



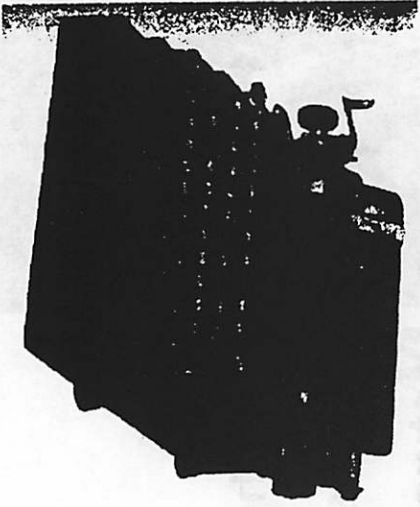
Yet Another Workstation Network

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Topics:

- Studies of the availability of workstations for loadsharing
- Interconnects: The remote-to-local access time ratio from Spector to NOW
- Can a true "global layer operating system" offer adequate performance?
- The myth of commodity parts
- The application space
- Some market trends
- What I actually think!

1952: Horatio Fuddnuddler seeks NSF funding to explore the hypothesis that many typewriters are idle between 6 p.m. and 8 a.m.



FUNDING DENIED: **BORING**

1982: The Hebrew University shows mathematically that many workstations are gonna be available for loadsharing

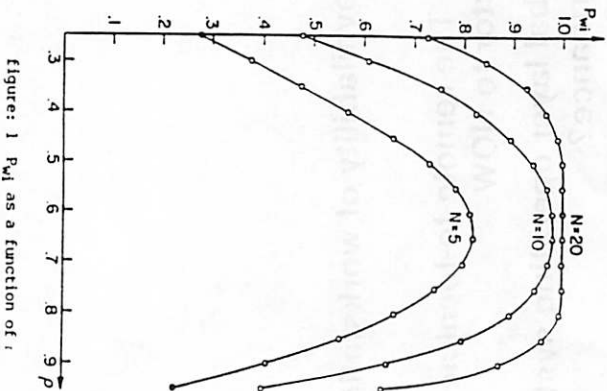


figure: 1 P_{n,i} as a function of i

1987: The University of Wisconsin shows empirically that many workstations actually are available for loadsharing

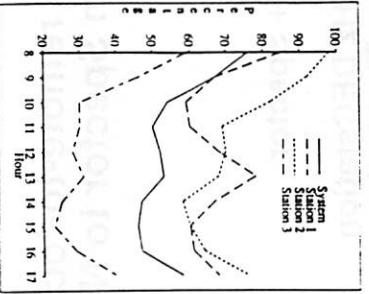


Figure 10. Availability of Remote Cycles During Weekdays (Mon-Fri, 8am-5pm)

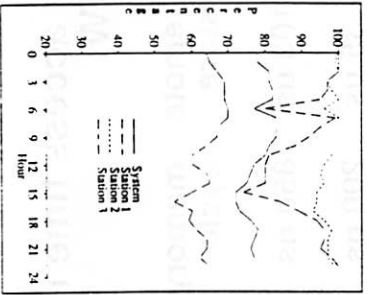
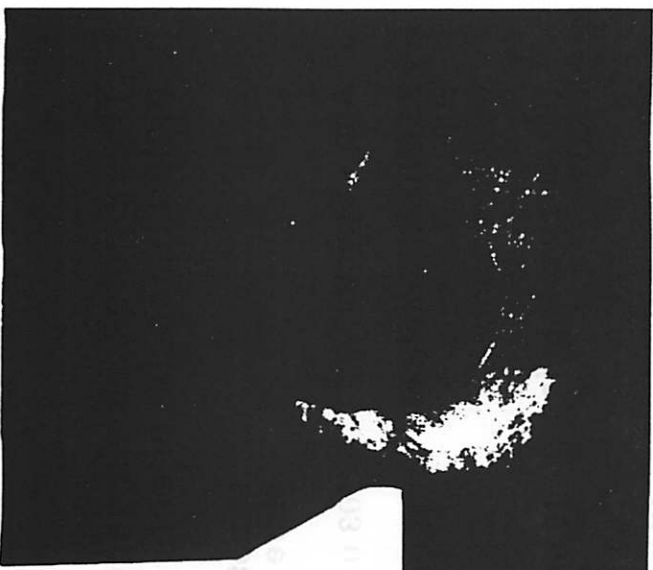


Figure 11. Availability of Remote Cycles During Weekends (Sat-Sun)



I DON'T BELIEVE IT!
IT'S MIND-BOGGLING!

1994: The University of California at Berkeley announces that you just may have some cycles you're not using

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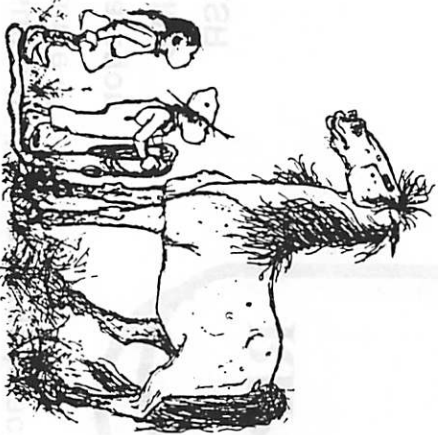
The remote-to-local access time ratio from Spector to NOW

	remote store	memory cycle	ratio
Alto + Spector	103 us	850 ns	121:1
25 MHz DECstation 5000 + Thekkath remote memory	35 us	200 ns	194:1
100 MHz workstation + NOW	10 us	150 ns	67:1
250 MHz workstation + NOW	10 us	150 ns	67:1

The remote-to-local access time ratio including cache effects

	remote store	cache	ratio
Alto + Spector	103 us	850 ns	121:1
25 MHz DECstation 5000 + Thekkath remote memory	35 us	1 cycle	875:1
100 MHz workstation + NOW	10 us	1 cycle	1000:1
250 MHz workstation + NOW	10 us	1 cycle	2500:1

Can a true "global layer operating system" offer adequate performance?



GLUENIX

STONE SOUP

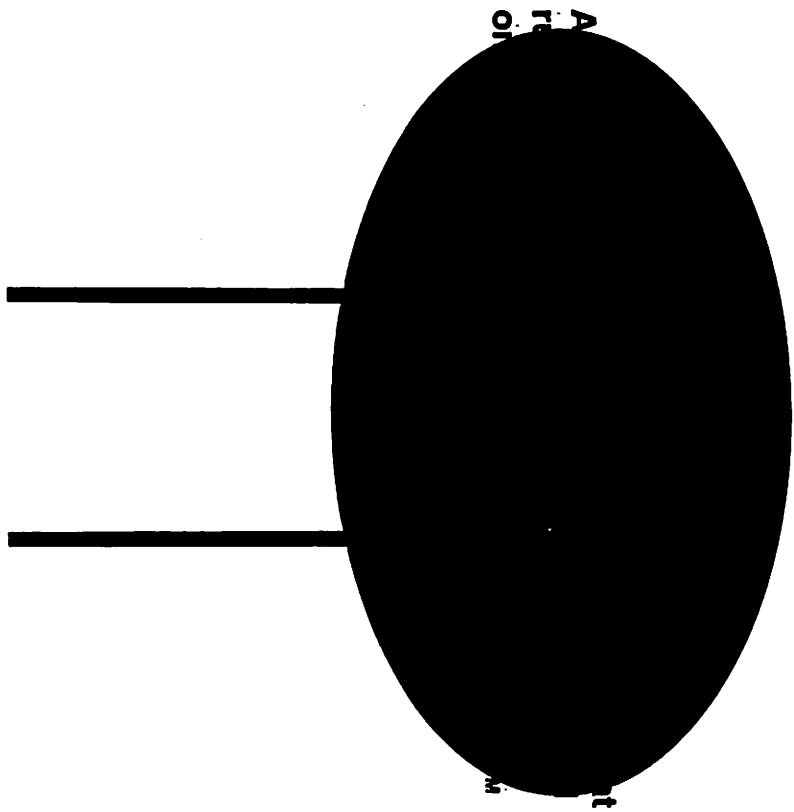
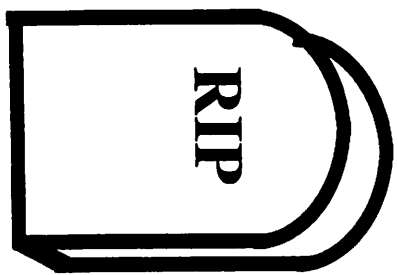
AN OLD TALE



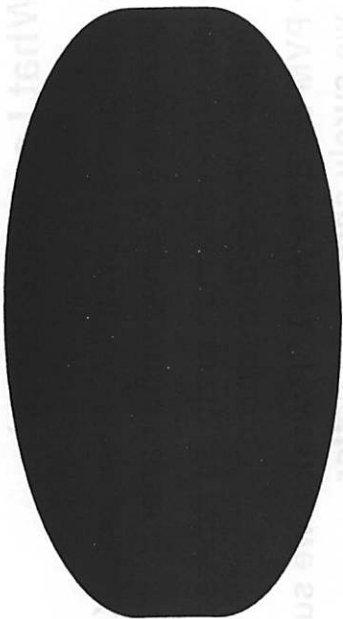
"This commodity parts multiprocessor is great. But y'know, it'd be even better if only it had ..."

The application space

- Let's assume that we manage to achieve the performance of ...
- the Paragon
- the CM-5
- the KSR

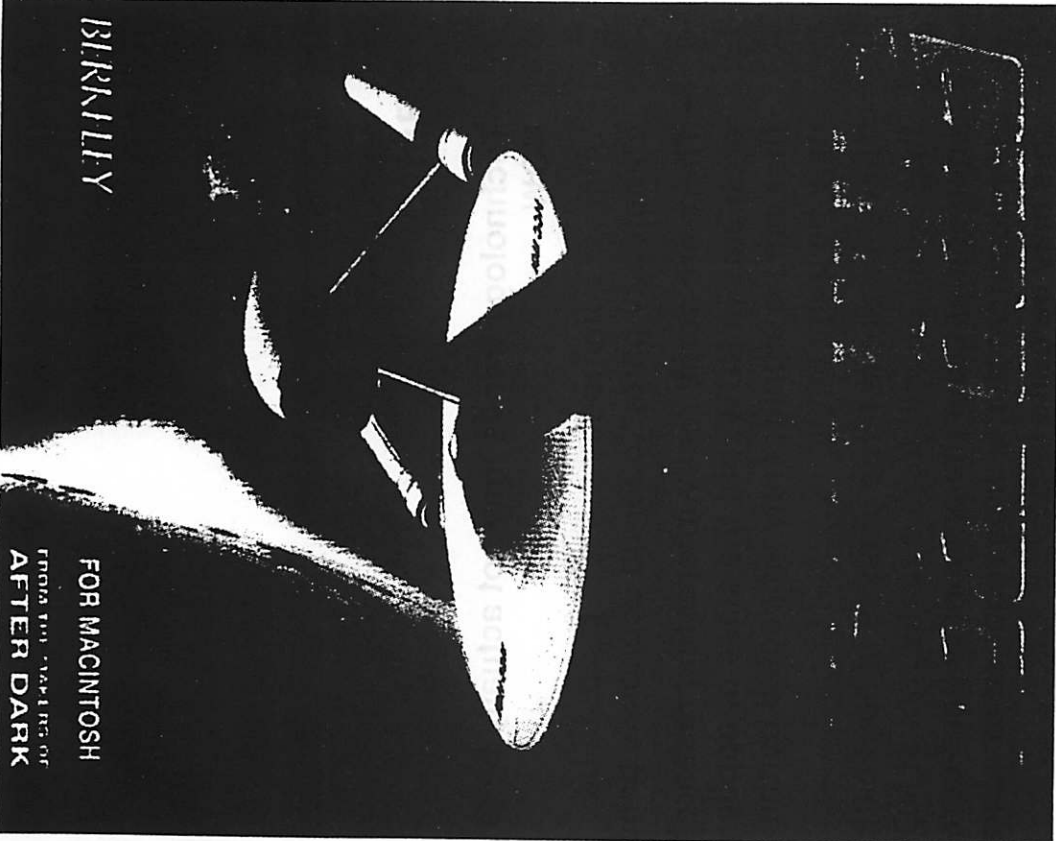


PC



Unix

Mac



BIRKILLY

FOR MACINTOSH
FROM THE TABLETS OF
AFTER DARK

What I actually think!

- One genesis of NOW: Hennessy, Katz, Lazowska & Levy white paper
- Idle workstations surely do represent an under-exploited resource
- PVM on Ethernet/TCP works; we surely can, and we surely should, do better
- Influencing the direction of commodity parts is a worthwhile endeavour

But ...

- Technology trends may not actually be favoring NOW
- "Almost commodity parts" or "could be commodity parts" offer no economic benefit
- There are some really interesting research problems in NOW, but the class of applications that will be significantly impacted by this work may be quite small
- There are some large classes of applications that could benefit from a really robust NOW environment, but the amount of hard-core development that will be required to achieve this may be quite large