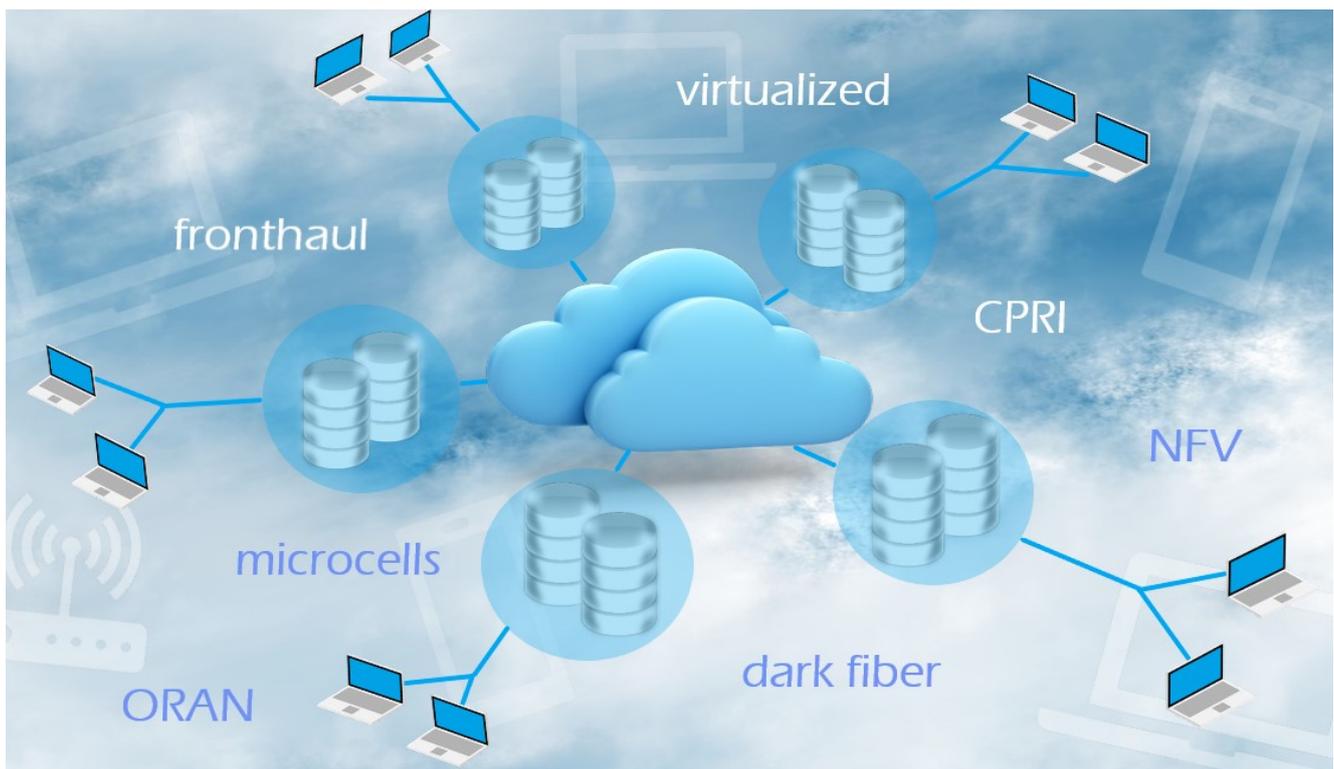# Virtualized RAN rollouts stutter
Operators await interoperability, standards
Cloud RAN deployment forecast 2017-2025

A report from RAN Research
Part of Rethink Technology Research
EXECUTIVE SUMMARY ONLY

Contents

Tables & Graphs

About this Report

This document contains explanatory notes and brief commentary to accompany the Excel spreadsheet **'Rethink RAN Service Cloud RAN data Module March 2018'**. The surveys and forecasts on which the outputs are based were conducted during early 2018. We have studied and modelled the deployments and strategies of the top 100 4G operators, as tracked by Rethink Technology Research's quarterly surveys, interviews and desk research and conducted a survey of 74 tier one operators about their detailed plans for RAN deployments to 2021. The commentary refers only to a selected number of the data tables included in the Excel data module. Additional tables are included in the spreadsheet and listed in the table of contents below (e.g. additional regional breakdowns).

The context for Cloud-RAN

In the three years that Rethink Technology Research has been tracking and forecasting Cloud-RAN, it has become clear that, despite some early hype, this technology will have a slow burn. It is a far greater change, to network platforms, internal organization and investment cycles, than any other aspect of the virtualized telco network.

There is rising interest in Cloud-RAN and other types of virtualized RAN, often tied into developments in 5G. However, progress will be cautious until other developments, which in many MNOs' view will be necessary to make economic sense of C-RAN, are mature. These include edge compute, agreed standards for management and orchestration (MANO), and widespread 5G radio upgrade.

Cloud-RAN definitions

We anticipate a steady increase in the percentage of new site deployments which are controlled by a central baseband. However, until 2020, most of these will be based around the relatively established architecture of a centralized base station shared by several cell sites (radio+antenna). These are not very different from a base station hotel, though increasingly, advances in fiber and other fronthaul options will make it possible for a larger number of sites to share, over longer distances.

In this early stage (Phase One), there will also be many deployments of localized small cell clusters with a centralized or virtualized controller, as these are a relatively simple way to trial vRAN approaches without risk to the main network, and to generate immediate returns from, for instance, an airport roll-out.

After 2020, there will be a significant leap in deployments of macrosites which are controlled by a virtualized network function (VNF) on an inhouse or public cloud server. These will be driven by improvements to long distance fronthaul technologies. We regard this as Phase Two of C-RAN.

In Phase Three, which advanced operators will start from 2019 – but will come far later for most MNOs – the network will be densified with a middle tier of virtualized clusters or sub-nets. These will typically use two types of cell:

A relatively short-range macrocell, similar to a microcell in conventional networks, often in higher frequency spectrum such as 3.5 GHz. We refer to this as a mid-tier macro.

A high powered small cell, which we call a 'mini-macro'. Like small cells, these can be mounted on street furniture and be heavily automated, but they have higher power and range than a traditional Phase One small cell. They will often be deployed in high frequency spectrum such as millimeter wave bands.

In both cases, these interim layers of cells will be connected to their controllers by 'midhaul' links – shorter than full fronthaul in the macro vRAN but enabling wider area

networks than small cells (e.g. a metro rather than an enterprise or hotzone).
In summary, in our definition, there are four potential phases of deployment, and three
tiers of virtualized networks. Not all operators will do all of these. These are illustrated in
Figure 1, and the terms we will use in this report are listed in Table 1. We use Cloud-RAN
as a generic term for all kinds of shared and virtualized RANs, even when they are not in
the cloud.

Table 1. The potential phases and tiers of Cloud-RAN deployment

Deployment phase	Type of Cloud-RAN	Definition	Tier of base stations
1	Centralized RAN	Shared baseband, not supporting full VNF technology such as NFV	Localized clusters of macrocells, or small cell C-RAN
2	Virtualized RAN	RAN deployed as VNF, often NFV-compliant, on internal cloud server	Wide deployment in macro layer
3	Densified C-RAN	As above, but with multiple tiers of controllers	Additional sub-nets – mid-tier macros, mini-macros and small cells
4	Hosted RAN	RAN deployed as VNF in public or third-party cloud	Central baseband units in cloud

Figure 1. A typical four-phase deployment plan for Cloud-RAN, with earliest dates of wide-spread commercial roll-out; and the three-tier architecture that will emerge.
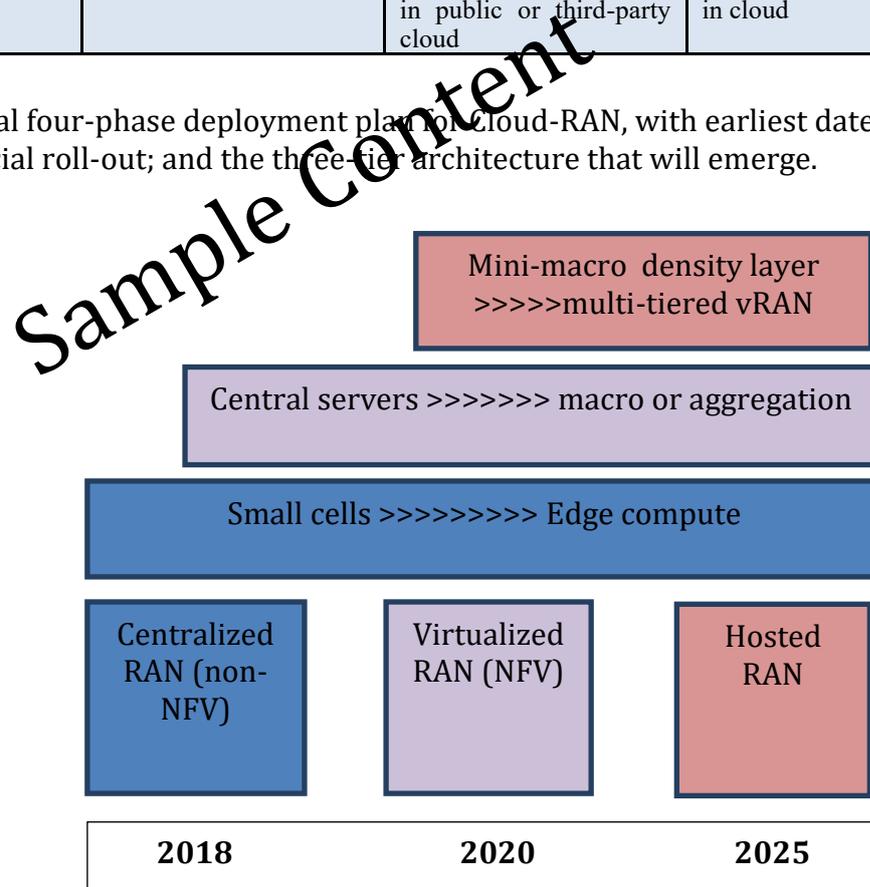
Patterns of Cloud-RAN deployment

Because these different architectural variations have emerged, deployment of C-RAN is following very different patterns from those expected in 2015. In that year, Rethink published its first Cloud-RAN forecast, and expected to see virtualized macrocell deployments reach 450,000 in 2020. While the top line figure for 2020 has not changed significantly, the patterns of deployment vary from those envisaged at the time. The progress to full virtualization, as opposed to centralization, looks slower than initially anticipated, and there are more complex phases and tiers on the roadmap.

Figure 2. 2015 forecast deployments of Cloud-RAN enabled sites. Source Rethink Technology Research 2015

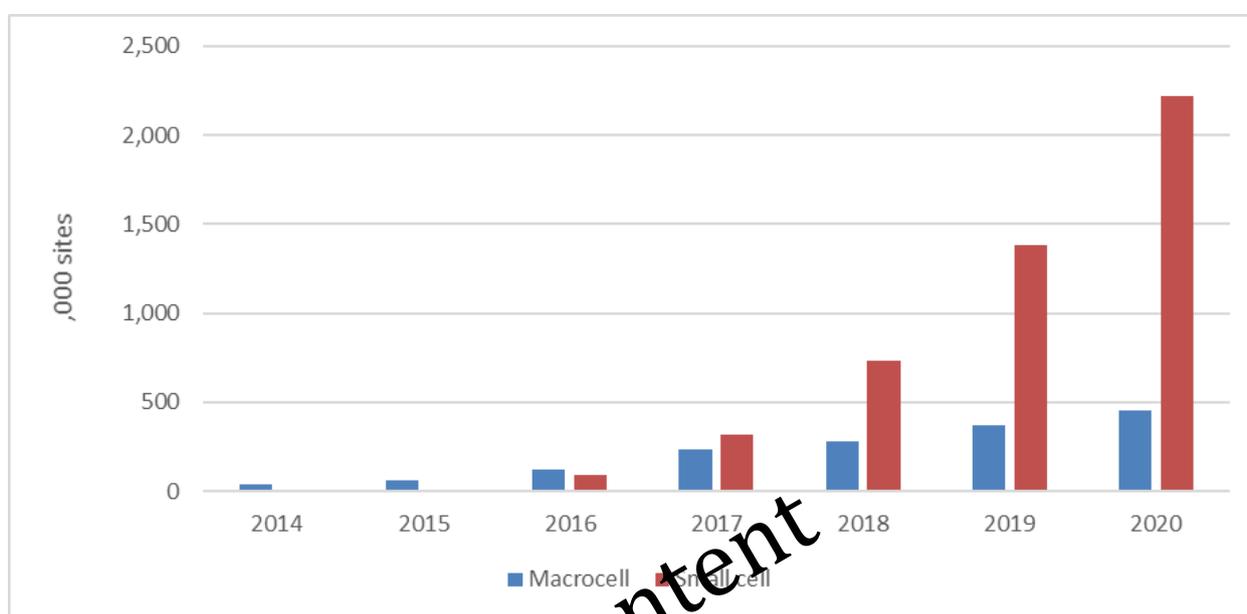As operators conduct more trials and assessments, the richness of data from surveys has increased and we can take a more nuanced view of their likely patterns of deployment. Since C-RAN decisions are subsequently taken in conjunction with those about 5G, we have also been able to extend the forecast to 2025. Many operators are thinking this far ahead, at least conceptually, while our models have been able to incorporate a range of new assumptions driven by 5G developments.

Figure 3 shows the results of the updated forecast. Although the number of virtualized or centralized macrocells deployed in 2020 is expected to be slightly higher than in the 2015 forecast, these will be more concentrated in the hands of a few large-scale deployers and will include a large number of what we call mini-macro cells – base stations which are intermediate, in power and range, between full-scale macros and small cells, and which can often be mounted on roofs or poles rather than towers. These will help to densify 5G and 4G/5G networks, creating clusters of capacity in areas like cities, and localized vRANs, which can then be aggregated to a central server. These are a key part of our three-tier C-RAN model.

Who should buy this report

This report is critical to anyone involved in network planning or long term technology strategy for cellular networks, as well as partners, implementers, equipment suppliers, software providers and investors, at C Suite level down to product marketing and product planning. The RAN Research arm of Rethink Technology Research is essential reading for anyone who wants to stay on top of current trends and thinking among tier 1 and tier 2 MNOs across the globe. It's like being a fly on the wall in one of their planning meetings.

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Rethink is a thought leader in quadruple play and emerging wireless technologies. It offers consulting, advisory services, research papers, plus three weekly research services; **Wireless Watch** which has become a major influence among leading wireless operators and equipment makers, **Faultline,** which tracks disruption in the video eco-system and **Riot**, our Rethink Internet of Things weekly service.

Our research services include **RAN Research**, a research stream forecasting all aspects of cellular RAN shipments; and **Rethink TV** offering monthly research forecasts in OTT video technology and **Riot Research**, our forecasts on IoT topics.

RAN Research derives from a broad research base of over 140 service providers (MNOs, telcos, cable and satellite operators, over-the-top providers) worldwide. These organizations are surveyed on a regular basis about their network infrastructure and business plans, and have a relationship of trust with Rethink.

Rethink also has deep relationships with the telecoms ecosystem (tier one device OEMs, vendors, technology developers, integrators, regulators etc), and is perceived as a thought leader in many areas of the telecoms and media sectors. Key areas of expertise and research experience include HetNet migration, small cells and carrier WiFi; transformation strategies for the RAN and the BSS/OSS; convergence of IT and network skills and platforms; device and chipset roadmaps; spectrum strategy.
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