

The new modern trunk telecommunications network in Croatia

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1 Introduction

When Croatia gained her independence in 1990, the telecommunications network that she had was quite underdeveloped. This is best illustrated by several basic indicators of development given in Table 1.

By hard work and engagement of the "Hrvatska pošta i telekomunikacije" (Croatian Post and Telecommunications), in spite of the war and constant repairs due to war destruction, the situation in the Croatian telecommunications improved substantially

after the completion of the first medium-term development plan 1991-1995. This is best illustrated by the comparison of the same basic indicators of development (1995/1990), presented in Table 2.

As the capacity of the telecommunications network was growing according to the needs, it was at the same time being modernised both by restructuring, and by applying the latest technology - optical fibres as transmission medium, and by consistent and constant digitalisation of the commutation and transmission systems.

Il presente articolo analizza e descrive la nuova struttura e capacità tecnica della rete di telecomunicazioni in Croazia. Tale rete, che risulta essenziale per lo sviluppo del sistema dei trasporti, è stata riorganizzata in modo da resistere maggiormente ai disturbi esterni. L'utilizzo di fibre ottiche ha consentito, inoltre, di incrementare in modo sostanziale la capacità di trasmissione della rete stessa.

One of the most important elements of the telecommunications network in our country is obviously its trunk network connecting the centres of higher category and representing the backbone for a high-quality transmission of all kinds of information (voice, images, signals, data). The old structure of this network was quite uneconomic and susceptible to interruptions, and it was realised mainly by the today already obsolete coaxial cables (which have a relatively narrow scope of applications apart

from other drawbacks), and radio-relay systems, using analogue technology.

2 The new structure of the trunk network

The "Regulations on public telecommunications in the fixed network", introduced in 1995, has defined among other things, the new structure of the telecommunications network in Croatia. According to these regulations the hierarchical division into levels remained, but the levels were reduced from five to only three (Figure 1) as follows:

Ord. No.	Indicator	1990
1.	density of telephone subscribers per 100 inhabitants	17.2
2.	digitalisation of the local commutation system	16 %
3.	digitalisation of the trunk commutation system	52 %
4.	digitalisation of the local transmission system	31 %
5.	digitalisation of the trunk transmission system	20 %

Table 1

Ord. No.	Indicator	1990	1995/1990
1.	density of telephone subscribers per 100 inhabitants	28.9	+68 %
2.	digitalisation of the local commutation system	50.7 %	+217 %
3.	digitalisation of the trunk commutation system	95 %	+82 %
4.	digitalisation of the local transmission system	75 %	+142 %
5.	digitalisation of the trunk transmission system	89 %	+345 %

Table 2

INTERNATIONAL AND INTERCONTINENTAL NETWORK

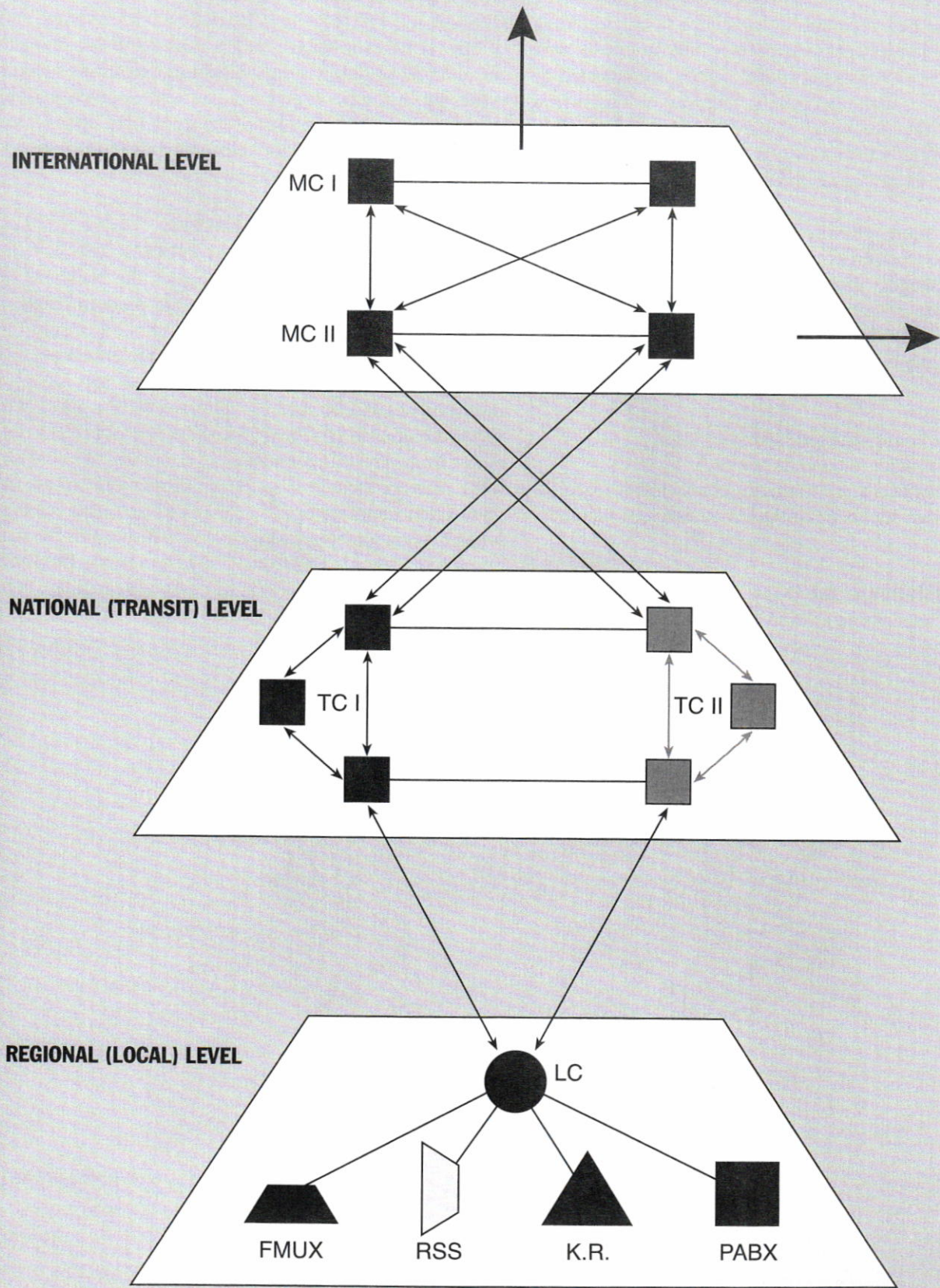


Figure 1 - Hierarchical structure of the new telecommunications network organisation

- access (local) level,
- transit (national) level and
- international level.

Moreover, in the new structure every switch is connected to two switches of higher category and not only to one as was previously the case. Thus, every local switch is connected to two transit switches within its county, and every transit switch is connected to two appropriate international switches. This increases substantially the toughness of the network in case of interruption due to any cause (breakdowns, natural disasters, etc.).

There are many more international switches according to this organisation - 10 (formerly only one) as follows:

- two of the 1st category in Zagreb, and
- two each of the 2nd category in Zagreb, Rijeka, Split, and Osijek (Fig. 2).

There are also more transit switches according to the new organisation - 40 (formerly only four), two each in every county:

- primary (in the county capital), and
- secondary (in a major town in the county).

All the transit switches are mutually connected (Figure 3), providing the main backbone of the Croatian telecommunications network.

3 The implementation of the trunk network

The new trunk telecommunications network has been imple-

mented with the latest transmission media - optical fibres. The single-mode optical fibres (ITU recommendation G. 652) have been used, which are applied at wavelengths of 1300 nm (II window), and 1550 nm (III window). The average number of optical fibres in cables ranges from 12 to 24. The already installed fibre optics trunk telecommunications network is presented in Figure 4, and the overview is given in Table 3. An overview of connections of the trunk fibre optics telecommunications network to the telecommunications networks of the neighbouring countries is given in Table 4.

4 Prospects for further development of the trunk telecommunications network

As can be seen in the previous chapter, the backbone of the trunk network in Croatia today is the modern fibre optics network providing the digitized transmission of information (SDH) at speeds of 622 Mbit/s (7,680 telephone channels) and 2.5 Gbit/s (30,000 telephone channels), and in the future it will be possible to increase the transmission speed without any difficulties to 10 Gbit/s (120,000 telephone channels).

Apart from physical connections via optical fibre cables, the trunk network includes also the application of cordless (radio) connection mainly via radio-relay systems, and since 1992, when Croatia joined the international consortiums for satellite communications - INTELSAT (Washington), INMARSAT (London) and EUTELSAT (Paris), also via satellites. Figure 5 shows the tendencies to expand the application of the fibre

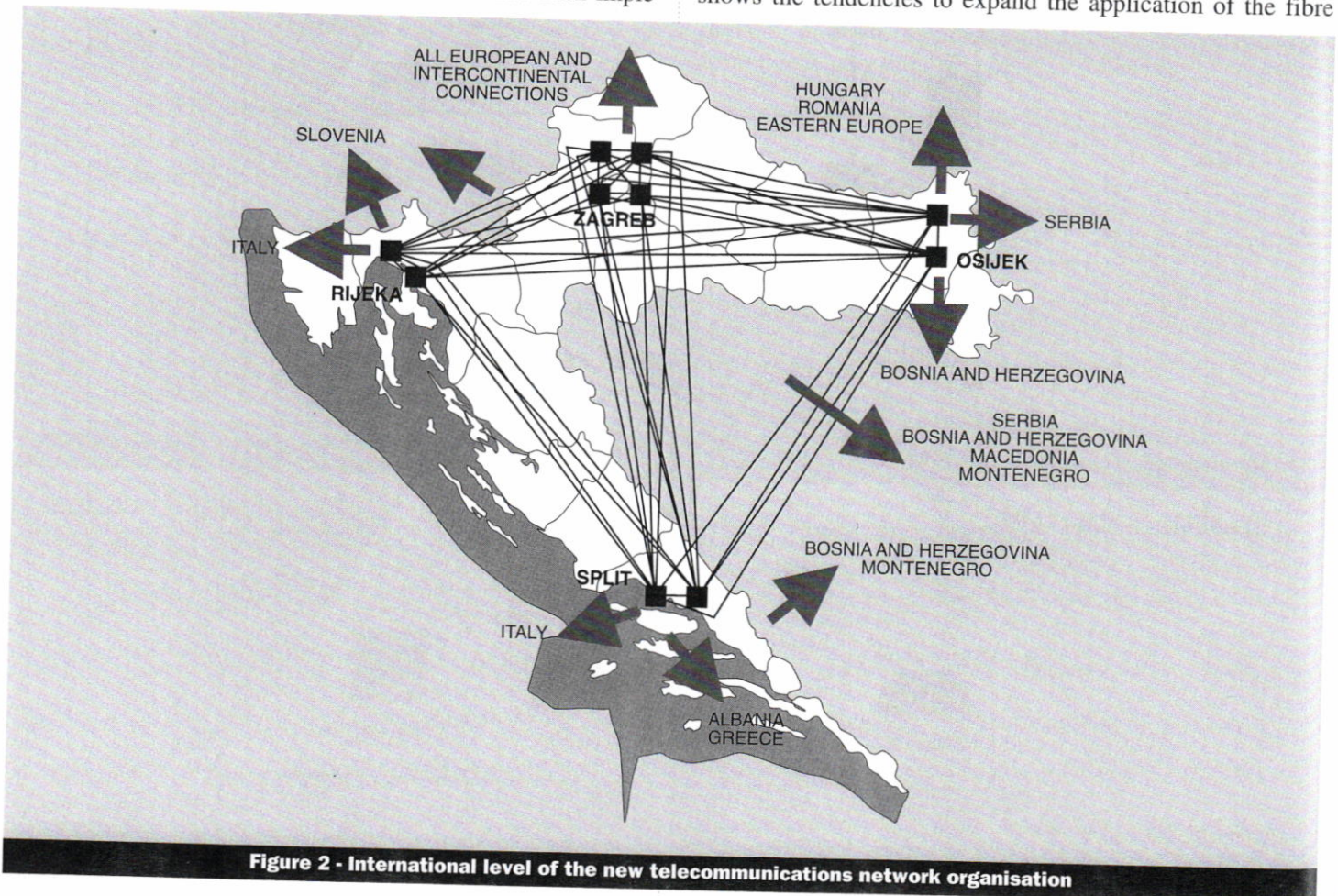


Figure 2 - International level of the new telecommunications network organisation

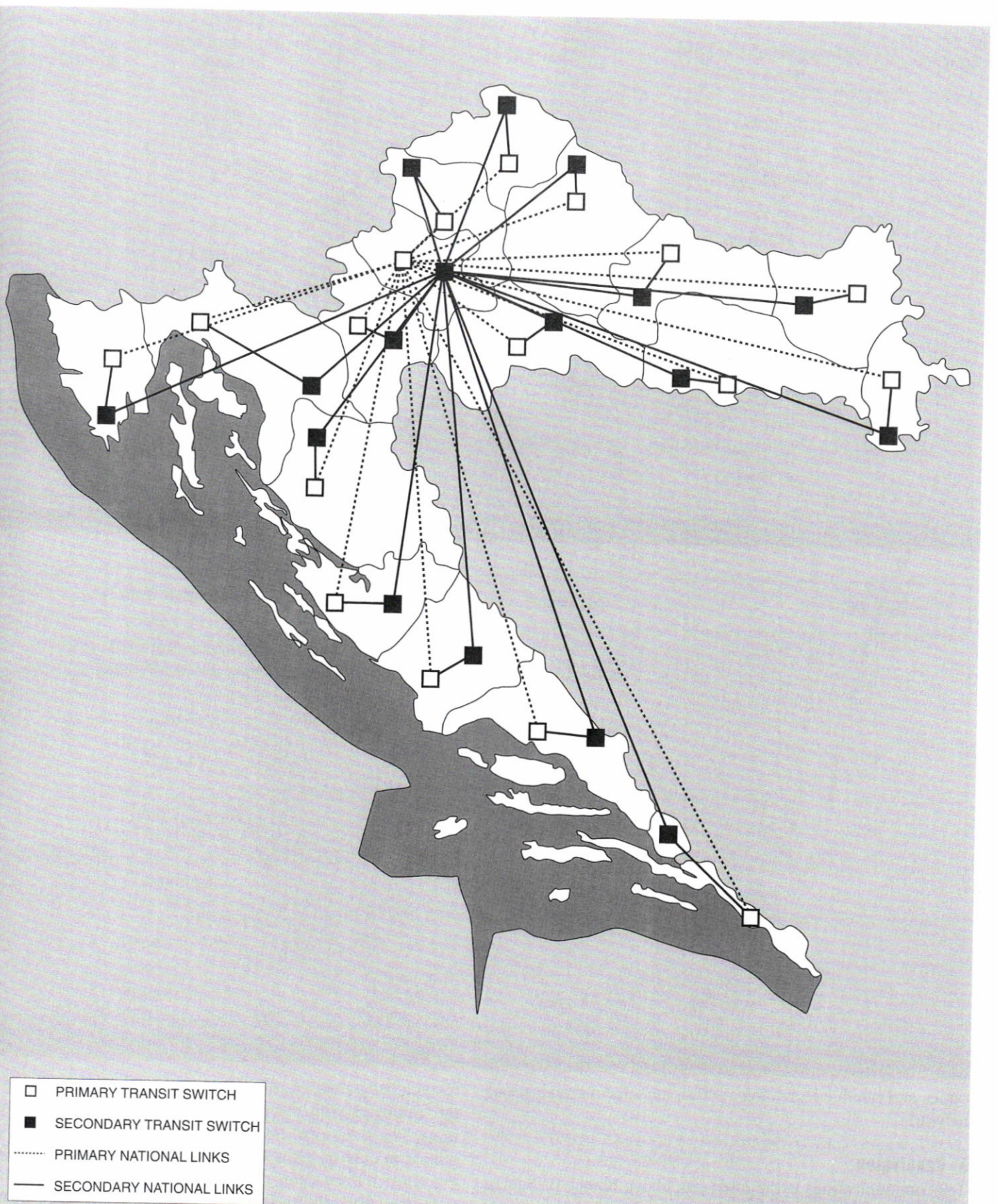


Figure 3 - National level of the new telecommunications network organisation

Ord. No.	The name of the fibre optics cable	Section	Length (km)	No. of optical fibres in cable	Year of construction
1.	TEL	RI - ZG (Goričan)	323	24	1993
2.	ADRIA 1 (SEG 1)	RI - DU	658	24	1993
3.	(SEG 2)	DU - Durres	186	24	1996
4.	(SEG 3)	Durres - Korfu	210	24	1996
5.	CRO - ITA 1	Umag - Chioggia	102	12	1994
6.	CRO - ITA 2	DU - Bari	170	12	1997
7.	JADRANKO	RI - DU	610	12	1995

Table 3

Ord. No.	Country	Connection from
1.	Hungary	Varaždin (Goričan) Osijek (Donji Miholjac)
2.	Slovenia	Zagreb (Bregana) Zagreb (Krapina) Rijeka
3.	Italy	Rijeka (Umag) Dubrovnik
4.	Bosnia and Herzegovina	Karlovac Split Split (Ploče) Osijek (Županja)
5.	Albania	Dubrovnik

Table 4

optics and satellite technology within the telecommunications network.

5 Conclusion

Telecommunications is the most propulsive branch of human activities, returning the invested capital faster and to a greater extent than any other branch. Therefore, proper functioning of the telecommunications is the main pre-condition for the prosperity and development of every country. The paper shows that the new trunk telecommunications network in

Croatia has a number of features which place Croatia among the countries with the medium-developed telecommunications. The new organisation of this network increases its toughness in case of interruptions, and due to the application of the latest transmission media - optical fibres, it has already today great possibilities of transmission, which can be easily increased to a greater extent in the future. Obviously, the present characteristics of the new trunk telecommunications network already allow high-quality transmission of all kinds of information, and according to further plans of "Hrvatska

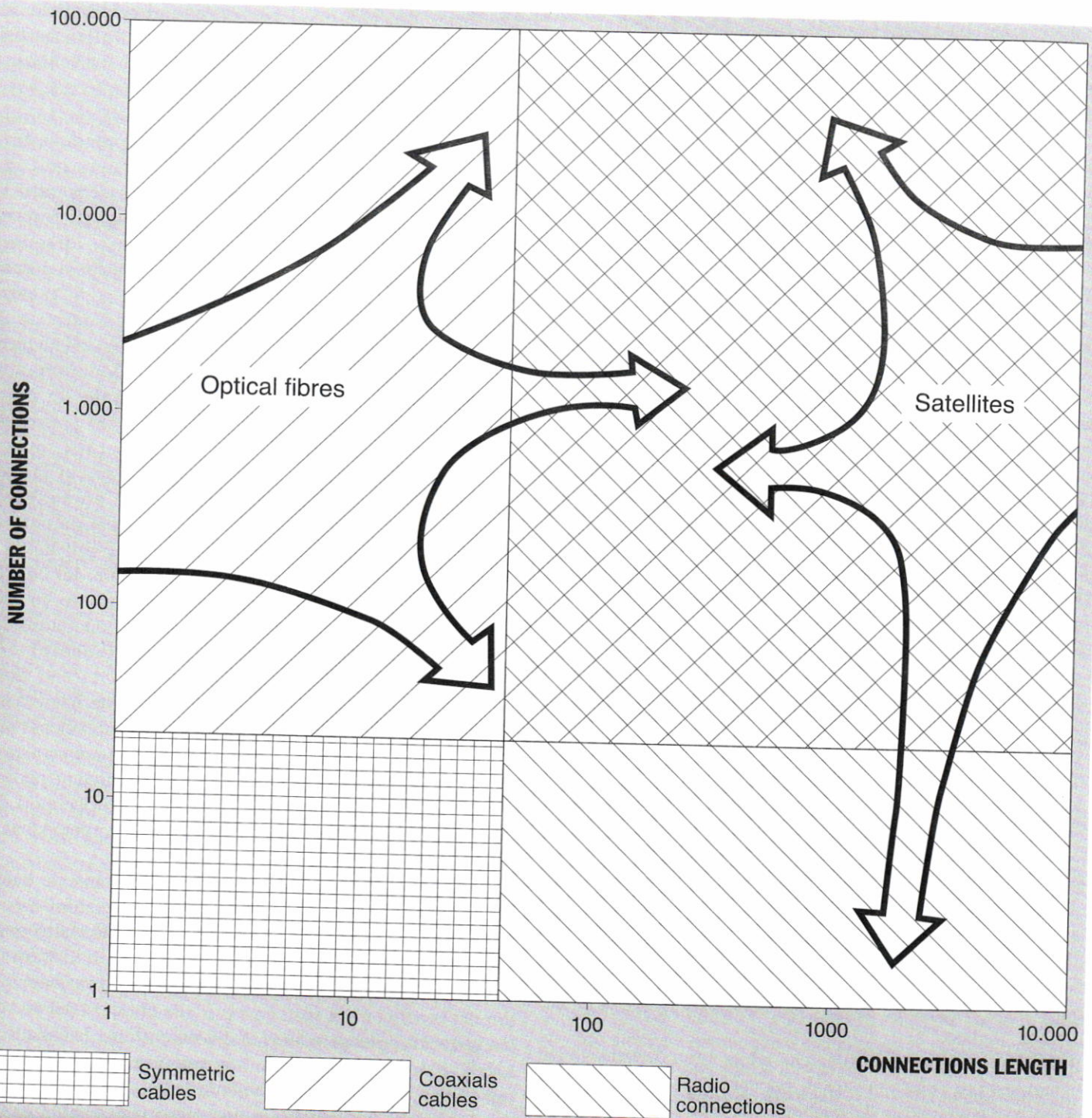


Figure 5 - The tendency of expanding the application of the fibre optics and satellite technology in the telecommunications network

pošta i telekomunikacije" (Croatian Post and Telecommunications), it will continue to develop both quantitatively according to the needs, and qualitatively, following the telecommunications development tendencies in the world.

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