

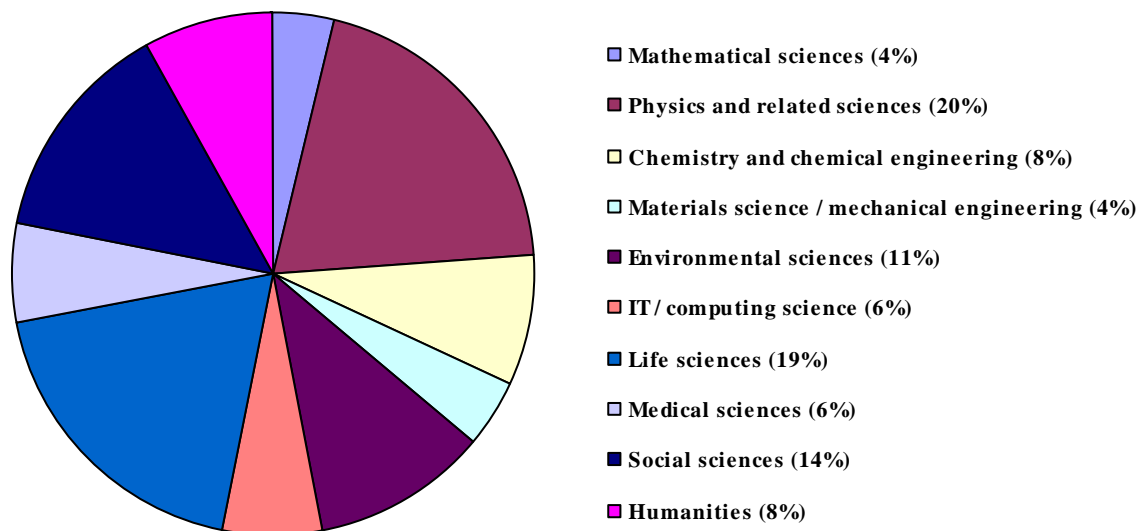
I want to quickly summarize the SERENATE Report on the future networking needs of the European research community over the next five years or so. The work was carried out by the Academia Europaea, the European Science Foundation and TERENA.

Its conclusions are derived primarily by analysing the views of researchers from a wide range of subject disciplines and geographical locations. Those views were obtained by a questionnaire and by discussions at the two workshops at La Hulpe last September and at Montpellier in January.

The Questionnaire was posted on the Web and invitations to reply was sent to more than 4000 individuals and we had replies from almost 500.

Of those who responded, 73% came from the European Union, 15% from Accession States and EFTA, 7% from other European countries and 5% from non-European states or where the location is unclear.

Responses came from a wide range of disciplines and sub-disciplines as is shown in this pie-chart. (T1)



And a first conclusion to be drawn from this wide distribution of research areas is that there has been great progress during the past five years with researchers having a reasonable environment for research networking for many parts of Europe.

One piece of evidence for that comes from the fact that good networking is essential for international collaborative projects and the survey shows the large degree of international collaboration which is now taking place. Almost 60% of those replying to the questionnaire said that 25% or more of their research budget is committed to international collaborative projects. This is markedly different from the situation some 5 years ago. (Interestingly, collaboration is mainly within Europe, almost half of respondents (46%) said that less than 20% of their collaborators were outside Europe.

That agrees with the fact that when asked what fraction of their network traffic, coming in or going out, involved other European institutions and what involved institutions outside Europe, 42% felt that traffic with European institutions is the greatest, 21% felt traffic with non-European institutions is the greatest and 26% felt it was equal.

There are therefore many reasons to be grateful to governments and the many different organisations involved in funding to have provided these networking services. HOWEVER we can't be complacent since the situation in several areas in Europe is far from satisfactory, and arguably is getting relatively worse, since the speed of overall developments in the networking field is so rapid, that very great efforts have to be made in these weaker areas if they aren't to slip relative to the rest of Europe.

Rather than going through the details of our study, I think it is useful to concentrate on our recommendations so that we can decide whether we are happy with them or not.

Satisfactory network performance for the end-user depends on a healthy infrastructure in three areas:

- On the campus
- Nationally
- Internationally

Of those who commented as to what, if anything, was limiting their use of the research network, 57% felt there was such a limitation. And of these, 40% felt there was a limitation at the campus level. This compares with the 20% who felt there was a limitation at the national level and 23% who felt there was a limitation at the international level.

In short, there is serious evidence that for many European researchers the major source of limited network performance is local – primarily at the campus.

So we come to our first recommendation.

Relevant to universities

- A major source of limited network performance is at the campus, and this fact must be drawn to the attention of senior management in the university and similar sectors.

Let us turn to the National Research and Education Networks (NRENs)

When users were asked to comment on their local NREN, quite a number chose not to reply and were therefore presumably happy.

Of those that did, 43% were neutral and there was an equal number of those who were positive or were critical, in each case about 28%. So on the whole – user satisfaction.

Not surprisingly, many of those critical of the national service felt that they had insufficient say in the policy relating to the NREN, (and 6% who were neutral or positive still would have liked to have more say).

As we will see later, there will be a need for the NRENs to support much enhanced services, rather than just providing bandwidth and that means that **ALL** NRENs will need to engage in a deeper dialogue with the campuses and the national bodies responsible for the universities' IT infrastructure.

There is no evidence that end-users want, in any way, to control their NREN organisations which in most cases are regarded as operating efficiently, - but they Do feel that NRENs should devote more resources to listening to users needs.

So two more recommendations:

- NRENs should increase the flow of information, including road-maps of likely future service developments, to their end-user communities, and make more educational material available.

- NRENs should devote more resources to listening to the needs of users.

It is an assumption in the 6th Framework Programme, that participation by industrial partners, primarily SMEs, is essential. Indeed most national research programmes encourage such collaboration. One would therefore expect that where there was such collaboration, networking through the NREN would be possible and easy. In practice, answers to the questionnaire show that this is far from being the case. Of the respondents who are actually collaborating, or contemplating collaboration, with a partner from the for-profit sector, slightly more than 50% reported difficulties. So our next recommendation:

- NRENs should explicitly explore the problems arising from research collaboration between universities and for-profit organisations such as SMEs and give advice to the relevant stakeholders.

SERENATE is impressed by the evidence of growing network requirements from all areas of research. The needs will surely grow dramatically over the next 5-10 years, in all disciplines and in all countries. Moreover many researchers are asking for much more from the network in the way of services.

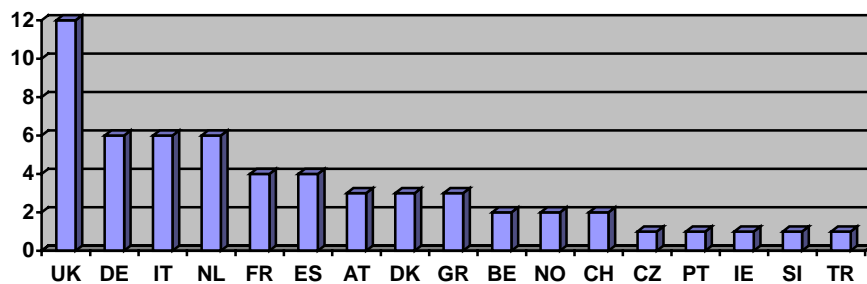
Thus, a very high percentage of end-users expressed concerns about security (20%), privacy and confidentiality (10%) or both (5%). There are of course especial privacy concerns in medical research and social studies, particularly when good networking permits the widespread distribution of photographs and test records etc. of patients. But the concerns are widespread.

There is also a wide-spread belief that many hackers and virus creators come from universities. This may not be the case, but there is some evidence that hackers may work through university networks. It is therefore important not just for the academic community but for the general public that NRENs are sensitive to these problems.

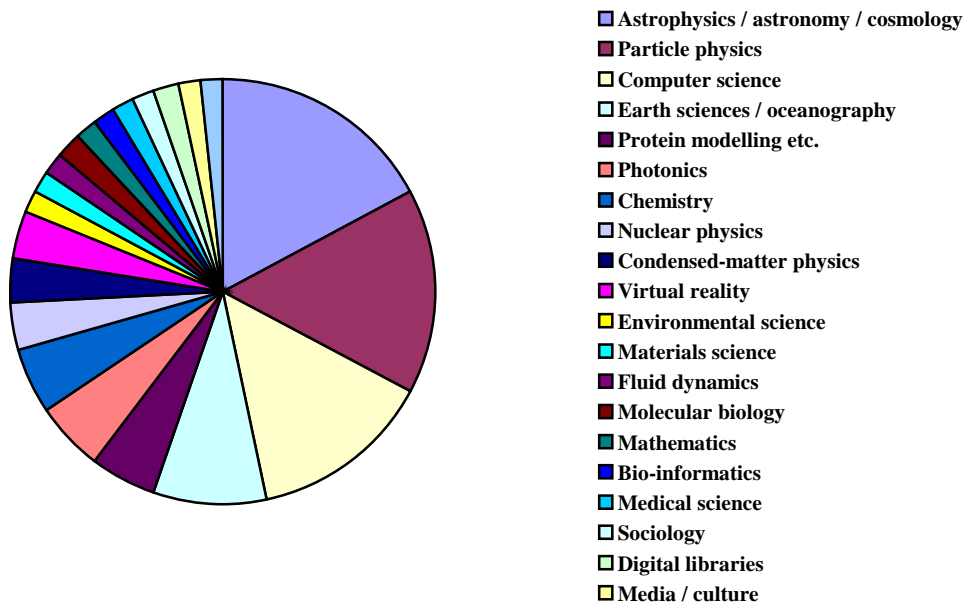
A separate issue is that the current working assumption of most NRENs is that the researcher only need the network and its facilities on the campus. But a number of researchers, particularly in the humanities and social sciences traditionally work at home. Moreover, the growth of collaborative research means that many researchers, and a growing

number, spend a significant fraction of their time at other campuses abroad. There will therefore be growing demand for the researcher to be able to access networks wherever he or she happens to be, at the office, laboratory, home or away abroad. This implies a need for so-called AAA services i.e. authentication, authorisation and accounting services for the research and education community, which will require new expertise in the NRENs. They will have to plan for good broadband remote access. That further implies the need for the deployment of a set of AAA services, or the like, compatible across Europe, and more generally on a global basis. NREN and university together will have to establish appropriate licensing arrangements for the research community of what a researcher can and cannot do in various places.

The most demanding for network services is probably Grid computing. It is remarkable that despite the fact that Grid computing is so new, respondents to the questionnaire from a wide range of disciplines and countries said they were active in Grid computing or have clear plans in this area. This is the national distribution of these respondents (T2)



And this is their disciplines (T3)---



and you see it is not just particle physics and astronomy. So there are a number of further recommendations aimed at the NRENs in connection with enhanced services:

- NRENs must take account of the growth in user expectations in the form of more complex services.
- The NRENs should plan for good broadband remote access for researchers at the office, laboratory, home or away on a mission.
- NRENs should recognise that a greater demand for AAA services will in most cases require new expertise.
- It is important for academic and education users that the deployment of AAA (or similar) services is handled in a compatible manner across Europe.
- NRENs and universities together should establish appropriate licensing arrangements for the research community.
- NRENs should become more involved in initiatives aimed at reducing “spam” and protecting against viruses and hacking.

If an end-user experiences unexpected poor performance in international data transfer, it is normally hard for him or her to understand the reason since such transfer will involve at least 5 different organisations. Hence our next recommendation:

- NRENs, and DANTE, should co-operate to put in place a service that when triggered by the user, would determine whether the performance obtained was indeed worse than normal, and if so, take responsibility for correcting the situation.

In all this we are stressing a move to services, but it should not be forgotten that there is a demand for more bandwidth from a significant number of research end-users. Two areas are given as examples where increased end-to-end bandwidth is needed: remote visualisation of data and videoconferencing.

43% of respondents currently use visualisation of real or simulated data, but of these, 90% suffer problems, primarily because of the size of the files. Despite these problems 75% would like to use in some way remote visualisation, where for example separated collaborators want to examine the same model of a molecule or the flow of a river or something.

Another driver for improved bandwidth is the wish of the research community to use better videoconferencing facilities. Of those who responded to the questionnaire 16% already use it, and 14% want to do so. However, 70% of the regular users find its use is very limited at current bandwidths and with no guaranteed quality of service. What they want is interactive videoconferencing simultaneously from different sites and all of TV broadcast quality.

We did not make any specific additional recommendations about such matters, but we should in the final report say something about it.

We finally make recommendations aimed at the European Commission and national funding bodies.

The first two relate to charging for networking, since SERENATE recognises that there is no such a thing as a “free lunch” – networks do actually cost money. Currently, in most European publicly funded research institutions there is no charging for networking resources at the point of use. Not perhaps surprisingly, a large majority of research end-users (91%) do not wish to see any change from this approach.

However, some (9%) feel that some form of charging might be acceptable, and possibly desirable. This is usually argued as appropriate where there is heavy use or special needs. However our recommendations are:

- Basic research networking should be regarded as a public good.
- Any move in the direction of explicit charging for heavy or special use must be treated with great care. It must not be considered until both the financial and technical issues are well-understood and stable. (Because, of course these demanding users are very often those who will develop the technology)

The other three recommendations relate to the important issue of the Digital Divide in Europe, but that is discussed in the next session

- We are far away from “equality of networking opportunities” for researchers in all countries of the European Research Area. There is a European internal “digital divide”. To implement equal opportunities requires strong political commitment, and spending significant sums of money.
- Elimination of telecommunications monopolies and the rapid introduction of effective competition among several operators are crucial.
- The regular reports on each Accession State’s progress towards accession should be required to specifically address the extent to which their Research and Education Network has been brought up to EU levels.

