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Understanding Neutral Host Networks

Dean Bubley | Follow

On July 9th, I ran my first whole-day workshop in London on the emerging sector of **Neutral Host Networks (NHNs)**, together with Peter Curnow-Ford of Viatec Associates. The event backgrounder is here (**link**).

It covered an important new addition to the mobile industry landscape. Along with pure private networks and "thick" MVNOs, NHNs are extending the 4G/5G marketplace, to many more stakeholders than today's handful of cellcos in each country.

Definition: *An NHN is 3rd-party cellular network providing wholesale, commercial mobile localised coverage solutions to national mobile network operators (MNOs) or other communications service providers (CSPs). That access can be either paid or unpaid, and in dedicated NHN-owned spectrum, unlicenced/shared or the MNO's own bands. NHNs typically use small cells, but not always.*

NHN uses & types

NHNs have many possible use-cases, and several business and technical archictecture models.

The main common theme is wholesale enablement of 4G/5G, in areas with poor coverage, reflecting difficult economics or tricky accessibility. A secondary motivation is a desire by venue/property owners for more control of wireless usage - and ideally monetisation.

The key uses for NHN deployment are:

Rural / remote areas

Metropolitan centres needing 4G/5G densification with small cells

In-building, especially for large sites such as offices, stadiums and hotels

Road and railtrack coverage (and potentially in-vehicle)

Industrial sites and large transport hubs

Temporary sites and events (eg festivals, major construction projects)

Some classes of residential and SME commercial venue

There are several types of NHN model emerging, plus a number of other similar or overlapping approaches, as well as hybrids. The two most important versions of NHN are:

Multi-Operator Small Cell as a Service (SCaaS), without the NHN having spectrum of its own. This can either use multiple small cells clustered together (eg one per MNO) & sharing backhaul, or a single small cell capable of virtualisation and with radios supporting multiple MNOs' frequency bands.

Spectrum-based NHNs, where the provider is a full local MNO in its own right, with its own radio resources (shared or dedicated) and network, hosting other MNOs & SPs as tenants or roaming partners.

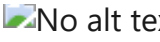
An additional model is the use of some form of cloud/virtualised RAN, with shared fibre / antennas linked back to different MNOs' signal sources and core networks. One more option is for "pure" private 4G/5G networks, run by an enterprise, to also offer NHN capabilities as a secondary function - for instance for a 5G-enabled factory where the network is mostly for the robots, but can also support employees & visitors' smartphones.

We considered NHN to be different to a few other alternatives such as national roaming, network-sharing, or government-run/funded wholesale cellular networks.

There are several SCaaS players already in the market, and many more being trialled or discussed. Some are TowerCo's expanding to new markets, some are indoor specialists, and others are starting with metro deals with local authorities, or street-furniture assets.

As yet, we were unaware of any of the spectrum-based NHN offers being fully commercialised yet, although that should change in the next 12 months, either in the US with CBRS spectrum, or in a number of other markets such as UK, Germany, Ireland, NZ and elsewhere with early trials ongoing, with new spectrum owners or lessors.

The workshop discussed which model is the best-fit for each use case, summarised in the chart below. This may evolve over time, and there are certainly nuances and exceptions, but for now, this is a unique mapping of the overall opportunity space. Rural coverage in particular has many options - and while NHNs have opportunity, there is also a chance that



Challenges and Opportunities

The workshop discussed a whole range of NHN enablers and components, such as suitable spectrum bands and cloud-based core networks, and perhaps eSIM. I'll cover those in other posts or presentations.

There are numerous technical and operational challenges to getting NHNs to work properly, especially where dedicated spectrum and core networks are involved. The workshop discussed these, and while some of the detailed discussion will remain private, it's worth highlighting a few interesting outputs of the day:

The biggest variable is how to get operators to sign up to use NHN capacity, especially where they have to pay for it. Sometimes access will be free to the MNOs (perhaps beyond providing backhaul or core-network interconnect), and paid for by a venue. But even in those cases, there are substantial contractual and organisational challenges.

There is a lack of appropriate tools and back-end software. Planning and design tools are not yet focused on NHN deployments, especially if they use different spectrum bands, or have other constraints. There is also a gap around NHN-friendly billing and charging software, although perhaps existing wholesale billing platforms can be customised.

Security was raised as an issue - can NHN deployments be fully trusted by MNOs, which may be using them as local partners? How is security - at many levels from physical access to small cells to authentication and fraud-management - managed? This could well be an obstacle to uptake (or an excuse for inaction)

For 5G, can NHNs and MNOs inter-operate their mechanisms for QoS and network-slicing? How can an MNO offer a premium service & SLA to a developer or content provider, when the final delivery is on someone else's infrastructure?

Skills - are there enough engineers and installers who understand how to make this work? Especially where 5G small cells are involved, perhaps with mmWave and MIMO radios - there simply isn't a deep pool of trained and certified personnel to deploy them for NHNs in-building or wide rural areas.

How can efficient marketplaces for spectrum resale/leasing or wholesale access be developed? What does a future NHN "dashboard" or aggregation play look like, and are there APIs being implemented to enable them?

Backhaul and fibre - is it in the right place, either indoors or outdoors? This is problematic in rural areas in particular, but also for enterprise deployment, particularly where landlords may have different investment priorities to their tenants.

Some of the key opportunities in the next 24 months will be in solving these problems, as well as the early pioneers rolling out NHN services themselves.

We will also see numerous "adjacencies" for NHN that tie in with it. There is a strong overlap with open-access wholesale fibre deployments, as well as some interesting NHN/edge computing scenarios such as combining multi-operator SCaaS with multi-operator (and enterprise) edge cloud facilities.

adopted by enterprises, it is possible that the opportunity space for NHNs may shrink in some locations.

Conclusions and next steps

There's a huge amount of interest in the NHN space. Numerous countries are releasing new spectrum bands, and many stakeholders (such as infrastructure owners, venues, enterprises and local goverment authority bodies) are keenly interested in experimenting. Trials, testbeds and prototypes are attracting attention and investment.

While a limiting factor might be getting the big MNOs on board, there is a chance that they may get pre-empted by other NHN tenants that nudge them into action. Cable operators, MVNOs, cloud players and others might exploit NHNs - especially the spectrum-based ones - to launch their own 4G/5G services at lower cost than solo deployments. One enterprise I spoke to recently even suggested launching venue-specific MVNOs themselves, on their own core-network platform. We can expect a whirlwind of innovation around NHNs, and also the wider class of "non-public networks" (NPNs) for 4G and 5G.

If you're interested in more detail about Peter & my work on NHN models, please drop me a line at *information* at *disruptive-analysis* dot *com*. We're intending to run **additional public workshops later in the year**, in London and elsewhere. Potentially, we're interested in partners to help market the events, or assist with with logistic in other geo's. In addition, **if you want a private under-NDA workshop for your organisation**, we can adapt to meet your specific needs. We also work with investors, enterprises, venue-owners and solution vendors to **craft strategies around the NHN sector**.

Published By


Dean Bubley

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Update on the use-cases, approaches & challenges for #NeutralHost mobile networks, following on from my public workshop last week. A combination of #smallcells, new localised 4G & #5G #spectrum licensing, and a universal demand for better cellular coverage are driving various NHN models.

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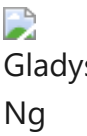
11 comments



Gladys Ng
Principal Regulatory Affairs Manager at Office of Communications Authority Hong Kong
10mo

Thanks for discussing on the NHN and mmWave band. Very useful

Like Reply

Trevor McLaughlin
10mo

I predict it happens within the next 12 months. Call me optimistic.

Like Reply 3 Replies

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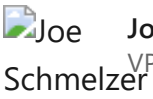
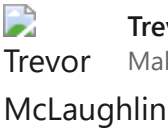


Joe Schmelzer
VP of Marketing at Cel-Fi by Nextivity
10mo

For sure it's a possibility. There is one business model in particular I could envision, but not sure if the financials would work out. I do not have enough current data to assess...

Like Reply



Trevor McLaughlin
Make progress that matters
10mo

Joe That is a great question, and I do not have a great answer to reply with. I can completely understand the reluctance to believe that it will happen. And I understand the reason behind the carriers not moving in that direction up until this point. Nonetheless, I see it as a real possibility in the near term.

Like Reply

Graham Payne
10mo

Good piece again Dean. Not sure in the table about Government wholesale as we have already served many Government buildings using our multi-operator (neutral host) service utilising our G-Cloud contract status. Lots of good stuff in your article though and we believe neutral host, open access will drive faster and lower cost ways for MNOs to roll out improved connectivity.

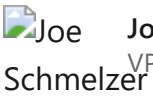
Like Reply | 1 Like

Joe Schmelzer
VP of Marketing at Cel-Fi by Nextivity
10mo

Hello Dean, I find your work and output to be very rational, thought through, and well-researched! Glad to have discovered you recently. The *idea* of the NHN is great. Just like the *idea* of the multi-carrier small cell. The technology isn't, and hasn't been, the limiting factor, for a long time now. The reason they don't exist commercially is the carriers don't want them to exist. The ROI for them doesn't work

in the space continues to say things like "...when the contracts get sorted out..." "...when the business model gets sorted out..." etc. It hasn't been sorted out. And I see no line of sight to that happening. It will require substantial participation from the MNOs, substantial and RECURRING costs to onboard and maintain NHN systems into the core EPC (etc.). Everyone talking about how great NHN will be some day is NOT a carrier...

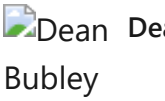
Like Reply | 4 Likes 2 Replies



Joe Schmelzer
VP of Marketing at Cel-Fi by Nextivity
6mo

With regard to the marriage of CBRS and 5G...I'm a doubter. Unless you mean the "5Ge" stuff... :-) If you review all the awesome use cases for "5G" you'll note they require large swaths of contiguous spectrum. Minimum 100MHz blocks. QUALCOMM's research papers -- the ones they have used and continue to use to hype 5G in the industry -- they all use MINIMUM 400MHz spectrum, and most of the studies use 800MHz. CBRS in total is 150MHz. It's not going to have the spectrum to support much of what people think they are going to get with 5G. 5G over CBRS might be slightly better than 4G LTE. No biggie. I fully realize I am highlighting problems and no solutions, which I don't prefer...but... I believe, if mmWave 5G is going to really see mass adoption, the outside-in network model for coverage will have to evolve. Small cells have to see mass adoption. I'd like to say the scale of it will help the 5G cost basis, but with beam-forming and massive MIMO, the "5G APs" are going to be complicated to build, and expensive. Therefore, (shameless self-promotion notwithstanding) solutions like Cel-Fi that do a very efficient job of distribution coverage inside, will become de rigueur.

Like Reply



Dean Bubley
10mo

Hi Joe Thanks for the comment & I agree that getting MNOs wanting to participate is the hardest part. There are a few variables that might change things - regulatory intervention on rural coverage % for instance, might force a choice on NHN vs. national roaming. The other variable is 5G frequencies simply not working indoors. The paradox of offering public services on private property is always a challenge. If MNOs want to offer paid QoS or URLLC slices, then outdoor-only services won't cut it.

Like Reply | 4 Likes

Neeraj Yadav — Sr. IBS Engineer | RF Indoor Planning Expertise on iBwave | DAS - Small Cell - WiFi Planning | IBS Site Execution

Interesting insights as always. Thanks for sharing

Like Reply | 2 Likes

James Saye — Helping people prepare for the future — 10mo

This is a great roundup, thanks for sharing. It feels like the barriers to entry for NHN and Private Cellular are dropping significantly over the next few years, particularly with better/smaller/cheaper RAN hardware, virtualisation, and shared spectrum.

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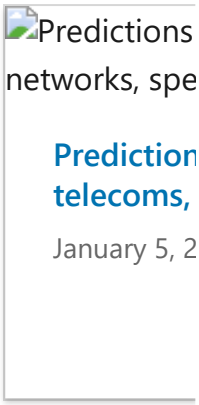

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