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# e-Infrastructure convergence in UK

A Federated approach

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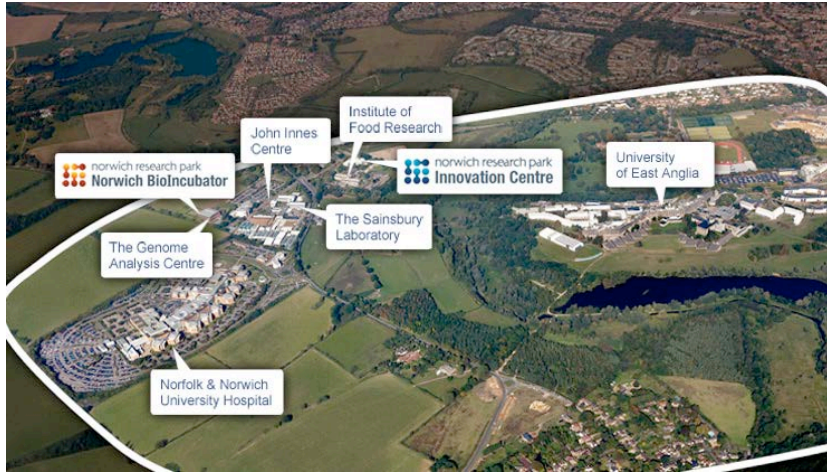
# Background

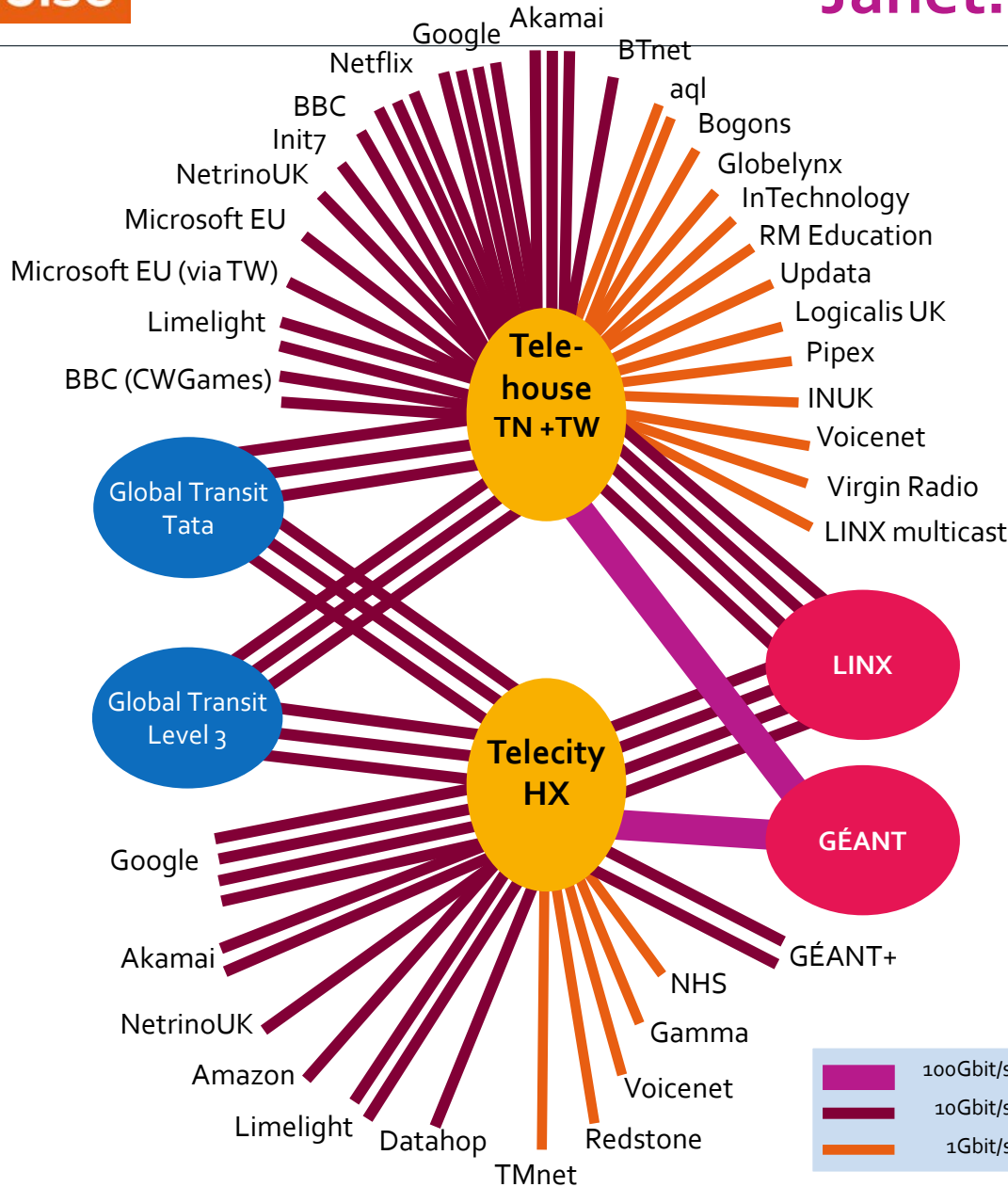
- UK e-Science programme – 2001-2009
- Research Council International Review
  - Recommendations...
  - HPC papers – lobbying UK government 2010-2011
    - Department for Business and Skills
  - £154M announced late 2011
  - £100M + on HPC in various forms
  - £26M Janet (Jisc)
  - Delivering from 2012 onwards

# UK e-Infrastructure components

- Foundation components
- Data communications substrate
- National R&E network Janet plus high-capacity peerings with:
  - National commercial Internet Service Providers
  - International: NRENs via GEANT & commercial Internet
  - Compute & Data Storage services – internal and external plus national frameworks
  - Research Council National Laboratories and Facilities
  - Community resources – University/Organisation level compute & storage resources & local facilities

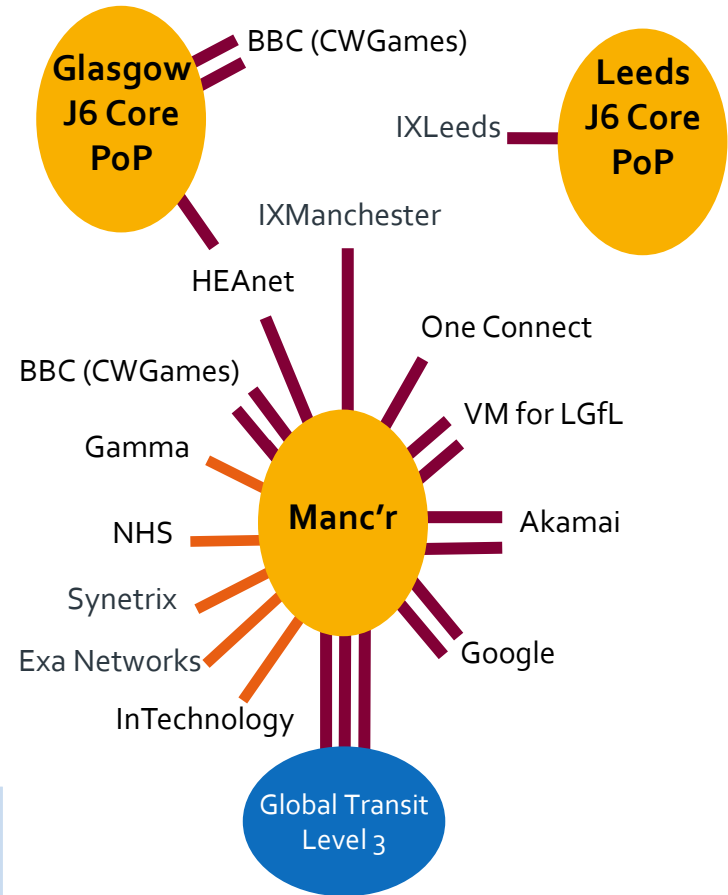






Total external connectivity  $\approx$  900 Gbit/s

Total by the end of this year  $\approx$  1 Tbit/s





- Scales
  - National
  - Regional
  - Local – Organisation
- Facility Types
  - Research Infrastructures
  - Research domain facilities

- STFC (Science and Technologies Facilities Council)
  - Rutherford Appleton Laboratory
  - Daresbury Laboratory & Hartree Centre
  - GridPP – Particle Physics
  - DIRAC HPC – Particle astrophysics & cosmology
- Wellcome Trust Sanger Institute
- EMBL/EBI Hinxton
- Norwich BioScience Institutes
- Francis Crick Institute
- Met Office (MONSooN HPC partnership with NERC – Natural Environment Research Council)
- European Centre for Medium range Weather Forecasting (ECMWF)

- National
  - EPSRC Archer HPC
  - EPSRC Research Data Facility
- Regional
  - ARCHIE-WeSt – Scotland
  - N8 – Northern England
  - HPC Midlands
  - MidPlus HPC
  - Great Western 4 (GW<sub>4</sub>)
  - Science and Engineering South
  - HPC Wales

- Other Research Intensive Universities
  - Local Compute & storage
- Other Publicly funded entities
  - Catapult Centres – 8 and growing
    - Area focus on academic/industry bridge & SME support
      - Eg Digital Catapult
      - Satellite Applications Catapult
  - NPL – National Physical Laboratory
  - Others...
- Industry & Commercial entities
  - Private compute & storage
  - Commercial service providers

# Co-ordination

- E-Infrastructure Leadership Council (UK)
  - Ministerial chair
  - Research Council, academic & industry members
- UK cross-Research Council e-Infrastructure Working Group
  - Project Directors Group – broad stakeholder representation
  - Security and Access Management Working Group
  - Cloud Working Group
- HPC Special Interest Group – self organised
- (Big Data Special Interest Group) – self organised

- Research Councils
- Jisc
- Mature research communities – have private infrastructure/s
  - Particle physics
  - Particle astrophysics and cosmology
  - Natural Environment Science
  - Bio-molecular sciences
  - Medical and Life Sciences
- All looking to a more general solution with workload mobility between private and public/commercial services
- Research community expertise

# Active areas

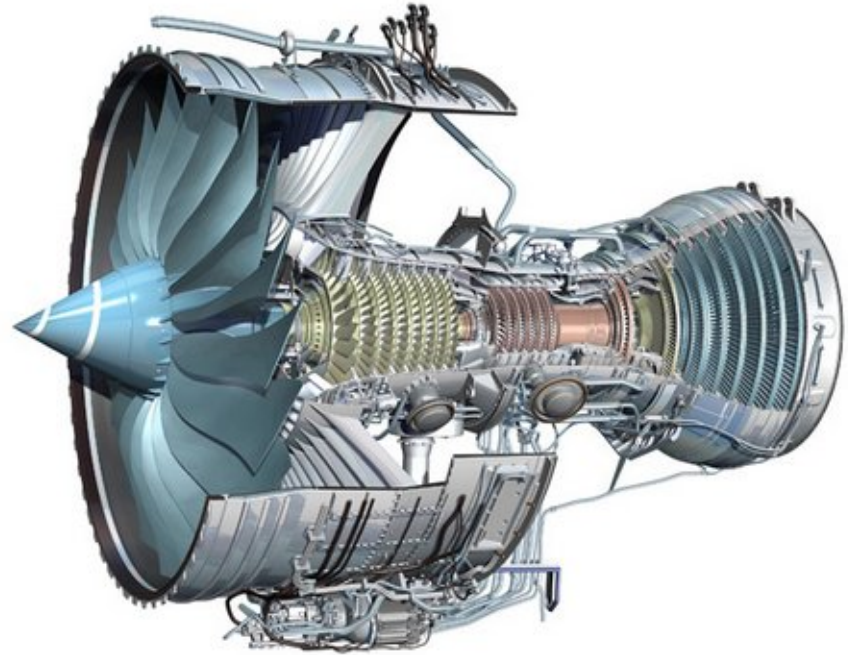


- Networking
  - Peerings – ISPs. Commercial service providers...
  - End-to-end performance – encourage more effective use of networks, higher-throughput
  - Information assurance and networking - Ann Harding tomorrow
- Research Data management work
- Security & access management Working Group
  - Contribute to consensus on AAI approaches & mechanisms – more from David Fergusson tomorrow
- Framework contracts for access to commercial providers
  - Amazon, Microsoft
- HPC access portal - Arcus
- Datacentre framework contracts
- Collaboration – EGI, EUDAT, e-IRG

# Facilitating Industry engagement

A connectivity perspective

- £4M e-Infrastructure funds “reserved” for industry support
- Connections to Janet ?
- State-aid compliant scheme designed
  - Project applications
  - Must be “innovative”
  - External assessment
  - Must contribute 40-50% of total project value
  - Connection can be 50-60% of total project value
    - These are R&D projects (low TRL) – Not close-to-market
  - Values are “Market-rate”



Large company – Rolls-Royce -10Gbit/s

SMEs

- 1) Assisted Living – 1Gbit/s
  - 2) Radio Astronomy – 2.5 Gbit/s
- +2/3 more

- From UK Government:
- “State-Aid: The Basics Guide”
- If you think your activity might be state-aid..
  - Can you re-design it so it isn't ?
  - If you can't avoid it, take a well-trodden path
  - Think “State-aid” early
  - Don't ignore it
  - Seek advice...

- Heavyweight, high-overhead & beurocratic !
- Inflexible for all concerned – project proposal, asesment, monitoring – much harder to adapt to changing requirements.
- Vision – industry & academic engagement is fine
- Future options ?
  - Market-value offerings – by definition no state-aid issue
  - Flexibility – contract structure
  - Lowest feasible recurrent cost combined with metered use and billing
  - Still have connection overhead in time terms – little appreciated how long & complex this can be !
  - My view needs a minimum 3 year forward-look to be sensible
  - 1 year to plan, agree and implement, then 2 years service.

- Not a quick or short-term fix
- Need to have a medium to longer term persistent requirement (and a rational & objective one !)
- If not, many things still possible !
- NRENs have excellent peerings with commercial ISPs – Janet certainly has
- Good starting place – use existing service arrangements via IP peerings
- Establish a programme of work and review as this evolves
- When scale becomes appropriate, consider a direct peering with the NREN/academic partner/facility.

# Convergence ? – evolution...



- Plenty of physical infrastructure
  - Private / domain specific
  - Commercial
- Data communications
  - High quality & capability network
    - Critical and end-to-end (multi-domain, holistic)
    - Organisations, NRENs, GEANT & global partners, ISPs...
- AAI
- Drive evolution through experience of major research communities
  - Moving workload to external service providers
    - Elastic expansion

- “One-stop-shop” – premature
  - Too simple, real world is complex
- Evolving for “long tail”
- Federated approach where appropriate
- Rational & objective approach to analysing requirements
  
- Genuine progress in some areas !
- Stakeholder communications
- Strong substrate
- Much development needed in the soft environment above the physical infrastructure