Summary of Minutes of the Fourth Round Table Conference on the Neutrality of Networks

1 Date and time: February 28 (Wed), 2007, 13:30 to 16:00

2 Location: Rose, 6F, New Building, Toranomon Pastoral

3 Attendees:

(1) Members (Honorifics omitted)

Takanori Ida, Hiroshi Esaki, Kiyohisa Ohta, Yoshinori Sakai (Deputy Chairman), Nobuko Takahashi, Toshihiko Hayashi (Chairman), Masayuki Funada, Toshihiro Matsumura,

(2) Observers

ACCESS Co., Ltd.; Apple Inc.; Internet Initiative Japan Inc. (IIJ); Intel Corporation; INFOCITY, Inc.; Google Japan Inc.; GOURMET NAVIGATOR INC.; KDDI Corporation; J-Stream Inc.; SOFTBANK TELECOM Corp.; D4DR Inc.; TELECOM SERVICES ASSOCIATION; Japan Internet Providers Association (JAIPA); Nippon Television Network Corporation; Nippon Telegraph and Telephone Corporation (NTT); Fujitsu Limited; Microsoft Corporation; Mobile Content Forum (MCF); Yahoo Japan Corporation; USEN Corporation

(3) Ministry of Internal Affairs and Communications

Mori (Director-General of the Telecommunications Bureau), Sakurai (Director-General of the Telecommunications Business Department), Taniwaki (Director of the Tariff Division), Ninomiya (Senior Planning Officer of the Tariff Division), Samura (Director of the General Affairs Division), Suzuki (Director of the Telecommunications Policy Division), Ohashi (Director of the Computer Communications Division), Imagawa (Senior Planning Officer of the Telecommunications Policy Division)

4 Agenda

(1) Presentations 3) (first half) by observers at the Round Table Conference

[Takizawa, Chairman of the Executive Committee, TELECOM SERVICES ASSOCIATION] (Document 4-3)

- It seems necessary to build a consensus on the vision of NGN, including the question of whether or not we should make a distinction between the Internet and NGN in our discussion.
- Currently, the ratio of P2P traffic in the Internet is very high. However, as new large-capacity traffic is expected in the future, we must refrain from discussing things from the viewpoint of P2P alone. In addition, further developments can be considered in things such as the content,

quality and the business model of the provider for each traffic, so it is difficult to decide a uniform rule at the present stage.

- As for fairness among layers in the use of networks, it is desirable from the viewpoint of providers for lower layers to be fair to upper layers. From the viewpoint of users, it is desirable for the services of each layer to have substitutability.
- NTT says that it has, for the moment, no plan of unbundling for NGN except for three interfaces. However, if the entire network is to be divided into layers to allow unbundling of necessary functions, diversified services will be created as a result, so we want rules to be made in order to open the said service functions.
- As for the Internet, we should deliberate on how to address the matter while considering how rules are being made in overseas countries. Until we are ready to make rules of our own, it is appropriate to leave the matter to the market principle.

[Kurasawa, Vice President, GOURMET NAVIGATOR INC.] (Document 4-4)

- Our service is to provide restaurant information to allow Internet users to search for restaurants. The business model is to provide restaurant information to the Internet users free of charge and collect fixed basic subscription fees from restaurants, and a fee for using sales promotion tools for encouraging agents. There are many players in the restaurant industry. Their sales promotion budget, however, is low, thus information transmission over the Internet is an effective service with growing numbers of users, members and restaurants.
- We are considering the costs and time incurred by users and their operational environment for making content. This depends greatly on the environmental condition of networks. The Gourmet Navigator side, too, is making efforts to make content easier to use and to place cache only for images on the ISP side.
- At the beginning of the service, content mainly consisted of text. More and more advanced technologies are being used with the advent of ADSL (constant connection and fixed rated system) and the spread of broadband.
- Since the user benefit does not necessarily depend on high performance, we provide mainly still images. Rich content is not necessarily suitable.
- However, it is important to think of new services to keep pace with new technologies. It is necessary to provide various options since user needs are diverse. Reducing the number of options by making all networks have high quality, high function and high price must be avoided.

[Kamo, Vice President, USEN Corporation] (Document 4-5)

- When looking at the neutrality of networks from the viewpoint of providers, it is a broad

principle that individual layers can be connected in an open basis to ensure the fairness of use. As for the fairness of cost sharing, it must basically be left to the market principle, except for some bottleneck facilities.

- What is important when looking from the viewpoint of users is to enhance network transparency. It is necessary to ensure the disclosure of quality information (providing rankings that clearly show what users are paying for and make regular evaluations), and the disclosure of the details on restriction of use (rule making and prior disclosure of the details in placing restrictions on particular protocols, applications and terminals, etc.).
- Currently, users choose networks based not on quality but on price and brand, since users cannot use the information related to quality as a criterion for determination.
- In addition, because content application service providers cannot see whether they can provide services to end users and the risk of restriction from the network operator side exists, service development will be impeded. Network operators are losing their motivation to invest in quality and spend money on sales activity (cost for acquiring clients).
- The distribution rate of GyaO is 768kbps, while there is no difference in the status of reception failure between optical networks and ADSL according to a monitor questionnaire. It is not the infrastructure per se, but the difference in geographical areas or the means for connecting to networks (ISPs) that matters.
- IX connection cost, data center cost and server cost are incurred by content providers, users pay network operators for networks lower (to the user side) than IX and users pay terminal manufacturers for the terminals used by the users. This is the cost-sharing structure of current networks. Any discussion on cost sharing must be made within this structure.

[Main discussions]

(Member)

The discussion for NGN has so far focused on domestic issues, such as the market dominance of NTT, and TELECOM SERVICES ASSOCIATION raised a question of how to set up a national system in terms of international standardization. We should discuss this first. What shall the Government do to enhance the presence of Japan regarding the international standardization in ITU, etc? In addition, what do you think have been the problems so far?

(TELECOM SERVICES ASSOCIATION)

It is not an answer of the Association, but for one thing, when considering what sort of network NGN shall aim at, it is important to create a widely acceptable NGN ahead of other countries by quickly accumulating achievements to make de facto standards. For another, the leading ICT vendors in the world are now mostly US manufacturers. Japanese manufacturers must commit themselves deeply to the efforts being put forth in Japan and strongly promote a movement

toward making the products of Japanese manufacturers be de facto standards.

(Member)

Both are essential points. The same is required for not only NGN, but also mobiles.

(Ministry of Internal Affairs and Communications=MIC)

How Japan behaves regarding NGN in the international world is a material issue. The status in Japan is that the overseas development of equipment (networks and services) is smaller in volume compared to the domestic broadband and mobile development. Under such an awareness of the problem, we set up the Round Table Conference on ICT Global Competitive Power at the direction of the Minister. It has been studying how Japan should demonstrate its global presence in several fields, including the next-generation IP network, wireless and broadcasting fields. An interim report was drafted in January, and now we are working to finalize the report by the end of April. In the Conference, we set up the Next Generation IP Network Forum (shared by industry, government and academia) under circumstances where global standardization of NGN has been promoted, and started to work on domestic standardization, how to make it appealing for the world, how to ensure mutual connectability and mutual operationability. We are just striving to discuss, on a shared basis between industry, government and academia, how to promptly disseminate NGN as a network of global standards.

(Member)

In the presentations by USEN and the TELECOM SERVICES ASSOCIATION, their stated view was that it was appropriate to leave the matters of cost sharing and fees to the market principle. Do you think the matters will go smoother if left to the market principle?

(USEN)

I think it is O.K. with the Internet since it has developed as it was left to the market principle. It seems permissible to leave matters to the market principle as long as the network operator side can provide the material for users to make judgment under the situation where rich content has appeared and the base of broadband users has expanded in recent years.

(Member)

It seems that by leaving the matters to the market principle, fees will be established on their own through competition among two or more network operators and we will have nothing to worry about afterwards. However, I thought the discussion so far had revealed the reverse.

(USEN)

I think that the problem is that consumers are being provided insufficient information. Users really do not understand, and are left at a loss as to where the problem is and why they cannot use it. It is O.K. to leave matters to the market principle, but as a premise, it is necessary to disclose information.

(Member)

I think information should be disclosed as a responsibility of the operator side if users are not given enough information. The section titled “Users’ viewpoint” on page 5 of USEN’s document said that quality information must regularly be disclosed and ratings should regularly be evaluated. In that case, who do you think should do them? Do users request them?

(USEN)

Users are not requesting them but, as a content provider, we feel them to be necessary in providing services to users. It would be favorable to conduct a regular evaluation of ratings, but how to actually do it is a very difficult question. For example, users will not understand if we just convey information as it is, such as how much bandwidth should be secured per user and the percent of operation rate at which lines must be reinforced. It is desirable for carriers and ISPs to display such information by some means such as an easy-to-understand classification. It really is a difficult question how to do such, and we have no specific ideas.

(Member)

Since it is not easy to make comparison, and operators are constantly in competition that makes comparison more difficult, we must start by making a rule defining what to compare. It seems that we should discuss the matter here, if we can build a consensus to work on it jointly.

(Member)

It is no great thing in the distribution industry that a product goes through various stages before it reaches the end user. However, users need not care much in their daily lives about what the contracts between wholesalers and retailers are, and consumers’ freedom to choose, as they desire, is ensured. What is the problem in communication?

(USEN)

Maybe the problem is, just as in the financial service, that there is much in communication that people in general cannot imagine and that is not visible in any form. I thus feel that it is an industry that requires the making of rules that are more rigid than in other industries.

(MCF)

I understand that there are problems on the network side, but the structure of CDN is also a big point on the distributor side. Using P2P mitigates the load on the server side and user benefits may be improved. Do you have any solutions on the distributor side? In addition, the questionnaire shows that USEN is on both the content provider side and the network side. Is there any questionnaire dedicated to those who use GyaO Hikari (using their own ISP)?

(USEN)

CDN is connected or peered to IX as GyaO, as usual. Besides, distribution is sometimes made by placing cache in ISPs. Furthermore, in the case of Flets, distribution is sometimes performed by direct attaching. Since users may sometimes be unable to see and hear content via the usual IX, we are providing peering and cache as well as making it closer to the edge. We are not

implementing the P2P business model. The first reason is that a license for P2P cannot be obtained from content holders. The second is that content and CM are distributed separately in order to insert advertisements in each user attribute and this process cannot be employed in P2P. The questionnaire is for GyaO users, not for GyaO Hikari (ISP) users. GyaO Hikari users number slightly over 10 % of 2000 respondents. The defective reception rate of GyaO Hikari is at a low level.

(MCF)

I heard that delivery servers are placed on the ISP side. Can you disclose their network structure and number?

(USEN)

No, we cannot, because they are not ours.

(MCF)

Such information may be necessary in terms of dissemination to users. What are you going to do about information disclosure on the distributor side?

(USEN)

Disclosure is possible since the information on how many content servers and where they are placed has nothing to do with the source of the competitive edge of GyaO.

(J-Stream)

We engage in content delivery. The foremost factor of defective reception is a PC problem, but many cases occur due to traffic loss between the networks of ISPs and IXs. If servers are placed at many places with a view to eliminate traffic losses or disperse the load, the expense cannot be collected. Then we can do naught but depend on peering and not do everything with CDN. The only possible way for stabilization is to reduce the infrastructure cost, but whether or not video distribution can be a business depends on the wholesale prices of the current carriers. It seems to be impossible if it goes on as it is now. In order to show images by normal streaming and collect the cost through advertisements, the base cost of lines has not been reduced, and thus we cannot help distributing at the cost of quality.

(USEN)

I think the price to end users can be raised if it becomes a matter of course that network operators and content delivery operators perform labeling. It seems that people may purchase products of higher quality even though their prices are a bit higher if their labels were reliable. If that is duly realized, it will be beneficial for network operators, users and content providers.

(Member)

It is good if quality is improved as a result of labeling, but it can be achieved under the premise that sound competition takes place. Users will not allow providers to gain extra profit by this. From this point of view, “it is essential that end users be linked together,” in the

GOURMET NAVIGATOR presentation is very important. Based on this, how do we secure the fairness to enhance the quality? The fairness includes labeling. It is O.K. if labeling comes up as an objective means for appealing to the public, but to gain profit from that seems a peculiar idea. What matters is that what we should do to cause technical innovation because the cost has not been reduced due to uninnovated technologies. If the problem is that there are no available choices, a rule must be made to make them available.

(KDDI)

It was pointed out that the bottleneck is the high cost of infrastructure lines. In comparison with what do you say that the cost is high? Just simply saying high makes us embarrassed. Our fixed communication service is ¥60 billion in the red annually and we never think that the cost is high. The reason why you think it high is attributable to the fact that not only communication cost but also actual infrastructure cost such as electric poles and conduits are high. This discussion will thus be insufficient if limited to the communication service alone.

(Member)

As for the three NGN scenarios on page 3 of the TELECOM SERVICES ASSOCIATION document, NGN cannot be enclosed without sacrificing technical development. When standardizing NGN, it seems that no distinction can be made among the three scenarios so long as operators compete with each other in providing new services based on technical innovation.

(TELECOM SERVICES ASSOCIATION)

How we should consider the major premise of whether or not we demand quality of the Internet has been dropped from the discussion. Users and those who engage in the distribution service perhaps do not know where the bottleneck exists if seen from their standpoint, but in most cases it is the network that cannot be made by the self-help efforts of providers. This discussion will be fruitless if it is based on the recognition that nobody will guarantee the responsibility relating to networks. Under such circumstances, why we raised the question of what we should aim at is because we are not sure if every one thinks that NGN will not be created as such a network. A general concept may arise that mixed menus will be adopted for NGN, such as those with guaranteed bandwidth and different rates. No conclusion will be reached if we discuss the Internet. I think we should make networks for which we can identify where the responsibility lies.

(Member)

Ratings can be determined by, for example, returns and risks in the case of financial products, but as for content (distribution) you will see by just thinking of quality that how to do the rating is quite difficult. Furthermore, who does it and how far does it go? I think we should consider the cost of any rating system and its social merits under another situation.

(USEN)

I agree to the view of TELECOM SERVICES ASSOCIATION. It will be more productive to discuss what we should do in NGN rather than in the current Internet.

(2) Presentations 3) (latter half) by observers at the Round Table Conference

[Bessho, Chief Compliance Supervisor and Manager of the Legal Department, Yahoo Japan Corporation] (Document 4-6)

- Our challenges include ensuring innovation through ensuring fair competition, and ensuring the provision of services to users at a proper rate. Furthermore, as long as ensuring fair competition is one of our challenges, discussion on the neutrality of networks is needed, considering the actual state of the market in Japan.
- As for vertically-integrated business, it is necessary to consider for what purpose and for whom the business is intended. Certification and settlement require the existence of diversified frameworks and it will affect users if restriction is placed on such frameworks.
- Since the fields that can be vertically integrated are limited, the anti-competition element is big, and thus fair competition must be ensured in each horizontal region.
- As for NGN, whether or not anti-competition elements exist has yet to be validated. What are important include QoS, certification and settlement, users' freedom of choice, clarification of service details, and clarification of the basis for pricing.
- Regarding the fairness of the use of networks, it is essential to maintain a free business space without heightening the barrier for entry. For this, it is important to ensure the openness of platform functions, the equivalence of the use of applications and the open connection of terminals. Securing the free exchange of mutual platforms will provide an opportunity for innovation.
- As for the fairness of cost sharing, it is important that the rate system be necessary and transparent to show the fairness of cost sharing. It is doubtful whether the principle of compatibility should be applied to the communication field. There is also a question of whether a specific way of using a specific service by a specific user, which is linked to cost sharing, can be identified. What matters is that whoever assumes the responsibility is identified.
- At present, data is often insufficient and it is necessary to continue studying while collecting and validating data in order to conduct the discussion in a proper manner.

[Murakami, Vice President, Google Inc.] (Document 4-7)

- What is to be noted as the background of the fact that the Internet has been booming is the point that it is an infrastructure that urges technical progress in a flexible and open form of so-called “Innovation without permission”. In addition, that there is a restriction framework to guarantee the openness and indifference for the facilities of the Last one mile cannot be ignored in terms of the system.
- The Japanese broadband market is an intensive market, and it is expected to keep on growing at a slightly high level of intensity. NTT maintains its competitive edge to some extent for the Last one mile of FTTH in the broadband market for consumers. NTT has been requested to open its optical facilities to other competitors, but the conclusion is still unknown.
- If no proper competition happens to exist, wired broadband providers may unexpectedly have the incentive and ability to be the gatekeepers of the Internet.
- The Government should aim at making a wider band available to users at a lower price. If, however, broadband providers are allowed to handle some services on a priority basis, it will damage economic and technical incentives in a form that goes against the Government’s objective of expanding available bands.
- The neutrality of networks means to prohibit any discrimination based on transmitters and destinations of Internet traffic, and it must be ensured by enforcing restrictions with the minimum possible intervention.
- Speaking from my experience in the United States, broadband providers may attempt to remove the control of their activities on the Internet from the users. The vertically-integrated carriers may have incentives to gain larger profits through discriminatory handling of other players, and there may be the possibility of bringing economic incentives to gain profits from the rarity of a band in which preferential treatment has been artificially created. Therefore, it is necessary in Japan to discuss the neutrality of networks.

[Yoshida, Representative Co-President, Intel Corporation] (Document 4-8)

- Our stance for the neutrality of networks is that access to legal content, the starting of applications selected by users, the connection of devices that are harmless to the Internet and satisfactory communication bands accompanied by provision of services should be ensured. We agree to the basic concept of the Ministry of Internal Affairs and Communications. Service providers must not limit the connection function of content/devices or limit the device connection function without any proper reason.
- As for the improvement of Japan’s global competitive edge, how to develop and build stable

infrastructures of the global standard is important.

- From now on, we will enter the era where vertically-integrated and horizontally-nonintegrated business models exist together and it will be possible to combine the advantages of both models for building infrastructures. Under such circumstances, it is important to make them have a structure that allows users to receive the most beneficial services viewed from them and a structure that allows competition caused by innovation to bring income from services.
- It is important to make platforms that continuously reduce infrastructure costs. The main frame will change to the horizontally-nonintegrated type even if we do not make all of the platforms. It will be possible to reduce the development cost by using the standard model in an open environment.
- How companies use ICT to raise their competitive edge is classified by layer. We make the model as we consider how information can be transmitted to users in a shorter time and the infrastructure that is needed for that.
- As for standards, we must create standards to be delivered from Japan. Usually, we often bring domestic standards out to the world, but for NGN we should be able to participate in it from the beginning.
- When new technologies and services appear, it must be the users who select them. For that purpose, both users and the provider's side must mature, and it is important to consider the neutrality of networks so that innovation will be constructed in the course of the growth.

[Main discussions]

(Member)

There was a comment in a "first-half" presentation to leave things to the market principle. I recognize that, in a case where individual negotiation is to be conducted requesting the sharing of the additional cost since a communication operator places a load on particular content providers and applications, it is a typical market principle to impose restrictions on access and speed if the operator says "No". It is a case of perfect relative negotiation, and they know the situation because they are both professionals. If the negotiation failed here and restrictions were to be imposed on content, consumers could switch communication operators so long as the competition mechanism is working, even if unreasonable restrictions had been imposed. When you say the market principle, is such a case also included in the market principle (market mechanism)?

(USEN)

I think it is. However, if network operators have narrowed bands, they must announce that to the consumers. Currently, they do have narrowed bands, but they have not disclosed it. If they have disclosed it, I understand that it is the market principle.

(Member)

When an economist says “market principles,” he/she means “competitive market principles”. What you told us now is the story of “freedom of contract” which allows the relevant party to relatively make any contract so long as it will not go against public decency. Does the term “market principle” not mean the competition principle under the environment where a contract is concluded with an operator because the other operator is unfavorable?

(TELECOM SERVICE ASSOCIATION)

What you pointed out is totally right. What matters is that whether there are any other options. We used the term “market principle” to indicate that providers will be weeded out under the situation where users can switch providers or can use other providers.

(Member)

I recognize that relative negotiation is a typical market principle. I would like to ask Google. Do you disagree with performing QoS under the circumstances where there is a fear of NTT dominance in the Japanese communication market and consumers not being able to switch providers immediately? Otherwise, do you think it is questionable, without regard to whether the communication market is competitive or not?

(Google)

I would say “Yes” to both. Why we told you the background of the fact that the Internet has been booming is that the latter case must not be true as logic. Another concern is that things will keep on going in Japan for the moment under the situation where a particular carrier exists who has market dominance in the Last one-mile service of FTTH. Our comment covered both aspects.

(Member)

This round table conference has so far focused on domestic discussions based on the viewpoint that weak upper layers are not treated unreasonably by strong lower layers, but I wonder if this is true or not. Google and Yahoo have grown to be global dominant players. Thus, it is necessary to question whether it is permissible to leave the relationship between upper layers and lower layers as it has been so far.

(IIJ)

It was said that we are in the middle of a course of change and innovation, and I think the focus should be on assumed future changes. We are now at the stage where the standard use of infrastructures has not been refined. Innovation is now taking place, and it is difficult to discuss what we should approve and the extent to which we should approve such in terms of fairness and neutrality based on the current use. With that as a premise, we must identify the neutrality of infrastructures and services after discussing what the uses and services of interfaces and infrastructures are. In this sense, sometimes QoS may be a requirement, but a statistical

multiplexing network will often work conveniently and effectively. Since network form is not necessarily limited to any single one and the diversity of services may often develop innovation, I feel that the discussion would be better organized if we could clarify how to conceive the concept of a neutral interface that will not prevent innovation with the premise that new possible uses and various possible changes may occur instead of conducting discussions that may converge on the target at the present stage.

(Microsoft)

It is a key point not to prevent innovation. I do not think that this discussion is to examine how to secure fairness for network layers where the communication layer is too strong. It is the world of ICT, where dominant players can easily be born in any layer due to the network effect. The problem is that potential innovation will stop when dominant players take exclusive actions. Social responsibility will be generated not only in lower layers, but also in upper layers, according to their respective market dominance. It seems better to clarify that the reason network neutrality is demanded is because ensuring the neutrality of networks is important for innovation to take place.

(Member)

Innovation will not necessarily take place uniformly, but in some cases, it occurs intensively, making a breakthrough. On the contrary, QoS ensures the profits of foregoers, and it seems possible that different rates are being charged to collect prior investment. It is not desirable to fix such an approach, but it will diffuse if it becomes the standard after initially being optional. Then, in relation to not preventing innovation, rewards to those who made innovations should also be considered.

(Member)

Broadband access service cannot be switched to other providers. As for the portability of cellular phone numbers, I think the fact that terminals incidental to operators must be changed and users are then forced to buy new terminals has also prevented users from switching operators. When switching to another operator, is it possible to promote transfer by, for example, taking the terminal of the former operator as a trade-in?

(USEN)

For the present, no. Leaders from electric poles may be shared but terminals may not (I guess that it is not from USEN as an ISP but as an owner of infrastructures,).

(NTT)

In the case of fixed communication, terminals are open-priced, but it means that the cost of optical terminating equipment in customer premises is collected by use fees

rather than by being individually purchased by users. Thus, this cannot be much of a barrier to switching of providers. Temporary interruption cannot be avoided upon switching providers, and this may be only a possible problem.

(Member)

Do you mean that it will be possible if negotiated among providers?

(NTT)

Providers are competing with each other, so each provider will beg prospective users to use it.

(Member)

Can innovation be promoted if users increase their knowledge on each stage and can tailor their use for themselves?

(NTT)

The rate of NGN is not definite yet, but it cannot be possible for services accompanied by QoS alone to be provided. Users will make choices. It is difficult to ensure the quality in best-effort type networks. We are going to set the rate system and the QoS level from now on. We of course assume risks as well, since we assume the cost, but it is a huge-scale experiment in one sense, and we think all that is necessary is for the users to use and become familiar with NGN.

(Member)

The term “end” in saying “end to end” refers to networks and not terminals. It is the Internet that connects in networks while ensuring the diversification of networks. It is O.K. even if the unit of the particle in the network is ultra QoS network, but the value of the network is that it works. As GOURMET NAVIGATOR pointed out, even low infrastructure cost is permissible, as long as it can ensure connection. On the other hand, ISPs appear to be smart in using the best-effort type and the worst-effort type differently. How can we ensure the fact that both can be controlled as desired and it is impossible to designate one as a requirement? We should respect the neutrality by not designating one as a requirement. In the discussion of whether the upper is stronger or the lower is stronger, how much information can be distributed may be a significant point for the neutrality of networks. In other words, it is highly possible that whether or not the right to access certain information can be created through other providers becomes a point for realizing the neutrality of networks.

(INFOCITY)

The word “innovation” has recently become quite popular, but it seems to have been defocused. It is not enough to just say, “Innovation is important.” We also find

“Innovation without permission” on page 2 of the Google document, but what matters most is whether this is ensured or not. Then we will deploy our developments in the world for users to choose. Conversely, the environment where users can make that choice is extremely essential.

End