STUDY

April 2005

PUBLIC INTERVENTION in BROADBAND MARKETS

GERMANY

Public intervention in broadband markets

Study conducted by the research firm Cabinet Wik-Consult on behalf of l'Autorité de régulation des télécommunications and Caisse des Dépôts et Consignations

NOTICE

Autorité de régulation des télécommunications (ART) and *Caisse des Dépôts et Consignations* (CDC) have called on the firm Wik-Consult to conduct a study on public intervention in broadband markets in Germany.

The study will be made public in a concern for transparency and information.

The study's conclusions are the sole responsibility of the firm and do reflect in any way the opinions of ART or of CDC

wik-Consult • Report

Study for ART

Public Intervention in Broadband Markets in Germany

Dieter Elixmann

Bad Honnef, 09.03.2005

Contents

1 Broadband market in Germany: a general overview

Empirical evidence about the broadband access market in Germany

At the end of 2004 there are about 6.7 mill. xDSL subscribers. Thus, the broadband access market in Germany has been very dynamic in the past two years as at the end of 2002 there were only 3,2 mill. subscribers, i.e. the number of subscribers has doubled in two years. However, it is fair to state that the German penetration rate is relatively low in an international comparison.

Broadband in Germany first and foremost is based on DSL solutions, i.e. in the mass market ADSL is prevailing. The main mass market services today (beginning of 2005) offer a bandwidth of 256 – 384 kbit/s upstream and 1 – 3 Mbit/s downstream.

Other broadband access technologies like satellite, cable-TV infrastructure and fibre are used in Germany, however, their significance for the market is still very limited.

Satellite up until now mainly rests on uni-directional solutions, i.e. ISDN dial-in is required and only in the case of big downloads the satellite is used additionally. Bi-directional solutions are only about to be launched in the market. In any case they are more expensive than the uni-directional solutions. Sound forecasts about adoption and diffusion of bi-directional solutions are not yet possible.

Broadband over the cable-TV infrastructure still is handicapped on the one hand by the split market structure - an institutional division of (a great number of) market players on network level 4 (virtually the in-house part of the network) and (less than 10 players on) network level 3 (the part of the network between the head end and the user's premises). On the other hand there is no real national market player on network level 3. Rather, the players have a more or less regional focus and, thus, do not operate on an efficient scale. However, several approaches of players in the past three years to merge have failed due to cartel office concerns.

Finally, regarding fibre there are of course business users which are hooked upon the communications network by fibre. However, it is fair to state that up until now Germany has not witnessed any public debate on FTTx (Fiber to the Home/Cabinet etc.) issues, let alone the development of (trial) projects or plans for a nationwide deployment of FTTH/FTTC. Otherwise stated, in a short and mid-term perspective there are no market driven developments to be expected and it is virtually impossible to identify any player willing and able to become the nucleus of a pro-active deployment of fibre infrastructure. Several reasons for this can be identified. First, there is a risk averseness of the capital market regarding long-term infrastructure investments. Secondly, many telecommunications market players still are not operating in a financial condition sustainable enough to allow them to unleash infrastructure investments beyond what is necessary and economically required by the demand side of the market. Thirdly, the market players which have already invested in own access infrastructure – Deutsche Telekom

AG (DTAG) and competitors alike - are not keen on making new investments which devalues their old ones. Fourthly, there is a widespread belief that bandwidth (potentially) available on copper infrastructure will be „enough“ for a long time to allow the provision of all services currently foreseeable, i.e. the conventional wisdom in Germany says that fibre deployment only makes sense if there is a „killer application“.

Broadband competitors of DTAG virtually have four options to offer a DSL product:

- Offering a DSL service on the basis of DTAG DSL access, i.e. the customer keeps its DSL access contract with DTAG
- Resale
- Unbundled local loop of DTAG, deployment of own infrastructure to hook upon the Main Distribution Frame (MDF)
- Direct access of an end user on the basis of own network facilities.

The most important competitor offering ADSL services today is by far DTAG with a total number of 5.7 mill. installed DSL access lines equalling a market share of around 85 % (related to the total figure of 6.7 mill. xDSL lines). The remainder of 1 mill. access lines is mainly provided by the German market participants providing access services (“Teilnehmernetzbetreiber”, essentially city carriers as well as national carriers). In this case they are offering DSL access on the basis of unbundled local loop or via direct access.

Changing the perspective from DSL access provision to provision of Internet access via DSL yields the following distribution of market shares: T-Online (subsidiary of DTAG) accounts for a market share of 55 %, United Internet has a market share of 16 %, AOL has a market share of 11 %, Freenet has a market share of 5 % and Arcor accounts for a market share of 5 %. The remaining market share of 8 % can be attributed to many city carriers and other smaller ISPs.

Thus, broadband infrastructure in Germany is exclusively deployed by private companies. Public intervention in this market is only observable to the extent that city carriers are involved.

The history of the German city carriers goes back to the first half of the 1990s. At that time especially energy utilities and savings banks owned by local and regional jurisdictions (e.g. the cities) have commenced activities in the field of telecommunications. The driving force of this activity was firstly the anticipation of the liberalisation of the telecommunications market. Secondly, the public entities were strongly convinced to have more or less significant comparative advantages in comparison to other (potential, i.e. at that time upcoming) network operators because of strong rights of way and economies of scale and scope regarding deployment of infrastructure (water, electricity etc.). Thirdly, outsourcing of telecommunications activities into a new unit “City Carrier” was seen as a reasonable vehicle to eliminate existing inefficiencies and to get cheaper telecommunications services.

It is important to note that city carriers in Germany have not been established with a broadband (mass market) perspective. Rather, their focus was to offer a traditional portfolio of services for the mass market (narrow band, analog, voice). Only over time, i.e. since the beginning of the new century, they are investing and becoming vital players in the broadband market.

Across all of the city carriers different business models could and still can be observed. The main features making up the differences are the customer focus and the product focus. The majority of city carriers follows a strategy to focus on residential and business customers as well as on the carriers carrier business. However, there are city carriers having a specific focus on only business customers and the carriers carrier business. The big German city carriers like NetCologne (Cologne), Hansenet (Hamburg), ISIS (Düsseldorf, see chapter 3) or EweTel (North-West Germany) are examples with a broad customer focus. A company with a narrower focus on business customers and carriers is e.g. 3T, see chapter 4. Also with respect to the product portfolio there are significant differences. 3T e.g. is mainly focused on the sale of leased lines. The other city carriers mentioned above are, however, integrated companies with a service portfolio comparable to that of DTAG.

Usually city carriers are competitive access providers the activity of which is mainly based on own infrastructure and on unbundled local loops of DTAG. The general division of labour between the utilities and the city carrier still is that the parent companies deploy (at least a significant part of) the transmission infrastructure (ducts, dark fiber) and the city carriers light the capacity and operate the network.

The German city carrier market has undergone several changes in the past years. It is obvious that several city carriers even today, i.e. 7 years after complete liberalisation of the market and sometimes even a longer time since their foundation are not operating profitable. It is fair to say that the sector at large was only EBITDA positive in 2003. Thus, it may not surprise that already since the turn of the century consolidation was seen as necessary and has changed the market structure significantly. On the one hand international operators have bought into or acquired completely city carriers. Examples are Elisa Telecom from Finland (today called “Tropolys“) who own a total of 14 city carriers (see chapter 2) and Versatel (Netherlands) who have acquired e.g. VEW TELNET (Dortmund), KomTel (Flensburg), CompleTel (Munich), tesion (Stuttgart) and Berlikomm (Berlin). Moreover, Hansenet, formerly owned by e-biscom (Italy) is now owned by Telecom Italia. On the other hand consolidation took place between national operators. Examples are EWE Tel (from Oldenburg) who are today majority owner of Osnatel GmbH (Osnabrueck), BREKOM GmbH (Bremen), Nordcom GmbH (Bremen, Bremerhaven) et htp GmbH (Hannover), Arcor AG et Co. KG who acquired Isis (Duesseldorf) and are holding a majority share in wuecom GmbH (Würzburg) and Netcom GmbH (Kassel) and M''Net GmbH (Munich) who have acquired NETKom GmbH (Nürnberg, Fürth, Erlangen).

Digital Divide in Germany

Sound information regarding the extent and the structural features of Digital Divide in particular on a regionalized level are only available for Germany with the publication of the „Breitbandatlas“ (broadband map). This map has been commissioned by the Federal Ministry of Economy and Labour and will be available not before mid of 2005.

In Germany there are about 5.200 local networks and about 7.900 MDFs. We assume that DTAG has already connected all of the MDFs by fibre. According to DTAG information more than 91% of all MDFs are ready for DSL technology. Around 6.700 MDFs (i.e. slightly less than 85 % of all MDFs) are already equipped with DSL technology today. There are three main obstacles regarding a 100 % DSL coverage:

- About 10% of all access lines based on copper technically are not suited for DSL because either the distance between MDF and end user (length of haul of the local loop) is too big or the quality of the copper cable is not sufficient for DSL.
- Not all of the local loops in Germany are based on copper. Rather, in some cases a particular part of the access line, usually the connection between the MDF and the street cabinet is fiber based (« Fiber to the Cabinet », so called ISIS/OPAL areas). DTAG has relied on this deployment strategy in particular in the beginning of the 1990s in the new Länder (i.e. East Germany). ISIS-OPAL areas do not support DSL protocols.
- DTAG does not install the technical equipment (DSLAMs etc.) because the anticipated demand is too low (lack of economy).

Competitors in Germany reach about 2.700 MDFs at the end of 2004 which according to our estimates yields a coverage of more than 50% of the population. We anticipate this dynamic of competitor activity still continue to go on.

Obviously competitors do not aim at deploying infrastructure to reach the entire population in Germany. This mirrors the fact that often there are conditions not allowing to make a viable business case. The reason for this is on the hand due to lack of enough (willingness to pay by) end users. On the other hand there are still unfavourable conditions for competitors on their input side. Indeed, one can assume that often a business case can not become viable because of the (high) input costs for the unbundled access line and collocation even if the broadband investment is strategically and economically reasonable with respect to the end user potential. In particular usage restrictions set by DTAG in the collocation areas force competitors to build up to three times more locations as effectively necessary. DTAG up until today allows only that competitors collocating at its MDF to use this area for unbundled access line and interconnection access (ICAs). Connections to third party collocation areas, switching/routing, and termination of leased lines for customer access are not allowed, rather, a competitor has to build up

own additional collocation sites for this. These additional sites are leading to substantially higher costs.

It can be taken for granted that among the MDFs equipped by DTAG with DSL technology there are those who are accessed by „many“ competitors, those who are accessed by „a few“ competitors and those who are not accessed by any competitor. The first alternative presumably is true of the densely populated agglomerations like e.g. Berlin, Hamburg, Ruhrgebiet/ Düsseldorf/Köln, Frankfurt and München, the second one is true of selected regional centres (in particular in those regions where city carriers are active) and the latter alternative is true of particular rural areas. Sound empirical data about the number of MDFs affected in these different zones is not available. Yet, it deserves to be stated that all of the areas capable of DSL technology by investments of DTAG can in principle be accessed by competitors through resale.

To the extent that competition in the German broadband market rests on resale one has, however, to take into account that this option virtually does not allow competitors to offer innovative products, rather, it is mainly competition where a homogeneous product defined by the incumbent is “enhanced” with certain features by the competitor and the main determinant of competition in the end user market is price. A remedy for this situation would be bitstream access where, however, competitors and DTAG today (March 2005) still have different views about the essentials of such an input product. The national regulator is currently about to conduct the market definition and presumably will publish a decision in the second quarter of 2005. This decision in all likelihood will also clarify the very nature of a bitstream access offer in Germany.

Future developments

It can be taken for granted that in ISIS / OPAL areas wireless technologies will become a prominent role for competitors. Another perspective is that competition may be fostered in areas where fibre has been deployed to the cabinet or even to the home by DTAG if unbundling is mandated also for these infrastructures. Broadband satellite solutions at large will remain a niche market which might, however, play a more important role in underserved areas. The potential of cable TV operators to diminish the digital divide will be crucially dependent from the activities of network level 4 providers. In our view fostering fibre to the home activities in Germany requires an appropriate business model and this is not available by now. In this context it might be useful to think about a carrier neutral deployment model, i.e. a “third party”, e.g. a venture capital firm, invests the money to deploy the infrastructure. The infrastructure is then sold as dark fibre to any competitor the focus of which is based on lighting this infrastructure and providing broadband services to the end user. A critical issue of such a model is of course how the incumbent firm in the market DTAG will judge such a model and if it is likely to become a customer of the infrastructure provider. In any case it would be useful to test market requirements by an appropriate regional field trial.

2 Presentation of the Tropolys Rhein-Main project

2.1 Organisational background

Tropolys Rhein-Main is part of the Tropolys Group[1]. The latter is an association of 14 city carriers in Germany with own network. Tropolys was for a while owned by the Finnish company Elisa (formerly known as Helsinki Telecom). However, since March 2004 Tropolys is majority owned by the venture capital firm Apax (Europe IV). The remaining shareholders are cities and the management. Tropolys had a turnover in 2003 of 134 mill. EUR. Tropolys owns a network of around 11.000 route km fibre throughout Germany. It has about 70.000 customers, the bulk of them business customers. Actually, Tropolys Rhein-Main comprises five different units:

- HU-Kom,
- Maineotk,
- Mainzkom,
- Rmn and
- Pulsaar.

Historically, these units (except rmn) have been established as city carriers (i.e. separate subsidiaries with a focus on the telecommunications business) by energy utilities, see section 2.2. These energy utilities at that time were mainly owned by the cities involved.

In the following we are concentrating on the first four companies because they are covering a geographical area being connected whereas Pulsaar is operating in another region of Germany, namely in Saarbrücken. We stipulate to use the term Tropolys Rhein-Main in the following for the companies except pulsaar.

2.2 Background and motivations of public action

MainovaTK Telekommunikations GmbH has been founded 1998 by the energy company Mainova as the city carrier of Frankfurt. Under the regime of the old German telecommunications law requiring licences Mainova had a Class 3 licence for Frankfurt. Mainzkom has been founded in March 1997 by Stadtwerke Mainz AG as the city carrier of Mainz. Mainzkom had a Class 3 licence for Mainz, Landkreis Mainz-Bingen, Landkreis Groß-Gerau, Mainz-Amöneburg, Mainz-Kostheim and Mainz-Kastel.

---

1 See www.tropolys.de.

HU-Kom has been founded by Stadtwerke Hanau as the city carrier of Hanau. Pulsaar Gesellschaft für Telekommunikation mbH has been founded in April 1998 as the city carrier of Saarbrücken. Rmn has been established in 1997 by regional energy companies Gas Union and Kraftwerke Mainz und Wiesbaden.

The public utilities have set up these activities mainly for two reasons. Firstly they had already deployed telecommunications infrastructure for their own communications purposes (voice, surveillance, remote maintenance etc.). Secondly, there are economies of scope. Indeed, costs of deployment (in particular regarding the costs of digging) are lower if they can be shared among several infrastructures (like electricity, water or sewage) and telecommunications. In earlier times the communications infrastructure of the utilities was mainly based on copper, meanwhile it is much more fibre based.

The regional activities of Mainova and HU-Kom today are marketed under the brand “Maineotk”. Mainzkom is still offering services under its old name, however, the market positioning of maineotk and mainzkom are quite similar except the fact that the former is focusing on the Frankfurt region and the latter is focusing on the Mainz region. Regarding rmn see section 2.4.

In 2004 all city carriers mentioned have been acquired by Tropolys, i.e. the earlier public shareholders have sold their assets completely.

This sale is mirroring one important facet of consolidation in the German city carrier market. Indeed, Tropolys meanwhile has acquired 14 city and regional carriers in Germany located all over the country. The reason why the public shareholders have sold their shares was mainly to concentrate on their core business. An important driving force for this strategic move is the change in the regulatory treatment of the energy market in Germany. Energy companies are required to legally unbundle network activities and service activities in order to get price transparency and to guarantee a non-discriminatory access for competitors. This, in turn, forces especially the smaller energy companies “next to the end users” in the German value chain of energy production and provision to change their business strategies. It is expected that especially the fragmented local and regional market structure (on the distribution side) – Germany has about 700 small and very small local and regional energy companies – is ripe for consolidation.

2.3 Key figures and features of the business model

In the beginning the business model of the city carriers involved was mainly concentrating on the bandwidth business. In Frankfurt the focus was e.g. on the carrier business, in Mainz on business customers. Mainzkom has established a link to the German Internet exchange point DeCIX in Frankfurt already in 1998. Since the year 2000 Mainzkom was also providing telehousing and hosting services. Later they also bought a share in an IT company. Maineotk in Frankfurt has become an ISP in 2003.

Today, Tropolys Rhein-Main operates in the market as a regional Full-Service-Provider. The geographical focus is on the Rhein-Main area comprising mainly the cities of Frankfurt am Main, Mainz and several counties (in German: Landkreise), see section 2.4 for more details.

The area in which Tropolys Rhein-Main is active belongs to the most densely populated areas in Germany. Frankfurt has a population of about 600.000 and a number of households of nearly 300.000. Mainz has a population of about 250.000 and the number of households is approximately equal to 120.000. In total, about 2,4 mill. people are living in the area Tropolys Rhein-Main is covering.

Since the acquisition of the city carriers by Tropolys their customer focus has changed significantly and is to comprise now also the high-end residential customers. Besides this group, the customer focus of Tropolys Rhein-Main still is on small and medium sized enterprises, key accounts, institutions and administrations owned by jurisdictions, and other carriers (wholesale carrier's carrier services). As an example we highlight reference customers of Mainzkom. These encompass e.g. public and business customers like Bischöfliches Ordinariat (church), Boehringer Ingelheim KG (chemistry), CDU-Landesverband Rheinland-Pfalz (political party), 1. FSV Mainz 05 (soccer team), LBS (building society), LRP Landesbank Rheinland-Pfalz (bank), Schott Glas AG (industry), Schott Musik International GmbH & Co.KG (music rights), Sparkasse Mainz (bank), Staatstheater Mainz (theatre), Stadtverwaltung Mainz (city administration), Stadtwerke Mainz AG (utility), SWR (broadcasting) and carriers (BT Ignite, Colt Telecom, D2 Vodafone).

The product focus of Tropolys Rhein-Main is characterized by providing voice services (covering a range from ISDN access to professional Private Branch Exchanges), data services (covering a range from Internet dial-up to high speed access of complex networks) and custom–tailored system solutions. Products for business customers encompass voice services, value added services (freephone, shared cost), ADSL and SDSL services, firewall, leased lines, web servers and data services. Products for residential customers are mainly based on DSL services and ISDN.

Since the acquisition by Tropolys the city carriers have lost to some extent their price flexibility. Products and services "off the shelve", i.e. basic services like voice etc. are

offered uniquely with prices fixed by Tropolys. Only regarding the regional and local project business (solutions) each city carrier has autonomy to set the prices.

The telecommunications infrastructure is still today deployed to a large extent by the utilities. Some of them even keep the infrastructural assets on their balance sheet to a large extent. For example, 80 % of the infrastructure used by Tropolys Rhein-Main in Frankfurt is still with the utility Mainova, i.e. not with Maineotk. In Mainz, however, the fibre infrastructure is completely owned by Mainzkom and therefore an asset on the balance sheet of Mainzkom. Stadtwerke Mainz (the utility) of course are deploying the infrastructure and they still own the ducts. The entities of Tropolys Rhein-Main are renting the infrastructure from the utilities on an exclusive basis and they therefore have to pay a higher price for this right.

Tropolys Rhein-Main has a turnover of about 22 mill. Euro in 2004 whereof Mainzkom incurs about 8 mill. Euro and maineotk about 11 mill. Euro. The plan for 2005 is to increase turnover by 20 % whereof two thirds should be contributed by project and system business and the remaining one third by standard business. Tropolys Rhein-Main is EBITDA positive since the beginning of 2004.

2.4 Technical description

Distinct network maps of each of the city carriers making up Tropolys Rhein-Main are not available. In Frankfurt about 120 km own fibre and in Mainz about 170 km fibre (route km) are owned. To get an impression of the network coverage of Tropolys Rhein-Main we refer to the network map of rmn.[2] Actually, rmn comprises the following partners: HEAG MediaNet Darmstadt, HU-KOM Hanau, Maineotk Frankfurt, Mainz-Kom Mainz, WiTCOM Wiesbaden and 3T Offenbach[3].

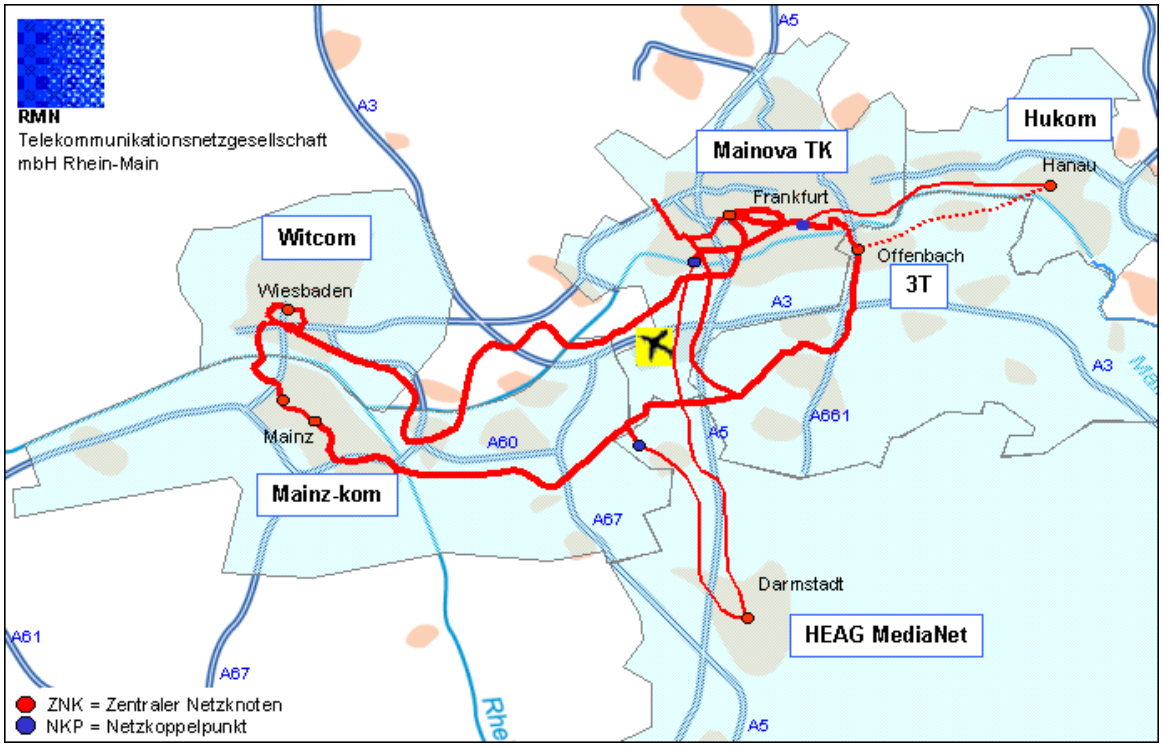
Rmn can be viewed to some extent as the trunk network provider for the other partners involved. The business model of rmn is focusing on the provision of transmission and data services for carriers, ISPs, universities and operators of corporate networks in the Rhein-Main area. Main products are RMN InterCity Link (SDH / PDH leased lines with different bandwidths) and RMN LAN Link (these links are protocol independent (ISO layer 2) and are provided as Ethernet services 10Mbit/s, 100Mbit/s and 1Gbit/s). Rmn is EBIT positive since 2000. The annual revenue is below 10 mill. Euro.

Rmn owns a backbone of 345 km, see the following map. The network is based on SDH and Ethernet technique.

---

2 Regarding rmn see http://www.rmn-tk.de/de/index.htm
3 Regarding 3T see chapter 4.

Figure 2-1: Backbone network of rmn and its partners



Source: http://www.rmn-tk.de/de/rmn-backbone.htm

With respect to jurisdictional boundaries the geographical activity area of rmn mainly covers the cities of Frankfurt, Offenbach and Mainz (in German terms “kreisfreie Städte”, i.e. cities not sub-ordinated to a county) and a couple of counties (in German: “Landkreise”), encompassing Landkreis Offenbach, Landkreis Groß Gerau, Landkreis Mainz-Bingen, Landkreis Main Taunus and Landkreis Main Kinzig, see next figure.

Figure 2-2: Cities and counties in the Rhein-Main area affected by business activities of rmn

Source: http://www.kreisnavigator.de

Tropolys Rhein-Main has deployed infrastructure to access all of the MDFs in Mainz. In Frankfurt about three quarters of all MDFs are accessed.

Mainzkom has an own Autonomous System (AS); in earlier times they had even three ASs. Mainzkom is peering e.g. with Telefonica Deutschland at two locations (in Frankfurt and in Mainz).

Tropolys Rhein-Main is thinking about resale of broadband access. However, their focus will remain on own infrastructure. ADSL 2+ is planned, however, no fixed date about a market launch has been specified so far. Big business customers are accessed by fibre (STM-1 and higher). FTTH solutions for residential customers are not in the focus.

2.5 Financial description

The investment budget of Tropolys Rhein-Main is below 5 mill. Euro in 2004. Thus, the investment activity of Tropolys Rhein-Main accounts for about 2 % of the total investment of more than 200 mill Euro by all city carriers in Germany. This amount, in turn, is relatively low compared to the 600 to 800 mill. Euro DTAG is investing for broadband facilities in 2004.

To give an example of a particular local deployment activity: the investment costs for a DSL-offer in Mainz and Ingelheim, i.e. the complete coverage/access to all of the 13 MDFs amounted to 300.000 EUR.

2.6 Impact of the project

The activity of the city carriers being part of Tropolys Rhein-Main have contributed to make the market more competitive. However, the different entities have different levels of competition on their home turfs. In Frankfurt, competition is fierce both in the residential and business market as well as in the wholesale market. The reason is that many carriers have deployed own infrastructure since the second half of the 1990's (often relying on swaps) and they are offering services and solutions on the basis of this infrastructure. One implication is that there is a very high pressure on prices. This situation changes completely when one is focusing on the suburban and rural areas surrounding the big cities. Here the number of competitors is low, often only the city carrier and DTAG have deployed own infrastructure. Thus, prices and margins obviously are much higher than in Frankfurt.

3 Presentation of the ISIS project

3.1 Background and motivations of public action

ISIS Multimedia Net GmbH & Co KG has been the first city carrier in Germany. The foundation period goes back to the early 1990s. At that time Westdeutsche Landesbank (WestLB, the “superbank” of the savings banks in Northrhine Wesphalia having two main locations in Düsseldorf (Northrhine) and in Münster (Westphalia)) got rights of way in Münster for a network connecting their different locations. This was the idea for a business concept to outsource communications infrastructure services into a separate entity, namely ISIS. In exchange for the right to deploy infrastructure also in Düsseldorf, the city of Düsseldorf was allowed to become a shareholder of ISIS. Thus, ISIS has a “bank history”, i.e. experience with connecting bank branches.

ISIS was founded in 1994 by the local utility Stadtwerke Düsseldorf (50%) and WestLB (50%). In 1996 the deployment of corporate networks was started. In 1998 – at the time the German telecommunications market was completely liberalized - ISIS also launched activities in the residential market. 1998 was also the year when other utilities (Duisburg, Neuss) took a share in ISIS. In 2001 Arcor acquired a share of 74,9 % in ISIS. Today ISIS is a 100 % subsidiary of Arcor (which itself is owned by Vodafone (74%), Deutsche Bahn (18%), Deutsche Bank (8%)).

The reason why the former shareholders sold successively their share was on the one hand that they aimed at refocusing their business strategy by concentrating on their core activities. On the other hand, according to ISIS the utitlies and WestLB achieved a very good price when they sold the company.

3.2 Key figures and features of the business model

The geographical focus of ISIS is on the areas comprised by the Regierungsbezirk (i.e. in Germany the next lower administration level within the “Länder”) Düsseldorf. Regierungsbezirk Düsseldorf encompasses a population of about 4.5 mill. people and 2,1 mill. households. ISIS has deployed infrastructure to reach about 80 % of the population in the region.

Regarding the customer focus of ISIS there is a specialisation on governmental and business customers. The mass market is mainly focused on by the parent company Arcor. Meanwhile 11 cities within Regierungsbezirk Düsseldorf have moved completely from DTAG to ISIS. All hospitals in Düsseldorf and the majority of hospitals in the region are customers of ISIS. In addition ISIS offers a broad portfolio of services for many institutions like savings banks and banks, cultural institutions and associations (Vereine). The state administrations of Northrhine-Westphalia have access to the fibre network

throughout Regierungsbezirk Düsseldorf. Hundreds of schools, police departments and further public institutions have access to the network of ISIS. According to ISIS the reason why public customers chose ISIS was mainly because price is the most important aspect for governmental/ public authorities regarding communications services and ISIS is cheaper than competitors.

The product portfolio of ISIS encompasses several product and service lines like telephony and Internet; networks including installation, management, and support; leased lines between company locations and corporate networks; Internet firewalls, Webhosting and Webpublishing; CENTREX (PBX within the network); Multimedia services via cable TV infrastructure and video conferencing; solutions for governmental entities; data transmission and archives in the medical segment; telephone boxes and Internet cafes; realisation of Germany wide WLAN and medical network solutions; and the Germany wide operation of hot spots (in 2003 ISIS was among the top ten Hot Spot providers in Germany).

Dark fibre is rarely sold to carriers namely only if there is a benefit for the company. Thus, ISIS obviously does not want to sell infrastructural assets viewed as strategic to competitors.

ISIS is part of a loose cooperation of city and regional carriers in Germany called "RegioNet" comprising e.g. NetCologne (Köln), Versatel (Dortmund, including the former tesion active in Baden Württemberg and BerliKomm active in Berlin), HanseNet (Hamburg), EWE TEL (Oldenburg), and M"net (München).

ISIS has about 300 employees (headcount).

3.3 Technical description

ISIS is switching more than 10 mill. minutes daily in its own network.

Only three areas within the license area of ISIS are using ISIS/OPAL technology (equalling 7% of the area). In this case DTAG has deployed fibre to the cabinet which means that DSL protocols are not supported.

ISIS has connected a total of about 30.000 households with own FTTC solutions in its area. ADSL 2+ tests are underway. However, according to ISIS for the time being there will be no acceptance in the market for this service. The reason is that no greater bandwidths beyond those which are provided today are needed in the mass market in a short and medium term. This situation will only change with the appearance of (bandwidth demanding) applications. Of course this assessment does not hold regarding business customers.

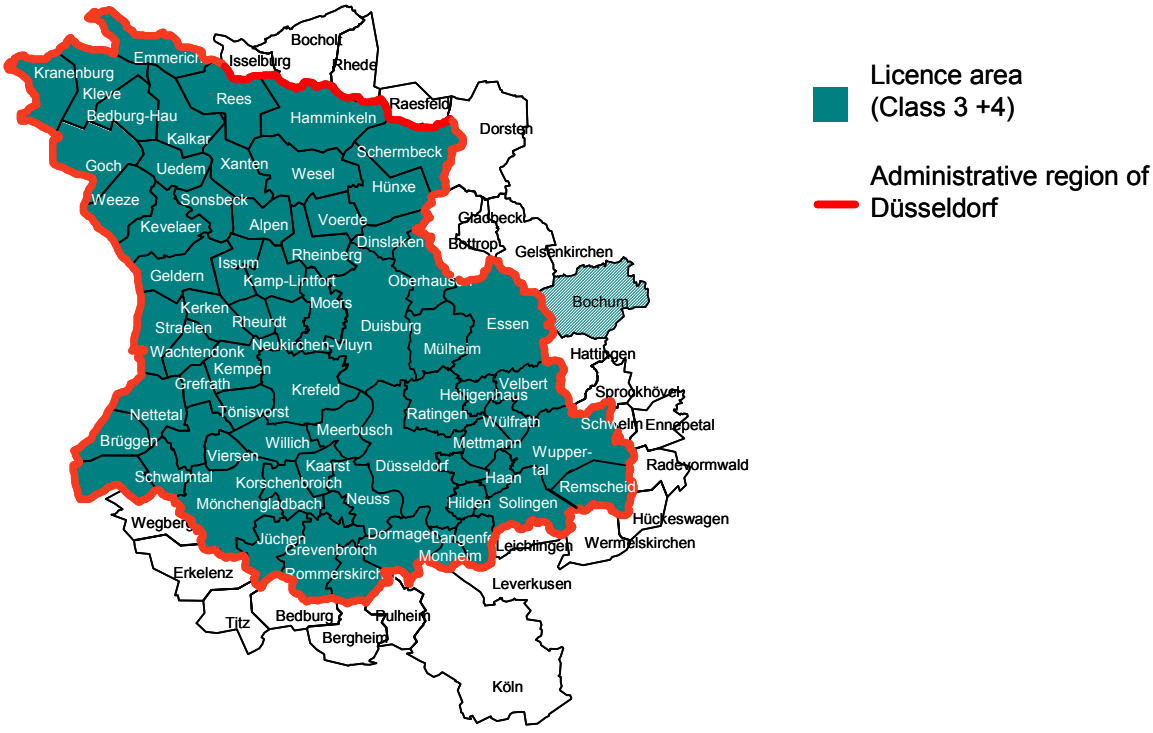
ISIS views Wimax as a potential interim solution to FTTH. However, no activities in this regard have been launched so far.

The city network in Düsseldorf and the regional fibre network encompasses about 1.300 route km backbone equalling around 170.000 fibre km.

Regarding network deployment ISIS is allowed to use ducts from (the utility) Stadtwerke Düsseldorf, but also from Rheinbahn Düsseldorf and ducts owned by the city of Düsseldorf. ISIS is digging own ducts to connect all this. For connections between cities ISIS is using also fibres from Arcor along the railways. Moreover, the former o.tel.o, meanwhile acquired by Arcor, had exclusive rights from its former shareholder RWE (the multi utility conglomerate) for using the fibre RWE had deployed along the earth lines of the highest and high voltage lines, respectively. These rights were carried over to Arcor and ISIS is also using these lines today owned by Arcor.

The following map shows the administrative region of Regierungsbezirk Düsseldorf where ISIS was also holding a class 3 and 4 licence (for transmission lines and voice telephony, respectively) required under the terms of the old Telecommunications Act.

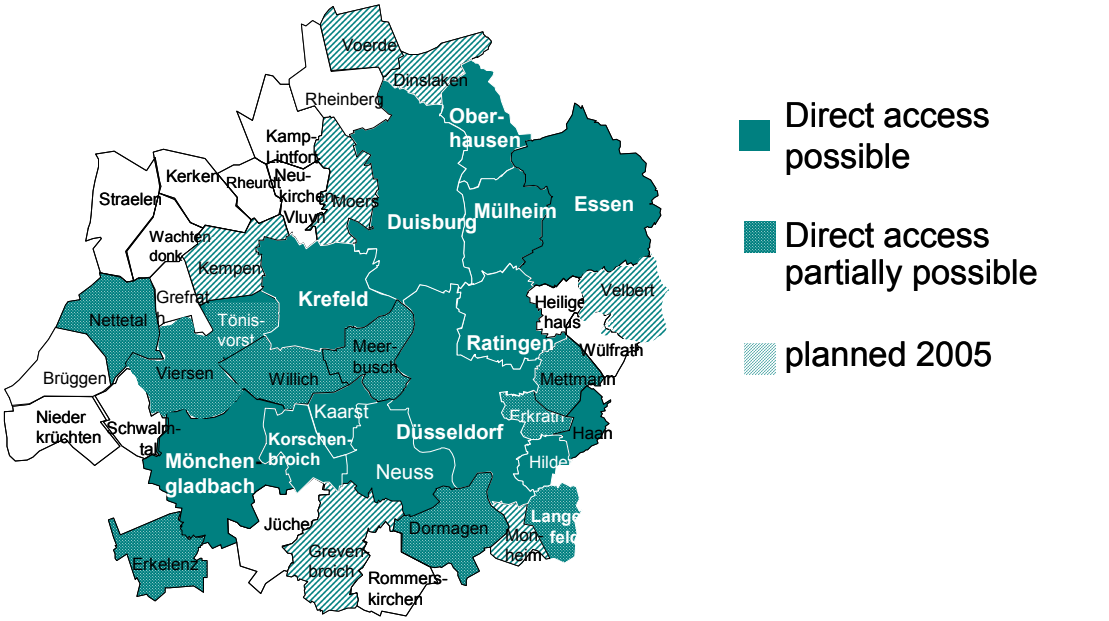
Figure 3-1: ISIS licence area



Source: Company Presentation ISIS

The next figure shows the areas in the Regierungsbezirk Düsseldorf where ISIS has deployed already own infrastructure and where it is planning to deploy additional infrastructure.

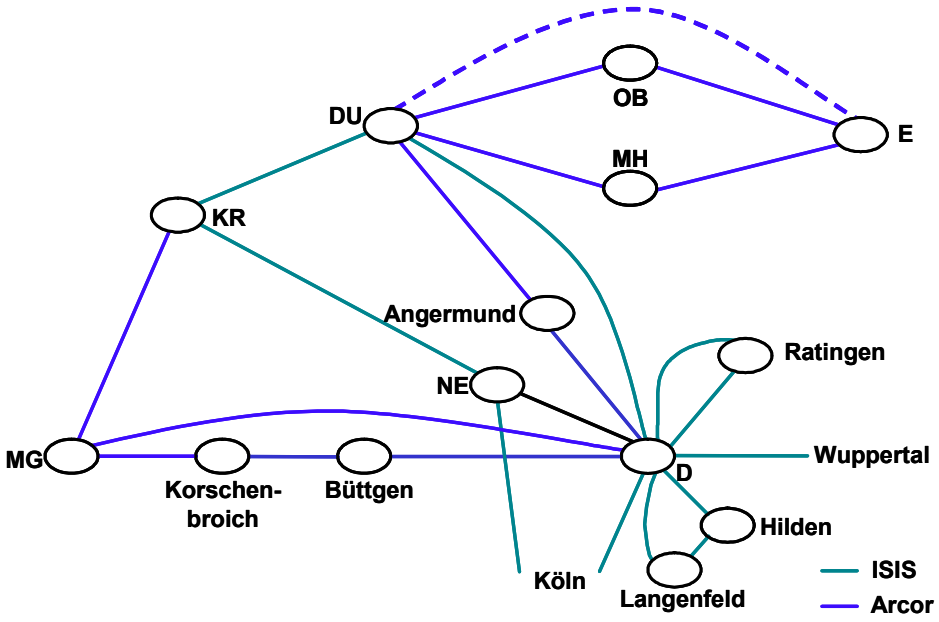
Figure 3-2: Plan of network expansion until the end of FY 04/05



Source: Company Presentation ISIS

The next figure highlights the connections between cities in the area ISIS is covering where ISIS uses own infrastructure and Arcor fibres, respectively.

Figure 3-3: ISIS city connections



Source: Company Presentation ISIS

Over time the network roll out will migrate to cover the complete area. This roll out process can be characterized by the following stages:

- Switched infrastructure and some leased lines; some direct fibre access links to large business customers
- Leased lines and fibre to collocation areas, more direct fibre access links
- More direct fibre access links, FTTC solutions, substitution of leased lines
- New fibre based products (e.g. CATV, Ethernet Links, ...) enlarge Fiber Density, more FTTC solutions and
- Some 10 years later ... FTTH everywhere.

3.4 Financial description

ISIS has invested more than 10 mill. EUR regarding deployment of broadband infrastructure and facilities in the business year 2004/05 (end of March).

ISIS has a share capital of 26 Mio. Euro.

The funds of ISIS were always and exclusively private, i.e. no public funds were used. Regarding use of EU funds ISIS has discussed to apply for these funds regarding their activities along the Dutch border (thinly populated and rural area). However, they have come to the conclusion that the requirement to give non discriminating access to competitors is not worth the effort. Thus, the strategy is to trust on own infrastructure and to omit decisions allowing competitors to keep up.

ISIS had a turnover of 102 mill. EUR in the business year April 2003 to March 2004. Thus, the financial year 2003/2004 was the first time when more than 100 mill. Euro turnover was reached. The threshold value of 50 mill. Euro turnover was reached in 2000. For the year 2004/05 a turnover of 125 mill. EUR is planned. Residential customers account for 50 % of the turnover, the other 50 % are coming from business customers. ISIS is EBITDA positive since 2001. The company had a real profit for the first time in the financial year 2003/2004, i.e. about 10 years after its foundation. ISIS expects a profit of 7 mill. EUR in the current financial year ending March 2005 and it is aiming at reaching a 20 % profit rise in the next financial year.

3.5 Impact of the project

At the end of 2004 ISIS has about 100.000 telephony customers, 50.000 Internet customers and 5.000 cable TV customers. Moreover, ISIS has about 75.000 ADSL customers. The adoption of ADSL is, however, very dynamic and at the end of March 2005 already more than 100.000 ADSL customers are expected.

Altogether, a total of 180 MDFs are connected, 3 of them with leased lines and the remainder with fibre (swaps with other city carriers). Thus, the market position of ISIS and its flexibility to meet new market requirements is based upon its infrastructural assets. Customer access lines which are too long to allow provision of DSL services up until now didn't play a crucial role with ISIS. This might change in the future when MDFs are hooked upon the ISIS network in the more remote areas.

Like several other city carriers in Germany, the most prominent of which is Hansenet in Hamburg with a market share of more than 40 %, ISIS is also a successful broadband player on its home turf. The market share of ISIS is varying between 0,5% to 16% across the MDFs connected.

ISIS is in particular engaged in supporting an e-school initiative in the cities of Düsseldorf and Duisburg.

Summing up, having in mind that until 1998 there was still a far reaching (quasi) monopoly status of DTAG with respect both to infrastructure and service provision it is fair to state that ten years after its launch ISIS has become a vital competitor in its regional market.

4 Presentation of the 3T project

4.1 Background and motivations of public action

3T Telekommunikationsgesellschaft mbH has been founded in August1996 as a unique subsidiary of the public utility Energieversorgung Offenbach (EVO). The share capital at that time was 1 mill. DM (i.e. slightly more than 500.000 EUR). In the beginning of 1998 a capital increase took place and additional utilities from cities in the vicinity of Offenbach and a company called TIMe start-up management became shareholders. Thus, EVO had a share of 66 %, the Stadtwerke Dreieich, Langen and Neu-Isenburg each accounted for a share of 8 % and TIMe had a share of 10 %. In December 2001 TIMe start-up management, at that time already owned by the Finnish Elisa, has sold its share to the remaining shareholders. In March 2002 another capital increase took place: the share capital since then is equal to 1.662 mill. EUR. EVO owns a share of 73 % and the Stadtwerke Dreieich, Langen and Neu-Isenburg each account for a share of 9 %.

When 3T was established the network mainly consisted of the communications network infrastructure of the parent company EVO, i.e. the network was concentrated on locations of and connections between power stations. Thus, the origin of 3T is more or less the same as with many other city carriers in Germany. Utilities (Stadtwerke) had deployed a copper or fibre optic network already long before liberalisation of the telecommunications market for own purposes. These network facilities were used mainly for supervising and steering of own technical equipment. When the telecommunications market was deregulated there was an incentive to use this network also for providing services to outside customers.

Contrary to many other utilities in Germany who have sold their shares in their communications subsidiaries the shareholders of 3T up until now haven't discussed any plans to sell the company. The main reason is presumably that 3T is profitable. Moreover, even if there were plans to sell expectations regarding the sale price level might be too high to be met by a potential investor. Yet, one should keep in mind that currently discussions about reorganisations and mergers of many utilities in the region are underway where in particular EVO is involved.

4.2 Key figures and features of the business model

The geographical focus of 3T is on the city and the county of Offenbach; see more details in chapter 4.3. This area encompasses a population of 460.000 (of which about 120.000 are living in Offenbach).

According to 3T their main objectives, viewed as the separate communications subsidiary of their parent companies, are (1) the marketing of the resources of all shareholders for telecommunications purposes, (2) the realisation of economically durable results with highest possible interest rate for shareholders, (3) the extensive customer retention through enhancement of the shareholder's product portfolios and (4) the expansion of telecommunication infrastructure as contribution for the promotion of the economy of towns and communities in the 3T region.

The area in which 3T is active mainly consists of the city of Offenbach, the Frankfurt/Main Airport and specific lines extending to Rheinland Pfalz and Baden Württemberg, see chapter 4.3. Since 2003 all of the business areas in the city and the county (Landkreis) of Offenbach have access to the 3T network.

Regarding the customer focus 3T is concentrating on business customers and telecommunications carriers. The target group consists of banks, governmental entities, and companies. Thus, 3T follows a clear strategy of not providing services to the residential segment. According to 3T this decision is mainly due to the expectation that there is no sufficient scale effect in the region where 3T is active. Otherwise stated, there are highly competitive areas in the Frankfurt region with many competitors where margins are very narrow. In suburban and rural areas a priori there might be a chance for a competitor like 3T to get into the residential market, however, the residential market requires specific sales forces and this would be to the detriment of the currently very slim structure of 3T.

3T has about 100 customers whereof about 60 % are carriers and the remaining 40 % are direct customers. Reference customers are e.g. Pepsi Cola and Dorint Hotel Neu Isenburg.

In the beginning the business model of 3T was mainly based on selling leased lines. One of the main comparative advantages of a city carrier like 3T compared e.g. to a national or supra-national carrier is that these small entities do know and understand much better the communications needs of customers on their home turf. Thus, 3T has established a specific division of labour with pan-European carriers like COLT. 3T was aware of potential customers for communications services and solutions and had to convince the pan-European carrier of the market opportunities. The carrier then bought leased lines from 3T.

Today, the product portfolio of 3T has been expanded and comprises mainly telehousing, selling of bandwidth within the area covered by the network in the Rhein-Main-Neckar region (see chapter 4.3), selling of bandwidth outside the area covered by the network (by purchases from other carriers), selling of bandwidth to and from Frankfurt/Main Airport, and consulting. Otherwise stated, 3T is *not* active in the fields of Internet, cable TV and telephony. Regarding telephony 3T only acts as a reseller. Moreover, 3T never has done and will do any infrastructure swaps with other carriers.

3T markets leased lines from 2 Mbit/s to 155 Mbit/s (on request also with higher speeds) and the respective monitoring services.

3T has also deployed FTTx solutions for specific customers (e.g. in Neu Isenberg there are 40 FTTx access lines for 60 customers).

The telecommunications network infrastructure 3T is using is today still to a large extent deployed by the utilities, i.e. the parent companies of 3T. 3T, in turn, rents this infrastructure from the parent companies under an exclusive arrangement; for more details see chapter 4.4. 3T is responsible for network operation etc.

3T is cooperating with rmn, a trunk network operator for several city carriers in the Rhein-Main region, see chapter 2.

Currently 3T is about to evolve from an infrastructure carrier to a value added carrier. Still 3T will primarily use its own resources. Yet, they will also use value added products of their subcontractors. The use of subcontractors ensures a wider spectrum of products especially those for which 3T does not have the necessary market scale. Products in this context encompass IT applications, intelligent telecommunications solutions and specific transmission services. In addition, 3T will focus more and more on advising customers regarding system solutions and applications which are logically connected to telecommunications. In this regard, 3T is acting both as a consultant and similar to a system house based on telecommunications.

The changed 3T strategy will in particular lead to focusing on Ethernet as the new network technology (“all services over one datastream”) and to new products related to Ethernet.

4.3 Technical description

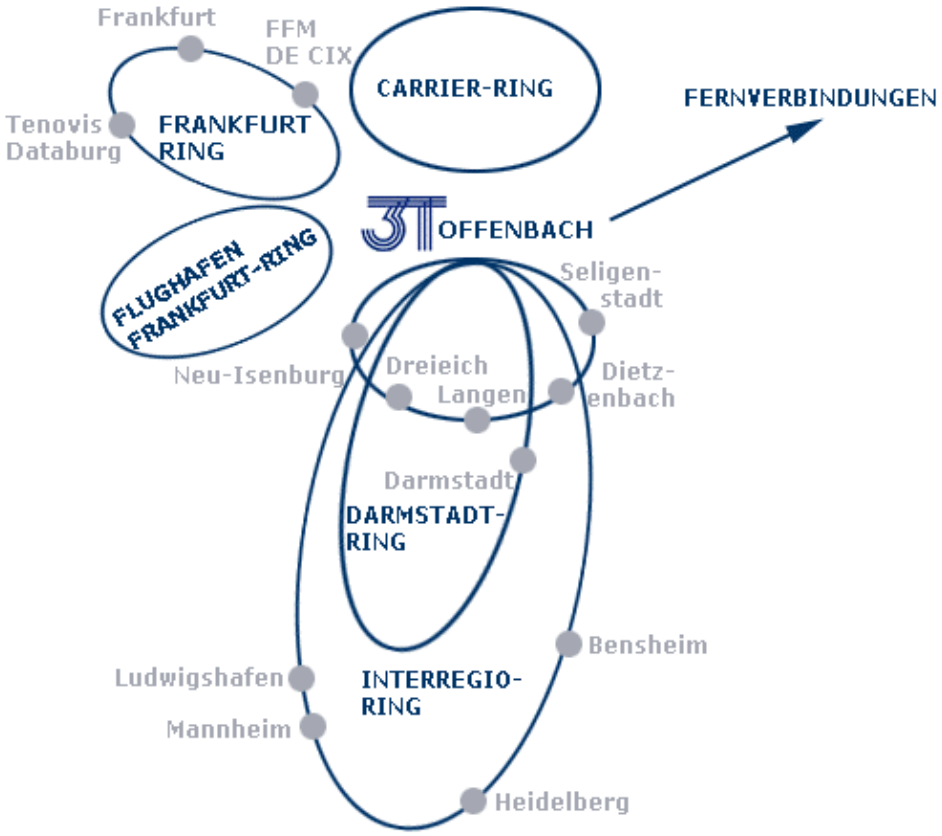
In the beginning the focus of 3T’s activity was on the region Offenbach and Frankfurt/Main Airport. Today, 3T has expanded its reach and owns infrastructure in the Rhein/Main/Neckar region, see below. 3T has a fibre optic network of more than 800 (route) km. The geographic network development was mainly driven by the ability to get new customers. Under the regime of the old Telecommunications Act 3T had originally a class 3 licence for the city and the county (Landkreis) of Offenbach. The licence area was enlarged in 2003 and covers today Hessen, Rheinland-Pfalz, Baden-Württemberg and Bayern, see next figure.

Figure 4-1: Licence Area of 3T

Source: CD-ROM Company Presentation 3T

The next figure visualizes the inter-regional network of 3T in the Rhein-Main-Neckar area.

Figure 4-2: The inter-regional network of 3T (Rhein-Main-Neckar network)

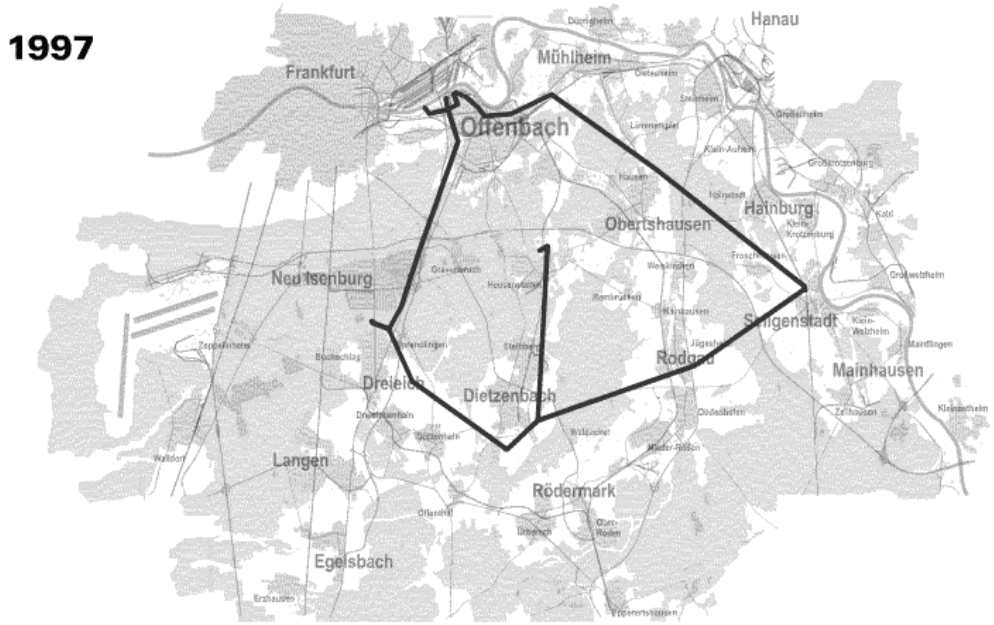


Source: http://www.3t.net/texte/netz/netz3.php#

Obviously, there are several rings with different geographical coverage. The carrier ring is mainly devoted to voice traffic in Offenbach. The Frankfurt Ring especially yields access to the German public Internet exchange De-CIX. 3T is, however, not listed as an Autonomous System accessing De-CIX. Virtually, the 3T backbone is the ring Offenbach, Seligenstadt, Dietzenbach, Langen, Dreieich, and Neu-Isenburg. The two other rings (Darmstadt ring and Interregio ring) are mainly connecting the 3T network with the cities of Darmstadt, Bensheim, Heidelberg, Mannheim, and Ludwigshafen. 3T owns a Telehouse in Offenbach where all of its Rhein-Main networks come together.

The next two figures are showing the rapid network development of 3T between 1997 and today.

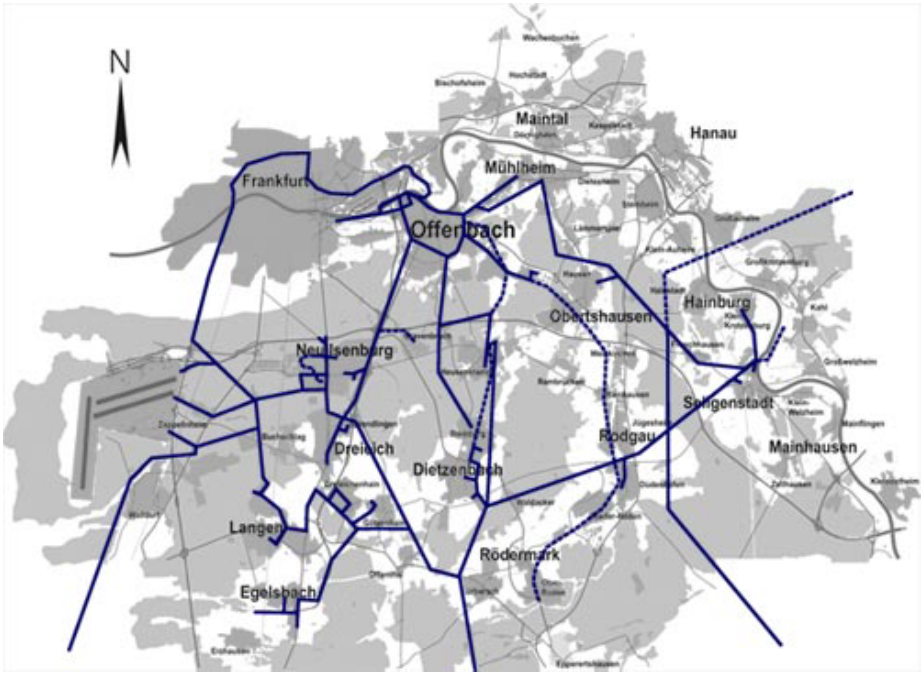
Figure 4-3: 3T Network in the year 1997



wik CONSULT

Source: CD Rom Company Presentation

Figure 4-4: 3T Network in the area Frankfurt Offenbach today



wik CONSULT

Source: http://www.3t.net/texte/netz/netz.php#

3T has one strategic asset compared to other carriers operating in their geographical area. Indeed, a contract with the Frankfurt/Main Airport carrier actually allows to hook upon the network each building on the airport area (in cooperation with the airport carrier). Thus, 3T and DTAG are the only carriers who have direct communications infrastructure access to Frankfurt/Main Airport.

Regarding on the one hand the deployment of infrastructure 3T is using and on the other hand the ownership, i.e. the arrangement who of the players, parent companies or 3T, have the assets on their balance sheet, there are basically 3 levels to be distinguished:

- Fibre backbone infrastructure (the ring infrastructure); in this case the owner is the parent company and the agreement of 3T with its parent company is that 25 % of the network fibre km have to be rented by 3T.

- Basic network ("Grundnetz"), i.e. the main network within towns and cities along the roads; this infrastructure is not only deployed by the parent company for 3T but also for its own purposes. 3T has 50 % of these assets on its balance sheet. Moreover, the agreement with the parent company is that 3T has to pay back the entire infrastructure over a time period of 10 years. In recent years 3T has begun to deploy Grundnetze also on its own, i.e. in areas where the parent companies are not deploying infrastructure.

- Access network, i.e. the links giving access to the Grundnetz; in this case 100 % of the assets are on the balance sheet of 3T.

If 3T is renting infrastructure from its parent companies, i.e. if the assets are (at least partly) in the balance sheet of the parent company, this relates to dark fibre. Lit facilities are always contained in the balance sheet of 3T.

3T has connections to all of the MDFs in the geographical area, where it is mainly active.

4.4 Financial description

The annual investment volume of 3T in recent years amounts to 1.5 mill. to 2 mill. EUR. Virtually, all of the investments are related to broadband. Thus, comparing the three city carriers taken account of in this study, 3T is by far the smallest one.

All investments 3T has made up until today were not supported by public funds.

Compared to the big city and regional carriers in Germany like NetCologne (Cologne), Hansenet (Hamburg), ISIS (Düsseldorf) and EweTel (Oldenburg) who have annual revenues above 100 mill EUR the revenues of 3T are significantly lower. Indeed, they

are between 5 and 10 mill. EUR. Comparing (March) 2004 and (February) 2003 figures 3T exhibits a growth rate of 18 % regarding revenues after tax, of 11% regarding operating income, of 2 % regarding net income, and of 75 % regarding EBT. 3T is profitable. According to estimates of 3T they are probably one of the most profitable city carriers in Germany with respect to revenue margin.

3T is estimating its market share at 10-20 % with respect to total turnover with business customers in the geographical area they are covering.

4.5 Impact of the project

3T has positioned itself as an infrastructure carrier in the Rhein-Main-Neckar area with a specific geographical focus on Offenbach and the Frankfurt/Main airport.

Moreover, the business model is that 3T acts as a neutral consulting firm advising end customers about services and solutions of other carriers which deliver their services and solutions via 3T's network. Thus, 3T is not acting in the end user business.

The market presence of 3T has a considerable effect regarding availability of modern broadband infrastructure in its service area. Indeed, according to information of 3T DTAG has but exclusively a copper network in the area and no fibre infrastructure. Overall, 3T estimates its share of fibre infrastructure at around 90 % in the area where it is active. Thus, carriers and business customers alike have benefited from 3T's market activity.

Availability of an appropriate communications infrastructure can be seen as one of the factors that made the area where 3T is active more competitive in comparison to other areas adjacent to Frankfurt (e.g. Eschborn in the North-East of Frankfurt).

The example of 3T proves that city carriers with a specific geographical focus and a business model meeting the needs of the market can have positive effects on the development in economically under developed regional areas. Albeit small they may have one strategic asset: knowing their customers very well and being in close cooperation with local governments regarding future plans for new industrial and housing zones enabling them to start deployment activities relatively early.