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## Building on Buchanan: evolving road hierarchy for today's urbanism
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In his seminal work *Traffic in Towns*, Colin Buchanan laid out in about four pages a basic principle for road hierarchy that has become an influential force in shaping the layout of urban areas for forty years (Mot 1963).

However, on closer inspection, hierarchy need not be the rigid device it often appears to be, but can be a robust, flexible tool for the generation of urban layout. Following research investigation into the nature of road hierarchy, it emerges that hierarchical principles can be used creatively to form the foundation of a broader, more general system for street management.

### Conventional road hierarchy
*Traffic in Towns*, also known as the 'Buchanan Report', laid out a comprehensive vision for urban planning for the motor era. While this vision included some memorable images of modernistic 'traffic architecture' with a megastructural medlay of tower blocks, multilevel pedestrian decks and motorways, the 'new look' imagery was not itself essential to the basic principles, as Buchanan himself noted (Mot 1963). In effect, Buchanan made the founding principle of *Traffic in Towns* the straight-forward distinction between roads for traffic and those providing access to buildings: "Basically, however, there are only two kinds of roads-distributors designed for movement, and access roads to serve the buildings" (Mot 1963). In effect, this 'basic principle' is a division between a system of traffic distributors, where the needs of movement are prioritised, and a system of 'environmental areas' where

environmental considerations are prioritised. This directly echoes the approach of H.A. Tripp two decades earlier, who asserted that these two functions were "mutually antagonistic", and must be separated in two kinds of urban road (Tripp 1942, 1950; Mot 1963).

Although the concept of road hierarchy is still with us, it has become somewhat less prominent in successive guidance documents (for example, in the UK, *Roads and Traffic in Urban Areas*, Dot-Iht 1987; *Transport in the Urban Environment*, Iht 1997). And, in contrast to Buchanan's clearly set out formulation, today's expression of hierarchy has become somewhat toned down, and the distinction between different kinds of distributor and access road blurred. Yet to the extent that the basic principles of road hierarchy still hold sway, they are often seen as problematic from certain urban design and planning points of view, and in the face of criticism from a variety of those quarters there is a danger of hierarchy being further compromised or dismantled altogether. The time therefore seems ripe to revisit the principles of hierarchy and explore if and how they may be adapted for today's needs.

There are many kinds of road hierarchy in existence, and they all appear to be ranked by some kind of 'traffic function'. This traffic-oriented impression is reinforced by the typical ranking from major traffic roads such as primary distributors, or traffic-only roads such as motorways, at the 'top' of the hierarchy, down through intermediate road and street types, to pedestrian-only streets or paths at the 'bottom' of the hierarchy.

While the rankings may appear to be by some kind of 'traffic function', and hence the criticism of

hierarchy for being traffic-oriented and part of the urban problem, on closer inspection the actual criterion for distinguishing and ranking different roads is found not to be based on traffic flow, or traffic speed, or any actual traffic or engineering criterion (Marshall 2005). It turns out that the ranking is actually based on the geographical scale of significance of the network to which a road belongs, where roads are arranged topologically according to a structural property known as 'arteriality' first identified in a cartographic context (Morrison 1966).

### A new formulation for hierarchy
The fundamental basis for the system is premised on the linking of two ideas:
- any street section has a combination of link status and place status. (The terms link status and place status echo the distinction between 'link qualities' and 'place qualities' of Caliandro 1986; and are equivalent to the terms 'arterial connection' and 'urban place' used elsewhere, Marshall 2005.) Link status and place status are independent, and not one the inverse of the other, as with the 'mobility function' and 'access function' of conventional hierarchies;
- link status and place status will depend not only on the immediate attributes of the street section (including physical form and demand for use), but on their role with respect to the wider street and urban system considered as a whole.

Link status denotes the relative significance of a street section as a link in the network. It is effectively based on its scale of significance within the network it belongs to: for example, local access street, district distributor, city arterial. In principle this could relate upwards to a national or international

scale significance.

Place status denotes the relative significance of a street locale as an urban place in the whole urban area. For example, a street or square may perform a city-wide role or a more local role. The place status is, like link status, related to geographical scale.

Each street section is classified according to its link status and its place status. In accordance with the way they are defined, these are independent variables. They can therefore be arranged as a two-dimensional classification framework, rather than the linear ranking typical of conventional practice.

From this kind of framework it is possible to distinguish different types of street, defined by their combination of link and place status. These types may be represented as 'cells' in a 'periodic table' of street types.

Key features of the system are:
- the classification serves to classify any street section in strategic terms, that is, it relates the significance of a street section with respect to all streets/places the whole city;
- the units on each axis are comparable, they relate to geographical scale, for example, district distributor, district centre;
- because of the way they are defined, link status and place status are not mutually exclusive, and a given street or street type can combine both, in principle, such as in the case of the traditional boulevard;
- the 'periodic table' is felt to provide a good balance between simplicity and complexity. It is complex enough to give a 2D spread of types of street, but by limiting to 2D is easily graspable by users.

### Applications and conclusions
This exercise in

classification is, as been stated, not done for its own sake, but for the purpose of assisting the design and management of individual street sections relative to the functioning of the whole system. Here, the combination of link status and place status can be used to guide decisions in the trade-off of street-space, between different transport modes and different urban activities (Marshall *et al.* 2004; Svensson 2004). Hence, the trade-off of the street-space in a particular locale will be affected not only by the immediate demands placed on that locale, but its strategic significance relative to the wider city context. This means that in designing street-space within a particular locale, there will be a simultaneous trade-off between immediate demands for space and time (for pedestrians to cross; for one stream of traffic to turn right or left across another stream; for street trading, etc.) and the overall functioning of the city.

As well as guiding decisions on street design and management, the classification can be used as a basis against which to judge the performance of a street.

This paper has demonstrated a classification system where a street is classified according to two independent criteria, namely link status and status. This classification can then be used as a basis for trading off street space (area at the micro scale) to support link-related and place-related functions. This is considered an advance on conventional classification, for the purpose of meeting today's urban, streets-oriented agenda, in that it can readily accommodate street types not currently recognised, such as the arterial street; and the classification allows the link function of the street to be traded off against activities relating to the role of the street as an urban place, on an explicit and transparent basis.

In the end, hierarchy need not be seen as a 'tyranny of traffic regulation', but can be 'built upon' to provide an organizational logic that can bridge the professional divide, between planning and engineering traditions, just as Colin Buchanan himself did personally.

This route hierarchy can in turn provide the foundation or 'skeleton' for a broader urban code, that would relate the different kinds of route type to different permutations of land use and built form, hence creating a comprehensive 'code' for urban design.