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Communication Architecture

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TO: The Federal Communications Commission

Re: Reply comments to PTC-220, LLC's reply comments of Jul 11, 2011 to my submission of June 20, 2011 regarding WT Docket No. 11-79

Comments

In alignment with my submission of June 20, 2011 regarding WT Docket No. 11-79, I am providing below my reply to comments to my submission by PTC-220, LLC on July 11, 2011.

There are two ways to view PTC-220's comments as to my submission. First, there are the issues that I presented to which they did not note any exceptions. Arguably, as addressed below, these continue to be the most damning as to the credibility of their original submission. Second, there are the comments which they did make which are in fact detrimental to their case in that they demonstrate the errors of their viewpoint to addressing PTC exclusively with the 220 MHz spectrum that they have and that they are seeking. I address each of these categories in turn.

NO PTC-220 EXCEPTIONS

There are 3 primary points in my original submission to which PTC-220 took no exception. Each of these is addressed below.

1. **Actual PTC wireless requirements**

   Even now, to my knowledge, PTC-220 has failed to deliver any actual wireless requirements for PTC, even though they had engaged a study with TTCI 5 months prior to their submission in 2011 (now 14 months). Performing such an analysis is very straightforward, and the lack of providing any data is indeed suspicious as to their sincerity or willingness to provide such results. A credible analysis would not simply state the worst case scenarios but would recognize the substantial difference in PTC wireless requirements relative to the traffic control system in place for any given traffic corridor. Many corridors have relatively little

wireless requirements for handling PTC, while others are more intense, albeit not to the level so as to require additional 220 MHz spectrum, if even the current 220 MHz owned by PTC-220, given the other spectrum currently available to the railroads.

2. **Only 220MHz**
   PTC-220 suggests that only 220MHz can meet their requirements. However, as noted in my submission with no exception taken by PTC-220, this very point is belied by Class I railroads that are taking advantage of the Mobile Access Router (MAR) which is integrated with the on-board locomotive PTC platform to utilize multiple communication paths. If there is any question on this point, then I recommend that FCC have an individual discussion with CSX, a Class I railroad that is part of PTC-220, as to their use of various wireless technologies to deploy PTC. I admit that there may be major metropolitan areas in which 220MHz spectrum may facilitate difficult wireless coordination issues, but that situation does not exist across the majority of freight railroad operations. However, in those major metropolitan issues where 220MHz may be advantageous, I truly believe, based upon my experience as the architect of the first PTC system that provides the underlying architecture of PTC being deployed by the freight and commuter railroads, that the current 220MHz spectrum owned by PTC-220 will be more than sufficient for PTC.

3. **Comparison of PTC with Advanced Traffic Control Systems**
   PTC-220's comparison of PTC wireless requirements with those of advanced traffic control systems across the globe is clearly misleading, and PTC took no exception to my making of that point. The wireless requirements of PTC are in no fashion similar to that of the systems that PTC-220 noted – not even close. I find such representations to be either extremely naïve or purposely misleading.

PTC-220 EXCEPTIONS

PTC-220 listed 2 primary exceptions to my submission. Each of these is addressed below:

1. **"The integration of intermediate signals (ISs) into PTC does not exceed regulatory requirements."**
   Arguably, this is a relatively minor point relative to the suggested overall wireless requirement for PTC. Nonetheless, my point is quite valid in that the railroads' technicians in sync with FRA have used poor analysis, if not judgment, in understanding what PTC can do relative to the requirement stated in the regulation associated with the mandating of PTC. As described below, the performance of PTC as currently designed, can benefit little, if at all, by integrating IS's into the system.

In support of FRA regulations, the primary purpose of IS's is to provide a train crew with the understanding that the advancement of their train into the forthcoming block of track is subject to their ability to stop within half the range of vision short of a preceding train. However, even those with the least amount of understanding of PTC functionality should realize that this capability cannot be provided by PTC as currently designed in that PTC has no knowledge of the location of other trains, yet alone the end of those trains. Hence, PTC cannot provide protection for this most important situation that occurs with an unfortunate frequency. In fact there is a solution to this problem that the railroads have yet to figure out, or at least incorporate to the dismay of the individual railroads themselves, as well as NTSB that provides the window on railroad safety for Congress. Simply stated, the end of the train can be determined through several methods that are well within the technical reach of current technologies. More detailed information on both the issue and the solutions can be found on a posting "IS… Not", authored by a retired Metro North senior Operations manager, on my blog www.strategicrailroading.com. Hence, I stand on the point of my initial submission that the ISs are not required to be incorporated in that they provide no information that can be handled currently by PTC as to preventing accidents due to following trains in the same block.

As to PTC-220's secondary point regarding monitoring ISs so as reduce the number of switches that need to be directly monitored, thereby reducing the complexity of the wireless network, I find this point to be substantially misleading as to the degree of occurrence, but more importantly to be functionally inappropriate and potentially dangerous. Specifically, all switches that need to be monitored for PTC will require continuous **direct** monitoring to ensure that PTC can perform properly and effectively. To rely only on the indication, a.k.a. aspect, of the IS is meaningless once the train has passed the IS and changes in position of switches have occurred subsequently thereby placing the train in danger of moving through a misaligned switch.

2. **"Other options were exhaustively considered before pursuing 220MHz for PTC."**

   PTC-220's comments describe 5 examples of their consideration of "other options" to state this point, and I address below their fatuous rationalization of their activities as of the date of my submission for each of the examples.

   a. **The 160 MHz Band**

      PTC-220 admitted in their comments that over 6 years ago there was a study completed that found that 160MHz was the best band for PTC, "although not without significant challenges". Specifically, there were several points that were noted that motivated the railroads, under FRA grant, to design a high data rate radio apparently without consideration of selecting trunked radio as a solution to these challenges. However, when some 220 MHz spectrum became available 2 of the 4 primary Class Is (NS & UP) chose the path with the least technical resistance and purchased said spectrum. Arguably, this was the most expensive and least spectrum efficient path. The other 2

primary Class Is (CSX & BNSF) were subsequently *persuaded* to jointly own the 220 MHz in the name of PTC interoperability. However, as noted elsewhere in this submission, at least CSX, if not BNSF, is continuing its implementation with other than a pure 220 MHz platform.

b. Trunking

PTC-220 correctly notes that there can be delays in transmissions due to dynamic contention for available channels. However, this is a design issue as to the assignment of channels to user groups and not necessary a barrier, even for the most contentious regions of major metropolitan areas. Interestingly, PTC-220 notes that the railroads have been testing trunked radio since 2001 (11 years of testing a well-proven concept), and that "most of the major North American railroads believe that trunking will play a part in the future of the 160 MHz band". I interpret PTC-220's comments to mean that most railroads realize now that they made a mistake by not pursuing trunked operations, instead of conventional radio, to meet FCC narrow-banding requirements, and would rather avoid admitting that mistake by buying new spectrum. Basic business analysis would recognize the investment in conventional digital as a sunk cost, and proceed with a cost-effective shift to digital trunked to deliver advanced capabilities and minimize, if not avoid, investment in a parallel 220 MHz, while providing for good wireless citizenry of spectrum efficiency.

c. Cellular Systems

PTC-220 notes that "individual railroads may choose to implement cellular or other communication links into their PTC networks (which indeed the case) … but 220 MHz has been defined as the common interoperable communications path." The point here is that some railroads are blending wireless technologies, as they deem appropriate based upon cost, coverage, and throughput. This proves that additional 220 MHz spectrum, if indeed any, is not required everywhere. Again, the on-board Mobile Access Router provides for interoperability via multiple wireless communication paths. Interoperability is NOT an inherent property of 220 MHz, as suggested by PTC-220's statement.

d. MeteorComm 44 MHz Technology

PTC-220 makes a valid point as to "the inherent man-made noises, especially in the locomotive environment" that can affect the reliable use of 44 MHz for PTC. However, as with cellular, there is a tremendous opportunity to use 44 MHz off the locomotive, e.g., monitoring switches. Such a statement is again consistent with PTC-220's primary approach to obtain additional spectrum by developing an exaggerated perception as to the absolute requirements for 220 MHz without providing any actual data analysis. Again, as noted earlier, such an analysis would have to consider the different PTC wireless requirements dependent upon the traffic control system be used.

e. Software Defined Radio

PTC-220 notes that "the MeteorComm radio being developed for PTC ***is*** a software defined radio ... (which is designed) to operate in a single band with two defined modulations." .. and so is my cell phone in the same fashion. This is not a great accomplishment on MeteorComm's part, and certainly not one that delivers any great value to the railroads, PTC or not. In fact, such a restricted design will result in even less consideration of (increased defensiveness as to) a blended wireless platform that can handle multiple bands by technicians that cannot develop and deliver a business perspective to properly direct their technical accomplishments.

In my extensive experience with the railroads as both a Chief Engineer Communications for a Class I as well as an independent consultant (meaning that I represent no suppliers), I have consistently noted an unfortunate mindset as to considering new technologies. For example as to wireless, given the extensive investment in conventional radio technology there has been a tremendous reluctance on the part of the technicians to accept the sunk cost and move forward with cost-effective solutions that service advancements in railroad operations, e.g., the deployment of digital trunked radio. It is my opinion, that the greatest value of the PTC mandate is that of forcing the railroads to develop an industry-wide wireless data network that would not have been accomplished otherwise given the individual railroad technology agendas in sync with a lack of an industry-wide technology strategy. Unfortunately, while the railroads technicians are now developing an industry-wide wireless data network, they are doing so without a strategic business perspective in sync with a strategic technology plan. They would rather pursue a parallel 220 MHz spectrum with little concern that they will be challenged by their upper management. This lack of strategic perspective relative to PTC is, unfortunately, not limited to only wireless communications. The railroads' technicians have done so with ISs as noted above, as well as with an unbelievable positioning technology that far exceeds the actual requirement for PTC and even futuristic traffic control techniques. For further detail on these points, I refer you to my article being published in the April, 2012 issue of Railway Age.

In summary of the above, I do believe that the railroads have been confronted with a very difficult task to implement ***interoperable*** PTC by 2016. However, they have done so only from a technical perspective without sound business judgment as to alternatives that are more cost-effective and, as to wireless, most responsible to the utilization of a very limited resource. Hence, I applaud FCC's rejection of PTC-220's request for additional 220 MHz spectrum in that PTC-220 has not provided an actual analysis of what is required for PTC as well as a strategic perspective of how such spectrum will be of value to them in the future, especially in the light of the significant spectrum that they currently have that is substantially underused.

I thank you for your consideration of this submission, and I welcome further comments and questions by FCC and PTC-220.

Sincerely,
Ron Lindsey