A Brief Insight into Rwandan Telecommunications

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A BRIEF INSIGHT INTO RWANDAN TELECOMMUNICATIONS

I. THE PAST

A. 1. Geography

Rwanda, whose Capital is Kigali is 26.338 Km² big. It's located under the Sahara slighly the Equator. It's surrounded with Zaïre, Burundi, Tanzania and Uganda. It's a mountainous country with an altitude of 1750 meters with respect to the sea level. Rwanda is center of the African Continent at 1700 Km far from the Indian Ocean and at 2000 Km far from the Atlantic Ocean. The overage annual temperature is 18°. Rwanda is a great Lake Country : Lake Kivu to the West, lake Tanganyika to the South and Lake Victoria to the North-East.

2. Population

Rwanda is peopled with 8,000,000 inhabitants whose majority is under 18 years of age. Three ethnies live in Rwanda.

- The Bahutu, pertaining to the majority, are 85 %,
- The Batutsi, are 14 %,
- The Batwa are 1 %

3. Economy

The gross national product is US$ 300. Rwanda is a developping country. Beside coffee whic is the main source of hard currency, the economy of the country relies on tea and such ares as tin and Wolfram. The economy shows an annual budget deficit.

4. Political aspects

Up to 1991 the Rwanda political regime was that of monopartism. However, the country nowadays counts 16 political parties among which 5 are part of the transition governemnt. In about 12 months, the country is heading toward the legislative and presidential elections. The problem which Rwanda has now been facing since october 1 st, 1990 is that of the war caused by the rebels who called themselves RPF INKOTANYI (Rwanda Patriotic Front INKOTANYI). Just as I am writing this the war is still on.

5. Historical insight into in the 20th century : Rwanda

First colonised by Germany since 1986, then Belgium trust territory since 1916, Rwanda got its independance in july 1 st, 1962. The first republic was 11 years long. Then in July 5, 1973 after having deposed President Grégoire Kayibanda, the militaries have now taken the power under the leadership of Major General Juvénal Habyarimana who is still the head of the country, now in the process of multipartism. Within a few months an election will take place and a multiparty goverment is expected to settle full democracy in the Country.

B. The history of telecommunications development

1. The colonial period

It was only in 1924 that the first automobiles appeared in Rwanda crossing the rare roads built two years early. This event was going to enhance the transporting of mail whic used to be the work of messengers having to walk at a medium speed of 6 Km/h. The mail was carried by vehicles and got to their destination on the day of dispatch. Howover, only a few places were available to practice this kind of telecommunication on account of the searcity of the roads.

By 1930 the first wireless telegraphy station was settled in Rwanda, linking Kigali, Capital of Rwanda to Bujumbura, Capital of Burundi. This station served essentially for the forwarding of the official correspondances. Within the next 25 years the Chief towns were successively equipped with a similar wireless telegraphy. Each of these stations communicated exclusively with Bujumbura by means of manual transmission and aural reception of the signals of the Morse Code. The liaison Bujumbura-Bukavu (Zaïre) was the only outlet for the traffic to and from Bukavu to Kinshasa before entering the international liaisons.

The Rwanda stations were administratively attached to the regional Direction of Telecommunication in Bukavu, which was in turn under the control of the general direction in Kinshasa.

One cannot therefore say that here was a general rwandan telecommunications network at this period rather there was a branch of the ex-belgian Congo General network.

In 1956, a regional direction proper to Rwanda and Burundi was created in Bujumbura-Kigali; Gisenyi and Butare kept their direct liaison with Bujumbura but the other international stations were connected to Kigali, making then an embryo of a national telecommunications network. The forwarding of the international traffic was enhanced by the openning of the liaison between Bujumbura and Kinshasa.

In addition, the first local telephone networks appeared in Rwanda, these networks were served by small manual telephone exchanges :

- Kigali and Gisenyi in 1956,
- Cyangugu, Nyabisindu and Gitarama in 1958.

It's at this stage of development of it's telecommunications that Rwanda got its national severeignty in july 1st, 1962. During its first year of independence, the Rwanda telecommunications operated within a joint Agency linking Rwanda to Burundi.

At this transition period, an effort as far as telecommunications were concerned was mainly focused on the opening of direct connections, both domestic and international.

2. Between 1962 and 1987

As it can be noticed, the telecommunications have known a drastic development between 1956 and 1962. During this period Rwanda has been not only forwarding its telephone messages directly without being put through Zaïre, but also it acquired new and modern equipment purchased in Holland. (Philips)

II. THE PRESENT

A General Direction of Telecommunications is in charge of the Rwandan telecommunications. This general direction is in turn controled by the Ministry of Transports and telecommunications. The Rwanda telecommunications have so far neither financial autonomy not self-sufficiency. But the World Bank is now sponsoring a program meant to put the national telecommmunications under the control of a limited campany called RWANDATEL.

A proper national legislation relative to telecommunications is still inexistent in Rwanda. One has to refer to the laws and recommandations of both the International Union of Telecommunications (CCITT-IFRB, etc..) and INTELSAT. Those wishing to invest in the field of telecommunications are found to sign a contract with the General Direction of Telecommunications.

The General Direction of Telecommunications is structred as follows :

1. General Direction,
2. Direction of Equipment and Maintenance
3. Direction of exploitation
4. 7 departments

- department of administration an finances
- department of inspection and control
- department of planning and programming
- department of exchanges and cable network
- department of energy and transmission
- department of earth station
- department of data processing.

Each department is divided into sections.

The personnel is 615 agents strong

KIGALI	400 agents
OTHER REGIONS	215 agents

There are four (04) major telecommunications centers :

BUTARE - CYANGUGU- GISENYI- RUHENGERI and 7 local centres :

GITARAMA-NYABISINDU-GIKONGORO-KIBUYE-BYUMBA-RWAMAGANA-KIBUNGO

Each telecommunications major centres is headed by a centre manager who is responsible for the management of the centre; as well, each local centre is under the authority of a local centre manager who controls production and management. You will find herewith a map showing the different centre.

General organisation of the telecommunications network.

The infrastructure of the Rwanda telecommunications network is constists of the following elements :

- telephone switchboard
- telegraph switchboard
- rural telephony
- transmission by microwave links
- earth station
- local networks

As far as the telephony switchboard is concerned, modern telephone exchanges E-10B and E-10S were digital exchanges using the MIC liaisons.

In Kigali, an E-10B telephone exchange operates as :

- international transit centre,
- national transit centre,
- grouping centre,
- manual centre equipment with operators' transmitters.

In the other regions, four (04) E-10S grouping centres were installed in Gisenyi, Butare, Cyangugu and Ruhengeri. Butare centre controls two separated concentrators in Nyabisindu and Gikongoro. These automatic switchboards are digital and up-to-date (they can be used, for example, to link 64 Kbit/s data. They serve 500 to 5000 subcribers. Thanks to Kigali grouping centre with its distant concentrators and to the regional exchanges, 12 majors towns in Rwanda have telephone networks. All the regional telephone exchanges are connected to Kigali centre with interurban lines. The microwave, nurstly digital, are used to support the interurban communications. The Kigali E-10B exchange dispose of transwitters which can manually serve for both regional and international communications.

There are 2 types of international microwave links :

- Ground communication microwaves
- Microwaves forwaded by the eath station.

The ground traffic concerns UGANDA and BURUNDI. Communication with other countries is possible through eath-station and satellite. The international traffic is of less importance as the channels are not enough. The telex network is made up NEDIX exchange (Japan made) in service since 1988.

<u>The existing transmission network (basic network architecture)</u>.

<u>The structure of the network</u>

The basic transmission network in Rwanda has a star-shaped stucture both for analogy and digital liaisons. The central nerve of this star is in Kigali from where the liaisons link Kigali to other important towns.

<u>Description of analog radio microwave links</u>.

The analog microwave (FH, GTE LENKURT) interconnect the following centres, within the 2 GHZ band.

Kigali-Butare
Kigali-Gisenyi
Kigali-Cyangugu

The total length of the liaisons is 290 Kms and the number of the microwave links equals 6.

KIGALI-BUTARE LIAISONS

The Kigali-Butare liaisons are presently used to forward the Kigali international channels to Bujumbura (Burundi). Those channels are planned to be used as emergency ways for communications between Butare and Gisenyi.

The operational technical equipments

1. Telephone national network

Kigali town which was equiped with Philips automatic switchboard (UR 4 SA type) has now acquired an automatic telephone exchange (E-10B) built by ALCATEL (French company) to which 50000 consumers at least can subscribe. The other towns are equipped with E-105 Alcatel exchanges to which 500 consumers can subscribe.

2. The telex network

At the beginning of 1988, the only telex exchange that Rwanda had was in Kigali. It was a TWKN/100 automatic switchboard made by SIEMS Company. It was settled in 1963. This switchboard served the Kigali subscribers and 21 consumers spread over the different regions of the country. As this exchange was old and had reached saturation point, the Rwandan administration decided to replace it. Presently, a japanese autoswitchboard (NEC-NEDIX 510 type) is operational since 1987. its capacity is 200 local channels and 120 international channels. Beside the NEDIX 510, an ELTEX U ALPHA switchboard system was ordered from SAGEM and was installed in 1987. The ELTEX U ALPHA, with the capacity 512 channels will serve for outgoing international traffic and far taxation while the NEC exchange will be serving for private international traffic.

3. Telephone international network

Before the earth station was operational in April 1982, the international traffic was possible thanks to HF Liaisons through Bruxelles, Paris and Frankfurt and since the microwave with Uganda was cut, a HF liaison with Nairobi (Kenya) was opened. Two international liaisons operating through microwave were established to get in contact with Bujumbura and Kampala.

4. Traffic structures

1. Taxation plan

For local communications, charges are regardless of time. Only fixe rate is applied. As far as interurban, communications are concerned, charges, depend on the time used; however still both daily and night tariffs are the same. Presently, the charging proceeds of "3 national, as far as interurban communications are concerned. The charging system consists of a periodicity of 15 seconds. The following figure presents the interurban charging stages as fitted with the technical specifications of the constructor.

National charging stages

STAGE	PERIODICITY IN SECONDS	
	Standard tariff	Reduced tariff
1	60	60
2	30	30
3	15	15
4	12	24

The charges for the international communications depend on both the length of communication and the distance between countries. Communication with certain specific services are not charged. (National and international registrations, the state police force, the fire brigade, derangements).

Tarification and telephone traffic

a) Quality of service

One can notice that the efficiency of the local traffic in Kigali is only 49 %, which is below the performance expected by the general direction of telecommunications (65 %). This efficiency is due, for 74 % to the occupation of the demanded and for 17 % to the no-response of the demanded. As to the interurban calls for Kigali, the weakness of the efficiency rate is due to the place 38 to 48 %, congestions 29 % and to the occupation of the subscribers to be joined in Kigali (19 %).

To solve the problem of the flow of traffic, tariff arangements are planned to incite the subscribers to :

- have their telephone installations adjusted to the importance and type of traffic,
- alter the time of their calls in respect with tariff arrangements,

The international traffic knows a relatively important inefficiency rate.

b) Daily telephone consumption

- 81 % of traffic is consumed during the busiest hours of the day. In particular, 51 % of the traffic is consumed between 7.00 and 12.00 in the morning.

- 30 % of the traffic is consumed during the working hours in the afternoon (14.00 to 17.00). However, between 13.00 and 14.00, the traffic decreases and can only represent 4 % of the whole traffic.
- Only 5 % of the traffic is realised after 20.00.
- On Saturdays, an important traffic exists in the morning. As for Saturdays, an important traffic exists in the morning. As far Suturdays, the telephone traffic is at long intervals.

The average length of communications

The average length of the calls depends on the distance.

Tariff of telephone communications.

Lump tariff for local calls. Local calls constitue nearly 80 % of the communications by the consumers. However, these calls are under-charged as they represent only 13 % of the incomings of the traffic.

The international system

TARIFF RATES	
Periodicity in second	Destinations
2 ------>	Neighbouring countries
1,75 --->	European countries
1,50 --->	European countries, East Africa
1,25 --->	European countries, Africa,America
1 ------>	West Africa, Southern Africa
0,75 --->	Asia, South America

High fares for international calls.

a) The share of the incomings from the international traffic within the gross incomings of the Rwandan telecommunications is like in most african countries, predominant. This reveals the fragile character of the management of this service.

b) The quality of the service is not satisfactory; hense the insatisfied customers and losser in the incomings to the cost of the general direction of telecommunications. The inefficiency of the service is mostly due to business of lines (23 %) non-response and congestions. (12 %)

c) A close study of the present international tariff from and to Rwanda reveals an important asymmetry. It follow then the tendency of having a reverse traffic as the subscribers may prefer to be called from abroad tastead of establishing communication from Rwanda ("Call me back").

A gradual tariff adjustement should the be carried out, considering the diverse contraintes that this field of communication faces : financial stakes, limited channels and reactions of the outstanding customers.

The tariffs of the other important services

1. Telegraph

The use of telegraph has now decreased, as far as international traffic is concerned, due to the increasing practice of telephone and telecopy. The international traffic however brings substantial incomings. Though a tariff adjustment is necessary, it should be noticed that the telegraph remains the only means of telecommunication for most people in this country. A flexible tariff is then recommended.

2. Telex

Telex is a service for which the incomings within the though pretty used, gross budgets are decreasing. However, the international traffic increased in the recent years. It brings about 90 % of the incomings of the traffic. The use of telex may be in the near future in competition with the increasing practice of telecopy.

3. Telecopy

This service is quite new and in full progress. Mostly practised the business class, it is likely to generate an important telephone traffic which should attract great interest.

4. In a landlocked country like Rwanda, telecommunications services play a crucial role because they allow openess to the external world. The gouvernment have been focusing their effort in this field. They mainly consist of openning the country to the neighbouring countries. (OBK Programm) and the rural zones (Rural Telephony Programm). To achieve these programm, the gouvernment appeals to their own investments, donations bilateral and multilateral borrowings which allowed to build a network of modern and trestworthy telecommunications securing thus regional and international openess of the country.

The development of telecommunications could have known a bigger pace, had it not been the war caused by the rebels from Uganda. Indeed, the situation is presently suchthat the investing budget cannot but serve the requirements the war.

The role of penetration of the basic services of telecommunications is calculated in the number of the customers or the number of the lines in operation.

Account of March 31, 1992

E-105 Grouping Centre

Grouping Centre	Satellite centre	Initial capacity			Number of lines in operation
		Ordinary sub-scribers	Distingui sted sub-scribers	Telex subsc-ribers	
BUTARE	Gikongoro Nyabisindu	785 224 224	16 8 8	4 4 4	687 182 221
CYANGUGU	-	480	16	-	325
RUHENGERI	-	592	16	4	548
GISENYI	-	592	16		601

Kigali Grouping Centre

Satellite centre	Installed capacity	Number of lines in operation	Observations
RWAMAGANA KIBUYE KIBUNGO BYUMBA GITARAMA	256 256 256 512 512	169 173 174 257 269	
TOTAL	1792	1042	

Qualite of service

Since the electronic exchanges were put in operation in Rwanda, regular measuring and statistics of quality of service are made and published under the heading of "Logbook of the Director General of Telecommunications".

Quality of service

(Rate of efficiency as far as automatics is concerned)

Traffic	Rate of efficiency	Objective	
		Short term	Long term
Local	30	60	70
National	54	58	62
International	25	35	40

One can notice that the rate of efficiency as far the national traffic is concerned, is beyond the objective as expected by the first stage (50 %). However, the efficiency of the international traffic requires considerable effort.

Studies on the character of telephone demands.

At the end of 1988, Rwanda, was, with a telephone density of 0,1 main line/100 ihabitants, the last among the african countries. A confrontation bellow the NGP with the telephone density in different countries shows that this country has genuine possibilities of developping its telephone network.

The telephone exhanges installed in 1987 are all digital and constitute a strong frame for future network. However, it should be printed out that the distribution of telephones between Kigali, the Capital with the rest of the country is not proportional to the breakdown of the population by departments. (Kigali) nearly represents 4 % of the rwandan population but possesses 58 % of the telephone lines. A couple of telephone exchanges have already reached the point of saturation (Butare, Gisenyi, Nyabisindu, Byumba, Gitarama).

Presently the telephone demands face high installation costs. These are calculated according to the length of the line : from the applicant's property limits to the connecting box of the cable (superior to 20 m). On the other hand, the weak number of function lines per month discourages potential subcribers.

Prevision of the telex demands

The telex park, strong of 100 teleprintes has now reached the point of saturation. The starting of the NEDIX exchange in 1988 allowed an extension of the park. The installation of an other telex exchange ELTEX was put in service in 1989. Most of the telex consumers live in Kigali. A weak traffic does not allow yet the installation of an interurban telex exchange. Present demands are not important due to the interest in new services (telecopy).

Interurban traffic

The Rwanda network possesses up-to-date and digital exchanges thanks to which-evaluation of the traffic is possible. The telephone network in Rwanda is small. However, the telecommunications authorities are aware of a possible increase as far as demand is concerned. The possibility of extending the network exists.

7. a) All the equipment is imported as the country cannot efford plants specialisted in telecommunication equipment.
The main equipment suppliers are :

1. FRANCE
2. JAPAN
3. HOLLAND
4. GERMANY
5. BELGIUM

The consumers themselves may buy both the receivers and their accessories. The may also get telex and fax machines together with their accessories provided, they inform the General Direction of Telecommunications. Private companies are also entitled to get private exchanges. Three types of maintenance of the obove equipment exist :

1. The equipment belongs to the subcriber but is by the General Direction of Telecommunications.

2. The equipment belongs to the subcriber but is kept, fit by the General Direction of consumers.

3. The equipment belongs to the consumer and is maintained by himself.

b) *The Rwandan goverment policy as to the development of high technology of telecommunications.*

Since 1982, the government engaged in the program of modernizing the telecommunication equipment.

Equipment	Year of purchase
1. Earth station	1982
2. International transit centre	1987
3. National transit centre	1987
4. International telex centre	1988
5. Digital microwave links	1982
6. Alcatel telephone exchanges	1987

The companies supplying Rwanda with the telecommuniccation equipment are from :

Country	Equipment	Manufacturer
France	- Telephone exchange - Telex equipment - Transmission equipment	ALCATEL-CIT SAGEM, ELTEX SAT
Germany	- Telex - Measuring apparatus	SIEMENS "
Japan	- Eart Station - Rural telephny - Telex	NEC NEC NEDIX 510
Holland	- Cables - Telephony accessories	NKF-KABEL NKF-KABEL

If the above countries are in a high position, as far as equipment supply is concerned, it's because they are the biggest commercial partners of Rwanda.

8. Direction and extent of change in the telecommunication policy and their relationships with pressure groups, businessmen, syndicates, national security agencies, national institutions, investors.

As part of public administration, the general direction of telecommunications has no relationships with specific national groups (enterprises, syndicates, busnessmen,..). The only relationships known so far are these between customers and suppliers.

The general direction of telecommunications is in close relations with such international institutions as the international Union of telecommunication, INTELSAT, INMARSAT.

As the state wants to free itself from the telecommunications policy, a limited company will soon be in charge of the national and international telecommunications. Their genuine relation will be undertaken with different economic operators (investors, businessmen, national security agencies...)

9. The type of financial deals between the economic operators and the State. Do telecommunications contribute towards the state gross budget ?

The state is the only investor in the field of telecommunications; it is then both the only operator and service supplier in the field of telecommunications. This is all the more undestandable because the Direction General of Telecommunications is under the control of the Ministry of Transports and Communications.

Telecommunications bills are paied through the account of the Ministry of Finances in favor of the state gross budget. A budget for telecommunications which rounds us$ 2,500,000 is voted every year. Though the state is well aware that this amount is insufficient and therefore needs an adjustment, the telecommunication budget is not likely to raise up as the national budget itself shows a chronic deficit.

The bounds set to telecoms services as operator of public telecommunications

As it was said in the previous pages, the only telecommunications operator is the state. The state has monopoly on telecommunication services. But a limited company Rwandatel is soon to have control over national telecommunications. This company will be functionning with different phases.

Do exception to the monopoly of telecommunications exist ? The policy and use of private and/or leased lines. Existence and statutes of added value services.

Telecommunications are in total control of the state. The Direction General of Telecommunications is in charge of both international and domestic telecommunications. Telecommunications in a third world country are not to be considered in a similar way than those in developed countries, as far as duties and rigths of both private companies and the administration are concerned. In this country, the state has both obligations and rights with the customers. Leased circuits do not actually exist, except for the circuit leased by SITA (International company for aeronautic telecommunications).

III. THE FUTURE

12. Charges in telecommunications policy

Since 1987 Rwanda telecommunications knew considerable progress (new and up-to-date telephone exchanges and digital telex) which allowed integral automatic international communications. 1992 is to be the year of change in telecommunications policy. For the time being, Rwandan telecommunications are a state property which has no particular means to reach a meaningful development. The absence of juridical, financial and management autonomy results from the present telecommunications policy. A limited company is now being created to exploit and control the entire field of telecommunications.

The restructuring of telecommunications will proceed in a clear definition of the roles of both the state and telecommunications limited company.

Thus, the role of the state will be the defining and the regulating of telecommunications policy, while the limited company will be in charge of exploitation and management. To this end, the government was allowed a credit from AID (International Association for Development) to back part of the coast of the restructuring of telecommunications policy, especially of the research department. After bids were invited, that the chosen research department was ICEA (Consulting enginers and associated economists) a french private research company. The Consultant is now Concertrating on the following tasks :

- Settlement of the company and evaluation of its organization,
- Management of development,
- Commercial management,
- System of information,
- Management of human resources
- Budget
- Accountancy,
- Security.

During the execution of this program, the Consultant will have to train the staff of the Direction General of Telecommunications and help transfer both know-how and knowledge.

13. *Global trends which affect the country and which may influence future developments.*

Among the trends which affected the country are political, socio-economic and strategic trends.

a) Political trends

A new Consitution adopted in Rwanda since 1991 gave way to multipartism. Presently, 16 political parties exist. They are all for the privatization of state entreprises among which telecommunications.

b) Socio-economic trends

The creation of a limited telecommunications company will allow easier availability of telecommunications services to a larger market. Indeed this company not only will have more consumers but also the shareholders will take advantage of it.

c) Strategic strends

Rwanda has been in war for nearly 2 years (since october 1st, 1990). The Uganda-based rebels are still launching their attacks against the national territory.

The political authorities are now aware that rural telephone is of great use in the border regions, especially those with Uganda North) Burundi (South) and Tanzania (East). As to the West, Lake Kivu stands for the border between Zaire and Rwanda. Actually, rural telephony is in operation since 1990. At the places (76) in the Prefectures of Cyangugu, Kibuye and Gisenyi have telephones. The program was backed by Suiss Goverment.

14. The changes in the next ten years.

a) Evaluation and future prospects

A meeting of financial backeds held in February 1988 was an opportunity for the Rwanda government to make the first, positive evaluation of the execution of a certain number of programs. Then had to define the prospects which should take into account the following needs :

- Development of the existing network so as to settle telephone in the most landlocked places,
- Supply telephone services to a larger market by increasing the number of public phones,
- Maintenance of the quality of service by consolidating the network.
- Maintenance of the efficiency of service : Invoicing-recovery.

b) Extension of local networks in provinces

The improvement of service in provinces requires the creation of new local centres.

KABUGA, KANZENZE, RUHANGO, MUKAMIRA, MABANZA, BUGARAMA, KIRAMBO, KABAYA, NGORORERO and BIRAMBO.

c) Creation of two local centres in the the urban area of Kigali (NYAMIRAMBO, KICUKIRO).

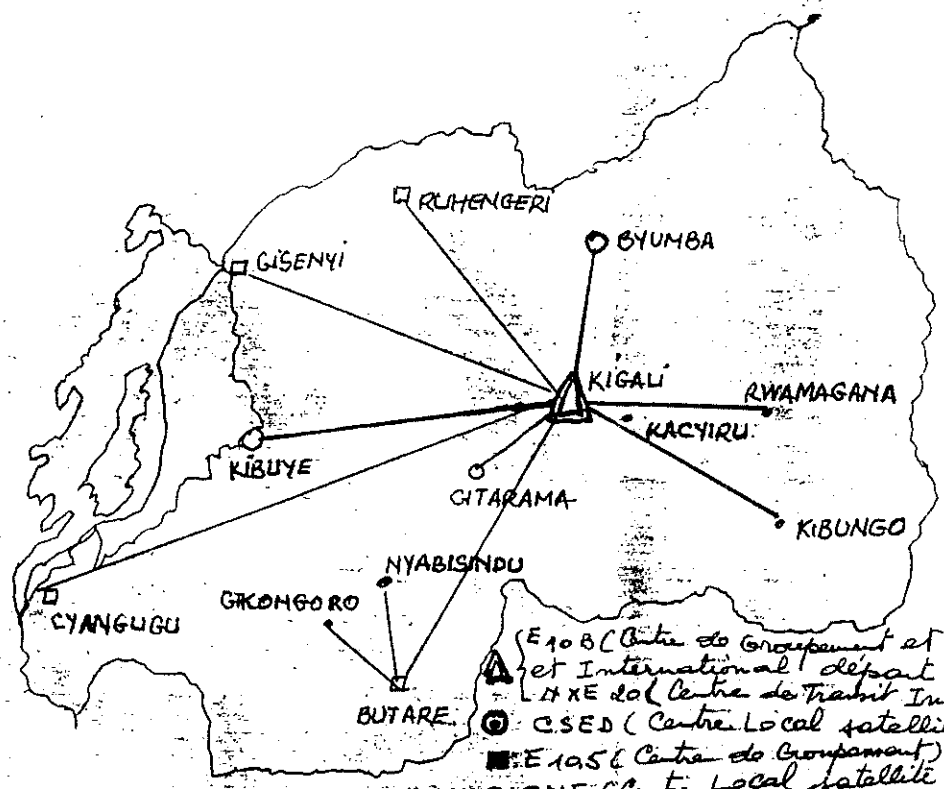
d) Program of the organization of Kagera basin contries.

The program is concerned with the needs in telecommunications of the countries around the Kagera basin : RWANDA, UGANDA, TANZANIA and BURUNDI.

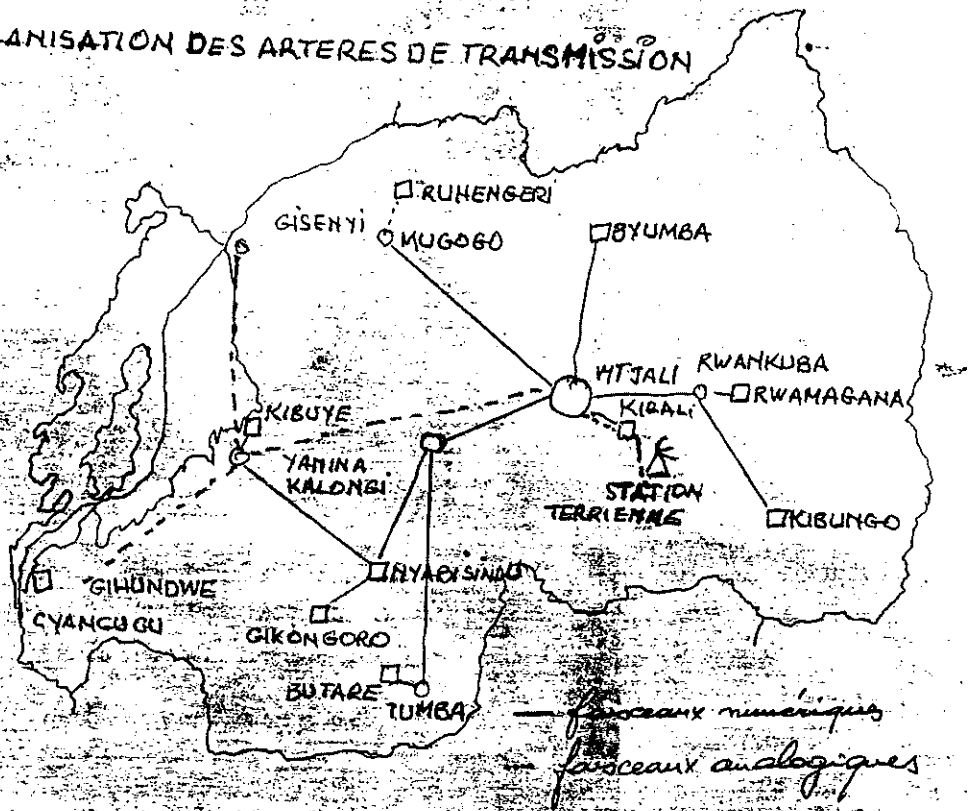
I. PRESENTATION DU RESEAU.

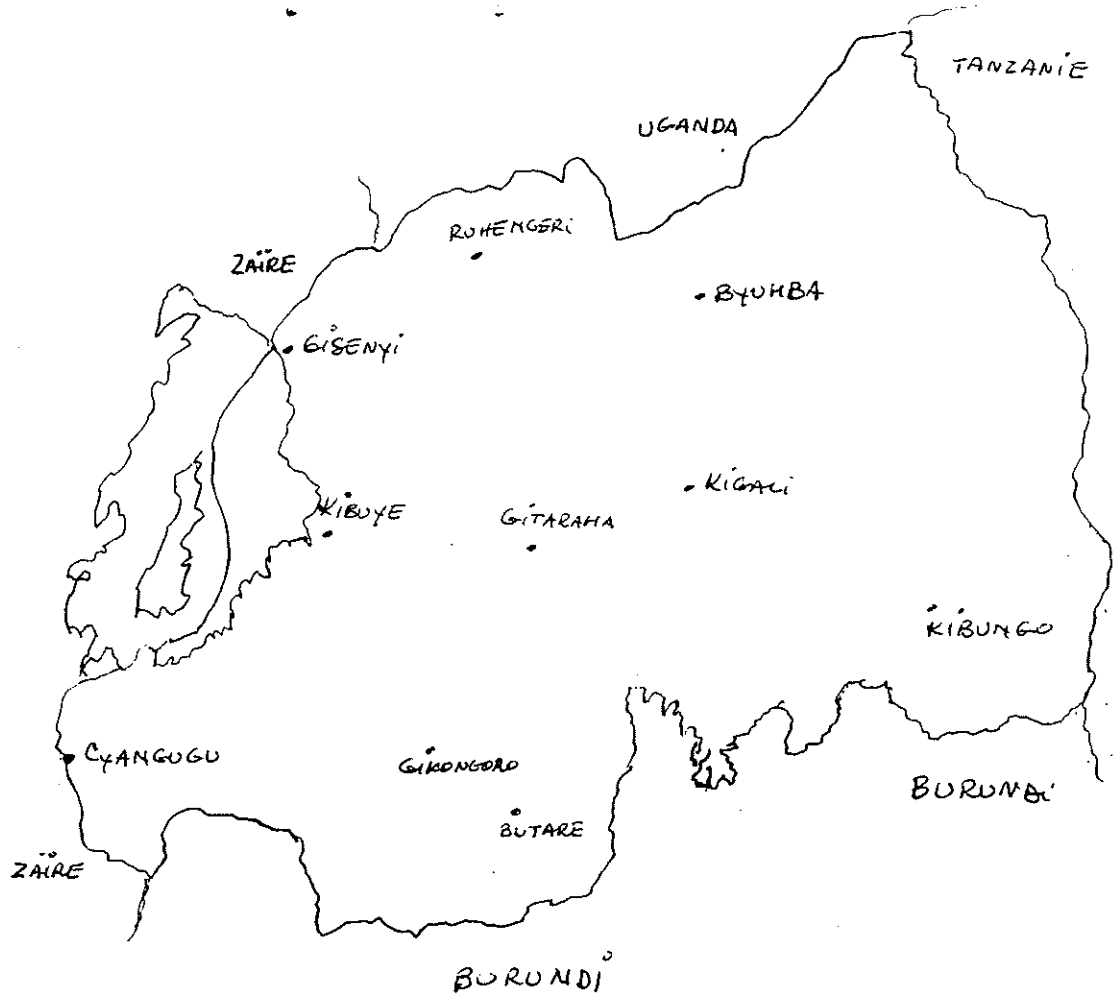
LE RESEAU TELEPHONIQUE RWANDAIS

CENTRAUX TELEPHONIQUES ET LIAISONS FONCTIONNELLES



ORGANISATION DES ARTERES DE TRANSMISSION

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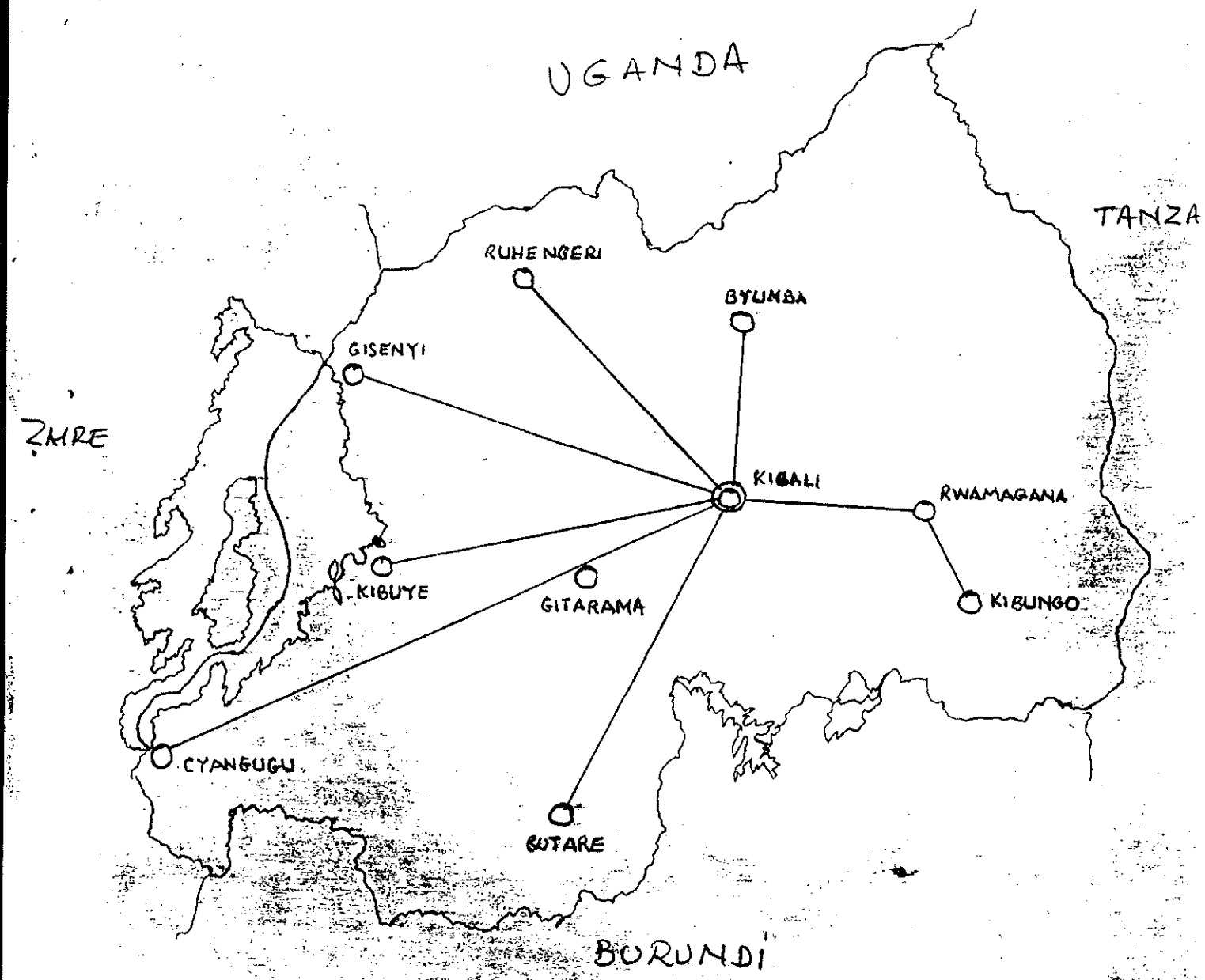
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CYANGUGU
GUTARE
BURUNDI