Microsoft - 1996

- revenues = 11.4 B$
- earnings = 3.4B$ (over 30%)
- revenues/employee = 500,000$
- 10,000 invested in 86 = over 2M$ today
Not Enough?

- GM + Ford + Chrysler
  - 1,147,000 employees
  - combined revenues of 365 B$
  - combined earnings of 12.9 B$

- Microsoft CAP > CAP of the Big Three
But ...

38 Million households have a PC
43%
US households earning more than $40,000 having a PC

57%
But what about business?

- Do you know a business which has not purchased PCs already?
- Does your secretary need a 400 Mhz Pentium II?
US High school & university students having a PC

73%
Figure 3.6

Percentage of 20- to 24-year-old population enrolled in colleges, universities, and technical schools in selected countries, 1990.

Major players sell sub-1000$ PCs
- IBM Aptiva E26
- Compaq Presario 4540

Intel will sell a cheap Pentium (Celeron)

Most PCs sold in the US in 1997 purchased by repeat PC buyers
In the world's largest PC market...

...we are reaching saturation levels
PC Industry of the 80s & 90s

PC Industry of the 00s & 10s
So, what's next?
Network Computers?

- At 500$ a piece can it compete with sub-1000$ PCs?

- But what about TCO?
  - NT 4.0 Terminal Server Edition (Hydra), it's the Windows equivalent of X-terms
  - with Cyrix you can even open a Win32 window on a Mac and even UNIX
Think Embedded
50M vehicles sold yearly WW
Smart Cards

On the card:
- CPU
- RAM
- ROM
- EEPROM

Bar chart showing growth from ~0.5B in 1998 to 1.2B in 2000.

Brands: VISA, MasterCard, AdaCore
Embedded Gadgets
Dallas Semiconductor
Java Ring

〜1M transistors
64 KByte ROM, 134KB NV SRAM (100ns writes)
Math accelerator RSA encryption in < 1 sec
communication rates 115 Kbits/sec
Reader costs < 15$
May the Network be with you.
The Real Network Computer
Alcatel's Internet screenphone

- WWW, Mail, Personal Java
- CPU: Motorola PowerPC 823
- ROM: 1 MB
- DRAM: 8 MB
- Flash: 4 MB
- Modem: 33.6 kbps, ISDN
- Smart card reader
- Keyboard: Touchtyping, retractable
- Screen: Touchscreen, color, 7"6, 640 x 480, VGA
- Size: 28.2*21.8*12 cm
- Phone Caller identification and Call waiting, handsfree...
Embedded Market?

Big deal ...
Overall % of Embedded Processor Shipments

76%
Overall % of Embedded Processor Revenues

PC: 19%
Other Embedded Realities

- Average 32-bit embedded RISC price
  - 1994: 68$
  - 1997: 27$

- Very fragmented market
  - Processors/Microcontrollers
  - Software/Kernel/OS
How Big is it?

**IDC**
- 1995: 700 M$
- 2000: 1.6B$

**Wessels, Arnold & Henderson**
- 1996: 2.5 B$
- 2001: 5.2 B$

**IDC forecast**
- 48M non-PC internet devices in 2001
- 6.6 B$ in information appliances in 2005
- Growth rate of 75%
And it's going to get even bigger
Cell Phone

1998
- 20 - 50 MHz CPU
- 0.5 - 1 MB ROM
- 0.12 - 0.25 MB Flash
- 0.25 - 0.5 MB RAM

2005
- 400 - 800 MHz CPU
- 2 - 4 MB ROM
- 2 - 4 MB Flash
- 2 - 8 MB RAM
Digital Set Top Boxes

1998
- 50 - 100 MHz CPU
- 1 - 4 MB ROM
- 1 - 2 MB Flash
- 1 - 2 MB RAM

2005
- 800 - 1600 MHz CPU
- 16 - 64 MB ROM
- 16 - 32 MB Flash
- 16 - 32 MB RAM
Hardware evolution means ... ... BIG changes ahead ...

SOFTWARE opportunities.
Booming Markets ...

▶ Want to capitalize on their investments
  ✤ Don't like too many standards
  ✤ Don't like a fragmented market
  ✤ eg: The Mainframe, Minicomputer & PC markets

▶ Attract the BIG guys (if they can think straight)
Commoditizing the RTOS market
The Imperative

System Software Providers

Tomorrow: Microsoft View

Laptops, Desktops, Servers

Handhelds, PDAs, Cell Phones, Paging

Process Control Applications

Embedded Real-Time and

IBM

Microsoft

Microsoft
Embedding Java?

- Visa just endorsed the Java card
- Every new smart card embeds the Java VM
- Java VM on a smart card
  - 16K ROM
  - 256 bytes RAM
Java to be on TCI's set-top boxes
Java in HP printers (that's HPJava)
Java in Webphones (Alcatel, Nortel..)
Java in Tektronics Oscilloscopes
Java in Nokia 9000i Communicator
Java in a Psion
Java in a Ring
...

AdaCore
Win CE is not standing still

- Win CE for Handheld computers
- Smart cards for Windows
- Win CE to be on TCI's set-top boxes
- Win CE AutoPC version
  - Clarion, Daewoo, Hyundai,...
- Sega Dreamcast System powered by Windows CE
Win CE Auto PC
What does Ada have to do with all this?
Embedded Pervasive Computing

Tremendous opportunity for Ada to become what it was always intended to be:

The language for embedded software
Embedded $\Leftrightarrow$ Ada
% of 8 bit Microcontrollers shipped today

89%
Assembly is just fine

C is paradise
Do not use Ada
- For today’s applications

But for Tomorrows embedded 32/64 bit apps
- where large & powerful application
- will be possible on inexpensive hardware
- embedded in everyone’s life
Which Embedded will benefit from Ada?

- Medium to large size apps
- Product reliability more important than product features
- Inherent application concurrency
To make Ada a success in the embedded world we just need to ....

... call it .... JADA