

Université Cheikh Anta DIOP de Dakar (SENEGAL)

Campus Network : UCAD

Capacity and infrastructure requirements

Dr. Ibrahima NIANG

iniang@ucad.sn

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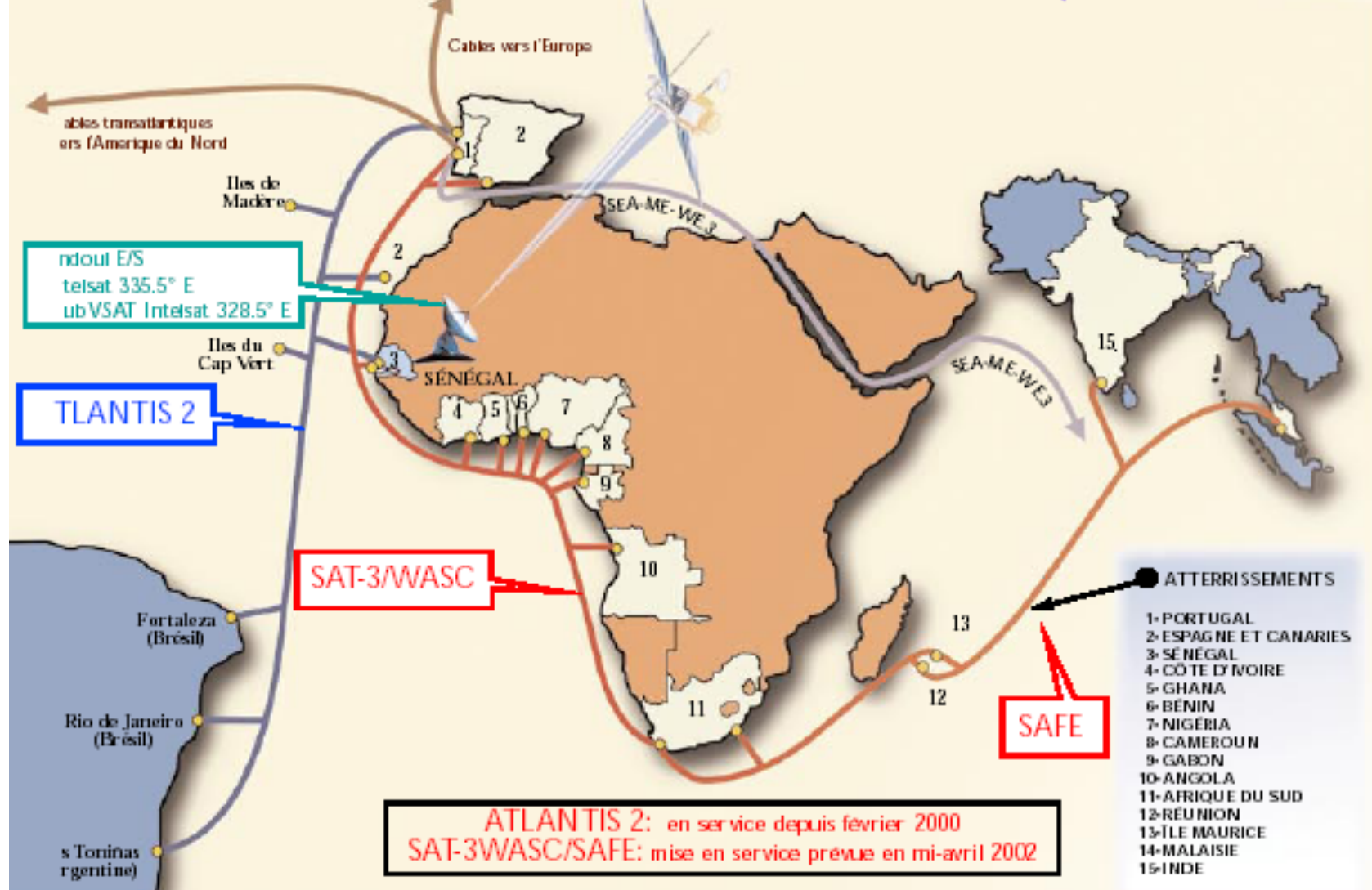
Outline

- National infrastructures and services
- Presentation of University of Dakar
- Current Network architecture
- Limits of current architecture
- Network Evolution architecture
- Strategies designed to achieve the goals
- NREN in Senegal

National infrastructures and Services (1)

- Digitized telephone network at 100%
- Fiber Optic : 3000 km
- National IP Network
- Internet : 465 Mbps bandwidth Internet for the international
- 1 operator on the fixed Telephone
- 2 operators on the mobile telephone

RÉSEAU INTERNATIONAL DE SONATEL · CÂBLE SOUS-MARIN A FIBRES OPTIQUES ET SATELLITE



ATLANTIS 2: en service depuis février 2000
SAT-3WASC/SAFE: mise en service prévue en mi-avril 2002

National infrastructures and Services (2)

- ISDN - Integrated Services Digital Network
- Internet (64 Kbps-> 10 Mbps)
- ADSL (*Asymmetric Digital Subscriber Line*) (256 Kbps -> 2 Mbps)
- Wireless Networks
- Television over ADSL and Vidéo on demand

Presentation of University of Dakar (1)

- UCAD

- Create on 1957
- 1 099 Professors-Researchers
- 1 171 technical and administrative staff
- 43 764 students from 66 nationalities

Presentation of University of Dakar (2)

- **Faculties**

- **Médecine, Pharmacie et Odontologie(FMPOS)**
- **Sciences Juridiques et Politiques(FSJP)**
- **Sciences Economiques et de Gestion(FASEG)**
- **Sciences et Techniques (Mathématiques et Informatique) (FST)**
- **Sciences et Technologie de l'Education de la Formation(FASTEF)**
- **Lettres et des Sciences Humaines(FLSH)**

- **Higher School and institutes**

- **Ecole Supérieure Polytechnique(ESP) (Ingénieurs génie civil, électrique, mécanique, chimique et informatique)**
- **Ecole des Bibliothécaires, Archivistes et Documentaires (EBAD)**
- **Ecole Normale Supérieure d'Enseignement Technique et Professionnel (ENSETP)**
- **Centre d'Etude des Sciences et Techniques de l'Information (CESTI)**
- **Institut National Supérieur de l'Education Populaire et du Sport (INSEPS)**
- **Institut Fondamental d'Afrique Noire (IFAN)**
- **Autres instituts**

Presentation of University of Dakar (3)

- Research
 - 1099 professors–researchers;
 - 3000 Phd students;
 - 85 laboratories.

Campus network UCAD

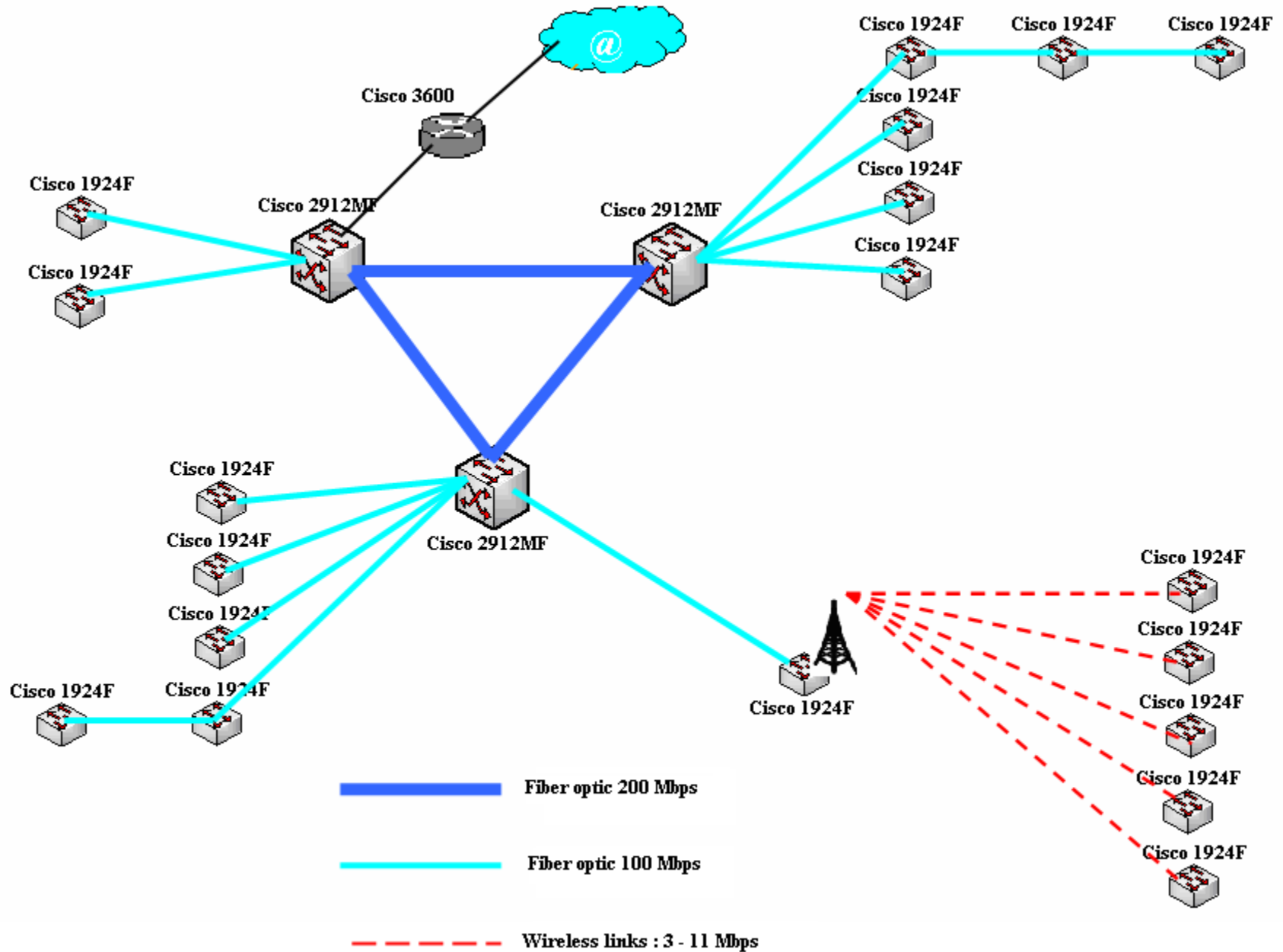
- **Campus Network is created since** 2000 ; financed by the Wold Bank Institute
- **Informatic Direction** is created for ensuring :
 - the daily network management
 - the technical support of the park and the availability of the services and applications
 - Infrastructures and services evolution
- **Informatic Direction** is made up of 5 structures
 - User Support
 - Network
 - Remote Training
 - Applications Development
 - Continuous Training

Today, campus network is financed by university budget

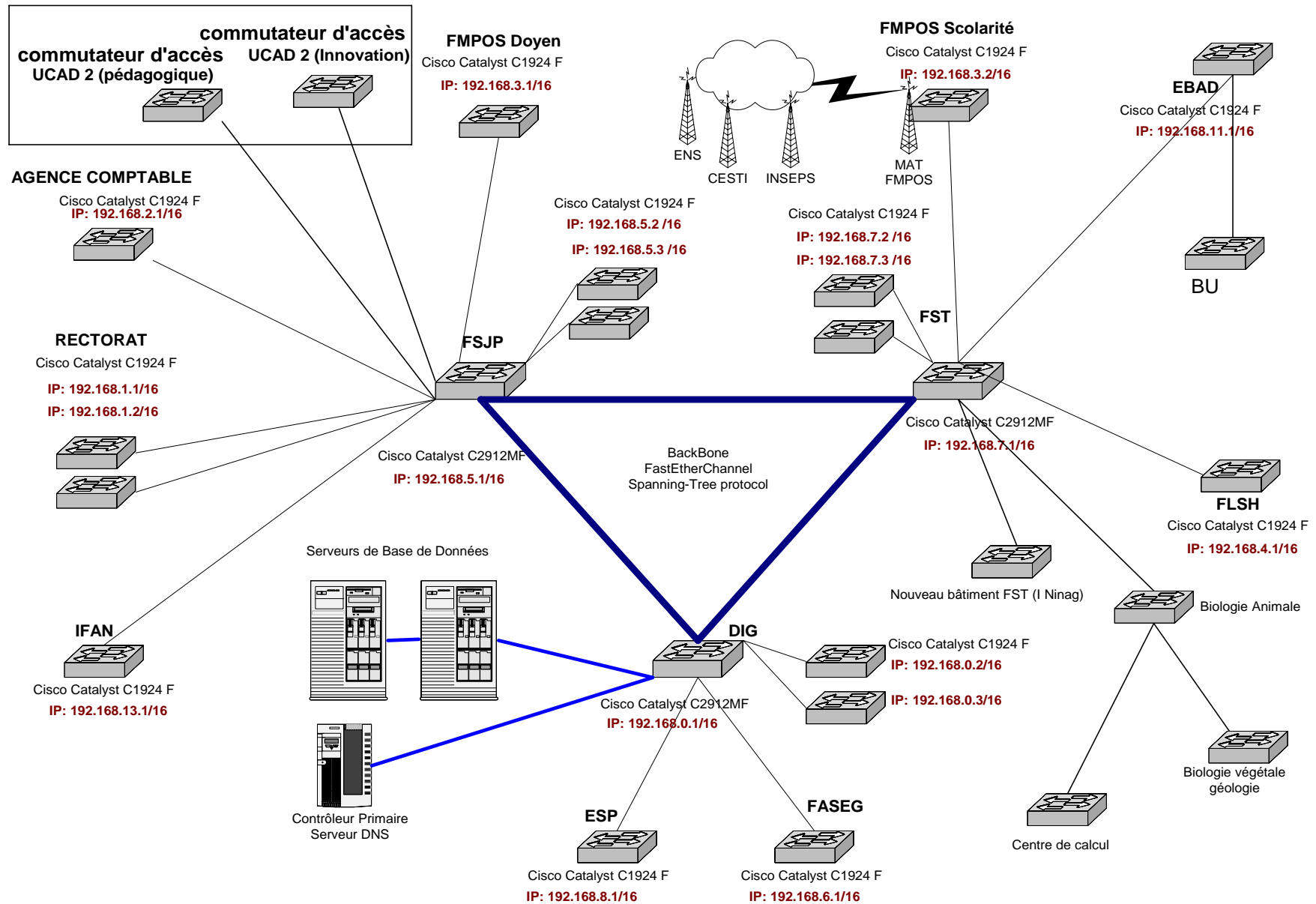
Current network architecture (1)

- Campus network connecting all academic departments
- Provide Internet access to all academic departments
- More than 6 km for fiber optic
- Core of the network (approximately 3 km) in triangle using 200 Mbps
- 2 Mbps bandwidth for Internet Access
- Wireless networks are used to connect 5 distant sites (maximum distance approximately : 3km)

- **Current campus network design**



• Connectivity of departments



Current network architecture (2)

- **Materials and components**

- Network use primarily Cisco materials (2 routers, 1 firewall pix and more than 50 switches).
- Network connect 16 servers and 3,000 stations.
- A power generating unit of 75 kVa feeds this infrastructure in the event of cut of electricity.

- **Network Services**

- Services available on the campus network:
 - Mail service (more than 2,500 mails)
 - Web service
 - DNS service for internal and national services (UCAD manages domain .sn)
 - FTP service
 - Videoconference lservice on ISDN
 - Security : firewall, radius, antispam, antivirus,

Current Network architecture (3)

- Applications for administration

- Three applications developed by Informatique

Direction:

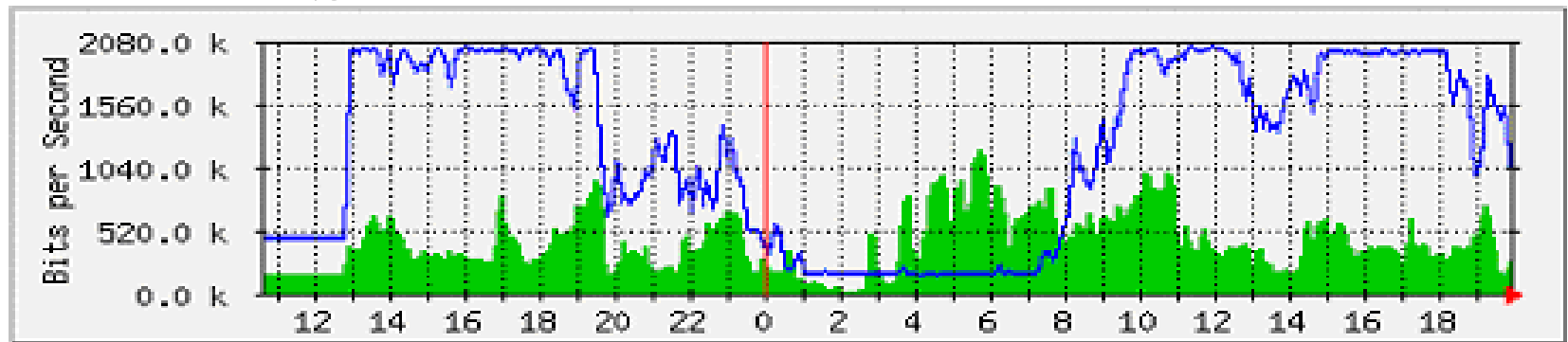
- Students Management (inscriptions administrative, teaching, timetable and examinations)
- Financial Management (budget and compatibility)
- Human Resource Management

Limits of current architecture (1)

- Network initially planned for 300 PCs without Internet access; it passes from 300 to 3000 PCs with internet access
- Extensions sometimes not controlled
- Some problems with network security

Limits of current architecture (2)

- Old age of the network equipments
- Internet Saturation



- High cost for internet connection (1500\$/month)

Limits of current architecture (3)

- The current state of the network has limits for new services like voice over IP, videoconference and remote training
- No redundancy ; problem of connectivity in the event of link disfonctionnement

Limits of current architecture (4)

- Current network will not be able to deal with the evolutions envisaged
 - One student – one PC (gouvernement project)
 - One professor – One PC(university project)
- Network equipments do not allow routing for Vlans

Network Evolution architecture (1)

Objectives

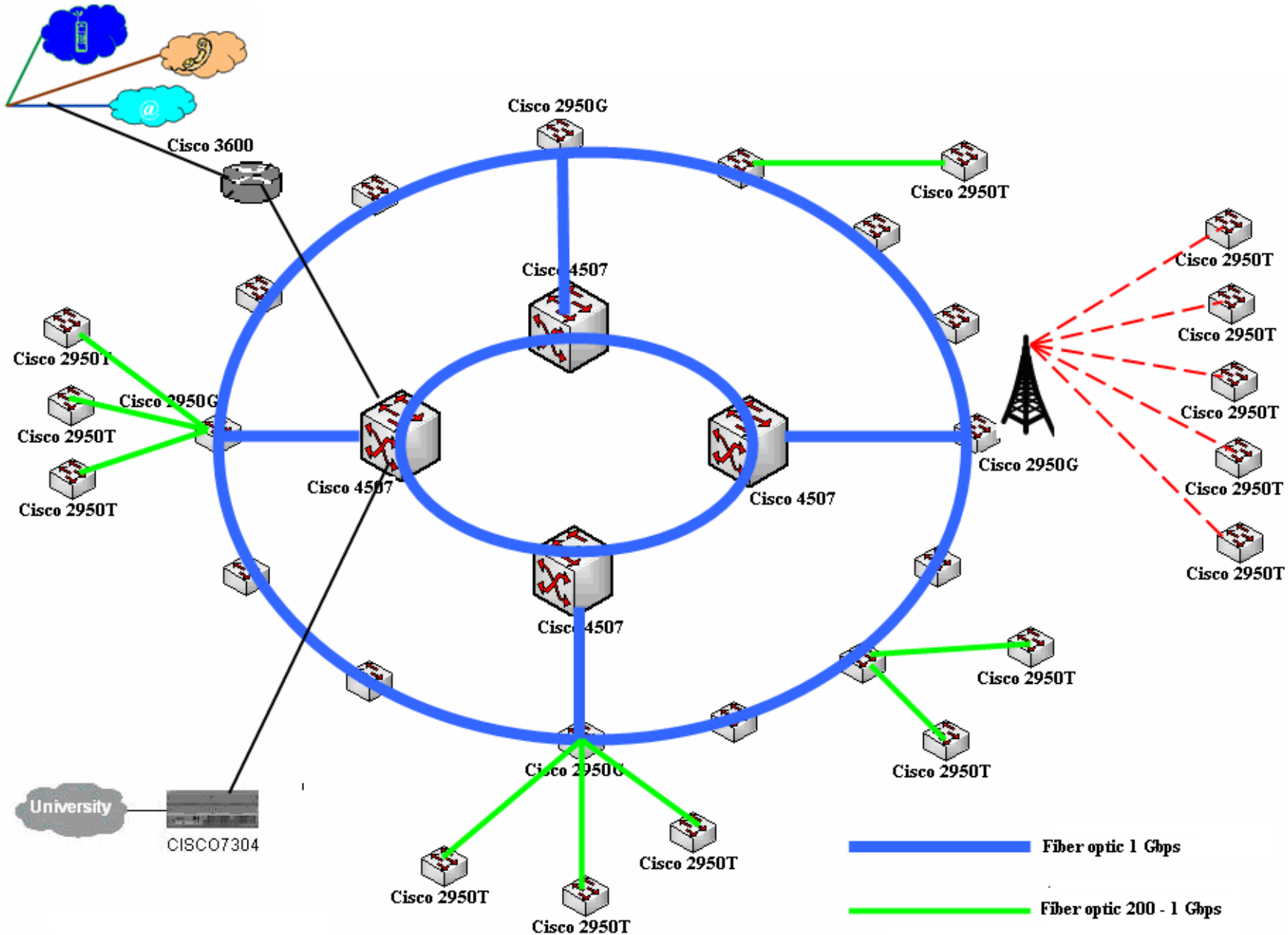
- Redefinition of the architecture of the backbone in optical loop : Gbps links with optical fibre straps (also 1 Giga bits) ;
- Bandwidth will have to pass from 2 Mbps to 10Mbps ;
- Network equipments will be renewed (backbone and others switches) to support new services like voice over IP, remote training.
- Design of an Intranet to facilitate the information exchange ;
- Network extension with wireless for distant sites with constant bandwidth

Network Evolution architecture(2)

Objectives

- Renew security of the current architecture (network segmentation, use equipments for network security...);
- Possibility to do routing for Virtual LAN ;
- Allow an reliable access Internet with a continuous service for all users.
- Support access to the networks services for all students

Evolution campus network design



Network Evolution architecture (3)

New services

- Voice over IP
- Vidéoconférence
- TeleMedicine with the university polyclinic
- E-learning

Strategies designed to achieve the goals

- The following actions will be carried out :
 - Study and evaluation of the cost of the project
 - Determination of the UCAD financial contribution ;
 - Search for financing ;
 - ongoing educational opportunities for local engineers, and technical staff
 - Implementation of evolution network architecture as well as the associated services;

NREN in Senegal (1)

- Opportunities ; Necessity??
 - Do not have visibility of research results
 - Ressources optimisation
 - Ressources sharing : example servers sharing for simulation
 - Digital Library sharing
 - ...

NREN in Senegal (2)

Some Problems

- Universities and research centers are autonomous
- Need to have high level authority to deploy NREN (in the case of Senegal : ministry of education and ministry of scientific research
- Contribution telecommunication providers

No first it's necessary to have a good connectivity in campus network

Conclusion

- It appears clearly that university UCAD took a great step to develop its network Campus
- The vice-chancellor of the University strongly supports the informatic direction
- Actions are to be carried out to improve the network
- UCAD is ready to place this potentiality at the disposal of NREN in Senegal and in West Africa

- Thank you for your attention