Neutral Host Environment for Public Multi-Tenant Venues

Market Drivers

Within a neutral host environment a single physical network infrastructure is deployed and operated by a neutral host provider such as an American Tower or Crown Castle. This single network infrastructure is designed to support a full range of technologies and to offer public and/or private connectivity. The neutral host provider allows various mobile network operators to access (or "share") the network. This model is most commonly found in busy locations that have a high volume of mobile users.

The market drivers for a neutral host environment can be based on a single factor or a combination of several factors.

- The venue owner requires a single infrastructure for all mobile operators, therefore "sharing" is the only way for operators to gain access to the venue.
- Physical space limitations make it impossible for each mobile operator to deploy their own network infrastructure.
- The cost savings achieved by an operator who decides to share infrastructure results in a much better ROI when compared to the cost of the operator deploying and managing their own network. This is especially true for:
  - Venues that are vacant outside of major events (e.g. sports stadiums, concert halls, etc.)
  - Overcoming indoor/outdoor coverage and capacity challenges in busy locations
  - Rural areas or uniquely challenging locations such as rail lines

Typical environments which are well suited for a neutral host model include large public, multi-tenant venues such as, stadiums, sports arenas, amusement parks, rail lines, resort areas, convention centers, college or business campuses, shopping malls and large residential or mixed use developments.

A "WIN-WIN" Environment

Multi-tenant hosted environments support many different types of wireless technologies, such as Wi-Fi, CBRS, and 3G/4G/5G cellular technologies. In addition, the neutral host model supports a mixed multi-vendor setting which allows mobile operators the ability to make their own vendor decisions and select the equipment of their choice.

A neutral host environment, where the network infrastructure is shared, can be beneficial and profitable for all parties involved:

The Venue Owner:

- Satisfies the expectation for coverage from all operators
- Establishes an impressive network infrastructure used for their benefit
- Generates revenue from renting space and utilities related to the service
- Managed under a single agreement from the neutral host provider versus numerous agreements from multiple operators

The Mobile Operator:

- Saves CAPEX required to deploy their own infrastructure
- Saves OPEX since operating costs are shared with other operators
- Frees up resources to be spent elsewhere on other projects
- Allows entry to venues that require a single multi-operator infrastructure
- Takes advantage of 3rd party service enablement provided at a lower cost

The Neutral Host Provider:

- Provides services to all operators
- Profits from the deployment and on-going operation of the network

Mobile operators and venue owners can generate revenue while increasing user satisfaction by ensuring a quality user experience. This shared network environment delivers substantial cost savings and greater network efficiency for all parties involved.

Unique Challenges

To find the right solution for a neutral host environment, these unique challenges must be taken into consideration.

- The need to improve wireless coverage across multiple operators leveraging common and scarce resources, such as fiber, towers, or other real estate available.
- The attempt to provide a profitable anchor tenant service such as Wi-Fi.
- The support multiple generations of cellular technologies, including 5G which will greatly increase capacity and coverage burdens across multiple tenants or operators.
- The unrelentless bandwidth spikes caused by mobile applications (e.g.: sports arenas: parking applicator online ticketing, point of sale, etc.) and patron usage/video streaming.
- The struggle to deliver consistent coverage and the optimal user experience across indoor and outdoor areas.
- Higher network capacity is required to process large amounts of cellular data from a high volume of patrons.
- Venues are usually susceptible to area-specific dead zones caused by building materials (concrete) or signal pollution due to original design flaws (e.g. overfit/miscalculations).

Limited Fiber Issues? No Problem...

Today, many environments face the challenge of limited fiber. However, adding new fiber infrastructure is expensive and time consuming.

- *Based on several variables, such as buried or aerial based fiber, the industry estimates* ***the general cost range for fiber infrastructure is between $18,000 and $22,000 per mile.***
- *In addition, some settings make new fiber installation even more challenging and expensive. For example, in a train station or along train tracks are difficult environments to lay new fiber, hence significantly driving up the cost of the fiber installation.*

HFR Networks solves the problem of limited fiber by better utilization of the deployed fiber, and enabling additional fiber drops off the current fiber infrastructure.

In addition, HFR Networks provides the ability to add more services and support many moblie operators with segmentation on a single fiber.

HFR Networks' Neutral Host Solutions

To solve the complex challenges found within multi-tenant hosted environments, HFR Networks offers two solutions, the flexiHaul HSN8000 series and the packet-based flexiHaul M6424. Both solutions are capable of handling large counts of remote radio heads (RRHs) at a tower site while transporting the traffic for each one in its own ITU wavelength. This achieves complete isolation for competing networks deployed on the same infrastructure at the same site.

HFR Networks' solutions provide:

- A field-proven platform optimized for multi-tenant scenarios which deliver increased performance and the full cost advantages of a shared model (e.g. infrastructure, space, power, etc.).
- The ability to support many different brands and versions of equipment (e.g. BBUs, RRHs, DAS systems, etc.) that will vary by technology and mobile operator.
- A cost effective way to address coverage gaps when 1) cellular either gets overwhelmed, or 2) fiber is constrained, or is not available due to cost or other budgetary decisions/constraints.
- Scalable solutions with "pay-as-you-grow" economics which allow you to scale tenants and the capacity per tenant across mixed services (e.g. 10G/25G, CPRI/ eCPRI, 4G/5G, etc.).
- Clear service demarcation points with the ability to monitor and troubleshoot in real-time to ensure the highest quality of user experience.
- The flexiHaul Element Management System (EMS) that delivers the visibility and tools required to manage strict service level agreements (SLAs) within a multi-tenant hosted environment).

HFR Networks' Solution Benefits

Within a neutral host environment, HFR Networks' solutions deliver significant cost benefits and operational efficiencies such as:

- Lowers overall total cost of ownership (TCO): 50% lower cost; 90% turn-up time savings; 75% footprint reduction and simplified spares inventory compared to transponder based offerings.
- Scales easily with a "pay as you grow" architecture that enables increased capacity quickly, as needed.
- Simplifies/converges network to reduce deployment/ operational costs while simultaneously supporting multiple services, such as 4G LTE, 5G and Ethernet services.
- Preemption enables the support for mixed Ethernet services along with mobile traffic.
- Allows for multiple carrier isolation using a shared infrastructure.
- Provides an open, standards-based solution across leading RAN suppliers (Ericsson, Nokia, Samsung, etc.) to end vendor lock-in and eliminate interoperability problems in mixed CPRI implementations.
- Enables better utilization of the deployed fiber for remote radio head (RRH) connectivity thus reducing costs/delays associated with additional fiber investments.
- Ensures an effortless deployment and operation; the integrated Element Management System provides full visibility and operational control to deliver higher performance in order to exceed the requirements of operators' service level agreements (SLAs).

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