

# What Exactly is a Hybrid SON?

Optimizing the network even in the absence of a D-SON

While RF engineers agree on the definitions of distributed and centralized self-organizing networks (D-SON and C-SON), the industry is still missing a good understanding of hybrid SON (H-SON).

H-SON is mandatory in 4G networks, where tightly-integrated, vendor-specific D-SON options are readily available. Because H-SON and C-SON are both located within the centralized network management infrastructure, many see H-SON as almost a proxy for C-SON. In reality, H-SON is a much more complex set of interoperating capabilities, and over-simplified characterizations do not properly emphasize its role in the big picture of SON.

This paper offers a focused, accurate picture of H-SON, and explains some of the recent innovations in the H-SON sector.

## Interaction of H-SON and D-SON

When C-SON is deployed in a network it implicitly means that there are no other conflicting D-SON modules active; by definition, if it is C-SON, it's not H-SON.

On the other hand, H-SON has to co-exist with D-SON modules having the same optimization goal. For example, if distributed automated neighbor relation (D-ANR) is activated on a network element (for example, an eNode-B) the only other solution targeting ANR optimization should be H-ANR and not C-ANR.

## H-SON Motivation

D-SON is not yet—and most likely won't ever be— controlled by just a simple on/off switch. As cellular radio access technologies (RAT) become more and more complex, the same is true for supporting technologies like SON. These days, RF engineers must understand new RAT technologies and also the new D-SON products that control them.

The D-SON attributes that dictate the outcome of an optimization cycle have to be set by users, and this is not a straightforward task. For the sake of simplicity, let's take the example of D-ANR. D-ANR attributes that must be configured by users before starting D-ANR include:

- Thresholds for adding a neighbor as RSRP and RSRQ thresholds along with D-ANR A3 and A5 threshold offsets
- Removal timers for relations, cells, and eNode-Bs with no handover activity
- Maximum and minimum numbers of UEs reporting D-ANR related measurements

Also, D-ANR is not responsible for blacklisting or whitelisting neighbors or X2 connections; this has to be done manually. Or, better, by H-ANR.

What quickly becomes clear is that a better solution for setting D-SON attributes is an H-SON solution that monitors D-SON actions and uses machine-learning algorithms to update D-SON attributes and policies over time. This advanced mechanism reduces complexities and lets engineers control their SON implementation as if it was operated by a simple on/off switch.

H-SON must be transparent for D-SON while leveraging its quick response time. Because H-SON is mainly adjusting D-SON attributes, it adds a small load to the network management communication layer.

Finally, a true H-SON should be able to perform a standalone optimization on the NE without the D-SON license; in other words, H-SON must include the capability of optimizing the network even in the absence of a D-SON.

## Advantages of H-SON

When appropriately designed, H-SON offers the best of both worlds and offers a range of new functions and benefits that do not currently exist in each of the other D-SON variants. For example, Viavi has innovated a predictive SON based on the H-SON concept, as well as a holistic controlling mechanism for the combined H-SON system.

H-SON changes the way coverage and capacity optimization (CCO) works, including cell-specific rather than network-wide optimization settings—crucial for integrated control of D-SON. As another specific example of how H-SON changes the operational model, Viavi hybrid-ANR functionality offers an improved ANR solution that considers the entire end-to-end context. It combines quick, real-time neighbor relation updates delivered by D-SON with the statistical significance offered by a hybrid-SON solution with a network management overview.

Viavi has also generated unique intellectual property for multi-mode optimization within the context of H-SON, offering the ability to control multi-vendor and multi-RAT options in almost any combination. And, by considering the physical location of the H-SON system, Viavi is the first company to offer a cloud-based SON solution.

## Conclusions

A well-executed hybrid SON is much more sophisticated than a simple, centralized SON solution. Full-scale H-SON provides the initial set of attributes for D-SON modules, and monitors network data to learn and update D-SON attributes over time.

H-SON is transparent for D-SON, preserves the quick response, corrects D-SON decision glitches, creates a holistic overview of networks supplied by multiple vendors, and provides a seamless reconciliation of the functions of multi-vendor D-SON modules.



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