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INTRODUCTION

[Na Lateral]

"A novelty this year will be the presentation of partial results of the *RedeH* Project, in which several new work groups are developing dynamic circuit service prototypes for the new hybrid network."

The theme of this 11th edition of the WRNP will be Digital Image, Culture and Collaboration, looking at several aspects of the use and transmission of digital images. The applications extend from sciences and engineering, where visualization as images of the result of numerical calculations enormously accelerate their being understood, to culture, where digital technologies, which have already made chemical films and magnetic tape for photography and television obsolete, are at the point of also winning over the cinema. At the panel on the first day of the event, we will have leading experts in these areas, such as Marcelo Gattass, of the Pontifician Catholic University of Rio de Janeiro (PUC-RJ) , Tereza Carvalho, of the University of São Paulo (USP) and Jane de Almeida from Mackenzie University (São Paulo). The panel will include a small showing of super-high definition videos.

Since the last WRNP, there have been several advances in the area of infrastructure of RNP networks which will be made available to their users still in 2010. The expectation is that, by the end of this year, the metropolitan networks (gigabyte optical infrastructures) in the remaining 11 state capitals of the *Redecomep* (Community Educational and Research Networks) will be inaugurated. Also in the same period, the existing *Ipê* Network should be completely replaced by a new version, largely based on the optical infrastructure of the *Oi* Telecommunication Company, with whom RNP signed a long-term agreement intermediated by ANATEL, the Brazilian Telecommunications Regulatory Agency. Initially, this new network will take connections of at least 3 Gpbs to the 23 state capitals and the Federal District south of the Amazon River, most of them being 10 Gbps. This large increase in capacity was preceded, already in 2009, by a substantial increase in international connectivity capacity, raised from 3 to 10 Gbps.

The WRNP also will have the presentation of work developed by RNP itself, including the current cycle of RNP Work Groups (GTs-RNP) and the resulting experimental services. A novelty this year will be the presentation of partial results of the *RedeH* Project, in which several new work groups will be

developing dynamic circuit service prototypes for the new hybrid network. All these groups will present technical demonstrations throughout the WRNP and the Brazilian Symposium of Computer Networks (SBRC), in RNP theme stands in the main hall of the Events Center of the *Fundação de Apoio da Universidade Federal do Rio Grande do Sul (Faurgs).*

There will also be a presentation of the RNP Services and Solutions Directory *(Diretoria de Serviços e Soluções)* , whose activities include managing production services at RNP, many of which arising from the results of the work groups.

At the end of the WRNP, a joint panel will be held with the SBRC, where three researchers of this community, who have already represented it in the RNP Board of Directors, Antônio Abelém (Universidade Federal do Pará-UFPA), José Neuman (Universidade Federal do Ceará-UFC) and Luci PIrmez (Universidade Federal do Rio de Janeiro-UFRJ), together with three RNP directors, will make an evaluation of the functioning of the current organizational model, in addition to showing their visions on what is to come in the next few years. The moderator of this panel will be José Augusto Suruagy Monteiro (Universidade Salvador- UNIFACS)

Michael Stanton

RNP Director of Research and Development

11th WRNP Digital Image, Culture and Presentation

21 YEARS OF RNP

As it comes of age, RNP is renewing itself, getting ready to take on even greater responsibilities. With 21 years of a lot of work, and the dedication of several people and institutions, RNP has built a solid reputation, recognized in Brazil and abroad for its quality and credibility.

Even after all this time, there are still challenges of inclusion which, in the past, motivated the idealizers of out institution. Even though the *Ipê* Network's capacity has multiplied and its applications are much more advanced, there is a lot to be done.

The 11th WRNP coincides with the end of a work cycle in which the goals of infrastructure modernization, innovative R&D proposals, advanced services, community integration and global cooperation are being evaluated, in order to project the new challenges for the future.

In this scenario, the expansion of the Inter-ministerial Inclusion Program of the Culture Ministry and, in the new future, of the Health Ministry, have been revealing new projects and opportunities. Making access to digital banks widely accessible to people at all levels the possibility of collaborative production and integration with educational and research institutions inland are opportunities which feed innovation and new service initiatives.

In the last four years, the results of 29 Work Groups in R&D expanded and enriched the offer of *Ipê* Network applications and defined very important solutions for the close to 600 RNP user institutions. In addition, some of these solutions started to be adopted outside of the academy, paving the way for new partnerships between RNP, researchers and other organizations and companies.

At the moment in which the government is working to widen the access to broadband for the population. RNP contributes directly in the preparation and execution of this plan so that the objective can be achieved. We defend that this should begin with the campuses, schools, institutes or universities- they are the key institutions in the process of digital proficiency for society.

The initiative of the Federal Government, who created the National Broadband Plan, opens up an important opportunity for a partnership between RNP and the new Telebrás. The union of the efforts of RNP with that company will allow for progress in increasing connection capacity and quality, especially for the federal educational and research institutions located in the country's interior, using a modern, high-capacity infrastructure.

With this objective, the RNP also is making technical cooperation agreements with Oi Telecommuncations, which, as part of its investment in R&D established by Anatel, in partnership with the Ministry of Science and Technology, will install high capacity network infrastructure in the next 10 years to interconnect RNP user institutions.

A high quality network for research, education and culture, with access for all, independently of location, is emerging starting now. Thanks to the tireless work of all RNP employees, that has resulted in important partnerships with government organs, companies and our higher education and research community.

Nelson Simões da Silva

José Luiz Ribeiro Filho

General Managers through 2010 and 2000, respectively.

RNP Timeline

The 70's

Brazilian researchers abroad became fascinated with the benefits of electronic information exchange. They return bringing the dream of interconnecting Brazilian academic institutions.

The 80's

- **The motivation to use data communication emerges at the universities. The 80's are marked by mobilization to end the isolation of the scientific and technical communities;**
- The RNP (National Educational and Research Network) is formally launched, with the pioneering mission to disseminate the use of the internet in Brazil for educational and social purposes.

The 90’s

- **RNP’s principal strategy is a plan to implement a Point of Presence (PoP) in each Brazilian state.**
- The first step is taken to make possible commercial internet in Brazil, with critical participation of the RNP.
- **The ministries of Education (MEC) and Science and Technology (MCT) begin the Inter-ministerial Implementation and Maintenance Program for the National Education and Research Network (PIMM) to implant the RNP2 backbone.**
- The 1st RNP Workshop (WRNP) is held, created to debate the path of networks in Brazil and in the world.

The 2000´s

- **The RNP2 backbone is discontinued to give way to the optical network, the *Ipê* Network.**
- The *Ipê* Network connects close to 600 institutions and over a million users.
- **The *RedeH-FuturaRNP* project is launched, responsible for setting the basis for the next generation of the Brazilian educational network.**
- The São Paulo-Miami connection has its international capacity increased to 20 Gbps.

2010

- **Through an agreement signed with the Oi Telecommunications Company, RNP increases its aggregate backbone capacity by 280%.**

IPÊ NETWORK- CHARACTERISTICS, SERVICES, FUTURE GROWTH

The *Ipê* Network is the name which the primordial service that the National Education and Research Network provides to the Brazilian academic community. It is a communication service based on protocols and internet networks aimed at collaboration, research, education and dissemination of culture, both on a national level and in connections with the rest of the world.

Currently, the *Ipê* network includes not only the interstate backbone, which in the connection grid between the 27 state Points of Presence (PoPs), but also branches which serve federal educational and research institutions. The network is funded with resources from an inter-ministerial program which brings together resources of the Education Ministry (MEC) and the Science and Technology Ministry (MCT), and, more recently, has begun to include resources also from the Ministry of Culture.

Having begun its operations in 1992, with a few interstate connections between capital cities close to the coast, the network grew steadily, both in capacity and in reach to the most distant regions. Today, the network is present in all capital cites, and starting in 2002 started also to fund and manage connections with federal institutions in other cities in each state.

The network operates using a collaborative model, each Point of Presence is hosted in an educational or research institution, which assumes an important role in the local operation and management of the user institutions. At the 27 PoPs, the network maintains state-of-the-art routing equipment, which assure in the traffic of IPv4 and IPv6 in the core network, as well as multicast IP, with these latter two forms taken to user institutions according to the local possibilities of the Pops and the institutions themselves.

A great quantum leap in the *Ipê* Netowrk was made in 2005 with the installation of multigygabyte infrastructure between 10 Points of Presence. Since then, between the capitals of Rio de Janeiro, Minas Gerais, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Pernambuco, Bahia, Ceará and the Federal District, communications are made wuth ample capacity (band) and without restrictions of this nature. The network is about to make a second great leap. Because of the agreement signed with Oi, the extension of the multiple gigabyte *Ipê* network will be increased to 24 PoPs with only the three which are north of the Amazon River excluded, where there is still no high capacity physical telecommunication infrastructure.

During the 11th WRNP, in the Infrastructure Today and Tomorrow (*Infraestrutura Hoje e Amanhã)* session, the topology of the new network that is expected to be

built during 2010 will be presented, as well as services which will potentially be offered because of the large available capacity. Some traffic indicator statistics will also be presented to show growth in the use of the network.

Alexandre Grojgold

RNP Director of Engineering and Operations

EVOLUTION OF THE NETWORK

1992 Map

Aggregate velocity: 390.4 Kbps

Link Technology:

LPCD

National integration- current situation

Aggregate velocity: 61.4 Gbps

Link Technology:

Points of Presence connected to Gygabit

Points of Presence connected to Megabit

Projection by the end of 2010

Aggregate velocity: 233.2 Gbps

Link Technology:

10 Gbps

3 Gbps

200 Mbps

20 Mbps

FUTURARNP PROGRAM

The current combination of domestic and international connections with gigabit access in the metropolitan area changes the way research networks are used a great deal. In addition to better capacities available for end-to-end communications, it also opens up the possibility for the use of a variety of heretofore unfeasible applications. At the same time, the new paradigm emerges for end-to-end circuits, which allows for better treatment of these applications than the traditional IP, generating great flows of information. A hybrid network offers the services of IP packages and end-to-end circuits in a common infrastructure.

Since 2002, the option for a hybrid network has been adopted by literally all research networks which offer high capacity services (gigabits). Now it will be RNP's turn, which, since 2008 started to design the next phase, the sixth in its evolution.

The *RedeH-FuturaRNP* project is aimed at performing a technological prospecting to serve as a basis for planning this next phase in the evolution of RNP's network.

Study groups were defined in four areas, in order to generate support for the new network design, based on a hybrid architecture.

- User community and its applications;
- Access to infrastructure to allow for large network capacities;
- Hybrid network architecture and technologies;
- Support for applications, especially middleware;

Group 3 was organized in sub-projects involving researchers from ten institutions and RNP technicians in key end-to-end circuit subjects, such as dynamic procurement, management and operation and interoperation between distinct technologies and domains. Each team received equipment to build a circuit network in its laboratory, and all these laboratories are interconnected through the experimental *Cipó* network, an overlapping network build on the *Ipê* and *Giga* networks. The *Cipó* network allows for validation of the interoperation of technologies and domains.

The great benefit of the development of this work will be to launch the future circuit service for RNP users. Today the manual provision of end-to-end circuits is an arduous process for applications which require this service, typically to guarantee bandwidth for demanding applications. The automation of this operation will make this service quicker and simpler, allowing for a large increase to users who need it. This is doubly true for international circuits used in scientific collaboration work, where partner networks already use dynamic circuits, as in the Internet2 and ESnet networks in the United States.

Michael Stanton

RNP Research and Development Director

WORK GROUPS

Since 2002, RNP's Work Group (GTs) program has been promoting the formation of partnerships between the organization and research groups for the development and introduction of innovative applications and services on the *Ipê* network, operated by RNP.

Some of the services made available today by RNP to its user community, such as *fone@rnp, video@rnp, MonIPÊ,* the Public Key Infrastructure for Education and Research (ICPEDU), the Federated Academic Community (CAFe), and systems like the iVA, being adopted by RNP's Network College (ESR) in the Distributed Class project, resulted from work performed by the GT's, and are examples of the success of this program. Currently in the experimental phase, the Distance Learning Service (EDAD) comes also from the research and development efforts of the GT's.

The formation of new GT's is initiated every year, by the publishing of a Proposal Request to the research community. The proposals received are analyzed by representatives from RNP and from the academic community who select the groups to be hired. Each GT is made up of a coordinator and a team of assistants: researchers from public or private institutions, and has the accompaniment of one or more RNP technicians.

Since 2006, the activities of the GT's have been divided into two phases: In the first phase, for one year, a prototype is developed to validate the proposed application or service. If it is successful, the GT is hired for one more year to implement a pilot service. During the WRNP, the GT's from the current period should demonstrate their prototypes working.

While they are working, the GT teams also use the *Ipê* Network backbone as a research laboratory. Thus, RNP fulfills part of its mission vis-à-vis the academic community.

Since the creation of the program, 56 Work Groups (GT's) have been hired. The table below shows the list of the GT's since the beginning of the program. More information on the work topics and people involved are available at: http://www.rnp.br/pd/gt.html. The GT's for the period 2009-2010 are presented in greater detail in the following pages.

2002-3 : --**Voice over IP (VoIP)**

-- Digital Video (VD)

-- **Network Educational Applications**

-- Directories

-- Quality of Service (QoS)

2003-4: -- VoIP 2

-- VD2

-- Network Configurations

-- **Directories 2**

-- QoS2

-- **Public Key Infrastructure for the academic environment (ICPEDU)**

--Collaborative Computing-P2P

2004-5:--**Advanced VoIP**

--Reliable multicast

--Pervasive grid;

--Middleware;

--**Measurements (MED);**

--ICPEDU2;

--P2P2

2005-6: **--Storage on the network**

-- Digital TV;

--University access wireless broadband mesh network (ReMesh)

--Remote visualization;

--MED2

--ICPEDU3

--Video Management (GV)

2006-7: --Virtual Community Grid (VCG);

--Digital TV 2;

--ReMesh 2;

--**Distance learning infrastructure(IEAD);**

--MED3;

--**Failure diagnosis and recovery automation (ADSReF);**

--GV2

2007-8: -- **VCG 2;**

--Virtual museums (MV);

--High velocity transportation (Travel);

--IEAD 2;

--Distance Learning (EDAD);

--ADRef 2

--Overlaid service networks (Overlay)

2008-9: --Education and research in virtual worlds;

--MV 2;

--Travel 2;

--Federation of Educa Brasil Repositories (FEB)

--EDAD 2;

--Monitoring of SGSD-based (BackstreamDB) backbone traffic;

--Overlay 2;

--Digital and Art Media (MDA);

2009-10: --Monitoring of the torrent universe;

--Mixed reality;

--Services for transposition of federated authentication;

--FEB 2;

--802.11s wireless mesh network with high scalability;

--**BackstreamDB2;**

--Software components for social interaction and collective Intelligence;

--MDA 2;

COLLABORATIVE WEB TOOLS- SOFTWARE COMPONENTS FOR SOCIAL INTERACTION AND COLLECTIVE INTELLIGENCE// GT-CWTOOLS

The web today is collaborative. Web pages, which before only allowed for mono-user interactions, have now incorporated resources aimed at collaboration. Electronic commerce websites, for example, began to offer support for evaluation, review, message exchange, wiki, sharing of photos, recommendation and other resources for each product. 2.0 web systems improve as more and more users interact and contribute. A “collective intelligence” is built based from analysis of user interactions.

In the applications with support to collective intelligence, information needs to be collected, recorded, processed and presented. As these non-trivial tasks are added to the difficulties inherent to the development of collaborative web systems for mobile computing, it has become necessary to provide better instruments to develop applications for 2.0 web. The use of software components contributes to easing these difficulties, making possible for developers and researchers to experiment and make prototypes quickly for computer solutions.

The Groupware Workbench Porject (http://www.groupwareworkbench.org.br) offers an execution infrastructure and component kits to build collaborative systems. This infrastructure provides component installation, updating, grouping, customization, availability, reuse and life cycle support.

The GT-CWTools works in developing new components for this infrastructure, so as to offer support to build social networks and process data for collective intelligence. To define and evaluate the components developed, they will be used in three real projects with GT partner institutions:. The components will be used for: construction of a social network for collective study of Brazilian architecture through images, implementation of support to collective intelligence and social interaction in the news system of the Journalism course at the School of Communication and Arts of the University of São Paulo (ECA/USP); and implementation of a help desk on free software at the Free Software Competency Center (CCSL) of the Mathematics and Statistics Institute of USP.

Algorisms of collective intelligence will be used, encapsulated in the components, to perform groupings, recommendations by similarity, search criteria, navigation by tags and filtering, among other functions. In the same

way, components will also be used for social interaction to allow for collaboration in these scenarios.

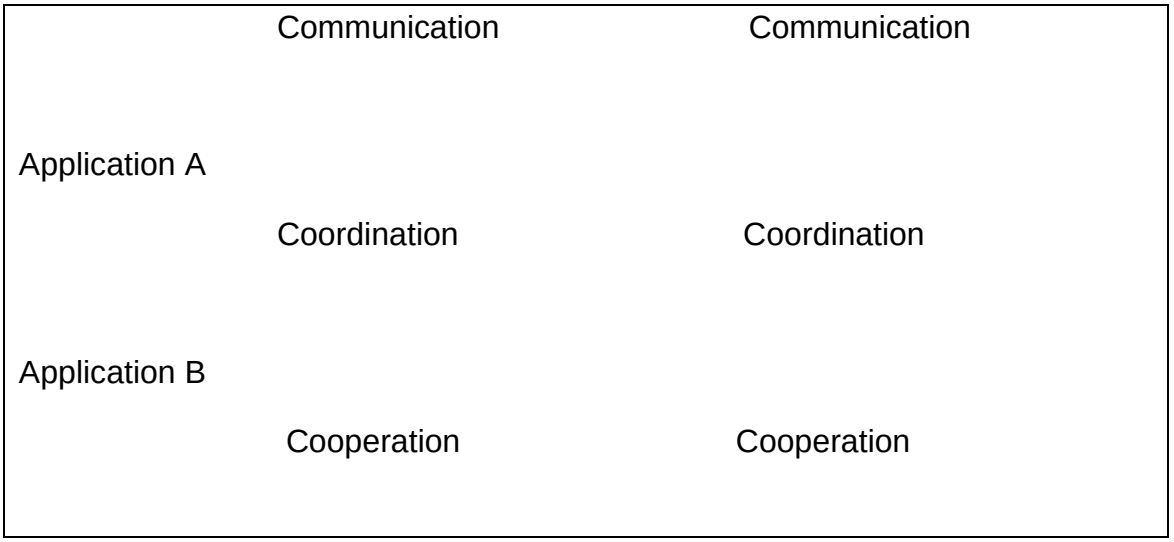
Within the context of this GT, the software components also are being extended to the open mobile platform *Android,* in order to allow the investigation of support to collaboration through multiple devices. It is expected that this tool may be reused in the future to build and reconfigure social networks and collaborative systems for the widest variety of application domains.

For more information, visit:

https://sites.google.com/site/groupwareworkbench/gt

GT Coordinator:

Marco Aurélio Gerosa (IME/USP)



A 802.11S WIRELESS MESH NETWORK WITH HIGH SCALABILITY//GT-DHTMESH

The IEEE (Institute of Electrical and Electronics Engineers) is defining a standard called 802.11s which allows for the creation of wireless mesh networks, where the nodes communicate through multiple skips. Different from conventional AdHoc networks, which work on the network layer, the 802.11s networks work on the link layer.

The protocols to discover routes, which generally are known as routing protocols, in these networks are referred to as Path selection protocols and, naturally, manipulate MAC addresses instead of IP addresses. The 802.11s specifies a Path Selection protocol, called Hybrid Wireless Mesh Protocol (HWMP), which should be implemented by all equipment compatible with the standard but which supports the use of other protocols.

HWMP is a protocol which has a reactive and a proactive mode and was designed mainly aiming to serve the environment in which mesh network traffic is mostly destined for the Internet. This generates high delay problems for discovering internal routes, in addition to overloading the nodes which have the function of root nodes. Added to this is the fact that the HWMP is based on sending broadcasted messages, and it has been observed that it does not have good scalability, allowing for networks of up to 32 nodes, as detailed in its specifications.

To solve these problems and allow for the creation of 802.11s networks with high scalability, the members of the GT-DHTMesh developed a path selection protocol called DHT-Based Cluster Routing Protocol (DCRP). The objective of this GT is to implement DCRP in real 802.11s equipment and create a mesh network with them. This network will be used to analyze the two protocols and compare their performances. The implementation will be developed for the Linux kernel. The OpenWRT of this operating system will be used, which is directed toward wireless routers.

In order to achieve a high scalability, DRCP seeks to considerably reduce the number of broadcast messages on the network. To do this, it introduces a certain level of hierarchy to send the frames, through a division of the network into clusters, and the use of the Distributed Hash Tables (DHT). The DHT's are used to allow for the publishing and consulting information related to the topology of the network using unicast messages.

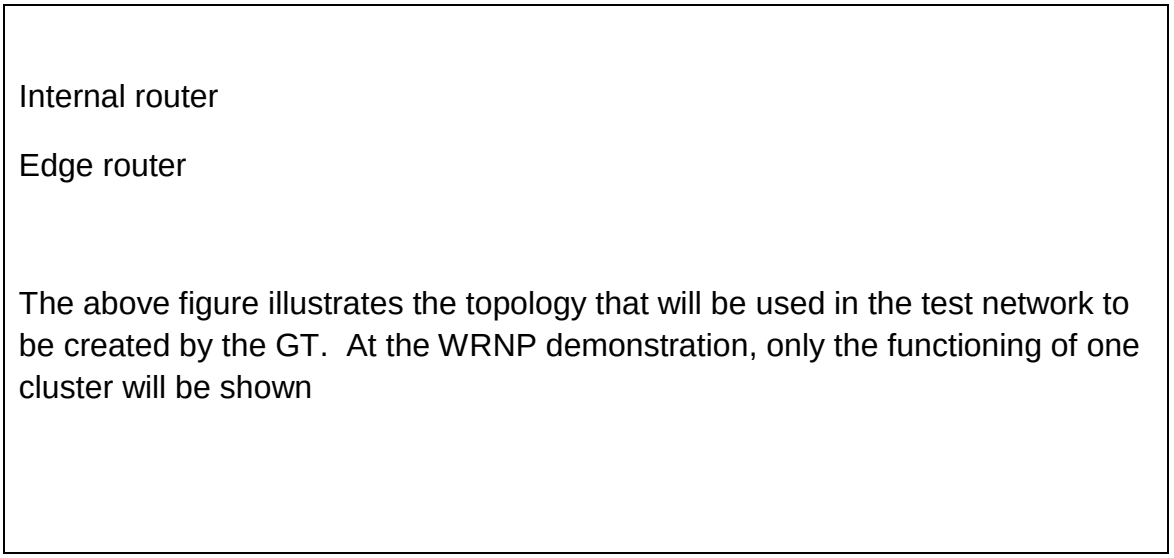
DRCP uses as a base, a proactive protocol called RA-OLSR, but executed independent instances of this protocol, one inside each cluster, and another considering each cluster as just a single node. There is also a DHT inside each cluster and another for the inter-cluster network.

For more information, visit:

GT-DHTMesh:http://www.dimap.ufrn.br/-dhtmesh/

GT Coordinator:

Marcos César Madruga Alves Pinheiro (UFRN)



The above figure illustrates the topology that will be used in the test network to be created by the GT. At the WRNP demonstration, only the functioning of one cluster will be shown

TOPOLOGY OF THE TEST NETWORK

MIXED REALITY WORK GROUP//GT-RM

This group proposes the creation of a set of software tools which together will make up a system to create mixed reality presentations. The proposed system is subdivided into two main modules: one for augmented reality and the other augmented virtual environment.

The augmented reality module is made up of image processing tools. These tools use cameras (including webcams) to capture paper with special markings. Through processing algorithms, these markings are converted into virtual 3D images. These are applied on top of the image of the real environment (captured by the same camera). On a monitor screen (or using a projector connected to the video output of a computer) there is a presentation of real and virtual together.

The module of augmented virtual environment is made up of a virtual environment and by tools to integrate the virtual environment with the real one. The virtual environment is based on the platform developed by the Virtual Museums GT (GT-MV). This platform allows displaying of videos inside the virtual environment. As a proposed extension to this project, a tool is being developed to execute these videos in real time.

The tools to integrate real with virtual are based on the use of sensors (like cameras) which capture actions generated in the real environment and exhibit them in the virtual environment.

Figure 1 shows the application of a tele-class using resources of mixed reality. As the figure shows, we have a classroom with two projections. What is being projected behind the teacher are her slides. On the wall a 3D environment video is projected. This is used by the students to watch the class remotely. The 3D image of this room is projected on the wall to give the impression of continuity of the physical space of the room. This continuity, however, is done virtually.

In the 3D virtual room environment, the students watch what is being transmitted by the teacher. The real time video is captured by the camera positioned at the back of the room (behind the students). This process of showing the video in the virtual environment characterizes augmented virtual environment, since the user, accessing the system by Internet, sees the virtual system (classroom environment) added to the video which is being shown inside the environment.

The teacher also uses the camera on the classroom ceiling to use the augmented reality system. This camera captures paper with markings. When a marking is captured, it converts the marking into a 3D object which is shown in the video room of this camera. The 3D object generated also will be shown to the virtual students. The teacher may also move the marking to show the 3D objects in other angles and thus show them with more detail.

For more information visit:

http://www.natalnet.br/gtrm

GT Coordinator:

Luis Marcos Garcia Gonçalves (UFRN)

FIGURE 1- MODEL OF CLASSROOM WITH THE GT-RM SYSTEM

SERVICES FOR TRANSPOSITION OF FEDERATED SIGN-ON CREDENTIALS//GT-STCFED

The objective of the Federated Academic Community (Federação CAFe) is to provide a single sign-on mechanism (SSO) for members of the Brazilian educational and research institutions. For this, the CAFe Federation uses the Sign-on and Authorization Infrastructure (AAI) based on the *Shibboleth* middleware.

Educational and research institutions may join CAFe as identity providers to sign on their users, and a service providers, which can be accessed by all members of the federation. These services should provide a web application which implements the protocols used by *Shibboleth.* For services whose target public is not restricted exclusively to the academic community, this implementation could be a limiting factor.

The main motivation for the GT-STCFed is to allow for members of a *Shibboleth* federation to interact with non-*Shibboleth* applications. The objective of this GT is to develop an infrastructure which guarantees a *Shibboleth* federation (for example the CAFe Federation (i) that its members access service providers which are outside the *Shibboleth* domain, and (ii) the transposition of credentials between different sign-on technologies.

In the GT-STCFed two services are being developed: the Security Token Service (STS) and the Credential Translation Service (CTS). The functions of the STS are the issuing and validation of security credentials, according to WS-Trust specifications. CTS, on the other hand, deals with aspects of credential translation between different security technologies.

The scenario illustrated in the figure below shows a service portal belonging to a *Shibboleth*-based federation (like café) as service providers outside the *Shibboleth* domain and the STS and CTS services. The portal is introduced to group the services affiliated to the federation, making them available to members of the *Shibboleth* domain.

The users, in turn, using the same accounts and passwords of their institutions, can access the affiliated service providers (steps 1 to 3 in the figure). In this scenario, the affiliated provider may demand, for example, through its protection quality policy [WS-Policy] an X.509 digital certificate (step 4) as sign-on credential. The GT-STCFED infrastructure (STS and CTS) converts the SAML sign-on assertion (issued by the *Shibboleth* Sign-on authority) into an X.509n

digital certificate, waited for by the affiliated provider (steps 5 to 6) and sends it together with the external provider access request (step 7).

For more information, visit:

http://www.gtstcfed.das.ufsc.br/

GT Coordinator:

Joni da Silva Fraga (UFSC)

Client

Member of Shibboleth Federation

1)Access to SP

2)Shibboleth sign-on

3)Access to non-Shibboleth application

4)Obtain WS-policy

5)Request new credential

6)Translate credential

7)Access to non-Shibboleth application

_____

SP-Service Provider

STS-Secure Token Service

CTS- Credential Translation Service

IdP- Identity Provider

OI

PUBLIC ADMINISTRATION CAN ALSO BE SIMPLE LIKE THIS

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MONITORING OF THE TORRENT UNIVERSE//GT-UNIT

BitTorrent is a highly popular P2P application which has become a standard for file sharing on the Internet. Despite its ample adoption, little is known about the real workings of the universe of BitTorrent networks. Information may be useful, for example, for detection and dimensioning certain illegal activities on the Internet, for projects of new P2P applications and also for information for marketing campaigns.

The objective of this GT is the creation of a scalable architecture for BitTorrent network monitoring. This architecture, known as TorrentU is formed by two principal elements: Observer and Telescope.

The **Observer** is the module responsible for the distributed coordination of a group of telescopes used to monitor specific points of interest in the universe. It allows the user to configure a set of monitoring strategies, as well as visualizing the data discovered in different presentation formats.

The **Telescope** is the module responsible for monitoring specific parts of the universe, according to the strategies pointed by Observer. A telescope has a set of “lenses” which can be used to observe communities, tracers and peers.

The lenses of the telescope can be configured so as to cover a larger scope of the universe, with regard to shared contents, to the quantity of torrents published and the geographic location of the peers and tracers. It is also possible to adopt a more restricted monitoring scope, pointing the lens to a specific content, which allows for a better understanding of this type of network and the elements present in it.

Through the proposed architecture, the objective is to analyze a consistent and flexible group of monitoring strategies. These strategies may be combined so as to provide different degrees of coverage, richness of details and precision of information.

The **coverage** refers to the number of elements to be observed, with focus on the geographic distribution of the peers, on the interval of publication time or on the types of available content. **Richness of detail** includes a set of attributes to be observed, such as the number of peers involved in sharing specific contents, the number and velocity of downloads, the peers which support a certain functionality, among other aspects. Finally, precision is related to the frequency with which contents are observed and the size of the sampling.

Another important aspect in the proposed architecture is its orientation towards efficiency. Monitoring strategies can be combined so as to maximize the quality of the data obtained consuming the minimum amount of resources.

For more information, visit:

http: //labcom.inf.ufrgs.br/-gtunit/

GT Coordinator:

Antonio Marinho Pitta Barcellos (UFRGS)

Mininova

BT Junkie ISSO Hunt

PirateBay

Overlaying of torrents in communities	**Number of peers according to the lenses**
Geographical distribution of the peers	**Distribution of clients used**
	uTorrent
	Azureus
	Manline
	BitComet
	Others

MONITORING OF SGSD-BASED BACKBONE TRAFFIC//GT-BACKSTREAMDB 2

The GT-BackstreamDB 2 seeks to design and implement a distributed solution for passive traffic monitoring, which allows for definition of arbitrary metrics and generation of real-time measurements, considering backbone flows as a whole. The specific objectives of the group are:

- Development of a monitoring tool based on a Data Stream Monitoring System (SGSD);
- Integration of the tool with the *Ipê* Network Monitoring Service (MonIPÊ);
- Implementation of a web query interface supporting user sign-on with different privilege levels.

This tool brings benefits to web administrators, allowing that metrics of interest are expressed in a high-level language, replacing scripts executed on stored data. The approach facilitates maintenance and allows for obtaining results in real time, in addition to favoring their reuse. The integration with MonIPÊ and the PER-Formance Service Oriented Network monitoring Architecture (PerfSONAR] allows for services already planned for in these projects to be added to the tool, such as the sign-on service.

During the WRNP the workings of this solution will be presented, identifying how the user will interact with the system. The proposed strategy uses SGSD nodes located close to the data sources and which are already implanted in the RNP Points of Presence (pOPs) of Paraná (PoP-PR) and Santa Catarina (PoP-SC). The network administrator can define the metrics of int4erest through a web interface or use a query previously created in the Query Library. Measurements will then become available by Web Services using the PerfSONAR structure.

For more information, visit:

http://www.natalnet.br/gtrm

GT Coordinator:

Luis Marcos Garcia Gonçalves (UFRN)

FEDERATION OF EDUCA BRASIL REPOSITORIES//GT-FEB 2

Technology has permeated the educational scene. Thus, more and more, digital learning objects emerge. These objects with educational content need to be stored, catalogued and made available on the web, allowing for them to be shared, recovered and reutilized. To solve this demand, several learning object repositories available on the web have appeared. These repositories, each one independent among themselves, necessarily require the effort of the user to locate and select materials of interest in each one of them individually.

The Federation of *Educa Brasil* Repositories (FEB) has the purpose of organizing various repositories into one hierarchical system known as a federation, centralizing information regarding objects stored in the federation participants in a single web portal. Thus, a user looking for digital learning objects for a specific purpose can use the search portal made available by the federation.

The portal classifies search results based on level of similarity, using intelligent information recovery methods, with a system of term weighting and association of similar words. In addition, it provides a web interface for administrators and repository registration.

The portal, in the administrative module, also provides for the creation of a federation of federations, establishing a confederation of repositories of learning objects. Thus, it is possible to segment repository administration by region, allowing for autonomy among them without losing the facility of centralized object searching.

FEB is being tested with learning objects of institutions and initiatives such as the *Biblioteca Nacional* (National Library) [of the Ministry of Culture], the *Banco Internacional de Objetos Educacionais (*the International Bank of Educational Objects) [BIOE of the Ministry of Education]; repositories of the Federal University of Rio Grande do Sul [CESTA, LUME, ENGEO and OBAA) and more recently the ARCA Project (of *RedIRIS*, Spain's educational network).

At WRNP the structural confederation model will be demonstrated, and a brief explanation made of the data preparation processes and use of search and administrative tools.

For more information, visit:

http://feb.ufrgs.br

GT Coordinator:

Rosa Maria Viccari (UFRGS)

DIGITAL AND ART MEDIA WORK GROUP//GT-MDA 2

The **GT MDA** arose from the need to create a systemic process to provide technological infrastructure which supplies a tool structure, essential to support technological artistic activities, such as the Versus telematic dance programs [In] TOQue and the *e-Pormundos Afeto.* Based on this context a tool was developed whose main objective is to offer the user a simple interface to manipulate different simultaneous media forms and flows.

The proposed tool is called **Arthron** and is made up basically of four components, the *Decoder,* the *Encoder,* the *Reflector,* and the *Articulator.* Each one of these components has a specific role in the preparation of an event and can be local or distributed geographically in the network.

The main function of the *Decoder* is to exhibit a single media flow, decoding and exhibiting at the output of some device a specific flow. The capture of the flow is made through the User Datagram Protocol (UDP) in a port previously defined with the *Articulator.*

The *Encoder* is responsible for capturing and codifying the media source [which can be either an external source or a local file] and for sending it to a *Reflector,* which will distribute to the destinations configured in the *Articulator.*

The *Reflector* is the component whose functions are replicating, redistributing and transcodifying a certain media flow over the network. It does this in two ways: One is by sending it directly, that is, replicating and redistributing without any kind of alteration in the original flow to one or several *Decoders* specified by the *Articulator.* The other way is to perform the transcodification of a floe at a lower rate for monitoring by the *Articulator* and sending to the Internet.

The *Articulator* is the principal and most complex component of **Arthron.** It is responsible for the remote administration of the other components, concentrating a large part of the functionalities:

- Flow programming;
- Animation programming;
- Monitoring and measurement;
- Modification of the configuration of other system components;
- Blockage and release of components;

- Generation of a link for publication on the internet;
- Automation of flow exchanges;
- Video effects;
- Publication on the web;
- Location map;

Besides the artistic and technological aspect, **Arthron** can be used in other situations of real time and pre-recorded digital media manipulation, such as telemedicine activities and digital TV, among others.

In this WRNP, the GT-MDA demonstrates an **Arthron** execution scenario which can be visualized in Figure 1. The potentials of the tool will be presented, as well as its already mentioned functionalities through the *Articulator* component.

For more information, visit:

http://www.lavid.ufpb.br/gtmda

GT Coordinator:

Tatiana Aires Tavares (UFPB).

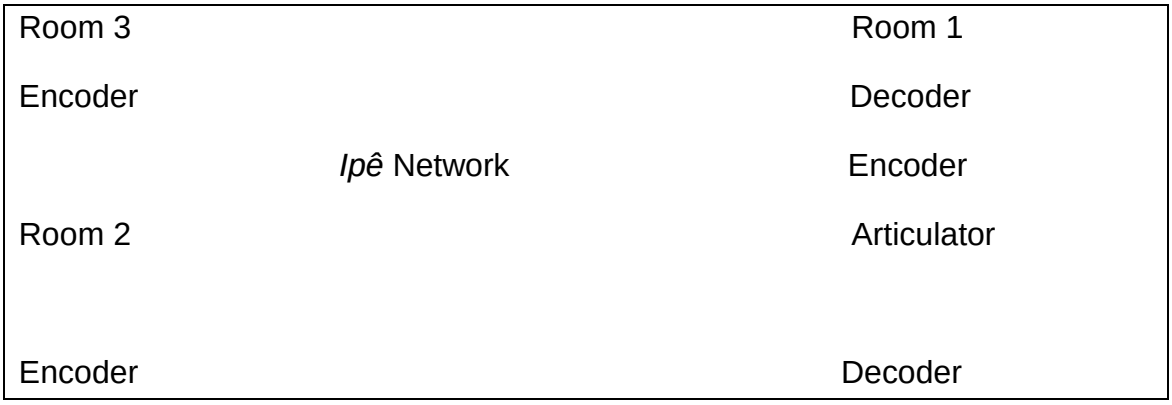

Figure 1 Arthron Scenario Demonstration at WRNP 2010

EDAD AND IVA- INITIATIVES TO SUPPORT DISTANCE LEARNING

Since 2009, RNP has been investing in research and development in two platforms to support distance learning: the iVA System [Interactive Video and Audio System], derived from the GT-IEAD and the Experimental Distance Learning System derived from the GT-EDAD.

Although they have the same subject, the IEAD and EDAD work groups approached different aspects of distance learning. IEAD focused on the benefits of synchronized classes [live with teacher-student interaction] while EDAD concentrated its efforts on the advantages of asynchronous classes, in which teacher and student do not have to be available at the same time.

iVA-Interactive Video and Audio System

The GT_IEAD, under the coordination of Professor Valter Roesler, of UFRGS, developed the iVA from 2006 to 2008. Currently, iVA is being evaluated by the Network College (ESR), training service unit of RNP, as a distance learning tool in the project known as Distributed Classes (*Turmas Distribuídas).* The project's objective is to allow for synchronized classes to be held through the different ESR units, in such a way that the instructor can present the content to different locations simultaneously, expanding knowledge dissemination to all regions and reducing travel costs. In addition, it maintains the faithfulness to ESR methodology and allows for interactions between teacher and student.

The solution architecture is made up of a tele-classroom generating content, where the teacher is located, and several remote poles which communicate between themselves by audio and video, which allows the teacher to administer his or her classes both at the same physical location as well as to the remote poles. To give the students at the remote poles the sensation of a class where they are physically present, 46" TV's are used where they receive permanent transmission of the teacher's image and, at the same time, follow the slides through the projector.

The iVA is also being used by Inmetro in its project to create training "Telecenters" spread among the units of the Brazilian Network of Legal and Quality Metrology (IRBMLQ-I). At present, 34 of the 55 telecenters planned are ready.

EDAD- Experimental Distance Learning Service

The GT-EDAD, under the coordinator of Professor EDmundo A. de Souza e Silva, of COPPE/UFRJ, between 2007 and 2009 developed a scalable and robust solution for storage and dissemination of interactive class videos. EDAD is in the experimental phase at RNP.

The idea is to make available and operate a national infrastructure to disseminate on a large scale multimedia educational material, in the form of previously prepared video classes. Using a universally accessible platform, students can watch these pre-stored classes at any time, without the need for the teacher to be present.

The solution architecture is made up of clusters of servers which perform the functions of managing or storing the classes and are located in the RNP Presence Points. The system allows the student to navigate through the video class, using a topics index (guide), to interact with the transparencies (slides), guided by the video of the teacher, and also do exercises, using applications initiated during the video class.

The RNP created the Network College (ESR) to disseminate Information and Communication Technology knowledge, with units in Brasília, Cuiabá, João Pessoa, Porto Alegre and Rio de Janeiro.

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RNP Services

RNP provides services to its community which takes care of all distance communication and advanced collaboration, besides disseminating knowledge and strengthening network infrastructure. The portfolio of services is a result of a process of innovation, analysis of trends and needs, and represents a group of quality services managed and operated by RNP together with its partners. The target publics of these services are RNP user organizations, as well as special, strategic or high-demand user communities, as well as other groups defined by public policies by sector.

Strategic management of the portfolio and life cycle of RNP services is being structured and developed, and will permit establishing metrics and indicators, allowing for definition of goals and helping in the analysis and constant evolution of the services offered. The portfolio of RNP services is made up by the Service Catalogue, that is, the services which are effectively available, in addition to the services which are being planned and developed (pipeline). Currently, the Service Catalogue has the following list of items:

- Web Conference- virtual environment to hold meetings, presentations, classes and others, allowing for real time interaction between all participants, using collaborative work resources;
- fone@RNP- VoIP service which allows for savings on calls, increasing the number of extensions and mobility;
- Internet Data Center (IDC)- strategic hosting service of equipment and servers [collocation] in an environment with a special physical and logical infrastructure, in addition to guarantees of high availability, security and uninterrupted operation;
- Federal Network Interconnection Point (FIX/PTTMetro de Brasília]- traffic exchange point, coordinated and operated by RNP, which promotes the direct interconnection between the networks which make up the Brazilian Internet, increasing operational velocity and quality and directly benefiting user organizations;
- Live video broadcast- live event transmission (streaming);
- TV Signal transmission- diffusion of TV channel signals of interest to user organizations;

- Videoconference- on demand virtual rooms which allow for holding multi-point videoconferences;
- On demand video- environment for submission of videos, forming a repository with content related to the core activities of user organizations.

RNP also provides support to Web Conference services through a Service Desk to answer questions and to forward service issues, following RNP's collaborative model activities. RNP's objective is to expand the scope of activities of the Service Desk to other services, which will represent an advance in the standards of service quality.

In the planning and development stage are the following services: Federated academic Community (café) and Public Key Education and Research Infrastructure (ICPEDU), which will be operated by RNP.

Antonio Carlos Nunes

Assistant RNP Service Management Director

- http://www.rnp.br/servicos/
- The Web Conference service is currently restricted for the use of specific communities;
- The Internet Data Center (IDC) has a strategic Usage Policy.
- The live video broadcast services, on demand TV and video signal transmission services use the RNP digital video network (RVD), an intelligent network of distributed servers which optimizes the video replication and transmission.

Extreme Networks of Santa Clara, California, founded in 1996, is a publicly-held company which designs, manufactures and installs sophisticated Ethernet solutions which meet the most difficult challenges of network connectivity and IP-based communications.

Throughout its history, the company has supplied more that 15 million Ethernet ports and has established a presence in more than 150 countries. The company increases the value of the network with its advanced software platforms which provide significant information and control for applications and services. This helps companies and service providers who need to have high-

performance secure networks which support voice, video and converged data. The intelligence is enhanced with an extendible, flexible and secure protocol-based communication capacity, allowing devices to communicate with each other.

PROJECTS AND PARTNERSHIPS

Aiming to continually improve the services and solutions offered to the *Ipê* Network user community, RNP is involved in managing projects focused both on managing optical network infrastructure and services and applications.

In the area of network infrastructure, RNP directs the National Optical Infrastructure initiative (ION), whose objective is to gradually replace the domestic backbone with proprietary connections. In this regard, partnerships are being formalized with Oi and the *Companhia Estadual de Distribuição de Energia Elétrica do Rio Grande do Sul* (CEEE-DI)(Rio Grande do Sul State Electric Utility) which will permit reduction in operating costs with long-distance circuits and expansion of the *Ipê* network inland.

In a broader scope, however in the same direction, there is the Latin American Science and Technology Optic Infrastructure (IOLACT). The focus of this initiative is to build a proprietary optic network within the scope of the Mercosur. The partnership formalized between Global Crossing, RNP and the Latin American Cooperation of Advanced Networks (CLARA) will guarantee the connection between Porto Alegre and Buenos Aires.

Still in the category of optical network infrastructure, the Community Educational and Research Networks (Redecomep), launched in 2005, has already inaugurated 16 proprietary metropolitan networks. By the end of 2010, there will be 27 networks in operation in Brazil, not including the 14 planned for other cities inland. In addition, as an offshoot of Redecomep, RNP has started the *IT Campi* program, whose goal is to go the last mile to the campuses of the Federal Higher Education Institutions (IFES) and Federal Science and Technology Institutes (IFETS).

Services and applications for health, education and culture

Attentive to the interests and needs for collaboration and communication of the user communities, RNP is developing a series of specific projects in the areas of health, culture and education. The University Telemedicine Network (Rute), for example, which already has 37 centers in operation and is in its third phase, allows for remote evaluation of clinical cases and preparation of pre-diagnoses at a distance, in addition to contributing to continued health research and education.

In the cultural area, RNP is managing a pilot project with the Ministry of Culture. The project's objective is to democratize the access to cultural archives and content and encourage collaborative production and dissemination of culture by the Internet, using the *Ipê* network. Along this line, the Public TV Interchange Network (RITVP) and the RedeIFES@RNP can be highlighted, which will allow for the adaptation of the federal university TV connectivity infrastructure using the network operated by RNP.

Finally, in the area of education, there are initiatives which seek to improve the access to information and develop distance learning platforms, like the Capes Periodical Update Portal and the Digital Solutions for Education.

José Luiz Ribeiro Filho

RNP Service and Solutions Director

DIGITAL SOLUTIONS FOR EDUCATION

Fruit of a technical cooperation program between RNP and the Special Secretariat for Distance Learning, of the Ministry of Education (SEED/MEC), the objective of the program is to develop Information and Communications Technology solutions for distance learning and network connectivity solutions to improve the communication and connectivity situation in the country's public schools. The initiative, which began in 2007 and is in its fourth phase, includes support to the National Educational Technology Program (Proinfo) and extension of support for transmission of the *TV Escola* signal by the Internet.

EDUCATIONAL NETWORKS AND THE CHALLENGE OF MEETING SCIENTIFIC COLLABORATION DEMANDS WITH 4K RESOLUTION

4k resolution corresponds to 4,096 horizontal pixels and 2160 vertical pixels, that is, approximately four times the total number of pixels used today in the 1080i HDTV format and 24 times more than the standards for Cable TV signals.

This new resolution will make collaboration possible in several areas of knowledge, such as advanced scientific visualization, which allows scientists to better understand phenomena which are simulated by large and complex computer models.

In the area of digital cinema, it is expected that this format will be widely used in the near future. In addition to the extraordinary image quality, there is the possibility of distributing the content directly to movie theaters through the network and remote real time collaborative editing, reducing movie post-production costs. We also highlight the use of 4K in telemedicine in applications of remote surgical diagnosis, in which image resolution is a critical factor. Additionally, the 4k 3D [stereo] allows for a virtual reality experience through immersion in virtual environments, bringing together the frontier between real and virtual.

RNP is a member of the Cinegrid and the Global Lambda Integrated facility (GLIF) which are organizations of researchers and institutions which collaborate with the development and use of this new technology. From the point of view of educational networks, the challenge is to transport millions of bit to meet the requirements of these applications. To give an idea, real time transmission (streaming) of a 4k video without compression requires a transmission rate of around 8Gbps. Adding compression, we can reduce the transmission rate to 1.5 Gbps or to 500 Mbps, when the M-JPEG2000 format can be used. Besides the need of a network infrastructure to make these applications possible, we encounter other limits related to TCP and UDP protocols, which were not designed to work with this type of application in high speed networks, meaning that it is necessary to use some modified versions of these protocols. Also in the final systems, which store and transmit the videos, several technical requirements must be observed so that they can be used, such as the network board capacity, the performance of access to the storage devices, memory and other items.

In July/2009, together with the inauguration of RNP's international 10Gbps link, during the International Festival of Electronic Language (FILE) of 2009, the

organization supported the simultaneous transmission of a 4k film of São Paulo to Keio University in Japan, and the University of California at San Diego (UCSD), in the United States. RNP Coordinated the network support for this activity through the creation of dedicated lightpaths [optical circuits] for transmission through several research networks: Kyatera and Ansp in Brazil, Florida Light Rail and Cisco Wave [C-Wave] in the United States and JGN2plus and Wide, in Japan. The following GLIF Open Lightpath Exchanges [Goles] also participated: Southern Light (São Paulo), Ampath (Miami), Starlightn (Chicago), and T-Lex (Tokyo). More than 60 researchers were involved in this transmission of the compressed media with 4 K resolution (4096 x 2160] to 400 Mbps and a non-compressed videoconference in HD [900 Mbps] between São Paulo, UCSD and Keio University.

Iara Machado

Assistant RNP Director for Advanced Internet

4K IN THE CINEMA AND IN THE MEDIA

[Na lateral]

Projection of film in 4k format is demonstrating a substantial difference in images in terms of luminosity and transparency

Close to 110 years after the Lumière brothers invented the cinema, digital technology is dreaming once again of replacing it, now with the potential of a projection with a resolution of more than 8 million pixels per frame. Recently, the 4 k resolution was established as the standard resolution of digital cinema recommended by DCI [Digital Cinema Initiatives], an association of the largest studios of Hollywood. The term “4K” refers to the number of horizontal pixels of the 4096 image. It is an image with four times more definition than HD and 24 times more than traditional TV.

The projection of movies in the 4K format shows a substantial difference in images in terms of luminosity and transparency. We can verify the textures and details of objects, perceive the shapes of faces in the crowd, observe details and differences in colors, have a notion of the screen as a “whole” and the perception of an image that can be seen completely without taking our glance out of focus. Even without being able to measure the quality of each one of the images side by side, it is already known that 4k eliminates cinema graining, producing another image, which can be the image of stories in a very near future.

The world is up against a new universe of incredible sharp images, with vivid colors and details, intense brightness and impressive transparency. But what type of scenes, what kind of subject, what kind of language, what type of cinema will inaugurate this new technology?

4k launches challenges not only for the production areas, which will need to adapt to the impressive richness of details furnished by this technology, investing in items like remodeling of scenes and costumes, which, from now on have to be taken care of the minutest of details, so as not to appear out of the standards demanded for ultra-high definition.

There are also impacts on production and even on the style of the narratives. If definition is so intense that it allows us to see the background as well as the figure, what can we actually see? How should we work with focus in a projection in which the elements are mostly all in focus? What kind of method

should be used to obtain new forms of images? What type of images, what type of effects will be constructed?

These are just some of the questions which begin to be discussed in the scope of culture and media because of 4k. Visualizing details never before seen in landscapes, objects and people, we will have to reflect artistically and cognitively about this volume of uncountable scale of extra information. Our own image, together with its reflection in us, is getting ready to be tripled by the intense brightness and by the luminosity of this new technology which today is within our reach.

Jane Almeida

Mackenzie University

TECHNOLOGICAL IMPACTS OF 4K

4K Cinema is the most advanced technology of digital cinema commercially available today. 4k is characterized by the use of digital technology both in distribution and in the projection of movies. Digital projectors for 2k Cinema [2048 x 1080 pixels] began to be used in 2005 and could show 2.2 megapixels of resolution. In the case of 4k Cinema [4096 x 2160], the projectors have a capacity to show 8.8 megapixels. Therefore, 4k cinema has four times more resolution than 2k Cinema and 24 times more than standard TV.

From the technical standpoint, the challenges for 4k Cinema are enormous. A resolution of 4096 x 2160 at 24 frames a second could imply a non-compressed video rate of 750 MB/s (that is, 6.6 Gbps) and a storage demand of 2.5 TB for 60 minutes of film. Such volume of data causes a significant impact on the editing, exhibition and transmission of video, as well as in the storage infrastructure and networks. These demands can be mitigated by compression mechanisms, which, nonetheless, introduce significant delays in the processes if the proper care is not taken in their implementation. Solutions are frequently used which divide the load into its different elements, such as servers, discs and compression boards.

From the resource standpoint, production/coding, projection, storage and distribution equipment is very expensive. Implementation and maintenance of a complete 4k cinema solution (production, exhibition and transmission) requires very specialized human resources, currently scarce in the market as it relates to a technology which is quite new, even being an evolution of the 2k Cinema.

Tereza Cristina M.B. Carvalho

University of São Paulo

SCIENTIFIC VISUALIZATION AND GEOGRAPHICALLY DISTRIBUTED COOPERATIVE WORK IN THE OIL INDUSTRY

The oil production systems in deep waters, including the floating production units and all the equipment involved in production, are currently designed by complex computer modeling systems. These systems involve the areas of structural calculations, meteo-oceanography, hydrodynamics, risers, anchoring systems, underwater equipment, foundations and evaluation of geological and geotechnical risks. The design of a new production unit is a long and costly process and may last years and consume hundreds of millions of dollars. The designs are directed by several specialists, sometimes geographically dispersed, generating independent artifacts and results, but highly inter-related.

The need for collaboration is a characteristic which is inherent to designs of deep water floating production units. The possibility of sharing information among users, control the execution of different modeling tools, visualize and manipulate virtual 3D models in submerged environments of virtual reality is pushing the limits of team activities in the oil industry, especially in oil engineering.

In summary, in the oil and gas industry, activities are cooperative, multi-disciplinary and geographically distributed, and thus require velocity and quality in the sensoring, numerical simulation and visualization processes. These demands result in requirements which are still not being met by current computer networks. The search for ways to perform transmission of 4k videos is certainly a step in the direction of solving these problems.

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Ismael H.F. dos Santos

PETROBRÁS