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Coming up for air

Post-Modern nodal maps or Modernist underground maps to represent London and other cities

Abstract

Coming up for air : post-modern nodal maps or modernist underground maps to represent London and other cities.

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In graph theory terms nodes are linked by arcs. The series of arcs are in transport terms the train lines or bus lines identified and marketed by individual transport operators. In this paper we ask if it is now time to focus on the nodes and not the lines. Nodes as gateways to the city activities are also points of interchange between transport types. A traveller centric map is presented in which travellers use the map to switch between modes dependent on location, purpose and security. London as a world city is compared to Glasgow as the largest city in Scotland in terms of number of nodes and transport system redundancy.

1   Introduction

Gateway Cities and indeed City Gateways are the subject of this session and, as noted by the session organisers, these concepts have additional relevance given the award of the 2012 Olympic Games to London. London is the main focus of this paper although we will draw upon our recent work in other UK towns and cities to try to identify what in gateway terms, identifies the world city status for London.

 "Cities are complex webs of transport routes, nodes and services" (Docherty 2006). From our perspective we would stress that the nodes are activity centres at which, or around which, the city economy takes place. These are the offices, shops, government departments, banks, theatres and so on grouped into identifiable areas often well known to Londoners and that are a mystery, or welcome discovery, to London's visitors. The city transport and service systems exchange people, supplies, data and waste to and from these nodes. The largest of these nodes can be considered 'gateways' but groups of nodes such as the tourist area of central London can also constitute a gateway to and from the Olympic sites (Brannen 2005).

Against this complex backdrop Harry Beck's 1931 Underground diagram (fig 1) has brought an enormous simplicity to city life. The diagram gives a confidence to any traveller that they will be able to navigate the whole underground system and with it - seemingly - the whole of London. This diagram was one of the icons of 'Modernism' in Britain and is retained to this day as <u>the</u> armature for the Capital's transport information.

Figure 1 Beck holding his original diagram

In this paper we show a new way of representing London by an Aboveground diagram based around the nodes of London's economy. We use this array of nodes as a new armature on which to co-ordinate London's transport information. Such a diagram feeds into and supports a 'Post-Modern' view of city life. The diagram allows for both the day-to-day imperfections of real city transport systems and the complexity of how our lives are now lived in cities, some 75 years after Beck.

2   London aboveground diagram

Buses and streets are the main feature of personal movement aboveground. Yet no equivalent solution to the Underground diagram had been produced by bus operators. Recent Transport *for* London (T*f*L) bus route information has focused on providing route diagrams at bus stops. This again successfully uses 'Beck' style line diagrams for buses going from any particular bus stop. However a system wide map cannot be made using this notation as there are many more bus routes than available colours. An integrated bus and tube system diagram is similarly ruled out.

Beck's solution for the tube network came from his work with underground water mains and sewer pipes - ours came from trying to make a simplified bus network diagram. Bus service routes are one way in which to detect centres of activity. Buses are flexible in routing over time and get to the heart of where people want to get to which are activity centres with shops, banks, post office, cafes, restaurants, bars, entertainment. They also connect to other forms of transport trains, tubes, planes, ferries.

The Quickmap Aboveground diagram was produced over a two year period where the members of the company surveyed London area by area to locate the positions and features that make up the nodes of activity in the city. Using these nodes a system wide bus map can be made for London and indeed this was launched in 1999 by Ken Livingstone just before he became Mayor.

Figure 2 Livingstone launches London by bus

Because this diagram is independent of the tube and rail systems, then these can be added to the diagram to give an integrated transport network diagram on a single A4 sheet. A central London "all-on-one" map is shown in the Appendix of this paper.

3   Lines versus points or arcs versus nodes

We can formalise the distinction we have made as between the network diagram of the Underground and our own diagram of Aboveground nodes. In graph theory nodes are connected by arcs. That is to say, if we take a stretch of underground such as the central line passing through Westminster then each station (node) can be linked in a graph to the next station, e.g.

St James Park ---- 1 ---- Westminster   St James Park ---- 0 ----- Embankment

So in a graph, we enter the value 1 if there is a link and 0, or more usually a blank, if there is not. We can see this in the figure below
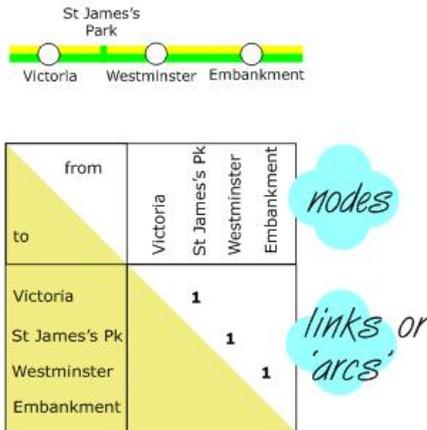
Figure 3 *train lines as graphs*

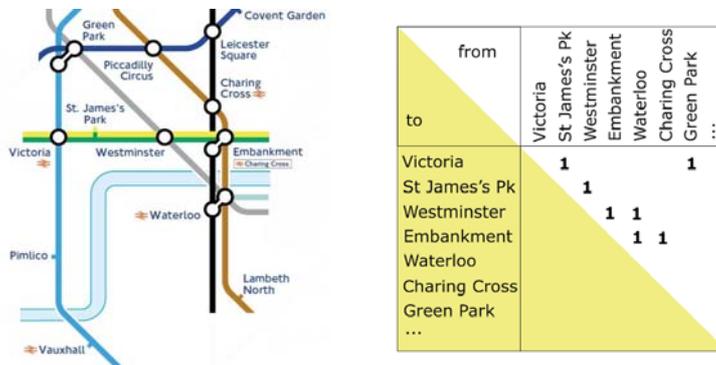A slightly more complex part of the tube diagram can be resolved in the same manner, see figure

Figure 4a,b tube snippet

However if we take a city user's perspective or the travellers perspective as we call it, then this same area as shown in the underground diagram, fig. 4, is given in our aboveground diagram, see fig.5.
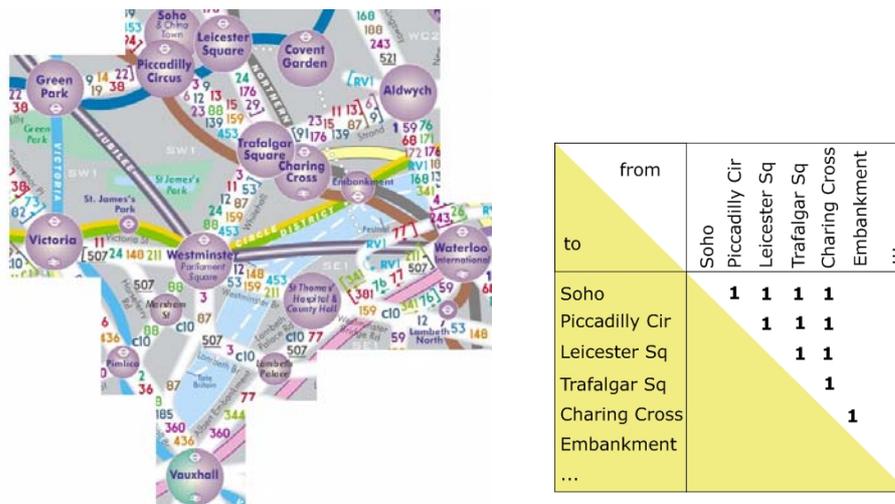

Figure 5a,b Quickmap all-on-one *map snippet and node connection graph*

Clearly in fig 5, not all the nodes have tube lines passing through them e.g. Soho; many more nodes are served by buses; all have walking access and main streets and pedestrian paths show these opportunities too.

Transport has always been a means to an end rather than an end in itself – excepting Sunday drives and the Orient Express.   The transport operator's focus is rightly on their equipment and system. But the traveller focuses on where they want to arrive and what they can do there. Hence by prioritising the surface of the city and its centres of activity both traveller and operator requirements can be met in an integrated transport diagram.

This is symbolically shown below with the interests of the traveller focusing on the nodes and the interests of the operators, including T*f*L Street Management, on particular means of transport.
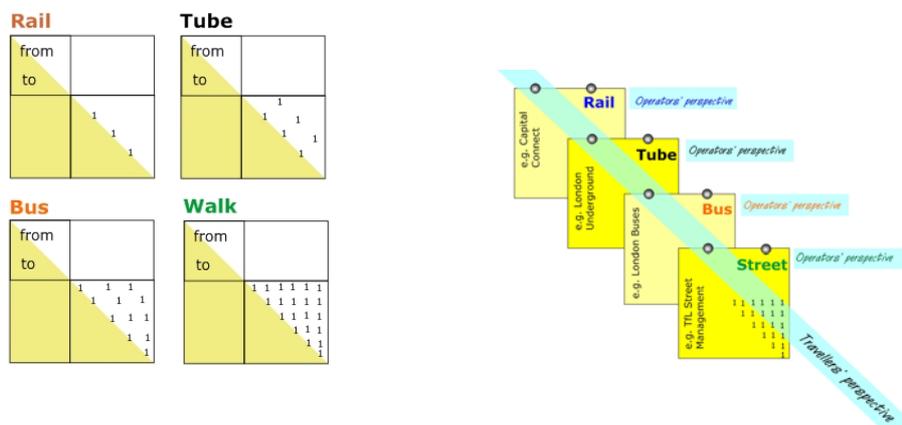

Figure 6a,b Travellers perspectives are different to Operators

The Tube network diagram is often seen by visitors as a simplified 'map' of London. It is of course partially selective in its areas of coverage with much of South London and many other parts of London suburbia also without close access to the tube. It's definitely not all Metroland out there!   The Aboveground diagram is independent of the spatial reach of the Underground network itself.

Having established a new way of representing London without many of the single operator constraints we can ask what are the consequences for moving about the city?

4   Benefits of an Aboveground armature for city transport

We note the obvious point that London as a destination *is* above ground and the economy works by using the above ground infrastructure effectively. Streets, Landmarks and local identity, are critical to generating a sense of surface geography.

By giving the surface 'nodes' the priority in a diagram of the city, then travellers can see where they want to get to and *then* address the issue of which transport means (including walking) are available to reach their desired destination. The choice may depend on how much time is available, what the weather is like and so on. The distribution of these centres of activity is more organic than portrayed by the lines of

the Tube diagram. But the distinction is not that one is better than the other – we need both - and indeed many ways of representing how the city and its transport is organised. We see this as a change from the 'modernist' view of single, perfectly functioning machine-like systems, where for example the Tube never breaks down and where it reaches all parts of London equally. To the viewpoint of travellers who want to get to their destinations despite the 'post modern' complexities of changing daily routines, system failures and the real geography.

Coming up for air from tube stations people's spatial knowledge can be limited to the surrounding area and separated from that of other tube stations. This lack of connection formed in mental maps of London's surface – can lead to even nearby tube stations requiring time consuming line changes rather than a short walk. Comparing the position of Lambeth North tube station on the Underground diagram and the Aboveground diagram (figs 7a,b) shows an example where a <u>short walk south west</u> would get you from Waterloo to Lambeth North rather than a perceived <u>long walk to the south east</u>.
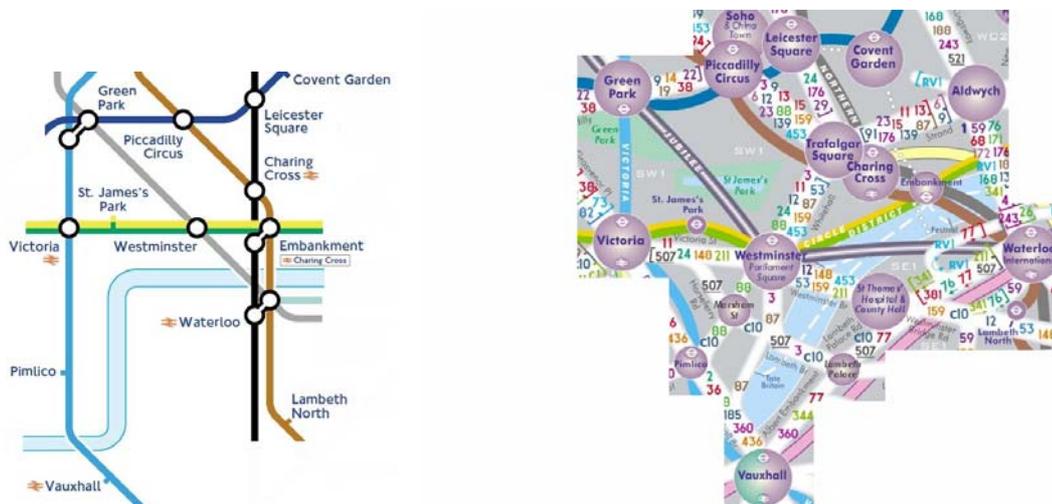

Figure 7a,b Underground and Aboveground diagram comparisons

The Aboveground diagram will appear either 'rich in content' or 'complicated' depending on a glass half-full or half-empty analogy. Familiarity with using the map (Quickmap 2006) leads to great confidence and enjoyment in 'using London'; in Glasgow , see below, the equivalent achieved significant modal shift.

The ability to navigate the Tube network is not impaired by the Aboveground diagram while the options for seeing how the Tube stations relate to London itself is greatly expanded. Getting from Charing Cross to Covent Garden by Tube would require at least one change and add to the overloading of Covent Garden station which has to be closed for capacity reasons at peak tourist times. It is very much more pleasant and as just as quick or quicker to walk.   The tube is also overloaded at peak commuting times so that any additional travel by visitors that can be enjoyably achieved above ground is also a benefit. But this already views the problem as defined by the Tube system rather than London itself.

<u>Security benefits too</u>

A specific distinction between the above ground and the under ground armatures for transport information representation in London is provided by the events following the 7th July 2005 bombings. Much of the Tube network was still suffering disruption three weeks later, see below
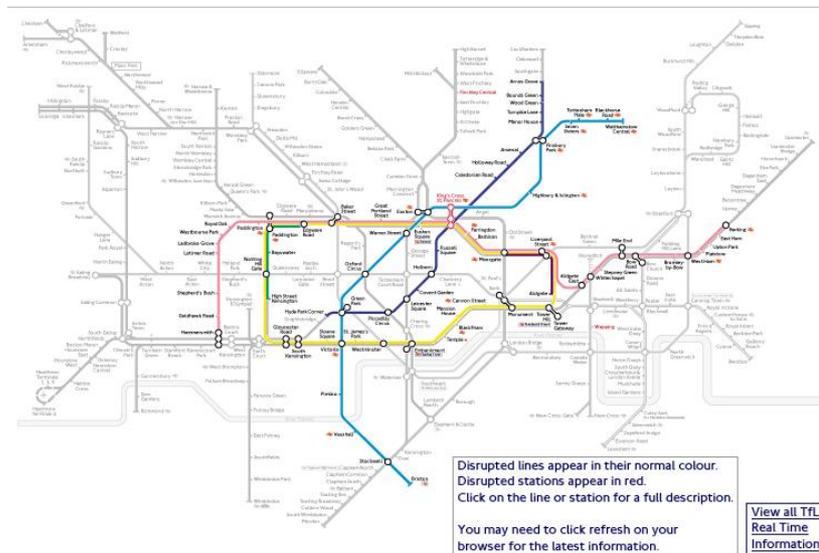

Figure 8 disruptions

Figure 8 shows the disrupted lines (in bold or colour) as of the 24th July 2005. The pale lines are the lines that continue to run although some delays are expected on those lines too given the general level of system disruption.

Note that under these circumstances other transport modes (not shown on Tube diagram) become important e.g. walk, bus and rail options to replace the coloured (disrupted lines) rather than rely on the remaining (grey) elements of the single Tube system, (that are shown). Integrated transport information <u>is available</u> on the internet from T*f*L. Although as noted earlier the bus information adopts tube map iconography and is shown connecting from station hyperlinks on the tube line diagram. Again the transport information armature is that of the Underground.

On the day of 7th July the web and phone information systems for London were overloaded and people walked. Predominately they walked to the Gateway nodes provided by the main train stations and may of them stopped off to buy maps on the way because of a lack of familiarity with the surface geography. At the time we produced a special free issue 'walking to main stations' map, *see appendix*.

Quite separately from considering the use of the internet on the day 7/7, the structure of the internet is important as a systems model.

The original purpose of the Internet was *to provide a communication system that was invulnerable to military attack.* Communication would continue irrespective

of the nodes removed or links damaged. Thus the Internet itself provides a multi-nodal model which is particularly relevant to London's transport systems.

The fusion of London's four major transport networks into a single multi-nodal Aboveground representation provides individual travellers with the choices to continue their journeys relatively easily if disruption occurs. The combination of individual transport networks is shown in the Quickmap *all-on-one* map. The effect of the integration of the networks can then be measured and formalised as reduced vulnerabilities resulting from the removal of any 'links or arcs' in the graphs above. This is ongoing research at Quickmap.

5   Other cities and towns

Quickmap has made nodal maps for various clients in the UK. We have become aware of just how different London is as a city when we have brought our method of hybrid map-diagram making to other towns and cities. As a very simple way of illustrating this we have counted the nodes defined from our direct surveys and in one case from our automated node production. For Rotherham we produced a node map showing local bus network as a diagram for the web. An automated method of selecting activity nodes based on the NapTAN database provided a different 'cut' of the Rotherham activity space and generated more nodes than we or the client required. The Glasgow Region and inner London cases are comparable on the basis of having a common area of 150 square miles (390 sq km).

City of Urban area	Number of nodes	Area in square miles
London	416	150
Glasgow	126	150
Rotherham-Sheffield Conurb.	181	150
Luton-Dunstable Urban area	43	70

Table 1 node densities

These values for number of nodes contain some subjectivity as is well illustrated by the Rotherham case but the surveying method we use is, we hope, consistent although it will vary with the objective. What makes a world city? Is it the number of nodes or their proximity or density per square mile? It is not clear at this stage except for the step change in number of nodes for London compared to elsewhere in UK.

Interestingly the Brennan (2006) raises many of the issues we have been dealing with here since Ken Livingstone launched our first map-diagram of the London Surface 'London by bus'. Brennan of the CLP sees the central tourist area of London as a gateway to the Olympic village and that visitors will move between the two areas. The CLP sees the importance, economic and otherwise, of encouraging the Olympic visitors to spread to areas beyond tube station immediate localities.

6   Conclusion

We need to make sense of London's Surface and have the same confidence to use the London Surface as we do the London Underground. To achieve this new information systems are needed, such as the mapping system shown here. Pocket media (maps and phones) are important as these can be kept on the person and allow for the unexpected desire for route change. The latter can arise for social, business, weather, congestion, outages or security reasons. Early feedback suggests that the *all-on-one* type of surface nodal map does indeed provide the level of confidence to fully navigate the city surface that we also see in the use of the Tube diagram. But the *all-on-one* that confidence includes the ability to cope with difficulties in any part of the transport system.

A post-modern view of a city and of its transport systems is a multiple view, a high proportion of our map purchasers are women who welcome the map as an addition to personal effectiveness and security. We still need the 'modernist' simplicity of the Tube system diagram. Now some 75 years after Beck we also need to take into account the multiple views of travellers Aboveground much more seriously.

The Operators view of the transport world is their set of arcs - their linear route maps by bus or tube or rail. In contrast the users - the travellers - priority is on their starting points (origins) and their destinations which are predominately the nodes of city activity that constitute home, work and play.

We have seen how, on the days immediately after the 7th July attacks, the city transport system rediscovered walking to transport gateways and just the London surface itself. This will we suspect remain important for the summer of the Olympics to meet a range of social, economic and security objectives.

References

Brannen, E. (2005) Draft Central London tourism development framework 2006-

2009. Central London Partnership, London.

Docherty, I (2006) RGS-IDG Seminar announcement, Glasgow University.

Quickmap (2006) www.quickmap.com/feedback.htm

Quickmap published *London by bus* in 1999 and followed this with the first edition of *London all-on-one* in 2001. A new map, *London tube and walk* will be published in jan 2007 it will include central area Landmarks as well as nodes as an aid to walking navigation. Quickmap also specialises in making web based animated maps as can be seen for the new National Stadium at Wembley in the showcase at www.quickmap.com Tubemap snippets (c) TfL.