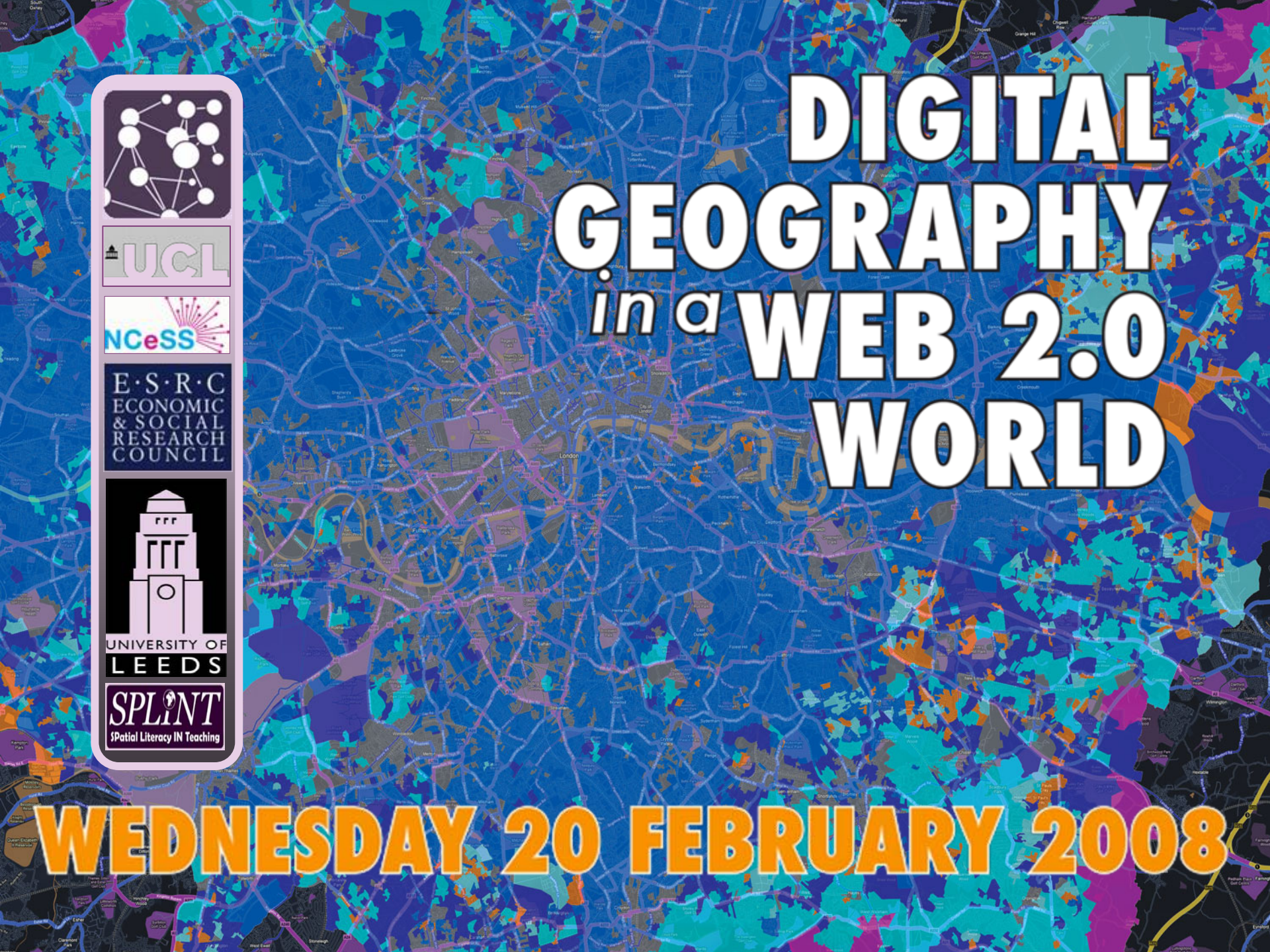
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DIGITAL GEOGRAPHY in a WEB 2.0 WORLD
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MoSeS:

SimCity for Real

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50 Years of Urban and Regional Modelling

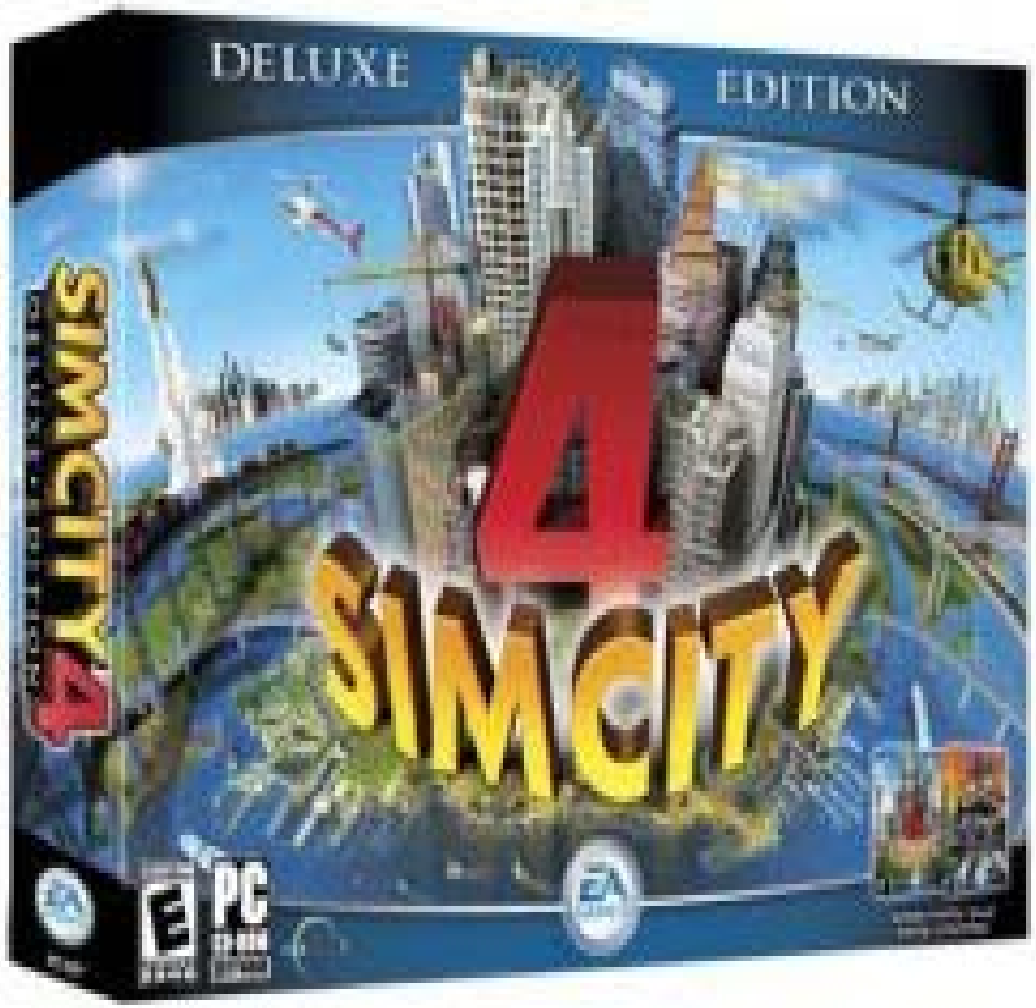
•despite the rich tradition of urban modelling over the last half century there has been relatively limited success in application

- complex systems
- lack of good data
- computational power
- ability to represent policy issues in a realistic way

•BUT: - this could be beginning to change!

SimCity

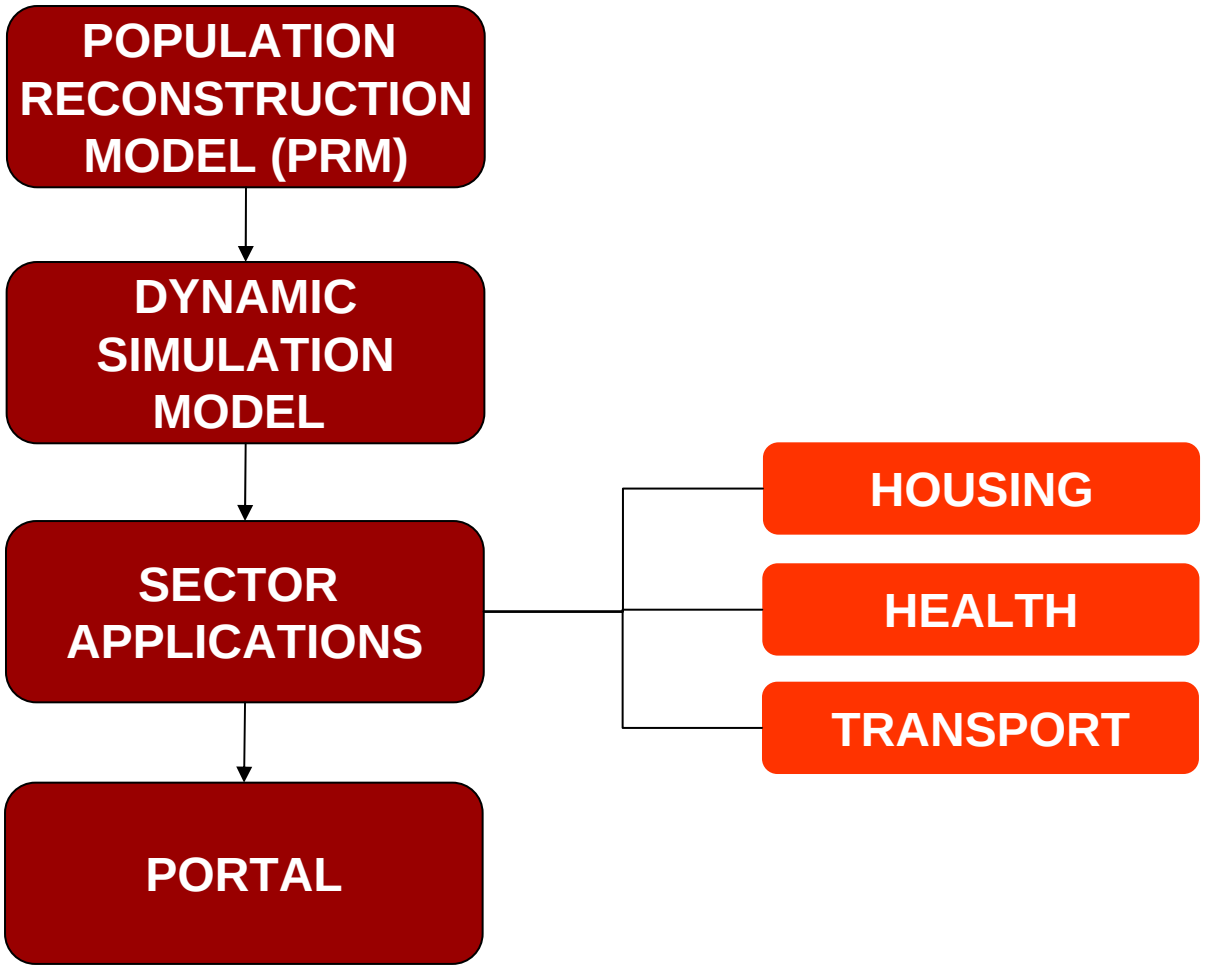
- Popular PC simulation game
- Excellent graphics and user interface
- Plausible logic to urban dynamics
- Available now for ‘real’ cities
- Can we create a “SimCity for Real”?



MoSeS – Modelling and Simulation for e-Social Science

- Part of the ESRC NCeSS programme
- Challenge of constructing simulations which represent the behaviour of real people in real cities.
- Construct an e-infrastructure for urban simulation
- Deployment of various demographic models of population composition and its change through time
- Applications of the simulation approach to problems in planning health care, housing and transportation

MoSeS: Schematic Overview



Generating an Initial Population

- The Population Reconstruction Model (PRM) constitutes a complete synthetic representation of the UK population, represented as a series of individual people, grouped into households and represented at the finest possible spatial scale – Output Areas (200,000 in England & Wales).

- The base data are drawn from the UK Census Sample of Anonymised Records (SAR) and embellished by other data sets such as BHPS.

- PRM comprises totally ‘realistic’ individuals and household relationships

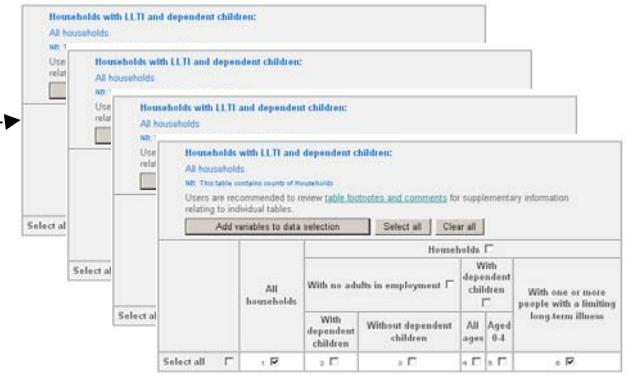
with no possibility that real named individuals can be identified within the synthetic population.

Generating an Initial Population

- We know the aggregate population and socio-economic characteristics of Output Areas – these act as constraints in the PRM process
- We make use of micro-data from individual and household SARs to populate an Output Area with people, who when looked at in aggregate accurately replace the known cross-tabs
- Use a genetic algorithm to optimise this process – computationally intensive!

Methodology for the PRM

Census tables for zone i



i

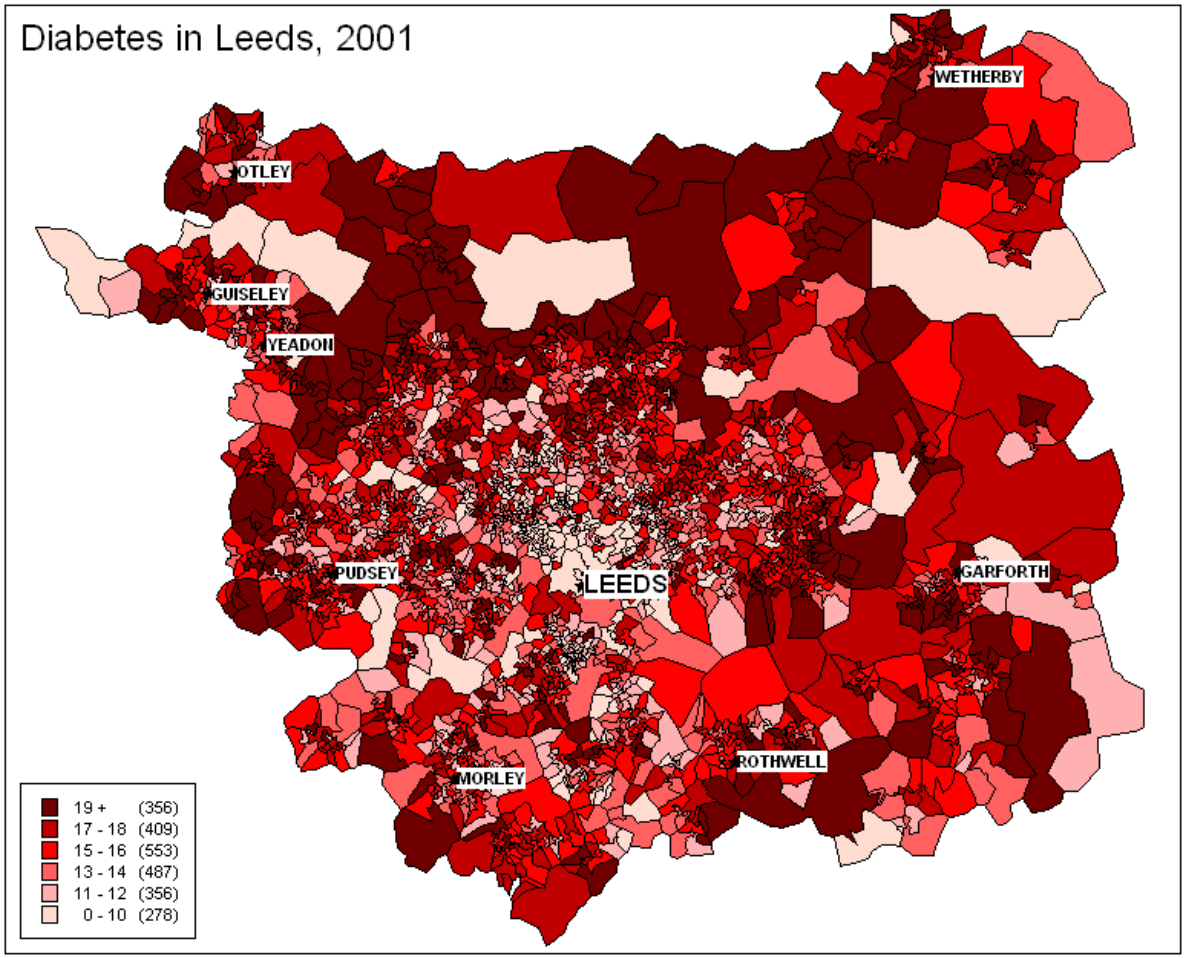
Synthetic list for zone i

Household SAR

BHPS

Repeat this process for
52 million individuals

Generating an Initial Population



- By combining different microdata sets we can produce plausible estimates of distribution that are not available from conventional sources

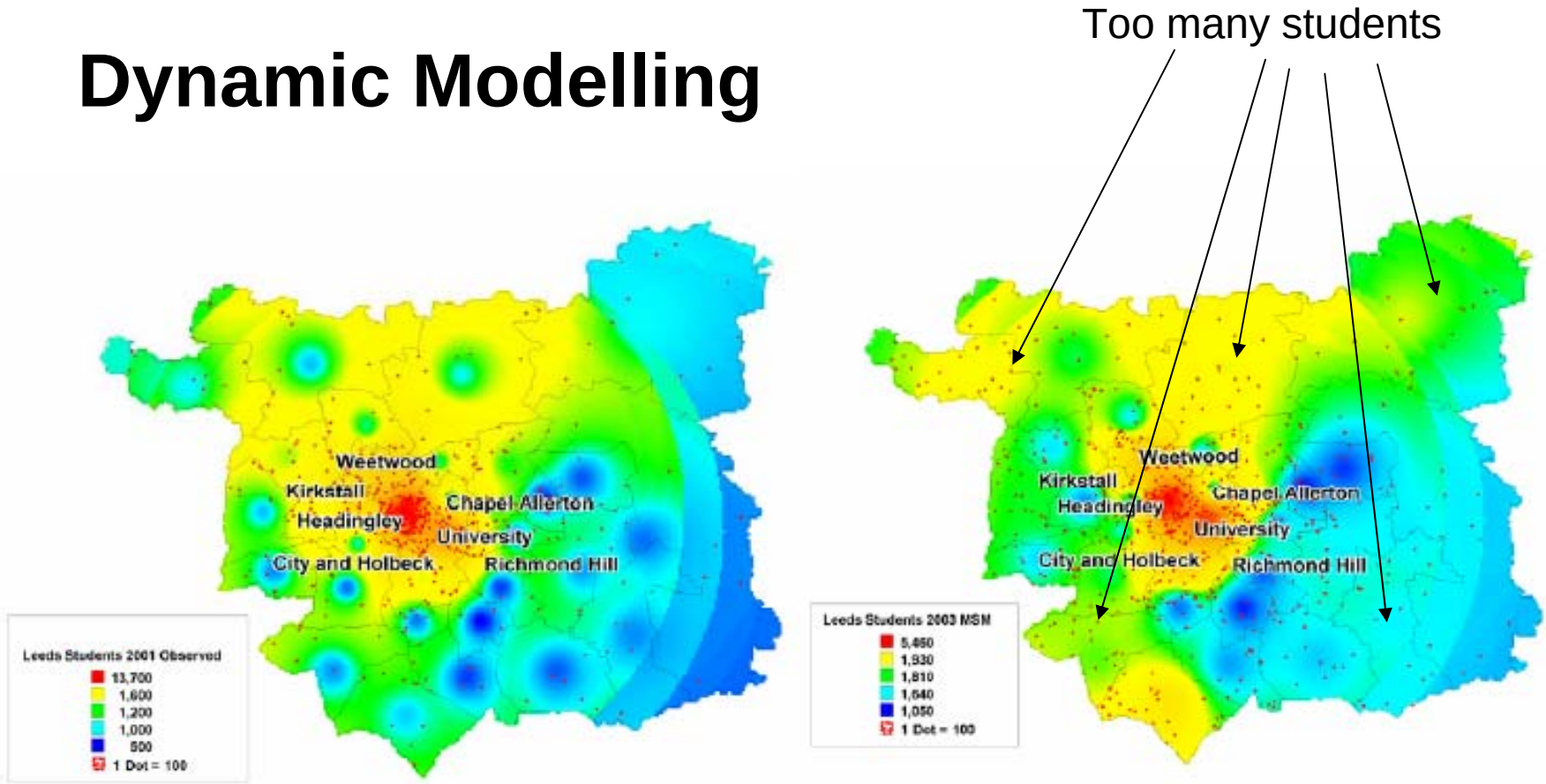
Dynamic Modelling

The dynamic model projects the synthetic population (PRM) into the future.

This is achieved through the simulation of individual demographic processes, including births, deaths, migration, marriage, separation, and changes in health status.

- Dynamic model has been implemented up to 2031
- Computationally intensive

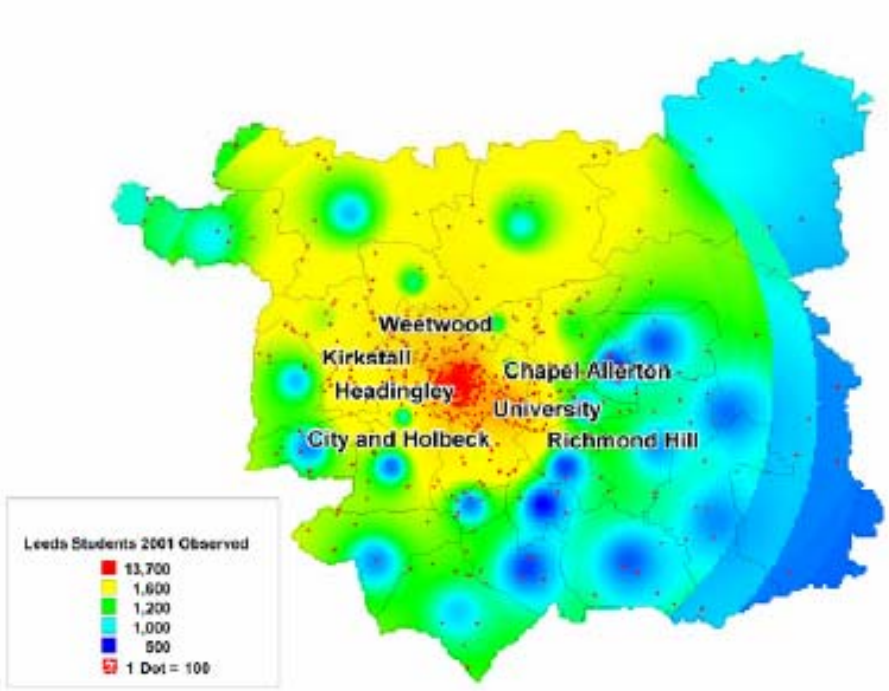
Dynamic Modelling

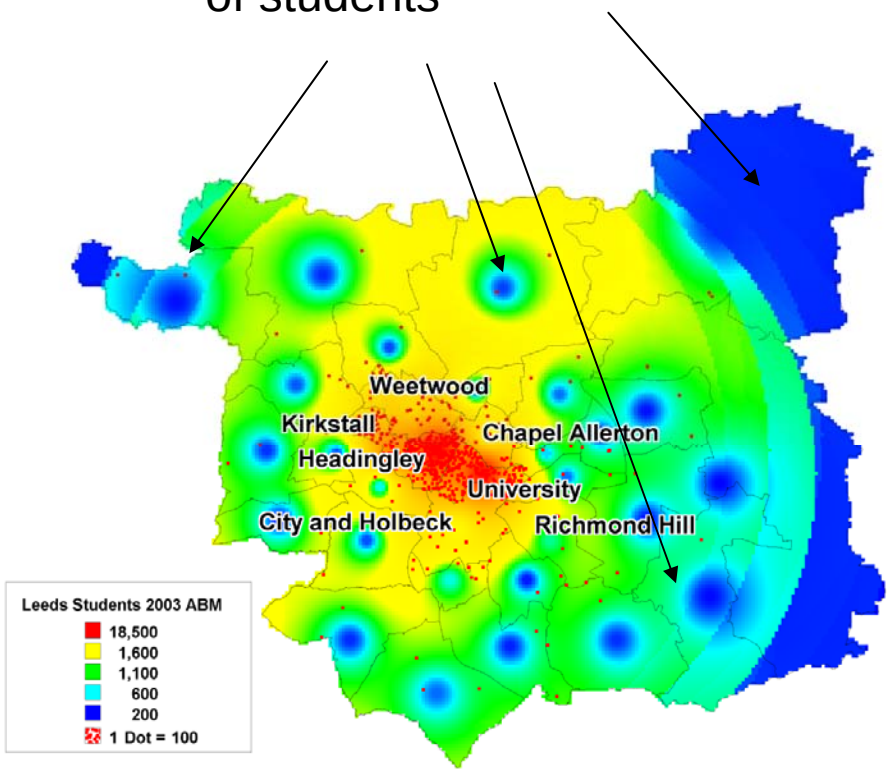


Location of student populations in a conventional model – an acute example of the difficulties in simulating intra-urban migration patterns

Dynamic Modelling

Correct number/ distribution of students





Location of student populations – use of agent-style rules (no marriage or family relationships; three year degree courses; preference for Halls of Residence…) allows much more realistic behaviours

Applications

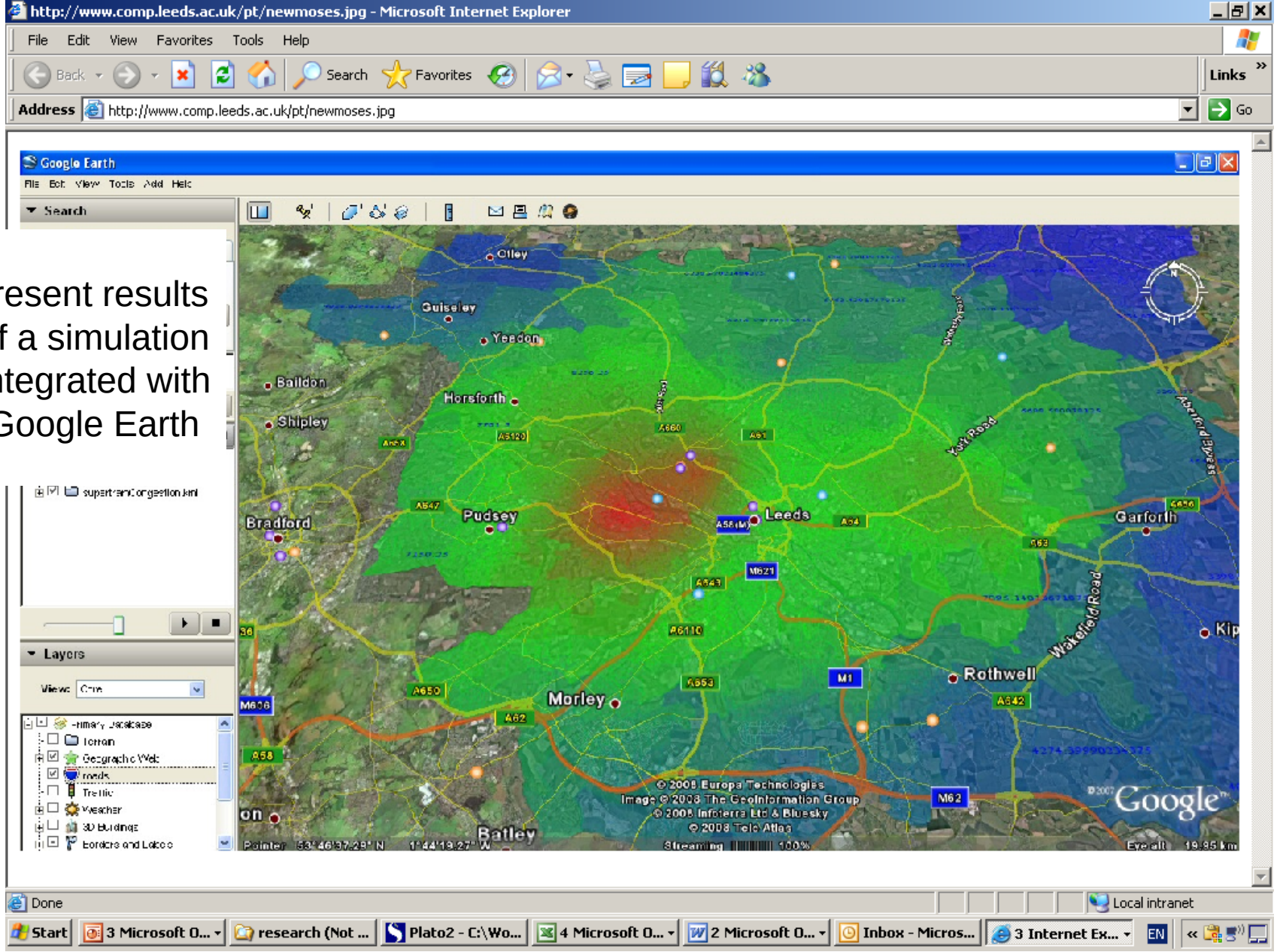
Moses is conceived as not just an academic and intellectual exercise, but as a practical tool for policy users.

Moses is building local relationships with interested users in the Leeds Teaching Hospitals Trust, Leeds City Council Social Services, and the Leeds Area Regeneration Partnership.

These ideas are also being shared with a broader nationwide community and with a global audience of planners and policy-makers.

Applications

Web portal allows user to select areas of interest and other drop-down functionality



Present results of a simulation integrated with Google Earth

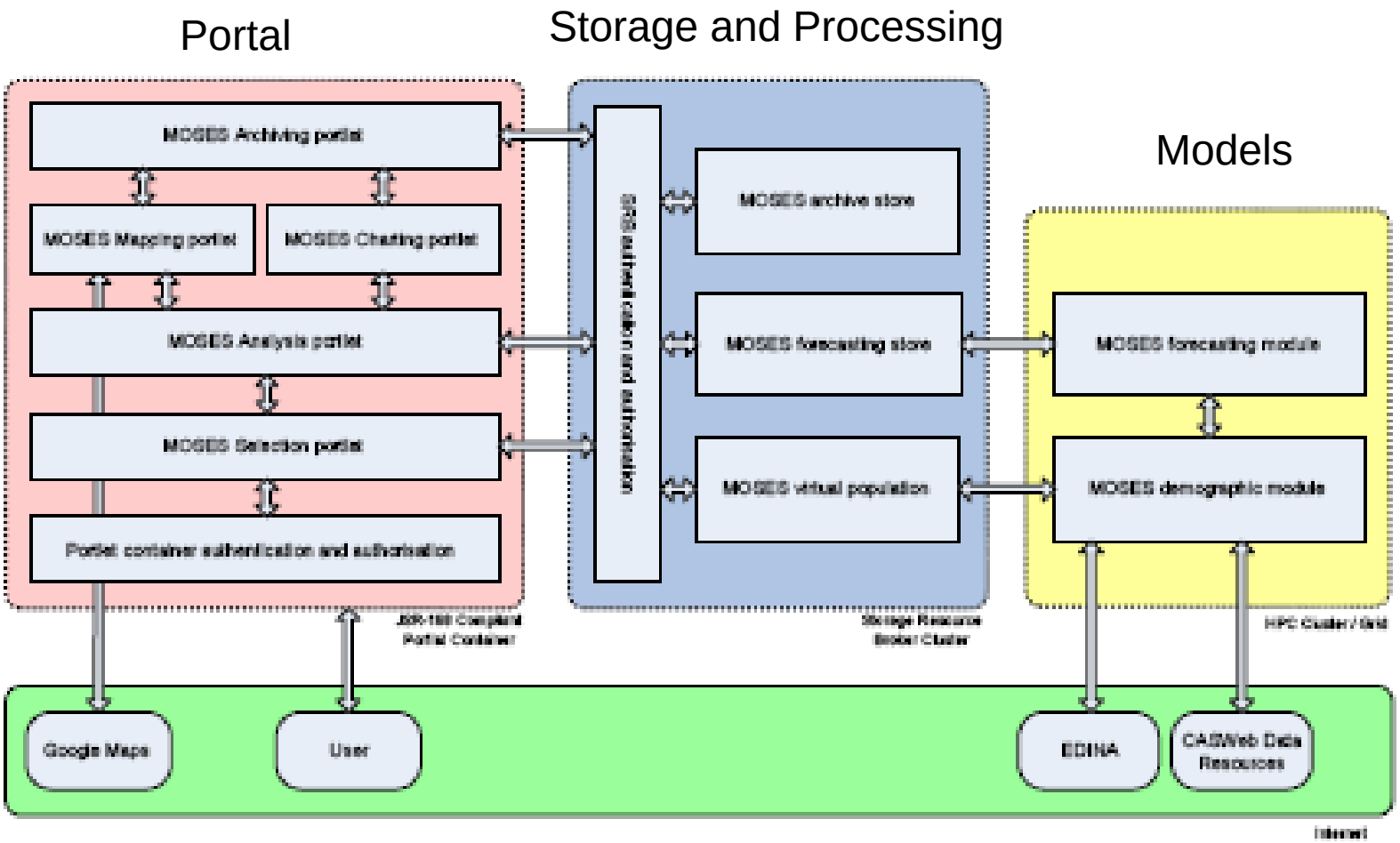
Architecture

- Social simulation is computationally intensive, so that realistic problems are beyond the reach of desktop computers

- Social simulation involves the integration of multiple data sources – access to data can be virtualised within an e-infrastructure framework

- Social simulation may be accessed by multiple remote users, for example by strategists within different regional healthcare providers, or by planners in the social services and housing teams within the same local authority.

Architecture



Next Steps

In the next phase of development, Moses will become more closely aligned with the GeoVue node of NCeSS.

Working together through the **Genesis** programme, the two nodes will begin to prepare a platform providing the methods, data and infrastructure for generative social science.

Through further development of the analytical methods and visual tools supporting Moses, we aim to promote continued awareness of e-social science in both academic research and the practice of public policy simulation.

Generative Social Science

Simulation of artificial societies *in silico* from the bottom up

Evolutionary systems theory combining elements of game theory, experimental economics, complexity and institutional analysis

Implementation via grid-enabled computation and data resources