The internet – an underexplored mechanism to foster inter- and transdisciplinary global communication and knowledge sharing on dryland stewardship

Dr. Oscar Gilberto Cárdenas Hernández
Universidad de Guadalajara - CUDI

Brief history of Internet

- The first recorded description of social interactions through networking was a series of memos written by J.C.R. Licklider of MIT in August 1962 discussing the concept of "Galactic Network".

LSE Department of Law

Introducing the Internet

- The idea of a network of linked computers was first suggested by psychologist JCR Licklider in 1960 in his paper *Man-Computer Symbiosis*.
  - "It seems reasonable to envision, for a time 10 or 15 years hence, a 'thinking center' that will incorporate the functions of present-day libraries together with anticipated advances in information storage and retrieval…*The picture readily enlarges itself into a network of such centers, connected to one another by wide-band communication lines and to individual users by leased-wire services.* In such a system, the speed of the computers would be balanced, and the cost of the gigantic memories and the sophisticated programs would be divided by the number of users"

J.C.R. Licklider

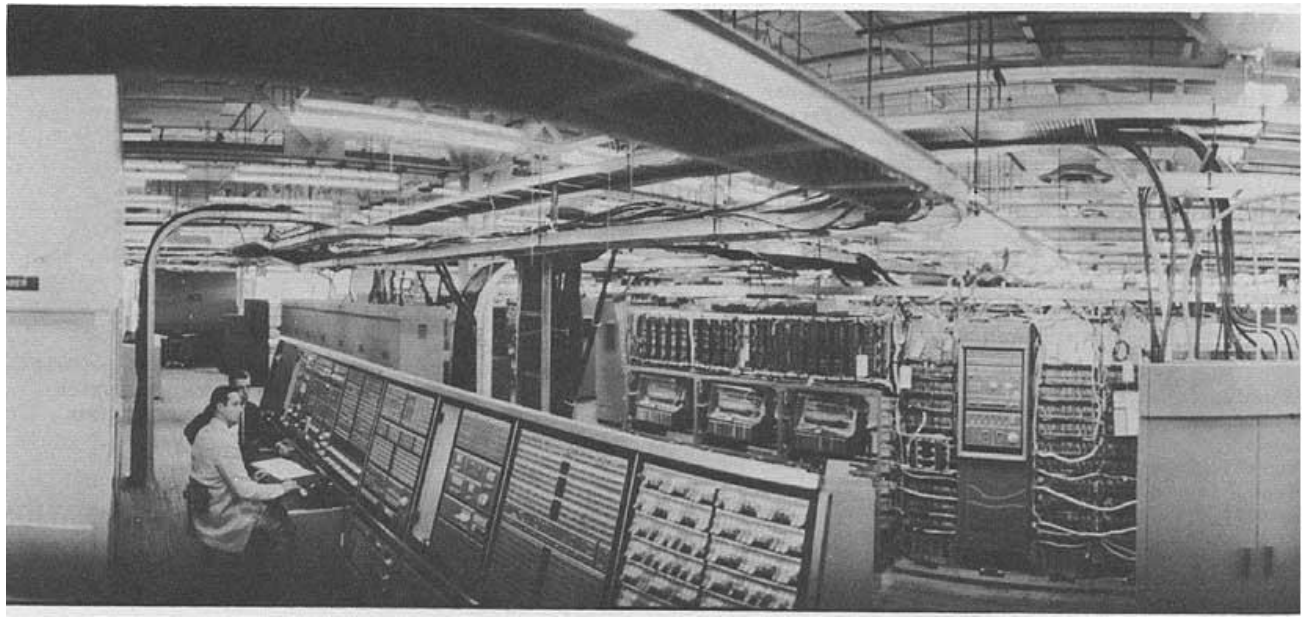
Brief history of Internet

Leonard Kleinrock at MIT published the first paper on packet switching theory in 1961.

Theorethical feasibility of communications using packets rather than circuits.

Brief history of Internet

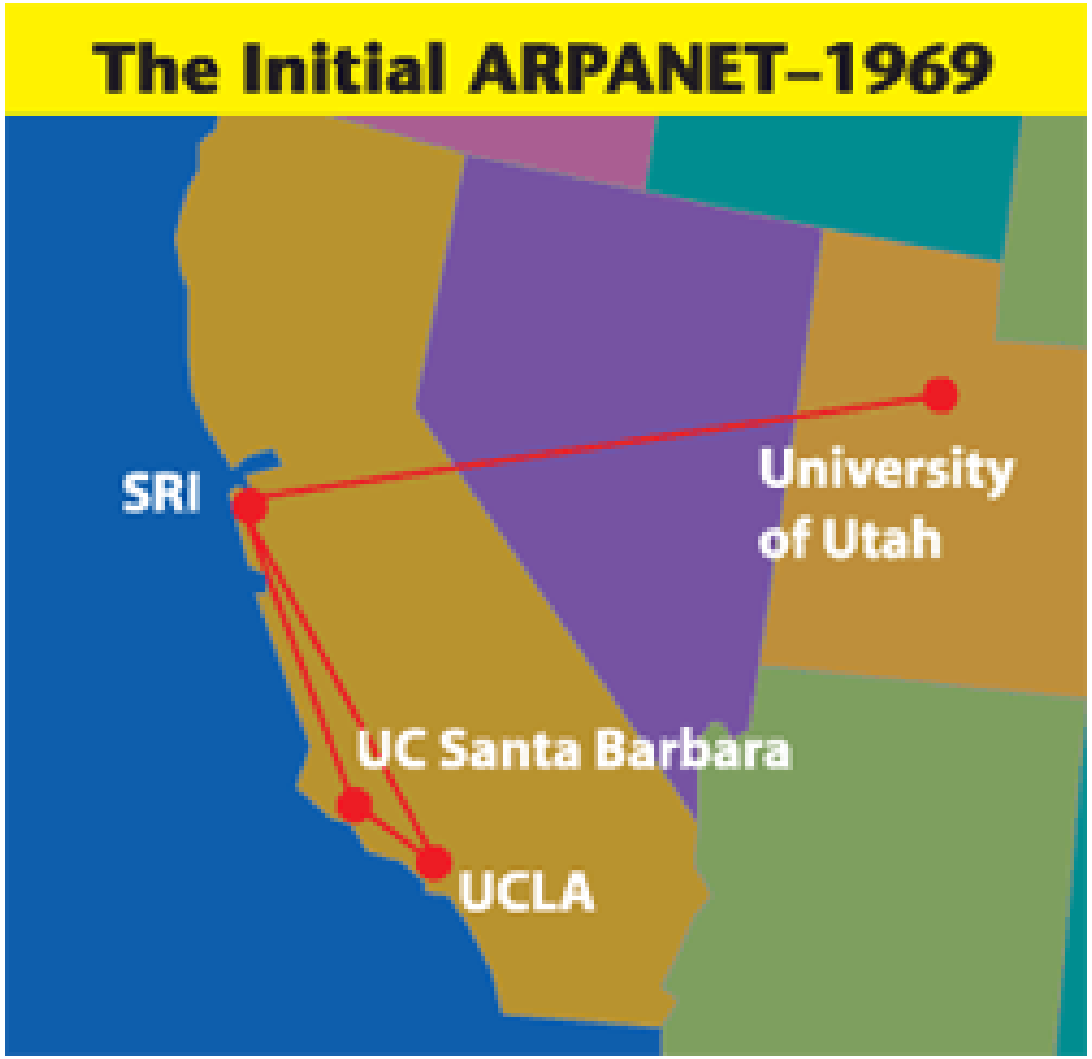
In 1965 Lawrence G. Roberts and Thomas Merrill connected a TX-2 computer in Massachussetts to a Q-32 computer in California with a low speed dial-up telephone line, creating the first wide-area computer network.



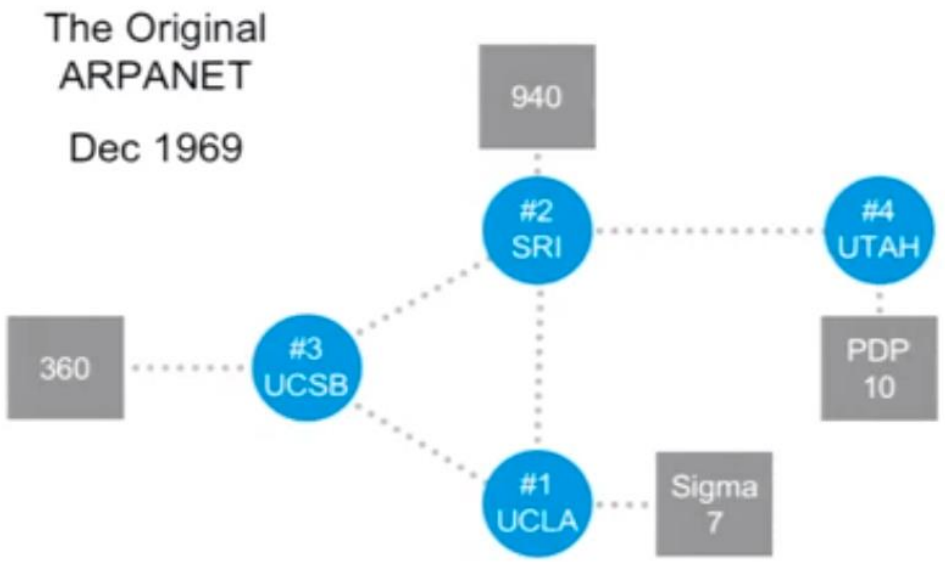
Brief history of Internet

However, the results of this connection showed the importance of packet transmmision.

In 1967 Lawrence G. Roberts published the concept of computer network. In the Defense Advanced Research Projects Agency (DARPA) developed the ARPANET or Advanced Research Projects Agency Network



Brief history of Internet



Three teams were working on packet transmission at the same time: MIT (1961-1967), RAND (1962-1965) and NPL (1964-1967).

The word "packet" was adopted and the proposed line speed to be used in the ARPANET design was upgraded from 2.4 kbps to 50 kbps.

Brief history of Internet

Computers are based on the Binary System and use Binary Digits in place of decimal digits.

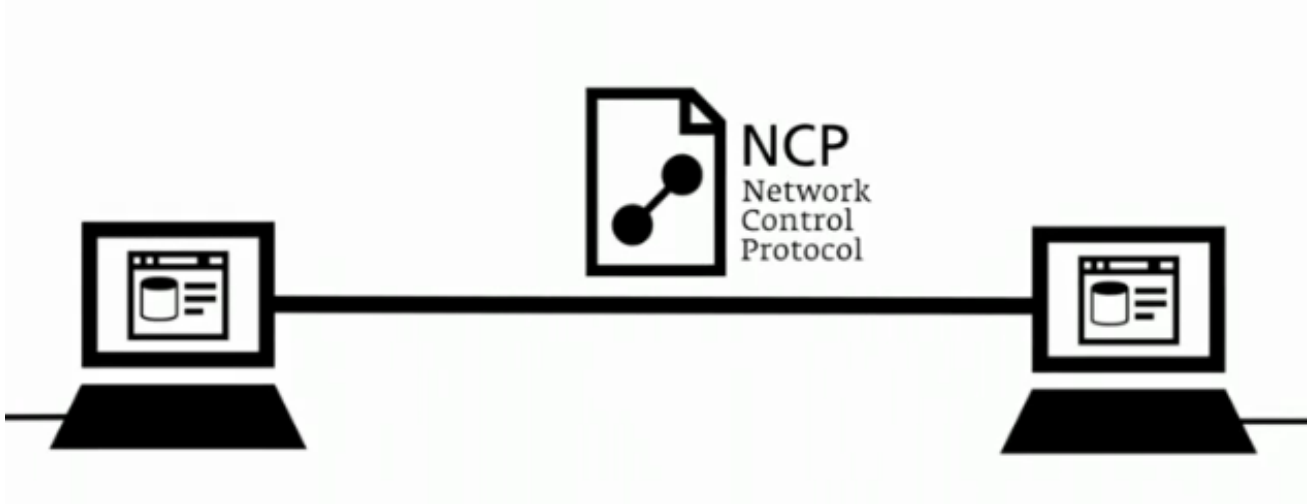
The word bit comes from the words "**B**inary dig**IT**". Bits only have two values: 0 and 1.

Bytes are a collection of 8 bits.

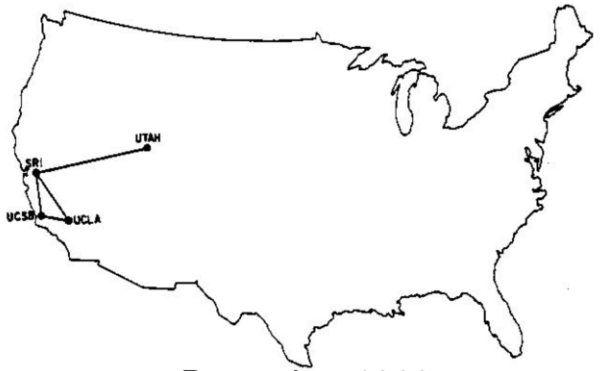
Brief history of Internet

Computers were added to the ARPANET while work continued to complete a Host-to-Host protocol and other network software.

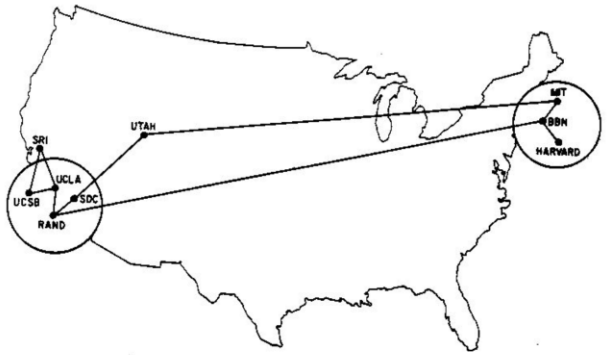
In 1970 the Network Working Group (NWG) under the direction of S. Crocker finished the first Host-to-Host Protocol called the Network Control Protocol or NCP.



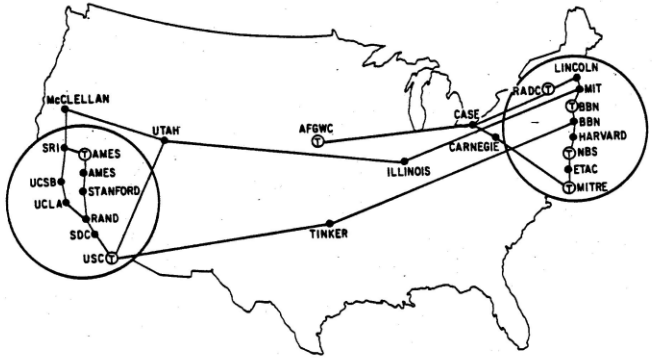
Brief history of Internet



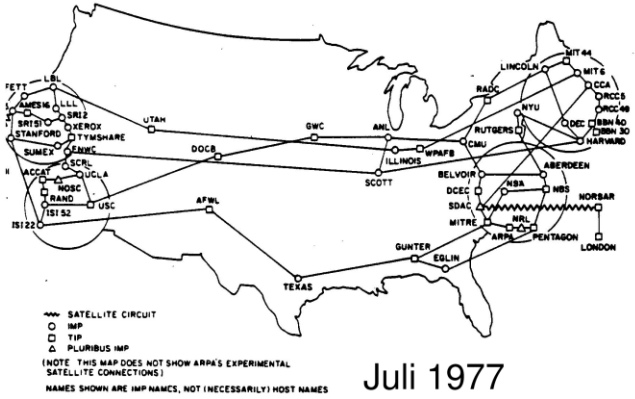
Dezember 1969



Juni 1970



März 1972



Juli 1977

ARPANET grew into what we know as Internet.

The key idea behind Internet is an open architecture networking:

Individual networks may be separately designed and developed and each may have its own unique interface which it may offer to users and/or other providers

Brief history of Internet

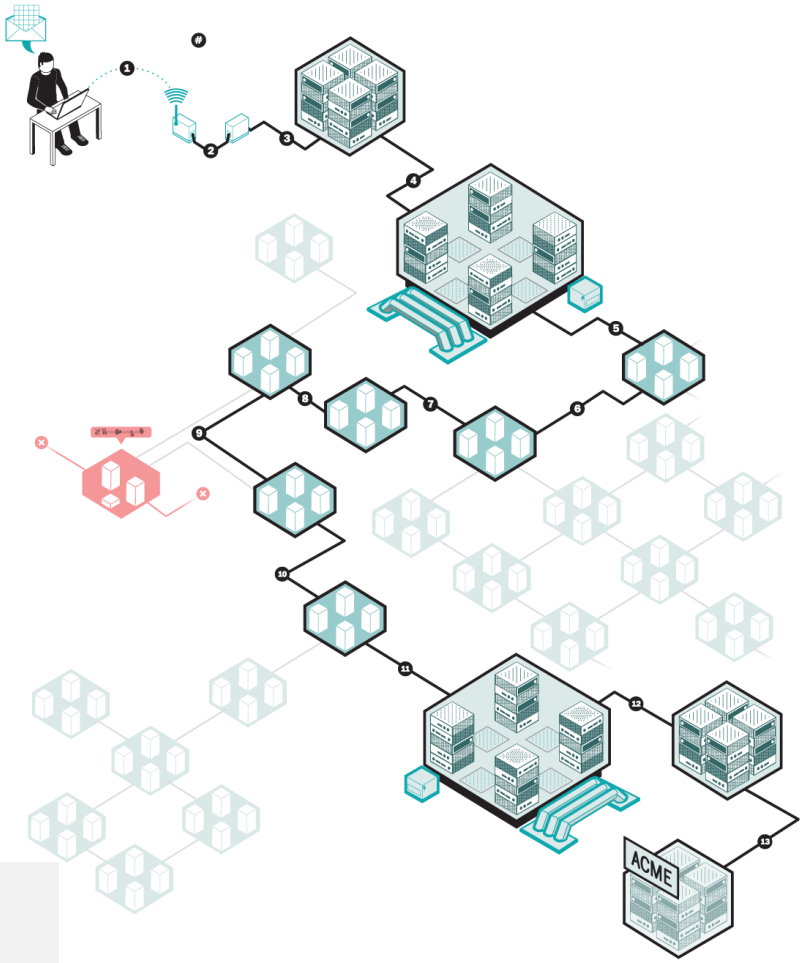
Bob Kahn developed four rules for an open architecture network:

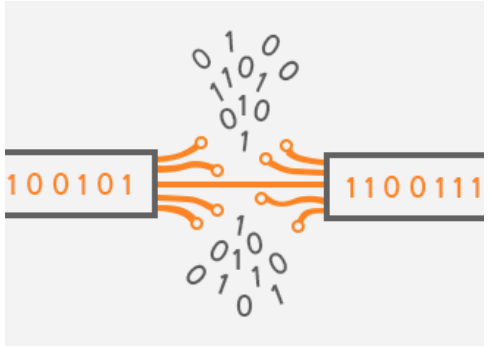
1. Each network would have to stand on its own.
2. Communications would be on a best effort basis.
3. Black boxes would be used to connect the networks (gateways and routers).
4. There would be no global control.

Brief history of Internet

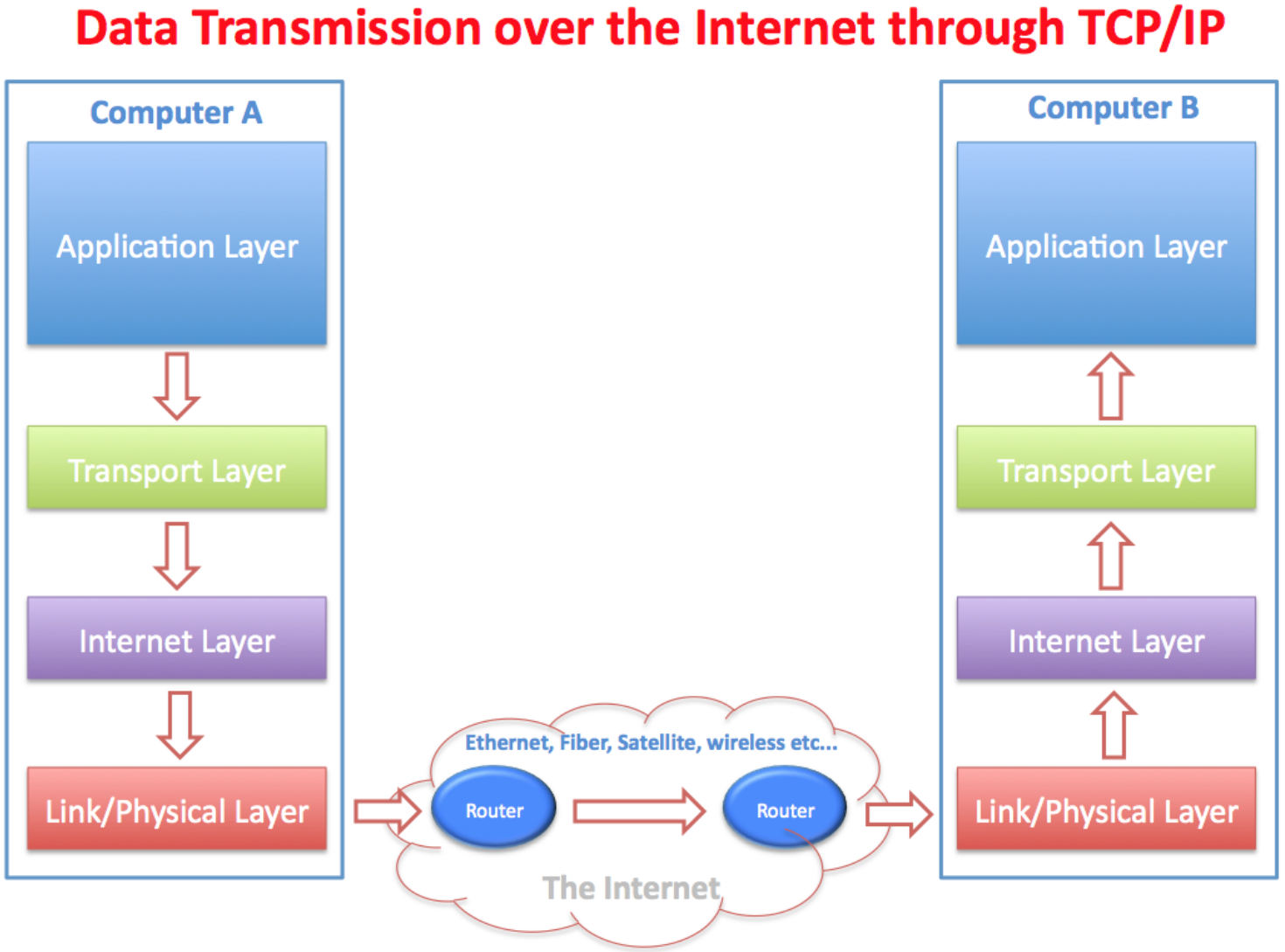
Other key issues:

1. Algorithms to prevent lost packets.
2. Provide host-to-host "pipelining" (multiple packets could be rerouted from source to destination).
3. Gateway functions to allow it to forward packets appropriately.
4. The need for end-end checksums, reassembly of packets from fragments and detection of duplicates.
5. The need for global addressing.
6. Techniques for host-to-host flow control.
7. Interface with various operating systems.



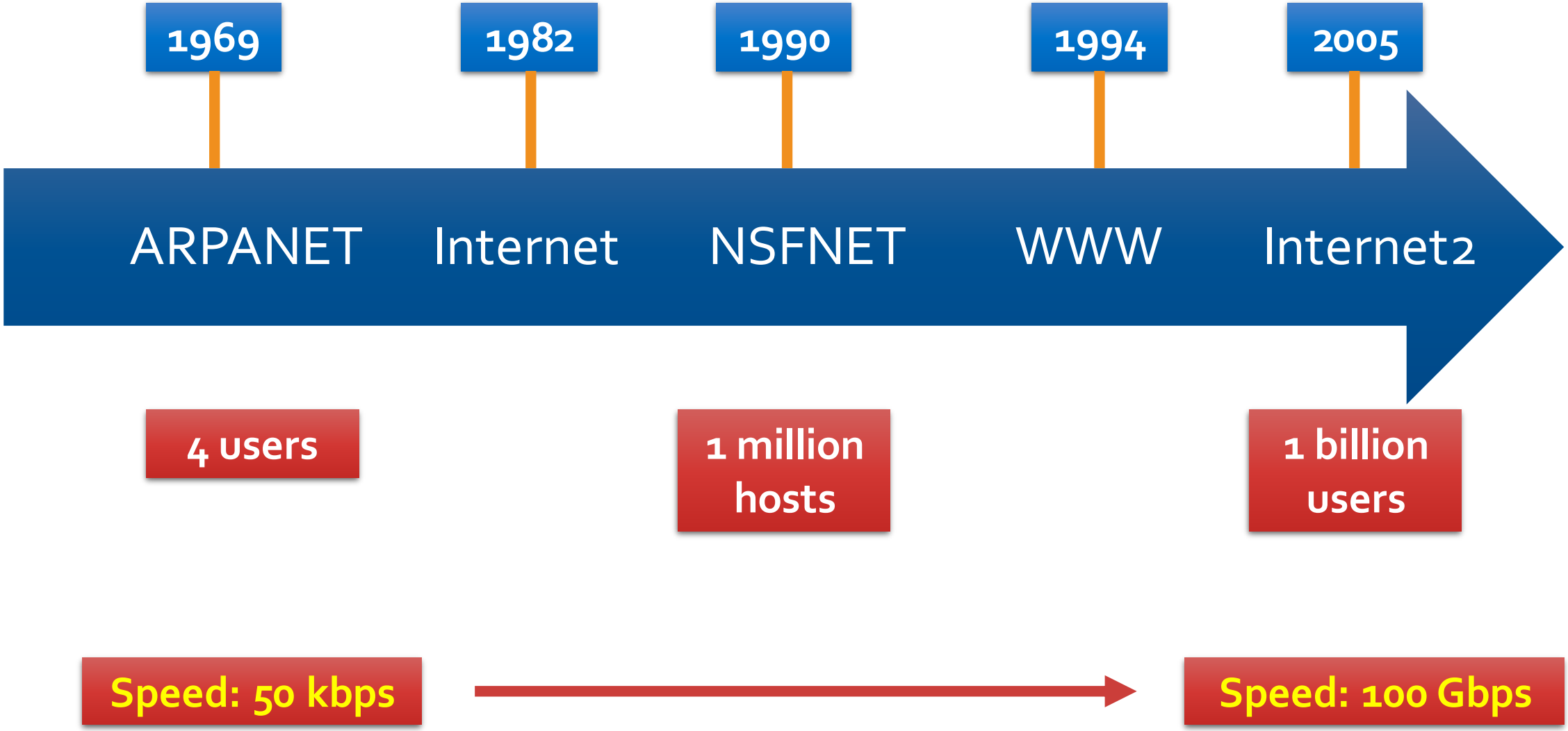


Brief history of Internet



- Bob Kahn and Vint Cerf developed the Transmission Control Protocol (TCP).
- Cerf, Tomlinson and Kirstein developed the TCP/Internet Protocol (IP) → **TCP/IP**
- TCP/IP was implemented in 1983.
- 1985 could be considered the year of Internet birth.

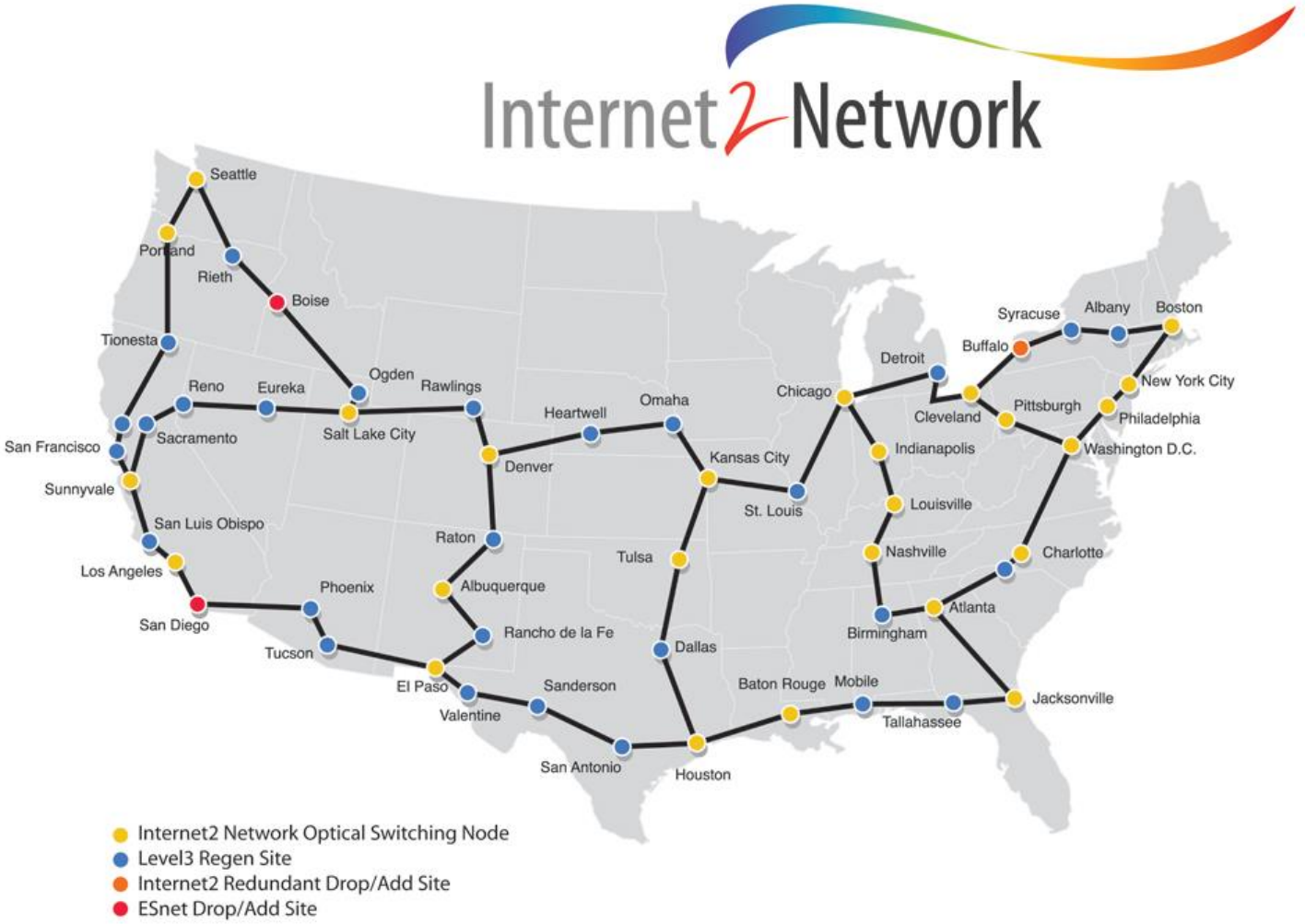
Brief history of Internet



Internet2

Internet2 is a not-for profit US computer working consortium that includes members from research and education communities, industry and government.

As of November 2013 it has 500 members, including 251 institutions of higher education, 9 partners and 76 members from industry, over 100 research and education networks, and 67 affiliate members.



Internet2

- Internet2 operates an Internet Protocol Network through optical fiber.
- Internet2 DCN (Dynamic Circuit Network).
- Internet2 Network connects over 60,000 US educational, research, government and other institutions.
- Schools, libraries, museums, health care organizations.

This year's theme:

"Community: Leading the Way."

Internet2 Upgrades Speed to 8.8 Terabits per second

Broadband Stimulus, Education, Fiber, Health, Public Safety, Tribal Broadband

March 11th, 2011

Rahul Gaitonde, Deputy Editor, BroadbandBreakfast.com

WASHINGTON March 11, 2011 – Internet2, the nationwide ultra high-speed education network, announced that it will increase the network's speed by a factor of nearly 900. The network's existing speed is already approximately 1,000 times as fast as a the fastest widely-available high-speed residential connection.

Internet2 will increase its speed from 100 gigabits per second (100,000 megabits per second) to 8.8 terabits per second (88,000,000 Mbps).

The University Corporation for Advanced Internet Development (UCAID) administers the network. Currently the network connects 66,000 research institutions nationwide. The network was set up in 1997 to connect 100 research organizations. Internet2 was established to provide research institutions increased bandwidth separate from the commercial internet that was growing in popularity.

Internet2 in Mexico

In Mexico we also needed a solution to connect universities, government agencies and companies through greater bandwidth at reasonable costs.

The strategy for the development of Internet2 in Mexico was based upon the willingness of seven leading Universities to bear the cost of the installation of a high speed backbone, on a pro-rata basis

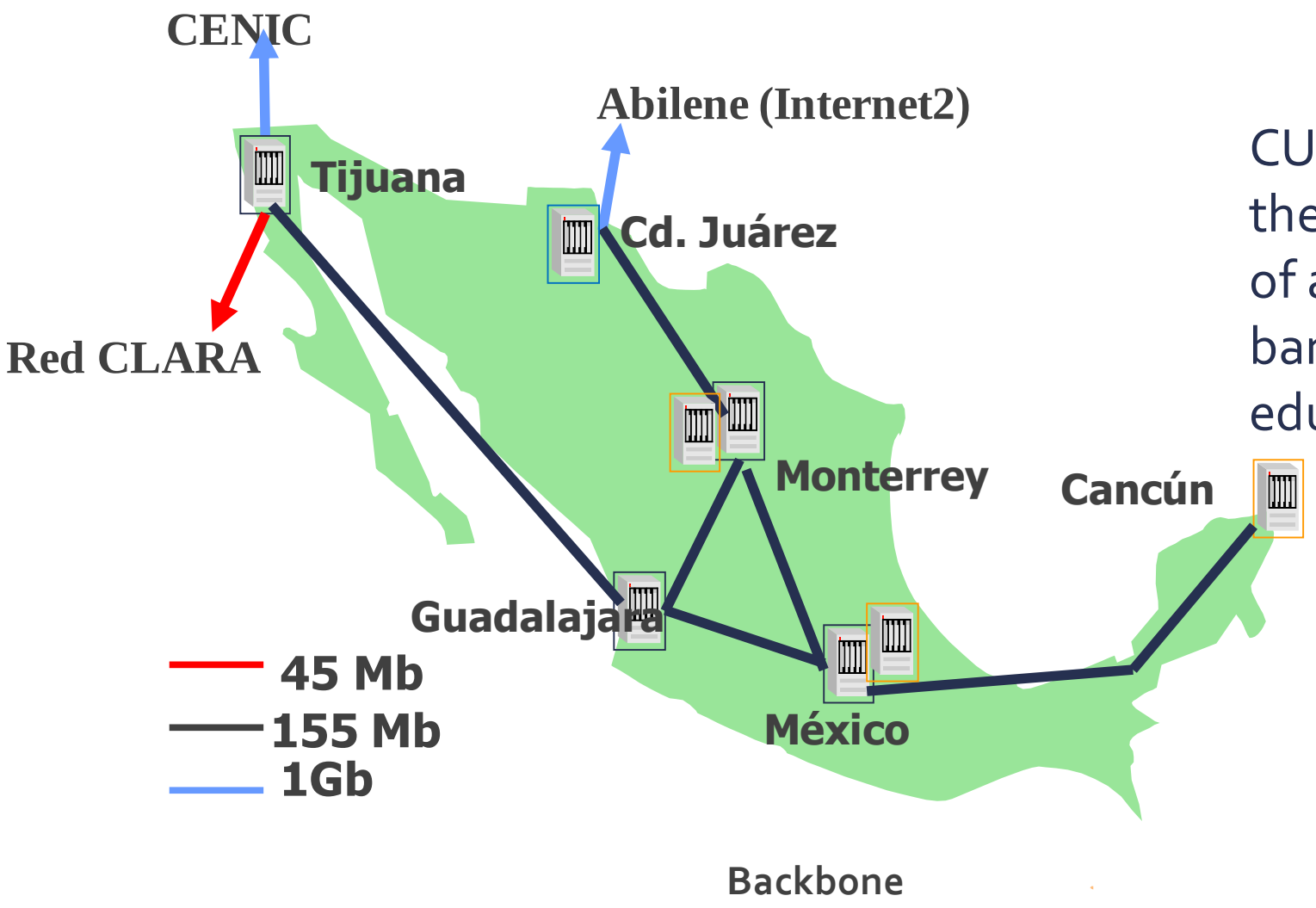
Internet2 in Mexico

On April 8th, 1999, a non-profit private corporation was created to implement and fund the network:

Carlos Casasús
Chair

Corporación Universitaria para el Desarrollo de Internet, A.C.

Internet2 in Mexico



CUDI'S members are committed to the development, use and support of advanced networks and wide band connectivity applications for education and research.

Internet2 in Mexico

Present membership

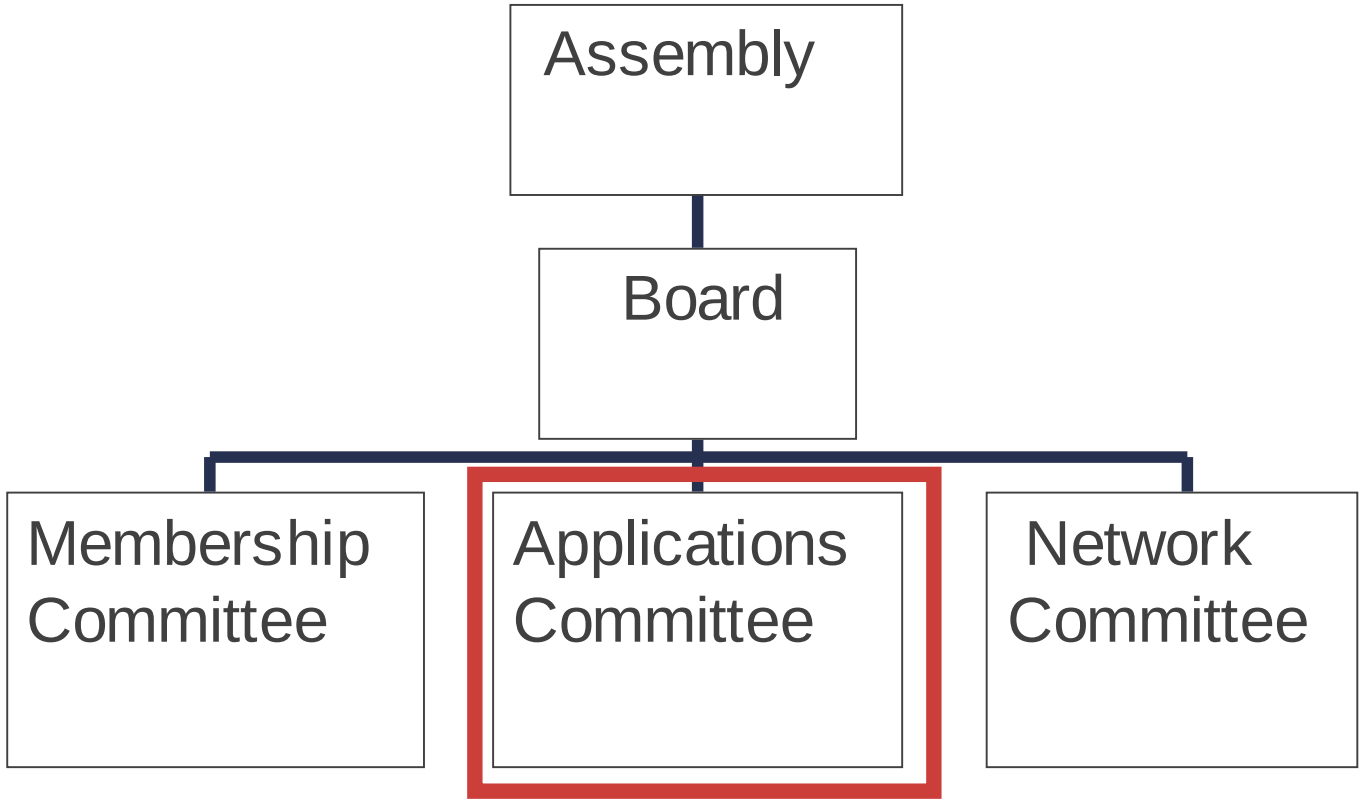
- Academic, Research and other Institutions: 98
- Students: 1’400,000
- Teachers: 100,000
- Networked computers: 150,000

This represents approximately 70% of the students of the Mexican higher education system

La asociación alcanza ya 258 instituciones académicas

ASOCIADOS (19)								
BUAP	CICESE	CCONACYT*	DGEST****	IMSS	IPN	ITESM	UNIPOL***	UAX
UACJ	UAL	UANL	UAT	UAEH	UAEM	UAM	UDG	UNAM
UV								
AFILIADOS (79)								
BID	Casa Univ. Calif.	CECyTEM	CESNAV	CIE	CIMMYT	CINVESTAV	CLAVIERO	COLPOS
COLNAL	COLSON	CONABIO	CONACULTA	FMS	HRAEB	HGMGG	HRAEZ	IE
UALTI	IMP	IMTA	INAH	INE	ITESI	ITESO	ITSC	ITSL
ITSON	ITSNCG	ITSPR	ITSTeziutlán	INEGI	ITAM	ICyTDF	SEDENA	LANIA
TAMU	TESE	UAA	UABC	UABJO	UAChapingo	UACH	UADEC	UAEMEX
UASLP	UADY	UATX	UAG	UAGRO	UAN	UAQ	UAS	UAZ
UCOL	UGTO	UJAT	UJED	UIA	ULSA	UMICH	UM	UNACAR
UNACH	UNICARIBE	UNILA	UP	UPN	UPAEP	UQROO	UR	USON
UVM	UNESCO	UTS	UNITEC	UTT	UTCV			
CENTROS PUBLICOS -CONACYT (28)*								
CIAD	CIATEC	CIATEJ	CIATEQ	CIBNOR	CICY	CIDE	CIDESI	CIDETEQ
CIESAS	CENTRO GEO	CIMAT	CIMAV	CIO	CIQA	COLEF	COLMEX	COLMICH
COLSAN	COMIMSA	ECOSUR	FIDERH	FLACSO	IMORA	INAOE	INECOL	INFOTEC
IPICYT								
SUBSISTEMA DE UNIVERSIDADES POLITECNICAS (40)***								
UPA	UPALT	UPBC	UPCHI	UPDGO	UPFIM	UPDELGOLFO	UPGPDGO	UPGTO
UPM	UPEMOR	UPP	UPPUEBLA	UPQ	UPSLP	UPSIN	UPTLX	UPTGO
UPVM	UPVT	UPV	UPZAC	UPZMG	UPAmozoc	UPBicentenario	UPCentro	UPHuatusco
<UPJuventino	UPMH	UPPenjamo	UPChih	UPEGro	UPRR	UPSZac	UPTecamac	UPApodaca
UPMP	UPSC	UPQRoo	UPPT					
INSTITUTOS TECNOLÓGICOS (92)******								
CIDET	CENIDET	ITACAPULCO	ITAGS	ITAPIZACO	ITBBanderas	ITBOCARÍO	ITCANCÚN	ITCELAYA
ITCERRO AZUL	ITCHETUMAL	ITCHIHUAHUA	ITCHIHUAHUA II	ITCHINÁ	ITCUAUHTÉMOC	ITGUZMÁN	ITJIMÉNEZ	ITJUÁREZ
ITMADERO	ITVALLES	ITVICTORIA	ITCOLIMA	ITCONKAL	ITCOSTAGDE	ITCULIACÁN	ITDURANGO	ITSALTO
ITENSENADA	IYGUAYMAS	ITHERMOSILLO	ITHUATABAMPO	ITHUEJUTLA	ITIGUALA	ITIZTAPALAPA	ITJIQUILPAN	ITLAGUNA
ITLA PAZ	ITPIEDAD	ITRMXE	ÁZAROCARDEN	ITLEÓN	ITMOCHIS	ITMATAMOROS	ITMATEHUALA	ITMAZATLAN
ITMÉRIDA	ITMEXICALI	ITMINATITLÁN	ITMORELIA	ITNOGALES	ITNVOLAREDO	ITNVOLEON	ITOAXACA	ITOCOTLÁN
ITORIZABA	ITPACHUCA	ITPARRAL	IYPNEGRAS	ITPINOTEPA	ITPUEBLA	ITQUERETARO	ITREYNOSA	ITROQUE
ITSCRUZ	ITSALTILLO	ITSNJUARIO	ITSLP	ITTAPCHULA	ITTEHUACAN	ITTEPIC	ITTIJUANA	ITTIZIMIN
ITTLAHUAC	ITTLAJOMULCO	ITTLANE	ITTLAXIACO	ITTOLUCA	ITTORREÓN	ITTUXTEPEC	ITTUXTLA	ITURSULOGALVAN
ITVMORELIA	ITVOAXACA	ITVGUADIANA	ITVYAQUI	ITVERACRUZ	TVILLAHERMOS	ITZACATECAS	ITZACATEPEC	ITZITÁCUARO

Internet2 in Mexico



Internet2 in Mexico

- Agreements with Telmex, Avantel and CFE for network backbone.
- Network to be used exclusively for Educational & Research Applications.

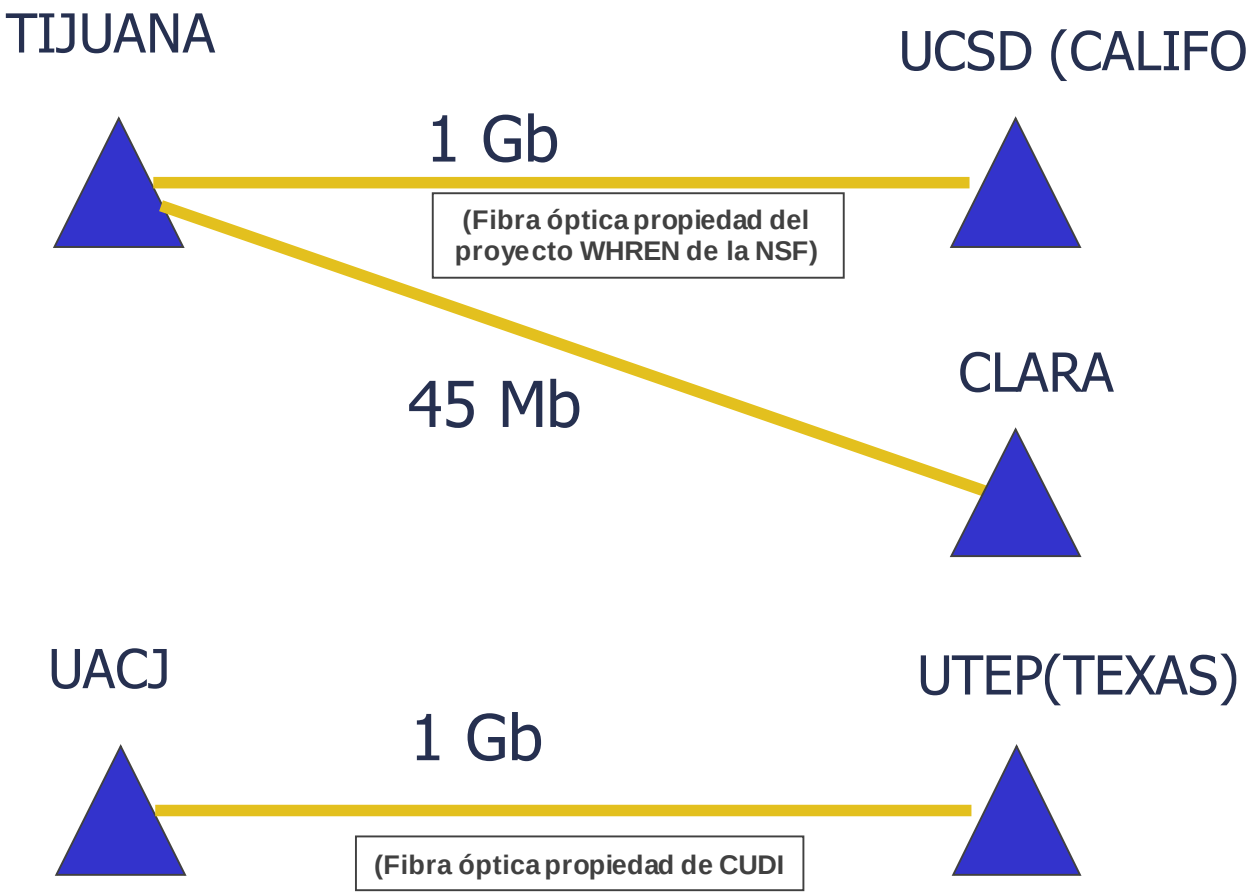
TELMEX®

Avantel®

CFE
Comisión Federal de Electricidad

Internet2 in Mexico

International Connectivity



Internet2 in Mexico

International Advanced Networks

- **UCAID** (University Corporation for Advanced internet Development) de EUA http://www.internet2.edu
- **CENIC** (Corporation for Education Network Initiatives in California) de EUA http://www.cenic.edu
- **CANARIE** (Canadian Network for Advanced Research Industrie and Education) de Canadá http://www.canarie.edu.ca
- **REUNA** (Red Universitaria Nacional) de Chile http://www.reuna.cl
- **RETINA** (Red Teleinformática Académica de Argentina) http://www.retina.ar
- **RNP** (Rede Nationale de Ensino e Pesquisa) de Brasil http://www.rnp.br
- **RED IRIS** (Red de Interconexión de Recursos Informáticos de las Universidades de España) http://www.rediris.es
- **CLARA** (Colaboración Latinoamericana de Redes Avanzadas)

Other accessible networks through Abilene (approx. 4,00 institutions)

Europe-Middle East

AUSTRIA (ACONET)
BELGIUM (BELNET)
CROATIA (CARNET)
CZECH REPUBLIC (CESNET)
CYPRUS (CYNET)
DENMARK (Forskningsnettet)
ESTONIA (EENET)
FINLAND (FUNET)
FRANCE (RENATER)
GERMANY (G-WIN)
GREECE (GRNET)
HUNGARY (HUNGARNET)
ICELAND (RHNET)
IRELAND (HEANET)
ISRAEL (IUCC)
ITALY (GARR)
LATVIA (LATNET)
LITHUANIA (LITNET)
LUXEMBOURG (RESTENA)
MALTA (UNIV. MALTA)
NETHERLANDS (SURFNET)
NORWAY (UNINETT)
POLAND (POL-34)
PORTUGAL (FCCN)
QATAR (QATAR FOUNDATION)
ROMANIA (ROEDUNET)
RUSSIA (RBNET)
SLOVAKIA (SANET)
SLOVENIA (ARNES)
SPAIN (REDIRIS)
SWEDEN (SUNET)
SWITZERLAND (SWITCH)
UNITED KINGDOM (JANET)
TURKEY (ULAKBYM)
*CERN
DANTE (Europe)
NORDUnet (Nordic Countries)
TERENA (Europe)

Asia-Pacific

AUSTRALIA (AAIREP)
CHINA (CERNET,CSTNET, NSFCNET)
HONG KONG (HARNET)
JAPAN (SINET,WIDE,JGN2)
KOREA (KOREN,KREONET2)
SINGAPORE (SINGAREN)
PHILIPPINES (PREGINET)
TAIWAN (TANET2,ASNET)
THAILAND (UNINET,THAISARN)

Americas

ARANDU (Paraguay)
CANARIE (Canada)
CEDIA (Ecuador)
CLARA (Latin America & Caribbean)
CUDI (Mexico)
CR2NET (Costa Rica)
RAGIE (Guatemala)
RAICES (El Salvador)
RAAP (Perú)
RAU (Uruguay)
REACCIUN (Venezuela)
RENATA (Colombia)
RENIA (Nicaragua)
REUNA (Chile)
RETINA (Argentina)
RNP (Brazil)
REDCYT (Panama)

Africa

ALGERIA (CERIST)
EGYPT (EUN/ENSTIN)
MOROCCO (CNRST)
TUNISIA (RFR)
SOUTH AFRICA (TENET)

Central Asia

ARMENIA (ARENA)
GEORGIA (GRENA)
KAZAKHSTAN (KAZRENA)
TAJIKISTAN (TARENA)
UZBEKISTAN (UZSCI)

Internet2 in Mexico

Key Applications

Aeroespacial

Considera
centros de
las disciplin

Arte, Ciencia y Cultura

La creación de la Cc
dos hechos fundam
intercambios en este

Astronomía

Tiene com
conjuntos
canalizar la

Bibliotecas Digitales

Busca cana
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Ciencias de la Tierra

Las principales
uso de herrami
virtuales para t
como Ciencias

Contaduría y Negocios

El bjetivo de la cc
desarrollar proyec
y talento que Méxi

Educación

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Energías Renovables

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Enseñanza de la Ciencia

Promueve la parti
investigación en la

Inteligencia Artificial

La Comunidac
brinda la red
investigación,
todas aquellas

Interacción Humano – Computadora

Promover la comunicación y colab
para la divulgación del área de
proyectos conjuntos que aprovech
reúne a interesados en innovaci
colaboración, tecnologías interactivas y técnica

Ingeniería

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Matemáticas

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Estudios Socioambientales

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número de personas que se h

REMERI

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preservar
tiempo RE

Referencia.

Salud

Busca in
proyectos

Social and Environment Studies

cudi

Social and Environment Studies Community

- Is one of the thematic communities in CUDI.
- More than 100 people and more than 20 academic and instituciones y organizaciones académicas del país.

Social and Environment Studies Community

It is created as part of the Long-Term Ecological Research Mexican Network (Red Mex-LTER).

Formerly known as Comunidad de Ecología (Ecology Community).

Mex-LTER

Mex-LTER was created for the interest of researchers on:

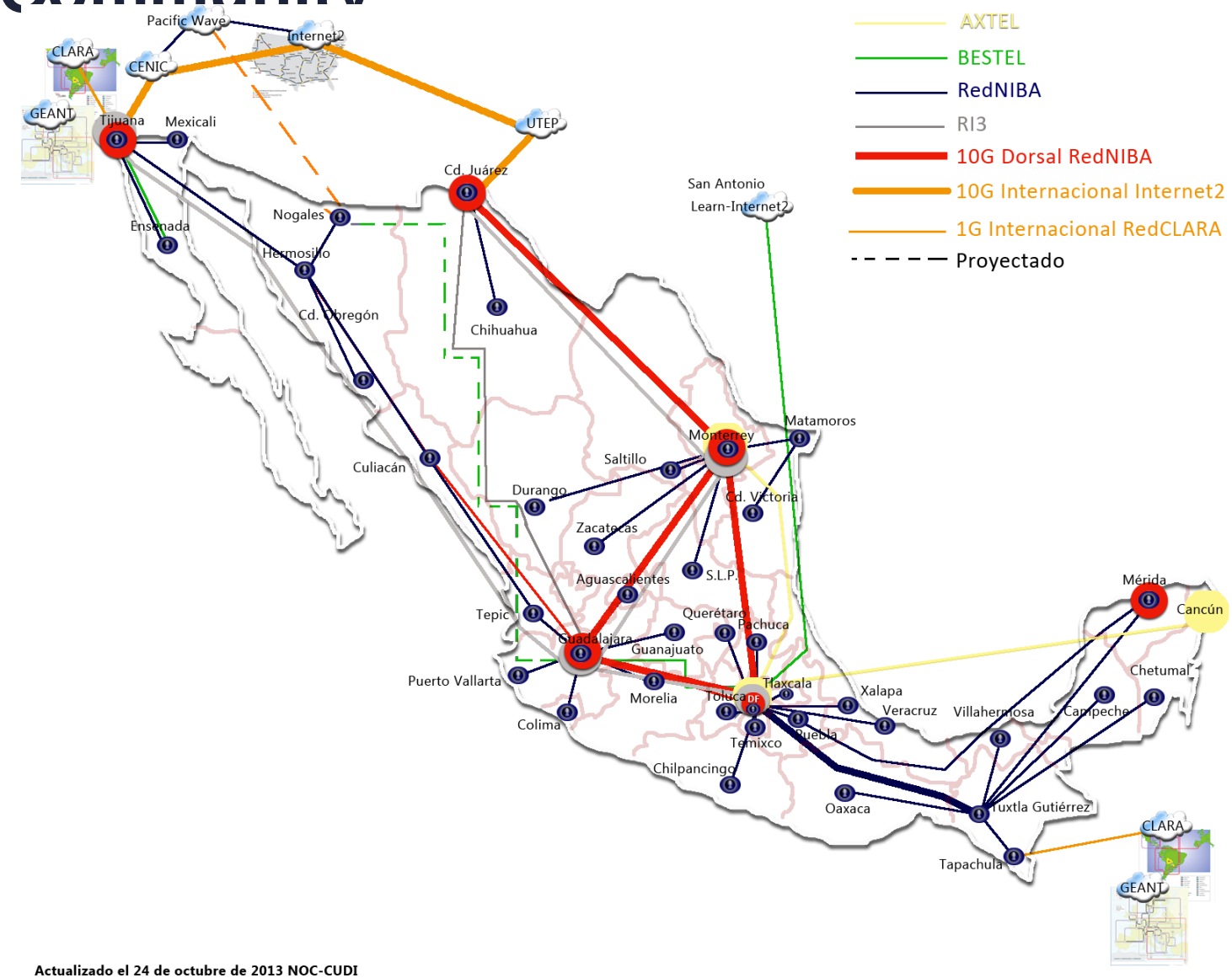
- Long-term ecological research at great scale.
- Similarity in projects and objectives.
- Managed and conserved terrestrial and aquatic ecosystems.
- Comparison among different biomas and ecological regions in Mexico.
- Collaborate and share information.

Mex-LTER and the Social and Environment Studies Community

Regional networks and collaborative projects are highly needed because ecosystems and environmental problems do not recognize political limits.

Mex-LTER and the Social and Environment Studies Community

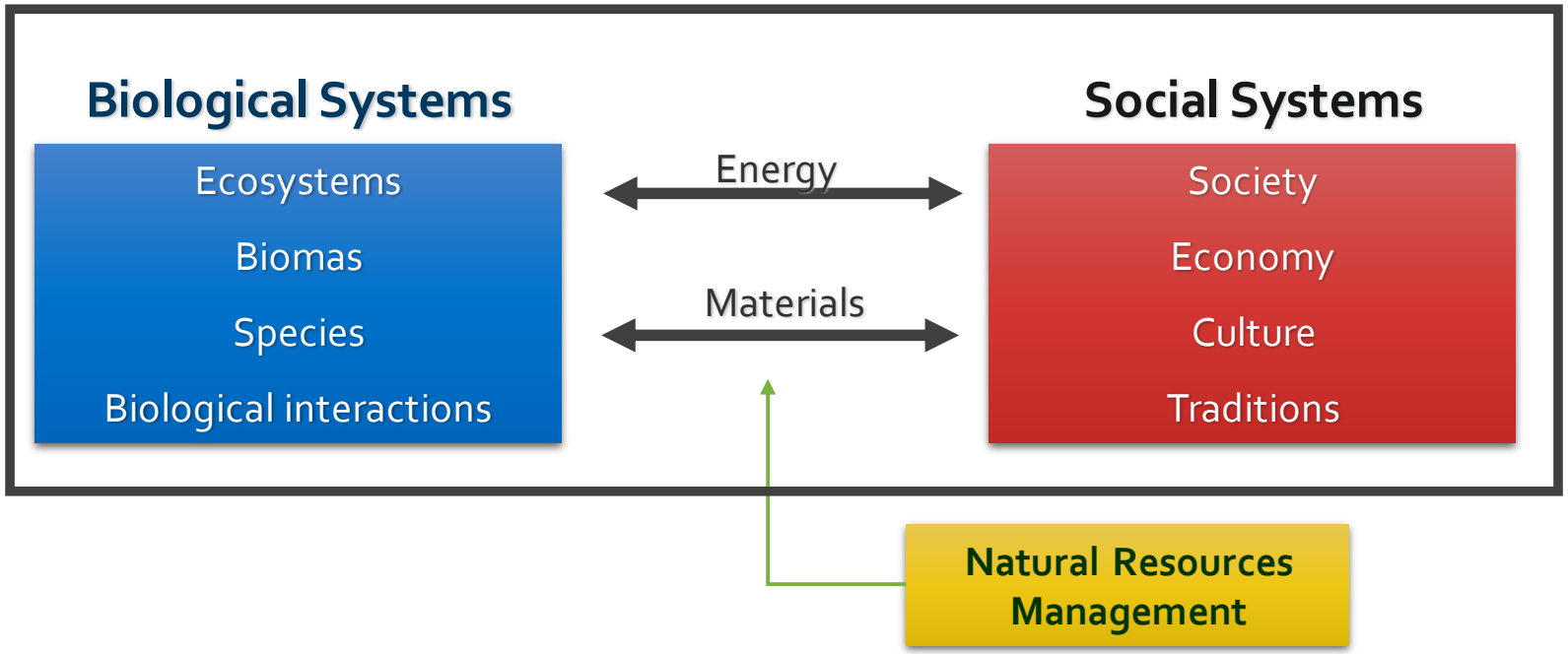
Academic networks are also important for knowledge sharing and thus for the advance of science.



Actualizado el 24 de octubre de 2013 NOC-CUDI

Social and Environment Studies Community

The Social and Environment promotes collaboration, data/information sharing and development of projects focused on the study of social and environmental systems in Mexico through the National Network for Education and Research (RNEI, Red Nacional de Educación e Investigación).



Social and Environment Studies Community

Using RNEI allows discussion both in the field and through the videoconference system (using different tools).

Social and Environment Studies Community

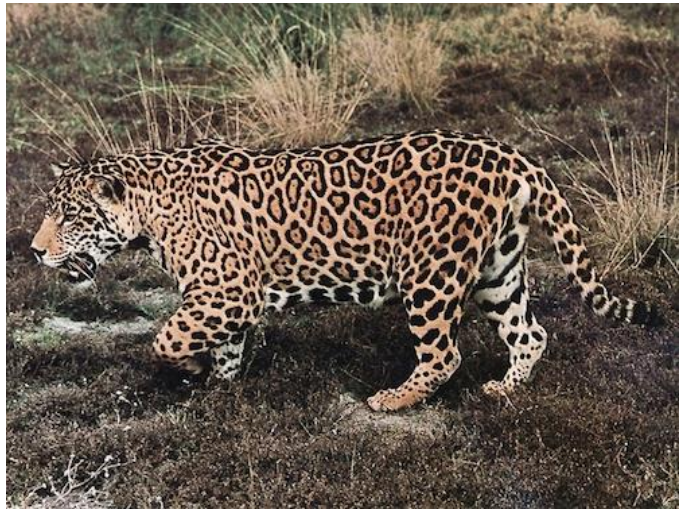
Future projects

1. Mex-LTER / ILTER
   - Monthly seminars (January 2016).
   - Current status of MexLTER sites.
   - Accesibility to Data / Metadata.

Social and Environment Studies Community

Future projects

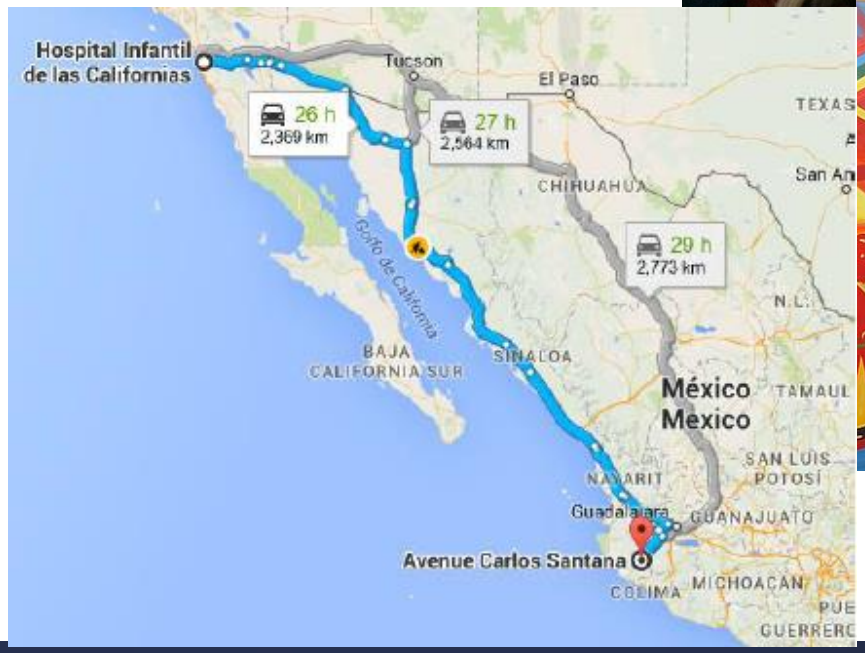
2. Platform to record sights of wildlife.
   - Public accessibility through CUDI.



Social and Environment Studies Community

Future project

3. Telemedicine.
   - Tiopa-Tlanextli (Autlán) y Hospital Infantil de las Californias (Tijuana-San Diego).
   - Remote health care to poor families in the Costa Sur de Jalisco region.



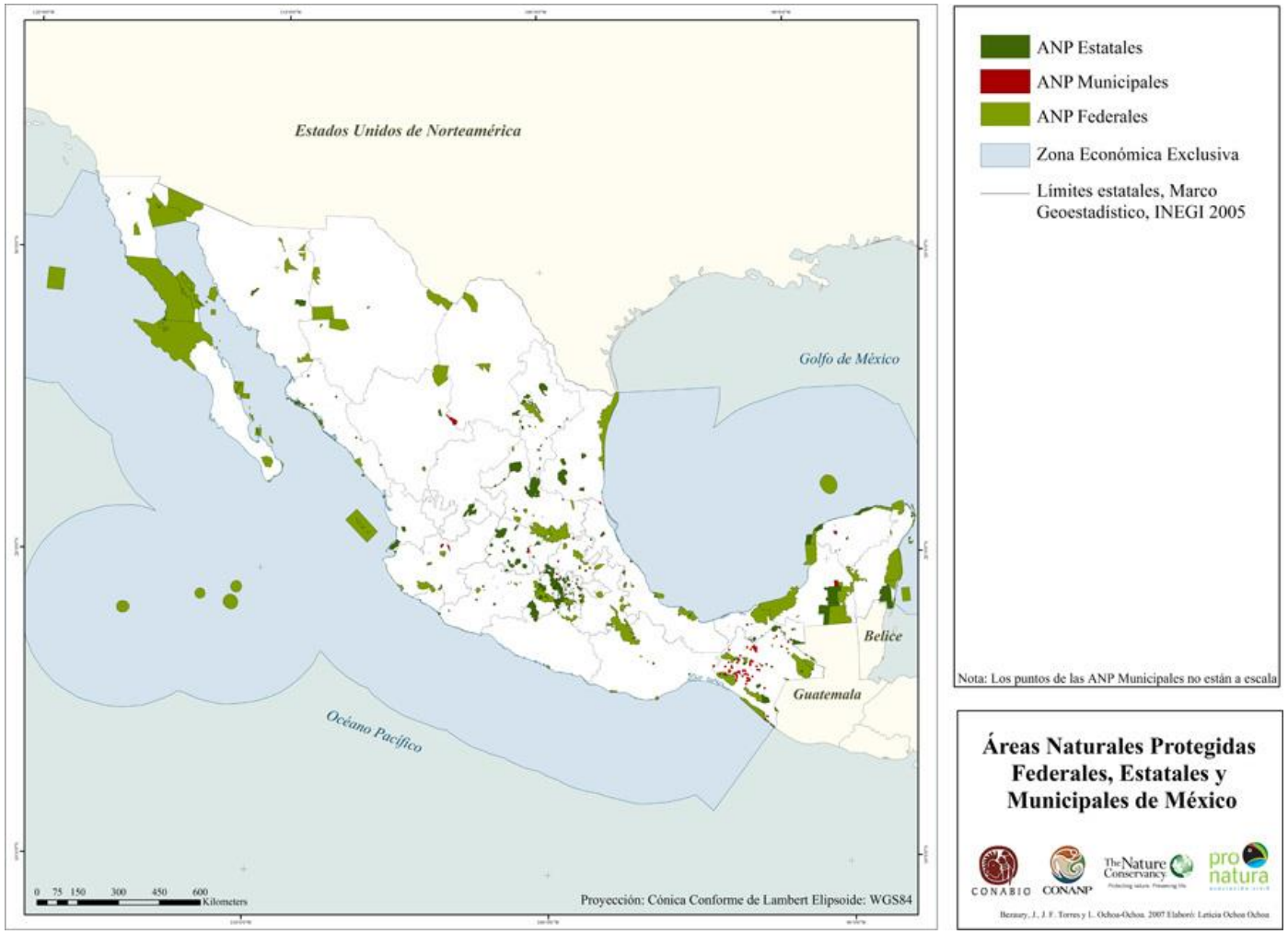
Social and Environment Studies Community

Benefits?

- Participants know the work of others in the same field.
- Collaboration and exchange.
- Symposia, seminars, workshops, "virtual days".

Social and Environment Studies Community

¡¡¡No to the dismantling of the Natural Protected Areas System in México!!!



Social and Environment Studies Community

¡Gracias!

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http://virtual.cudi.edu.mx