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Cosmic Alignment: the Critical Infrastructure Network

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It's rare, but every once in a while a significant new enterprise will emerge when the stars of need, availability, and resources align at some point in time. Sadly, I suspect that more often than not such unique opportunities are missed because they are not recognized by the parties who are in a position to take advantage until it's too late. Right now in the United States there appears to be just such a cosmic alignment in the wireless arena – a window of opportunity that could be exploited to create a major advance in our national interests, simultaneously addressing three urgent communications needs while also providing a substantial boost to our economy.

What I am proposing is the design and deployment of what I call the "Critical Infrastructure Network" (CIN) which will meet the collective wireless broadband communications needs of the public safety community, the utility industry (including the electric power "Smart Grid") and people and small businesses in remote rural areas who currently have no broadband Internet access. Each of these three user constituencies is facing an urgent need for enhanced broadband services, and each is in line to receive some sort of federal help in meeting those needs. When one takes a close look at what is required and the costs involved, the concept a single network, the CIN, serving all three seems irresistible.

The proposed CIN will operate on the combined 700 MHz spectrum consisting of the public safety broadband block and the commercial D-block, totaling about 22 MHz. This is not really much of a departure from what was originally intended for this spectrum. The original FCC plan was to have a single nationwide commercial D-block operator join forces with the Public Safety Spectrum Trust (PSST, the public safety spectrum license holder) to build a "Shared Wideband Network" (SWBN) that would provide services to both commercial customers and state and local public safety entities. The idea of a

public/private partnership was driven by the need to have a common nationwide network that would allow "first responders" and other public safety personnel from different agencies to communicate and share data with one another, and have it financed by the private sector. With the requirement to build a network with specifications and timetables defined by the PSST, the nationwide D-block was offered along with other license blocks during the FCC's 700 MHz spectrum auction that concluded in March, 2008. That auction was a big success with the *exception* of the D-block, which failed to attract a single bid above the rather modest minimum.

The reasons for lack of commercial interest in the D-block have been widely discussed and debated. However, while the FCC is considering a re-auction of some sort in order to salvage its idea of a public/private SWBN partnership, current economic conditions suggest that this might be a tough sell. Meanwhile, tired of waiting for a common network some state and local public safety agencies are beginning to look at other alternatives for broadband services. In many cases, left to their own devices these agencies will turn to providers of proprietary "turnkey" systems that lack open network standards. This means that a lot of money will be invested in systems that will fail once again to deliver on the promise of nationwide compatibility.

Much of the money that will pay for such local public safety broadband networks over the next few years will most likely come from federal grants to state and local governments as part of stimulus spending packages. I am certainly not going to argue against federal help for police and fire protection, particularly while most state and local governments are facing huge budget shortfalls, but it seems to me that the money for broadband wireless systems would be much better spent on a common network operating on a common channel block with open air-interface standards (ideally based on proven commercial standards). Such standardization would enhance competition and dramatically lower costs of both network and user equipment.

Federal funding for public safety broadband networks using the PSST spectrum and common air interface standards would be more than justified by the operational and economic advantages of nationwide system commonality. But even greater benefits can be derived from expanding the concept to encompass other critical needs with the CIN. Just as the SWBN concept envisions a single network that provides service to both public safety and private commercial users the CIN would offer broadband communications for multiple constituencies, particularly the new Smart Grid needed to usher in a new era of electric power generation, transmission, and distribution. In fact, the CIN makes even more operational sense than the SWBN because the very high reliability and security needed by public safety users, and achieved only at significant added network cost, are more suitable for critical infrastructure applications than for ordinary commercial users.

So what would qualify as "critical infrastructure" for use of the CIN? Besides the obvious public safety entities (which could certainly include federal as well as state and local agencies) infrastructure users would include power, gas, and water utilities vital to national interests. The Smart Grid will likely be the most significant utility application because its efficient operation will depend upon extensive and widely distributed data

communications. Most of this will be machine-to-machine (M2M) data communications used to automate and optimize the operation of the power grid. Grid enhancement is critical to steps required for national energy independence including connection to wind and solar generation facilities and implementation of peak load management and other conservation measures.

Availability of a highly reliable wireless broadband network will significantly reduce the cost and time needed to build the Smart Grid. In fact, the Utilities Telecom Council, an industry organization that lobbies on behalf of utilities' communications interests, has recently petitioned the FCC to allocate 30 MHz of spectrum in the 1800 MHz band for a nationwide wireless network dedicated largely to the needs of the Smart Grid. The UTC is requesting that the spectrum be granted to the utility industry, which includes both public and private enterprises, at no cost. However, even if the FCC grants this request (a process that could take several years), there remains the question of how such a network would be financed, deployed, and managed. Experts have estimated that construction of the nationwide SWBN built to the reliability and coverage requirements specified by the PSST would cost around $20 billion over five years. That's for a network operating in the 700 MHz band; because of lower coverage from each tower in rural areas the costs for a similar network in the 1800 MHz band would likely be significantly higher.

No doubt, if and when the FCC grants spectrum for a dedicated wireless broadband network for utilities the UTC will argue that the federal government should also at least partially fund its construction. But if we are going to be spending this sort of money for public safety wireless broadband communications (and we will, either on a unified common network or a patchwork of local networks) why would we want to spend at least that much again just so utilities don't have to share? And if utilities are in a position to participate financially in the deployment and operation of their own network, why not offer tax or other incentives to apply those resources toward a common CIN? In fact, because it is at the heart of the national goal of energy independence the federal government is prepared to invest heavily in construction of the Smart Grid. By couching the CIN as integral to Smart Grid operation, as well as finally achieving the goal of public safety communications interoperability, it really shouldn't be hard politically to find a way to get it built.

Natural gas and water distribution utilities are not currently facing the same level of required modernization as is the power grid, but they, too, could benefit significantly from availability of wireless broadband M2M communications. This is particularly true for disaster recovery, where the enhanced reliability of the CIN will allow for continued operation of remote monitoring, fault detection, and system management just when it is most needed. And having public safety and critical utilities share the same "disaster-proof" network will allow these entities to communicate with each other even when local telephone and commercial wireless networks are out of service. One can easily imagine scenarios in which that capability alone could save many lives.

Besides public safety and utilities, the CIN could provide broadband Internet access to individuals and small businesses in rural areas, a service that is also very much in the

current spotlight for federal funding. In much of rural America, once you leave the immediate vicinity of local telephone exchanges (that is, close enough for wire-borne DSL service) affordable Internet access is usually limited to dial-up speeds well below 100 kbps. With commerce and education becoming more and more dependent upon broadband Internet access, areas without such service will be left behind – the so-called "digital divide." Several federal agencies are involved in finding practical solutions, and use of extensive wireless broadband networks is certainly high on the list of approaches being considered. Some innovative technologies, such as using high altitude balloons as base station platforms, have been proposed for reducing the cost of providing wireless broadband service coverage in the most rural areas, but even so fully closing the digital divide will be a very costly endeavor. At the same time, the requirements of public safety will dictate that coverage of the CIN extend to remote areas. The obvious question is whether the CIN could also provide general broadband Internet access where commercial services, either wire-borne or wireless, don't exist. The simple answer is "yes," but perhaps not as emphatically as might be suggested by casual consideration. That's because the spectrum and backhaul requirements for the CIN in rural areas would be much greater if it provided Internet access to the general public in addition to serving the needs of public safety and utilities. Spectrum shouldn't be that much of an issue in low population density regions, but backhaul can be a significant cost factor in such areas. Nevertheless, it will certainly cost far less to enhance the capabilities of the CIN to include rural broadband access than it will to build a separate network for that purpose. What's more, the high altitude balloons and other technologies that hold promise for cost reduction in serving very remote areas could most likely be applied to the CIN as well.

To be sure, federal action on designation and funding of the CIN will not be without controversy. Besides expected objections to such spending on general principles it is likely that commercial operators like Verizon and AT&T will complain that a government funded network might compete with their offerings. But such objections are easily overcome. First of all, investing in a common CIN that delivers broadband services to public safety, critical utilities, and rural areas will save many billions of dollars compared with what might be spent building dedicated networks for each. And unlike the SWBN (which commercial operators have begrudgingly accepted), the CIN won't provide common carrier service to the general public in areas where commercial networks already operate.

The CIN obviously isn't a "shovel ready" infrastructure project, but immediate funding could be put to very good use by the PSST and Smart Grid developers in network planning and formulation of common operational standards. Infrastructure and end user device manufacturers would also get involved. That's work for a lot of engineers and support personnel at a time when spending on other telecommunications projects is drying up. The ramp-up to actual network construction will provide thousands of jobs, including many in the hard-pressed manufacturing sector.

So there it is, happening right now: three different national interest requirements for broadband wireless communications, each urgently needed, that could be satisfied with a single network for which spectrum (in just about the optimal frequency band) is already

allocated. And it's happening just when the federal government is seeking worthy infrastructure projects for stimulus funding. The stars are aligned for the Critical Infrastructure Network. Will leaders of the parties involved recognize the opportunity and seize it?

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