Interview with Marvin Ammori and Christof Weinhardt on "Network Neutrality and the Future of Telecommunication"

Marvin Ammori is a lawyer expert in issues involving technology, speech and innovation. He worked on network neutrality before Congress and the Federal Communications Commission for many years as the head lawyer for Washington, DC's leading digital rights organization, Free Press. In that capacity, he served as the lead lawyer on the seminal Comcast-BitTorrent case. He subsequently became a law professor, writing and teaching in global and U.S. Internet law. He is a Legal Fellow at the New America Foundation in Washington, DC and an Affiliate Scholar at the Stanford Center for Internet & Society in California.

Christof Weinhardt is head of the Institute of Information Management and Systems at Karlsruhe Institute of Technology where he also serves as a full professor. He is speaker of the competence field "Interaction of Science with Technology" and Vice Dean of Research at the School of Economics and Engineering. Further, he is director of the Research Center of Information Technology (FZI) as well as founder and director of the Karlsruhe Service Research Institute (KSRI) of the KIT. Since 2008 he has been member of the expert group "Business Economics" of the Deutsche Forschungsgemeinschaft (DFG) and member of the committee of enquiry of the German Parliament (Bundestag) on "Internet and Digital Society". His research focuses on problems and solutions of information economics and market engineering with applications in the areas of finance, energy, and telecommunications of electronic markets.

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Development of telecommunications industry and its innovative impacts on economy and society at large is driven by various factors. In addition to the respective corporate strategies and the dynamics of related technologies the relevant institutional framework with its regulatory rules has to be named which influences this development. In the 1990ies (in the U.S. and UK already in the 1980ies) the opening up of telecommunication markets and the forming of a vibrant, multifaceted, and highly efficient market segments were mainly enabled through liberalization, privatization and competition oriented regulation. The emerging Internet with its end-to-end-characteristics and its flexible openness for all sorts of applications has added to this development. For a number of years there is a discussion going on – first starting in the USA, however increasingly in Europe and globally – whether the Internet with its broadband accesses should remain open for any kind of (legal) application, i.e. whether the transport of data should be operated in a neutral, application-agnostic way; or whether one should introduce (paid) quality of service differentiation for data transport, also in order to create incentives for infrastructure investment and to satisfy specific customer needs.

The debate on network neutrality is led heftily and has not yet come to an end. A few countries such as Chile and the Netherlands have introduced strict network neutrality rules by law. In other countries, however, discussions are ongoing. Some first and general guidelines addressing net neutrality issues have been put in place in the U.S. by the FCC, in Europe by the European Commission, and in Germany in the coalition treaty of the current government naming network neutrality a desirable goal. The actual German parliamentary commission of inquiry on "Internet and Digital Society" is dealing intensely with the question of network neutrality. Quite a few

infrastructure providers and network operators fear that strict network neutrality rules would not leave sufficient leeway for future investment and business models so that the roll-out of broadband would suffer. On the other hand, users and service providers underline that neutrality and openness of the Internet represent a precondition for innovation and free evolution in a digital world.

As co-editors of this special issue we have asked two proven experts (see their brief portraits at the beginning) to answer a number of questions that we had pre-formulated. This way, the relevance of the debate on network neutrality for the future of telecommunications and its environment should be better assessable. Our readers will, thus, be able to form their own picture of the different positions and hone their own judgment.

BISE: What is your definition of network neutrality (NN)? What variants of this concept have to be distinguished?

Ammori: Network neutrality is a simple concept in principle. The concept requires infrastructure owners who offer access to the Internet not to exert control over the content and applications carried on that infrastructure. Under network neutrality, users, not infrastructure owners, decide how the network should be used. Stated even more simply, an Internet Service Provider (e.g., AT&T or Comcast in the U.S.) should not be allowed to block, degrade, or prefer one online technology to another. Because of network neutrality, you can write an application that conforms to basic Internet standards and it will be available, generally subject to the same quality of service, anywhere on the Internet without the need to get permission from every Internet service provider. Further, you can revise and upgrade the application without needing permission from the providers.

Network neutrality conforms to the broad version of the "end-to-end" argument: the argument that the Internet's lower layers (i.e. the physical layers such as fiber lines, cable lines, DSL, or wireless up to the Internet layer) should be a general purpose infrastructure supporting the broadest range of applications, rather than an infrastructure tailored or biased towards particular applications.

Both commercial ISPs and governments can violate network neutrality.

While we can define network neutrality as this concept – lack of network-provider control over content and applications – many people debate how to

implement this concept through a particular legal regime. Over the last six years of debate and commentary, proponents (and opponents) have proposed many different implementations. Network providers in the U.S. wanted to implement (and define) network neutrality narrowly: only blocking would be forbidden, but not pay-for-priority or other discrimination. Meanwhile, some consumer groups, technology companies, and academics wanted a broader implementation forbidding a wider range of provider-controlled discrimination, absent special justifications including security and other compelling interests.

Weinhardt: Net neutrality describes a state in which neither service and content providers nor end users are able to or have to pay additional fees for prioritized transmission on the Internet. Less relevant are, in my opinion, definitions containing access fees for single providers that are usually not available. For Internet users, net neutrality can entail access fees for distinct service categories. A very prominent example in this regard are voice-over-IP services. However, these definitions often confound the aspect of anti-competitive behavior of network providers with regard to competing services with the aspect of investments into the network infrastructure.

BISE: Was the Internet neutral to date?

Ammori: Yes, generally. Network neutrality does not require neutrality of all kinds. It refers to neutrality in a particular way (regarding the transport of bits), at particular layers (not neutrality in the content or applications, for example), and in particular connections in a network (generally last-mile residential).

For much of the Internet's history, and much of its commercial history, the Internet was "neutral" in the way envisioned by a network neutrality rule. For example, during times of congestion, the Internet Protocol treated bits equally, rather than preferring bits sent by the infrastructure owner or its preferred partners. This neutrality likely resulted from a combination of technology, law (including nondiscrimination rules in Title II of the U.S. Communications Act), competition (including that required by that Act and by other rules known as the Computer Inquiries), and consumer expectations. Over the past several years, Internet service providers have deployed technologies, such as those using deep packet inspection, to make it possible for them to prefer certain applications or classes of

applications over others, either for quality of service or preferences to partners and affiliates.

Some argue that the Internet has never been neutral because some consumers receive better access to some sites than to others, perhaps through caching. But that changes the subject. The roads are still neutral even if some people can buy faster cars than others or can afford a home in a better location.

Weinhardt: The status quo of the Internet can be described as neutral in terms of the above mentioned meaning, as mechanisms that prioritize services against additional fees are currently not in place. However, network operators manage their data traffic during peak times and, thereby, decide which services are being favored or discriminated (in bottleneck situations). Yet, this is only used to ensure a reliable functioning of the network during peak times. Then again, for instance, mobile service providers charge additional fees for voice-over-IP services. Although, this does not discriminate certain providers, it does discriminate certain service categories.

BISE: What is the relationship between NN and openness of the Internet?

Ammori: It depends on what you mean by these terms. Network neutrality and an open Internet generally refer to the same concept. Indeed, in the U.S., the FCC called its network neutrality order the "Open Internet Order".

Some people use "open Internet" to refer to a network without blocking (but with discrimination, so all unblocked destinations are technically "open"), rather than a network that is "neutral" and without discrimination.

Further, some people use the term "network neutrality" to refer to enforceable legal rules, rather than a concept or market outcome; "open Internet" would then refer more broadly to a concept or outcome. The relationship between enforceable rules and the outcome of an open Internet has been widely debated. Internet service providers sometimes argue that, even without enforceable rules, the Internet will be open to innovators, consumers, and citizens merely through market interactions. I think that is false, based on economic considerations, not least because Internet service providers often make the opposite argument: that economic considerations counsel them to discriminate.

Weinhardt: In my opinion, network neutrality is no necessary requirement for the Internet's openness. As long as service access is not entirely denied to anyone, the general openness of a quality-differentiated network is ensured.

BISE: What role has the current degree of NN played for the emergence of innovations in telecommunications?

Ammori: Network neutrality has played an absolutely central role for the emergence of innovations in online applications. In her book Internet Architecture and Innovation, Barbara van Schewick has written the authoritative analysis of the role of network neutrality in application innovation. Because innovators did not need to seek the permission of a centralized bureaucracy at an ISP (let alone dozens of ISPs), faced low economic barriers to entry, and could reap the rewards of innovation, successful innovators were able to create technologies like Google, eBay, and Twitter, none of which kept its initial business model nor was envisioned by an ISP.

People often contrast the innovation in a controlled, specialized network, such as the traditional phone network where the phone company rolled out innovations in devices and applications very, very slowly, with an uncontrolled and general-purpose technology like the Internet. The Internet brought us far more application innovation, yielding, among other innovations, high-definition video calling – something that the centralized phone network never managed.

Weinhardt: Telecommunications, in its narrower sense, with the traditional voice services has been and currently still is strongly characterized by companies that consider the Internet as additional service. This perception is especially common in the growing mobile market. The Internet has enabled many innovations. It is difficult to say to what extent neutrality, in terms of non-quality-differentiating data transport, has been responsible for these innovations. However, the general availability of services without prior "consent" on the part of the network operator has clearly been important.

BISE: Is it true that strict NN advances service innovations that are independent from specific networks whereas constraints to NN would support innovation and investment in the realm of networks?

Ammori: No. The first phrase is correct about service innovations, but the second

part is false about network investment. Constraints to network neutrality would not support innovation and investment in networks. ISPs argue that they will invest less in networks if they cannot monetize that network-investment through violations of network neutrality. But ISPs always argue that they will not invest in networks unless government removes a regulation (such as local franchising) or eliminate their competition (in devices, applications, and Internet access providers).

Network neutrality would encourage a certain kind of innovation and investment – in technologies to increase capacity and manage bandwidth neutrally. Constraints would just encourage investment and innovation in a different kind – in technologies that allow one to profit from scarcity rather than abundance (technologies of discrimination) and in lawyers and contracts for business partnerships to ration off that scarcity.

Further, in areas covering most of the population, even without network neutrality violations, the profits from investment outweigh the cost of investment. Therefore, carriers will invest to cover most of the population. Where the return on investment for a neutral network does not outweigh the costs, society can choose to have a more neutral Internet (almost) everywhere rather than a controlled Internet everywhere. (This decision would be parallel to deciding that supplying cheaper, but contaminated, meat to more people is not in the public interest, while supplying more expensive meat to fewer people is.) Moreover, society can solve the problem of investment in marginal areas through subsidies, but cannot solve the problems of a non-neutral Internet through government action – there is no simple way otherwise to ensure an open platform for innovation and speech.

Weinhardt: It can be assumed that there will be services requiring better data transport quality than currently provided, and which will, therefore, benefit from turning away from net neutrality. Besides, in the future, such a network could provide features that can be used by service providers. For instance, the network could identify whether a service can be carried out in the desired quality and, otherwise, inform the costumer. In such cases, restricting neutrality makes it possible to allocate quality or network resources according to the respective needs via differentiated offers.

In general, the possible additional receipts generated by differentiated offers lead to more investment funds for the expansion of the network infrastructure.

In my opinion it is, however, a problem if network operators discriminate competing services exclusively for competitive reasons. Such cases can never be efficient or desirable. I am convinced, though, that this is not an issue that should be mainly discussed when talking about network neutrality, since this is evidently only a shielding of established business models.

BISE: Do you think that NN so far was an impediment for innovation in the field of networks and infrastructures (in contrast to the area of services)?

Ammori: No. In the previous answer, I noted that constraints on network neutrality would lead to investment in technologies of scarcity. I also noted that network neutrality ensures ISPs can innovate, so long as they create technologies increasing and managing capacity in a neutral way – just as consumer laws ensure car companies can innovate with safe cars.

We do not want to encourage innovation for innovation's sake. The global financial collapse resulted from financial "innovations" including certain mortgage-backed securities that increased systemic risk. In a Wired story by Ryan Singel, called "You Don't Want ISPs to Innovate" and published in June 2010, Singel discussed the "innovations" by ISPs. They are not Facebook or Google or Zynga or Hulu but technologies designed to collect and sell users' information, technologies to redirect users to ISP-owned sites despite security flaws in the redirection, and technologies that discriminate against competing or non-competing applications. Indeed, as he noted, the American ISPs (other than Verizon) have almost uniformly failed to invest in building fiber lines to the home while they seek to leverage their control of infrastructure to squeeze profits out of applications with minimal investment. So they have not invested and innovated regarding capacity, just regarding middleman "innovations" that consumers tend to oppose.

Weinhardt: Network neutrality is not binding. The operators are not forced to operate neutral networks. Rather, I am convinced that the way of using networks has changed over the years and, hence, generating their revenues by value-added services and telecommunications services

in the narrower sense doesn't work out for the operators in the future. Furthermore, services are becoming more and more demanding with regard to bandwidth, quality, security, and reliability of the data transmissions. In this field, the network operators are able to deliver added value with the help of differentiated offers and sustainable infrastructures. Yet, I wouldn't say that a historically developed and voluntarily chosen situation has been an impediment.

BISE: Seen the rapid technological dynamics, will it at all remain possible to operate a "neutral" network?

Ammori: We have seen rapid technological dynamics for many years, and companies were able to operate a neutral network.

To make the question more precise, some argue that carriers cannot operate their networks neutrally because of increased data usage. They argue that – because people use an increasing amount of data every year – congestion will increase with data usage, and the only way to ensure an acceptable user experience in light of that congestion is to prefer some technologies over others (by providing them quality of service, perhaps based on payment). But research primarily by Andrew Odlyzko at the University of Minnesota suggests that usage is increasing at a consistent rate, with no obvious recent spike in usage. Further, while exact numbers have been hard to come by, many researchers conclude that the costs of accommodating this increased usage are both falling and not particularly onerous. Finally, the experience of Comcast, which started to use application-agnostic network management practices after the Federal Communications Commission ordered it to stop interfering with BitTorrent, has shown that it is possible to manage bandwidth without distinguishing among applications or content. Comcast has also agreed to abide by network neutrality for seven years, as part of its recent merger with NBC, a media company.

Again, unsafe or fuel-inefficient cars may be cheaper to create than safe ones, just as non-neutral networks may perhaps save money; but policy should not support merely the cheapest product, where other considerations, such as competition, innovation, and freedom of speech are more important.

Weinhardt: Currently, a technologically entirely neutral network does not exist. It doesn't make sense to dismiss

reasonable traffic flow management and adopt fully "dumb pipes". This would result in irrefutable inefficiencies. However, the question remains as to how much discrimination we want to allow. Should it be possible to prioritize specific service categories? If so, how are they selected for prioritization? Should it be possible to ask certain service providers to pay? These questions are always somehow politically charged. To a certain degree, we are talking about a shift of power in favor of the network operators. That's why especially this aspect is being discussed very controversially in the Enquete Commission of the German Bundestag.

BISE: Is it true that bottlenecks in access networks necessitate unequal treatment of data streams?

Ammori: No. This question is both economic and technological. For reasons discussed above, carriers can address these bottlenecks through increased investment in neutral networks and through application-agnostic network management practices that let users choose how they want to use the network.

Indeed, as noted above, if a carrier has the right to engage in unequal treatment for payment, it will have incentives to create bottlenecks and then to auction off priority access. This would encourage investing in scarcity and discrimination rather than investing in abundance and neutrality.

Weinhardt: Already now, in a neutral network, bottlenecks have varying effects on different services. An e-mail possibly only needs a couple of seconds longer, while a phone call is being disconnected or becoming impossible to understand. A neutral network treats all data equally, but does not consider the varying requirements of the services that request or send this data. A differentiated network can fulfill this to a certain degree. However, according to this definition, it is not neutral anymore.

BISE: If one reduced the current degree of NN, what impact would this exert on the future development of telecommunications (networks and services)?

Ammori: Reducing network neutrality would decrease application-level innovation and network investment. First, depending on the particular market and technical outcomes, application-level innovation will decrease because innovators would face increased barriers to entry, namely higher technical costs (to write applications working on multiple

networks with particular network configurations) and higher contractual and business costs (to pay termination-access monopolists for the necessary quality of service to serve citizens). Again, Barbara van Schewick has rigorously demonstrated how a neutral network leads to greater application-level innovation than a non-neutral network.

Second, in addition to reduced application innovation, carriers will also invest less. They will have less incentive to invest in capacity to keep up with increased demand, as they could auction off scarcity. And they may invest less in poor areas relative to their investment in more affluent areas. In a non neutral network, carriers would supplement their subscribers' fees with payment from application-developers, but application-developers would likely pay much more to access affluent areas than poorer areas. If some affluent areas are far more profitable than other areas, carriers will likely invest in those areas, to ensure access, affordability, and speed to such profitable (affluent) consumers while investing less in other consumers. These other consumers would have more expensive and unreliable connections.

Weinhardt: In my opinion, differentiated offers can contribute considerably to a higher efficiency in the allocation of existing network capacities and, thereby, to the provision of quality for demanding future services in line with the respective demand. Thus, certain offers, which might possibly not emerge in a best-effort network, can be realized in the future. However, as this process also involves the danger of abuse, it cannot remain unwatched. Still, there is few evidence of real abuse. Hence, an early regulatory market intervention, as well as fixing neutrality as an irrefutable concept, would be wrong. In so doing, innovation can even be hindered, especially with regard to infrastructure, but possibly with regard to services as well.

BISE: In the field of telecommunications networks, do we need a sort of basic transportation service that should be ensured by all network operators or should the differentiation of offerings and prices be left to market forces as is the case in many other markets?

Ammori: We need a basic transportation service.

Economic features of the telecommunications market should make us question the efficacy of market forces. These include network effects, overwhelming economies of scale, switching costs, and termination access monopolies. Regarding termination access monopolies, for an application-developer to reach a particular user, the developer must go through the user's carrier, who has a monopoly on that particular user, without any competition.

Basic transport is, in fact, something we have in other markets. For traditional transport, we have common carriers, including ferries and railroads, and have neutrality in infrastructure including the electricity grid. The Internet is, and should be, basic infrastructure for a range of activities and business, from shopping to banking to travel to trade in ideas. Theorists favoring network neutrality have argued that "general-purpose technologies" drive considerable innovation; they also argue that some goods produce tremendous positive externalities throughout other parts of the economy and are "infrastructure goods," particularly if available for many purposes. As a result, these theorists conclude that the economic gains of a general-purpose Internet, one that functions like infrastructure, outweigh the potential harm of government imposing neutrality laws.

Weinhardt: There is the danger of network operators deteriorating transmission categories of low priority artificially in a differentiated network in order to create incentives to pay for a better transmission. Yet, the regulation of qualities or network capacities includes high risks as well. Standards that are too high can lead to inefficient overprovisioning and, thereby, even worsen the situation compared to a neutral network.

BISE: If for some reason (congestion, business policy) an equal treatment of data streams could not be assured who should have the initiative and the right do determine and select different qualities of service: the operator or the customer?

Ammori: The customer should. If the customer can determine which sites and applications receive quality of service, then the network itself is not biased in favor of some sites and applications over others. This unbiased network would promote open democratic discourse and open innovation and economic consumer choice for the same reasons a neutral network would do so.

The U.S. Federal Communications Commission generally agrees. During the FCC's open Internet proceeding, last year, Barbara van Schewick proposed a definition of network neutrality that would permit, under some conditions, discriminatory quality-of-service if controlled by the user. The FCC's order banned "unreasonable discrimination" and provided some limited guidance on the types of discrimination it would consider "unreasonable"; it stated that user-controlled discrimination is more reasonable than other forms of discrimination.

Weinhardt: The decision on the service quality on the part of the provider is advantageous as they have the exact knowledge on the technical requirements of their services and, thereby, can ensure that each customer of a network operator can use their service with good quality. Customers often are not acquainted with the technical concept of prioritization and are being more influenced by the offered tariff structure. In this regard, the subjects of network neutrality and access fees are strongly overlapping.

BISE: Do you agree that under the condition of intense network competition the issue of NN would disappear since the customer could easily switch to an alternative? What should be said for regions or markets where no well functioning competition is possible?

Ammori: I don't agree. Competition does not always lead to outcomes that consumers seek: even in competitive markets, governments impose regulations. Consider privacy rules; though companies compete, the competition does not lead to optimal privacy policies. Also consider air bags and seat belts; though car companies compete, the competition does not always lead to safe cars.

Effectively, all companies in the market may have the incentive to violate network neutrality. The competitive dynamic may increase that incentive. The presence of competition could make network neutrality violations even more likely for some companies, which would have thinner margins because of competition and would seek to cut costs or increase revenues even slightly through network neutrality violations. Barbara van Schewick, once again, has offered the most complete rebuttal of the belief that competition will solve problems for network neutrality.

For regions and markets without functioning competition – such as the United States – carriers can threaten network neutrality without even the hint of a check in the marketplace, and consumers have few or no options.

Weinhardt: Considering the current state of research, it is difficult to give a

distinct answer to this. It is often being claimed that competition solves every problem, as customers do not depend on the goodwill of one provider. In actual fact, however, it can be questioned whether the competition including varying qualities and pricing models leads to weaker competition. A homogeneous good can be compared immediately. A differentiated good, however, can be advantageous for a customer in some dimensions but disadvantageous in others. Hence, this new diversity can lead to less competition and more specialization in the market. Especially in the mobile web market, which is characterized by strong telecommunications providers, this development is quite likely.

BISE: Is it true that the concept and regulation of NN impacts (delays, reduces or enables) private investment decisions, e.g., in fiber infrastructure?

Ammori: No. Carriers in the United States generally argue that every regulation (that reduces their profits or they otherwise oppose) will lead to decreased investment rather than merely decreased dividends to shareholders. The evidence for their positions is generally lacking. In the US, however, no carrier is investing in a fiber to the home infrastructure, despite a network neutrality rule that the largest carriers do not oppose. (One carrier, Verizon, did invest in such infrastructure in some affluent east coast areas, but has discontinued that build out, unrelated to network neutrality.)

Harvard professor Yochai Benkler, with the Harvard Berkman Center, produced an in-depth, sophisticated report comparing network investment around the world. While network neutrality was not a key feature of his analysis (as few countries had yet imposed network neutrality), he concluded that unbundling/open access regulations generally lead to greater investment. The carriers in the U.S. argue that such regulation discourages fiber investment, though those rules have been lifted and they continue not to invest in fiber.

Weinhardt: Definitely. Companies need planning security. The development of the fiberglass infrastructure in Germany is a good example. There aren't many incentives for the operator, if he has to enable access for competitors on the cost base immediately afterwards. Also, companies will not implement technologies that they might not be able to use afterwards because net neutrality is a regulatory necessity. At the same time, it can be assumed that there are positive effects, for example for the development of the fiberglass infrastructure, given that a best-effort network leads to a less efficient allocation of capacities and that, therefore, broadband access will fast become necessary. In my opinion, it is, however, questionable whether this is desirable, and whether these decisions should be made by a regulator rather than being subject to the free market.

BISE: Assuming that a network operator offers QoS-solutions: how can the interconnection with other network operators be resolved who are regularly included into the service delivery process?

Ammori: I am not sure. I assume providers can contract for such interconnecting agreements and that technology vendors can ensure such service. Generally, some links are more congested than others. Quality of service is less necessary for uncongested links. So operators of some links can invest in capacity to address quality of service, rather than needing also to invest in discriminatory technology.

Weinhardt: One solution could be that major providers only warrant quality in their own network and, hence, assume that service providers deliver the necessary quality up to their network capacity. For the most part, bottlenecks occur in the last mile, where the development of additional capacities is relatively expensive. In the long term, however, alliances between network operators are conceivable, which agree on interconnection of prioritized data transmission. Already today, it depends on negotiations and the given traffic flows how they are set off against each other.

BISE: Do you think that the NN debate is an ephemeral phenomenon or do you foresee that we will still discuss this 10 years from now? Would we need for each and every network generation a new interpretation of NN principles?

Ammori: I am not sure what happens 10 years from now. If the Internet remains open enough for people to debate network neutrality, people will continue to debate it.

Weinhardt: In my opinion, the net neutrality debate will continue for quite some time. We are currently witnessing a growing tendency towards centralistic structures in the Internet. Cloud services are becoming more and more popular. Consequently, the general requirements for networks are increasing as well, if for instance every smart phone is depositing almost continuously data in the cloud. At the same time, the usage of real-time entertainment services is growing and television, a traditional medium, becomes less and less important for young people. Hence, networks will have to face increasingly large amounts of data, as well as increasingly heterogeneous service categories. As, in the future, network operators will not be the only providers of certain services, such as voice services, the necessary network functions and a sufficient quality have to be guaranteed for this purpose. The resulting cost could be covered by the users as well as the service providers themselves. In my opinion, the total cost for telecommunication services will not necessarily increase as a consequence. It can be rather assumed that the cost will shift towards the data transmission.

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