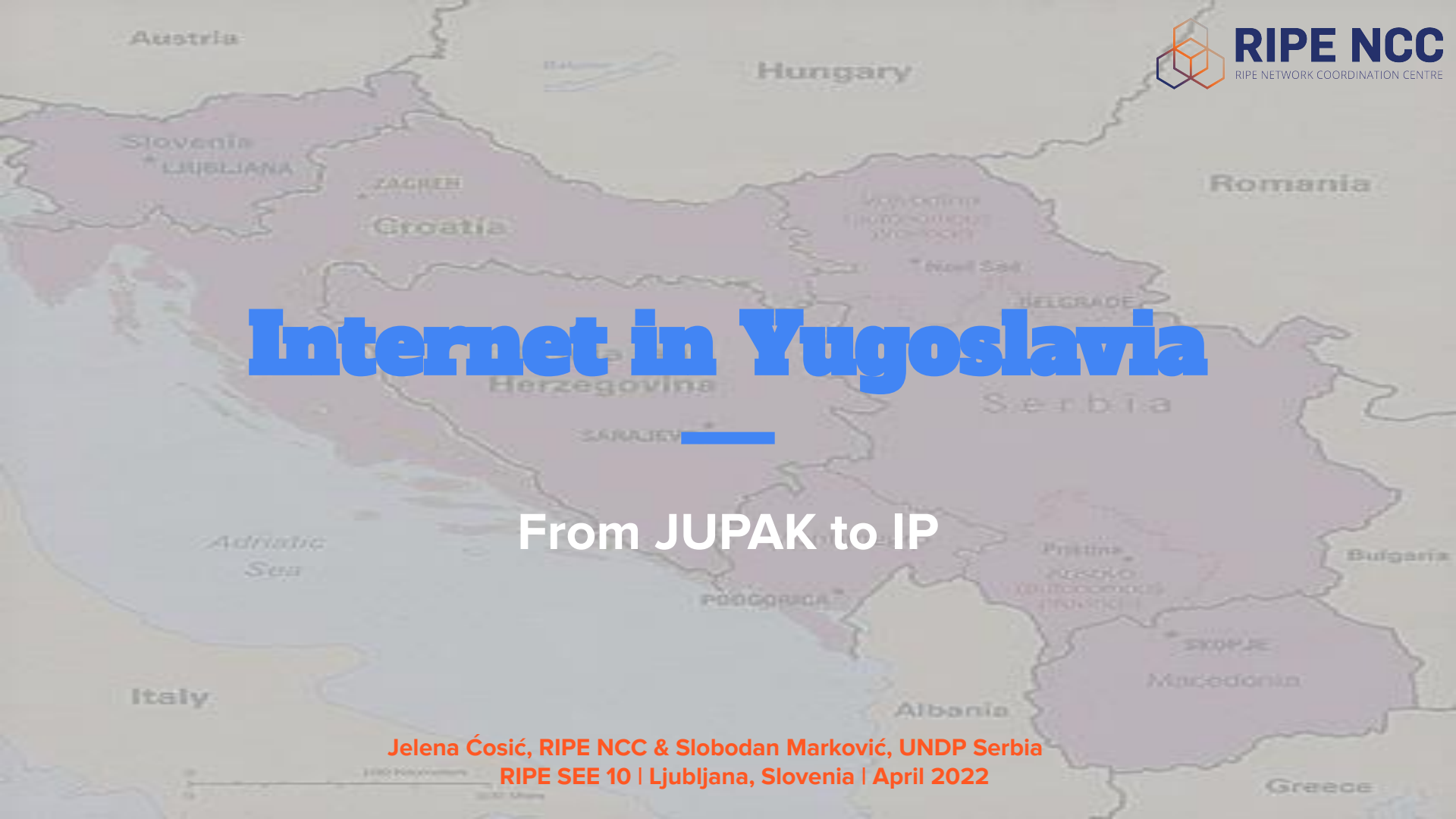


Internet in Yugoslavia

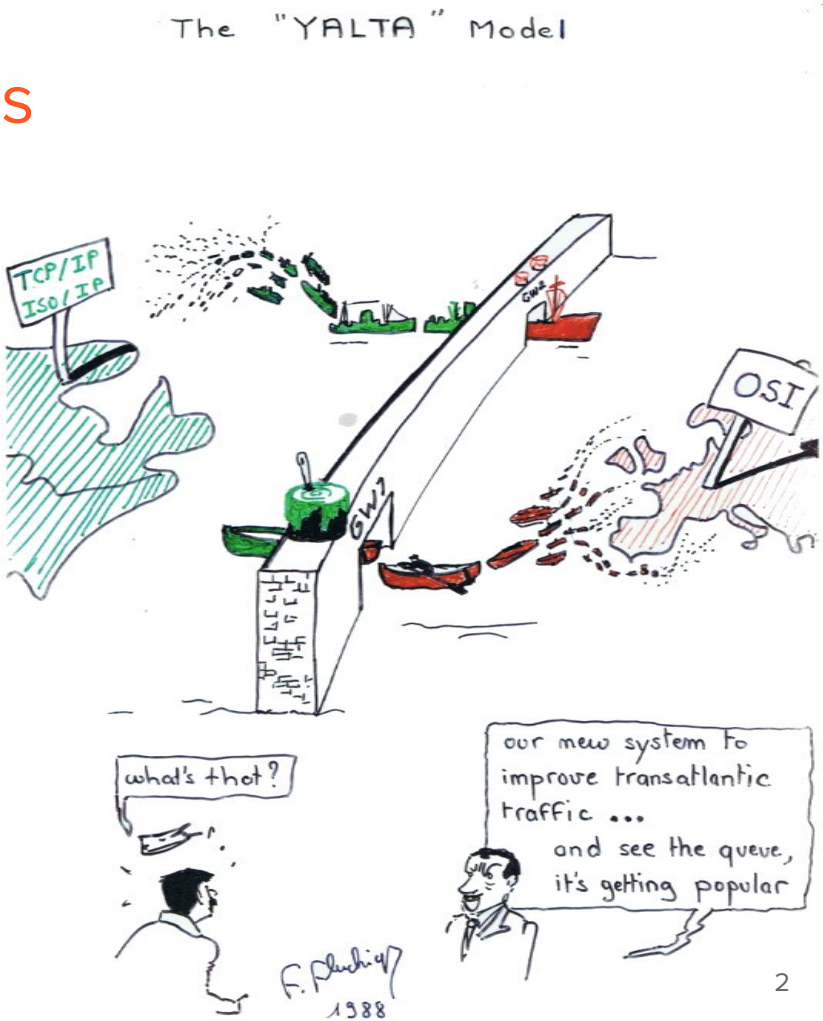
From JUPAK to IP

Jelena Ćosić, RIPE NCC & Slobodan Marković, UNDP Serbia

RIPE SEE 10 | Ljubljana, Slovenia | April 2022

European Networking in the ‘80s

- Telecommunications sector in Europe during ‘80s - PTTs as state monopolies
- European Academic and Research Network (EARN) - 1983
- “Rebels” vs “the establishment”; “radicals” vs “conservatives”
- RARE & EUREKA-8/COSINE - 1986

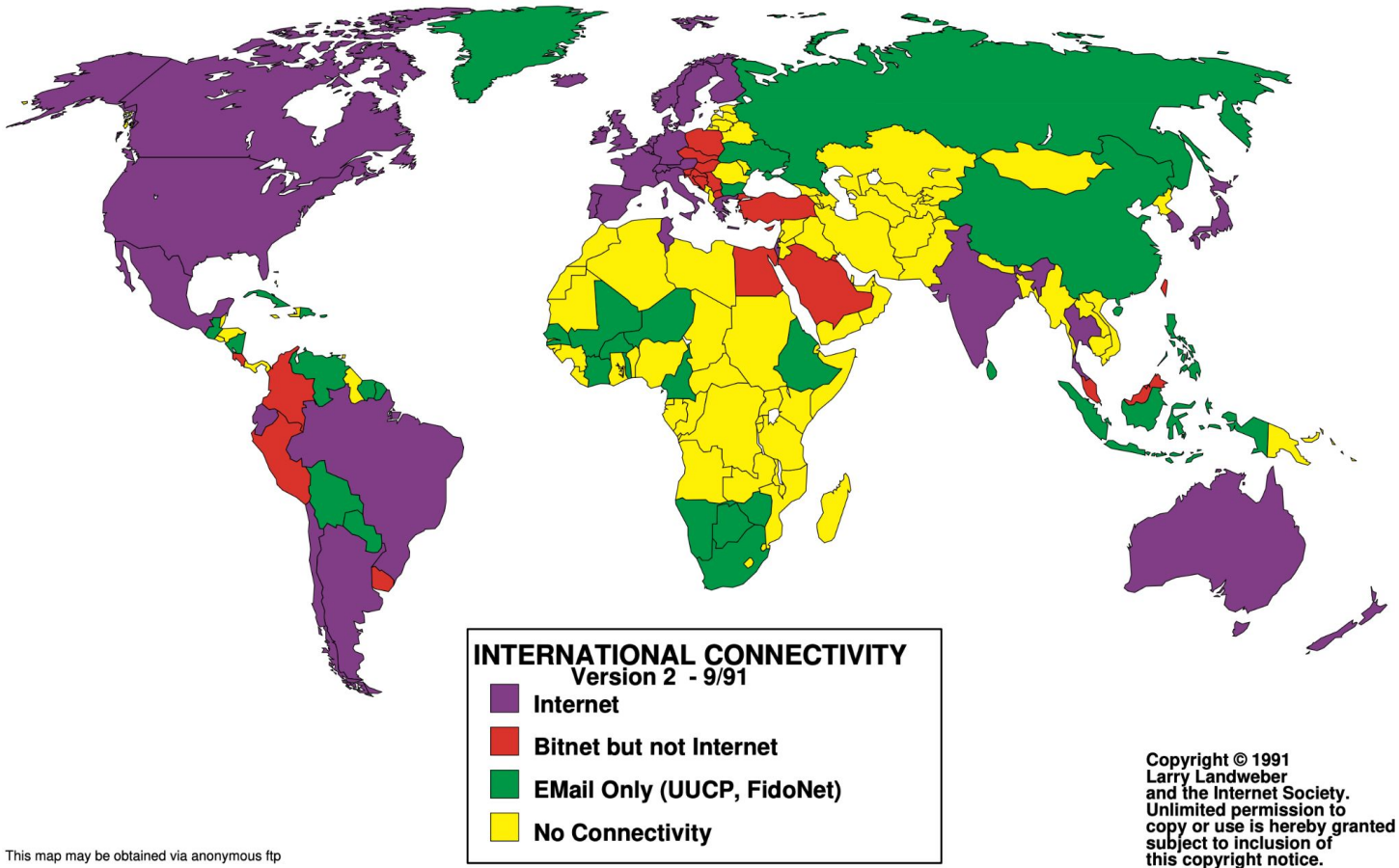


RIPE 1 Meeting

22 May, 1989

Participants:

Anders Hillbo	NORDUnet/KTH - Sweden
Peter Merdian	BelWü/Stuttgart - Germany
Ruediger Volk	Uni Dortmund/Eunet-D - Germany
Arnold Nipper	Uni Karlsruhe - Germany
Olivier Martin	CERN - Switzerland
Thomas Lenggenhager	SWITCH - Switzerland
Piet Beertema	EUnet/CWI - Netherlands
Daniel Karrenberg	EUnet/CWI - Netherlands
Francis Dupont	INRIA - France
Ives Devillers	INRIA - France
Antonio Blasco Bonito	CNUCE-CNR - Italy
Federico Ruggieri	INFN/Bari - Italy
Rob Blokzijl	NIKHEF/HEPnet - Netherlands
Marten Terpstra	NIKHEF - Netherlands


INTERNATIONAL CONNECTIVITY
Version 2 - 9/91
Internet
Bitnet but not Internet
EMail Only (UUCP, FidoNet)
No Connectivity
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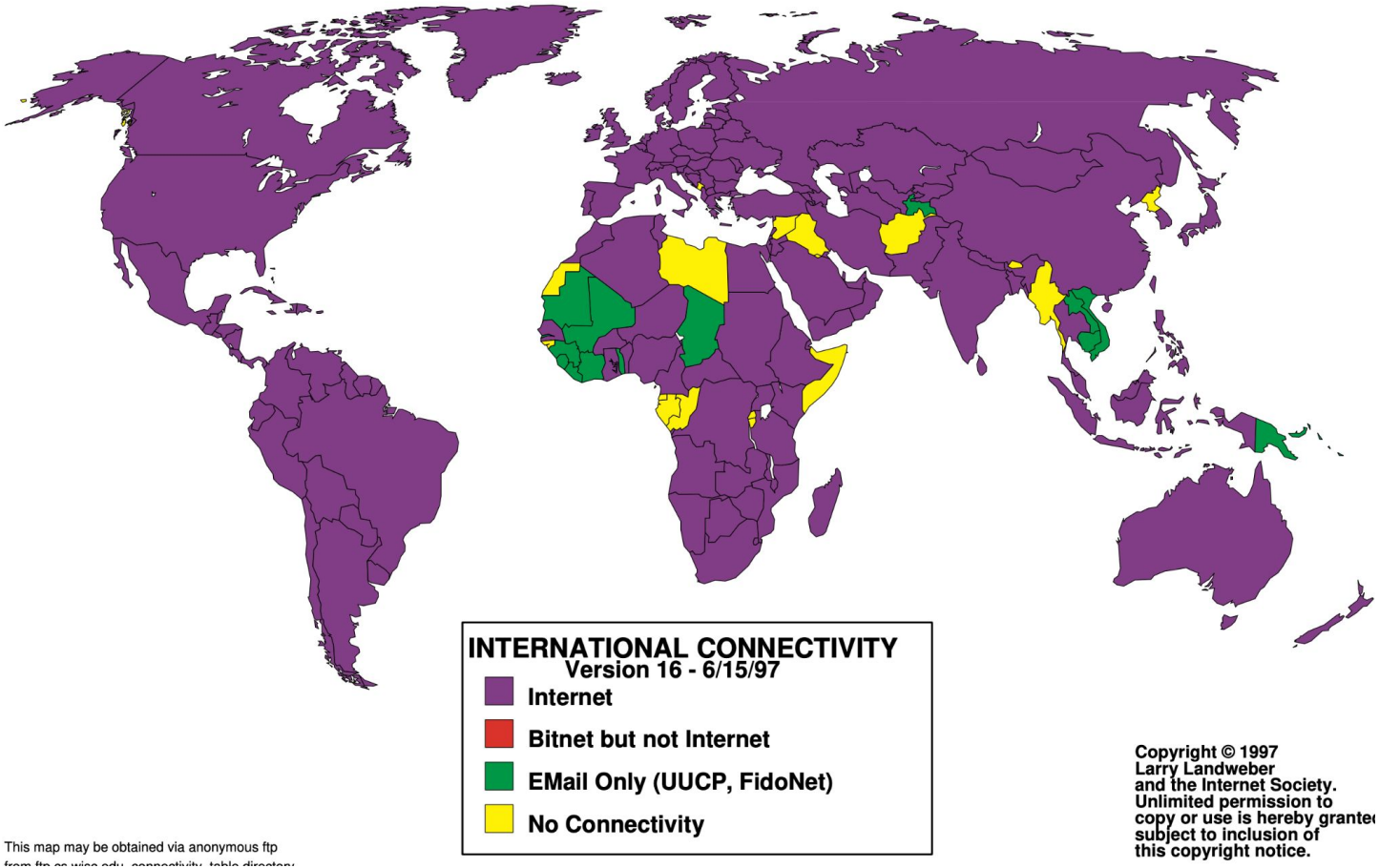
This map may be obtained via anonymous ftp
from ftp.cs.wisc.edu, connectivity_table directory


INTERNATIONAL CONNECTIVITY
Version 16 - 6/15/97
Internet
Bitnet but not Internet
EMail Only (UUCP, FidoNet)
No Connectivity
This map may be obtained via anonymous ftp
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Historical Context

- Unlike the countries of the Eastern bloc, Yugoslavia was not affected by restrictions on the sale of military and information technology equipment
- Yugoslav laws put limits on computer imports to support domestic production
- Escalating economic and political crisis

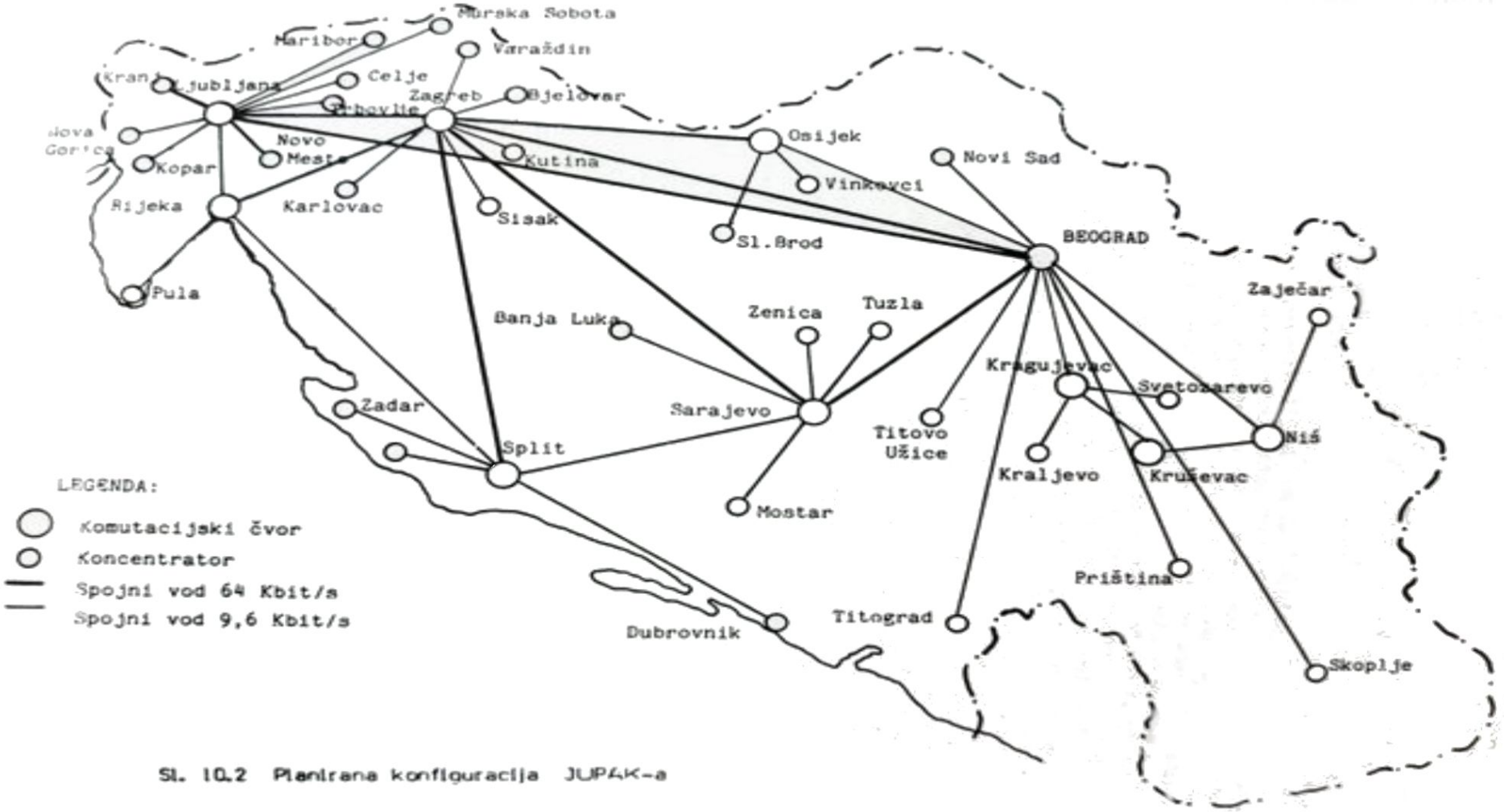
Early Computer Networking Initiatives

- Early 1970s - Initiative to establish Yugoslav Scientific-Technical Information Network (SNTIJ)
- No tangible progress until mid-1980s, but established a basis for future networking processes
- 1981 - Federal law on the national information system

Galeb - first microcomputer designed and produced in Yugoslavia

JUPAK

- National packet switching network based on X.25
- Agreement of sub-national PTT organizations on the network architecture reached in 1983
- But no consensus on joint equipment procurement
- Slovenia started in 1983, Croatia in 1984, Serbia in 1985, Bosnia and Herzegovina in 1986
- Commercial operation in Slovenia in 1986, in Croatia and Serbia in the late 1980s



Sl. 10.2 Planirana konfiguracija JUP4K-a

Academic/research Networks in Yugoslavia

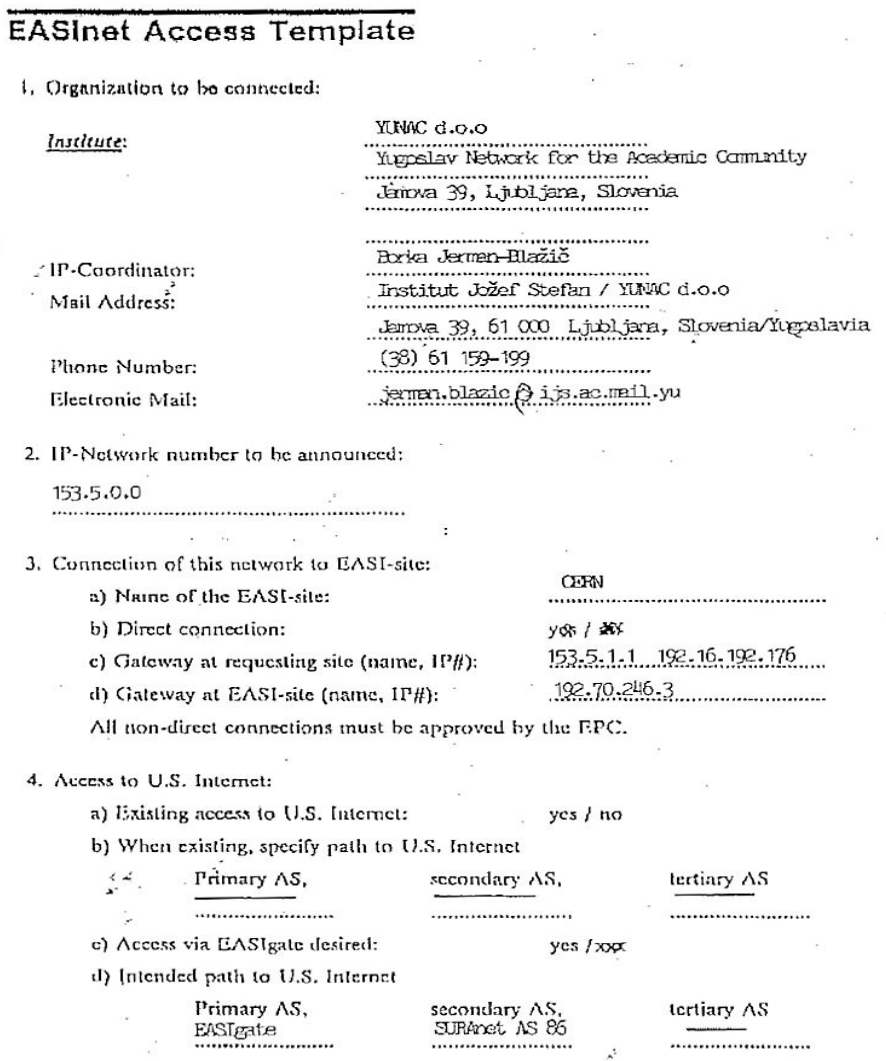
- During the 1980s, academic and research institutions in Slovenia, Croatia, and Serbia were linked to European/US networks via various technologies and projects
- COST 11 - Slovenian and Croatian institutions connect to Euronet in 1978 and 1984
- Slovenian and Croatian institutions participate in UUCP exchange via EUnet in 1988
- University of Belgrade connects to BITNET/EARN in 1989 via Austrian EARN in Linz

EUREKA-8 COSINE, YUNET and YUNAC

- 1987 - “Matic’s fund” provides funding for development of the Yugoslav Scientific-Technical Information Network
- Funded YUNET project - Yugoslav participation in the EUREKA-8/COSINE
- YUNET proposed by a consortium of academic and research institutions from Slovenia, Croatia, Serbia, and Bosnia and Herzegovina
- 1989 - Borka Jerman Blažič from IJS requested .yu ccTLD from IANA. Primary DNS servers at UC Berkeley, secondary NORDUnet and RIPE
- YUNAC - Yugoslav academic network organization, established by the YUNET project consortium in 1990 (became member of RARE)

.YU on the Internet

- 1991 - YUNAC requests IP ranges and connects to the IXI node in Vienna via JUPAK, only 10 days before Slovenia proclaims independence from SFRY in June 1991
- Internet link (TCP/IP over X.25) established in November 1991 with Nationaal Instituut voor Kernfysica en Hoge-Energiefysica (NIKHEF) in Amsterdam



EASInet Access Template

1. Organization to be connected:

Institute: YUNAC d.o.o
Yugoslav Network for the Academic Community
Jamova 39, Ljubljana, Slovenia

IP-Coordinator: Borka Jerman-Blažič
Mail Address: Institut Jožef Stefan / YUNAC d.o.o
Jamova 39, 61 000 Ljubljana, Slovenia/Yugoslavia
Phone Number: (38) 61 159-199
Electronic Mail: jerman.blazic@ijs.ac.mail.yu

2. IP-Network number to be announced:

153.5.0.0

3. Connection of this network to EASI-site:

a) Name of the EASI-site: CERN
b) Direct connection: yes / no
c) Gateway at requesting site (name, IP#): 153.5.1.1 192.16.192.176
d) Gateway at EASI-site (name, IP#): 192.70.246.3

All non-direct connections must be approved by the EPC.

4. Access to U.S. Internet:

a) Existing access to U.S. Internet: yes / no
b) When existing, specify path to U.S. Internet

Primary AS,	secondary AS,	tertiary AS

c) Access via EASIgate desired: yes / no
d) Intended path to U.S. Internet

Primary AS,	secondary AS,	tertiary AS
EASIgate	SURAnet AS 86	

Sanctions against FRY

- In parallel, Mirjana Tasić - Belgrade BITNET/EARN node admin - requests IP ranges from InterNIC in July 1991, works to setup DNS servers for internet link via Linz until May 1992
- Sanctions imposed by the UN Security Council on the FRY (Serbia and Montenegro) prevent Internet access

```
Date:         Wed, 3 Jun 92 09:57:26 CDT
From:         Wilfried Maschtera <Maschtera@EDVZ.UNI-LINZ.AC.AT>
Reply-To:     EARN Board of Directors <EARN-BOD@IRLEARN>
Subject:      Deactivation of line to Belgrade
To:           Yagos Puric <xpmfd01@yubgss21>,
              Svetozar Niketic <xpmfh01@yubgss21>

Dear Jagos and Svetozar,

on June, 2nd 1992 Mr. Axmann from the Ministry for Science and Research
called the head of our computing center, Mr. Valach and informed him
on the following:

On June, 2nd the Austrian government decided to follow UN resolutions
752 and 757 and to suspend the scientific, technological and cultural
cooperation with Yugoslavia (Serbia and Montenegro). As a consequence
the Computing Center of the University of Linz has to deactivate the
line to Belgrade.

This decision was confirmed when I phoned with Mr. Axmann. On June
3rd I informed the Austrian EARN Director, Prof. Schulz. He gave me
the order to follow the directive and to deactivate the line.

I do not agree with this decision but I have to comply with it.
Therefore the  line will be deactivated temporarely on June 3rd,
4 o'clock pm (16.00). Please note that we do not cancel the line
itself. All files destined for a location in Yugoslavia will be
saved.

I regret this decision but I ask you to understand that I have to
follow this order. We all hope that we can resume the transfer
and our good cooperation shortly.

Kind Regards / Wilfried
```

War Erupts in SFRY

- 10-Day war in Slovenia, June/July 1991 - communication lines were occasionally down, but quickly repaired (JUPAK was still working)
- Academic networks used for “alerting the international community” or “spreading propaganda”
- YUNET financing stopped in October 1991
- War in Croatia, September 1991 - communication infrastructure destroyed, JUPAK links severed

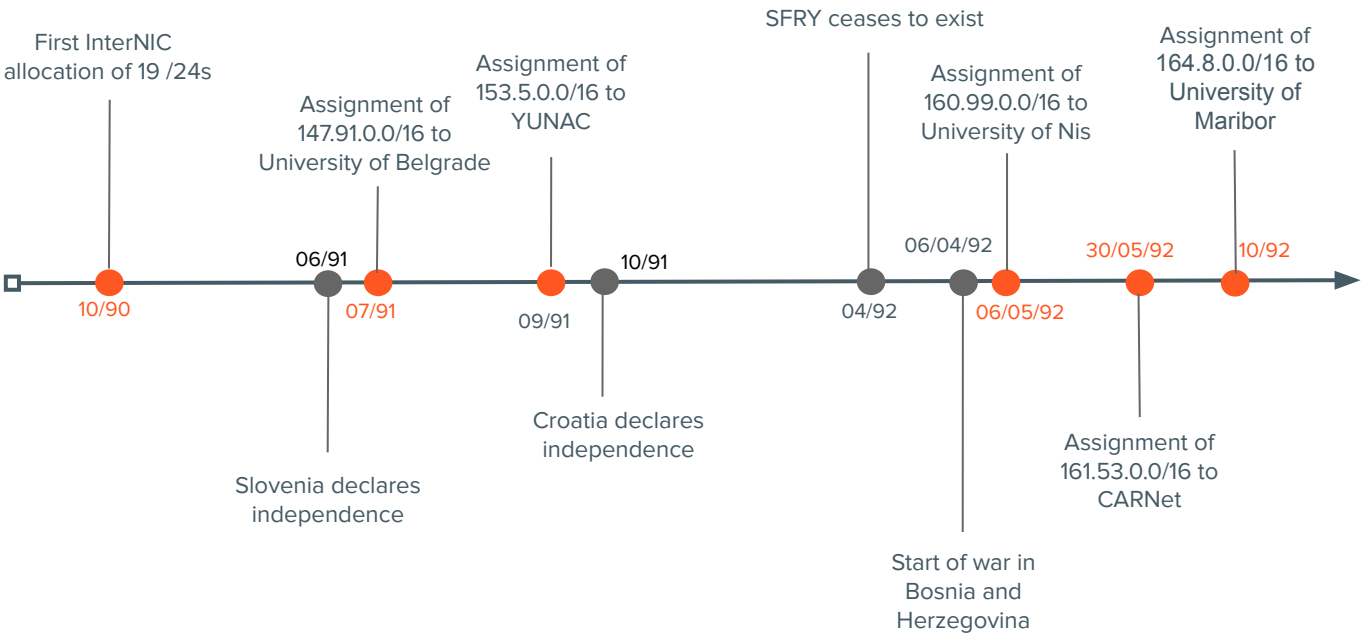
Communication station “Kum” damaged by JNA air raid on 2 July 1991

End of JUPAK, Raise of ZaMIR

- War in Bosnia and Herzegovina, May 1992 - communication infrastructure destroyed, JUPAK permanently terminated
- Sanctions against FRY, May 1992 - PTT traffic allowed (incl. X.25), but access to commercial services and scientific cooperation denied, leading to effective isolation of FRY
- Since 1992, the ZaMIR BBS network gradually expanded beyond the borders of war-torn former Yugoslavia

In the early days of the war in Bosnia and Herzegovina, in May 1992, the Main Post building in Sarajevo was burned down, severing telecom lines

IP Assignments to ex-YU Nets (1990-1992)



From: CATHY::LAVRENCIC "dr.Borut B. Lavrencic, IJS, +38 61 159 199 ext
To: BORKA,ANIMUS::EMIL
CC: LAVRENCIC
Subj: yu IP nets

UEK::LEON "Leon Mlakar, HERMES SoftLab, 554-982" 44 lines 12-MAR-1992 1

Prilagam uradna imena mrez, ki so mi jih prijavili tisti, ki so zahtevali stevilko mreze (C razred) pri meni:

192.84.90	FERNET	FER Ljubljana
192.84.91	YUnet	EUnet Slovenia
192.84.92	IRBNET	Institt Rudjer Boskovic, Zagreb
192.84.93	FAGG	FAGG Ljubljana
192.84.94	ETFNET	ETF Zagreb
192.84.96	IJSNET	IJS Ljubljana
192.84.97	ELELAN	ETF Beograd
192.84.98	BEONET	Univerza v Beogradu
192.84.99	ASTERNET	ASTER d.o.o.
192.84.100	METALNA	METALNA Maribor
192.84.101	ETFNET1	ETF Zagreb
192.84.102	TITAN	TITAN Kamnik
192.84.103	TAMNET	TAM Maribor
192.84.104	NILNET *	NIL d.o.o.
192.84.108	RCUNET	Racunalniski center Univerze, Ljubljana
192.84.105	------- rezervirano ----------	
192.84.106	IFSNET	Institute of Physics, Zagreb
192.84.107	UMBnet	RCUM Maribor
192.84.109	SOFTLAB **	HERMES SoftLab d.o.o
153.5	YUNAC ***	
192.64.18	SOFTLAB	HERMES SoftLab d.o.o.

* Nisem dobil uradnih podatkov. NILNET ime sem si izmislil (Pipi!!!!)

** Trenutno uporabljamo stevilko 192.64.18. Na novo bomo presli takoj ko nam bo cas dopuscal.

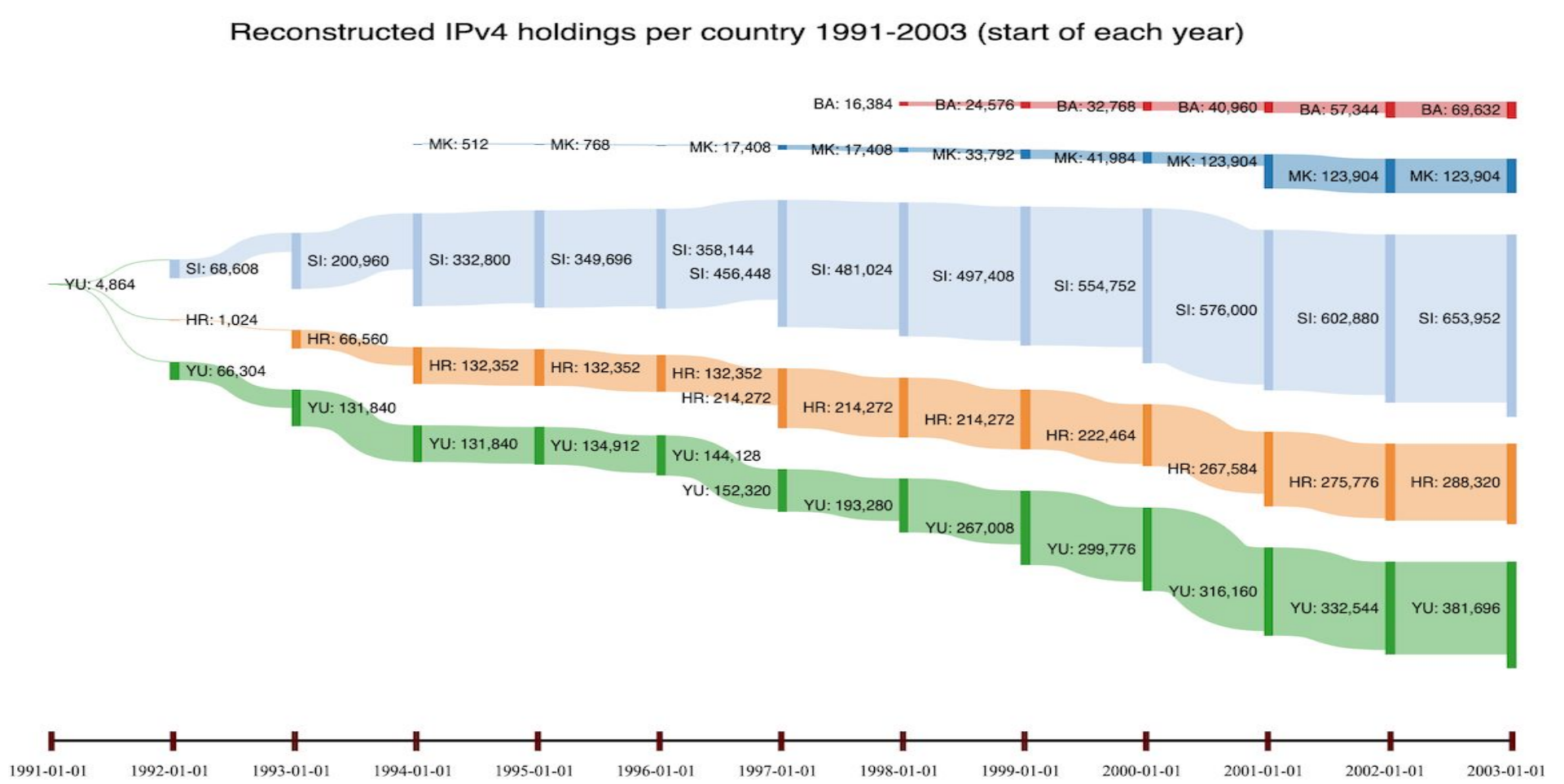
*** Neuradno ime (podobno kot NILNET). Stevilka (B razred) je bila dobljena direktno od NIC.

Tabela vsebuje samo podatke o mrezah (razen JUNAC), katerih stevilke so bile dobljene preko mene. Stevilke zahtevane direktno od NIC-a, ali se huje izmisljene stevilke jasno niso upostevane, ker o njih nimam podatkov.

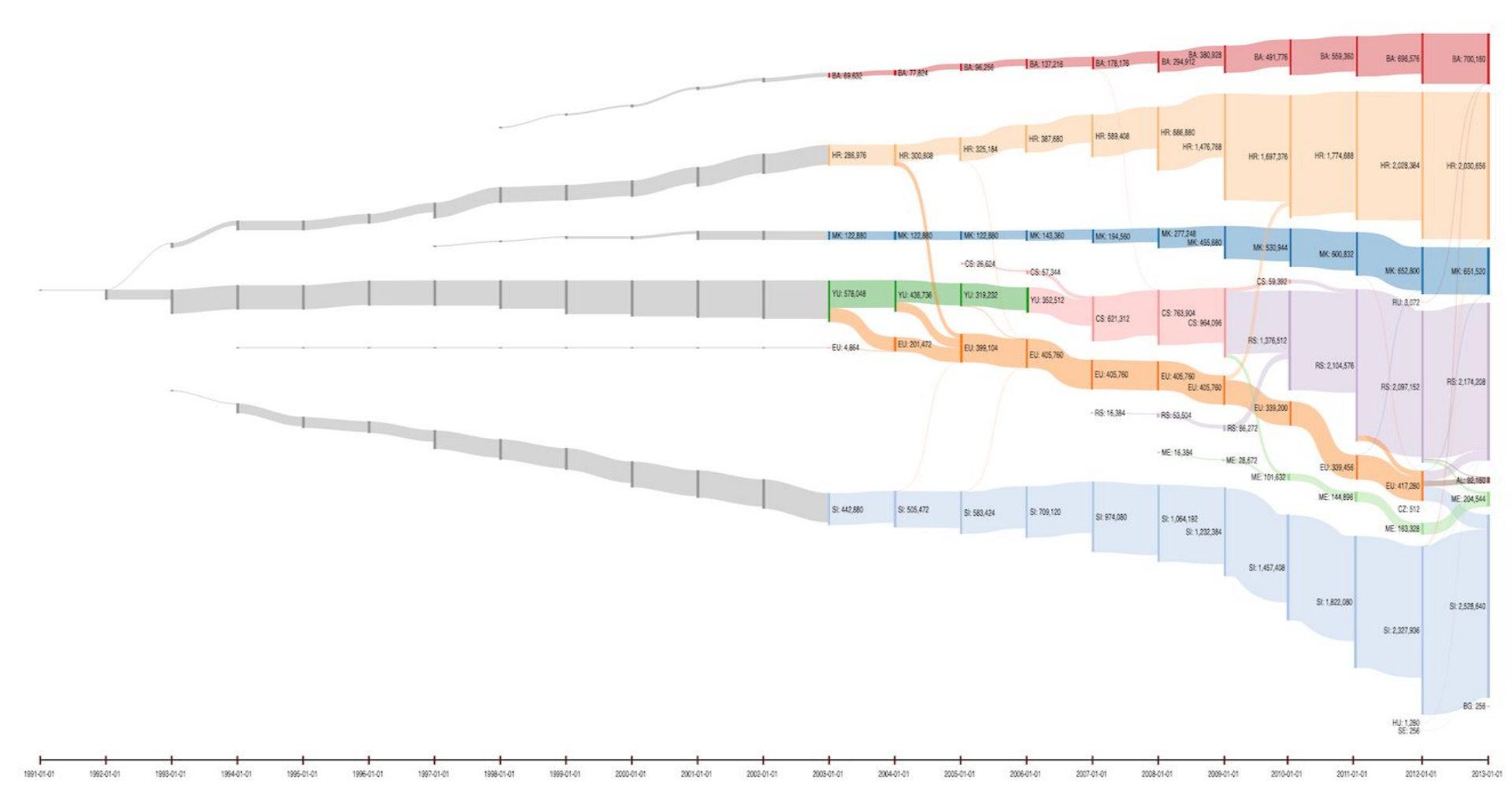
Tabela je na voljo preko anonymous ftp-ja v /etc/networks obliki na racunalniku ninurta.fer.yu (192.84.90.1, 192.84.91.1) v cftp/etc/networks.

Vse mreze seveda niso povezane med seboj. Trenutno so povezane: FERNET, YUnet, IRBNET, IJSNET, NILNET, YUNAC in SOFTLAB.

Leon



Sankey diagram, by Rene Wilhelm RIPE NCC



Sankey diagram, by Rene Wilhelm RIPE NCC

Some Conclusions

- Because of its unique geopolitical position, Yugoslavia enjoyed an advantage over countries in the Eastern bloc
- Considerable and long-lasting digital divide between the Yugoslav republics
- JUPAK was the primary telecommunications infrastructure for linking academic, government, and enterprise systems
- Building a "national internet" never received strong political backing in SFRY
- The academic community led the way, with a number of often disparate efforts (e.g. SLON/DECnet, BITNET/EARN, SNTIJ, EUnet)
- Microcomputer enthusiasts hacked their way through BBSs and the first academic networks, eventually forming private ISPs

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Questions?

jelena.cosic@ripe.net
slobodan.markovic@undp.org