

EEESTA Prestige Event

Semiconductors + software enable exciting lifestyles

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Evolution of the Computing Market

- Computing has evolved in parallel with the Semiconductor market over a similar but slightly longer period



- Semiconductor technology is now enabling computing to become embedded into everyday products



Favourite device ...Tom Tom Go 700

- Ski in the morning in Anzere and have dinner in Arosa



Bluetooth, GPS, All European Maps



Pictures taken
with Sony DSC T1

Technology driver - Content delivery

- Fastest concert recording to digital download release
 - Time between recording of a live concert performance and its release for digital download sale:
44 minutes and 39 seconds
- 'Sgt Pepper's Lonely Hearts Club Band'* by Sir Paul McCartney and U2
- Universal Music Group International for Live 8 (July 2, 2005)



Chip Industry Foundations

Technology Development IC

Transistor



Dec 1947-Bell Labs



1958 -TI

Standard MOS

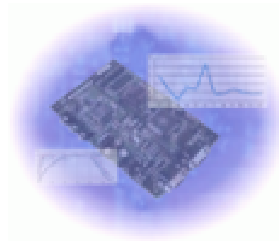


1967 - Fairchild

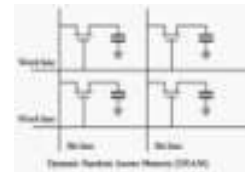
70s - Waves of New Products



Microprocessors



Digital Signal Processors

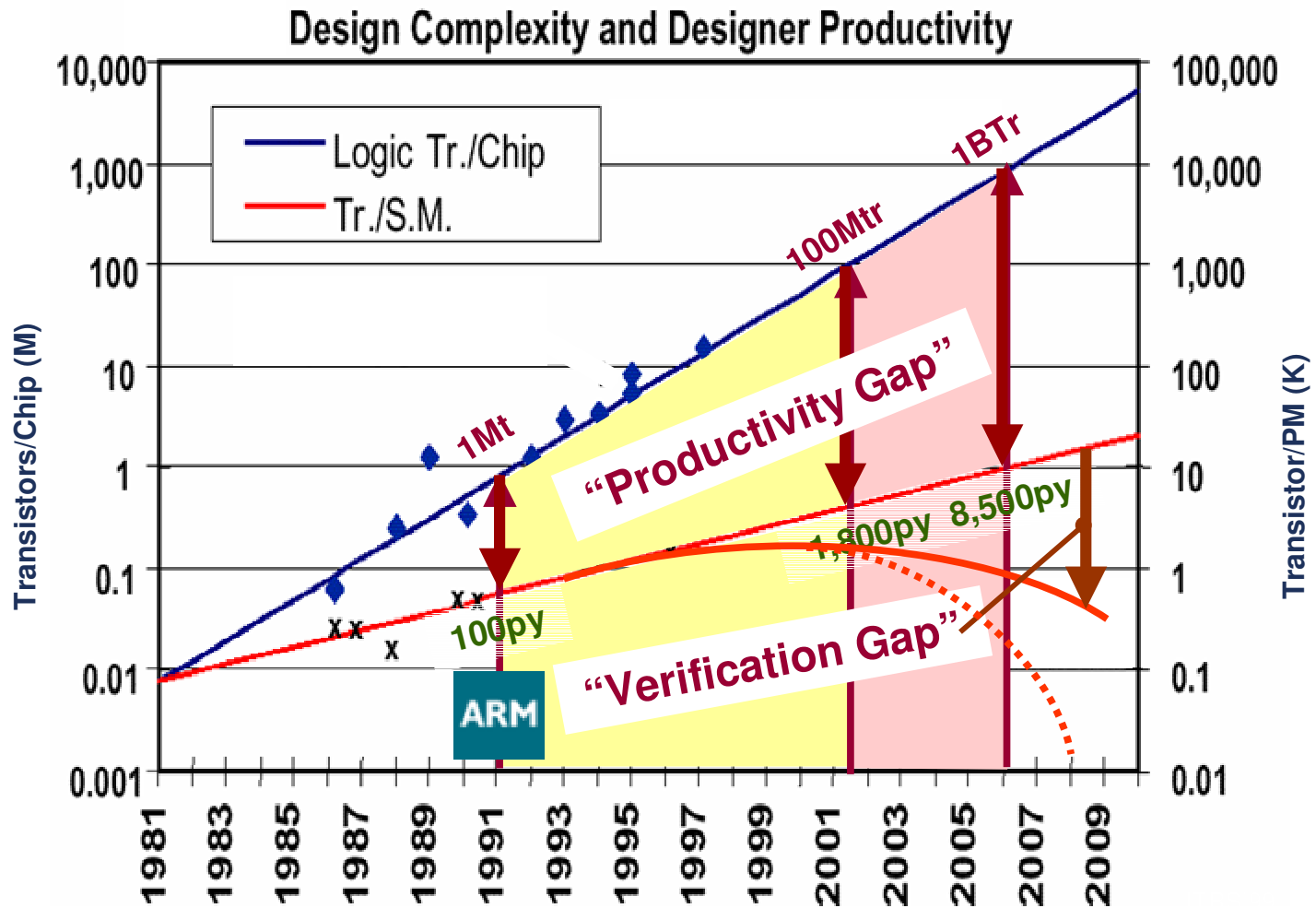


DRAM



EPROM

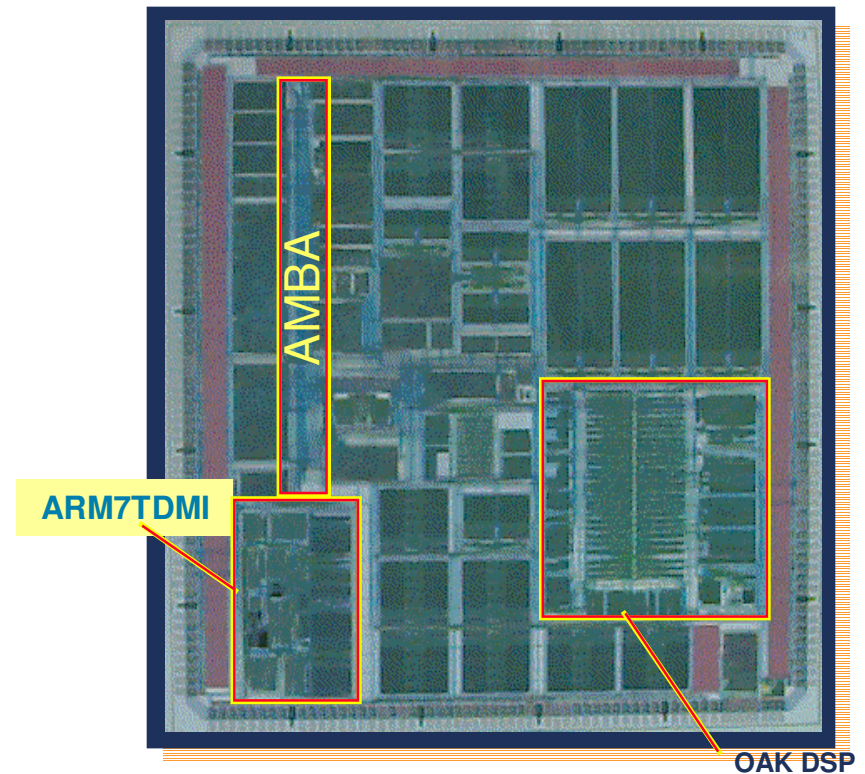
Consequences of Moore's Law



System Chip Methodology

- The design task is so large that it is not possible to design the whole chip oneself ...
- Components, from independent suppliers are integrated to produce the so-called System-On-Chip.
- The ARM RISC Processor has become a Keystone SoC Component; Fundamental to interfacing the Hardware and Software aspects of this Digital World

1998
Mobile-Phone Processor.
80mm², 0.6μm



PC approach - Scaling for Performance

80s & 90s industry growth and scaling in computing power



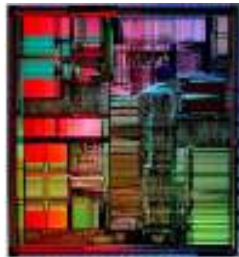
1982 - Intel 80286
134 thousand transistors
12MHz; 68.7 mm²



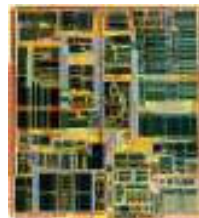
1985 - Intel 80386
275 thousand transistors
33MHz; 104 mm²



1989 - Intel 80386
1.2 million transistors
50MHz; 163 mm²



1993 - Intel Pentium
3.1 million transistors
66MHz; 264 mm²



1997 - Intel Pentium II
7.5 million transistors
300MHz; 209 mm²



1999 - Intel Pentium III
28 million transistors
733MHz; 140 mm²



2000 - Intel Pentium 4
42 million transistors
1.5GHz; 224 mm²

Scaling for Performance Consequence

80s & 90s industry growth and scaling in computing power



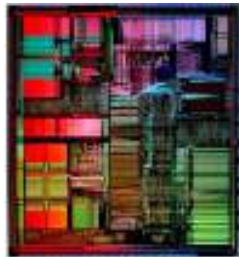
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Performance at
expense of power
and thermal
challenges

Move to multi-
processor



1993 - Intel Pentium
3.1 million transistors
66MHz; 264 mm²



1997 - Intel Pentium II
7.5 million transistors
300MHz; 209 mm²



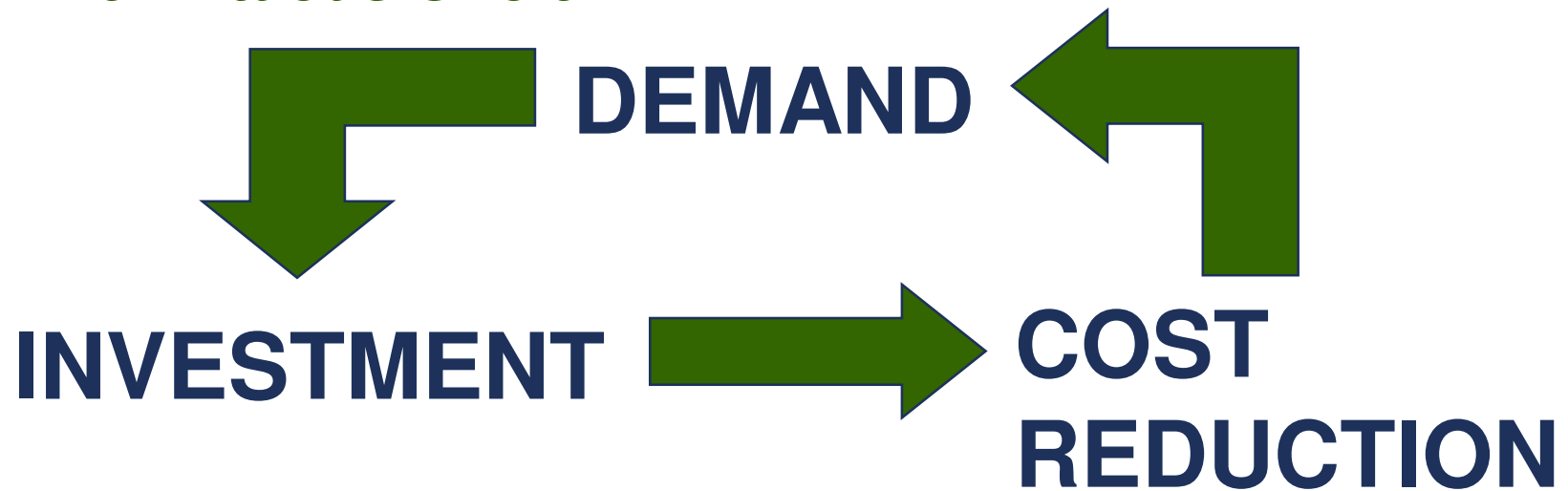
1999 - Intel Pentium III
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1.5GHz; 224 mm²

Financial Benefit of Scaling

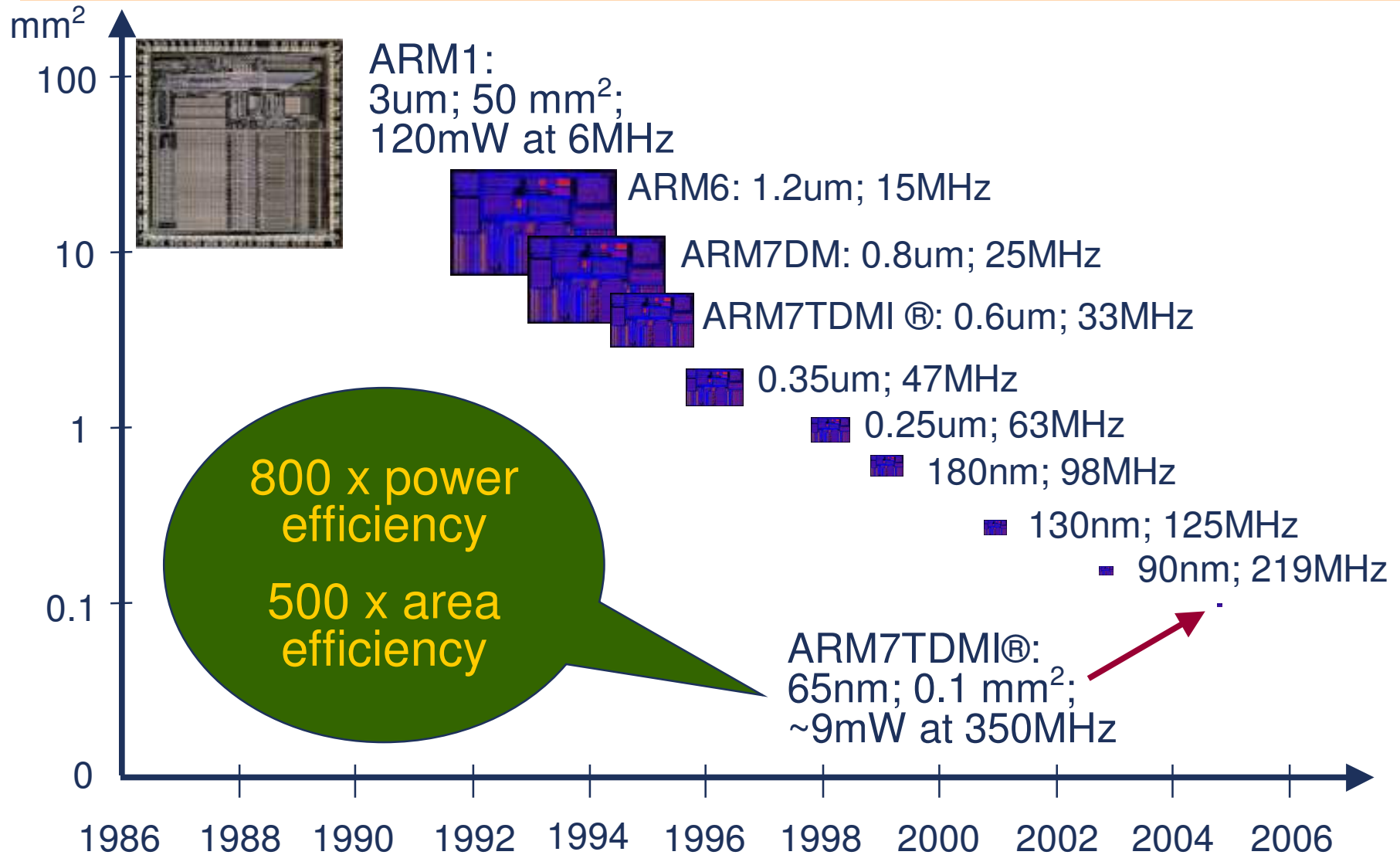
The Virtuous Circle



	1970	1980	1990	2002
Cost of 1MHz	\$7,600.82	\$103.40	\$25.47	\$0.17
Cost of 1 megabit storage	\$5,256.90	\$614.40	\$7.85	\$0.33
Cost of sending 1 trillion bits	\$150,000.00	\$129,166.67	\$90.42	\$0.12

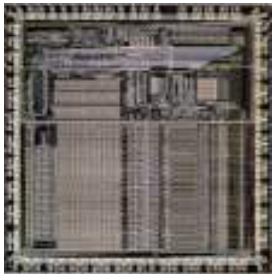
Source: "The New Paradigm" Federal Reserve Bank of Dallas 1999 Report and 2002 Actuals

Scaling in another direction



But ARM has done performance too

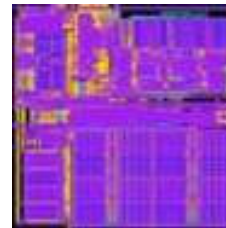
The 80s and 90s:



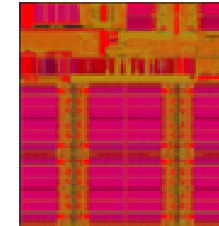
1985 – ARM1
50mm²;
4MHz; 3um



1988 – ARM3
12MHz; 1.2um

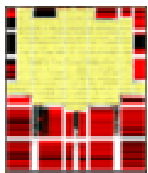


1994 – ARM710
132MHz; 0.6um

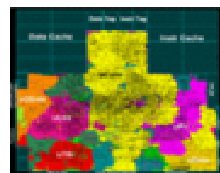


1999 – ARM920T
140MHz; 0.25um

The new millennium:



2001 – ARM926EJ-S
200MHz; 180nm
200 DMIPS

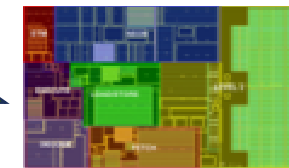


2004 – ARM1176JZ-S
400MHz; 130nm
480 DMIPS

600x
Performance
4.5mm² core



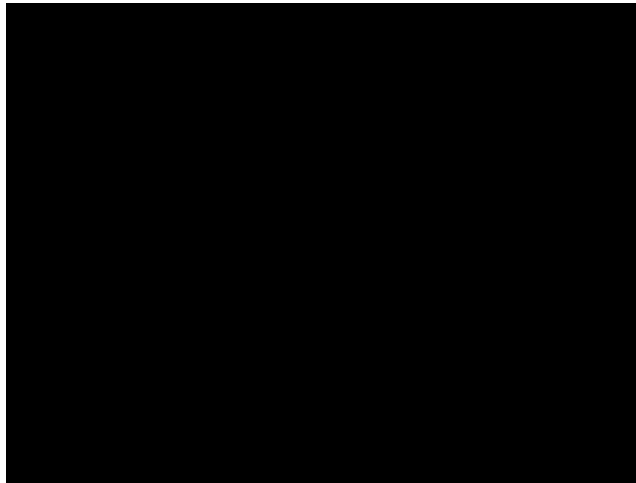
2005 – ARM MPCore (2 way)
620MHz; 90nm
1,488 DMIPS



2006 – ARM Cortex A8
1GHz; 65nm
2,000 DMIPS

Technology Driver – “Power to the People”

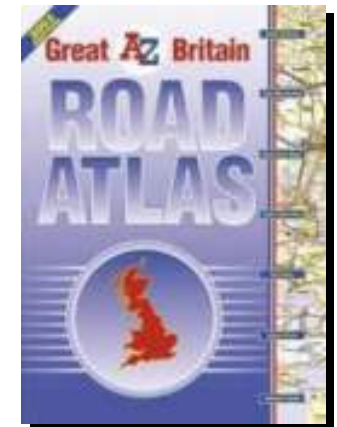
- What you can do with video / sound editing?
- What is real and what is false?
- Recording at low cost at home
- Power of communication via the web
- Re – Structuring of the Music Video Industry
- “Power to the People”



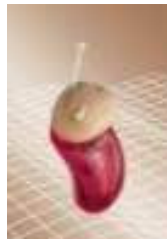
Technology driver - Miniaturisation

- Digitisation allows increased miniaturisation, performance and convenience

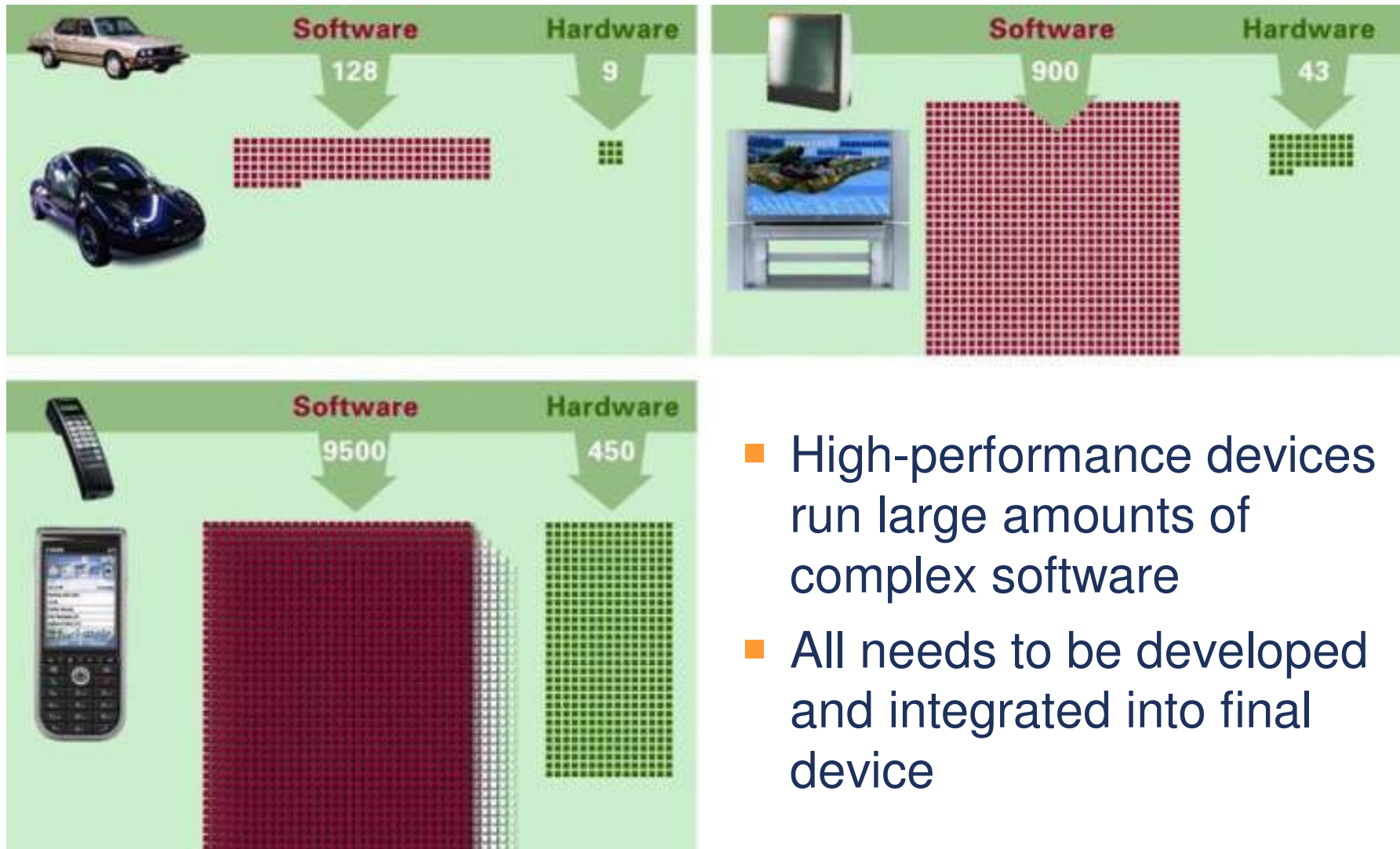
The best of analogue...



... has become smaller and better



Technology driver - More software



- High-performance devices run large amounts of complex software
- All needs to be developed and integrated into final device

Technology driver - Embedded intelligence



1913 Model T Ford
No electronics

2006 Chrysler announce
40% of models will offer
iPod integration

Circa 1980 BMW 733i
Introduction of ABS



2005 BMW 7 Series
iDrive Control system



2015 - Pervasive
but hidden electronics



INCREASING ELECTRONIC PRESENCE

Technology driver - Changing lifestyles



Future Outlook - Healthcare & fitness

- Largest opportunity to add value

- Healthcare systems under extreme stress despite \$3T global spend



- Improvements needed:

In efficiency, reliability, privacy, quality of life

- Product opportunities:

Disease prevention, monitoring, therapy, services, IT

- Emergence and growth of telemedicine

- Removes distance between provider and patient
- Need for connectivity increases hardware and software integration challenges

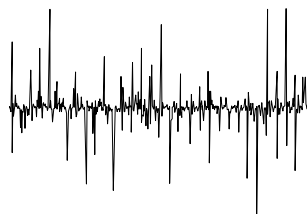
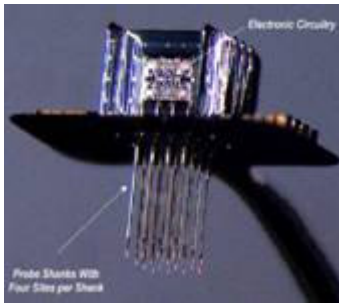


2020: Products for Kids

- Active clothing / skin? that changes colour / tone for mood?

"In his latest column for Business 2.0, "Wearable Tech," Rafe Needleman tells us that clothes that can change colors electronically are soon coming to our closets."

- Allow online searching by thought



- Holographic projection conference calling with friends

DNA Screen
On offer in a Cambridge shop



Ultimate Product?



IntiMist

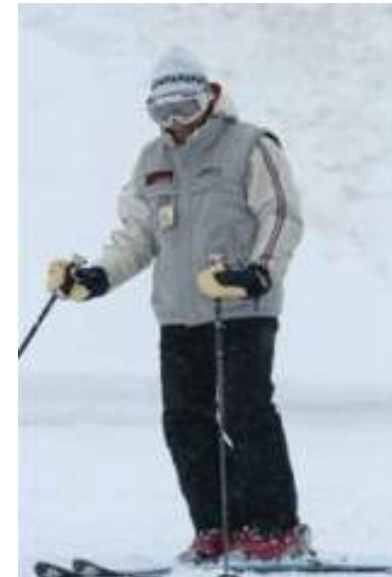
Electronic Bidet

The World's Best Toilet Seat!

- Heated Seat**
- 2 Heated Water Bidet Streams**
- Electronically Temperature Controlled**
- Electronic Water Pressure Control**
- Automatic Shut-off**



Home medical advisor,
Speech, patient history,
Take pills with patient
monitoring



Keizo Mura Skiing on his 100th Birthday
Salt Lake City