Heizer Optik, s.r.o. handle within the programme of FTTx optical access networks mainly structuring the transmission part of the network (network made of optical fibres), which can offer you following:

- project consultation
- study elaboration with optimisation of the proposal and of network parameters
- variation analysis and choosing the appropriate technological network parts
- decision on the technology and strategy of network structuring/service
- elaboration of a detailed implementation project
- delivery of the network technological parts and equipment
- installation
- final measurements and hand-over/take-over proceedings
- technical support in the transmission part when being put into operation
- service and maintenance
- upgrades and network widening

**FTTx OPTICAL ACCESS NETWORK (Fibre to the x).**

**Introduction**

Requirements on the transmission capacity and on the broadband services are nowadays constantly rising at the telecommunication market and that is why the optical fibre is clearly the transmission tool of the best perspective. Technology of optical fibres is taken almost for granted when structuring the transport intercity and metropolitan networks.

For operators of telecommunication network it is the best way to come up with a long-term vision of providing better (i.e. faster, of higher quality and better-structured) services accessible to a high number of customers. FTTx technology is an obvious way how to achieve it and its aim is to bring the optical fibre closer to the final customer of the broadband connection and services. In the optical access networks structured by FTTx technology it is possible to offer really high-quality Triple play services (telephone - television - internet) // (VoIP - IPTV - Broadband Internet-Ipcc TV). FTTx projects are divided according to the fact how close can the optical fibre be brought to the customer:

- **FTTC** Fibre to the Crub
- **FTTCab** Fibre to the Cabinet
- **FTTP** Fibre to the Premises
- **FTTB** Fibre to the Building
- **FTTH** Fibre to the Home
- **FTTBus** Fibre to the Business
- **FTTO** Fibre to the Office
- **FTTD** Fibre to the Desk ...etc.

The aim of the FTTx network should not only be connection of commercial organisations as e.g. firms, banks, hotels, but also connection of non-commercial institutions of public character such as local offices and institutions, schools, clerical buildings, etc. and least but not last, connection of all households in block of flats or family houses. The aforesaid proves that structuring an optical metropolitan access network will become the most important progressive and development investment on site.

**Technical solution in general**

Optical access networks are constructed in two basic topologies:

- **Point-to-Point (P2P)**
- **Point-to-Multipoint (P2MP)**

Point-to-Point topology (P2P) is the basic and the easiest to do, but a high number of fibres between the centre and the participants makes the optical infrastructure difficult and too expensive in case of larger FTTx networks. In such cases Point-to-Multipoint (P2MP) topology is more advantageous, where an optical signal trifurcation is used to the participants, e.g. 1:32, which enables connection of 32 participants to one optical port.
However, it is generally known that FTTx network has a wide range of variations by using the topologies mentioned above and it is necessary and possible to have it "tailor-made" according to the assignment and requirements.

**SIROCCO** system is a system developed by British Telecom especially for metropolitan networks. It consists of two main elements:

- **Multitube** - comprises of 1 until 24 pieces of 5 mm tubes

- **Fibre bundle** - offered from two fibres to even 12 fibres with a total diameter of 1 mm and 1.4 mm.

Both technologies enable a gradual structuring of the optical routes (thereby also breakdown of all the costs for a longer period) - it is possible to add optical circuits into routes as needed and it is also possible to flexibly change the network configuration.

In the whole network can be used active elements working in compliance with international standard applicable - 802.3z (Gigabit - Ethernet technology), whereas all the devices must support Quality of Service (QoS) on the L3 and L4 layer. Technology mentioned above shifts the whole system into a super temporal level with a long-term application. Guaranteed lifetime of the distributors is at least 20 years. This technical solution is at the top level of the data transmission worldwide. At the same time it is the most modern system, which is applied in such an extent on the networks in some cities of the world and gradually it will come to a mass spread of this standard (802.3z) on the whole planet. Objectively, it is a price-winner and most perspective telecommunication system of today substituting also classic telecommunication central offices.

Metropolitan access network is based on IP technology. It is a package-oriented network based on IP protocol, which is a standard for Internet computer network and it serves for data, voice and video transmission. It is based on IP package being the basic transmission element of the network. This package contains data that are transmitted over the network. Active elements in the package network provide that the data packages are delivered from sender to the appropriate recipient in the given network. IP technology further includes a MPLS switching algorithm that makes IP packages in the network much more efficient and it provides MPLS VPN mechanism to create individual private virtual networks for respective users.
An advantage of such network is implementation of IP television, Internet and data transmission together with IP telephony in one optical fibre with an added option of data transmission whatsoever. It is a complex multi-media service that combines by now independent and for the users very attractive service offer in one package. Another advantage is easy expansibility and sufficient capacity reserve of the whole network together with a multiple redundancy (back-up) of the main transmission paths. Aforesaid parameters can satisfy even the most demanding customers within the state authorities and other organisations enabling except for high speed also using all the services without limits - calling, broadband internet, video-conferences, multi-media presentations and interconnection of their branches by data networks of the highest data transmission protection and reliability.

Possible usage of urban optical infrastructure after structuring:

Metropolitan access network provides its users not only with an easy Internet connection for a good price, but much more:

Local municipalities:
Interconnection of respective town buildings and schools through a high-speed data line of LAN network, which enables an easy and cheap computer communication and further telecommunication services with an added value, VoIP telephony implementation saving operation costs related to the internal organisational communication, i.e. making phone calls within the city line free of charge.
Connection of the city video camera system, easy expanding in difficult city parts, possibility to connect temporary video cameras, camera supervision of important crossroads, their management based on the supervision and thus a higher street capacity.
Possibility to connect all parking machines and thus a centralised parking management, Easy application of electronic payment systems for paid services and using the electronic signature and electronic signature guaranteed, Supervision of electronic security equipment of city buildings by Town Police, Services application to citizens and organisations through an automatic system with a connection to the IP telephony, Building kiosks that can provide citizens with an electronic communication with the authorities.

Commercial field:
Lease of the transmission paths (to alternative operators, banks, internet providers, companies, etc.)
High-speed Internet connection,
Connection of respective industry businesses or their branches through a high-speed data line,
VoIP telephony implementation saving operation costs related to the internal organisational communication, i.e. making phone calls within the town network free of charge,
Providing cable distribution of television signal,
Interactive movie rental (Video de Maind)
Back projection of television programme (Time Shift)
Although having listed so many services, do not forget about further yet not discovered services in the teleinformatics. When Alexander Graham Bell invented telephone he did not even suspected the future existence of "fax machine"!
Characteristics of IP telephony

Package or IP telephony is a simultaneous and joint delivery of voice and data communication over a united communication structure based on Internet Protocol (IP). Voice over Internet Protocol (VoIP) is an alternative voice service for transmission of spoken word over data networks by converting and compressing the voice into data packages and at the end of the data route the original sound by a reverse process. Internet Protocol is used for voice transmission. Big advantage of VoIP technology in comparison to the classic telephony is saving the band breadth - depending on types of transmission algorithms for a convenient voice transmission quality band breadth of 15kbit/s to 24kbit/s is sufficient. Another significant difference between the two technologies, which is in favour of VoIP, are outstanding low costs on network equipment in comparison with building a phone central office. This ratio is commonly not less than 1:10 and the equipment based on IP protocol have usually much more modern telecommunication functionalities than e.g. deferred fax, fax into e-mail, message into e-mail, choosing the most suitable route, standby routes etc. With these differences, the services of voice transmission over VoIP have a better price comparing to the classic technology. Another great advantage is a general trend of making phone calls over Internet, which is the only possibility for future development of main networks. Further advantage is simultaneous voice, picture and Internet transmission over IP protocol through one fibre and thus all data for required types of services being transmitted over one network. The result is further cost optimisation for telecommunication circuits leasing. Least, but not last, alternative possibilities of phoning over VoIP create competition pressure in a relatively monopoly area. Portfolio of VoIP services includes a complete range of products and thus providing an alternative form of voice communication.

Characteristics of Broadband Internet

Broadband Internet means transmission over Internet network by 1 Mbit/s and more. Broadband Internet operates over IP protocol. It offers possibilities for transmission of Triple play services, i.e. simultaneous transmission of voice, data and video over Internet Protocol.

Characteristics of IpccTV

IpccTV means a closed television network used in industry and security applications. Compared to the classic access to the camera system IpccTV provides a high modularity and a significantly easier connection of new video cameras in the residential areas. IpccTV uses IP protocol and the existing network for picture transmission, so it is not necessary to separate single transmission medium (optical fibre). Each video camera has its own IP address and it is possible to watch it anywhere in the network. Access rights may regulate access to the camera screen.

Characteristics of IPTV

IPTV means transmission of television signal over IP network. Transmitter is placed in the main station and it is possible to use also existing classic main station for cable television (CATV). Broadcasting is solved by a standard multicas technology, i.e. broadcasting to all participants simultaneously. Transmission is settled by MPEG2 compressed format, which is suitable due to lower quality loss of the transmitted picture and video. Advantage of IPTV is an easier billing and possibility to offer a targetted programme set to the customer. Termination device at the customer is called set-top-box (STB). It can transmit IP packets into MPEG2 format and its decompression to the picture. STB are produced in more variations, e.g. STB combined with DVD player, video player, radio alarm clock, etc.