Design and Implementation of wireless networking in Hospitals

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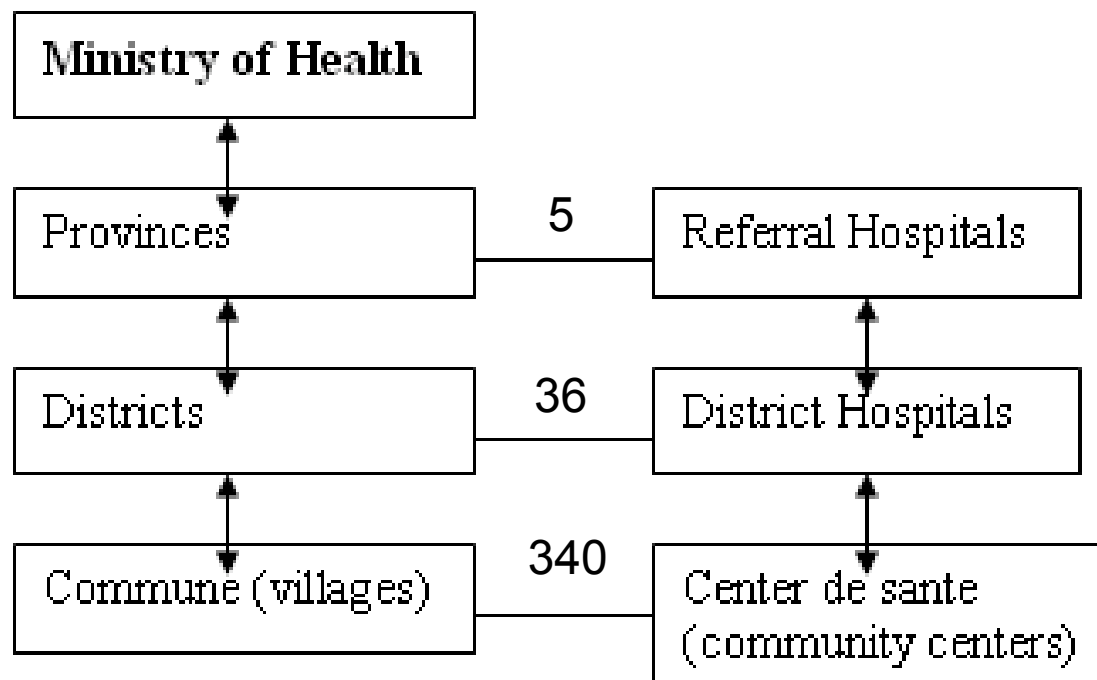
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Abstract

- introduction of Rwanda
- challenges in healthcare system
- ways of overcoming the challenges
- requirements for implementing telemedicine
- existing telecommunication infrastructure
- way forward
- proposed pilot project
- benefits and beneficiaries of this project.

Introduction

- Rwanda's recent history is marked by the genocide of 1994 in which at least 800,000 people, about 10 percent of the population, lost their lives.

- Stability and security have been restored, and recovery has been underway for several years now.

- Rebuilding the stock of human capital is an important part of the recovery process since one of the country's assets is the human resource.

- In the development of any country, the population's quality of life is one of the most important factors, which has to be achieved.

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- Rwanda is a decentralized country with 12 districts.

- The healthcare system administrative work has been classified into different levels: Provincial, District, and Commune.

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│  Ministry of Health │
└─────────────────────┘
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┌─────────────────────┐      5      ┌─────────────────────┐
│     Provinces       │─────────────│  Referral Hospitals │
└─────────────────────┘             └─────────────────────┘
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┌─────────────────────┐      36     ┌─────────────────────┐
│     Districts       │─────────────│  District Hospitals │
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┌─────────────────────┐      340    ┌─────────────────────┐
│ Commune (villages)  │─────────────│  Center de sante    │
│                     │             │ (community centers) │
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Challenges in Healthcare System

- very few medical personnel in public service
  - Doctors ~ **300**
  - Registered Nurses ~ **282**
  - Associate Nurses ~ **2731**

- lack of experience
- no means of upgrading the knowledge and skills of medical personnel
- high medical personnel turnover
- poor keeping of medical records
- inadequate numbers of facilities
- Low incomes of the population
- poor roads

Overcoming these challenges

- Telemedicine

  is the exchange of medical information between two or more
  sites using electronic media for the health and education of
  patients or healthcare personnel to improve patient care.

- Three main dimensions of telemedicine

  - health services

  - telecommunications services

  - medical technology.

- Its use would improve health care in rural areas,
  in home and in other places where medical
  personnel are not readily available

Requirements for implementing

- In order for telemedicine to be implemented
  - network the hospitals
  - acquire appropriate hardware
  - acquire appropriate software
- As for now our main concern would be networking of the hospitals
- There are hospitals already with wired LANs.
- July 8th-14th 2003 there was a successful demonstration of video conferencing which aimed at assisting young medical doctors to practice surgery while assisted by Senior and specialized doctors in any domain remotely.
  - King Faisal Hospital – Kigali
  - Faculty of medicine (NUR) – Butare
  - Ruhengeri hospital – Ruhengeri
  - Strasbourg hospital – France
- October 24th-28th 2003 3 Hospitals in Rwanda were connected
  - King Faisal Hospital - Kigali
  - CHU/CHK - Kigali
  - Faculty of Medicine (UNR) – Butare
- The connection was ISDN based and gave good connection by 384kbps (3 ISDN lines) & 512kbps (4 ISDN lines)
- However this is very expensive referring to the rate cost of our local telecommunication company.

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Existing telecommunications infrastructure in Rwanda.

- The country already has a backbone infrastructure based on:
  - cellular communications
  - PSTN
  - Broadband wireless
  - optical fiber

- Huge amount of ICT initiatives going on to expand current infrastructure

- There are a few Wi-Fi hot spots in some hotels. However there is still little usage of wireless LANs due to lack of sufficient skills and knowledge of these technologies

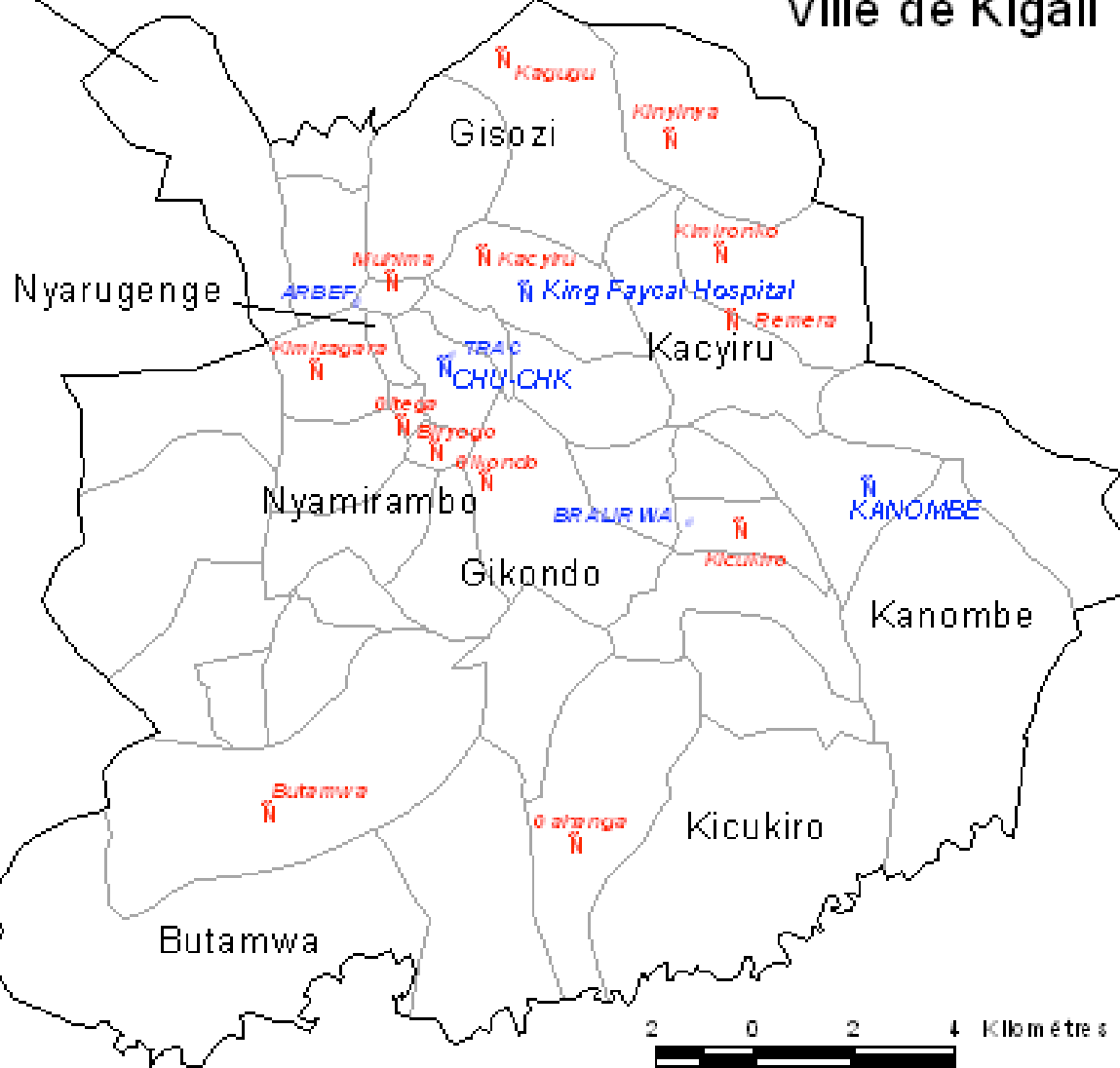# The way forward: Design and implement wireless LANs and WANs for hospitals

- Each hospital will be equipped with a LAN which will be a mixture of both wired and wireless technologies. This is because the hospitals are built on large tracts of land with many buildings scattered around and therefore by using wireless networking it will be cost effective

- For inter-hospital connection a wireless WAN connection will be provided in order to support sharing of data and resources among themselves and improve patient healthcare.

- For redundancy purposes, the hospitals will be connected in a point-to-multipoint manner. The optic fiber network will be used as an alternative link between distant hospitals

- With wireless networking it will be possible to cover long distances with repeaters, deploy the network quickly and easily maintain the network. A technology like Wi-Fi is capable of providing high bandwidth which is essential for the transmission of video and graphical data. It is a cost effective compare to ISDN and proven technology.

Proposed Pilot Project

- The pilot project to be undertaken involves four referral hospitals in Kigali, namely:
    - Kigali Central Hospital- Main Rwanda General Referral Hospital and used to train doctors.
    - King Faisal hospital- State owned but privately managed- offers high quality service.
    - Kanombe Military Hospital- Military officers and public.
    - Ndera Hospital- Mental Referral Hospital

From	To	Distance (approx) (Km)
Kigali Central Hospital	Kanombe	9
Kigali Central Hospital	King Faisal hospital	2
King Faisal hospital	Ndera	9
Kanombe	Ndera	2

Ville de Kigali

Gisozi

Ñ Kagugu

Kinyinya
Ñ

Nyarugenge

Mulima
Ñ

Ñ Kacyiru

Kimironko
Ñ

ARBEF

Ñ King Faycal Hospital

Kacyiru

Ñ Remera

Kimisagara
Ñ

Ñ TRAC
Ñ CHU-CHK

Gitega
Ñ
Ñ Gitega
Ñ Gikondo

Nyamirambo

BRALIRWA

Ñ KANOMBE

Kicukiro
Ñ

Gikondo

Kanombe

Butamwa
Ñ

Gatenga
Ñ

Kicukiro

Butamwa

2   0   2   4 Kilomètres

Benefits and beneficiaries:

- **Medical personnel**
  - Improve on their knowledge and skills since it will be able to share experiences and learn a lot from the system.
  - Would help assimilate both old and new knowledge, apply that knowledge to their patients, and remember each patient's individual health status and background. This will ensure reliable service to patients.
  - Communicate quickly with patients, hospitals, and other providers. This would save the doctors from traveling from one place to another for emergencies since communications can be easily done via the network.

- **Patients**
  - Improve patient safety by reducing medical errors.
  - Help patient's transfer between healthcare facilities.
  - Reduce duplicative and unnecessary testing
  - Help patients care by providing appropriate treatment to the patients since there records will be available even incase of changes of high personnel turnover.

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- **Ministry of healthy**
  - Planning and decision making, providing timely warnings about emerging health problems.
  - Reviewing, monitoring and evaluating various on-going health programmes.
  - Provide medical and health manpower requirements and taking timely decisions, on a continuing basis, regarding future manpower requirements.

- **Others (insurance companies, pharmacies etc)**

  Ensure health information sharing between providers, laboratories, pharmacies, and patients.

Recommendation.

- This project is highly recommended because it will act as a pilot project of Wi-Fi in Hospitals of Rwanda

- It will enable hospitals to improve healthcare delivery

- Build more competent medical personnel enriched with skill and knowledge thus raising the morale of medical personnel

- Enable Ministry of health to plan and make decisions timely. It will help Rwanda as a nation to reach its goal of Vision 2020

Thank you