
XM
XM Preview
64°F 1:45
GPS
W 72ND ST
E 79TH ST
E 72ND ST
W 57TH ST
E 63RD ST
BROADWAY
5TH AVE
YORK AVE
1ST AVE
2ND AVE
3RD AVE
PARK AVE
HENRY HUDSON PKWY N
FDR DR N
487
60
1 2 3 4 5 6
VOL
RADIO BAND
HDD/DVD AUX
FAV
TONE
INFO
CONFIG
SEEK
NAV
BACK
REC
DEL
DEST
RPT
AUTO
MENU
VEHICLE INFO

BY BERN GRUSH

Editor's Note: *The author is the founder and chief scientist at Skymeter Corporation, which develops and sells products that use GPS technology for road pricing, insurance and parking management applications.*

WHAT WOULD STEVE JOBS DO?

If Steve Jobs were to design a dash-top device that handled road use payments, what would such an *iVMTcharger (US)* or *iTDPcharger (EU)* look like? You might suppose he wouldn't be caught dead doing that, but what if he figured there was a market for one in nearly every vehicle in the US, Europe and Asia in 2015–2025 for when we can no longer ignore the failing ability of fuel taxes to fund our roads, or start using alternative power sources and the gas tax dries up, or when we start doing something about congestion as we keep talking about? What will road user fee collection look like then?

IF STEVE JOBS WERE TO DESIGN A DASH-TOP DEVICE THAT HANDLED ROAD USE PAYMENTS, WHAT WOULD SUCH A DEVICE LOOK LIKE?

Imagine how Jobs would think about the design of *acceptable* road tolling telematics. And he'd expand that thinking far beyond tolling only limited access interstate or interurban routes. He'd imagine a system capable of replacing the fuel tax. Or tolling all roads as the Dutch announced they would do.

Jobs likes customers to line up outside mobility stores starting the night before product release to be first to get an iWhatever. So his thinking would be one far cry from a simple $12 transponder. Of course, the cost of low-end road tolling telematics must be dramatically less than an iPhone — perhaps closer to $50–70.

JOBS WOULD SET UP A CREDIT EXCHANGE SYSTEM SO THAT YOUR CITY COULD REWARD YOU FOR LEAVING YOUR CAR HOME ONCE OR TWICE A WEEK.

Clearly, he knows there is not a person on the planet that wants to pay road tolls. Not even the experts who say we need to shift from gas tax to road tolls actually *want* to pay road tolls. He'd know that there will be competition and that his offering will have to do dozens of cool things that his competitors' offerings don't. He'd pack his design with wildly desirable features.

Jobs would have his on-board meter let you park your car and forget immediate payment. It would just be handled automatically. No curbside meter, no cell phone, no parking attendant. Nothing. He'd end the need for most parking tickets by eliminating time limits on street parking by substituting payments for the extra time parked, as is being trialed as "graduated parking fees" since late 2009 in Winnipeg.

He would have it handle pay-as-you-drive insurance so that those who drive less than average can be treated more fairly. Some drivers may choose to drive less to save yet more money, thereby reducing vehicles miles traveled (VMT); other drivers may choose insurance products that reward safer driving habits, thereby promoting safety.

He'd throw in an emergency call button and a carbon meter that governments could use to reward ownership of downsized or electric vehicles.

Jobs would set up a credit exchange system, *iTrips*, so that your city could reward you with a couple of hours of free parking, or a bus ticket, for leaving your car home once or twice a week. Or even provide you with some road use credits perhaps in the form of a tax credit.

He'd make his meter handle loyalty programs so if you kept using the same parking garage, you could get a discount or free parking hours from time to time. That would let you skip the monthly parking pass, because you're thinking of starting to telework more often anyway. He would even let merchants credit your parking account for purchasing at their store.

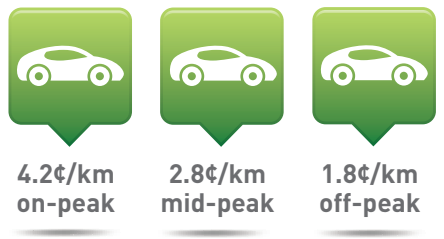
I doubt Jobs would stop there. He would put in Bluetooth so you could download your private parking and tolling bills to your smartphone for personal audit and maybe sort them out for your expense reports and deleting the record of paid activities from the meter. He'd enable location-based coupons for things you'd opt in to. He'd include a parking finder and reservation system — and a way to guide you right to the spot using your smartphone. He would put in a program that optimizes your time or route of travel to minimize your tolling costs.

It would have a pile of functions. It would lead to online purchases. It would be attractive to behold. It would do stuff you never thought a tolling payment device would do. It would be wrapped in more sex appeal than a sports car. It would be blindingly cheap. And you'll be able to pick one up for a network initialization fee at your mobility store bundled with your mobility services on the same monthly wireless account. He'd make it self-installable and uncheatable. If you were more careful about planning your car use, you could even save money on top of all this coolness.

You might even be *eager* to get one.

VMT CHARGING

The more that we talk about VMT charging here in the US, or Time-Distance-Place (TDP) charging in the EU, the more we need to start thinking about the acceptability or — let's go all the way — the unabashed *desirability* of road-use metering on our dashboards.



THE MORE WE TALK ABOUT VMT CHARGING, THE MORE WE NEED TO START THINKING ABOUT THE UNABASHED *DESIRABILITY* OF ROAD-USE METERING ON OUR DASHBOARDS.

When the day finally arrives that tolling capabilities are factory installed (which I believe is a long way off, since we do not yet agree on how to design the requisite policies), there will still be a worldwide after-market for well over a billion units. Consider that

pay-as-you-drive tolling regimes will become increasingly widespread, and will continue to vary from region to region, long before such factory installations and that the aftermarket dashboard is already ripe to become the next computing convergence domain. What happened to your desk in the 80s, your lap in the 90s, your palm, belt or purse in the 00s, will be happening to your dashboard in the current decade. Already, many of us have at least three in-car devices from among such gear as on-board navigation, hands-free cellular, satellite radio, iPod, OnStar, one or more toll tags, and dynamic, real-time traveler services. You may even have early video infotainment services coming to your passenger seats.

All of these things will start to converge now and will soon be online-enabled under the rubric of "the Connected Car" (see ngconnect.org for an idea-stimulating video). The Connected Car will also be loaded with whatever safety features come out of current Intellidrive (VII) R&D. And there will be much, much more.

This says that if the dashboard is the next focus for consumer-market device design, then tolling payment

systems could have a much sexier wrapper than a sticker tag. Tolling meters and payment handlers will disappear inside a rich, consumer-attractive telematics environment and today's ETC and ORT gantries will be replaced by open, GPS-enabled metering services that will operate privately and even anonymously inside these consumer devices, removing the capital and operational costs of unsightly gantry-based systems.

It turns out to be easier to guarantee GPS road-tolling anonymity via in-vehicle metering, fee calculation and settlement than it is to make the same provision for microwave technology, which requires external vehicle identification. In fact, privacy commissioners in the EU are already stipulating that no location data leave

the vehicle without explicit driver awareness and permission. Our privacy commissioners need to write road-tolling-specific guidance for GPS-based systems here in America, as well.

Furthermore, where the infrastructure for the "connected car" is provided, then the incremental cost to provide embedded VMT tolling will decline to almost nothing, similar to the cost of collecting the fuel tax today. In the same spirit that the incremental cost of any one service on your laptop or phone shrinks toward free, the costs of delivering toll-metering systems via the "connected car" will contract toward zero. This means that *government mandate of a particular tolling technology discourages innovation, drives up tolling costs, and even endangers privacy.*

As an example of what innovation can do, imagine the private provision of free GPS road-use metering payment services to the governments of a region or state in exchange for 10-year licenses to operate a GPS-based parking service (including a guaranteed revenue formula) from the same region or state, using the same tolling telematics.

The mere reform of municipal street parking (see *The High Cost of Free Parking* by Donald Shoup) by itself would fund the metering system a few times over — which at $100 per vehicle-year to operate would otherwise be an annual $25 billion expense for the US. This implies an advantage for municipalities who take control of the growing problem of parking congestion, an advantage for drivers with regard to convenience (no payment handling, no tickets, easier spot finding) and fairness (no overpayment), and an advantage to regions to be able to reduce or avoid the costs and clutter of microwave road tolling.

CAN ALL DRIVERS AFFORD THIS?

This may strike you as consumer devices that half the population could not afford. Not so. There would be a range of these devices, just as on display in mobile phone stores now. I have an $800 smart phone for which I paid $200 and agreed to a hefty three-year monthly contract, but I picked up a $25 pay-as-you-go near-disposable phone for my teenager, which she pre-pays by the minute out of her allowance. Furthermore, if governments thought about licensing the rights to provide wireless satellite payment services for parking, carbon rewards, loyalty

THE REFORM OF MUNICIPAL STREET PARKING BY ITSELF WOULD FUND THE DASHBOARD METERING SYSTEM A FEW TIMES OVER.

programs and the like, they could guarantee a minimum VMT or TDP charging service level for all drivers which would be afforded by the sheer volume of additional service transactions by the entire user population. Hence, nearly free, wireless VMT charging infrastructure can be made available to all.

This is the opposite of the idea of "value-added service" additions to remove the sting of TDP road pricing — rather this is making metering for tolling the added value (and free) service to governments who license the various service programs to private operators. In this way, access to cheap tolling meters for all is made possible.

If VMT charging is inevitable, then rich wireless telematics that can host road-use metering as a nearly free service is an idea whose time has come.

WHAT CAN GOVERNMENTS DO?

Ginger Goodin of the Texas Transportation Institute recently asked me a critical question: "How can government facilitate the development of private sector, multi-function, payment telematics?"

Governments have at least five ways to facilitate this development.

First, support standards in order to protect consumers of these services. Standards, in the case of road-use payment telematics, encompass drivers, billing operators, toll operators, parking operators, and insurance companies. These standards include communication interfaces, interoperability, privacy, roaming, charging reliability, security, and evidentiary weight for non-repudiation. The International Standards Organization (ISO) via its European partner, CEN, is releasing these standards in 2010 and is starting a new round of standards that will address compliance and, eventually, certification. Only one American transport professional regularly participates in this work. More should — especially from our state DOTs or perhaps from AASHTO.

Second, encourage voluntary use of metering telemetrics for parking payment services, while waiting for policy and planning to be ready for VMT charging. One way this can be done is to encourage municipalities to permit programs for voluntary parking payment via GPS-based meters. This means governments can let private enterprise absorb the new technology risk while watching whether the technology is in fact, reliable for a VMT charging load.

Third, encourage voluntary meter use by permitting pay as you drive (PAYD) insurance programs in jurisdictions where insurance regulators still lag the market, or by facilitating a gradually increasing percentage of insurance files be converted to PAYD. There are several ways to meter and charge for PAYD insurance and the ones that use pay-by-time-distance-and-place telematics are the most fair. These can be encouraged through subsidies to municipalities that partner with insurance companies to bundle parking and insurance on the same meter. The attraction here is that once a few thousand vehicles in a municipality or mega region are equipped for parking, then insurance companies can offer PAYD premiums to those motorists without consideration for developing a telematics system, since it would already be in place. This is a classic instance of the famous "network principle" which says the more people on the network, the more useful (read 'cheaper' in this case) it is for everyone involved.

VMT CHARGING AND TOLL ROAD OPERATORS

BY GABRIEL ROTH

Toll road operators stand to gain a distinct and valuable advantage from road-use charges being based on VMT, rather than on fuel taxes. If all roads were tolled, IBTTA members would no longer have to compete against "free" roads, which would enormously improve their competitive situation. Prospective toll roads now not financially viable could present opportunities for further productive investment.

As VMT charging becomes more widespread, there could also be opportunities for existing toll road operators to apply their skills in managing and maintaining, under contract to states or local authorities, more of the roads currently financed by fuel taxes or general revenues.

Even before VMT-based road-use charges become widespread, toll road operators could make their roads more attractive by offering their customers the kind of "add-ons" described in the accompanying article. They could, for example, give themselves additional advantages over competing "free" roads by offering quicker access to street parking facilities and information about congestion ahead.

Of further interest related to PAYD insurance is that it puts insurers who are early adopters at a competitive advantage. Their competitors will end up losing their low-mileage business to the early adopter because the early adopter would take some of their low-mileage business forcing them to raise their premiums. After a few cycles of this, annual pricing will become unsustainable and only PAYD insurance will tend to be viable, and PAYD premiums will serve as further signals to drivers to conserve VMT.

Fourth, encourage voluntary use by permitting users of these new devices to pay existing ETC tolls (such as E-ZPass or SunPass) with these same devices. This will reduce the

number of devices on the dashboard and the number of bills to be handled. Properly calibrated GPS-based systems can be set to determine correct tolling amounts without communicating via the existing microwave signals — i.e., without announcing its location to a gantry, or accessing proprietary signals. Those highways for which the tolling authority is a government could consider a small, off-peak discount, as further, instructional motivation to drivers. Might as well start now to train drivers that off-peak driving will be cheaper than on-peak driving.

Fifth, municipalities and mega regions can offer rewards of, say, parking-payment credits or bus tickets. These can be offered to drivers of vehicles that do not move during peak hours, or are small or electric, or are driven very efficiently (hypermiling) or less often. If municipalities permitted local business improvement associations (BIAs) to offer loyalty rewards to frequent shoppers in the form of parking credits, this would further develop this new metering sector, as it would reward users who subscribe to metering services.

The short answer to the question "How can government facilitate the development of private sector, multi-function, payment telematics?" is simple: permit demand to be created by removing restrictions and encouraging or rewarding the shift.

Even shorter: unleash private enterprise creativity.

As soon as that happens, there will be, as in the case of iPhone add-ons, a flood of innovation to address the fear, cost, lack of trust, and lack of acceptance associated with road use metering systems for VMT charging.

— BERN GRUSH, MaSc, is Chief Scientist for Skymeter Corporation, Toronto Canada. The author would like to acknowledge Gabriel Roth for his generous time and suggestions that have improved this article, as well as the sidebar highlighting the advantages of VMT tolling to toll road operators. Bern may be reached at bgrush@skymetercorp.com. **GABRIEL ROTH,** research fellow at the Independent Institute, has pioneered scholarly work on market-based roads, parking, and transit. He may be reached at roths@earthlink.net.