

## docomo Open House'22 Small Meeting QA Session Minutes

Question No. 1	
Q	I have a question about O-RAN. You explained that you have formed an alliance to develop and provide O-RAN to overseas carriers. I would like to ask if you have any plans to implement O-RAN at DOCOMO for your own business? Because you already commenced commercial services, wouldn't it be difficult to introduce O-RAN afterwards?
A	As shown in the presentation deck, in March 2020, we launched our service after completing commercial development of the master and slave stations of the radio access network based on the interface specified by O-RAN Alliance. When we first developed the service, we used dedicated equipment for master stations. Thereafter, however, we proceeded with the development of what is known as the virtualization concept, i.e., implementing this capability in a software that runs on a generic hardware. The description in the slide "aim for commercialization within FY2022" assumes the adoption of this scheme at DOCOMO. A key point here is that, by adopting an open, standardized interface between different equipments, the hurdle of introduction can be lowered if the same interface is employed even in cases where new equipments are added later. To further expand our 5G coverage going forward, we need to deploy more master stations. Once we complete the verification of performance and other aspects after combining the new virtualized master stations, we plan to properly introduce them in our network.
Q	Will this approach offer the prospect of reducing your capital expenditures in the future?
A	We expect this will lead to reduced hardware investment because we will be able to use generic hardware. The total amount of savings is still under review because there is also a software component. We have to properly evaluate the size of cost advantage going forward, because we are currently in the initial phase after service launch and the equipments are still new. However, we expect to reap cost advantage once we get into the phase of expanded adoption of this equipment.
Q	Please explain the status of R&D collaboration after DOCOMO became a wholly-owned subsidiary of NTT and your current views on the prospect of future integration? Please share with us your overall R&D strategy.
A	With respect to the basic philosophy pertaining to the split of responsibility between the holding company R&D and DOCOMO R&D, the holding company R&D performs basic research and is responsible for the research and development of technologies that can be used commonly by each group company, whilst the new DOCOMO group carries out R&D and technical development necessary for our business. This is the basic principle, and we believe this principle is more clearly recognized after we became a wholly-owned subsidiary, and we have agreed on this division of roles with the holding company. Some of the exhibits of today's Open House event are participated by the lab members of the holding company. As exemplified by the "5G Evolution & 6G powered by IOWN" area, the holding company is basically responsible for the technical development that serves as a core and requires a breakthrough. We, DOCOMO, consider ways to commercialize them at the earliest possible timing and how to employ them in our business, which in most cases relate to the communication layer. Meanwhile, for the Innovation Co-Creation Platform that we explained in the second half of the presentation, we intend to combine DOCOMO's technical assets with those of NTT group, and various technical assets owned by the holding company form the core of NTT group's technical assets. To help commercialize the wide array of technologies being developed by the holding company, operating companies are well positioned to make unique contribution by discerning how to combine different technologies with various assets to better serve our business, and we would like to firmly

	tackle this. After becoming a wholly-owned subsidiary of NTT, we have seen changes on two fronts; (i) the split of responsibility, as we mentioned earlier, has become clearer than before, and (ii) the flow, relationship and collaboration that allows us to incorporate various foundations and technologies from the holding company have become stronger, and I believe you were able to notice that from today's Open House event.
Question 2	
Q	This is a question relating to SA (standalone). While it is difficult to evaluate if the current pace of adoption (41 companies) is fast or somewhat slow following the service launch in December 2021, have you set any milestones for the initiatives targeting enterprises? Do you expect to see a constant growth in the number of companies adopting the service from currently 41 to the order of hundreds? Also, since you mentioned the service for consumers is planned for launch in July, can you give us a rough indication concerning its coverage at that point?
A	Initially, we plan to focus on the development of various use cases for 41 partners, working together with our enterprise clients. We came to an agreement with 41 companies to jointly develop use cases, as a result of making approaches from our side to a broad range of enterprises or receiving proposals from partners. The future capabilities like slicing, or properties such as high-speed, large-capacity transmission, low-latency and stable communications may carry different values and significance depending on practical case of each customer, so we attach priority to the creation of use cases with 41 partners with whom we started working together in December 2021.  We would like to reserve comments on your second question concerning the area coverage.
Q	Regarding the enterprise services of SA, I believe you are well advanced compared to your competitors, because they are either in the experimental phase, or only implementing the capability in fixed equipment. However, according to your explanation, it seems that you will first verify if you can establish a viable business with 41 partners. Do you think it will take the whole year of 2022 to complete this? Or, do you think the adoption will expand further beyond 41 companies at an earlier timing?
A	The deployment in smartphones is scheduled for summer this year, and we need to start preparing as quickly as possible how to utilize this capability in this scenario. In the case of smartphones, the main focus would be how the consumer users will utilize the service, and we intend to verify the utility and value we can offer with our enterprise customers in advance. I am not sure if I was able to provide you with a clear answer, but we would like to develop use cases as quickly as possible.
Question 3	
Q	Do you think providing slicing functions through the implementation of SA for consumers is a model that can appeal directly to consumers? Or, do you rather plan to deliver services that can exploit the network slicing functions by having users subscribe to services offered by certain companies? In the case of the latter, will it be correct to assume that, from the viewpoint of the service provider, they will be able to offer sophisticated services to subscribers of DOCOMO, but not to the subscribers of other carriers? I do not understand very well in what way you will appeal the services realized by network slicing to consumers.
A	At this point, we can only say that it is for future study. The services for consumers can be divided into two patterns: (i) the B2C model where DOCOMO directly provides services to consumers, and (ii) the B2B2C model in which our partners can deliver services to consumers via smartphones leveraging the SA offered by DOCOMO. The value to be offered is still under review, so we would like to refrain from commenting on further details.

Q	Would it be possible, for example, to differentiate the network stability between DOCOMO brand and ahamo brand?
A	There are many different possibilities and we can only say that we are in the phase of performing studies.
Q	Is it technically feasible to differentiate by brand?
A	That also depends on how to tie the brand and network capabilities. As far as the technology aspects are concerned, all the mechanisms that we explained earlier will become available, and we must study what to connect with such technologies. The differentiation by brand is technically feasible if we carry out the necessary development. But whether to provide such capability or not is a corporate judgment, and I would like to reserve comment on this.
Question 4	
Q	Let me confirm your strengths and weaknesses vis-à-vis the competition. Because I am sure that your competitors are also engaged in similar activities, I would appreciate it if you could share with us if there is anything that could potentially become your advantage on the technical front in the next three to four years, due to the lack of such technical elements on the part of your competitors. Please also let us know your strong/weak points in service development, if there is anything you do differently from other companies.
A	Our strengths and weakness compared to other companies can be evaluated from various viewpoints. One of our strong points is O-RAN, which is something we are strongly promoting and overseas deployment is envisaged. One of the rationales behind DOCOMO's promotion of O-RAN is our track record of integration—we tune up the network on our own to improve the performance, and build the network through integration with various vendors in such a way that what we constructed can provide value to customers. We believe this series of integration is a unique capability that the competition cannot provide. As written in the slide, we pursue "convergence" as opposed to simple combination, which means we seek convergence that can deliver enhanced capabilities and not a mere addition resulting from combining different equipments. This is something very fundamental for a mobile communications carrier, and we have a huge accumulation of experience as we have a long history of offering services combining the solutions of various manufacturers. This is what we are trying to address: Previously, we used these capabilities for the purpose of delivering our own services, but we changed our mindset in the direction to also use them to deliver value to other companies. In this "open age", leveraging our know-how on integration, we would like to successfully roll out our expertise in overseas markets as well.
A	We believe our mid- to long-term research is one of our strengths that the competition cannot match. Historically, we commenced research on next-generation systems from quite early on and started tackling 6G from around 2017. Currently, instead of conducting research only on our own, we work together with various partners to develop networks and use cases. We believe our innovative approach and commencement of activities from an early date are also our strengths.
Q	I believe new solutions will come out in the next one or two years. Can we expect a roll-out of a significantly larger number of solutions from DOCOMO earlier than your competitors?
A	That is exactly our aim. Many XR-based and other solutions are now becoming available and various initiatives have been undertaken by many players on an ongoing basis. We intend to cultivate new data we have never handled and not been offered as commercial business yet, e.g., the human augmentation platform we exhibited this time around. We are aiming

	to utilize human data, with an ambition of possibly converting even human emotions into data, so they can be processed, analyzed and actuated on various networks to create new services, which we believe is a very innovative area that no other companies are working on.
A	We believe we have strengths in data utilization, and the volume of data is one point that should be taken into consideration. If we take the example of mobile spatial statistics, which leverage location data, we analyze massive amounts of data at very high speeds, and technically, we offer the value of being able to process Japan's nationwide population distribution at any given time into statistical data in just 20 minutes. Just like this example, we would like to further enhance the value offered leveraging the big data we possess. Our weakness, on the other hand, is the speediness of our actions. We perform our development very meticulously based on an accurate understanding, and we admit that other companies are faster than us as they adopt a more speedy and agile approach. We would like to strengthen ourselves by speeding up the pace of development more than ever before. Also, leveraging the actual field of our Lifestyle Co-creation Lab, we started an initiative to have customers utilize the platform for technical verification, coordinating with partners' assets in data utilization—one of our strong points. The insights obtained through the verifications are fed back to customers to generate new value. We then perform further verifications and repeat the cycle of technical brush-ups. By accelerating the speed of this cycle, we believe we can reinforce our capabilities even further making use of our own strengths.
A	Mobile spatial statistics and real-time population statistics that were just explained, represent our uniqueness. Because we own the technology to process massive amounts of data, we plan to statistically process movement data and anonymize them, so they can be used in various new businesses, which is another distinctive feature of DOCOMO.
Q	It seems you still have some weakness in agile development. Have you taken any concrete actions to address this?
A	We have already implemented agile approaches, but one point of reflection is that we have not properly communicated this to the external community. Because agile development requires the right talent, we have already announced our plan to develop 5,000 agile development talents within the new DOCOMO group by FY2025. While we have already started executing actions aimed at faster development of smartphone applications or earlier market deployment of services capturing business requirements, we believe there is still room for further improvement.
A	As you rightly pointed out, we have weakness in service application development, as we had continued activities without changing the legacy organizational structure of an infrastructure company. However, we have already initiated a structure for integrated development uniting the planning side and the development team, which will enable us to move ahead with developments while observing the reaction of customers after first presenting a proposal in a PoC-type approach, and we will continue our efforts to further build up this structure. For example, in relation to XR development, we prepared DOOR this time around. This was first introduced on a PoC-basis long before we started offering this to customers as a commercial product. This PoC platform can now be used by the entire NTT group, as we plan to enable customers to access this platform going forward. This new approach is thus gradually becoming a reality.
Question 5	
Q	In the new spectrum allocation, the proportion of high frequency bands has been increasing. Can you explain the future direction of spectrum allocation and coverage

	expansion from the viewpoint of R&D?
A	We plan to use the high frequency bands for capacity expansion. Coverage expansion using high frequency bands needs to be considered in conjunction with the assumed use cases. Accordingly, it is important that we pursue technical development on both fronts, i.e., cultivation of use cases and development of technology that will allow the use of new spectrum.
A	As you rightly pointed out, we need to pioneer the high frequency bands. We cannot accommodate the traffic demand of the 2030s with the existing bands alone. In fact, there are barely any idle spectrum available in the existing bands, so we envisage usage of high bands close to the terahertz wave, with a current target of using up to 300GHz. Just like the millimeter wave, the use of high frequency bands poses various challenges, such as high propagation loss that makes it difficult to carry radio signals, and weakness of penetration against shields. We are moving ahead with our R&D activities on terahertz waves with the aim to solving these problems through technology and operations. The use of terahertz band entails difficulties not only on the radio side but also on devices; we have to start from development of devices, as there are nothing that can be used for mobile communications today. Because it is difficult to overcome these challenges only by ourselves, we intend to leverage the technologies owned by the holding company's lab and seek collaboration from vendors. Even with these efforts, the millimeter wave is not really suited for broad surface coverage. And this will be even more so with the terahertz band. Therefore, at least upon the initial introduction of 6G, we think it is better to use terahertz spectrum, if any, in limited areas for use cases where high-speed connectivity is needed, such as factories, etc. Meanwhile, technical development that will enable broader application of millimeter wave is needed. By employing low-cost techniques, such as reflectors and window lens, etc., we are currently working to make the millimeter wave usable for broad range of applications, with an ambition to enable the use of terahertz spectrum for various purposes further down the road.
Q	Up until now, I believe you followed the business model where area coverage was the biggest source of profit. The model for high frequency bands may not be suited for businesses targeting a large number of consumers, so it may become harder for you to generate profits. Do you share the same sense?
A	We, at R&D, have been making explorations so we can use the allocated spectrum for as many different applications as possible. We have been, and will continue making efforts to enable the use of high frequency bands for the widest possible variety of applications. To what extent we can realize this ambition is up to our future research and development. However, we have not made any decision to focus only on special use cases for millimeter waves such as inside factories, and we would like to make them available for consumers as well. At least, millimeter waves offer the potential for deployment in places crowded with people as well as other geographically limited locations, so we intend to expand its adoptions in such cases as much as possible. At this point, we have no intention of limiting the use of millimeter waves for only specific locations.
Q	Do you envision broad applications only for millimeter waves at this point?
A	Since we have already started using millimeter waves, we are promoting technical development that allows broader adoption. We would like to pursue more challenging initiatives with the terahertz spectrum going forward. Naturally, we have no set any restrictions pertaining to its usage, and we intend to use terahertz-level frequencies as broadly as possible. Basically, the technology that broadens the area of application of millimeter waves are considered to be effective for terahertz-level frequencies as well. And if we use such techniques on a continual basis, there is a good potential to expand the area

	of applications. Because the technology is not specifically tied to either millimeter or terahertz wave only, we plan to apply the technology originally developed for millimeter waves also to terahertz spectrum.
Q	In relation to this technology, in which specific area is DOCOMO more advanced from a global perspective?
A	We were early in exploring the use of reflectors, etc., which resulted in an accumulation of various know-how from an early date. The holding company also possesses excellent technologies, so we intend to apply them for mobile communications, develop good solutions as quickly as possible, and obtain know-how from operations.
Question 6	
Q	Regarding the external sales of O-RAN, can you walk us through how we should consider your strengths? If you are to sell O-RAN to overseas, not only your advantage in technology and know-how, but also the support you can provide will become very important, so it would be appreciated if you can give us a concrete image of your business model. I understand that Rakuten is also developing networks based on a similar concept. Can you comment on the difference between DOCOMO and Rakuten?
A	With respect to O-RAN, DOCOMO's strength is the same as the points that we mentioned earlier; we, the R&D team, have a track record of combining the equipment, hardware and software of various vendors, operating them in the field and fine tuning them to deliver the right performance. Such know-how and insights pertaining to integration are our major strong points. In fact, overseas operators do understand the importance of O-RAN for future innovation, but they are communicating with us because they do not have sufficient insights. To give you a recent example, we made a joint press announcement in January with KT of Korea and Fujitsu, which covered two elements; (i) DOCOMO provided technical collaboration for the verification of Fujitsu's O-RAN-compliant equipment at KT's lab, and (ii) conclusion of an agreement to perform verifications on the virtualization mechanism in the future. As for the business model, the support that needs to be provided in actual business deployment can be addressed with the help of NTT Data, as they have experience in overseas system integration and they serve many telecommunications carriers as their customers. We are currently discussing how to construct the support structure combining the capabilities of the entire NTT group. We plan to prepare the products and provide solid support including operations. We are moving ahead with necessary preparations keeping an eye on both aspects.
Q	Regarding network slicing, what do you think will be needed to monetize this service? For example, I can imagine the emergence of content which blends communication charges into service fee if slicing is done all the way up to the application level. When such service is not available in the current environment, it is difficult to assess whether future services that employ network slicing can grow into a 10 billion-yen business per annum, so I want you to give us some indication. How long will it take, or what kind of conditions need to be met, to establish a 10 billion-yen business per annum?
A	The question is whether we can charge additional fee when we construct a high-speed, large-capacity slice. After all, this will be determined by what kind of value will customer perceive in them, so we must properly tackle this challenge. While it is difficult to predict when and how sizable the business could grow, as it depends on whether we can offer value that can convince our partners. At the time of press release, we presented some examples of use cases, such as remote medicine support, etc. We need to verify how much value these use cases can deliver in reality.

Question 7	
Q	If metaverse takes off in full scale in five to ten years from now, which of your technologies will generate the largest amount of profits?
A	On slide 20, we described the four techniques that are essential to develop metaverse and the virtual space beneath; the front portal, 3D content, device/UI and XR space platform. I personally believe it is very important to firmly control the entry point, i.e., the front portal and roll out the space platform. How fast can we deliver an easy-to-use mechanism to the market will be key.
Q	I think it's probably a place where Meta is strong, but do you think you can prevail over the competition? Do you intend to make money by providing the platform, or by offering the development tools for the platform?
A	The presentation material contains a description "development tools", and how fast can we prepare the environment that allows for the creation of mechanism will hold the key. To this end, we are looking to provide both the platform and the platform development tools.
MC	Earlier, there was a question concerning the difference with Rakuten (question no. 6), and there seems to be a supplementary comment on this topic.
A	On slide 10 of the presentation deck, it is written that 13 companies are performing a review. DOCOMO provides a number of combination options for development servers, accelerators, virtualization platform and base station software, etc. We prepared several patterns of options to cater to the difference of requirements and capabilities of each market. One of our strengths, in our view, is the ability to offer virtualized base stations suited for the needs of each market.

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