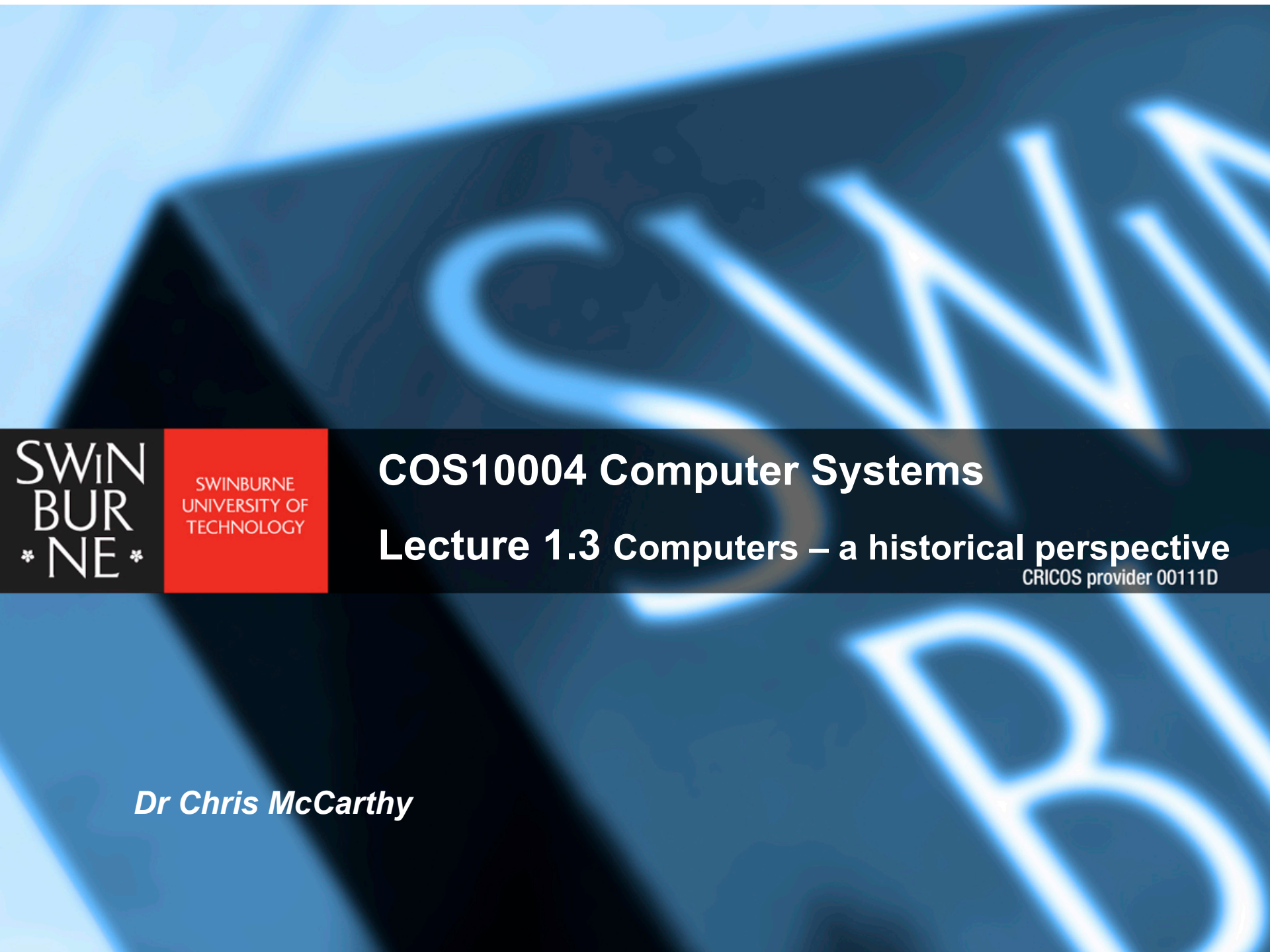


COS10004 Computer Systems

Lecture 1.3 Computers – a historical perspective

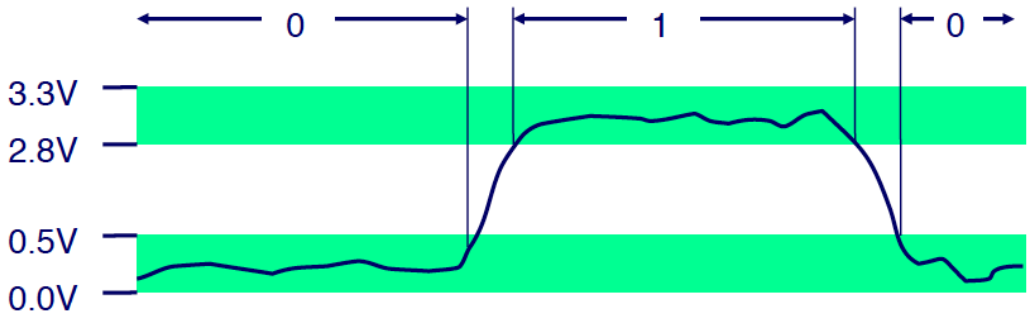
CRICOS provider 00111D

Dr Chris McCarthy

_start:

INFORMATION AND COMPUTERS

- What is information?
- Computing requirements to process information: representation, manipulation, storage
- Binary information: two states (on-off, true-false)
- Bit (Binary digit) notation: 0 and 1



INFORMATION AND COMPUTERS

- Multiple bit representation of information:
  - numbers (32 bits) -> double/float; int
  - Characters (8 bits) -> ASCII chars

- Numerical equivalence of multiple bits:
  - The computer doesn't know/care what the bits are supposed to be used for, it just sees bits
  - numbers/chars can be manipulated by same instructions.

INFORMATION AND COMPUTERS

- The Byte:
  - smallest addressable block of bits. Always 8 bits.

- The Word
  - the register size used by the CPU - might be 8, 16, **32** or 64 bits

- Use hexadecimal notation as a shorthand
  - 2 hex chars = 1 byte
  - Eg 11111111 = 0xFF

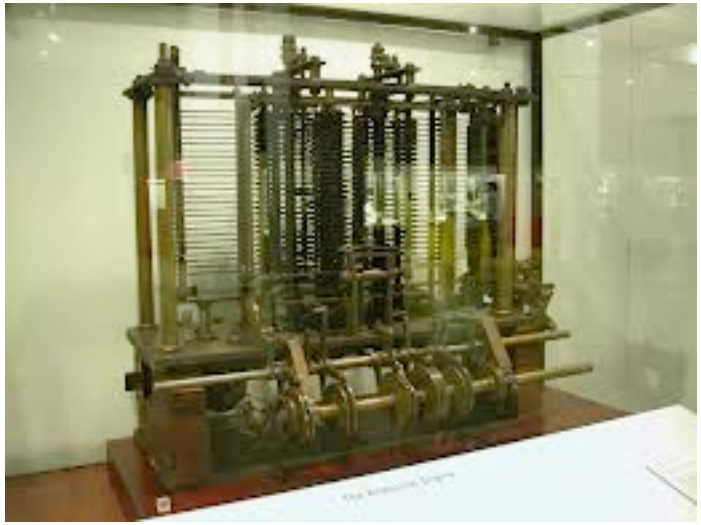
HEX – BINARY (4 BITS TO A HEX DIGIT)

Hex	Binary
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111

Hex	Binary
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

The History of Computers – Key Players

- Charles Babbage (1791-1871)
- Claude Shannon 1937
- Konrad Zuse 1938
- John Atanansoff 1940
- Howard Aiken and Grace Hopper 1944
- John Von Neumann 1945
- John Mauchly and J Presper Eckert, 1946
- Fred Williams and Tom Kilburn 1948




IBM AUTOMATIC SEQUENCE CONTROLLED CALCULATOR

MAJOR HISTORICAL COMPUTING PARADIGMS

- Batch mode processing — #24h turn-around!
- Time-sharing — #Many terminals, 1 CPU
- Personal computing — #Computer games!
- Networking — #Older than it looks, and surprisingly robust
- Embedded systems
- Supercomputers/GPU
- Cloud and Edge Computing

Still the thing when you use Supercomputers

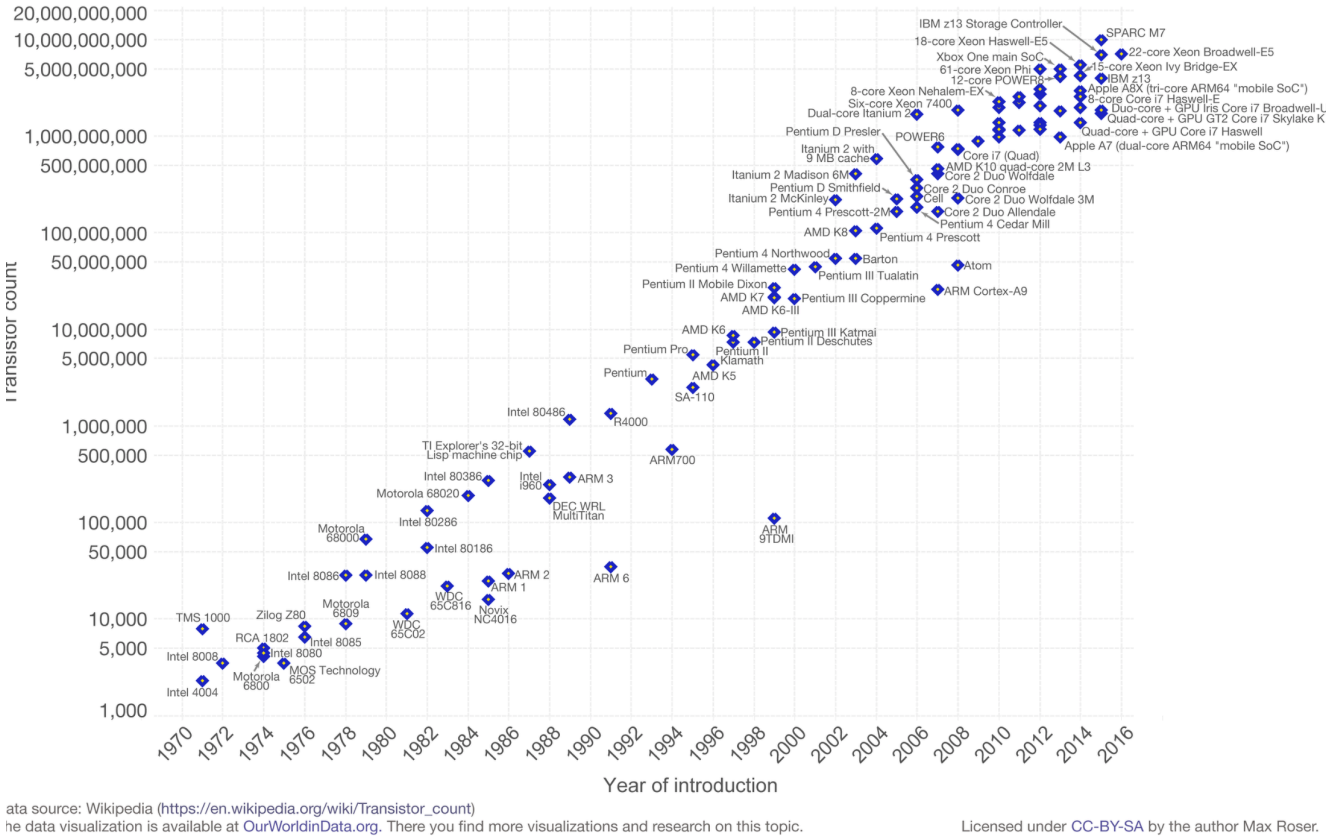
Windows XP for embedded systems(TM) **controlling ATMs, EWFTPOS, nuclear power plants. What could possibly go wrong?**

THE HISTORY OF COMPUTERS

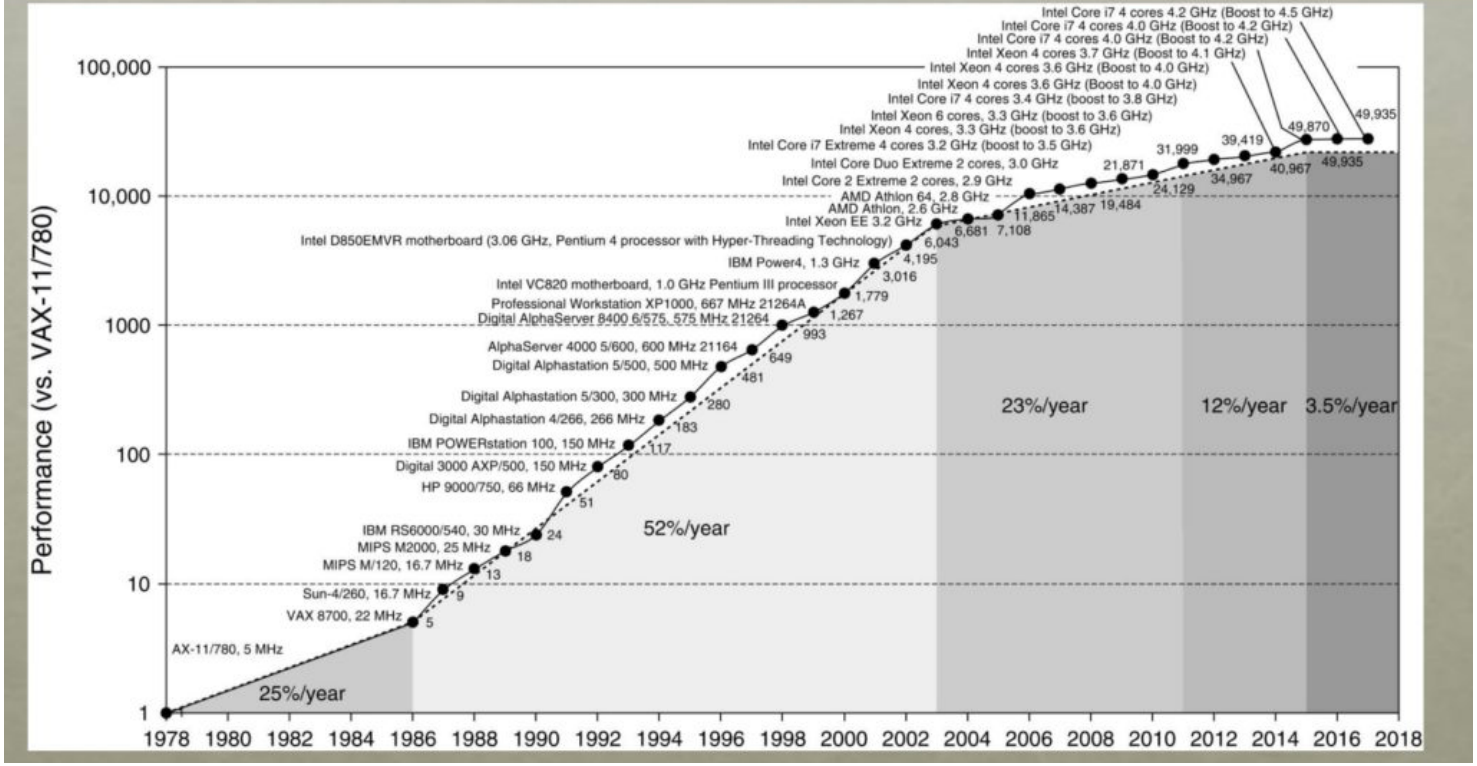
- Drivers for computers evolution:
  - National security (military superiority) - SIGINT, spying.
  - Commercial imperative - replace people, do things cheaper.
  - Related technologies - need to interface with other systems.
  - More recently:
    - gaming, Big Data, AI (GPUs!)

MOORE'S LAW

- Computing power approximately doubles every year



UNIPROCESSOR PERFORMANCE (SINGLE CORE)



https://www.nextbigfuture.com/2019/02/the-end-of-moores-law-in-detail-and-starting-a-new-golden-age.html

SUMMARY

- Computers are fundamentally about information:
  - representation, manipulation, storage
- Computer systems have a rich history:
  - Spanning centuries, accelerating after WW2
- Context evolving:
  - from large scale machines in labs, to pocket-sized smart phones, and everywhere in between !
- Next Lecture:
  - Bit representation and organisation