RIPE NCC Annual Report 2001

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Foreword

Kees Neggers
Executive Board Chair

The success of the RIPE NCC and its position in the Internet can be summarised in three words: community, collaboration and co-ordination. These form the base of the long-standing, bottom-up industry self-regulatory structure integral to Internet operation brought about through dialogue, participation and interaction by the RIPE NCC membership, the RIPE community, industry bodies and non-traditional players.

The well-established processes continue to serve, incorporating new players and fulfilling their requirements. The RIPE NCC continues to provide the neutral ground and flexibility for technical coordination of activities to support the Internet infrastructure.

Through the general outreach activities of the RIPE NCC and the planned introduction of ENUM operations in 2002, we increased our presence and relations with a variety of national governments. As the RIPE NCC has proven experience in registration activities I anticipate the smooth integration of the ENUM activity into its portfolio of services.

In 2001, the RIPE NCC hosted the ICANN Address Supporting Organisation (ASO) Secretariat under careful stewardship. The RIPE NCC continues to have a solid working relationship with the Internet Assigned Numbers Authority (IANA) operating under the auspices of ICANN (Internet Corporation for Assigned Names and Numbers). In the coming year the Regional Internet Registries (RIRs) will work closely together towards an ICANN mission that is compatible with the goals prescribed by the RIRs? memberships and communities.

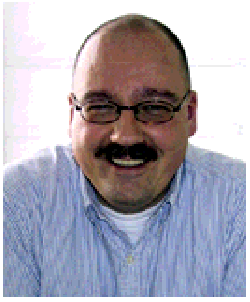
2002 will mark the 10-year anniversary of the RIPE NCC. Over these years it has secured a reputation for the provision of professional coordination and support services requiring neutrality and impartiality.

The changing needs of the Internet and the community responsible for operating its infrastructure remain a challenge for the RIPE NCC. Another challenge will be to find a balance between the membership needs and the importance of aligning IP address distribution policies globally. I am looking forward to continued collaboration between the RIRs and their communities towards a consensus on a global IPv6 policy integrating regional interests.

I would like to thank the membership for its continuous support of the RIPE NCC and call for their active and ongoing participation in the processes that have been developed by the Internet community over the years.

Kees Neggers
Executive Board Chair

Report from the Managing Director



Axel Pawlik
Managing Director

Summary 2001

I am pleased to report that the RIPE NCC remained stable in the midst of another strenuous year for the Internet. I am grateful to a team of professional staff for their commitment and hard work in providing services and support to the Internet community.

In 2001, the RIPE NCC experienced a less steep growth in its membership base compared to previous years, only slightly surpassing projected numbers for the year, reflecting a slowing in world economies

The year-end total number of members reached 3122.

To meet service expectations of the RIPE NCC membership and the RIPE community, the RIPE NCC improved and streamlined its operations and enhanced its service structure. Internally, the RIPE NCC strengthened its efforts within the Registration Services area that resulted in eventually reducing the response time. The RIPE NCC also focused on strategically reinforcing specific areas of support within the organisation by deploying necessary resources.

Significant activities carried out by the RIPE NCC this past year included:

- the successful roll-out of RPSL (Routing Policy Specification Language) within the new Whois Database;
- further upgrades to the RIPE NCC internal and networking infrastructure;
- intensifying the RIPE NCC outreach activities;
- the co-ordination of IPv4 and IPv6 address policy discussions on mailing lists, at RIPE Meetings and other RIR open policy meetings;
- the publication of the RIPE NCC Activities, Expenditures and Charging Scheme that was unanimously approved by the membership at the annual General Meeting (GM) held on 30 October 2001 in Amsterdam, the Netherlands.

The RIPE NCC also fostered continued and productive co-operation with the other RIRs to support their collective aim for a well-functioning Internet. In 2001, the RIRs jointly worked on the co-ordination of IPv6 policy development that resulted in the first global address policy incorporating all aspects of IPv6 address management.

In 2001, the RIPE NCC maintained the duties of the ICANN Address Supporting Organisation Secretariat. As this activity rotates yearly to one of the RIRs, the ASO Secretariat was handed over to the American Registry for Internet Numbers (ARIN) in December 2001.

Outlook 2002

Looking forward into 2002, the RIPE NCC remains committed to providing enhanced availability of its core services with greater emphasis on secure access to our services and security-related activities.

We foresee developments in our New Projects area affecting Routing Information Service (RIS), the Routing Registry Consistency Check (RRCC) and DNS Security (DNSSEC). The RIPE NCC will also provide a new co-ordination activity with the introduction of ENUM operations in 2002. Outreach activities will continue to focus on areas related to increasing the general awareness of RIPE and the RIPE NCC towards industry bodies as well as the public sector.

The RIPE NCC expects to see several productive developments beginning with the continued co-ordination among RIRs to facilitate the evolution of the global IPv6 policies as well as other emerging technologies. Following close collaboration with the Asia Pacific Network Information Centre (APNIC) in producing the RIPEv3 Database code, we will offer support to APNIC during the installation and roll-out of their new Whois Database.

We will adjust our activities, reposition our operational focus, and modify our resource levels accordingly to ensure the solid functionality and dependability in servicing the RIPE NCC membership and RIPE community with particular attention to registration services.

The joint RIR contract with ICANN has been through a lengthy negotiation process over the past year and will be subject to comments and community review. We anticipate that our working relationship with ICANN will progress and we will continue to follow developments and represent the needs of our community appropriately.

Finally, 2002 marks our entry into a new decade of service. The RIPE NCC has grown together with the Internet industry within its first ten years of service. We look forward to remaining an integral part of the Internet and its evolution by responding to membership needs, proposing and developing services as needed and ensuring stable, reliable and high-quality service provision.

A. P.

Axel Pawlik
Managing Director

RIPE NCC Background and Overview

The RIPE Network Coordination Centre is an association of 3122 members (as at 31 December 2001), primarily comprised of Internet Service Providers (ISPs), telecommunication organisations, and large corporations. Its services and co-ordination activities support the operation of the Internet infrastructure. Members of the RIPE NCC are responsible for managing Internet resources on a local level to their customer base. In this capacity they fulfil the role of a Local Internet Registry (LIR) within the hierarchy of the Internet Registry System.

The RIPE NCC was established in April 1992 by the Réseaux IP Européens (RIPE) community as a neutral and impartial organisation to support the industry self-regulatory processes established in RIPE and to provide a platform for technical co-ordination. To date, RIPE processes remain crucial in developing the activities of the RIPE NCC.

*New Countries Served in the RIPE NCC Service Region in 2001**

ISO Code	Country
AL	Albania
SL	Sierra Leone
TG	Togo
TM	Turkmenistan

** Countries are shown as listed in the ISO 3166 country code list.*

The mission of the RIPE NCC is to perform activities for the benefit of the membership, primarily activities that the members need to organise as a group, although they may be competing with each other in other areas. While an activity may result in services being provided to an individual member, performing the activity as a whole must benefit the RIPE NCC membership as a group. Membership is open to anyone using the RIPE NCC services.

The core activity of the RIPE NCC is to act as the RIR in its service region, providing global Internet resources and related services. The RIPE NCC also provides services for the benefit of the Internet community at large, including development and maintenance of the RIPE Whois Database. Other activities include the administrative support for the RIPE community, the development of innovative services and outreach activities with governments and other industry-related organisations. All activities and projects are described in the annual Activity Plan and budget that is approved by the membership. The RIPE NCC Activities and Expenditures 2001 can be found at:

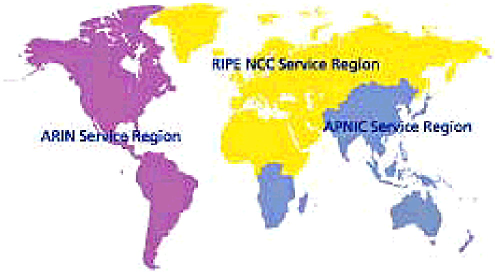
http://www.ripe.net/ripe/docs/ap2001.html

Other
Regional Internet Registries
APNIC
http://www.apnic.net
ARIN
http://www.arin.net

The activities and services of the RIPE NCC are defined, performed, discussed and evaluated in an open manner. The RIPE community regularly suggests new activities and the results of the activities are made available to the general public. The budget as well as actual income and expenditures are also published. Data submitted by its members for operational use are, however, kept in strict confidence. In all of its activities, the RIPE NCC observes strict neutrality and impartiality with respect to individual members.

The RIPE NCC is one of three Regional Internet Registries. It provides services to members in 89 countries out of 109 countries in its service region. Its service region incorporates Europe, the Middle East, Central Asia, and African countries located north of the equator. The other RIRs are APNIC, serving the Asia Pacific region and ARIN, serving North and South America, the Caribbean and African countries located south of the equator. The map below shows the three RIR service regions. A detailed map of the RIR service regions can be found at:

http://www.ripe.net/region-maps/



The RIPE NCC Executive Board

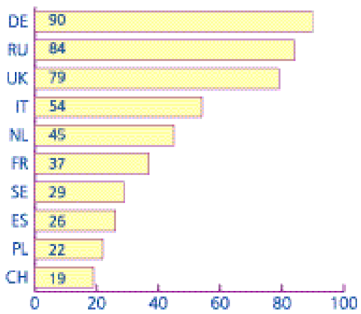
The organisational structure of the RIPE NCC consists of:

- Members who vote on issues during the annual General Meeting and who provide general input through participation at open RIPE Meetings.
- The Executive Board as appointed by the RIPE NCC membership
- The RIPE NCC staff.

The Executive Board includes individuals with expertise in the Internet community and represents the membership and the RIPE NCC service region as a whole. The RIPE NCC Executive Board members in 2001 were: Frode Greisen (ASO Liaison); Kees Neggers (Chair); Mike Norris (Secretary); Nigel Titley; and Wim Vink (Treasurer). The terms of both Mike Norris and Wim Vink expired in 2001. The members at the annual General Meeting 2001 elected János Zsakó and Daniele Bovio to the RIPE NCC Executive Board.

http://www.ripe.net/ripencc/about/gm/gm2001/draft-minutes.html

Membership Growth Summary



The RIPE NCC Top Ten Countries with New LIRs in 2001

The number of new members established in 2001 was 555, showing a decrease in growth rate when compared to the 871 members that were established in 2000. This was the first time in the history of the RIPE NCC that the membership growth rate declined (from 51 percent in 200(to 21 percent in 2001). In 2001 a total of 57 LIRs were closed. The chart below illustrates the actual membership figures of small, medium and large LIRs for the past two years as well as the projected membership fo 2002. The projected growth figures are based as at September 2001. However, in Q4 of 2001 we saw a significant drop in the membership growth rate. We expect to see this decrease continue in 2002 due to world economic conditions.

http://www.ripe.net/ripencc/about/

Actual and Projected Membership

	Actual		Projected *
	2000	2001	2002
Small	1,978	2,536	3,160
Medium	459	441	598
Large	130	145	159
Total	2,567	3,122	3,917

* Projection made in September 2001 as basis for the 2002 budget

The RIPE NCC employs a diverse group of professionals representing the following countries in 2001:*

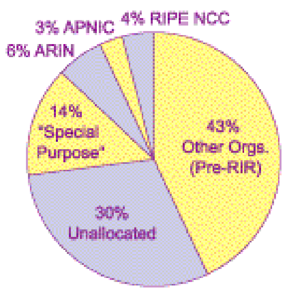
Australia	Poland
Austria	Portugal
Brazil	Russia
Canada	Spain
France	Sweden
Germany	Turkey
Hungary	Ukraine
Ireland	United Kingdom
Italy	United States
The Netherlands	Yugoslavia
Palestinian Territory, occupied	

*Countries are shown as listed in the ISO 3166 country code list.

RIPE NCC Services and Projects

Registration Services

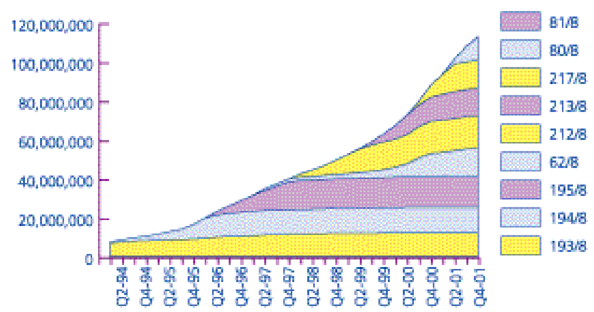
IANA IPv4 Allocations



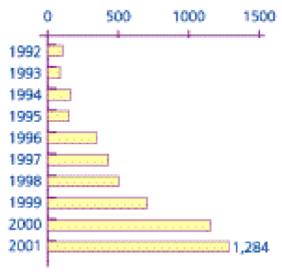
As a Regional Internet Registry, one of the core activities of the RIPE NCC is to provide registration services to its members. The overall goal is to provide the fair distribution of global Internet resources required fo the stable and reliable operation of the Internet.

The most prominent services are the allocation and assignment of IP address space, inter-domain routing identifiers (currently BGP autonomous system numbers) and the management of reverse domain name space (currently in-addr.arpa and ip6.arpa). These areas of activity also include auditing and quality control, training of LIRs and the production of documentation to support registration services activities. These activities ensure fair and expedient distribution of the resources. The criteria are also applied when members, acting as LIRs, provide registration services to their customers.

IPv4 Address Space Usage, 1994-2001

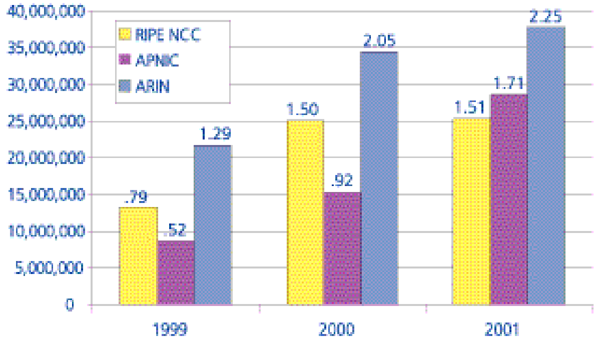


AS Numbers Allocated, 1992-2001



In 2001, the RIPE NCC processed a total of 22,123 resource requests and allocated more than 25,000,000 addresses (approximately 1.5 /8s) to its members. A request for additional address space was submitted to the IANA, resulting in the allocation of the address block 80/7 to the RIPE NCC in April 2001. From this range, 37 percent was allocated to LIRs in 2001. In the past year, the RIPE NCC has assigned 1,284 Autonomous System (AS) numbers to LIRs, an average of approximately 107 AS numbers/month. Upon the request of the RIPE NCC, two new AS number ranges were allocated by IANA in February and November 2001.

IPv4 /8 Allocations per RIR, 1999 - 2001



A total of seven IPv6 assignments for Internet Exchange Points (IXPs) and 26 IPv6 allocations were made to members in the RIPE NCC service region in 2001. A total of 50 /35 allocations have been made in the RIPE NCC service region since the introduction of IPv6 address space. A total of 118 /35 allocations have been made globally. An overview of IPv6 allocations made by the RIRs can be found at:

http://www.ripe.net/rs/ipv6/ipv6allocs.html

Global IPv6 Distribution per RIR, 1999-2001

RIR	sub-TLAs
RIPE NCC	50
APNIC	48
ARIN	20
Total	118

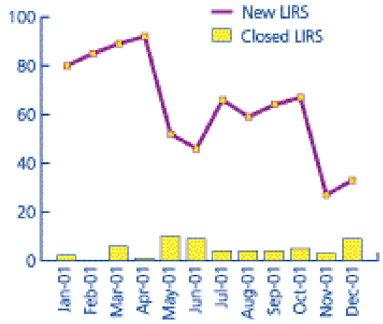
As an important part of the support extended to the LIRs, the RIPE NCC also provides training courses for the membership. In 2001, the RIPE NCC conducted 55 LIR Training Courses in 25 different countries within its service region. A total of 1,552 attendees from various LIRs were trained. The training course material was constantly refined over the year, covering new topics and modifications. Additionally, three IP request tutorials were given at RIPE Meetings in Amsterdam, Bologna and Prague. These tutorials contained basic material selected from the current course material and were open to all RIPE Meeting participants.

Further information about the RIPE NCC LIR Training Courses can be found at:

http://www.ripe.net/training/

Cities where the RIPE NCC LIR Training Courses were held in 2001:

Accra, Amsterdam, Athens, Barcelona, Berlin, Bologna, Brussels, Budapest, Cambridge, Copenhagen, Dresden, Frankfurt, Istanbul, Kiev, Lisbon, Ljubljana, London, Madrid, Manchester, Moscow, Munich, Nice, Oslo, Paris, Prague, Riyadh, Rome, Sofia, Stockholm, St. Petersburg, Talinn, Vienna, Warsaw, Zurich.



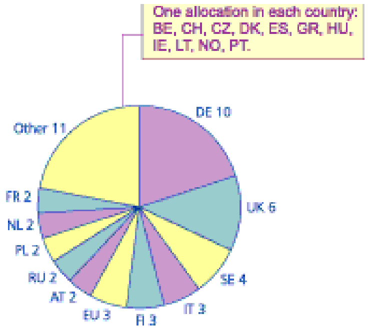
The remarkable growth the RIPE NCC experienced in the past few years came hand-in-hand with a high workload for Registration Services. During 2001, the RIPE NCC implemented a series of internal measures to bring down the ever-growing response time and to increase efficiency in service provision. These measures included increasing and restructuring resources and reviewing request-processing methods.

Resources were added to increase the support for the day-to-day operations and for the co-ordination of policy development. Furthermore, additional Hostmasters and Trainers were hired.

The set-up process of new LIRs has been further improved through enhanced automation and additional comprehensive documentation, flowcharts, along with Frequently Asked Questions (FAQs). This information is located in the "New Members" section at:

http://www.ripe.net/ripencc/new-mem/

Tools and Support for LIR Operations



Total IPv6 Allocations Made by the RIPE NCC up to 2001

Responding to the recognised demand for efficient request handling and dissemination, the helpdesk mailbox <lir-help@ripe.net> proved to be a continued success providing a faster operational or policy-related questions. In 2001, faster approvals for cor were granted by the RIPE NCC due to the introduction of a two-day turr ongoing member requests. The RIPE NCC continued to provide its mem opportunity to consult with Hostmasters at the "Hostmaster Centre" duri networked centre allowed one-to-one interaction to discuss questions tha regarding their operations with the RIPE NCC. In addition, Registration member tools were enhanced, further automated, and adapted where pos transition to the new RPSL version of the RIPE Whois Database (see sec Services). These included:

- Web ?Asused? (Checks the usage and consistency of IPv4 allocati
- AUTOHM (The command-line version of the European IP Addres syntax checker.)
- WEB141 (The source code of the web interface to the above.)
- RIPE NCC Autonomous System Syntax Checker
- STT (The Standard Text Tool for generating customised standard
- Crypt CGI Interface (To encrypt a clear text password to use in a ? of the authentication schemes.)
- ?Asinuse? query (To determine when an AS number last appeared tables collected by the Routing Information Service.

More information about publicly available member tools can be found a

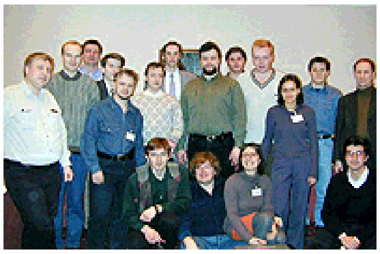
http://www.ripe.net/ripencc/mem-services/tools/index.html

Policy Developments in 2001

The RIPE NCC adheres to Internet address distribution policies develop consensus in the RIPE LIR Working Group (LIR-WG). One of the prim the RIPE NCC is to ensure that all policies are developed in an open and Through open discussions at RIPE Meetings and on public mailing lists, following policy changes was reached:

- Criteria for Initial /20 PA Allocation: a policy requiring a new LIR previous usage of a /22 (25 percent of a /20) or demonstrate imme percent of a /20). The RIPE NCC implemented this new policy on

- At the RIPE 40 Meeting in Prague (October 2001), the RIPE comr Assignment Window (AW) policy. Consensus was reached in the policy to allow any LIR to make multiple assignments to their owr contacting the RIPE NCC as long as the individual assignment is v Window. This new AW policy was implemented in December 200



LIR course Participants with the RIPE NCC Trainers

- A policy was developed for IXPs under which unique IPv6 addres the infrastructure of the Internet Exchange Point could be obtained conclusions of discussions at RIPE Meetings and on public RIPE r this issue are outlined in the document "Interim IPv6 Address Assi Internet Exchange Points" and can be found at:

http://www.ripe.net/rs/ipv6/eix-interim.html

- A request form "IPv6 Request Form for Internet Exchange Points" RIPE NCC and published on 15 August 2001 and can be found at:

http://www.ripe.net/ripe/docs/ipv6request-exchangepoint.html

In 2001, discussion continued over rewriting the existing IPv4 policy document "European Internet Registry Policies and Procedures". <ripe185-bis@ripe.net> was set up for discussions and inputs. An editor established to review the draft document. The new draft version of the " in the RIPE NCC Service Region" can be found at:

http://www.ripe.net/rs/ipv4policy.html

IPv6 address policy discussions on the development of a global address topical issue throughout the year in all RIR regions. A public mailing lis <global-v6@lists.apnic.net> was set up to co-ordinate global policy disc development of a revised IPv6 addressing policy. The new draft "IPv6 A Assignment Global Policy" version published on 22 December 2001, is

http://www.ripe.net/ripencc/mem-services/registration/ipv6/global-ipv6-

In an effort to illustrate the similarities and differences in regional addre was written to provide a comparative overview of the policies in the RIR Comparative Policy Overview (version 1.0)". The document is available

http://www.ripe.net/rs/rir-comp-matrix-rev.html

The RIRs continued to co-ordinate service provision and policies where year, staff members from each RIR attended each other?s open policy m valuable exchange of information and experiences. In 2001, the RIRs int of all IPv4 allocations made by each RIR to date. This data is published accessible on all RIR ftp servers, allowing the community to use the data

In addition, the RIRs began presenting statistics on global Internet resou
operational matters. This data is collectively kept up-to-date and present
policy meeting.

More information about Registration Services can be found at:

http://www.ripe.net/ripencc/mem-services/registration/

Database Services

Another prominent activity of the RIPE NCC is the operation and maintenance of the RIPE Whois Database and the implementation of new Database functionality requested by the Internet community. The Database provides information about address space, reverse delegation domains, routing policy and contact information. The RIPE Whois Database can be queried at:

whois -h whois.ripe.net ***or*** *http://www.ripe.net/perl/whois*

Transition to RPSL and the New Whois Database

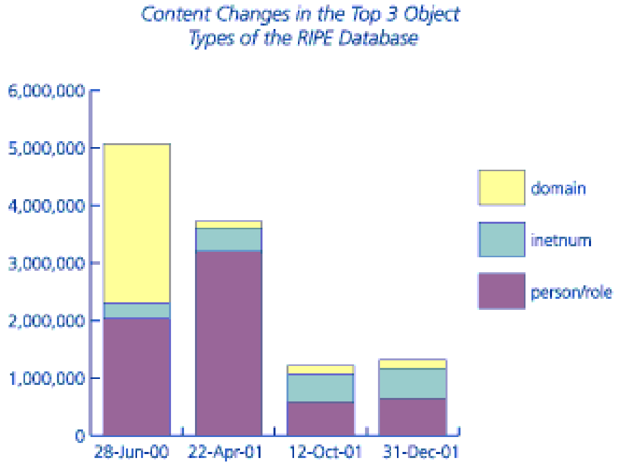
In 2001, the RIPE NCC completed the re-implementation of the Database software. The previous RIPE Database system used the language known as RIPE 181 for Routing Registry objects. The new system uses a language called RPSL (Routing Policy Specification Language), described in RFC 2622, that defines an extended syntax for all Database objects and many extra features for the Routing Registry objects (aut-num, route, inet-rtr, etc.).

The new version of the software (version 3.0) was released on 4 April 2001. The code was completely rewritten and many new features were implemented such as Routing Policy System Security support specified in RFC 2725, fast IP lookups and automatic access control. High performance of the system is a feature that addresses the increasing load on the RIPE Database. Comparison tests showed that the new version of the RIPE Database was seven times faster and was able to sustain a quadrupled load as compared to the previous version.

Particular attention was given to plan the transition phase to the new RPSL version of the RIPE Database due to the substantial changes in object format and Database functionality.

The transition began with the switchover to the new format of the Database and new Database system that took place on 23 April 2001.

The transition consisted of three phases in order to make the procedure as seamless as possible. The transition lasted six months and was officially completed on 15 October 2001.



Database-Related Projects

The RIPE NCC continued to develop several projects related to the RIPE Database. The Database Consistency and Statistics project was re-implemented in 2001 and will be put into production during the first weeks of January 2002.

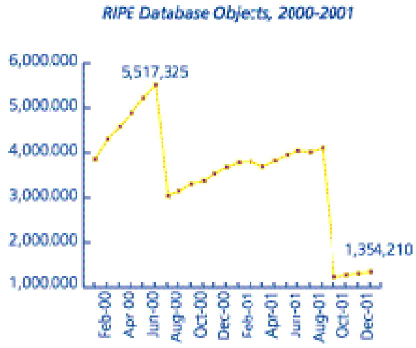
The Routing Registry Consistency Check project was presented to the community at the RIPE 38 Meeting in Amsterdam and received positive feedback. The development of the prototype was delayed due to the transition to the new Database and resumed after the transition period was completed. New developments will be presented to the community at the RIPE 41 Meeting in Amsterdam in January 2002.

The RIPE NCC announced that it would offer continued support and development of the routing registry tool set known as RAToolSet. The takeover was made official on 26 September 2001 under an agreement between the University of Southern California (USC) and the RIPE NCC.

More information about Database-related projects is available at:

http://www.ripe.net/ripencc/pub-services/db/index.html#projects

Database Statistics



As in 2000, there were major changes in the Database contents. After the migration of the major ccTLD Registries from the Database in early 2001, many person objects containing contact information previously related to these Registries remained. The existence of contact information in the Database not directly related to the activities of the RIPE NCC raised several issues that were communicated to the RIPE community and the RIPE NCC membership. The Dutch Data Protection Authority entered into dialogue with the RIPE NCC pointing out concerns from the data protection perspective and requested a prompt transfer of the information. The transfer of this contact information to the national domain names registries completed the migration of this data.

The transfer of the person objects took place on 21 September 2001 and approximately three million orphaned person objects were removed from the RIPE Database. The total number of objects reaching a maximum of slightly more than four million decreased sharply to 1.2 million objects at the date of the transfer. The load on the Database continued to increase during 2001, reaching 16 queries per second on average with peaks up to 40 queries per second. The number of objects returned per day totalled twice the number of objects in the Database. Basic IP look-ups constituted 60 percent of all queries.

With 3.5 updates per minute on average, the updates did not experience substantial changes. Seventy percent of the updates were creations of th new objects. Following the transfer of person objects, the RIPE NCC noted a slight change in the pattern showing a more prominent role of the ?inetnum? objects. This shows that the Database is once again mainly being used as a reference for IP address look-up.

Database Documentation

The migration to the new RPSL Database required documentation such as the Database User Manual to be completely rewritten. The manual was split into three documents: a reference manual, a user manual and an operations manual. The ?RIPE Database Reference Manual? was published as a RIPE document in 2001 and provides complete documentation of the Database features. The other two components will be completed in 2002. Registration Services documentation and LIR Training Course materials containing RIPE Database information were also updated.

In addition to these developments, the RIPE NCC continued to provide user support and monitored data quality in order to maintain current dat in the RIPE Database. Training has been a part of the Database support activities. An RPSL tutorial was delivered at the RIPE 38 Meeting in

Amsterdam to assist users migrating to the new Database system. Database training also continues to comprise a significant part of the LIR Training Course.

More information about Database Services can be found at:

http://www.ripe.net/ripencc/pub-services/db/

DNS Services

During 2001, the number of hosts registered in the RIPE NCC service region increased steadily by 2,925,000 to reach 15,646,845 hosts. This translates into a growth rate of 23 percent for 2001.

Associated with the assignment of address space is the setting up of the appropriate entries in the Domain Name System (DNS) to enable the reverse mapping of the addresses in the ?in-addr.arpa? and ?ip6.arpa? namespace. This remains the primary DNS activity carried out by the RIPE NCC.

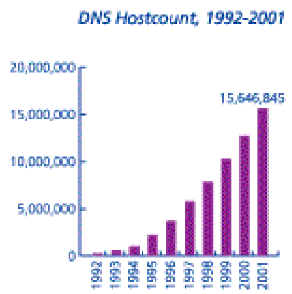
In addition to setting up the reverse DNS zones the RIPE NCC also monitors the quality of the reverse name servers that it delegates to and makes the necessary improvements where needed.

More information about reverse delegation is available at:

http://www.ripe.net/reverse/

In 2001, the RIPE NCC continued to provide a stable secondary DNS name service to 84 country code top-level domains and several second-level domains. This service is offered upon request to any country code Top-Level Domain (ccTLD) organisation.

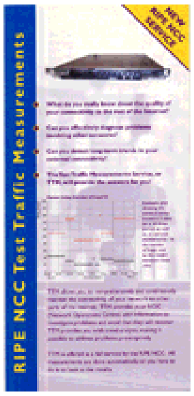
Apart from running its own name servers, the RIPE NCC is also responsible for the operation of k.root-servers.net, one of the DNS root name servers located at the London Internet Exchange (LINX).



Since the beginning of 1992, the RIPE region monthly Hostcount has been run to indicate the growth of the Internet in its region. All of the DNS zones under the ccTLDs in the RIPE region are examined and the available hosts are counted. The RIPE NCC publishes summary statistic derived from the Hostcount output data. Although not always accurate ir absolute numbers due to hosts hidden behind firewalls, misconfigurations, etc., it shows a good relative growth factor over a longer period of time.

More information about the RIPE region Hostcount is available at:

http://www.ripe.net/hostcount/



Test Traffic Measurements Brochure

Test Traffic Measurements (TTM)

The Test Traffic Measurements service is designed to reliably and impartially measure end-to-end performance characteristics of the inter-provider Internet. This is achieved by installing test-boxes at participating ISPs. These test-boxes send measurement traffic to each other. From this traffic, packet-losses and network delays are determined according to the metrics developed by the IETF IP Performance Metrics Working Group (IPPM-WG). As the RIPE NCC has an established track record of neutrality and impartiality, it is an ideal organisation to perform such measurements in a trusted way.

Under the TTM service, any site interested in these measurements can purchase a test-box with a service contract from the RIPE NCC. The service contract entitles the test-box operator to the analysis of the data collected by the RIPE NCC, software upgrades and new products based on the data.

With the introduction of this service in 2000, the RIPE NCC became the first organisation to offer tools for producing end-to-end performance measurements on the Internet for the entire Internet community.

It was projected that the number of test-boxes would grow from around 50 in early 2001 to as many as 200 by year-end. However, this estimate proved overly optimistic. Two main reasons for this are the world economic situation and the delays in the development of analysis products that translate the high-quality raw data into information immediately useful to network operators.

The first reason resulted in the cancellation of plans to deploy a significant number of test-boxes in 2001 by several large operators. The second issue was addressed in 2001 by means of implementing several improvements and new services on the test-boxes that include:

> * A web-based user interface on the test-boxes themselves. This interface gives access to the status of the test-box in real time and presents plots and a preliminary analysis of the data minutes after the data has been collected. (See example) This makes the test-boxes more suitable for debugging operational problems as they occur.
>
> A public demonstration of the test-box user interface is

available at:

http://tt01.ripe.net:10259/cgi-bin/inbound_delays.cgi

The following features are only accessible by owners of the test-boxes. User training on how to use these features will begin at the RIPE 42 Meeting in Amsterdam.

* Web pages summarising the results of the packet delay and loss measurements. The connections where the results significantly differ from the results in the days or weeks prior are highlighted. This page allows a test-box host to quickly find problems in their external connections.

* Expanded standard analysis of packet delays and packet losses with a "Plots on Demand" feature that allows test-box hosts to analyse data for any arbitrary time interval and enable them to zoom into problematic areas.

* An improved password scheme for the general TTM web site.

* A long-term trend analysis added to the regular data analysis.

* An IP-Delay Variation (IPDV) analysis. IPDV or "jitter" expresses the variation in delay seen by consecutive packets and is important for applications such as Voice-over-IP and Video on Demand.

* Bandwidth measurements studies. No standards have been set in this area to date. The RIPE NCC studied the reliability of various tools and chose one product. Beta tests are now in progress. It is expected that this will be deployed in early 2002.

Conferences

The RIPE NCC organised the PAM2001 (Passive and Active Measurements) workshop in Amsterdam, 23-24 April 2001. Approximately 120 people from all over the world attended the workshop. Proceedings of the workshop are still available, in hard copy and online at:

http://www.ripe.net/pam2001

On request of several customers, a smaller model test-box was developed in 2001. This test-box is one-fourth the height of the previous model and can be installed at the Point of Presence (PoP) where space is at a premium. The RIPE NCC also improved its internal infrastructure such that it can easily support large numbers of test-boxes.

Analysis of the data is an ongoing effort carried out in collaboration with the RIPE Test Traffic Working Group. In 2002, these studies will continue and it is expected that more services using the data will be developed. The RIPE NCC was also an active participant in the IETF IPPM-WG in the area of future measurements and interfacing the TTM service to Network Measurement Systems.

Finally, several university research groups started to analyse the TTM data. One of their results is a program for visualising the network between the test-boxes. This program is available for the community from the TU Delft, the Netherlands and will be developed further. More information is available at:

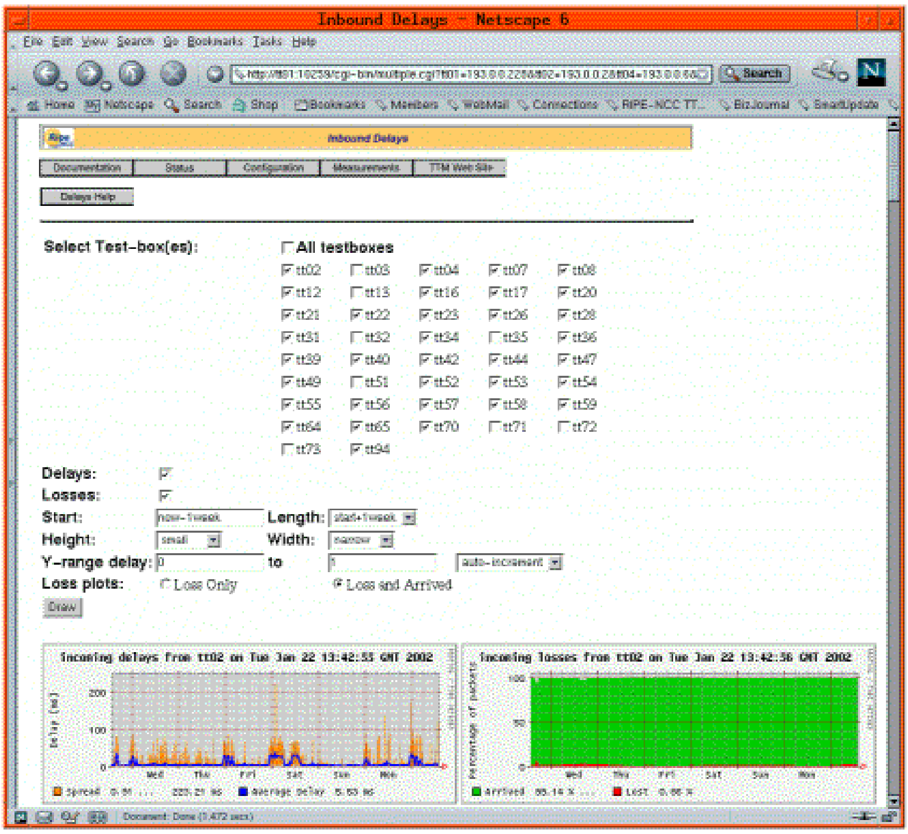
http://www.tbm.tudelft.nl/webstaf/janb/index.htm

A joint paper on modelling the delay measurements along a single path titled "Analysis of End-to-End Delay Measurements in the Internet" has also been published. These studies will continue in 2002.

More information about the RIPE NCC Test Traffic Measurements project is available at:

http://www.ripe.net/test-traffic

Example of the web site installed on the test-boxes, showing incoming delays and packet losses.



Routing Information Service (RIS)

The Routing Information Service has been established to collect inter-provider routing information at points in the Internet infrastructure in near real time. The information is time-stamped and stored in a database. The information produced by the RIS is a major improvement over the current looking glass technology and will support ISPs in their operations.

In 2001, the development of the RIS focused on increasing the number of data collection points and turning the RIS from an experimental project into a regular and reliable service offered to the Internet community.

Remote Route Collectors (RRCs) collect data for the RIS. In 2001, five new RRCs were installed: at the SFINX (Paris, FR), AMS-IX (Amsterdam, NL), CIXP (Geneva, CH), VIX (Vienna, AT) and NSPIPX2 (Tokyo, JP). The number of peering sessions increased from approximately 40 in January to 170 in December 2001. Installation of collection points at the Netnod-IX (Stockholm, SE) and in the USA are planned for early 2002. In order to cope with the increased amount of data and to provide a high ?up-time? a Redundant Array of Independent Disks (RAID) device has been installed.

The RIS Database can be queried online via several web forms. Several queries were added in 2001 based on user feedback. The entire RIS web site was reviewed and expanded. Examples showing how to use the RIS to solve common BGP-related problems in daily operations were added for operators with little experience in this area.

In order to provide information showing the development of Internet routing over time, a sub-project was initiated to extract the relevant parameters for the RIS Database. A first version of the RIS report was released in the summer of 2001 showing a handful of parameters for a few peering sessions. After receiving positive feedback from the community the RIS report will be expanded to show more variables for all peering sessions.

During 2001, several groups began using the RIS data for scientific research purposes. It is clear that the RIS data is a good source of information for understanding both the dynamics of BGP-routing as well as the growth of the routing tables in the Internet. An overview of results of this research as well as further information about the Routing Information Service can be found at:

http://www.ripe.net/ris/ris-index.html

Security-Related Services and Infrastructure

During 2000, it became clear that in the coming years the RIPE NCC and its membership will be faced with the challenge of deploying various Internet security technologies based on public key cryptography

Operations Staff at work

that include:

* Electronic Mail Authentication and Encryption. The possibility to use these technologies when communicating with the RIPE NCC has already been requested by the RIPE NCC membership and RIPE community.

* DNSSEC. The RIPE NCC is responsible for a large share of (reverse) name space. DNSSEC requires deployment throughout the DNS infrastructure. The RIPE NCC members operate a large part of this infrastructure. Thus the RIPE NCC can foster the ?top-down? DNSSEC deployment in this space.

* Certificates for IP address space, as initiated by APNIC.

* Access to LIR information on a secure, members-only area on the RIPE NCC website.

* IPSec, securing the contents of data in IP packets.

These technologies share common features in that they are gaining relevance, software is becoming available, and proper deployment on any significant scale is challenging. The most important challenges with the deployment appear to be the unfamiliarity with the new applications significant resource requirements (if not deployed cleverly) and proper management of keys and certificates.

For these reasons, two new projects were started. The first, secure services for LIRs, deals with the delivery and increased accessibility of RIPE NCC services to its membership, primarily related to resources distributed by the RIPE NCC such as IP address space certificates mentioned above. During 2001, this project was in the initial phase of analysis. Requirements were outlined and an in-depth analysis of modifications needed for the RIPE NCC internal systems was undertaken.

The second project, DISI (formerly known as DASIST), was started in December 2000. The goal of the project is to assist the membership with all aspects of deploying security technologies in the Internet infrastructure itself. Following a ?Birds of a Feather? (BoF) meeting at the RIPE 39 Meeting in Bologna, the Technical Security Working Group (techsec-wg) was established as a forum to discuss technical issues related to improving the security of the Internet infrastructure.

In its first year of operation, the DISI project focused on the deployment of security in the Domain Name System. The RIPE NCC intended to deploy DNS Security (DNSSEC) technology on the reverse DNS tree but quickly discovered that there are problems in the DNSSEC protocol making deployment prohibitively expensive.

The RIPE NCC participated in IETF efforts to solve protocol problems and developed a PERL programming library and DNSSEC course material. The programming library has been used by several groups to prototype and build DNSSEC maintenance tools. The DNSSEC course is a one-day hands-on tutorial intended for DNS administrators. The course was delivered three times in 2001: a trial run in Amsterdam, the Netherlands, at the HAL2001 conference in Enschede, the Netherlands, and at the RIPE 40 Meeting in Prague, Czech Republic.

More information on this project, course material, and the software developed can be found at:

http://www.ripe.net/disi/

Additionally, the RIPE NCC identified a need for the extension of the code base that is used in the operations of DNS root servers. In 2001, the RIPE NCC collaborated with NLnet Labs, the Netherlands, in the design and specification of name server software specially tailored for authoritative name servers. The goal of this is to develop a robust, high-performance open-source DNS implementation. Part of the project is a general-purpose environment for testing the functionality and performance of DNS servers.

Infrastructure Development

During 2001, several steps were undertaken to ensure the stable operation of the RIPE NCC technical infrastructure and keep it up-to-date with current technologies that will support and enhance services provided to the membership.

* **IT Infrastructure**

In 2001, the RIPE NCC successfully completed an extensive migration of the in-house desktop systems. Previously, the BSDI Operating System was in use on the workstations of all Hostmasters and engineers. Due to the increasing difficulty in maintaining a desktop environment based around this OS, it was decided to migrate to Linux. At the same time, Windows users were migrated to Windows 2000 in a redesigned Windows 2000 domain, considerably improving the maintainability of this environment. To complement the software side of these migrations, a major renewal of hardware used on the desktop was deployed. The project was completed in July 2001.

* **Office Services**

To achieve greater performance, fault tolerance, and ease of administration, a major migration of back-end services has been undertaken during the course of 2001. As in the case of the desktop environment the back-end services were based around BSDI. A major migration to the Linux OS involving the replacement of most existing servers with new hardware and the redesign of several services was carried out.

* **External Services**

Throughout the course of 2001, the RIPE NCC migrated external services to new hardware and Linux and Solaris operating systems. All external services with the notable exception of the RIPE Whois Database server previously ran on BSDI. It was also necessary to perform an upgrade to the k-root servers. This involved the replacement of the four Intel-based machines running BSDI to new Sun hardware running Solaris. This solution is viable for the short term. Investigations continue for the long term.

* **Connectivity**

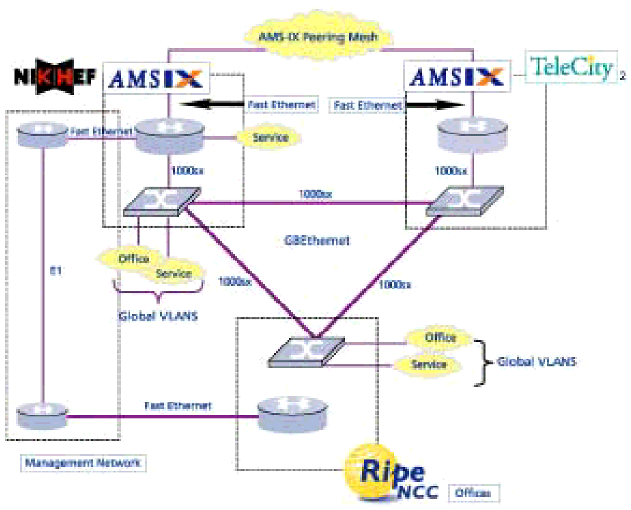
The RIPE NCC performed a range of upgrades to its network as part of a larger project. At the beginning of 2001, the network consisted of two main sites: the RIPE NCC office and the NIKHEF (National Institute for Nuclear Physics and High Energy Physics) location of the AMS-IX where external services are located. The two main steps undertaken include:

- The installation of a Gigabit Ethernet connection provided by KPN, the Netherlands, between the RIPE NCC and NIKHEF locations, providing a considerable increase in available bandwidth.

- The acquisition of a second AMS-IX PoP at the Telecity2 Collocation facility and the installation of two dark fibre segment lines provided by MMFN connecting this site to the RIPE NCC and NIKHEF AMS-IX locations. This will allow a transformation of the network topology into a triangle.

With the completion of the second stage, the RIPE NCC will have a cutting-edge technology network that will make the deployment of new bandwidth consuming services feasible. The new equipment and configuration also allows easier deployment of multicast, flow analysis, data integrity solutions and a more resilient and reliable network for RIPE NCC services.

RIPE NCC Network Diagram



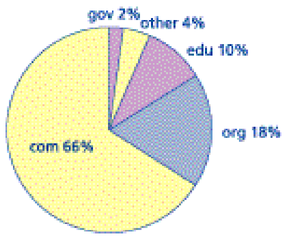
RIPE

RIPE (Réseaux IP Européens) is a collaborative forum open to all parties interested in wide area IP networks. The objective of RIPE is to ensure the administrative and technical co-ordination necessary to enable the operation of the Internet in the RIPE region. There are no membership requirements for participation in RIPE; activities are performed on a voluntary basis and decisions are formed by consensus.

The work of the RIPE community is carried out within a variety of Working Groups. Each of these RIPE Working Groups has one or more mailing lists where relevant topics are discussed. The RIPE community is the most important source of public input for the RIPE NCC and also plays a significant role in the development of the RIPE NCC annual activity plan.

The RIPE NCC is committed to supporting the bottom-up industry self-regulatory structure developed by the RIPE community. As an

2001 RIPE Meeting Attendance (RIPE 38-40) per Organisational Category



self-regulatory structure developed by the RIPE community. As an integral part of this structure the RIPE NCC provides administrative support for RIPE and facilitates the organisation of RIPE Meetings.

RIPE Meetings

RIPE Meetings take place three times a year. The RIPE Working Groups gather to openly discuss challenges of the day and develop solutions at each of these meetings. The main purpose of these open meetings is to discuss technical and policy issues affecting Internet administration and operations specific to IP networking. Network operators also meet at RIPE Meetings to discuss technical co-ordination matters.

Policies regarding IP networking are created within the RIPE collaborative forum. The RIPE NCC does not set policies but ensures the consistent application of policies within its service region.

Although two distinct organisations, RIPE and the RIPE NCC are highly interdependent in their operations.

RIPE 38	22 - 26 January	Amsterdam
RIPE 39	30 April - 4 May	Bologna
RIPE 40	1 - 5 October	Prague

A total of 1222 participants attended the RIPE Meetings during 2001

More information about RIPE Meetings can be found at:

http://www.ripe.net/ripe/meetings/

Participants at RIPE 40

The RIPE NCC in the Internet Industry

RIPE Chair Rob Blokzijl with Mohamet Diop of AfriNIC

The Regional Internet Registries are proactive in embracing new and existing technologies that require Internet resources. The RIPE NCC increased its outreach activities significantly in 2001. This resulted in a greater awareness of the distinct roles of RIPE and the RIPE NCC in Internet administration. Particular attention was given to enhance long established and new working relationships in the industry, bridging diverse interests while raising the reputation of the RIPE NCC as a valued neutral and impartial organisation. Fundamental to its outreach activities is the promotion of the bottom-up industry self-regulatory structure and long-standing processes that have secured the Internet infrastructure over the years.

The RIPE NCC represents the interest of its members and the RIPE community by actively participating in various forums and meetings. As a result of its presence in the past, the RIPE NCC noted an increase of requests to speak at conferences and meetings held worldwide. In 2001, the RIPE NCC responded to topical issues brought forward by the industry that included the migration to IPv6, the introduction of ENUM services, and the emergence of telecommunication services on the Internet.

The RIPE NCC participated in various IPv6 forums such as the IPv6 Task Force initiated by the European Commission, the IPv6 Forum and other events with a prominent focus on IPv6. The RIPE NCC worked in close collaboration with the IETF and the International Telecommunication Union (ITU) to prepare for the roll-out of ENUM services. The RIPE NCC contributed to workshops organised by National Regulator Authorities in order to clarify the role of the RIPE NCC in ENUM operations. The RIPE NCC also met with Members of the European Parliament from four countries and visited representatives of national governments and the European Commission.

In 2001, the RIPE NCC continued its commitment to the ICANN process and worked together with the ASO Address Council members gathering inputs from the RIPE community to advise ICANN. Additionally, the RIPE NCC held a respected presence at ICANN meetings in 2001, most notably in a joint RIR presentation on Internet security concerns at the ICANN Annual Meeting in November 2001 in Marina del Rey, U.S.A. In January 2001, Sabine Jaume began her second term as a RIPE region representative on the Address Council. Address Council elections were held at the RIPE 40 Meeting in Prague, Czech Republic, with Hans Petter Holen re-elected.

The RIPE NCC also continued its support for the emerging RIRs, LACNIC (Latin American and Caribbean Network Information Centre), and AfriNIC (African Network Information Centre) and contributed to their workshops and meetings. More information on the emerging RIRs can be found at:

AfriNIC: *http://www.afrinic.org*
LACNIC: *http://www.lacnic.org*

To provide the Internet community with an overview of how the RIRs facilitated the development of CIDR (Classless Inter-Domain Routing) and the Internet Registry System, the RIRs jointly published the article "Development of the Internet Registry System" in the Internet Protocol Journal available at:

http://www.cisco.com/warp/public/759/ipj_4-4/ipj_4-4_regional.html

Daniel Karrenberg, RIPE NCC Chief Scientist, was presented the Internet Society?s 2001 Jonathan Postel Service Award in recognition of his outstanding contributions made to the Internet community. In recognition of their experience in Internet operation, the RIPE NCC was also proud to have one of its staff members nominated for a seat on the Internet Architecture Board (IAB).

Financial Report 2001

Statement of Income and Expenditures 2001

in kEUR	Actual 2001	Actual 2000	Difference FY01 vs FY00	Difference % of FY00
Income				
Fee	8,746	7,982	764	10%
RIPE Meetings	322	220	102	46%
Other income	35	13	22	169%
Total Income	9,103	8,215	888	11%
Expenditures				
Personnel	4,519	3,262	1,257	39%
Operational expenses	1,854	1,453	401	28%
RIPE Meetings and LIR Training Courses	750	431	319	74%
Depreciation	674	503	171	34%
Total Expenses	**7,797**	**5,649**	**2,148**	**38%**
Surplus before miscellaneous costs and financial expenses	1,306	2,566	(1,260)	-49%
Miscellaneous costs				
Doubtful debts	321	53	268	506%
Personnel fund	(165)	165	(330)	-200%
Total miscellaneous costs	156	218	(62)	-28%
Financial expenses	(232)	(124)	(108)	87%
Surplus 2001	**1,382**	**2,472**	**(1,090)**	**-44%**

Balance Sheet as at 31 December 2001

in kEUR	31 December 2001		31 December 2000	
ASSETS				
Fixed Assets				
Computers	847		461	
Infrastructure	481		179	
Office equipment	61		66	
		1,389		706
Current Assets				
Accounts receivable	5,299		5,181	
VAT	17		15	
Miscellaneous	433		579	
		5,749		5,775
Cash On Hand		6,028		5,934
Total Assets		13,166		12,415
LIABILITIES				
Capital				
Reserves	477		477	
Clearing house	4,720		2,248	
Surplus	1,382		2,472	
		6,579		5,197
Current Liabilities				
Creditors	241		766	
Wage taxes and payroll payable	288		155	
Unearned revenues	5,610		5,621	
Personnel fund	(165)		498	
Miscellaneous payables	613		178	
		6,587		7,218
Total Liabilities		13,166		12,415

Notes to the RIPE NCC Statement of Income and Expenditures as per 2001

General information

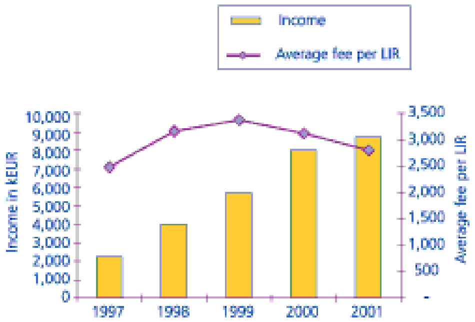
All amounts are expressed in kEUR. Currencies participating in the European Monetary Union are converted at the official rate set by the European Central Bank. All other currencies are converted at the daily exchange rate at the date of transaction or valuation.

Historic costs have been used throughout unless otherwise stated.

Revenues

Revenues increased by 11% compared to the financial year 2000. This increase was due to the excessive growth in new LIRs even though the fee was lowered in 2001. RIPE Meeting income was higher in 2001 as a result of increased attendance. On average, approximately 400 people attended each RIPE Meeting in 2001.

Interest income was 257 kEUR and is reflected in the financial expenses



Expenditures

In 2001, the RIPE NCC had a workforce of 75.9 FTEs (Full Time Equivalent) versus 61.7 in 2000. This increase in resources was necessary to cope with the increased workload that was mainly a result of the increase in new LIRs. As a result of this increased workforce, the personnel and operational expenses have increased by 35% compared to the financial year 2000.

RIPE Meeting expenses have increased by 240 kEUR as two of the meetings were held outside Amsterdam. In 2001, 55 LIR Training Courses were given versus 41 in 2000. In addition, more countries within the RIPE NCC service region were visited. This increased the LIR course costs by 79 kEUR in 2001.

The replacement of outdated computer equipment and several infrastructure projects have led to an increase of 171 kEUR in depreciation costs.

The Personnel Fund expense was calculated using the number of people with employment contracts of indefinite time working at the RIPE NCC as at 31 December 2001. The repayment for the fund to the RIPE NCC was 165 kEUR.

The economic downturn has resulted in more bankruptcies, an increasing amount of mergers and new members that did not fulfil their first payment. This has increased the doubtful debts considerably compared with 2000.

The surplus in 2001 was 1,382 kEUR, well below the surplus of 2000. This continues the trend towards a break-even level and further reinforces the decision to lower LIR fees in 2002.

Notes to the RIPE NCC Balance Sheet as per 31 December 2001

General information

All amounts are expressed in kEUR. Currencies participating in the European Monetary Union are converted at the official rate set by the European Central Bank. All other currencies are converted at the daily exchange rate at the date of transaction or valuation.

Historic costs have been used throughout unless otherwise stated.

Fixed Assets

	Computer	Infrastructure	Office Furniture
Book value 1/1/2001	461	179	66
Purchase costs	914	424	19
Depreciation	528	122	24
Value 31/12/2001	847	481	61

Assets are valued at historical costs and are depreciated on a straight-line basis, starting in the month after acquisition. Computers are written off in two years, infrastructure is written off in three years and office furniture and equipment in five years. All items under EUR 1,000 are expensed.

Current Assets

Accounts receivable	31/12/2001	31/12/2000
Receivables	5,442	5,201
Bad debts	(143)	(20)
	5,299	5,181

Receivables have been subject to two contradictory effects: the growth in new LIRs and the decrease of fees for 2002. As a result, the receivables have shown a slight increase.

A large percentage of bad debts was incurred by LIRs that applied for membership but were not actually established.

Miscellaneous receivables	31/12/2001	31/12/2000
Prepaid	321	531
Other receivables	112	48
	433	579

Prepayments include rent, equipment, pension, health and deposits for RIPE Meeting venues. Other receivables consist of interest receivable, payments in transit and long-term receivables.

Capital

Up to 1998, surpluses have been accumulated in the RIPE NCC reserves. In 1998, the RIPE NCC agreed with the Dutch tax authorities on a tax ruling that allows surpluses to be put in a Clearing House. All yearly surpluses since 1998 have been allocated to the Clearing House. More information about the Clearing House can be found at:

http://www.ripe.net/ripe/docs/clearinghouse.html

Current liabilities

Unearned revenues

The unearned revenues consist of invoices sent in the financial reporting year but pertaining to the following accounting year. Unearned revenues have decreased compared to the financial year 2000 due to a lowering of the fees in 2002. This effect diminished the increase in new "member" LIRs.

Wage taxes and payroll payable	31/12/2001	31/12/2000
Vacation and social premiums	142	98
Other wages and salaries	146	57
	288	155

Miscellaneous payable		
Accrued expenses	610	188
Other payables	3	(10)
	613	178

The due contribution payments to ICANN for the last two years are the main component of the amount accrued.

Items not shown in Balance Sheet

The RIPE NCC rents office space in two buildings and has four separate rental agreements for these. Four bank guarantees for a total amount of 135 kEUR have been issued to cover the rent of the office space in Amsterdam.

At year end, the RIPE NCC had committed to an amount of 178 kEUR for the renovation and refurbishment of newly rented office space. This total includes a landlord refurbishment contribution of 57 kEUR.

Auditor?s Report

To the General Meeting and
Executive Board of the RIPE NCC Association
Singel 258
1016 AB Amsterdam

Introduction

We have audited the financial statements of Réseaux IP Européens Network Coordination Centre (RIPE NCC), Amsterdam, for the year 2001. These financial statements are the responsibility of the management of the association. Our responsibility is to express an opinion on these financial statements based on our audit.

Scope

We conducted our audit in accordance with auditing standards generally accepted in the Netherlands. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation of the financial statements. We believe that our audit provides a reasonable basis for our opinion.

Opinion

In our opinion the financial statements give a true and fair view of the financial position of the association as at 31 December 2001 and of the result for the year ended in accordance with accounting principles generally accepted in the Netherlands.

Amsterdam, 19 April 2002

M.H.P van Winsen

Registerraccountant

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The RIPE NCC Annual Report 2001 can be found at:
http://www.ripe.net/ripencc/about/annual-reports.html