



## Position Statement on connected vehicles – the 39 steps

There is much interest in cooperative and autonomous vehicles and many opinions based on hearsay and emotion rather than fact or policy. ITS (UK) should be the go-to factual source for the UK.

These are the 39 Steps we see as our position, with a nod to the story by John Buchanan

1. Highly instrumented and connected vehicles are a logical and manageable step towards autonomous vehicles that offer a first stage of benefits to capacity, safety, reduction in reliance in infrastructure and the environment (although not the only route) and so ITS (UK) welcomes initiatives to exchange data between vehicles and with infrastructure to aid mobility.
2. Each new model, or update to a vehicle or service may introduce more connectivity. The pace of this change is only likely to accelerate.
3. Vehicle must mean not just cars but cycles, freight vehicles, buses and new modes of transport. Thinking should also consider the passengers in them and vulnerable road users around them. It is not simply about connecting cars to infrastructure.
4. This area offers an opportunity for useful cooperation with and learning from the rail, defence and aviation sectors.
5. The business case for connecting vehicles requires as the same forms of cooperation as autonomous vehicles may need as a start point. With users happy to provide their data to others and receiving a clear benefit from doing so, partners collecting and processing data and end users receiving a benefit.
6. Data and information are not the same thing. There should always be some facility either centrally (in the cloud) or in the vehicle to rapidly turn data into useful information, intelligence or behaviour change. Information is far more useful to most users than raw sensor data.
7. Data collected from vehicles and people is diverse and may include social media inputs, images, public transport occupancy, road condition, weather or safety messages as well as the location, speed, vehicle type and other core data.
8. Information delivered to vehicles may be diverse and could include network and weather warnings, routeings, car share offers, public transport alternatives, road operator advice and other appropriate material for the user and travel conditions.
9. It should also be used to provide other personalised services and offers which the user wants.

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10. Use of data from vehicles and people . be it via GPS or mobile devices or ANPR - is not new. We can learn from previous experience in areas such as overcoming privacy concerns, sampling, dealing with new data forms, conflicting data and dissemination while dealing with legacy systems.
11. It is important to keep up with central and EU Government regulatory work on data ownership control and privacy.
12. ~~Big data~~ analysis techniques and ways of fusing data may be needed to make the most of the high volumes of new data with unknown provenance, fused with ~~old~~ data of known value. But big data may not be able to be used everywhere
13. In the short term, in-vehicle data is an addition to existing travel services, not an immediate replacement for them. It will take time for further adoption and interoperability.
14. Consistency between fixed infrastructure and in-vehicle messages is desirable but must not stifle innovation. Consistency in safety related messages via all channels is essential, but for non-critical information this is not so crucial and indeed personalised information may be more popular.
15. Uncoordinated or uncontrolled data between vehicles may have emergent effects . for example reducing effective capacity on busy motorways if headways are enlarged beyond current levels for safety reasons.
16. Data sent to vehicles may have policy implications through how it is then used by the vehicle or driver (safety, routeing), since this is not controlled by a highways authority in the way roadside infrastructure is. But information sent for example via an app, should not have adverse policy implications if the information is created in accordance with their policy.
17. Ergonomic presentation in the vehicle to minimise distraction is a must. Driver training may have to be partly redesigned to include new tasks and sources of information.
18. Data from nomadic devices and apps is already available and may be as useful as that from the core of a vehicle's systems . it increases coverage and accessibility.
19. We need to understand the system of systems impacts of these vehicles . what will the impacts be on the safety of younger and older drivers? What will the impact upon network operations be? Will more car journeys take the place of potential public transport journeys?
20. Connection of vehicles on just motorways or in cities may not be enough . drivers do not know or care whose road they are on or where the road or street sits in the hierarchy. They may identify a rural road from a city street, but the grey area in the middle is a challenge. So end to end coverage and services are vital.
21. Not all sources of data are the same . a truck in Cumbria on a sparsely instrumented part of the network may feed in more useful data than a car on the well instrumented M25. But this depends on there being a communications link available to that truck and it being recognised as a trusted source of real time data.

22. Users of information may choose to pay more for better, faster, more utility but the minimum level available to all should be the same irrespective of vehicle type, platform or device (i.e. the EU Minimum Data Set).
23. These vehicles could provide a further ability to address local safety or congestion hot spots, help mitigate the impacts of bad weather and assist asset management . hence they could deliver benefits to non-equipped road users and network operators.
24. ITS (UK) is well placed to help with overcoming the practical issues, the business model challenges and the institutional barriers.
25. Some legislation and standardisation will be necessary and it will be important to take on board a wide range of expertise to get this right the first time from right across industry.
26. The penetration of instrumented vehicles in the fleet will not have to be very high before it can make a change in general fleet behaviour. We know this from other systems such as ISA and proximity systems.
27. The newest fleets and the newest vehicles do the most miles, giving them disproportionate importance to general behaviour.
28. The infrastructure technology to support new services will be crucial and it is unlikely that leap frogging straight to autonomous vehicles will remove the need for investment, which will need to be carefully future proofed.
29. Proper consideration needs to be given to how such vehicles can help deliver transport policy goals, and this should shape the implementation.
30. Providing data is not the same as having control over the outcome of what is done with the data.
31. To allow proper access to the market for the many SMEs which have the potential to be important in this new market, open standards and open data sets will be essential.
32. The systems used in the vehicles must fail safe but this will be a challenge shared by all.
33. There are real security implications with these systems. Like any IT system, they will be subject to attempts at unauthorised access and attacks by malware. Adequate security must be built in and maintained. Redundancy of safety critical systems will also need careful consideration.
34. There are also potentially complicated legal and liability issues which need to be clarified, settling specific responsibility on data providers, information providers, the highways authority, the car manufacturer, the service provider and the driver.
35. Connected vehicles need to be connected . what happens when there is no signal . either between vehicles or to infrastructure?

36. We should not assume just one data and communications methodology - vehicles have a far longer life than mobile phones and network generations
37. We must not be technology specific or prohibitive and should consider the outcomes we wish to achieve.
38. User acceptability is key and cannot be assumed. Liability, privacy and control issues may work against acceptance. Much of this may be perception, conjecture and rumour.
39. The above 38 steps are on the start of an adventurous journey for us all. They will need review . some will be met early and some continue as like the book it's a fast moving story. But it will make a gripping yarn when we get thereõ .