English summary

Broadband for nationwide growth - summary

At a Government meeting on 23rd July 1998 it was resolved to appoint a Commission to investigate the need for information and communications technology infrastructure (Dir. 1998:61, see App. 1). The Commission was to investigate the accessibility of advanced information and communications technology infrastructure in a regional and social perspective. In addition, technical development tendencies and needs were to be analysed. The Investigator was to present proposals on ways in which the State, acting in partnership with enterprise and telecommunications operators, should achieve good regional and social coverage of the infrastructure.

County Council Director Jan Grönlund was appointed to serve as Special Investigator. The Commission has chosen to style itself the IT Infrastructure Commission. Its report was submitted to the Minister of Industry on 11th June 1999.

The following is a summary of the report, starting with Part B, Chapters 7–13, which contain descriptions and an analysis. This is followed by a summary of Part A, Chapters 2–6, containing deliberations and proposals.

Part B Description and analysis

The technical outlook (from Chap. 7)

The Commission presupposes a subdivision of the infrastructure into a number of different levels.

– Uppermost comes the "applications level", comprising the user’s hardware and necessary software and data.

- Below this level comes what is called the IP level, containing programs – "protocols" – which make possible communication between different users' equipment.
- Below the IP level comes equipment giving the transmission network a certain transmission capacity.
- The line, with no equipment, is the next level.
- Installation of the line, lastly, requires canalisation, i.e. empty pipes below ground or masts, i.e. the lowest level.

The focus of the inquiry is on the two lowest levels, namely the line and canalisation levels.

The term "broadband" is defined for the purposes of this inquiry as a transmission capacity of at least 2 Megabits per second (Mbit/s) in both directions in relation to the user. It is critically important whether the network nearest the subscriber, known as the access network, has this capacity, because this capacity decides whether certain services can be used, e.g. good-quality image transmission or several simultaneous users.

One conclusion drawn from the review of technology is that most of the forms of access evaluated do not attain the broadband level defined by the Commission, but it is unclear which will be the dominant access method or methods in future.

Regulatory system and national authorities (from Chap. 8)

Sweden's regulatory system is geared to the EU's, the basic concern of which is with facilitating greater competition on existing networks and avoiding the introduction of barriers to competition. At the same time, some of the Nordic countries, Sweden among them, have a distinctive geographic character, with far larger sparsely populated areas than the other EU countries. The question is how these large, sparsely populated areas are to be provided with broadband structure within the framework of EU Directives and Swedish law.

Description of the IT infrastructure (from Chap. 9)

On the one hand, the present-day line network, especially at backbone network level, is considered highly comprehensive. The IT infrastructure has inherited a large network from the expansion and modernisation in recent years of the telephony network, the cable television network, optic fibre networks under the auspices of Svenska Kraftnät and the National

Rail Administration, municipal urban networks and the ongoing expansion of the ground-transmitted digital television network. On the other hand, the need for broadband services and other new and expanded services calls for networks with greater capacity than the present-day infrastructure is capable of offering. There are commercial and institutional impediments which restrain competition and network utilisation. This deficiency is particularly noticeable in the access network, i.e. the part of the network nearest the end customer.

With co-ordinated use of all providers' networks, we would to a great extent already today have good access to transmission capacity. Less expansion would be needed if the existing infrastructure could be used more efficiently.

This conclusion, however, does not hold good for regional distribution. Surveys of present-day networks have shown the market forces consistently giving priority to densely populated parts of Sweden with an estimated 70 per cent or less of the national population. A new backbone network reaching the central locality of every municipality in Sweden does not appear commercially justifiable, and still less so a new access network reaching all households and enterprises.

The debate on IT infrastructure (from Chaps. 10 and 11)

Up till now the debate on infrastructure has to a great extent reflected telecommunications as primarily a concern of the dominant, State-owned Telia corporation. Not until recently have questions of IT infrastructure found their way onto the political agenda. Most party political spokesmen endorse the aim of "accessibility to all", but some argue that this can for the most part be accomplished by the market, possibly with a measure of support in sparsely populated rural areas, while others want to see large-scale public involvement in the process of network expansion. Another point of discussion concerns the need for a co-ordination of existing State networks, symbolised by the concept of a National Superhighway Administration. The role of local authorities is also under discussion. Critics maintain that many municipalities and municipal companies have become excessively involved in network expansion and above all in the production of communication services on the networks.

The need for broadband services (from Chap. 12)

Three groups of users have been defined by the Commission in order to illustrate needs for access to broadband services, namely households, businesses and schools. The expansion of IT in schools and the commitments made by the State and municipalities on this point are progressively highlighting the issue of school network capacity. The need of large corporations for broadband capacity is often provided for today by their renting high-capacity leased lines or using a provider's communication service. The same is very much true of national authorities. The need of small businesses for broadband capacity in the access network is more limited but is likely to increase before long, parallel to the use of various applications. Small IT enterprises, on the other hand, may be greatly in need of broadband. Households at present have no demand worth mentioning where broadband services are concerned. Examples are given of a number of broadband services capable of simplifying the daily lives of persons with functional impairment.

Studies are quoted which illuminate the value to the national economy of investments in IT infrastructure. It is observed that IT infrastructure, generally speaking, does not of itself stimulate regional development but has to be combined with the whole fabric of educational, industrial and infrastructural policies in order to boost economic growth.

A specimen calculation by a consultant shows the volume of data resulting from a heavy capacity increase, above all on the access network. Assuming that the trend is above all in favour of a growth of capacity on existing telecommunications networks, total data communication in Sweden will have multiplied 20 times over within three years, while the availability of access networks with broadband capacity will cause this communication to become 200 times greater, and within six years 100 and 1,000 times greater respectively. The regions favoured by an expansion of broadband capacity on the access network, therefore, will soon have a considerable lead on regions which are not favoured in this way. The first mentioned (a 20-fold increase within three years) agrees well with the previously known fact of Internet traffic in Sweden doubling every nine months.

Expansion alternatives (from Chap. 13)

Transport network investments in Sweden are now running at between MSEK 1,000 and 2,000 annually. The Commission has tried to convey a picture of the investment costs which various types of expansion would

entail. Nationwide ISDN and ADSL expansion would cost, respectively, about MSEK 7,000 and MSEK 20,000–30,000. These alternatives represent developments of the existing telephony network .

An alternative broadband network, based on optic fibre and reaching all property units in Sweden, would cost between MSEK 55,000 and 60,000 without equipment on the network and between MSEK 66,000 and 82,000 with transmission equipment (but not users' equipment) included. Since the cable television network and a future mobile telephone network with far greater capacity will conceivably provide full coverage of urban communities, it is interesting to note that a network covering rural areas only, rural areas being defined as the area outside municipal central localities, containing 35 per cent of the national population, would cost between MSEK 40,000 and 45,000 exclusive of equipment.

Part A Deliberations and proposals

General deliberations (from Chap. 2)

One of the main questions addressed in the chapters on deliberations is whether the emphasis of future development is to be on the public sector or on the market. Economic analysis has shown that, even in a mature telecommunications market, effective competition is hard to achieve, due to the strong mutual connections arising through the networks.

Another balance to be considered is whether competition should be aimed for between large, network-owning providers or whether competition can be separately achieved at every technical level, i.e. canalisation, line, transmission network, IP network and applications. Effective competition according to this latter model presupposes, at least in more thinly populated areas, that canalisation and lines can be pooled or alternatively provided on a true-cost basis by a public owner. Commercial profitability can otherwise be hard to achieve, because the investment cost, divided between a limited number of subscribers, would be prohibitive. The respective roles of the State and the municipality as provider of such infrastructure is discussed.

Reference is made to the necessity of the State maintaining neutrality between technical solutions. This means choosing the best technology in each individual case, e.g. in connection with procurement.

Lastly a description is given of the balance between allowing the market forces to govern regional allocation and society encouraging

competition, especially in priority regions of Sweden, but at the price of this, in certain parts of the country, perhaps meaning over-investment in lines, compared with the needs of the immediate future, though at fairly negligible extra cost.

Choices between main thrusts and proposals (from Chaps. 3–4)

Conceivable proposals have been grouped under a competition strategy, an investment strategy and a demand strategy. These main strategies are compared with each other and also with a zero option, i.e. that of doing nothing at all. General measures are also described which ought to be taken whatever the general direction of policy. These include, for example, the establishment of a central official function for the purpose, among other things, of co-ordinating measures in this field which are at present being based on fragmented resources from several different quarters.

The legal feasibility of encouraging canalisation and its pooling is analysed. Special interest has been taken in this field because the Commission has found that most of Sweden's municipalities already have empty pipes below ground which could be used by other network proprietors. There are EC Directives laying down that pipes of this kind shall be available for pooling. An arrangement of this kind is also supported by Swedish law, but the possibility is not being utilised at present, perhaps on account of legal difficulties. Furthermore, it should be economically advantageous to encourage network proprietors and others laying down pipes to also lay down, at little extra cost, empty pipes for future use.

Proposals (from Chap. 5)

Vision and objectives

An efficient IT infrastructure for broadband communication is essential in order for Sweden to retain its leading role as an IT nation. The IT infrastructure is of consequence to all sectors of society: to enterprise and growth, as a means of equalising living conditions between individuals and between different parts of the country, to households, to the education system and to many other fields.

The aim is for the IT infrastructure (line and canalisation) for high-speed communication to have good coverage and to be open, i.e.

available to all providers, preferably at cost-based prices everywhere in the country, for the sake of competition and diversity, which in turn are important for the development of both infrastructure and services. Direct State inputs in defined areas shall further this aim.

Legislation and national measures of regional policy shall contribute towards the achievement of nationally effective competition, also in the more sparsely populated parts of Sweden. The aim is for access to broadband to be as good in the more sparsely populated areas of both southern and northern Sweden, which have about 30 per cent of the national population, as in the commercially profitable parts, and at roughly the same prices. Expansion of the broadband communication infrastructure shall be driven by needs and demand.

The following points are proposed for inclusion in a policy on IT infrastructure:

- Sweden shall have the world's best IT infrastructure, so as to achieve more growth everywhere in the country and better international competitive capacity.
- Good access to lines and canalisation, open to all providers, preferably at cost-based prices, shall encourage competition in the telecommunications sector and lead to low prices for the end user.
- The State shall encourage a horizontal market structure, so that competition will exist at most of the different stages of upgrading, as a counterpoise to the strong influence exerted by vertically integrated providers.
- The State shall have preparedness for a heavy future growth of broadband needs and the volume of broadband traffic.
- Security questions of different kinds must be taken into consideration, especially in connection with the build-up of new networks with many owners and providers.
- The IT infrastructure shall have a high level of regional coverage. This should apply to households as well as to businesses and public authorities.
- It should be made possible for financially disadvantaged groups among households to utilise broadband technology, partly because this can offer unique possibilities of improving the living conditions of persons with functional impairment and of older persons.

Proposed expansion programme

The expansion programme proposed is a reform programme with a number of starting points to facilitate many and vigorous smaller steps towards the vision, which means the State assuming special responsibility for the availability of broadband communication in the sparsely populated areas of Sweden. To guide this process, principles are needed concerning the allocation of responsibilities between State, municipality and market and the financing of regional policy initiatives. Measures are further proposed for the general promotion of competition, e.g. to help bring down prices and encourage development. I also wish to point to the importance of observing the need for competence.

- The State draws up a national structural programme for broadband lines. That programme shall indicate the objectives, focus and geographical and logical principles of a broadband network. This task will be entrusted either to a governmental investigator or to a national authority. Among other things the plan should include proposals concerning internodal points between backbone network and local networks.
- Deliberations are opened with the Swedish Association of Local Authorities and the Federation of Swedish County Councils, concerning a voluntary undertaking by municipalities and county councils to draw up programmes for providing broadband lines within their boundaries.
- The State takes the initiative in co-ordinating the municipalities prior to the construction of a backbone network with an open broadband line, so as to ensure that the principal localities of all municipalities are interlinked with each other and with the outside world, e.g. by means of a line to Öresund.
- A national authority function is established, e.g. within the National Post and Telecom Agency (PTS), with technical, legal, economic and industrial expertise on broadband infrastructure.
- The Government declares that regional support, rural support included, shall also cover necessary expenditure on investments in IT infrastructure for enterprise (housing utilities included) in the aid area and in sparsely populated areas of Sweden. This shall be conditional on the access network being connectable to a universally available broadband network via a connecting point within the municipality, on the network agreeing with the national and municipal structural programmes, and on capacity being substantially augmented. The range of uses under the Regional Enterprise Support Ordinance

should be enlarged so as also to include IT infrastructure investment costs.
- Parts of the network which have many users, but not enough for commercial financing, can be difficult to finance with enterprise support. Network expansion procurement justified on grounds of regional policy can be effected by PTS, under the Telecommunications Act and subject to an amendment of PTS's standing instructions.
- The State, the Swedish Association of Local Authorities and the Federation of Swedish County Councils compile full documentation concerning the public sector's need of services requiring broadband capacity on the network.
- Incentives are created for owners of land suitable for canalisation and proprietors of utility easements, rights of way etc. to promote canalisation. Primarily this should be achieved through a grant encouraging municipalities, telecommunications operators and other proprietors of utility easements to achieve open canalisation (e.g. in the form of empty pipes) for future use, simultaneously with excavation for other reasons. One prerequisite is the existence of a municipal structural programme with which the canalisation agrees. The support shall be combined with a duty to also grant canalisation to others wishing to install lines. Statutory provision to this effect can be made in the Telecommunications Act. More detailed rules should be issued in the form of an Ordinance.
- An introductory action programme for expansion is drawn up by the Government; a programme of this kind has been proposed by the Commission.

Competence

- The State makes an overall assessment of the IP technology (Internet technology) training needed, e.g. at post-secondary level.

Other measures to promote competition

- The Telecommunications Act is amended in such a way as to give clearer priority than at present to the role of the State in promoting competition, and also so as to make Telia's access network available at line level at cost-based prices (local loop unbundling) and so as to facilitate the pooling of radio and telecommunications masts.

- The Planning and Building Act is amended to promote the expansion of broadband networks.
- The access network part of Telia is converted into a separate company within the amalgamated group, to facilitate analysis of network costs and to avoid discrimination of outside competitors. This can be accomplished through a State owner's directive to the Swedish part of Telia.
- Means of avoiding a future monopolisation of local networks should be investigated.
- To improve the supply of open IT infrastructure, a State marketing company, "SweNet AB", is set up and permitted to utilise the lines and canalisation of Svenska Kraftnät and, if possible, of the National Rail Administration, but also, for example, those of the National Road Administration and the Vattenfall Companies. SweNet shall not act in a provider capacity.
- Svenska Kraftnät's standing instructions are amended so that its resources can be more actively used for the creation of broadband lines. The standing instructions of the National Rail Administration may also be in need of amendment to this end, as may be the articles of association of the Vattenfall Companies.
- The need of a bandwidth exchange for trading in excess capacity on broadband lines should be investigated.

Finance

- Part of the sales revenues resulting from the partial privatisation of Telia are transferred to a fund to finance the above mentioned investments in broadband lines and canalisation, i.e. State guaranteed loans for investments in commercially unprofitable parts, compensatory payments in connection with procurement, and the subsidised network investments for the benefit of businesses and persons with functional impairment.

Consequences (from Chap. 6)

The State inputs proposed have been estimated to involve an investment cost of about MSEK 12,000, spread out over a number of years, e.g. a five-year period. This is far less than the total investment cost of some MSEK 57,000 for a passive network or MSEK 66,000 for networks inclusive of equipment on the network, as calculated above for

nationwide coverage. In what way can the MSEK 12,000 be expected to contribute towards achieving the accessibility target?

Firstly, the State supportive inputs are mainly concentrated on what has previously been termed the most sparsely populated part of Sweden, comprising about 30 per cent of the national population. This part of the country, however, accounts for a larger share, some MSEK 40,000, of the MSEK 57,000, the reason being that the most sparsely populated areas also have the longest distances and, accordingly, a far higher cost per subscriber.

The cost of line installation can be substantially reduced if canalisation exists already. Here a reduction of as much as 50 per cent, i.e. MSEK 20,000, is assumed. If we assume that businesses provide half the MSEK 20,000, this would result in a remanining State cost of MSEK 10,000 on business support and procurement and MSEK 5,000 on canalisation support, making MSEK 15,000 altogether. The municipalities cannot be expected to reduce this expenditure to any significant extent.

The Commission´s proposed support budget has been put at some MSEK 12,000, the State contribution having been pitched as low as possible. The specimen calculation shows that this contribution is not certain to cover literally the whole of the sparsely populated countryside. To begin with at least, support for the more thinly populated areas should be concentrated on the central localities, where large numbers of people can be reached at relatively little cost per subscriber, e.g. the second., third and fourth localities of the municipalities concerned.

The chapter of consequences, finally, presents a number of general aspects of regional policy, market aspects, equal opportunities policy, crime prevention and national contingency preparedness relating to the proposals.

Översättning: Roger Tanner, Ordväxlingen AB