Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of Petitions for Rulemaking Regarding the Citizens Broadband Radio Service	GN Docket No. 12-354 RM-11788 RM-11789

COMMENTS OF THE DYNAMIC SPECTRUM ALLIANCE

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I. Introduction:

The Dynamic Spectrum Alliance (DSA), whose membership spans multinationals, small-and medium-sized enterprises, and academic, research, and other organizations from around the world, is committed to creating innovative solutions that will expand broadband solutions for consumers and businesses alike.[1] To this end, we respectfully submit the following arguments and urge the Commission to reject calls to make wholesale changes to the 3.5 GHz "innovation band."[2] Rather, the Commission should leave the rules largely unchanged, and encourage the continued investment and progress that is being made in the band under the current rules.

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[1] The DSA's membership spans multinationals, small-and medium-sized enterprises, and academic, research, and other organizations from around the world, all working to create innovative solutions that will increase the amount of available spectrum to the benefit of consumers and businesses alike. A full list of DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members/.

[2] See *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd. 3959 (2015) ("CBRS Order").

The DSA argues below that: (1) There has been significant investment under the current rules by companies, both large and small, from across the telecommunications industry and that these investments may be stranded, and future innovation stifled, if significant changes are made to the rules as proposed by both CTIA and T-Mobile; (2) The Commission should resist arguments to change the current PAL structure to one that would be favorable to only one class of entity – the large nationwide wireless carriers, at the expense of all other entities; and (3) That T-Mobile's petition fundamentally fails to appreciate the critical importance of unlicensed and lightly licensed spectrum in delivering wireless broadband services and thus ignores the need for a balanced approach between licensed and unlicensed/lightly licensed regulatory structures.

II. Progress and Investment to Date:

In April of 2015, the Commission unanimously adopted rules to drive investment in the 3.5 GHz "innovation band." In the two years since that decision, a large and diverse group of companies have invested substantial financial and engineering resources to develop standards, build systems, and design equipment to bring this band into widespread use, in reliance on the Commission's rules. For example:

- Google and Federated Wireless have built Spectrum Access Systems ("SAS") that are capable of both ensuring Citizens Broadband Service Devices ("CBSDs") do not cause harmful interference and interoperate seamlessly

with one another.[3] A number of additional entities have also filed with the FCC to be SAS administrators. [4]

- The Wireless Innovation Forum has completed work on an array of CBRS standards that will support SAS approvals this fall, and the first PAL auctions early next year.[5]
- Ericsson,[6] Intel, [7] Nokia,[8] Qualcomm,[9] Ruckus Wireless,[10] and others are well on their way to creating a rich ecosystem of 3.5 GHz LTE devices, with the

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[3] Monica Alleven, *Ericsson Seeks Permission to Conduct 3.5 GHz Experiments in Plano, Texas*, FIERCEWIRELESS (Apr. 3, 2017), *available at* http://www.fiercewireless.com/wireless/ericsson-files-sta-to-conduct-experiments-at-3-5-ghz-plano.

[4] For example, CommScope, CTIA, Key Bridge and Sony have all filed for and received conditional certification from the FCC to be SAS administrators.

[5] Letter from Lee Pucker, CEO, Software Defined Radio Forum Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission, and attached Spectrum Sharing Committee Release Schedule, GN Docket No. 15-319, 5 (filed 26 May 2017).

[6] Ericsson, Inc., *Ericsson Passes Extensive Testing for 3.5 GHz CBRS Shared Spectrum Usage With Access SAS*, NASDAQ (Feb. 27, 2017), *available at* https://globenewswire.com/news-release/2017/02/27/928131/0/en/Ericsson-passes-extensive-testing-for-3-5-GHz-CBRS-shared-spectrum-usage-with-Access-SAS.html.

[7] Necati Canpolat, *Industry Focuses Efforts on Wi-Fi, Coordinated Shared Spectrum, and Convergence of Wireless and Computing*, INTEL (Apr. 19, 2017), *available at* https://blogs.intel.com/technology/2017/04/industry-focuses-efforts-wi-fi-coordinated-shared-spectrum-convergence-wireless-computing/.

[8] *Nokia Expands Flexi Zone Small Cell Portfolio, Boosting Performance and Simplifying Deployment for Operators and Enterprises*, NOKIA (Sept. 8, 2016), *available at* http://www.nokia.com/en_int/news/releases/2016/09/08/nokia-expands-flexi-zone-small-cell-portfolio-boosting-performance-and-simplifying-deployment-for-operators-and-enterprises.

[9] *Qualcomm Extends Connectivity Leadership with Second Generation Gigabit LTE Modem*, QUALCOMM (Feb. 21, 2017), *available at* https://www.qualcomm.com/news/releases/2017/02/21/qualcomm-extends-connectivity-leadership-second-generation-gigabit-lte.

[10] Dave Wright, *Mobile World Congress 2017*, RUCKUS (Mar. 10, 2017), *available at* https://theruckusroom.ruckuswireless.com/wi-fi/2017/03/10/mobile-world-congress-2017/.

first 3.5 GHz LTE handset expected to reach the market later this year.[11]

Despite these investments and broad reliance on stable FCC rules, however, CTIA and T-Mobile now have petitioned the Commission to rewrite the rules in this band to make them more favorable to one business model—nationwide mobile wireless carriers—and to raise new barriers against the innovative new uses a far larger group of companies hope to deploy in the band.[12] In so doing, CTIA and T-Mobile threaten to not only lock out other potential users of the band, but also to strand the significant investments already made in reliance on the existing rules. While DSA understands the desire for private companies to secure returns on significant capital investment—and would be open to minor changes to the existing rules to achieve that end—the Commission should reject sweeping changes and maintain the FCC's reputation for regulatory certainty that has allowed investment and innovation in the 3.5 GHz and other bands to flourish.

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[11] Monica Alleven, *Industry Pumped for 3.5 GHz but Mostly Mum About Handsets*, FIERCEWIRELESS (June 8, 2017), *available at* http://www.fiercewireless.com/wireless/editor-s-corner-industry-pumped-for-3-5-ghz-but-mostly-mum-about-handsets.

[12] *See Petition for Rulemaking to Amend the Commission's Rules Regarding the Citizens Broadband Radio Service in the 3550-3700 MHz Band*, Petition for Rulemaking, GN Docket No. 12-354 (filed June 16, 2017) ("CTIA Petition"); *See Petition for Rulemaking to Maximize Deployment of 5G Technologies in the Citizens Broadband Radio Service and Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550- 3650 MHz Band*, Petition for Rulemaking, GN Docket No. 12-354 (filed June 19, 2017) ("T-Mobile Petition").

III. Resist Fundamental Changes and Keep the Framework Intact:

Specifically, the Commission should reject CTIA's petition to replace the current CBRS structure with rules designed to make the PALs economically rational investments for only a small set of large wireless carriers. CTIA asks the Commission to custom build PALs for these few companies' operations by enlarging PAL areas and replacing limited license terms with what are essentially permanent grants of spectrum rights. These drastic changes would upend most companies' 3.5 GHz business models. It would also drive most investors out of the market by frontloading spectrum costs into an initial license cost that is too high and that covers too much geography for any company but nationwide wireless carriers. This cannot be the outcome the FCC seeks.

Due to the physical characteristics of 3.5 GHz spectrum, and the technical rules required to coexist with military and other incumbents without harmful interference, the 3.5 GHz band is well suited for deployments with intensive spectrum reuse—where one base station might cover an office or a single outdoor venue. Therefore, the most efficient user of these frequencies may vary dramatically from place to place within a single market. A large carrier might value it most highly in a large public area such as Times Square, but on the grounds of a hotel outside a city center, the hospitality industry might be able to put it to the best use. Nonetheless, T-Mobile and CTIA seek to force companies to bid for licenses that cover their entire Partial Economic Area ("PEA"), which can span hundreds of square miles, even if they want to cover only a corporate campus, warehouse, rural community, or school.[13] Such a change would effectively close the door to intensive use by nontraditional licensees such as these venue owners and local companies.

[13] CTIA Petition at 9-11; T-Mobile Petition 16-19.

Increasing the size of the license areas to PEAs will correspondingly increase the cost of the license to the point where PALs are economically reasonable only for large carriers with a business model of monetizing spectrum over a large area. The Commission must ask itself why a venue owner, hospitality business, or other nontraditional wireless licensee would pay for a PAL covering areas potentially tens of miles outside of the local communities they serve? Although General Authorized Access ("GAA") spectrum[14] is available, as was noted in the CBRS Order, some types of investment are benefited by the certainty of access to spectrum under a PAL structure. It is unreasonable to imagine that the only such entities would be the large wireless carriers.

Partitioning is not a solution to the problem of overly large license areas. Partitioning is complex, and would require local investors that are not telecommunications companies to enter into a completely different course of business, resulting in high transaction costs and inefficiency.[15] It is unreasonable to ask a local factory owner, for example, to start a new business selling many square miles of spectrum access just to make acquiring a PAL for his or her geographically discrete facilities economically achievable.

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[14] GAA is considered part of the lightly licensed category of spectrum. As we note below, this category has similarity to unlicensed spectrum due to the lower regulatory barriers for access. Unlicensed and lightly licensed spectrum has attracted significant investment that has driven innovation in areas such as WiFi, Bluetooth, RFID, wireless microphones, and other types of applications.

[15] CBRS Order ¶ 100.

CTIA also raises vague concerns about the technical feasibility of assigning and managing smaller, census-tract license areas under the existing rules.[16] But there is no significant evidence to support their skepticism. An auction with census-tract PALs is no different, from a technical perspective, than one for larger license areas—it simply would include a larger number of individual auctions. There is no reason to believe that these would be so numerous as to strain the Commission's auction infrastructure, or raise other issues. Claims that licensing PALs by census tract would strain SAS operations are equally unfounded. SAS operations are almost entirely independent from PAL boundaries because they protect users from interference based on the actual location and coverage of transmitters, not license boundaries.[17] In fact, the demonstrated feasibility of the SAS, which manages the spectrum in real time based on actual transmitter locations, simply highlights the modesty of any technical challenges associated with auctioning PALs licensed on a census-tract basis.

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16 *See* CTIA Petition at 9-10.

17 SAS operators do take PAL boundaries into account in determining where a PAL licensee's operations are not entitled to protection, but this is an extremely limited part of the overall functioning of the SAS.47 C.F.R. § 96.53(i).

In the alternative, if the Commission concludes that PEAs are useful to a subset of providers, we would recommend that the FCC consider dividing the PALs such that half (3 or 4) of the PALs in any given area be larger in size, potentially up to a PEA, and the other half be maintained at the census-tract size. We do not support increasing the number of PALs per region, as we believe that value and utility of GAAs are critical to the benefits of the CBRS structure, but that a mixed PAL size would be a better alternative to an across the board larger PAL structure that would crowd out the exciting investment opportunities for edge investment that the current census-tract PAL creates.

Greatly extending PAL license periods and granting PAL renewal expectancies presents analogous concerns. Longer duration PALs will concentrate spectrum access costs into a single up-front barrier to entry, potentially barring many local businesses and rural carriers that will help ensure intensive use of the band. It will also decrease efficiency by increasing the probability that the most effective use for a channel in a given location will have changed before the license period expires. An expectancy of renewal would exacerbate these concerns further by allowing the large wireless carriers to, in effect, claim exclusive use of the 3.5 GHz band indefinitely. If any changes to the license period or renewal expectancy is to be considered, it should be tied very closely to the time necessary for a return on initial capital investment. The argument that a 10-year period with a renewal expectancy is necessary to ensure a return on capital investment is certainly overkill for the purported innovative technologies that the petitioners insist they are rolling out with 5G. Technology demands faster return on investment due to the rate of innovation, obsolescence, and expectations of the marketplace. Thus, the only purpose for such a long license period with renewal expectancy rights is monetization, not a return on capital investment.

Moreover, the significant investments in the 3.5 GHz band that have already taken place belie the notion that longer license periods are necessary to spur investment. PAL licensees will have the ability to re-bid for the same PAL at the end of its license period as the lowest-cost user of the channel because of their existing facilities, allowing the incumbent licensee to minimize the risk of losing its PAL license if it chooses to maintain it, while ensuring that the license remains in the hands of the entity that values it the most over time.[18] And because all 3.5 GHz equipment must be capable of operating in any 3.5 GHz channel,[19] even the expiration of a PAL term need not strand a licensee's investment in that area—it may continue to operate in GAA spectrum in the same way that it operated in PAL spectrum. Although there may be applications where greater interference in the GAA spectrum degrades service, licensees will have the ability to choose equipment and technologies that can operate in either environment.

[18] Note that, in situations where a licensee has completed a PAL significant deployment, that licensee is likely to value that PAL the most in future auctions.

[19] 47 C.F.R. § 96.39(b).

Finally, the Commission should reject extreme suggestions—from T-Mobile alone—to in effect scrap the existing three-tiered CBRS framework (in particular, GAA) and replace it with a traditional licensed wireless model.[20] Such a drastic change is completely unwarranted and would be a disaster for the many business that have invested in the band in reliance on a three-tiered framework with robust GAA, coordinated by the SASs.

Contrary to T-Mobile's claims, such a change would do little to foster 5G development. T-Mobile suggests that the presence of GAA spectrum will somehow hinder 5G deployments in the United States, and create incompatibilities with internationally harmonized LTE bands. The reality, however, is that the real incompatibilities between the U.S. and foreign bands have little to do with GAA spectrum or the three-tiered framework. Instead, they stem from the fact that the U.S. has widely deployed government radar systems in this band which make SAS control an absolute necessity.

[20] T-Mobile Petition at 9-11.

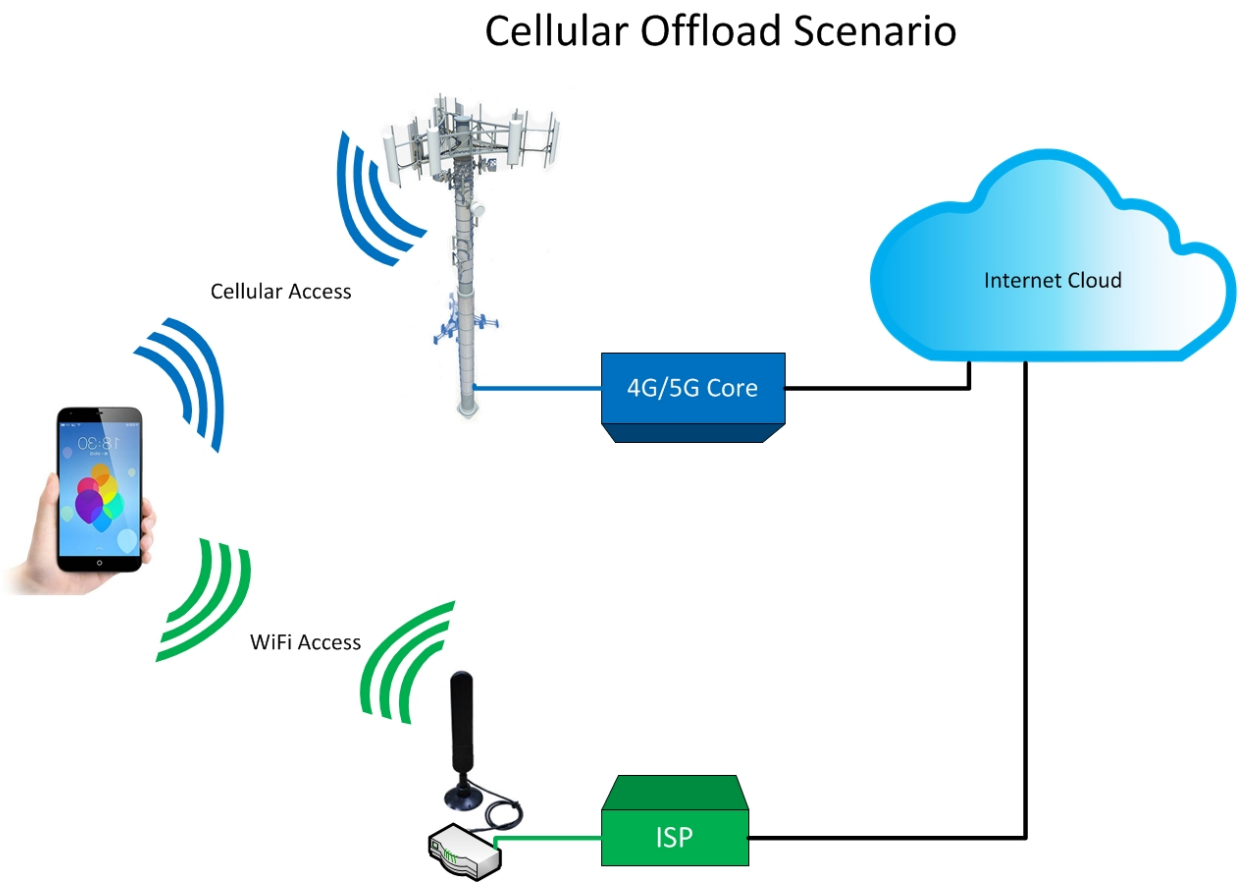
In fact, privileging the traditional large-carrier, macrocell deployment business model over those of other companies through dramatic changes to the 3.5 GHz rules would set back U.S. 5G progress by stranding the investments that have already been made and limiting participation to only a small handful of wireless carriers, as previously noted. Although T-Mobile argues that changing the 3.5 GHz rules would "potentially enable 1100 megahertz of spectrum for 5G commercial wireless use,"[21] it fails to acknowledge that the 3.5 GHz band is already a hotbed of 5G innovation under the existing rules. The real effect of rewriting the rules as T-Mobile requests would be to potentially enable 1100 MHz of spectrum for the exclusive use of T-Mobile and other national carriers, an outcome clearly inconsistent with the FCC's goal of designing rules promoting innovation and investment rather than using government rules to help individual companies.

IV. Specific Response to Aspects of T-Mobile's Petition:

Dealing with the reality of cellular offload is not even addressed in the T-Mobile petition, in which it asks the Commission to make the entire 3.5 GHz band available for auction. Cellular offload occurs when users of mobile smart devices are able to choose between comparable services, like mobile 3G/4G or fixed wireless, based upon application needs, costs, range and performance. This fundamental choice *by the user* is essential for making their own cost/value trade-off of each service. This consumer-

[21] T-Mobile Petition at 7-8.

based approach is what drives market decisions and influences manufacturers to build converged network solutions that will provide the optimal customer experience when accessing the internet. [22]



The 3.5GHz band is yet another opportunity to support and expand on the concepts of consumer driven wireless networks choices that will enhance that very important customer experience by providing a mix of cellular and fixed wireless services with the right balance to meet market demand. If the T-Mobile petition is adopted, the consequences of these policy choices would result in less market competition and lower

[22] https://hulaherald.wordpress.com/2016/07/15/openg

spectrum utilization, as well as poorer end user services at a higher cost.

There are several important facts that the Commission should consider when reviewing the T-Mobile petition:

- By 2020, 55% of all global cellular data will be off-loaded to WiFi networks,[23] growing to nearly five exabytes per month by 2020 (more than all mobile data in 2015) with a 50% CAGR. Clearly, as cellular bandwidth increases so must appropriately scaled unlicensed bandwidth be increased in order to sustain the continued off-load demand. This combination of cellular and fixed wireless to meet customer demands is the reality today and all indications are that this balanced requirement will continue for the foreseeable future.

- T-Mobile recently started to deploy LTE-U in the U-NII-3 bands as yet another off-load strategy. T-Mobile has made a public commitment[24] to ensure that WiFi services will not be impacted in any way as a result of this additional off-loading. Yet, as the expansion of cellular licensed bands increases so will the proportional offload to the U-NII-3 unlicensed bands. Without a proportional increase in the unlicensed bands it seems inevitable that WiFi users will be impacted.

[23] http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-forecast-qa.pdf

[24] https://newsroom.t-mobile.com/news-and-blogs/lte-u-launch.htm

- A recent GSMA study[25] documented that the higher the auction price, the lower the capital equipment investment by the provider for deploying the service, which results in poorer quality of service to the end user. Clearly then, a total reliance on auctioned spectrum alone will not result in lower costs or better services as implied by the T-Mobile petition.

- The unlicensed and lightly licensed bands such as GAA may be the greatest economic driver ever invented by regulatory policy[26]; providing low cost broadband solutions to billions of people around the world; supporting billions of devices; creating vibrant competition between thousands of companies; inventing new applications and even whole industries around the access to this service. And ultimately, adding trillions of dollars to the global economy.

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[25] Effective Spectrum Pricing: Supporting better quality and more affordable mobile services, GSMA Report, 2017; https://www.gsma.com/spectrum/wp-content/uploads/2017/02/Effective-Spectrum-Pricing-Full-Web.pdf "In other words, where governments adopt policies that extract excessive financial value from the mobile sector in the form of high fees for spectrum, a significant share of this burden is passed onto customers through higher prices for mobile and lower quality data services".

[26] ASSESSMENT OF THE ECONOMIC VALUE OF UNLICENSED SPECTRUM IN THE UNITED STATES, TELECOM ADVISORY SERVICES, LLC**;** https://pdfs.semanticscholar.org/5d81/ff994b7cbc9ccc0d067f1e102b0409755bbb.pdf?_ga=2.111779588.1831559566.1499905673-1041050670.1499905673. The economic value generated by current and future allocations of unlicensed spectrum; Richard Thanki, 2009, https://ecfsapi.fcc.gov/file/7020039036.pdf; see also, Wi-Fi Spectrum Needs Study, Wi-Fi Alliance, 2017; http://www.wi-fi.org/file/wi-fi-spectrum-needs-study .

- Finally, the spectrum needed to meet the growing demand for unlicensed and lightly licensed capacity has been well established based on solid analysis of current trends with a scientific basis for that forecast.[27]

Rather than restrict spectrum and competition with exclusive use authorizations through auctions, as suggested by T-Mobile, the evidence is clear that expansion of unlicensed and lightly licensed spectrum, will result in higher value, lower costs to consumers and greater utilization of the spectrum. It is worth noting again that T-Mobile itself has begun using the LTE-U protocol in the unlicensed bands to lower costs and be more competitive. Clearly, the unlicensed model is able to support both WiFi broadband and cellular broadband simultaneously; enabling the maximum competition, ensuring the highest utilization and delivering the greatest value to the consumer.

In addition, approval of unlicensed and lightly licensed spectrum applications can be accomplished relatively quickly and simply, without the complexity and proven delays of spectrum auctions, particularly where clearing of bands is necessary. This is where the Commission focus can truly have an immediate and dramatic impact to rapidly expand the deployment of broadband services to all Americans.

[27] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021; http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.pdf

V. Conclusion:

DSA Members are excited to be a part of this innovative new ecosystem, and to begin to witness the fruits of their investments in 3.5 GHz infrastructure. But the Commission should act quickly to reassure investors in this band that it will not strand their investments by making wholesale changes to the rules at this late date. Rather, the Commission should leave the rules largely unchanged and move ahead with the final approval of SAS operators and an Environmental Sensing System so businesses can finally bring the band into service for American consumers. In particular, we urge the Commission to reject the CTIA and T-Mobile petitions and ensure there is a *balanced approach* to spectrum for wireless broadband services between auctioned, exclusive use, licensed spectrum, and unlicensed and lightly licensed spectrum necessary for the 3.5 GHz "Innovation Band" to achieve its potential. This balance will ensure that open and free markets will thrive through competition with minimal reliance upon regulatory policy.

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