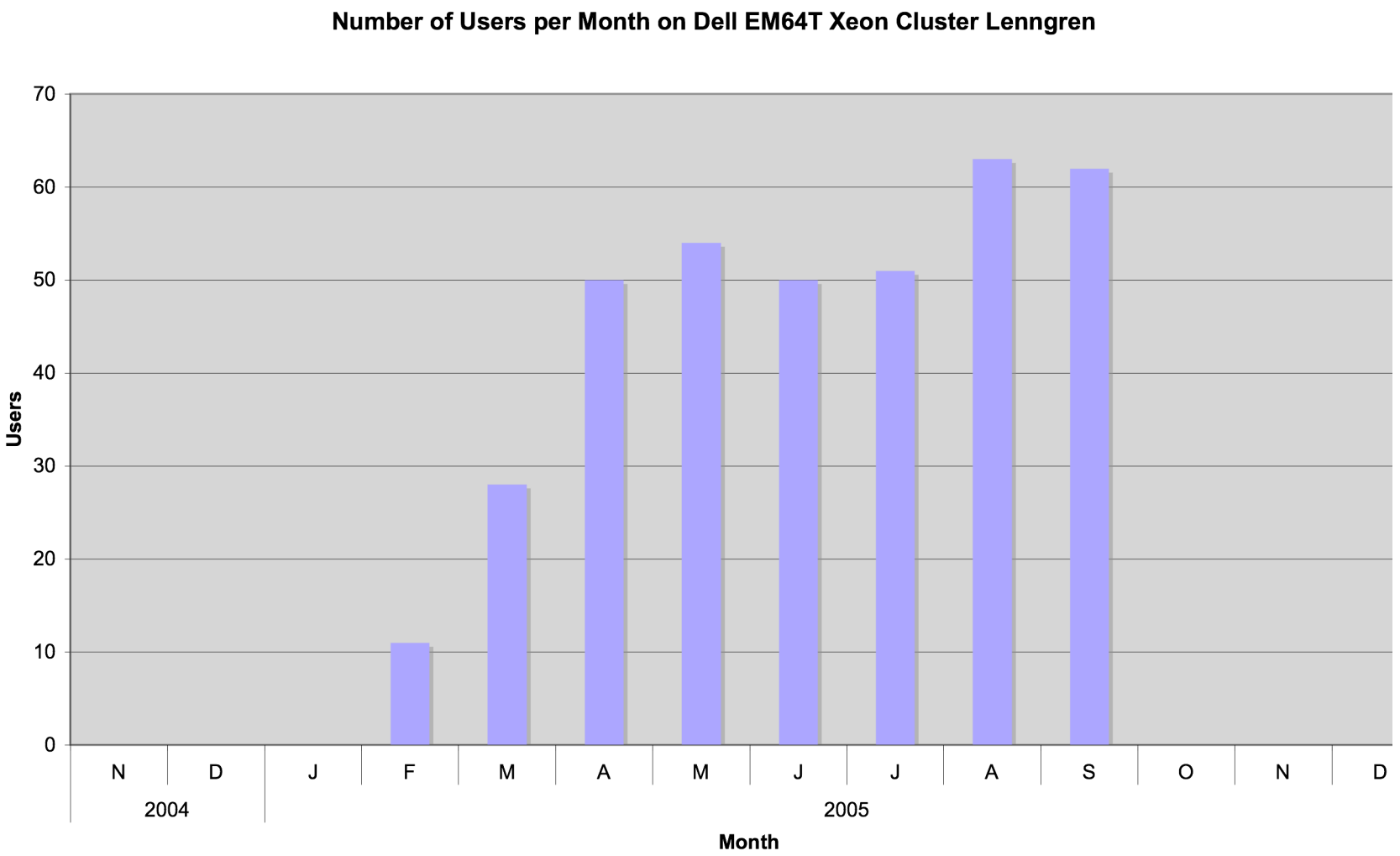
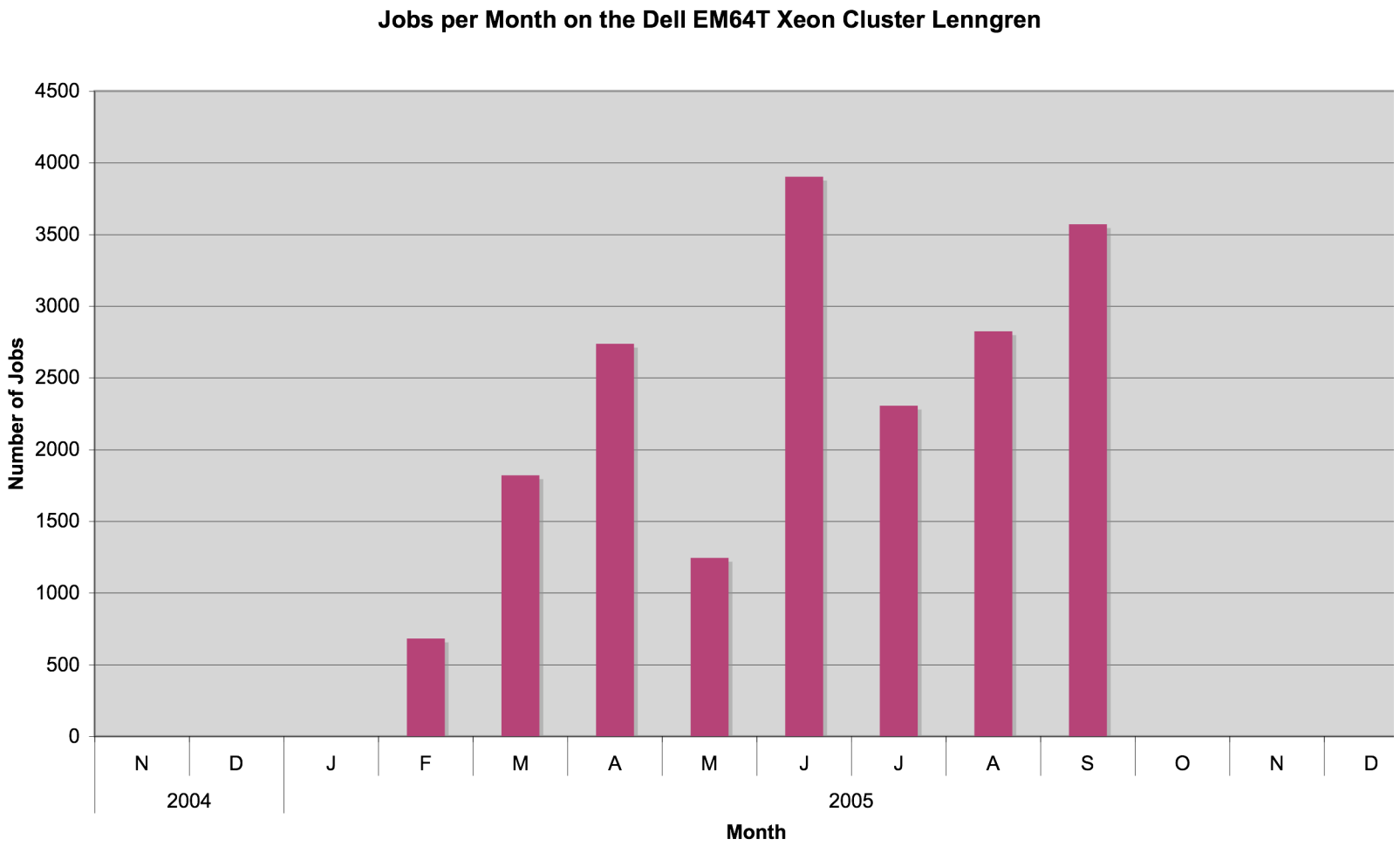
Lenngren: Number of Users per Month

Parallelldatorcentrum

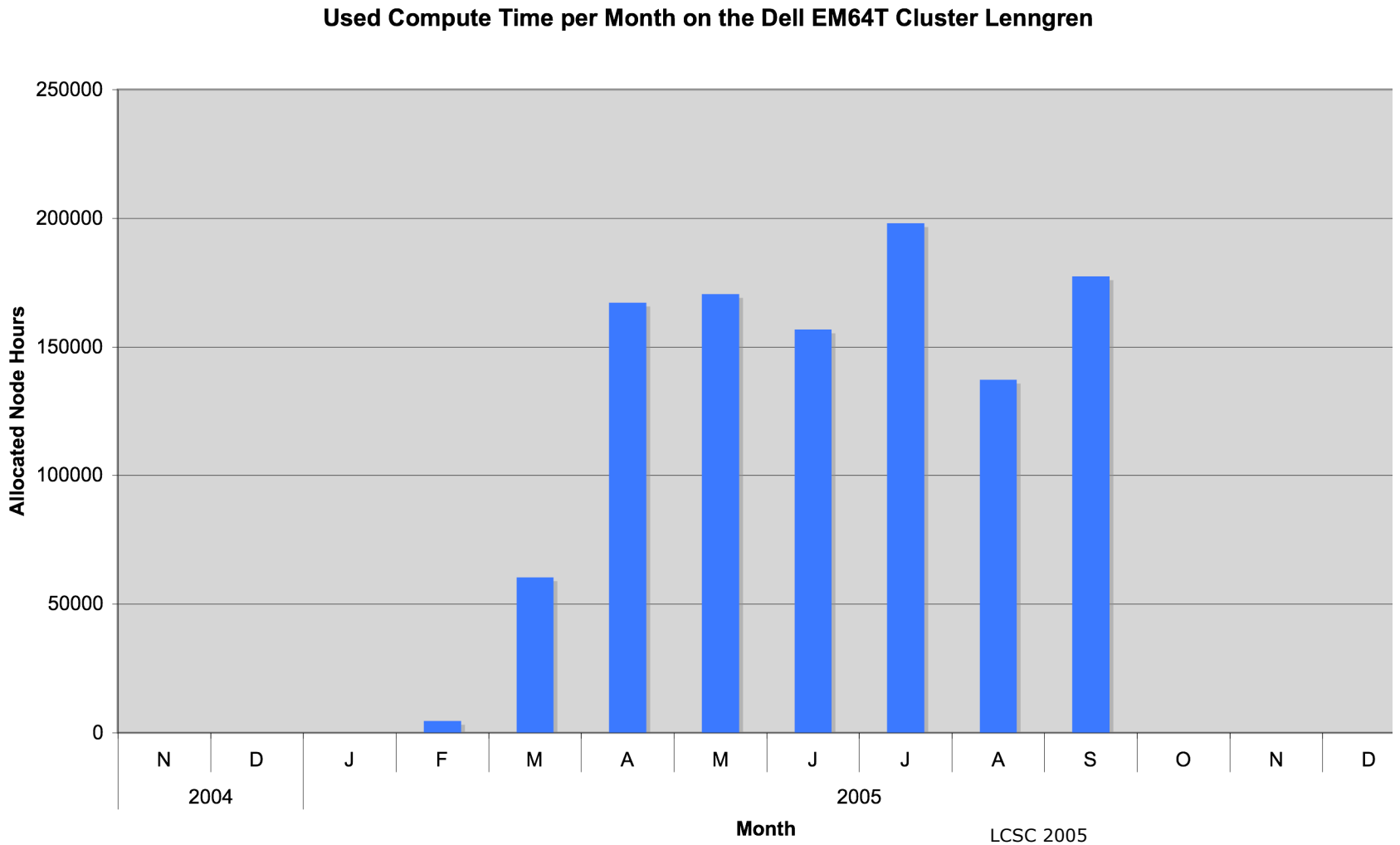


Lenngren: Number of Jobs per Month

Parallelldatorcentrum



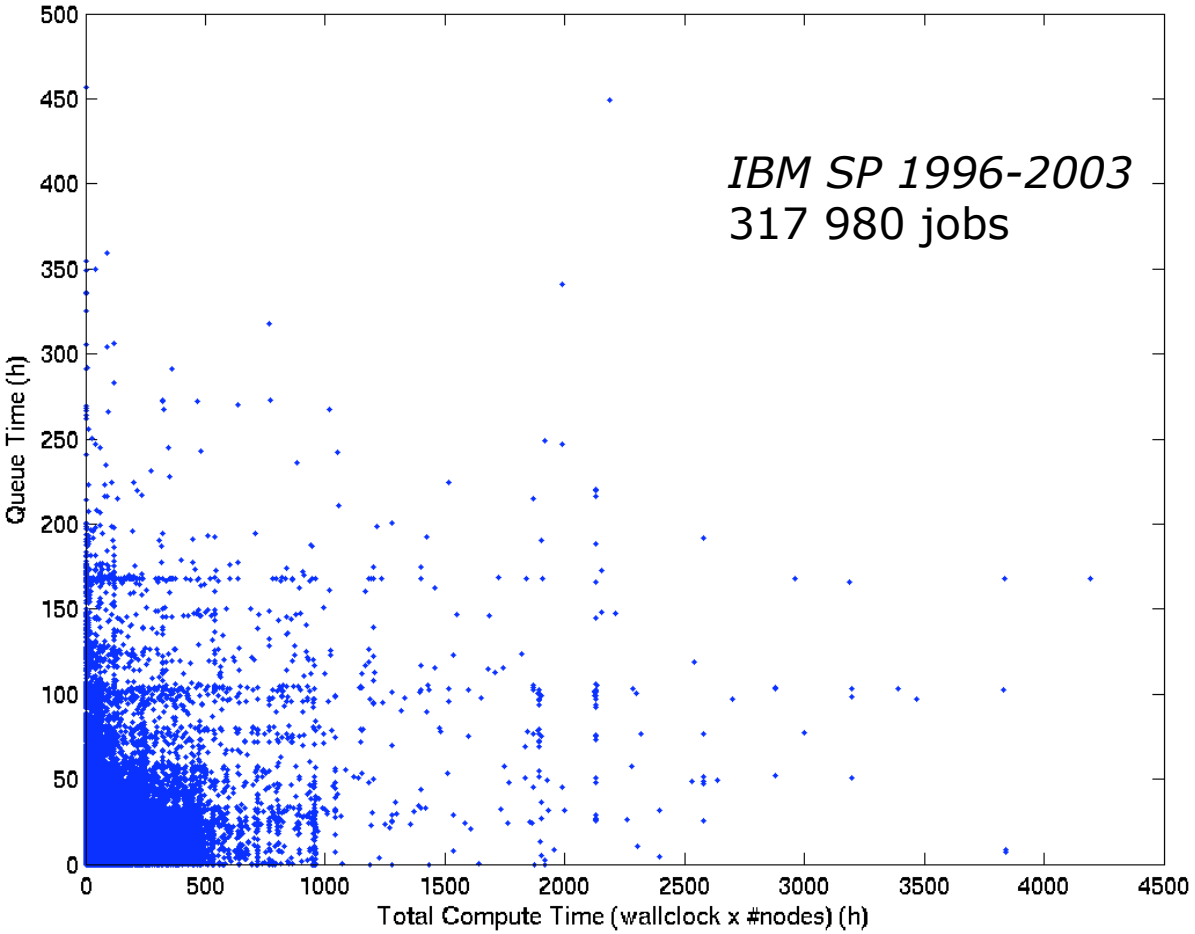
Lenngren: Compute Time per Month



Parallelldatorcentrum

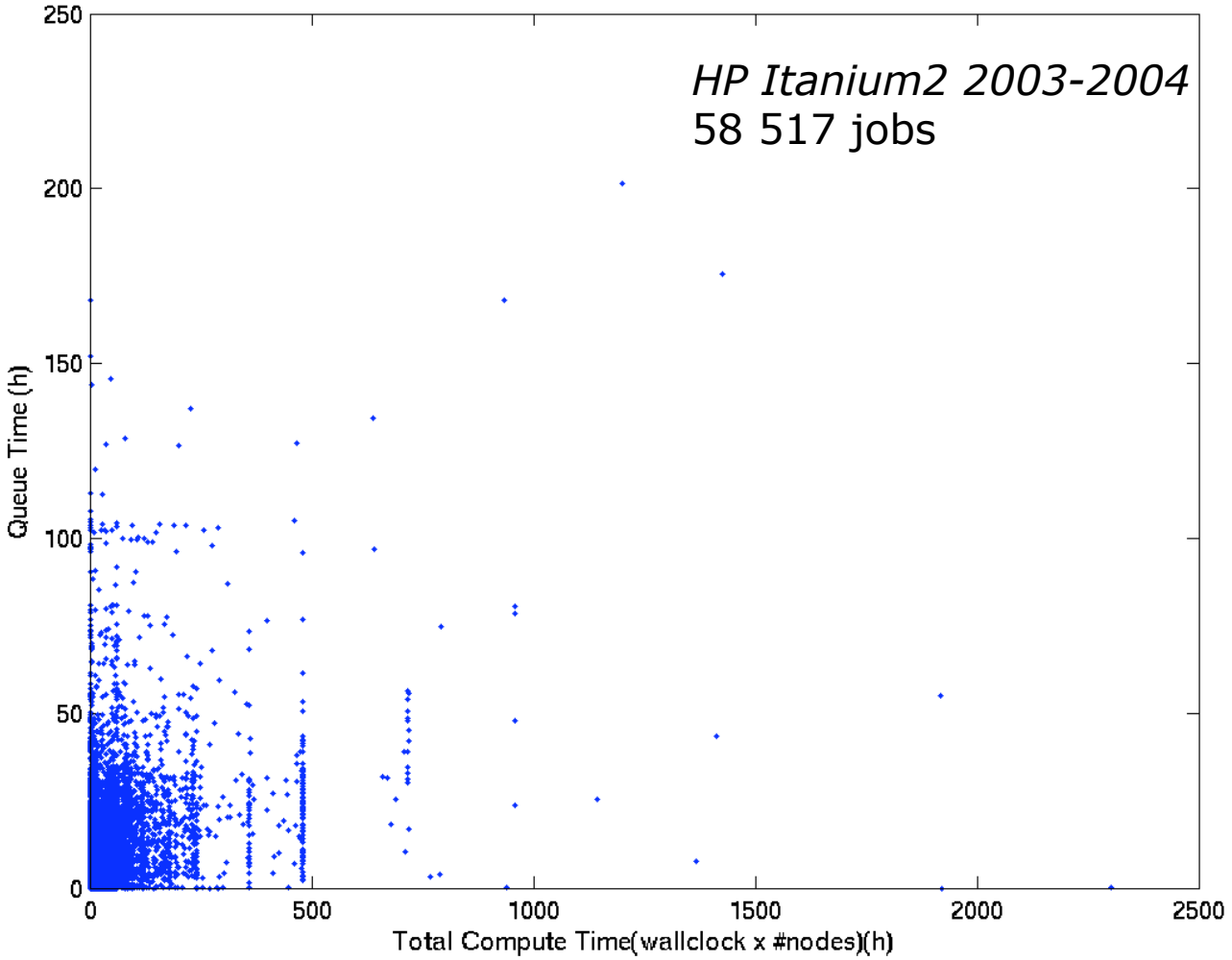
IBM SP Strinberg Queuing

Parallelldatorcentru



No Penalty for Large

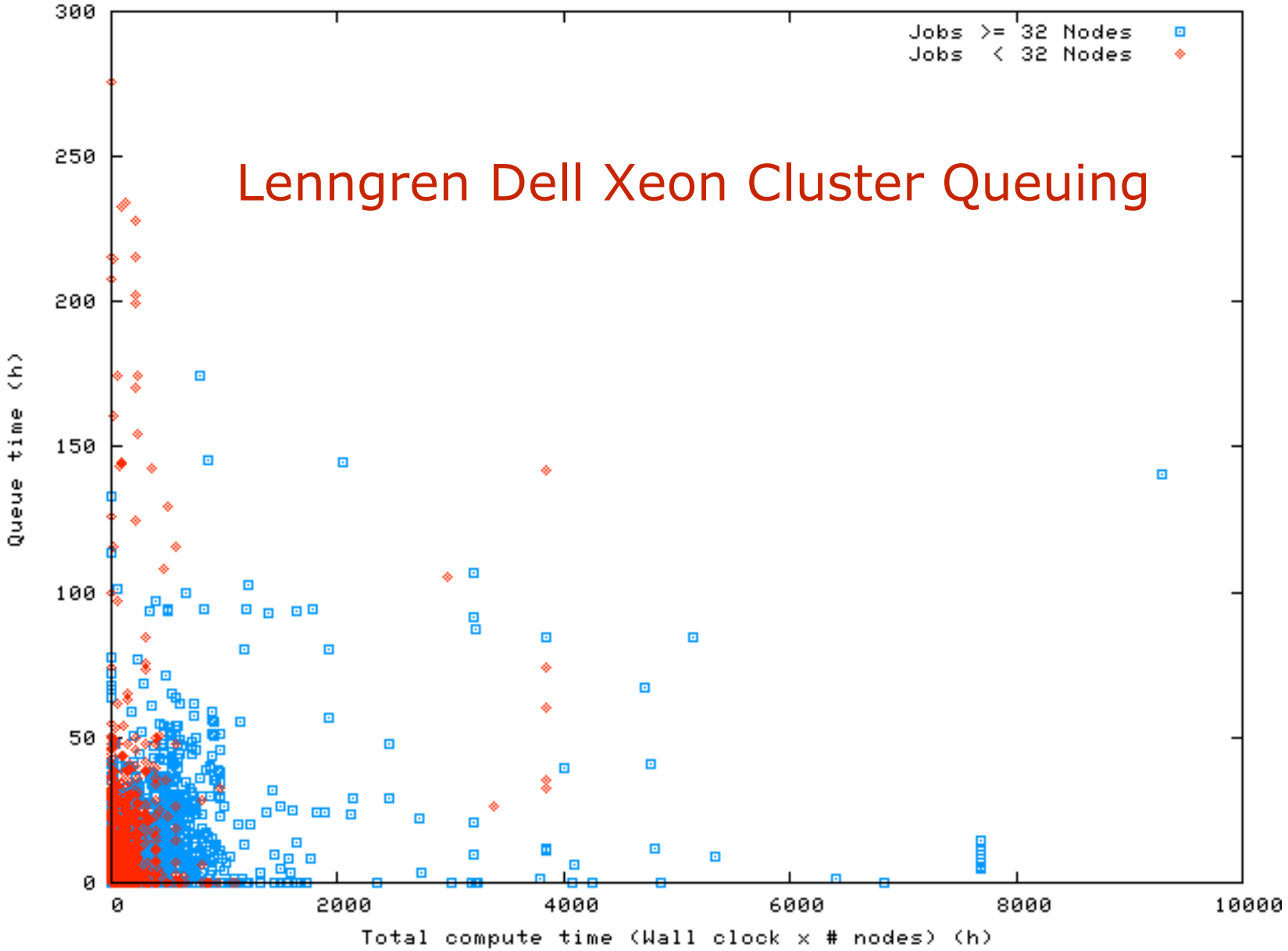
Lucidor HP Itanium 2 Cluster Queuing

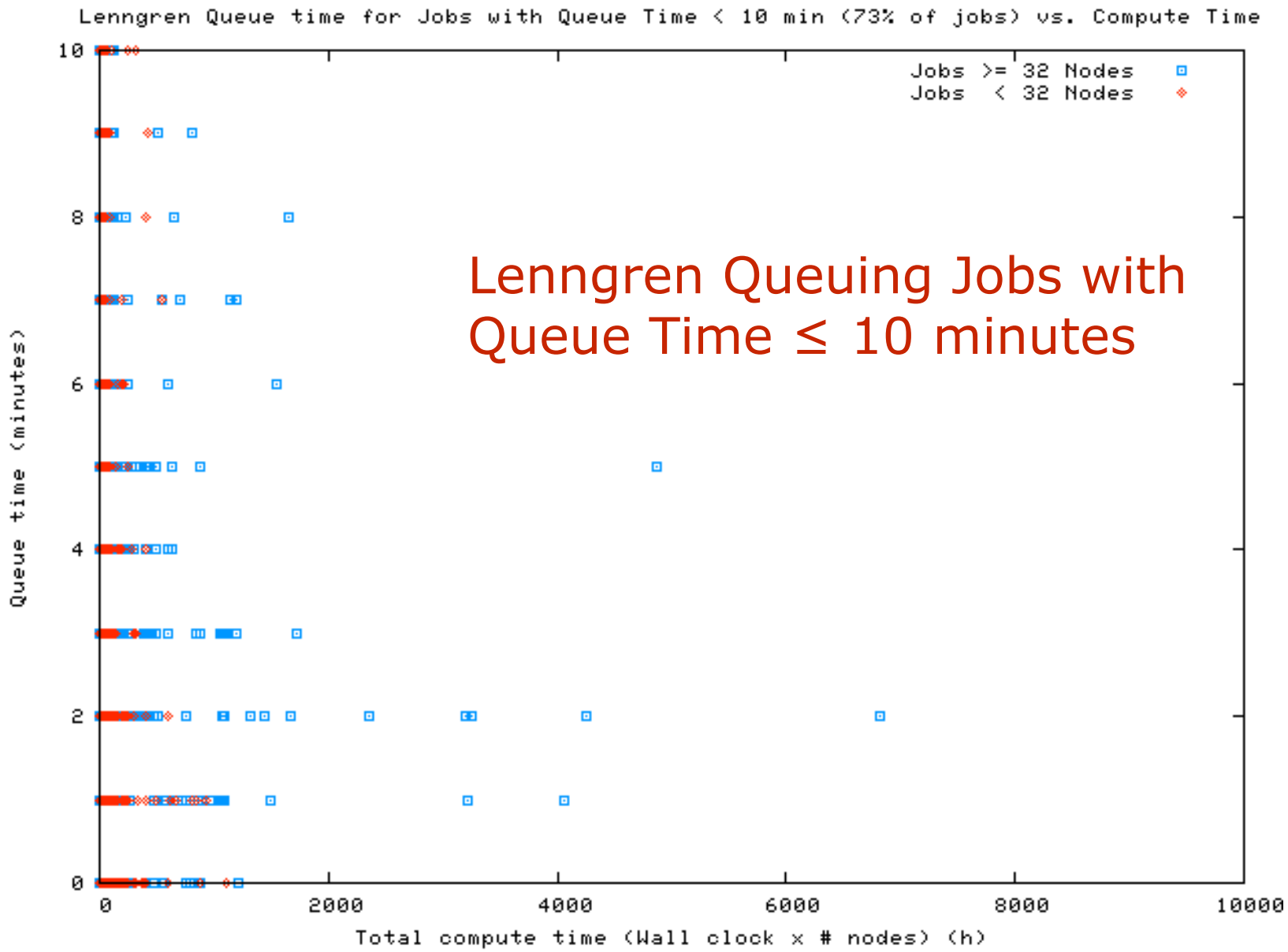


Parallelldatorcentrum

Parallelldatorcentrum

Lenngren Dell Xeon Cluster Queuing





Lenngren Queuing Jobs with Queue Time ≤ 10 minutes

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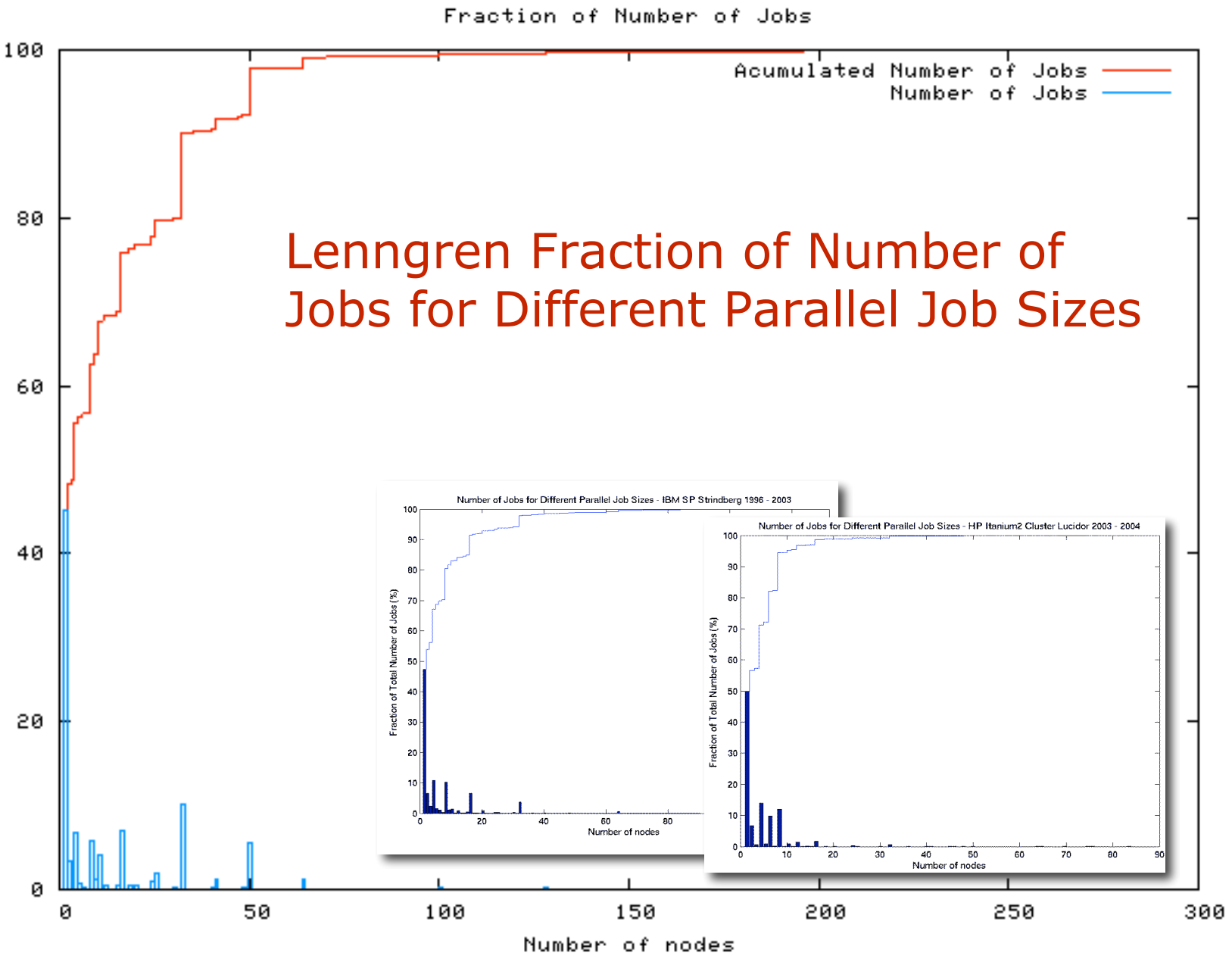
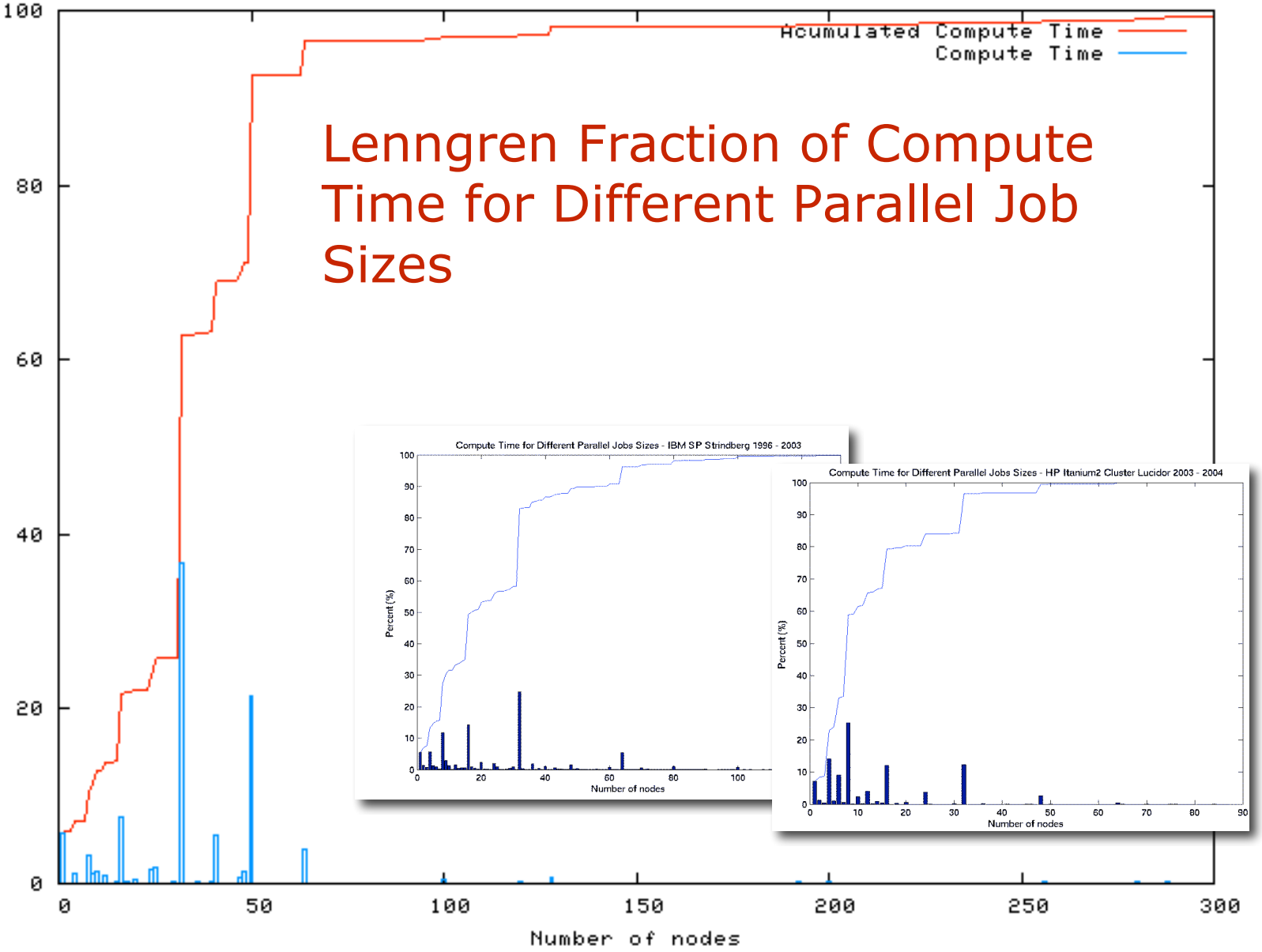
Lenngren Fraction of Number of Jobs for Different Parallel Job Sizes



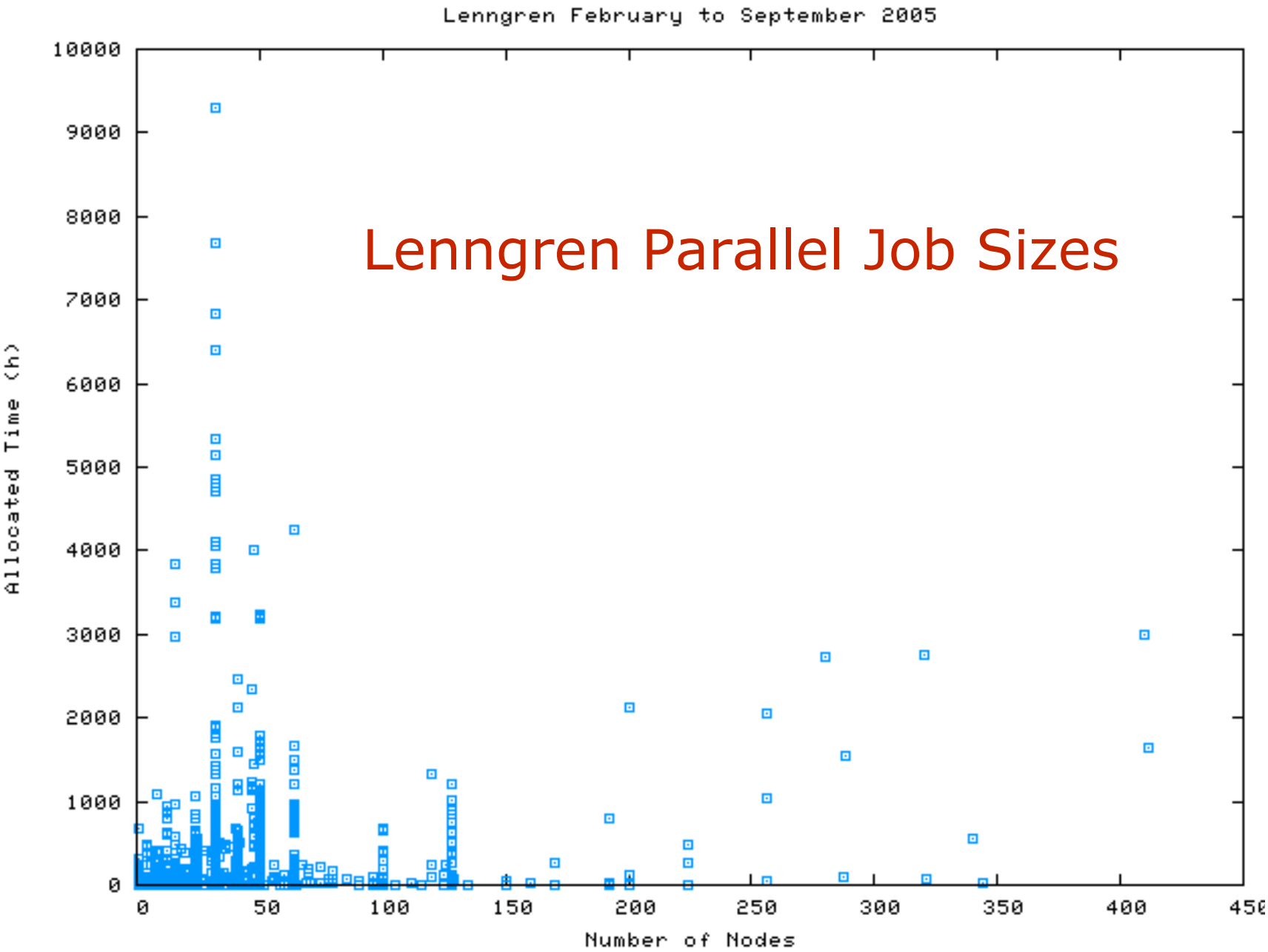
Parallelldatorcentrum

Lenngren Fraction of Compute Time for Different Parallel Job Sizes



Parallelldatorcentrum

Lenngren Parallel Job Sizes



Parallelldatorcentrum

Parallelldatorcentrum

Lenngren usage - unchanged since 2005/10/18 16:44

	Frame 1	Frame 2	Frame 3	Frame 4	Frame 5	Frame 6	Frame 7	Frame 8	Frame 9	Frame
42	service	tolja	elenius	arkady	olofg	open	open	open	open	
41	service	tolja	elenius	arkady	olofg	elenius	open	open	open	
40	service	tolja	elenius	arkady	olofg	elenius	open	open	open	
39	interactive	tolja	salci	arkady	olofg	elenius	service	open	open	
38	interactive	tolja	service	arkady	olofg	elenius	open	open	open	
37	interactive	tolja	olofg	arkady	olofg	service	open	open	open	
36	interactive	tolja	olofg	arkady	olofg	elenius	open	open	open	log-in
35	service	tolja	patrikj	arkady	olofg	elenius	open	open	open	log-in
34										
33										
32	service	tolja	patrikj	arkady	olofg	elenius	open	open	open	open
31	service	tolja	mikun	arkady	olofg	elenius	open	open	open	open
30	service	tolja	mikun	arkady	olofg	elenius	service	open	open	open
29	service	tolja	mikun	arkady	olofg	service	service	open	open	open
28	service	tolja	mikun	arkady	olofg	elenius	open	open	open	open
27	service	tolja	carstenm	arkady	olofg	elenius	open	open	open	open
26	service	down	tolja	arkady	olofg	elenius	open	open	open	open
25	service	tolja	tolja	arkady	olofg	elenius	open	open	open	open
24										
23										
22										
21										
20	tolja	tolja	down	arkady	olofg	elenius	open	open	open	open
19	tolja	tolja	tolja	arkady	olofg	elenius	open	down	open	open
18	service	tolja	tolja	arkady	olofg	elenius	open	open	open	cwmo
17	tolja	tolja	carstenm	arkady	olofg	elenius	open	open	open	cwmo
16	tolja	tolja	carstenm	arkady	olofg	elenius	open	service	open	cwmo
15	tolja	tolja	carstenm	arkady	olofg	elenius	open	open	open	cwmo
14	tolja	tolja	carstenm	arkady	olofg	elenius	open	open	open	open
13	tolja	mikun	carstenm	service	olofg	elenius	open	open	open	open
12										
11										
10	tolja	mikun	carstenm	arkady	arkady	elenius	open	open	open	open
9	service	mikun	carstenm	arkady	arkady	elenius	open	open	open	open
8	tolja	mikun	tolja	patrikj	arkady	elenius	open	open	open	open
7	tolja	tolja	tolja	service	arkady	elenius	open	open	open	open
6	tolja	tolja	tolja	elenius	arkady	olofg	open	open	open	open
5	tolja	tolja	tolja	elenius	arkady	olofg	open	open	open	open
4	mikun	tolja	tolja	elenius	service	olofg	open	open	open	open
3	mikun	service	tolja	elenius	arkady	olofg	open	service	open	syste
2										
1										

Lenngren usage - unchanged since 2005/10/19 00:58

	Frame 1	Frame 2	Frame 3	Frame 4	Frame 5	Frame 6	Frame 7	Frame 8	Frame
42	service	tolja	pmitev	open	elenius	heden	aodell	aodell	nilss
41	service	tolja	pmitev	open	elenius	open	aodell	aodell	nilss
40	service	tolja	pmitev	henrikg	elenius	davida	aodell	aodell	nilss
39	interactive	tolja	heden	henrikg	elenius	open	service	aodell	nilss
38	interactive	tolja	service	henrikg	elenius	davida	aodell	aodell	nilss
37	interactive	tolja	pmitev	henrikg	elenius	service	aodell	aodell	nilss
36	interactive	tolja	pmitev	henrikg	elenius	davida	aodell	aodell	nilss
35	service	tolja	patrikj	henrikg	elenius	davida	aodell	aodell	nilss
34									
33									
32	service	tolja	patrikj	henrikg	elenius	davida	aodell	aodell	nilss
31	service	tolja	mikun	henrikg	elenius	davida	aodell	aodell	nilss
30	service	tolja	mikun	henrikg	elenius	davida	service	aodell	nilss
29	service	tolja	mikun	henrikg	elenius	service	service	aodell	nilss
28	service	tolja	mikun	henrikg	elenius	davida	aodell	aodell	nilss
27	service	tolja	henrikg	henrikg	elenius	davida	aodell	aodell	nilss
26	service	down	tolja	henrikg	elenius	davida	aodell	aodell	nilss
25	service	tolja	tolja	henrikg	elenius	elenius	aodell	aodell	aode
24									
23									
22									
21									
20	tolja	tolja	down	henrikg	elenius	elenius	aodell	aodell	aode
19	tolja	tolja	tolja	henrikg	elenius	elenius	aodell	down	aode
18	service	tolja	tolja	henrikg	elenius	elenius	aodell	aodell	aode
17	tolja	tolja	henrikg	henrikg	elenius	elenius	aodell	aodell	aode
16	tolja	tolja	henrikg	henrikg	elenius	elenius	aodell	service	aode
15	tolja	tolja	henrikg	henrikg	elenius	elenius	pmitev	aodell	aode
14	tolja	tolja	henrikg	henrikg	elenius	elenius	pmitev	aodell	aode
13	tolja	mikun	henrikg	service	elenius	elenius	pmitev	aodell	aode
12									
11									
10	tolja	mikun	henrikg	henrikg	open	elenius	pmitev	aodell	aode
9	service	mikun	henrikg	henrikg	open	elenius	pmitev	aodell	aode
8	tolja	mikun	tolja	patrikj	open	elenius	pmitev	aodell	aode
7	tolja	tolja	tolja	service	open	elenius	pmitev	aodell	aode
6	tolja	tolja	tolja	henrikg	open	elenius	pmitev	aodell	aode
5	tolja	tolja	tolja	pmitev	open	elenius	heden	aodell	aode
4	mikun	tolja	tolja	pmitev	service	elenius	heden	aodell	aode
3	mikun	service	tolja	pmitev	open	elenius	heden	service	aode
2									
1									

261 batch nodes used out of 278 available.

Parallelldatorcentrum

2005-10-10 18:14

	1(u,i,d)	2(u,i,d)	3(u,i,d)	4(u,i,d)	5(u,i,d)	6(u,i,d)	7(u,i,d)	8(u,i,d)	9(u,i,d)	10(u,i,d)	11(u,i,d)	12(u,i,d)	13(u,i,d)	14(u,i,d)
n42	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	
n41	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	
n40	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	
n39	IB†	IB	IB	IB	IB	IB	IB†	IB	IB	IB	IB	IB	IB	system
n38	IB†	IB	up†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	
n37	IB†	IB	IB	IB	IB	IB†	IB	IB	IB	IB†	IB	IB	IB	system
n36	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	up
n35	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n32	IB†	IB	IB	up	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n31	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n30	IB†	IB	IB	IB	IB	IB	IB†	IB	IB	IB	IB	IB	IB	IB
n29	IB†	IB	IB	IB	IB	IB†	IB†	IB	IB	IB	IB	IB	IB	IB
n28	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n27	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB†	IB	IB	IB	IB
n26	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n25	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n20	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n19	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n18	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n17	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n16	IB	IB	IB	IB	IB	IB	IB	IB†	IB	IB	IB	IB	IB	IB
n15	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n14	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n13	IB	IB	IB	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n10	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n09	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n08	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n07	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n06	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n05	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
n04	IB	IB	IB	IB	IB†	IB	IB	IB	IB	IB	IB	IB	IB	IB
n03	IB	IB	IB	IB	IB	IB	IB	IB†	IB	login	easy	login	easy	easy

Last update: 2005-10-19 01:30

	d01	d02	d03	d04	d05	d06	d07	d08	d09	d10	d11	d1
n42	22	19	18	21	19	18	23	25	19	18	22	
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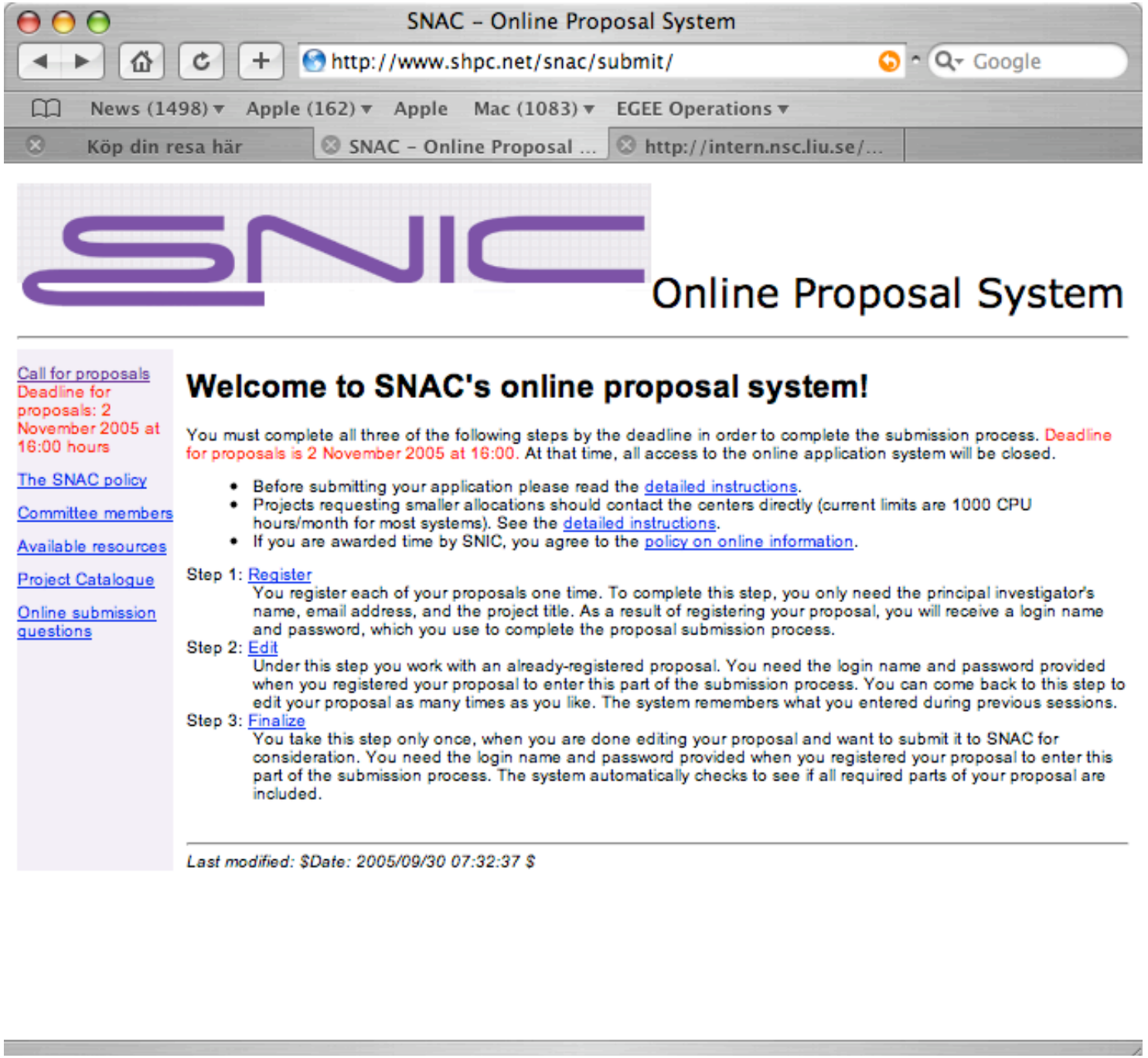

KTH VETENSKAP OCH KONST

Parallelldatorcentrum