

docomo Open House 2021 Small Meeting Q&A

Questioner No. 1	
Q1	I recognized your splendid network quality after listening to your explanation on the various initiatives, but do you think you can in the future establish a lead that consumers can appreciate when they compare you and other carriers? I believe Rakuten's network quality is currently inferior. In your view, what kind of measures can they take to make improvements?
A1	As far as R&D initiatives are concerned, we have started offering millimeter-wave services and carrier aggregation using the sub-6GHz frequency bands that will allow customers to experience high-quality network services including transmission speeds. In addition to these R&D activities, coordination with the network teams is also very important. For example, the network team executes actual throughput evaluations using the necessary tools provided by the R&D organization, and have also established a structure for operation/maintenance that enables swift detection of failures. In recent years, using big data, the R&D team has created a multi-faceted mechanism, e.g., for detecting areas with poor radio propagation conditions, etc., to offer services in collaboration with the network teams, which enabled the provision of a high-quality network. We would like to reserve our comments concerning the network of other carriers as it is beyond our knowledge.
Q2	I believe it would be difficult for an ordinary consumer to realize DOCOMO's superiority enabled by the use of big data. Should I expect that this will eventually manifest as a difference in your enterprise offerings?
A2	We are endeavoring to build a network that is easy to connect, barely causes disruptions and can assure a certain level of throughput, so our customers including general consumers can all enjoy a high-quality experience everywhere. As you rightly pointed out, enterprise customers may perform an evaluation comparing us with other carriers.
Q3	Please explain your views on 6G-related capital expenditures. I heard your CAPEX efficiency improved by seven times when you upgraded from 3G to 4G, and three times upon the migration from 4G to 5G. What are your views on 6G including its investment efficiency?
A3	It is difficult to comment on the 6G CAPEX outlook at this point as we are still in the study phase.
Questioner No. 2	
Q1	I heard that you will introduce virtualization in your core network during the fiscal year ending March 31, 2022. Does this mean you will complete the virtualization of core network by then? Or, if it is only partial virtualization, what percent of the network will have been converted by then?
A1	Virtualization can be divided into two main components: i) core network, and ii) radio access network. The presentation deck primarily contains descriptions concerning the virtualization of the core network side. In our current plan, over half of the core network will have been virtualized by the end of FY2020. Because the core network consists of a number of node systems that offer various services, we need to migrate our equipment taking into consideration the actual status of service delivery. We have thus employed virtualization in the equipment that are newly introduced. We expect to complete the virtualization of entire core network by the end of FY2024. For the radio access network, on the other hand, we are moving forward with the discussions for virtualization in accordance with the direction of open network (O-RAN). Specifically, we plan to conduct a verification trial within FY2021 and start practical implementation from FY2022 onwards. The real work begins now as there are still some technically challenging issues that we need to address.
Questioner No. 3	
Q1	I heard that the average data consumption of your customers is currently about 5-6GB, but I believe this could eventually rise to 50-100GB as the adoption of 5G-enabled devices expands. Please share with us your infrastructure (including the backbone) rollout plan and time schedule.

A1	<p>One possible approach is to skillfully combine the use of virtualization, which can be divided between hardware and software. For hardware, we will use generic equipment to the extent possible, and implement software on top of it to realize various features. We plan to properly tackle virtualization also for the purpose of improving our cost efficiency.</p> <p>As we mentioned earlier, our plan is to complete virtualization for over 50% of the core network by end of FY2020 and for the entire core network by end of FY2024.</p>
Q2	What is your projection concerning average data consumption per user in FY2024?
A2	It is hard to give you a concrete prediction, but we will prepare optimal network capacity commensurate with the usage status of customers.
Q3	The explanation provided by carriers have so far been centered on infrastructure-related matters such as the planned number of base stations and investment, etc., and we have not heard anything about possible killer applications or the projected pace of customers' data usage growth. What are your views on these points?
A3	During the presentation, we provided an explanation on a wide range of services that leverage virtual space as potential killer services for 5G. Besides these, we plan to offer 5G-unique services in various categories such as gaming, sports viewing and many more. In order to have customers utilize such services, we must properly build our 5G network. We will therefore strongly push forward our area buildout efforts in parallel.
Q4	If you pick up three killer apps/software that will allow you to exploit your technical advantage, what will they be?
A4	We basically believe video-related software would be key. However, 4K or 8K-compatibility is not necessarily required for consumer mobile devices. As presented in our "My Network" concept that we announced a while ago, we envisage a world where various peripheral devices are connected to a core smartphone. We anticipate a transition from a mobile-centered service offering to a world where more diversified services will be offered through the linkage and coordination with many peripheral devices. Other than those provided directly via smartphones, various applications and services that take advantage of 5G's characteristics offered through XR-enabled and other eyeglass-type devices or by converging virtual and physical spaces, will also become available.
Q5	As we move toward the photonics-based transmission environment of 6G, it is said that compound semiconductors may become necessary. Some compounds are rare metal, thus securing such resources taking international relations into consideration may also become a challenge. Meanwhile, due partly to the impact of COVID-19, many countries are now trying to increase domestic sourcing, but still rely on overseas procurement when it comes to network systems. In the next 10 years, how do you plan to promote domestic production while maintaining international collaboration?
A5	<p>As far as 6G is concerned, we are moving ahead with R&D, trying out the mechanisms that are tied to the IOWN concept promoted by NTT (holding company). Under the IOWN concept, there are ideas to produce various hardware in Japan. We will look into ways to collaborate with global players while also exploring various mechanisms in Japan.</p> <p>We are also conducting various studies on compound-based devices. We are currently proceeding with our technical verification in cooperation with domestic vendors and NTT labs on the technical performance that can be delivered through compound-based devices. As you pointed out, we must also study how to procure compounds as elements, taking into consideration its cost implications and other factors. We cannot rule out the possibility of using silicon at the sacrifice of performance at the end of the day. We are currently making studies, looking at the balance of performance and costs, including the possibility of finding an intermediate solution between silicon and compound.</p>
Q6	While Japanese semiconductor manufacturers were sifted out from the market, China has been reinforcing its compound or semiconductor capabilities as a national strategy. How do you think about this?
A6	Japan's approach and strategies are being discussed at the Beyond 5G Promotion Consortium led by the Ministry of Internal Affairs and Communications (MIC). No clear direction has been presented yet, but we hope to clarify what Japan should do towards the age of 6G, skillfully combining the various assets owned by Japanese companies.

Questioner No. 4	
Q1	With respect to the progress of O-RAN, when we look at the moves of overseas vendors, Nokia does not appear to be so positive and Ericsson has issued a negative statement about O-RAN. What are your views on the current position of these two companies? Do you think you can sufficiently promote O-RAN without these two companies?
A1	Other than DOCOMO, 12 companies have joined the 5G Open RAN Ecosystem. Because each company participating in the Ecosystem possesses unique strengths in such areas as hardware, software, virtualization platform and accelerator, etc., we plan to start verification trials from FY2021 splitting roles among the participants. We hope to have more organizations, who endorse our approach, join the 5G Open RAN Ecosystem in the future. As overseas carriers have also stepped up their efforts towards O-RAN since summer last year, we believe the momentum is building up.
Q2	What about Nokia and Ericsson?
A2	We would like to reserve any comments relating to specific companies.
Q3	You mentioned that overseas carriers are positive about O-RAN, but in my impression, such carriers unfortunately do not have technical capabilities as strong as DOCOMO and rely heavily on vendors. Don't you think it will be somewhat difficult for overseas carriers to promote O-RAN?
A3	We have sensed such difficulties in our dialogues with overseas carriers. However, we believe we can provide necessary support to overseas carriers who do not possess sufficient know-how through the 5G Open RAN Ecosystem.
Q4	Do you foresee any conflict between 5G Open RAN Ecosystem and Rakuten's global deployment of RCP?
A4	5G Open RAN Ecosystem is participated by a wide range of vendors, and we believe we can create a mechanism for commercialization by combining some representative vendors. We aspire to expand the O-RAN mechanism to overseas markets in cooperation with a wide array of vendors, without limiting it to only certain vendors.
Q5	Does that mean you are not always expecting a conflict and you may be able to incorporate Rakuten in a comprehensive manner in some cases?
A5	We would like to reserve any comments relating to Rakuten's strategy.
Q6	Concerning 6G development, the government has established a consortium for beyond 5G, secured R&D budget and established a verification center. How do DOCOMO/NTT labs and the government split roles and responsibility? How do you think Japan can establish a robust position in the global arena with 6G?
A6	We have been discussing with the MIC and other relevant parties on this matter. We are currently promoting studies, reflecting upon our current and past points of improvement toward the goal of achieving global success with 6G. Unlike the age prior to 4G, a deeper level of co-creation with a wide range of partners is required for 5G, and we intend to further accelerate such undertakings as we move toward 6G. Because there are many splendid industries and assets in Japan, we believe we are well positioned to take the initiative if we join forces among the relevant players and cultivate new opportunities.
Questioner No. 5	
Q1	Is there any prospect of solving the current challenges of O-RAN?
A1	One of the challenges is whether we can create a mechanism that will allow O-RAN to deliver proper performance. Because the radio access network is located closer to customers compared to the core network, higher processing capabilities are required for the radio access, thus superior performance needs to be delivered. The second challenge is whether we can solve these issues in a cost effective way. The third is whether we can create an environment-friendly system, especially in terms of power consumption. All these challenges need to be evaluated in a comprehensive manner, so we intend to start the verification trials from FY2021.
Questioner No. 6	
Q1	For O-RAN, do you plan to build the system based on the assumption of using accelerators for now? If you plan otherwise for the future, when do you think you can realize a complete white box? Please share with us your thoughts on this in conjunction with the semiconductor roadmap.

A1	For the time being, hardware like an accelerator will be needed. We will develop virtualized RAN that employs accelerators for now, but in the next step, we will look into the possibility of introducing a more generic solution like a white box.
Q2	In that case, will it be difficult to expect a dramatic cost reduction immediately?
A2	Cost reduction is important, but developing a virtualized RAN is not our goal. It will be senseless unless we introduce a mechanism that delivers splendid performance and cost benefits. We will properly address these points.
Q3	Regarding 6G and IOWN, I believe you are tackling them aiming for realization in around 2030. Do you plan to incorporate IOWN in the standardization of 6G? Or, do you plan to push forward the IOWN concept independently from the standardization efforts?
A3	We cannot provide you with a clear answer at this point because we are currently sorting out our approach. Because both 6G and IOWN set 2030 as the target year for realization, we intend to conduct studies for standardization in mutual cooperation. For standardization, without limitation to IOWN, we plan to work in concert with the international community and promote discussions and studies toward the same direction.
Q4	If international standards bodies turn their eyes on IOWN, what kind of issues do you think they will recognize?
A4	It is very important to achieve alignment on the technical components comprising IOWN as well as its vision. Studies and deliberations concerning IOWN has already been initiated on a global scale, and we intend to steadily define the details while aligning on its value propositions and direction, and promote standardization of areas that need to be standardized.
Questioner No. 7	
Q1	You explained that progress of core network virtualization is projected to be slightly over 50% as of March 2021. When do you expect to see the peak of investment, in terms of percentage to sales and absolute amount?
A1	We have started the virtualization of our core network five years ago. Because we are replacing into virtualization-compatible equipment matching with the retirement of the equipment that we are currently operating, we cannot give you a precise indication on the timing when actual investment will be incurred. However, as we mentioned earlier, we plan to complete the virtualization of core network by the end of FY2024.
Q2	How do you plan to differentiate yourself from Rakuten's RCP? Rakuten has already commercialized VRAN. In contrast, DOCOMO does not have so many alliance partners. Are there any areas where you have superiority?
A2	One of our strengths is the fact that O-RAN is already implemented and we possess its know-how. Secondly, we can also provide the optimal O-RAN configuration through the collaboration with a wide range of vendors, i.e., not just only certain vendors. Such collaborative approach, in our view, will allow us to respond to the diverse needs of the 5G era.
Q3	Rakuten already has a track record of introduction in a number of companies. Don't you foresee any problems concerning the timing when O-RAN gains attention and new players enter the market, and the timing of DOCOMO's commercialization?
A3	We don't think there will be a problem. 5G was launched in Japan in 2020, and only in 2019 even in the world's earliest markets, so its adoption will begin to expand from now onwards. The size of RAN-related markets is considered to be quite large according to many market surveys. The real competition begins from now.
Questioner No. 8	
Q1	Regarding the 5G essential patent ownership share on Page 10 of your presentation material, does DOCOMO own any patent that could become your advantage from a global perspective? Also, as your future policy, what kind of patent do you plan to hold in the future?
A1	We initiated the R&D and verification trials for 5G over 14 years ago. From early on, we have conducted technical verifications for the basic communication mechanism of 5G, proposed them to standard organizations and currently own them in the form of essential patents. Most of the patents we hold are those related to wireless communication and we own their rights. For the future, as has been the case so far, we believe our patent portfolio will consist mainly of

<p>radio technologies and a certain number of service-related patents. Going forward, we expect new technologies will become available one after another as a result of our collaboration and joint efforts with other industries. We will attach stronger focus on such new technologies and strive to obtain the rights of more patented technologies.</p>
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