C-RAN Deployment: Market Opportunity Analysis– 2018 and Beyond

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Report Description

This report explores the commercial potential of C-RAN (Cloud or Centralized Radio Access Network), the principal emerging architecture for distributed radio access networks (RANs) used in mobile phone networks. CIR believes that C-RANs will become essential for 5G mobile networks where they will contribute to both cost reduction and performance improvement. Not only is the conventional RAN approach expensive in terms of both Opex and Capex, there is also a problem with interference between the base stations. Mobile service providers in Asia are already reporting 30 to 50 percent Opex reductions. C-RAN deployments will also make a contribution to the essential need for power efficiency in 5G Networks.

In the report CIR discusses how major suppliers of equipment for mobile infrastructure will position themselves for the 5G market using C-RAN as part of their strategy. It also examines what functionality the mobile service providers are looking for from future distributed RANs. Finally, the report examines the size and structure of the market that the arrival of C-RAN will have for the fiber optics, radio communications, and server businesses. As far as the IT aspects are concerned, we include a discussion of how C-RAN is repurposing conventional data center concepts to create a low cost, high reliability, low latency and high bandwidth interconnect network within the BBU pool.

Although CIR believes that C-RAN presents a significant market opportunity going forward, we also explore the factors that holding back C-RAN and how these are likely to change in the future. One of these factors is fronthaul, which is being completely redesigned for the 5G era. This report shows how the recent great leap forward in fronthaul technology will positively impact the deployment of C-RAN architectures as latency and synchronization requirements increase. We also discuss the issues surrounding virtualization in the C-RAN architecture and what that will mean for opportunities for specialized processors and accelerators. Also included in this report are ten-year market forecasts for C-RAN revenues and deployments and a thorough discussion of product trends – such as the move to smaller C-RANs – as represented by the announcements from leading vendors.

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Although, distributed RAN architectures have been around since 3G mobile, the focus of building mobile architecture was on providing broadband connectivity and distributed RANs were not a priority. With 5G, priorities have changed and C-RAN deployment has become critical. This report is designed to guide business development executives, product managers, investors and others to where the C-RAN opportunities can be found.

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Chapter One: Introduction

1.1 Background to this Report

C-RAN is the principal emerging architecture for distributed radio-access networks (RANs) for mobile phone networks. Since the developed world is on the cusp of moving to 5G, CIR believes that the market for C-RANs will grow dramatically as the most effective way to reduce cost and improve performance (especially power efficiency) ready for the 5G era. In fact, as CIR sees it, C-RANs may be one of the most important ways for telco equipment and software companies to make money in the next five to ten years.

Such firms will have to flout C-RAN capability if they are to be big players in the mobile infrastructure boom that will follow from 5G deployment—a boom that has already begun, in fact. Fiber-optic firms hoping to cater to the needs of the 5G fronthaul market will soon be compelled to offer C-RAN systems in order just to compete. Already firms offering C-RAN and associated technologies include Altiostar, Amarisoft, ASOCS, Cavium, Ericsson, Huawei, Intel, M-CORD, NEC, Nokia, Phluido, Mitel/Mavenir, Samsung and ZTE, although other manufactures are also developing systems with C-RAN capabilities.

There are four reasons why CIR believes that money will be made in the C-RAN space in the near future. Most of these reasons link the C-RAN market explicitly with a 5G future. But there are also cost-related issues that might make C-RAN a market winner, even if 5G doesn't turn out to be everything currently promised. In fact, C-RAN is already proving in.

1.1.1 C-RAN Reduces OPEX: Revenue Generation in the pre-5G Era

Pioneer users of C-RANs in Asia are already reporting 30 to 50 percent OPEX reductions. This is due to the inclusion of network function virtualization (NFV) and software-defined (SDN) as an intrinsic part of C-RAN. The OPEX reduction more specifically derives from the fact that NFV and SDN can simplify the network, which provides better performance and hence lower costs.

This high level of cost reduction virtually ensures the long-term success of C-RAN, especially since all cost-reduction investments—by telcos in this case—are intrinsically low risk. However, as CIR sees it, there is still plenty of room for suppliers to offer more than a commodity package. In particular, the development of a virtualized BBU pool with NFV and SDN is complex and expensive and C-RAN suppliers can compete effectively if they can offer savings here, lowering CAPEX as well as OPEX.

1.1.2 C-RAN as 5G Enabler: A Long-term Opportunity

5G isn't just the next-generation of mobile phone system, but teases the possibility that broadband communications in the developed countries could shift to wireless infrastructure in much the same way that wireline phones were replaced by mobile

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phones. Here CIR sees C-RAN as the great enabler. It really isn't possible to deploy 5G networks without C-RAN. So, the success of 5G all but implies significant revenue generation for C-RAN.

Because it is anticipated that mobile operators will be deploying 5G over the next decade or longer, CIR believes that C-RAN presents a long-term opportunity. At the same time, CIR believes that we are early enough in C-RAN technology evolution for some vendors to cater better to the needs of the 5G market. A couple of examples will suffice here. There are many more in the report.

Providing smooth subscriber handover for competitive advantage: One of the key characteristics of C-RAN is that it shifts the functionality of the baseband unit (BBU) to the cloud. From the service operator's perspective, this means that the same number of cell sites can be managed with less computing power. However, the handover from one virtual BBU to another virtual BBU in the same or a different pool is complex and can cause drop-outs of calls as subscribers move.

As CIR sees it, providing smooth subscriber handover can be a significant competitive advantage to C-RAN firms, especially for inter-pool handovers. Mobile phone users in the past have been willing to put up with relatively poor-quality service. However, if 5G is someday going to replace the *wired* broadband infrastructure it will have to offer customers the performance of the current broadband service. As such, the subscriber handover issue is just one example of a general customer satisfaction promise that C-RANs will have to enable. The ability of C-RANs to support such a promise as both 5G and C-RAN evolve of the coming decade, will, CIR believes, provide significant competitive advantage for C-RAN suppliers.

A growing security requirement: Another source of competitive advantage going forward, CIR believes, will come from the need for data security. This is a growing societal requirement in any case and the new 5G networks will have the same need as any other networks for encryption, access control, etc. However, there are also some specific security requirements that are specifically related to C-RAN.

With C-RAN for a single BBU pool, many different mobile operators can share the equipment and there is need to protect subscriber information from being shared with other mobile operators. This means that the information in virtual machines could be compromised by clever professionals from one mobile company so they can poach subscribers from another mobile company. This could be a revenue generation disaster for mobile operators and possibly a PR disaster too, if customers find themselves pestered by representatives of a mobile company for which they never signed up.

While every check and precaution may be taken to protect customer data, obviously no absolute guarantee can be given that data will not fall into a competitor's hands. However, as CIR sees it, this is another area where we think that C-RAN suppliers can proactively provide mobile operators will some level of security guarantees. Also, if a

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breach does occur, the C-RAN manufacturers will need to fix the loopholes. CIR sees significant competitive advantage being generated for C-RAN suppliers in both these strategies.

1.1.3 What Could Possibly go Wrong?

Using existing infrastructure for 4G LTE, pre-5G trials are already taking place in some countries and real-world 5G infrastructure will start to be deployed in the next two years. This will represent a major inflection point for 5G revenues and—because 5G deployment is now so economically linked to C-RAN—CIR thinks that 5G will also be an inflection point for C-RAN revenues, too.

We are not only bullish that the 5G and C-RAN markets will see a big uptick once 5G starts to be deployed in earnest, but that this will spur other derived markets. For example, as CIR discussed in our recent report, "Optical Networking Opportunities in 5G Wireless Networks: 2017-2026," 5G fronthaul, in particular, will look quite different to the mobile infrastructure that went before it. While fiber optics has always been part of the mobile infrastructure, it is now anticipated that fiber optics will have a dominant role. CIR expects that mobile operators will join together and share the cost of deploying the fiber-optic network with allocation of pairs being given to each operator. Not surprisingly then, suppliers of fiber-optic systems are currently straining at the bit to design and sell their C-RAN systems into the 5G infrastructure that is beginning to be built now.

However, none of our optimism should be read as a belief that C-RAN is a "sure thing." As we have indicated, there are current unresolved issues surrounding C-RAN that must yet be resolved and which C-RAN companies can turn to their competitive advantage if handled properly. However, there are also bigger issues that could yet dampen C-RANs prospects going forward.

One problem that might emerge is that 5G fails to turn out to be the futuristic wireless broadband network that some people envision. If this turns out to be the case, then less will be demanded from C-RAN and the potential for C-RAN suppliers to stand out in the marketplace is lessened. In the long run, C-RAN and 5G infrastructure expenditures will depend on the take up of 5G services and, at present, customer projections for 5G can vary by an order of magnitude depending on who one asks.

Also, and perhaps even more importantly, standards making in the C-RAN space is at an early stage of the process, with different suppliers designing their own unique systems. Again, the extent to which C-RAN is a money-making proposition will depend heavily on how proprietary C-RANs can be replaced with standard ones, while meeting the real-world needs of 5G as it evolves, and preserving the ability of C-RAN suppliers to achieve competitive advantage.

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1.2 Objective and Scope of this Report

The main goals of this report are (1) to project C-RAN deployment and associated revenues over the coming decade, primarily in the context of 5G deployment, but also in the pre-5G era; and (2) to analyze the market strategies of the leading suppliers of C-RAN products. This report is designed to guide business development executives, product managers, investors and others to where the C-RAN opportunities can be found.

Our commentary in this report is provided in the context of the barriers that must be crossed in order to produce a fully-compliant, cost-efficient C-RAN system with the highest performance. CIR expects that some of these requirements will be easily met and others will be met in the future.

Finally, the report examines the size and structure of the market that the arrival of C-RAN will have for the fiber-optic fronthaul, radio communications, and server businesses. As far as the IT aspects are concerned, we include a discussion of how C-RAN is repurposing conventional data center concepts to create a low cost, high reliability, low latency and high bandwidth interconnect network within the BBU pool.

Our forecasts and analysis cover technology evolution, but we also quantify the C-RAN market for five major regions of the world.

1.3 Methodology of this Report

The methodology used to compile this report is similar to that used in other reports published by CIR. It is based in part on telephone interviews with a variety of players in this space ranging from key suppliers and users to relevant industry journalists. We have also conducted “live” interviews at major trade shows during 2017.

To the primary information mentioned above we have added data collected by CIR from third-party sources such as corporate websites, financial statements and presentations, as well as reputable trade and technical publications, including papers delivered at conferences.

1.3.1 Forecast Methodology

The forecasting methodology is explained in more detail in the chapters that include the forecasts themselves. Here we note that the framework for the methodology is similar to that used in other CIR reports. This is essentially to determine a baseline addressable market for C-RANs and then apply a relevant penetration rate.

In the case of C-RAN we began with the historical C-RAN expenditure and the projected expenditure from all the major mobile operators in the world and extended to a forecast by making assumptions about whether a new fronthaul network would be required or existing ones utilized.

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A major uncertainty is introduced into our projections by the fact that there is a very wide range of projections for the number of 4G and 5G subscribers using a C-RAN that will emerge over the next decade. Because infrastructure deployments are so tied to subscriber levels this must be considered a possible source of error throughout the forecasts included here.

1.4 Plan of this Report

In Chapter Two, C-RAN products and standardization is examined as well as the C-RAN variants and architectural differences. Also, NFV and SDN are explained with their use in C-RANs. RANaaS and Mobile Edge Computing are also covered in this chapter.

In Chapter Three, we focus on the deployment of C-RANs, including RRHs, fronthaul and network equipment and servers that are provided as part of a C-RAN system. Our analysis here is based in part on what happened during previous mobile technology generation change overs. Also, a ten-year forecast is produced on the share of the C-RAN deployment for China, other APAC, North America, Europe and the Rest of the World. A close look is carried out on the implementations of C-RAN throughout the world.

In Chapters Four to Ten, the five industry interest/standards bodies for C-RAN are looked at as well as product offerings from Altiostar, Amarisoft, ASOCS, Cavium, Ericsson, Huawei, Intel, M-CORD, NEC, Nokia, Phluido, Mitel/Mavenir, Samsung and ZTE.

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