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Some things to think about

The Internet of Things … and You

By Laura Stefani
stefani@fhhlaw.com
703-812-0450

Much has been made about the "Internet of Things" this year, in both the trade press and the popular media. As we were placing our Amazon and Best Buy orders for holiday gifts last month, debating the merits of iOS vs. Android, i3 or i5 chips, and 4K Ultra HD technology, should we also have been considering whether – and if so, how much – to link into the Internet of Things? We here at FHH Telecom Law think so.

First up, what is this "Internet of Things" (to establish tech cred, refer to it as "IoT")?

In some ways, it's nothing new. Our lives are already entwined with wireless devices and networks. Our smartphones are set up to connect automatically with the local Wi-Fi network at the office or the home. We have apps installed that will download basic fitness data from our Fitbit – our heartrate or the number of steps taken – or even more detailed medical data, such as a continuous read of blood glucose levels from implanted monitors. Others of us may already control our home thermostats or window shades from apps on our phones.

The Internet of Things takes advantage of this interconnection of electronic devices, allowing for the collection and sharing of data obtained from those devices without the need for human intervention. There will be consumer, governmental and industrial IoTs. For the consumer, much of this interconnection will occur in the home, with centralized devices collecting information and controlling objects all over the house. Your bottle of shampoo or bag of dog food may be equipped with inexpensive sensors that signal your home control device when you're about to run out; your home control device then

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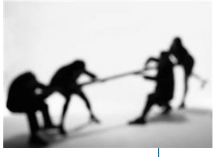
The facts tell the story

Competitiveness in the Wireless Industry?



By Jon Markman
markman@fhhlaw.com
703-812-0493

Every year (or thereabouts), the FCC releases a report on the competitiveness of the mobile wireless marketplace, last month releasing its 18th Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services. The report is a Congressional mandate, and while it contains a truckload of interesting data and analysis, it does not answer the fundamental question: is the mobile wireless market truly competitive? Instead, it puts the information out there and lets everyone make up their own minds. This has been the Report's fifth straight year taking this cop-out, er, middle-of-the-road approach, and there's no indication that the FCC will actually answer the question any time soon.

But that's not to say the report is not valuable to practitioners, companies, and individuals interested in the wireless market. As we mentioned, there is a lot of interesting data and analysis in the report, much of which is otherwise publicly available but not organized and consolidated anywhere else. And it allows us to get a good sense of what the FCC might say if they decided to actually take a stand: that the mobile wireless market is not competitive given its extremely highly concentration, that profits are high and growing to those at the top of the food chain, and that the FCC's limited efforts to encourage greater competition aren't doing much good … yet.

First, the basic facts: as of June 2015, there were over 350 million wireless connections (which, in a country of fewer than 320 million, is pretty impressive). Of those, over 98% are with one of the "Big 4" nationwide carriers (Verizon, AT&T, Sprint, and T-Mobile), with Verizon being on top at 36%, AT&T in second at 32%, T-Mobile

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Inside this issue

FCC Seeks to Define Grandfathered Protection for Citizens Broadband Radio Service Licensees

By Donald Evans
evans@fhhlaw.com
703-812-0430

Back in April of 2015, the FCC adopted an order creating a new Citizens Broadband Radio Service. The new service was an innovative approach to licensing that authorizes flexible use of the 3650-3700 MHZ band. The new service provides for flexible use of the spectrum in the band while offering priority status to government users and users who buy short term licenses at auction. It also allows the general public to use the band on an unlicensed basis subject to protocols intended to minimize interference between users. The Commission also had to deal with the existing users in the band who had previously been licensed under a nationwide license that recognized registered base stations and reception sites but was otherwise non-exclusive. The Commission decided that such licensees who have operating stations as of April, 2016 will have rights to priority usage of the spectrum for five years or the length of their license terms, whichever is longer. It was left to the Wireless Bureau to figure out exactly what protection zone would be afforded these grandfathered stations.

In October, the Bureau duly issued a Public Notice proposing defined protected zones and seeking input from the public on the proposal. The FCC would give each grandfathered station a 4.4 km zone around a registered base station to provide service to unregistered subscriber units (which must operate at a relatively low power). Registered subscriber units (which operate at power levels above 1 watt/25 MHz EIRP) would be protected in sectors corresponding to the direction and beam width in which they are oriented from the registered base station. Finally, other CBRS users would have to maintain a field strength limit of 44 dBuV/m/MHz at the edge of the protected zone. As noted above, this grandfathering protection would last for five years or to the end of the license term in order to give the incumbent licensees a chance to continue to employ their current equipment through its useful life and transition to new equipment when the transition period is over.

Not surprisingly, the FCC's proposal drew comments from incumbents wanting greater protection than the FCC would like. The Utilities Telecom Council, echoing earlier comments by other utilities like Exelon and Centerpoint Energy, urged a much greater protection zone. Utilities use this spectrum band for metering and other utility maintenance functions; they claimed service ranges as far as 24 kms from their base stations. They therefore seek a protected zone extending in all directions from the base station up to the farthest radius of a registered subscriber location. They also urge that grandfathering not be limited to the particular frequency on which a base station now operates because there might need to be changes in the frequencies to accommodate future operations. Similarly, the American Petroleum Institute seeks to lower the allowed field strength by interfering stations at the protected zone boundary to 37 dBuV/m/MHz to account for the omnidirectionality of unregistered subscriber sites. And the WiMax Forum recommends increasing the protected zone for unregistered subscriber units to 11.2 kms.

By contrast, WISPA (the Wireless Internet Service Providers Association), along with the WinnForum, recommends abandoning the protected zone concept altogether and instead requiring all subscriber sites to be registered. Each such site would be protected at an aggregate level of -95 dBm/MHz. This would simplify the task of the SAS (the entity that allocates spectrum to users in the band upon demand and subject to the assigned priorities) but would obviously complicate life for the licensees, who would have to register numerous sites.

It's now up to the Wireless Bureau to achieve the Solomonic balance between reasonably protecting incumbents who have invested considerable money in their existing networks and not unduly foreclosing other users of this spectrum from having access to a good bit of it for five years or more.

FLETCHER, HEALD & HILDRETH
A Professional Limited Liability Company

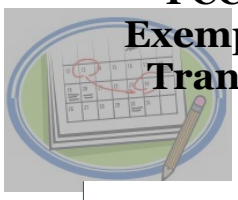
1300 N. 17th Street - 11th Floor
Arlington, Virginia 22209
***Tel*: (703) 812-0400**
***Fax*: (703) 812-0486**
***E-Mail*: editor@fhhlaw.com**
***Web Site*: fhhlaw.com**

Editor
Donald J. Evans

Design
Harry F. Cole

Contributing Writers
Frank Jazzo, Mitchell Lazarus, Ashley Ludlow, Jon Markman and Laura Stefani

The PRA to the rescue!



FCC Extends Small Carrier Exemption from Open Internet Transparency Requirements

By Ashley Ludlow
ludlow@fhhlaw.com
703-812-0423

Regular readers of *FHH Telecom Law* will recall that the Commission, in its *2015 Open Internet Order*, adopted certain enhancements to the existing transparency rule that governs the content and format of disclosures made by providers of broadband Internet access service. These enhanced transparency requirements built upon the original transparency rule the Commission adopted in 2010 which empowers consumers to make informed choices about broadband services by requiring providers to publicly disclose (on their websites and at the point of sale) information regarding their network management practices, performance characteristics, and commercial terms of service. The extent of disclosure must be sufficient for consumers to make informed choices regarding use of such services and applies to network management practices, including congestion management practices and the types of traffic subject to those practices; performance characteristics, including expected and actual broadband speed and latency; and commercial terms, including pricing, privacy policies, and complaint procedures.

Unsure, however, of the compliance burdens these enhancements would inflict on smaller providers, the Commission in that same 2015 Order adopted a temporary exemption from the enhancements for those "small" providers, which it defined for purposes of the temporary exemption as providers with 100,000 or fewer subscribers as per their most recent Form 477. Deciding that both the appropriateness of the exemption and the subscriber threshold would require further deliberation, the Commission directed its Consumer & Governmental Affairs Bureau (CGB) to seek comment on the exemption and to adopt an order announcing whether it would maintain an exemption and at what level by no later than December 15, 2015.

Well, that time has come, and this is what the Bureau had to say: if you're looking for the bottom line, the CGB deferred on making a substantive ruling, citing the Paperwork Reduction Act of 1995 (PRA), which, for those of you needing a refresher, requires that agencies obtain Office of Management and Budget (OMB) approval before imposing certain types of "information collections" on the public. While the Commission

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Process reform, in outer space

FCC Puts Part 25 Satellite Rules on Diet

By Frank Jazzo
jazzo@fhhlaw.com
703-812-0470

Last month, by a 5-0 vote, the FCC adopted a wide-sweeping reform of its Part 25 rules governing the licensing and operation of satellites and earth stations. This Second Report and Order in IB Docket No. 12-267 (*2nd R&O*) revises or eliminates numerous rules and policies and is aimed at streamlining the FCC's satellite regulatory regime. Spanning some 372 paragraphs in 115 pages, the *2nd R&O* is a comprehensive re-write of Part 25 and is a worthy successor to the first Report and Order in this proceeding, adopted in 2013, which revised over 150 rule provisions. The *2nd R&O* considered recommendations made by an FCC staff working group and further proposals made by FCC International Bureau staff and a Satellite Industry Association (SIA) working group.

Touted as one of the key reforms under FCC Chairman Tom Wheeler's process reform initiative, the *2nd R&O* increases satellite operational flexibility, reduces filing burdens, and updates Part 25 to facilitate new developments in satellite technology. According to the FCC, the *2nd R&O* will reduce licensee costs and lessen regulatory requirements.

Perhaps most significant is a new process to facilitate international frequency coordination of new U.S. satellite networks. Satellite system applicants will be able to "reserve" orbital and spectrum resources sooner than was previously permitted. Coordination information will now be able to be submitted to the International Telecommunications Union (ITU) at an earlier stage. This reform should enhance prospects for the U.S. satellite industry.

Space station construction milestone requirements are being substantially overhauled, maintaining only the requirement to place the authorized space station into operation at the assigned orbital location within the specified timeframe. To deter spectrum warehousing, however, the FCC modifies space station bond requirements to increase liability over time, going from $1 million to $3 million over five years for geostationary satellites.

The *2nd R&O* updates the FCC's satellite two-degree spacing rules, striking a "middle ground" between the positions being advocated by competing stakeholders in the proceeding. Intelsat had been pushing for the outright elimination of the two-degree spacing rules. The new rules refine current policy

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Enforcement Bureau says: "$25,000, please"

Non-Specific Rule, Non-Specific Violation, Very Specific Fine

By Mitchell Lazarus
lazarus@fhhlaw.com
703-812-0440

Suppose the rules governing operation on shared two-way channels are unspecific, mostly saying operators must take reasonable precautions to avoid interference. The rules don't actually prohibit interference; they just require the precautions, which will depend on the equipment and the service involved, with details left to the licensee. And now suppose a licensee is found to have caused interference.

In light of the interference, can the FCC impose sanctions for failure to take reasonable precautions – even if the licensee took precautions that plausibly came within the rule? The FCC's Enforcement Bureau thinks so.

Following a Notice of Apparent Liability last July, the Bureau has issued a Forfeiture Order imposing a fine of $25,000 against Mobile Relay Associates (MRA). The Bureau found that MRA had caused interference. However, the alleged offense was not the interference itself, but rather MRA's supposed "fail[ure] to take reasonable precautions to avoid causing harmful interference," including failure to monitor the channels so as to avoid causing interference. Confusing? Stay with us.

MRA operates a two-way business radio system under a Private Land Mobile license. Its website says MRA sells communications services to other businesses, including those that operate fleets of vehicles. Around Malibu, California, MRA operates a six-channel system for digital communications with taxis. Its license is for a "trunked" system, which means it covers multiple channels; when a user seeks to make a call, trunking equipment automatically searches its inventory to find one that is vacant. MRA has exclusive rights to four of the six channels, which are not at issue here. It is expected to share the remaining two channels with other users. According to the FCC's Enforcement Bureau, MRA has not met its sharing obligations.

The Bureau claims – and MRA does not dispute – that MRA:

- transmitted a synchronizing signal from its base station to mobile units nearly continuously, thus blocking other users;
- only occasionally put data on the signal;
- paused its transmissions for only five seconds every five minutes (later changed to three seconds every minute) to allow other licensees to transmit – but MRA said it would lengthen the pause if another user did transmit;
- did not monitor for other users, except during the five-second and three-second pauses, or otherwise take precautions to avoid causing interference; and
- did not "trunk" its system – *i.e.*, did not have it search automatically for vacant channels, but rather locked onto specific frequencies.

We see at least two apparent violations here. First, Items (1) and (2) seem to violate Section 90.403(c), which requires a licensee both to restrict its transmissions to the minimum practical time, and also to employ procedures designed to maximize use of the spectrum. MRA argued it needed nearly continuous transmissions to keep its mobile units properly connected to the system, but there is no such exception in the rule. Second, Item (5) seems to violate Section 90.187(h), which requires a party that holds a trunking license to modify its license if it does not actually trunk. MRA argued that trunking operation is optional under a trunking license; the rule says otherwise.

But the Bureau did not cite MRA for violations of those rules. Instead, it claimed violation of two other rules:

> 90.187(b): Trunked systems "must employ equipment that prevents transmission on a trunked frequency if a signal from another system is present on that frequency. The level of monitoring must be sufficient to avoid harmful interference to other systems."
>
> 90.403(e): "Licensees shall take reasonable precautions to avoid causing harmful interference. This includes monitoring the transmitting frequency for communications in progress and such other measures as may be necessary to minimize the potential for causing interference."

The Bureau calculated the fine it meted out starting with the base fine for causing interference, not for failure to take reasonable precautions. The base for interference is $7,000, which the Bureau doubled – because it had observed interference on two different days – and then raised to $25,000 on the ground that MRA continued its opera-

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If you've got a drone, you've got a job to do

FAA Sets Up Drone Registration System

By Jon Markman
markman@fhhlaw.com
703-812-0493

As the final day of Hanukkah arrived and Santa's Christmas Eve trek loomed just ten days ahead, the Federal Aviation Administration (FAA) decided to give a lump of coal to those of us who have, or want, this year's Hot Item. We're speaking not of hoverboards but drones. As of December 21, ***all*** drones – or, as the FAA and industry know them, "unmanned aircraft systems" or UAS – will have to be registered. And talk about a Christmas morning buzzkill: UAS that had never been flown prior to December 21 cannot now be flown outdoors until they have been registered – but we'll get to that in a minute.

The decision to require registration shouldn't surprise anybody. As we reported, the FAA had already announced its intention to impose some such requirement. It had even appointed a special Task Force to make recommendations. Now the FAA has moved ahead with a registration system that tracks prominent aspects of the Task Force's proposals.

The registration number must be "affixed" to the sUAS in a readily accessible, readable and legible manner.

The essential elements of the new registration system include:

All small UAS (a/k/a sUAS) – *i.e.*, any UAS that weighs less than 55 pounds at take-off – must be registered. The only exceptions: sUAS that either (a) weigh less than 0.55 pound at take-off (including everything on board the sUAS) or (b) are U.S. military craft.

The registration process is web-based. Anyone planning to use an sUAS strictly for recreational purposes will need to provide only his/her name, physical and mailing addresses, and an email address. Those who will be using their sUAS for non-recreational purposes will have to cough up the same information, plus the aircraft manufacturer and model name and the serial number (if available). (Would-be sUAS pilots younger than 13 will have to have a parent or guardian register for them.)

There is a registration fee, payable during the online registration process using most major credit or debit cards. Folks seeking registration of one or more "model" sUAS – *i.e.*, craft to be used strictly for recreational purposes – will pay a total of $5.00, which will cover all sUAS each registrant may operate. Registration of non-"model" sUAS – *i.e.*, craft to be used for commercial purposes – will have to pay $5.00 for each sUAS being registered. And for the economically-minded, in an attempt to encourage everybody to register sooner rather than later, the FAA waived the initial registration fee between December 21, 2015-January 20, 2016. (Note that *indoor* flying of drones, while probably hazardous to yourself and other animate and inanimate things, is not covered by FAA regulations. But the benefits of avoiding both the hassle of registration and the $5 fee may be offset by the emergency room fees that will likely result.)

Once the registration process has been completed, the applicant will be issued a Certificate of Aircraft Registration which will be good for three years. The Certificate for non-recreational sUAS will apply only to the craft described in the application; for hobbyist sUAS folks, the Certificate will authorize operation of all sUAS owned and operated by the applicant. The Certificate will include the registrant's name, an FAA-issued registration number and the serial number of the sUAS if the registrant has provided that number during registration. The registrant should be sure to have the Certificate on hand and available for inspection every time the registered sUAS is in operation.

The registration number must be "affixed" to the sUAS in a readily accessible, readable and legible manner. "Ready accessibility" means that it must be visible without the need to use any tools to get at it – so, for example, the number could be inscribed in a battery compartment, as long as that compartment can be opened without tools.

The registration requirement technically took effect as of December 21, 2015 … but it's not that simple. If you have a currently unregistered sUAS that you've flown, purely for recreational purposes, prior to December 21,

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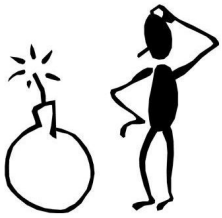

Are We Crazy, or Did the Commission Just Fundamentally Change the Nature of Unlicensed Operations?

By Donald Evans
evans@fhhlaw.com
703-812-0430

The Commission recently issued stern and hefty Notices of Apparent Liability (NALs) to two firms that had allegedly been blocking Wi-Fi operations within their facilities by effectively blocking any signals except those they had approved. One alleged miscreant was M.C. Dean, Inc., which manages events at Baltimore's Convention Center. M.C. Dean was using equipment that transmitted "deauthentication frames" which prevented anyone anywhere in the Convention Center (other than certain limited "public lobby areas") from obtaining Wi-Fi access – other, that is, than through the M.C. Dean Wi-Fi network, which Dean was happy to make available for $795-$1,095. In particular, the equipment prevented convention-goers from connecting to their own portable Wi-Fi "hot spots," thereby requiring them either to pay Dean's high rates or go without Wi-Fi altogether. The FCC found that M.C. Dean had engaged in this conduct for a couple of years, including at least 26 days over the last year (*i.e.*, the time within the relevant statute of limitations). On that basis, the FCC proposed a fine of $718.000.

The M.C. Dean NAL threatens to radically upset the paradigm.

The other alleged perpetrator was the Hilton organization, which was possibly blocking Wi-Fi operations at its Anaheim hotel and other locations for similar reasons. Hilton, unlike M.C. Dean, declined to respond adequately (in the FCC's view) to the Commission's inquiries. The Commission therefore proposed to fine Hilton $25,000 for thumbing its nose at the agency's enforcement effort. If Hilton continues to "fail to respond" to – and thereby to obstruct – the FCC's investigation, more fines for both the substantive offense and the refusal to respond (which irritates the FCC more than anything) may be in the offing. Both of these proceedings follow on a much ballyhooed enforcement action against Marriott last year for similar Wi-Fi blocking activity.

Clearly, the FCC has set its sights on companies which deliberately block access to other people's Wi-Fi facilities on their premises, but the rationale for this policy as articulated in the M.C. Dean NAL raises far-reaching issues about the very nature of unlicensed operations as we know them.

Unlicensed operations like Wi-Fi are governed by Part 15 of the FCC's rules. Those rules permit users of any authorized device to use the spectrum in specified frequencies at specified power levels. The hallmark of Part 15 operations, however, has always been that such operators had to accept interference from anyone and could cause interference to anyone (other than licensed operators). Since no one really monitors or regulates these operations, anybody could do anything as long as their own operations were within the rules. You might liken it to conversation at a cocktail party. While it makes things more civilized if everybody takes their turn before talking, there is no rule that prevents anyone from interrupting or talking over someone else. And, as at a cocktail party, Part 15 frequencies have a constant buzz of other people talking in the background that can sometimes get loud enough to disrupt your own little conversation. This "free for all" character of unlicensed operations is what generally makes it unsuitable for carrier-grade operation. Nobody is going to pay for a service that suffers interference with no ability to prevent that interference.

The M.C. Dean NAL threatens to radically upset that paradigm. The legal basis for the FCC's position is Section 333 of the Communications Act, which bars any person from willfully or maliciously interfering with or causing interference to any radio communications of a station "licensed or authorized" by the Communications Act. This provision had generally been read to protect only *licensed* stations from interference. This makes some sense because Part 15 operations, while certainly "authorized," would not normally be considered "stations." Is your garage door opener a "station?" Is your portable phone a "station?"

The word "station" is defined in the Communications

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(M.C. Dean NAL - Continued from page 6)

Act somewhat unhelpfully as a "station," but we do note that in discussing limits on "devices which in their operation are capable of emitting radio frequency energy by radiation" (a category that includes unlicensed devices as well as licensed ones), Congress did not refer to such devices as "stations." So not only is it not at all clear that the remote control clicker for your TV is a "station" entitled to protection from interference, but the Commission itself has repeatedly held that Part 15 operations are not a radio communications "service" that is entitled to interference protection. Commissioner Pai laid out much of this in his eloquent dissent from the Commission's NAL.

Despite its past pronouncements on the subject and despite the fact that it had never previously ruled that Part 15 operations were entitled to protection under Section 333 of the Act, the Commission has now declared devices that operate under Part 15 authorization to be "stations" which are "authorized" under the Act. This wave of the Commission's wand has enormous consequences.

This wave of the Commission's wand has enormous consequences.

Section 333 bars not just "malicious" interference to a station (which arguably describes M.C. Dean's activity) but also "willful" interference. The Commission has very consistently held that "willful" activity is not just willfully causing harm but also willfully engaging in the act that causes harm, whether that harm was intended or not. In other words, if you click on your remote control deliberately intending to change your own channel, and your remote also changes the channel of your neighbor in the adjacent apartment, you have willfully caused interference because you intended to, and did, press your remote control button, even if you had no evil intent toward your neighbor's viewing habits. Every click of a button, every use of a Bluetooth connection, every press of a microwave button is now a willful act that could possibly cause interference to someone else's "station." You have now violated Section 333 of the Act.

While the FCC's jack-booted agents will probably not be beating on your door for garage door opening violations, you can bet they will get complaints from people who are annoyed by something their neighbors are doing (microwaves, for example, can cause interference to portable phones next door). This is no longer an unfortunate consequence of community living, like putting up with police sirens at night, but a criminal offense.

The FCC's ruling has even broader implications, though.

The Commission is currently considering how to permit integration of unlicensed operations into the licensed operations of wireless carriers. Under the so-called "LTE-U" paradigm, carriers would supplement their licensed operations with the use of unlicensed spectrum when traffic must be off-loaded. While such usage should be perfectly proper under the normal Part 15 rules (which would require the carriers to accept any interference they would get from other independent Part 15 users), the Wi-Fi community has expressed concern that heavy usage of unlicensed spectrum by the licensed community would effectively preclude other unlicensed users from using that same spectrum. The carriers would be hogging it. Those concerns are well-founded, which is why the FCC is considering setting some limits to the practice. The M.C. Dean ruling, however, adds a new dimension to the problem. Under the Dean policy, carriers would not have to share the unlicensed spectrum since as long as they were operating no one else could lawfully interfere with their transmissions (other than by accidental transmissions). Because the carriers might be using the spectrum 24/7, the unlicensed spectrum would effectively become theirs.

Part 15 has been a huge success story for communications policy in this country because it has enabled so many useful, everyday devices to enhance the quality of our lives. It permits everyone to share equally in access to, and usage of, the radio waves that are mostly otherwise limited to station licensees. The M.C. Dean ruling threatens to upset that applecart without much, if any, thought to the broader consequences. No one likes having their Wi-Fi interfered with in the way that M.C. Dean and Hilton are alleged to have done, but a better solution, as Commissioner Pai urged, might be to adopt a rule that specifically proscribes malicious interference to unlicensed operations rather than anointing all Part 15 devices with the status of "stations" and the entitlement that status implies.

[*Editor's Note: The views expressed in this article are those of the author alone. They do not necessarily reflect the views of FHH or any of its clients.*]

*(**Competition Report -** Continued from page 1)*
now in third for the first time at 16%, and Sprint dropping down to fourth at 15%. Keep in mind that just two and a half years ago at the end of 2012, the Big Four had less than 94%, and a decade ago, smaller carriers had over 20% of the market. AT&T and Verizon together account for 71% of total revenue in the industry on only 68% of the subscribers, which is a result of having more of the high-end customers.

There is a more precise way of measuring this concentration, though: the Herfindahl-Hirschman Index (HHI). HHI measures how much control a given company or companies has in a market. It rates markets with a score of over 1,500 as "Moderately Concentrated" and over 2,500 as "Highly Concentrated." The FCC's HHI analysis shows that the mobile wireless marketplace had an HHI of 3,138 at the end of 2014, up from 3,027 at the end of 2013. In fact, it's been "Highly Concentrated" since 2006, and has seen only one decline in concentration (2008-2009) since the FCC began using the HHI in 2004. And lest you think that such an increase might be small relative to past years, it wasn't: the increase in concentration between 2013 and 2014 was one of the largest in the FCC's 11 years of analysis.

T-Mobile and Sprint are making far less money than their big competitors. It pays to be the king.

The story looks the same when you focus on coverage. While 99% of Americans are covered by at least two carriers, 97% by at least 3, and 91% by 4, only 19% are covered by 5 or more carriers. Further, those 19% live in only 9.5% of the total surface area of the country, meaning that options for wireless customers beyond the Big Four are limited to the big cities. And this is a decline from past years: in 2011, fully 42% of the markets in the country had five or more providers with at least 2% of the subscribers; now that number is down to 20%. Unsurprisingly, Verizon continues to dominate when it comes to coverage.

And if you instead look at control over spectrum, it's much the same: Verizon and AT&T hold 72% and 93% of the desirable 700 MHz and Cellular bands, a gap which becomes even more pronounced when you weigh the holdings by population. These two hold far more spectrum than do even their two little brothers, to say nothing of the regional carriers.

Unsurprisingly, given the high market concentration, Verizon and AT&T are making money hand over fist. Average Revenue Per Unit (or connection) is going down, but profits per connection are going up; this indicates that, while the price of wireless services is declining (some 45% since 1997), the *cost* of delivering such services is declining even faster. T-Mobile and Sprint are also making money, but far less than their big competitors: compared to EBITDA (Earnings before Interest, Taxes, Debt, and Amortization) of nearly $25 per subscriber for Verizon, and $19 for AT&T, Sprint saw only $11, and T-Mobile saw only $9. It pays to be the king, as they say.

There was quite a bit of discussion in the Report on price competition and market shifts away from the traditional two-year contract with subsidized phone model, shifts which T-Mobile has pioneered with the same aggressiveness that has made them the fastest growing carrier. It's certainly true that networks are competing on price in a way they didn't before, but that may only be because smaller networks like T-Mobile finally have a network of sufficient quality to compete with the big boys on an equal playing field: price only really matters if you're selling the same product, and after years of being able to trounce everyone on network coverage and quality, Verizon is seeing its lead there shrink, if only a little bit.

Receiving only the smallest bit of attention were important competitive factors like roaming and Mobile Virtual Network Operators (MVNOs), which act as nationwide carriers but without any physical network, making them kind of like nationwide roaming carriers. The scant treatment of roaming in the Report is a major hole. Roaming has been the lifeblood of smaller carriers, particularly regional carriers which depend on roaming to be competitive because they don't have their own facilities outside their home markets. The FCC's rules require carriers to give roaming rights to other carriers on reasonable terms, but the carriers with the biggest networks, AT&T and Verizon, have little incentive to actually do so: they have little need to roam, and roaming helps their competition. So they charge rates well above their costs because they can and because the FCC hasn't done anything to stop them. This is the primary reason, along with the Big Four buying up smaller fish, that we have seen such a marked increase in concentration over the last few years: smaller regional carriers cannot compete and are being pushed out of the market, not because of

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Irony alert

Look! A Quasar! … No, Wait – It's a Fitbit!

By Mitchell Lazarus
lazarus@fhhlaw.com
703-812-0440

Wrist-worn activity monitors like the Fitbit are good for radio astronomers. But not so good for radio astronomy.

Much as traditional astronomers use optical telescopes to see with visible light, radio astronomers use "radio telescopes" to observe distant objects by the radio waves they emit. With huge antenna dishes that focus on selected points in the sky, these telescopes are the most sensitive radio receivers on the planet. That makes them highly vulnerable to interference from other radio sources.

The biggest steerable radio telescope in the world, and probably the most sensitive, is at the National Radio Astronomy Observatory (NRAO) in Green Bank, West Virginia. Having a dish 100 meters across and an antenna boom that makes it 60 percent taller than the Statue of Liberty, this is the world's largest moving object on land.

To protect the telescope and others nearby from interference, the FCC maintains a National Radio Quiet Zone in and around Green Bank. Radio transmissions are severely limited, especially within 10 miles of the big telescope. There is no cell service; Wi-Fi and Bluetooth are prohibited; radio and TV reception are poor. The town has become a haven for people who think they are allergic to radio waves.

The NRAO Human Resources department, which does not think people are allergic to radio waves but is nonetheless concerned about the well-being of its staff, issued Fitbits to help personnel track their activity levels and thereby encourage exercise. Anywhere else in the country, this would have been a laudable initiative. But Green Bank is a different kind of place.

A Fitbit device syncs with the user's phone *via* Bluetooth, a form of low-power radio communication. Although Bluetooth is not allowed near the telescopes, NRAO people can be trusted not to sync their devices on site. But NRAO scientists, at least the ones we know, are skeptical by nature. On a hunch, they put a Fitbit into a radio-emissions test chamber and monitored Bluetooth frequencies. Their skepticism paid off. The Fitbit transmitted data not only while syncing, but also in short bursts every second of the day. A worker wearing one of these while on the telescope structure could create an interfering signal 10,000,000,000 times stronger than international recommendations permit.

The scientists who ran the tests note that a Fitbit can be carried safely if stuffed into a modified metal pill fob. But we're guessing that most NRAO personnel, accustomed to measuring the Universe and its expansion with the most sophisticated equipment known to science, will go back to measuring their own expansion with a tape measure and bathroom scale.

(Thanks to Dr. Harvey Liszt of NRAO.)

***(Competition Report** - Continued from page 8)*

competition, but because of, to use a term of art, unjust and unreasonable roaming rates.

As the Report alluded to, the Wireless Bureau issued an order at the very end of 2014 that made it easier for carriers to demonstrate to the FCC that Verizon and AT&T are abusing their power when it comes to roaming. The order confirmed that, when challenged an offered roaming rate, the FCC will look not just at other roaming rates (since those are all subject to the same artificial market factors making them equally unreasonable), but at retail rates, international rates, and MVNO rates. It also referenced the fact that there are complaints pending before the Enforcement Bureau on this very issue, none of which (including two brought by FHH on behalf of small wireless carriers) appear close to resolution.

At the end of the day, most people reading the Report will come to the same conclusion: this is *not* a truly competitive market. Whether the FCC should do more to intervene to make it competitive is more debatable, of course, but the FCC's unwillingness to explicitly state what its own Report clearly shows will leave many scratching their heads. But thankfully we at least have the wealth of data the Report provides in lieu of a conclusion from the Commission.

*(**The Internet of Things -** Continued from page 1)*

adds those items to your grocery list. Every lightbulb may be controlled remotely, meaning you will no longer have to rely on clunky timers to turn lights on and off while you're away on vacation or expecting to arrive home after dark. Sensors in your garden may turn on your soaker hose as needed.

Apple's HomeKit, Google's Nest thermostat, and Amazon's Echo are some of the first home control devices on the market, all in a race to dominate the home (reminiscent of the technology fights of years past – think Beta vs. VHS or 8-Track vs. cassette). Whoever gains market dominance within the next few years will dictate the world in which we consumers will find ourselves a decade from now. They will also dictate the standards and technologies that other manufacturers must follow to connect their devices to the home control device.

Much work remains to be done behind the scenes, as manufacturers work within standards-setting committees to agree upon uniform methods to allow for interconnection. Technologies such as Wi-Fi, Bluetooth, ZigBee, Thread, PAN, LAN, backscatter tags, and 5G networks (expected to be much faster, with lower latency, than 4G) will all be used to transmit data. Many of these need to be updated to insure better security, work with the newest version of the Internet Protocol (IPv6) being rolled out, provide for better battery life, or connect with each other.

Meanwhile, regulators must grapple with several issues. Most IoT technologies operate on unlicensed (that is, Part 15) spectrum and do not require licensing or other FCC involvement (as long as they meet equipment and technical standards, of course). But the demand for unlicensed spectrum (*e.g.*, 600 MHz, 2.4 GHz and 5 GHz) is expected to grow exponentially so that, even as the FCC opens more spectrum for unlicensed use, more will be needed. Perhaps not immediately – but certainly in the foreseeable future – the increasing spectrum demands are likely to require FCC intervention.

Another major issue is privacy. The Federal Trade Commission is taking the lead (though states and perhaps the FCC will also have some say) on how information can be collected, the best practices to prevent or address data breaches, and how to provide consumer notification about (and opt-outs from) the centralized data collection that is a dominant feature of IoT. And the government is working to set out best practices for industry to address cybersecurity – in this instance, how to ensure that the home control devices are not subject to hacking or unauthorized control. (Raise your hand if you want the kid down the street hacking into your system to turn on all of the appliances during the middle of the night.)

While shopping this year, consumers should be thinking about two issues: (1) which (if any) home control technology to select just right now and (2) how much privacy are you willing to trade off for the convenience of interconnection?

Whether and when to retrofit one's home, as well as which technology to adopt, is a personal issue. While there's currently much discussion about open standards and a standardized operating system to connect technologies, it's not clear that all major manufacturers will cooperate with one another. Apple, in particular, has been known to develop closed devices that do not play well with others; it may well go that route again in an effort to dominate the market. If that happens, you'll face another choice between being an Apple person or an open standards person. There may be significant advantages on both sides – but at this point in the development of IoTs, it may be too early to pick the approach best suited to your eventual needs. Also, until various technical issues are resolved, use and interconnection may be limited, which means early adopters may find themselves replacing home control devices or not getting the functionality that they really want out of them.

Whether and when to retrofit one's home, as well as which technology to adopt, is a personal issue.

In terms of privacy, it's important to recognize that the driving force behind much of the development of home control technology is the monetization of data collected and shared by IoT devices. The likes of Google, Apple, Comcast and Amazon want to learn more about your consumer habits. The more you play, by buying and using home control technology, the more they'll learn. Of course, our email and Internet use *already* is being tracked, analyzed and sold. Many observers believe that Americans tend to be much more agreeable to this than their counterparts in, say, Europe, where the "right to be forgotten" has been embraced as a measure to preserve privacy in a somewhat different context. It may be that you'd rather get that coupon for dog food once the bag is half empty, unconcerned that marketers have now labeled you as someone likely to spend extra on her pampered pet. Or not.

(Continued on page 11)

***(Non-Specific Violation -** Continued from page 4)*

tions after the FCC had notified it of the alleged violation. (Had the Bureau started its calculation with the base fine for failure to "conduct required monitoring", which is only $2,000, the total after adjustments would presumably have been much less than $25,000.)

MRA argued (1) the rules quoted above do not impose specific, hard and fast requirements, and (2) the steps it did take to avoid interference satisfied the rules as written. The Bureau responded that, because MRA in fact caused harmful interference, MRA violated the rules.

We think the Bureau's reasoning missed an important step. Both Sections 90.187(b) and 90.403(e) require only that the licensee utilize measures designed to avoid harmful interference. By their own terms they do *not* prohibit actual interference. A channel might be so crowded that no measures at all can completely prevent interference. As we read the rules, compliance consists of taking appropriate measures, whether they succeed or not. The occurrence of harmful interference does not by itself either constitute or prove a violation. MRA argued that it did comply: the rules don't tell it exactly what to do, said MRA, and the brief pauses in its transmissions sufficed for compliance.

If, in crafting a rule, the FCC declines to provide specifics and instead leaves it to the licensee to determine how best to proceed, and the licensee then takes steps that, at least arguably, fall within the broad guidelines of the rule, can that licensee properly be charged with violating that rule? We think not.

We have objected before to the Enforcement Bureau's levying large fines for actions that do not clearly violate the rule cited: here, for example, and here. FCC Commissioner Ajit Pai, part of the Republican minority, seems to agree: "Instead of applying the law to the facts, the Commission's enforcement process is focused on issuing headline-grabbing fines regardless of the law." In the MRA case, the Bureau would have done better to cite MRA for unnecessarily long transmissions or for not trunking, charges to which MRA would have had no real defense. The Bureau should not have followed the course it did without first issuing a clear public statement – or, perhaps better yet, revising its rules – to make very clear what is and is not permitted.

(FHH does not represent any party in this matter.)

***(Part 25 Satellite Rules -** Continued from page 3)*

to facilitate service to small antennas that exceed certain "default" two-degree spacing coordination limits. Commissioner Jessica Rosenworcel indicated that the FCC will launch a proceeding in the future to assess the impact of the two-degree spacing changes.

Additionally, the *2nd R&O* expands options for simplified earth station licensing. The "Permitted Space Station List" is expanded to all geostationary orbit (GSO) fixed satellite service (FSS) bands with routinely licensed stations. The FCC also adopts a flexible aggregate limit and technology-neutral routine limits on earth station transmissions. Replacement satellites will be permitted to be located within $\pm$ 0.15º of the satellite being replaced.

Overall, the *2nd R&O* simplifies, eliminates, updates or clarifies definitions and technical terms throughout Part 25. The changes should significantly reduce regulatory burdens and costs.

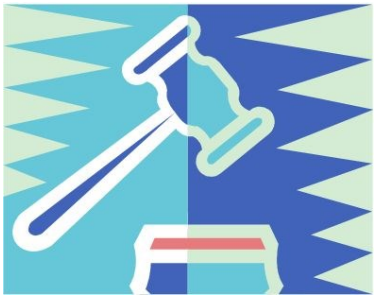
***(The Internet of Things -** Continued from page 10)*

As you go about your holiday shopping, consider the opportunities that may exist in the next decade to control home life both from afar (starting the dishwasher, monitoring the activities of your elderly parent or your kids, etc.) and while at home (precision watering of your pepper plants or having the control screen on your fridge remind you to take your medications). But also consider: How much do you want your life programmed, and what tradeoffs are you willing to make (privacy, increased cost, Wi-Fi congestion) to get there?

Meanwhile, manufacturers should be participating in, or at least monitoring, the progress of the standards setting committee(s) already at work. In planning the design of their next generation systems, manufacturers should consider adding technologies to facilitate interconnection with home control devices, which may mean being able to transmit on multiple unlicensed bands. The Internet of Things is already here in many respects, and it will only expand. That expansion may be gradual at times, and it may also leap ahead occasionally with watershed moments (technical developments, standards adoptions, regulatory intervention) that will spur consumer acceptance. The more a participant in the IoT market anticipates, and prepares for, such expansion, the better positioned it will be to take advantage of the opportunities that expansion will present.

Forward Auction Reminder

Now that the "reverse auction" deadline has passed – the part of the FCC Incentive Auction process where television broadcasters could throw their hats into the auction ring – the broadcasters can catch a breath while other people can now start worrying about the "forward auction" – the bit where the rest of the world gets the opportunity to bid on the hats that have been thrown into the ring. The window for filing forward auction applications begins on January 26 and ends on February 9, so if you are interested in contributing to the U.S. Treasury and picking up a 600 MHz wireless license, it's time to start gearing up. The rules of the auction – non-collusion prohibitions, designated entity discounts, eligibility for reserved spectrum, impaired spectrum blocks, bidding procedures, etc., etc. – can be tricky, so do your homework. You won't need to get out your wallets for a few weeks after the filing deadline, but be prepared.



(Drone Registration - *Continued from page 5)*
you've got until February 19, 2016 to complete the registration process, and you can keep flying it in the meantime. If you've got a model sUAS (again, purely recreational) that has not flown prior to December 21, you must register ***before*** flying it outdoors. (Yes, that means that that way cool octocopter with the super HD camera that was sitting under the tree on Christmas morning will have to stay in the box until you get it registered – unless, of course, the thoughtful person who gave it to you was kind enough to register you in advance.)

Those of you who have one or more sUAS that you have flown or plan to fly for non-recreational purposes – *e.g.*, in connection with some commercial undertaking – will be stuck with the current "exemption" process until March 31, 2016, at which point you'll be able to utilize the new streamlined, online registration process. (Since the current exemption process takes several months, if you haven't already started that process, it may be best to cool your jets until March 31, since the new registration process promises to be simple and fast.)

The FAA expects compliance, and is prepared to bring down the hammer on violators: civil penalties for failure to register can run up to $27,500, and criminal penalties could go as high as $250,000 (plus up to three years in jail). The FAA has not indicated precisely how it will calculate penalties in any particular circumstances, but at those numbers, it would be a good idea to get registered so that you don't have to find out the hard way.

The good news here is that, for folks interested in using sUAS for non-recreational purposes, a simple, streamlined registration process is in sight (although still a few months off). That universe of potential pilots includes broadcasters and other newsgatherers wishing to take advantage of the opportunities that sUAS provide for excellent video coverage of events. The FAA's regulatory approach has in recent years been less than encouraging on that front. The new registration process will at least make one aspect of beginning commercial operations easier to accomplish.

The FAA, at Congress's direction, is trying hard to get a handle on the increasingly widespread, and increasingly dangerous, operation of drones in the national airspace. Its job is dramatically complicated by the fact that there are so many sUAS already in operation, with holiday-related sales estimated to add several hundred thousand more by year's end. The FAA is playing catch-up ball. Whether its new registration system will solve its problems remains to be seen.

Check back with FHH's CommLawBlog.com for updates on the UAS front.

***(Small Carrier Exemption** - Continued from page 3)*

sought comment on its initial burden estimates in accordance with the PRA in May of last year, it has not yet completed this process. (This involves estimating the burden of complying with the transparency rule enhancements for providers *of all sizes* and obtaining approval from the OMB.) And to avoid acting prematurely in advance of that approval, the CGB extended the temporary exemption for smaller providers until December 15, 2016, at which time it expects the PRA process to be complete and the full Commission able to consider whether and, if so, how best to address the exemption for small providers, obviously with the benefit of more complete information.

But what did the CGB have to say about these small providers specifically? On June 22, 2015, it followed orders and released a Public Notice seeking comment on whether to maintain the temporary exemption and, if so, the appropriate threshold for whether a provider qualified for such an exemption. (The Public Notice also clarified that the threshold should be measured in terms of broadband connections, rather than in terms of subscribers or subscriber lines, and made clear that the current exemption applied to providers with 100,000 or fewer broadband *connections*.)

Still unclear about exactly what the enhanced compliance obligations require? You're not alone.

Several commenters argued that the temporary exemption should be made permanent, contending that the compliance burdens on smaller providers are disproportionately high due to their limited resources, the benefits are minimal, and there is no record evidence that subscribers are not already receiving sufficient information, while others on the opposite side of the spectrum argued that broadband providers are not providing the information that end users and edge providers need to receive.

While it certainly skirted around its obligation of providing some finality to the issue, some language from the December 2015 Report and Order hints at what CGB's likely position will be when December 2016 rolls around. Though prefaced with the diplomatic language that it "cannot fully evaluate th[e] impact" of the exemption "[u]ntil the PRA process is complete," the CGB did seem to side with those commenters pushing for increased transparency even for smaller providers: "[W]e cannot agree with those commenters that claim that the enhanced transparency requirements offer no tangible benefit to customers of smaller providers. As the Commission stated in the *2015 Open Internet Order*, the enhanced transparency requirements, while modest, are critical to enable end-user consumers to make informed choices about broadband Internet access services by providing them with timely information tailored to their needs. Similarly, the Commission stated that such requirements provide edge providers with the information necessary to develop new content, applications, services, and devices that promote the virtuous cycle of investment and innovation."

And don't expect an increase in the 100,000 threshold come December 2016 as proposed by some commenters who argued the threshold should be expanded to utilize the Small Business Administration's (SBA) standard of 500,000 or fewer subscribers or 1,500 or fewer employees. With respect to the means of determining the number of subscribers, Form 477, the CGB did hold that those providers not required to file a Form 477 can avail themselves of the exemption by demonstrating that they served 100,000 or fewer broadband connections aggregated over all the providers' affiliates at the relevant time should any complaint arise. But if you are required to file a Form 477, don't overlook it, as the CGB stated that in all other circumstances, the exemption will be tied to the information provided on Form 477. Providers obligated to file Form 477 that do not fulfill their obligation to file such information in a timely manner will be ineligible for the exemption, *even if* they serve 100,000 or fewer broadband connections aggregated over all of the providers' affiliates.

In more recent news, Congress is seriously considering codifying a small-business exemption from the Order's enhanced transparency requirements similar to the one temporarily granted by the FCC (see a discussion draft of the bill here), but applying the SBA's normal small business standard of 500,000 or fewer subscribers or 1,500 or fewer employees. In the meantime, however, the FCC rules still apply.

Still unclear about exactly what the enhanced compliance obligations require? You're not alone. The CGB did state in response to several such requests for clarity that it anticipates the Commission will release a public notice in the near future providing additional clarity regarding the enhanced compliance obligations. We'll let you know what they say.