From LEO to Azure: The Met Office HPC Journey

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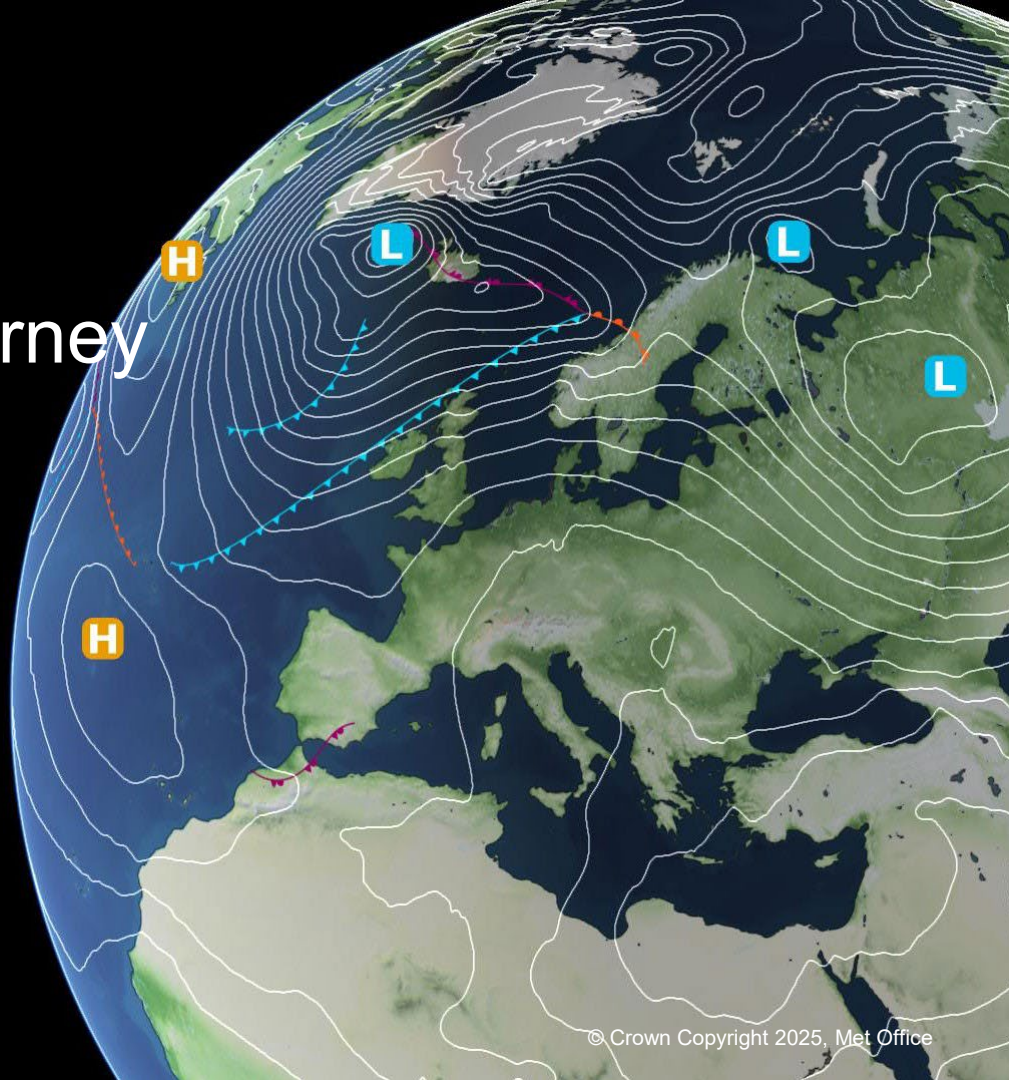

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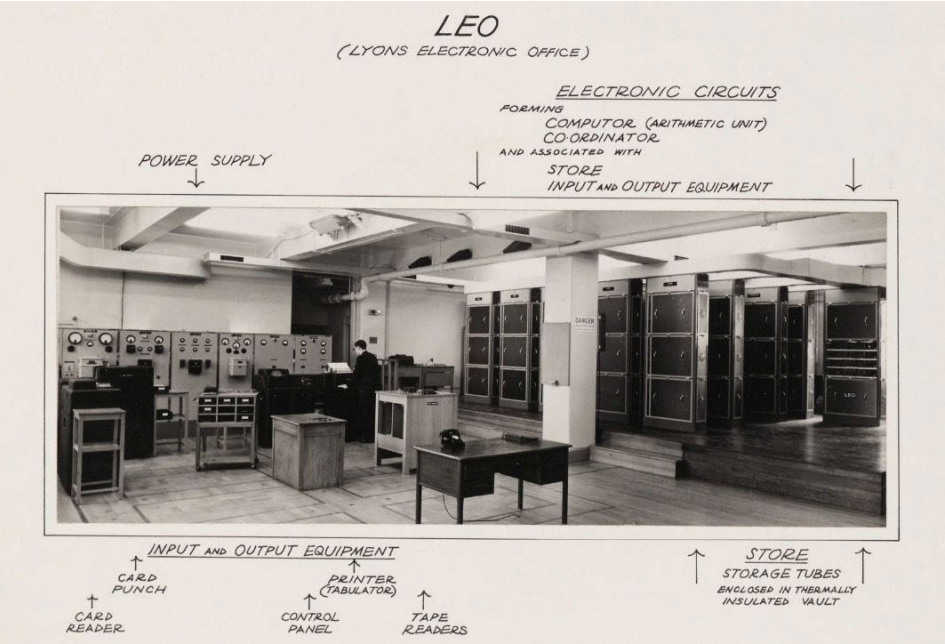
It all started with human computers

- L. F. Richardson well known for first attempts at NWP in 1917
- Hand calculated calculations took six weeks for a 6-hour forecast
- It was wrong!

Lyons Electronic Office (LEO) - 1951



- Designed as a commercial system by Lyons
- Used by Fred Bushby and Mavis Hinds “during evening sessions at Cadby Hall” for research
- Fixed-point arithmetic, tiny but huge storage
- 18x14 grid, 4 hours compute for 24-hour forecast. “looked like … the right chart!”

Met Office

Ferranti Mercury “Meteor” - 1959

- First Met Office owned computer
- Followed experiments on the Ferranti Mk 1 in Manchester
- Relocated from Dunstable to Bracknell
- Over 30 million punched cards by 1960
- Line printer programmed to play music for visiting dignitaries!

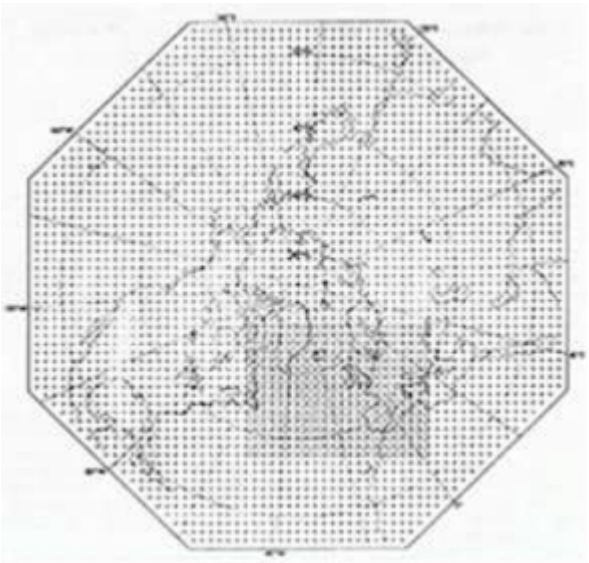
Met Office

KDF9 – “Comet” - 1965

- First transistor-based system
- 2nd November 1965 – first operational numerical forecast with big media launch
- 2 layer, 300km horizontal resolution regional model
- Paper tape supplemented punched cards – people recalled very bad paper cuts

IBM 306/195 – “COSMOS” - 1971

- First use of FORTRAN IV
- Unusual Northern Hemisphere octagonal grid + fine mesh local area
- We still use IBM mainframes today!



Vector Supercomputers

- 1982: Cyber 205
- First Met Office global model – due to Falklands war

- 1989: ETA-10
- Liquid Nitrogen cooled
- ETA Systems folded before acceptance

Met Office

Cray and the birth of the Unified Model

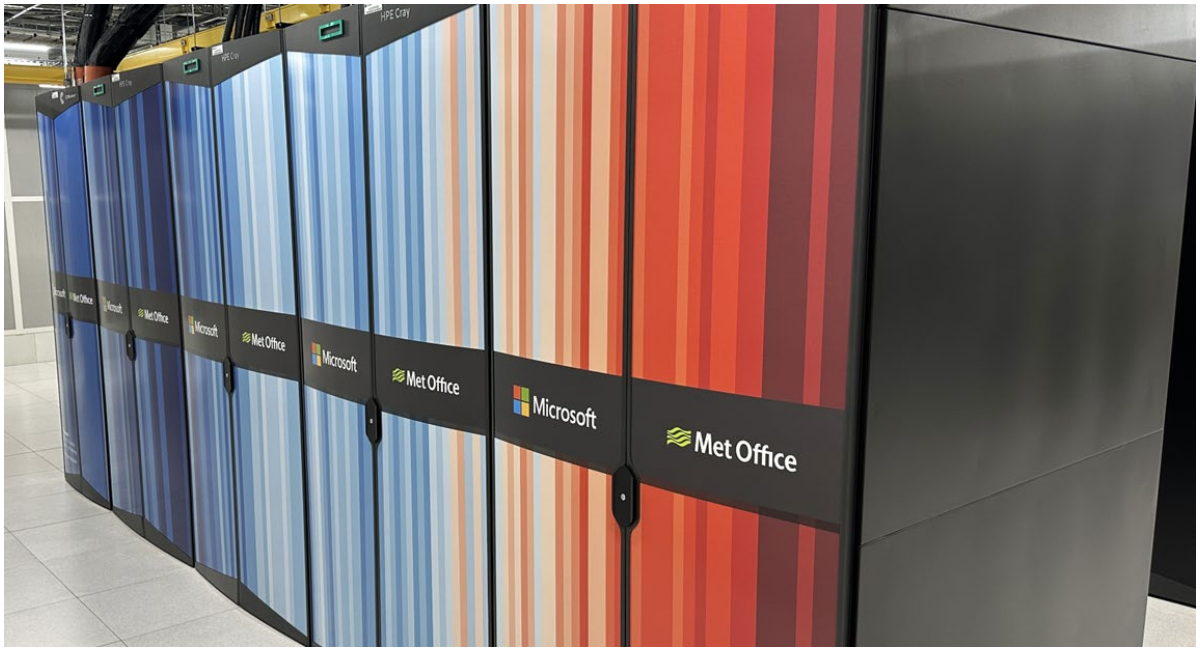
- Two C90s
- 1991 – Unified Model
- Hadley Centre

- T3E – 1996 + 1998
- #3 in top 500
- Bracknell to Exeter relocation

Met Office

NEC, IBM and Cray

Microsoft Azure

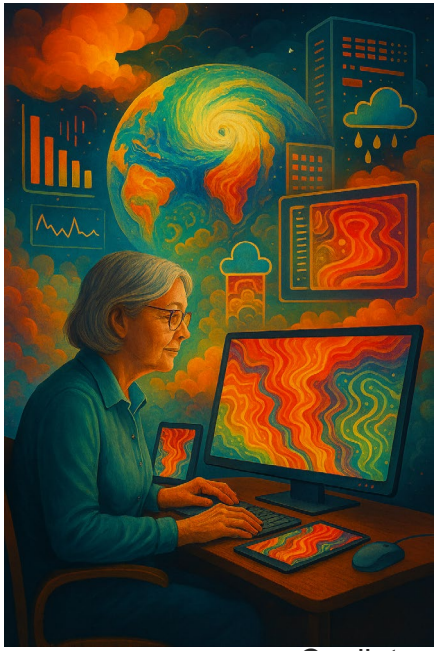


- First time we have run operations out of our own data-centre
- 4 systems in 2 centres giving higher resilience
- Managed service

And the future?

- Generation 2 of the Microsoft service
  - Momentum (LFRic) will replace Unified Model
  - Machine-Learning workloads - Anemoi

- Getting harder to get increasing compute
  - Moore's Law slowing
  - Increasing demand for silicon – price goes up
  - Increased power demand – price goes up
  - AI a potential saviour?



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