Academic Network of Albania
Building a NREN

RIPE NCC
Regional Meeting

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Activities

- Software applications for Universities management “UGOV”
- Network infrastructure services for public/no public(NP) Universities & Research institutes

…at next

- Services e-libraries & e-publishing
- Service e-learning
- Cloud computing
- High Performance Computing
- Grid infrastructure
- Clusters
- IXP, etc

The objectives of Network Project

- Design the infrastructure of the new Albanian Academic Network Backbone
  - **Physical infrastructure: passive and active**
    - Fibers, radio, physical links
    - Routers, switches
  - **Logical infrastructure and IP**
    - Routing and switching
    - Possibility of using WDM
  - **VoIP, NOC, SOC: service over the infrastructure**
    - Integration with PSTN
    - VoIP calls between universities
    - Network and Security Operations
- Support to ANA for the supervision of the network implementation
- Training to ANA staff and to Universities
  - Networks, routing, VoIP

The project is done in partnership with CINECA/CASPUR

- **Inter-University Consortium from Bologna/Roma**
- **They work on the common applications**

NETWORK INFRASTRUCTURE

Designing the Network Backbone

- The network has to connect all public universities in 7 cities
  - In Tirana: 7 public universities, 3 research centers and the Ministry of Education
  - 6 universities outside Tirana
  - 4 affiliates
- The backbone will connect all the Universities together
- An essential :
  - design the network backbone, bringing one or more Points of Presence to each University
- The academic network will also be connected to
  - The European Research Network (Geant)
    - Passing through the Italian Research Network (GARR)
  - The Internet
    - Via GARR and/or via a local ISP

Consortium GARR GÉANT

Survey Phase: Involving Stakeholders

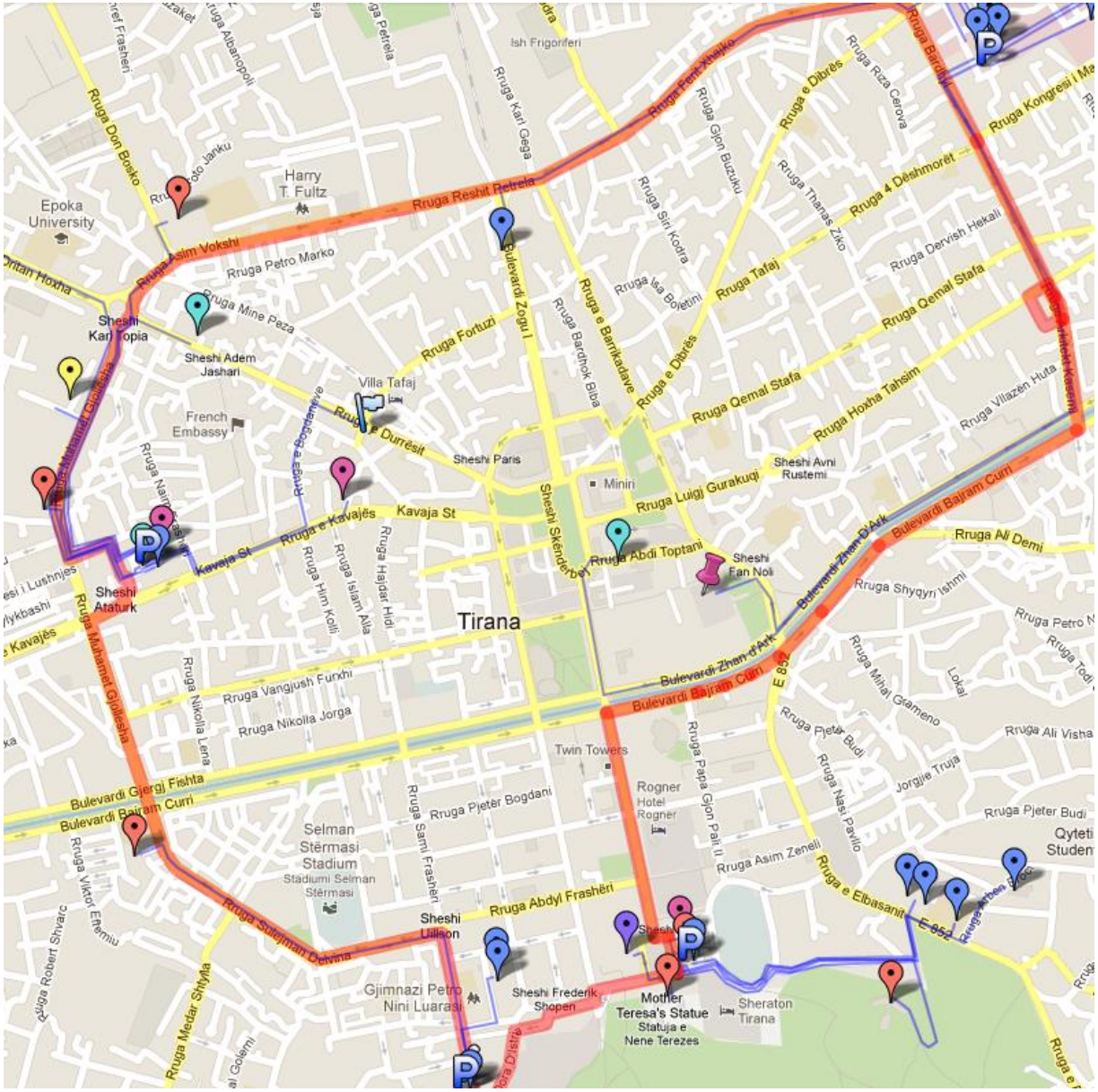
- Detailed surveys from Caspur & ANA in all Universities and Research Centres
  - *Tirana*
  - *Durrës*
  - *Elbasan*
  - *Korçë*
  - *Vlorë*
  - *Gjirokastër*
  - *Shkodër*
- Surveyed all available infrastructure and asked about needs and special requests
  - *Bandwidth*
  - *Communication with other universities*
  - *Servers*
  - *Applications*

Actually situation

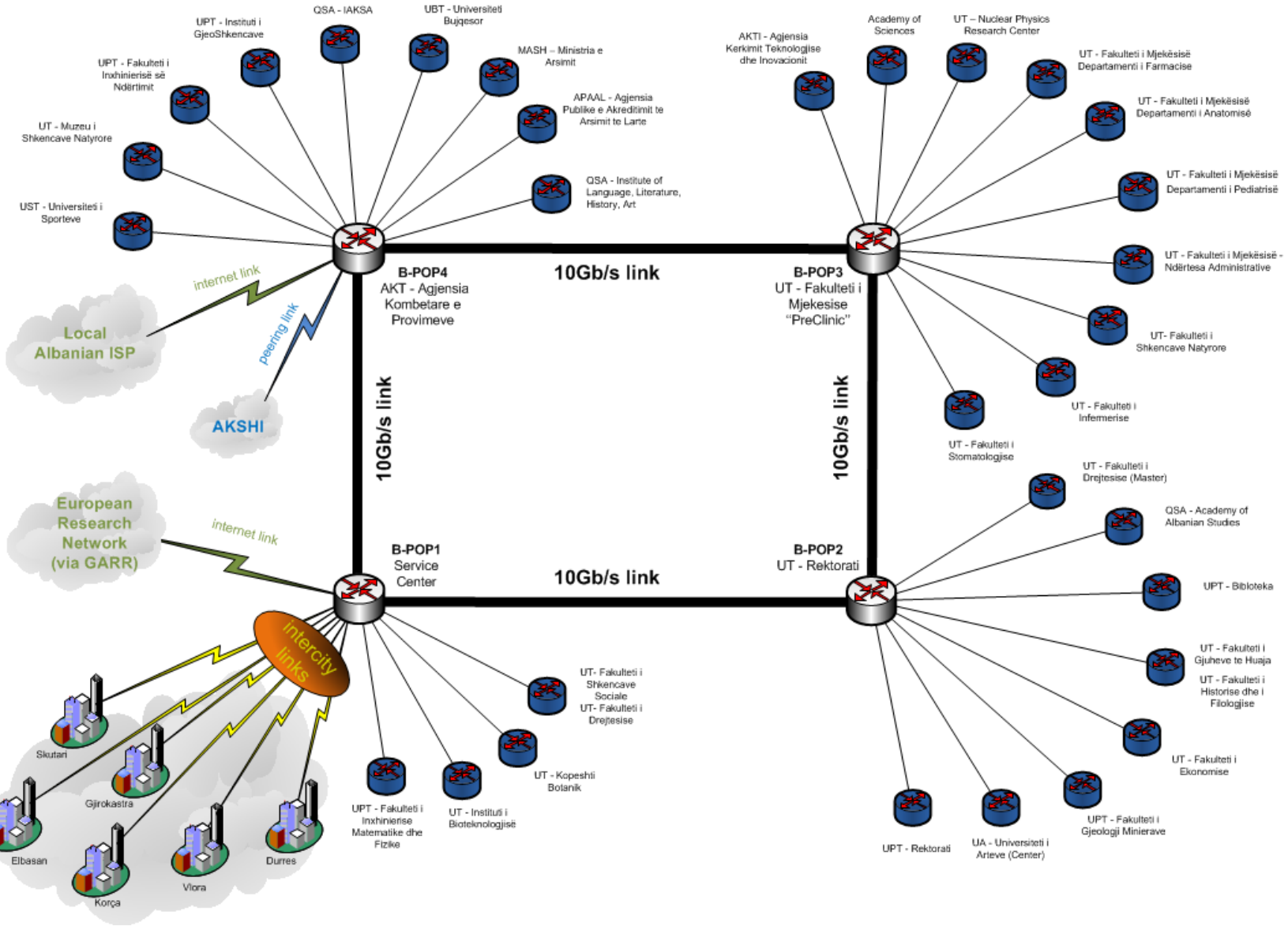
- Total Bandwidth currently available (download)
  - Around 200 Mbps (only for Universities)
- Number of servers
  - Around 60 (current or planned)
- Applications
  - Internal web/app servers (e.g. library)
  - Videoconferencing
  - 15 GRID servers (in a single site)
- People
  - Around 120,000 students + 7,000 staff
- Telephones
  - Around 350 outside phone lines (+ ~300 internal)

Physical Infrastructure

- MAN in Tirana
  - Ring
- 4 backbone PoPs
- Point-to-point links to buildings and universities in other cities



Physical Infrastructure Layout



Physical Infrastructure (1)

Design principles

- Geographic aggregation on two levels
  - Backbone aggregation PoP (BPoP, neighborhood area)
  - Edge aggregation PoP (buildings)
- Suitable bandwidth provisioning
  - Backbone PoPs links:

    bandwidth ≥ 10 Gb/s
  - Backbone PoPs to edge PoPs links:

    bandwidth ≥ 1 Gb/s
  - Edge PoPs to department CPEs links:

    bandwidth ≤ 1 Gb/s

Physical Infrastructure (2)

Design principles

- "Super-BPoP" inside ANA premises
  - New Data Center containing common servers and applications
  - Centralize the inter-city links
  - Establish a connection to other research networks
- WDM technology has been evaluated for scalability
  - But it looks expensive and overkill for now
  - It can still be implemented in a subsequent phase

IP network

Design principles

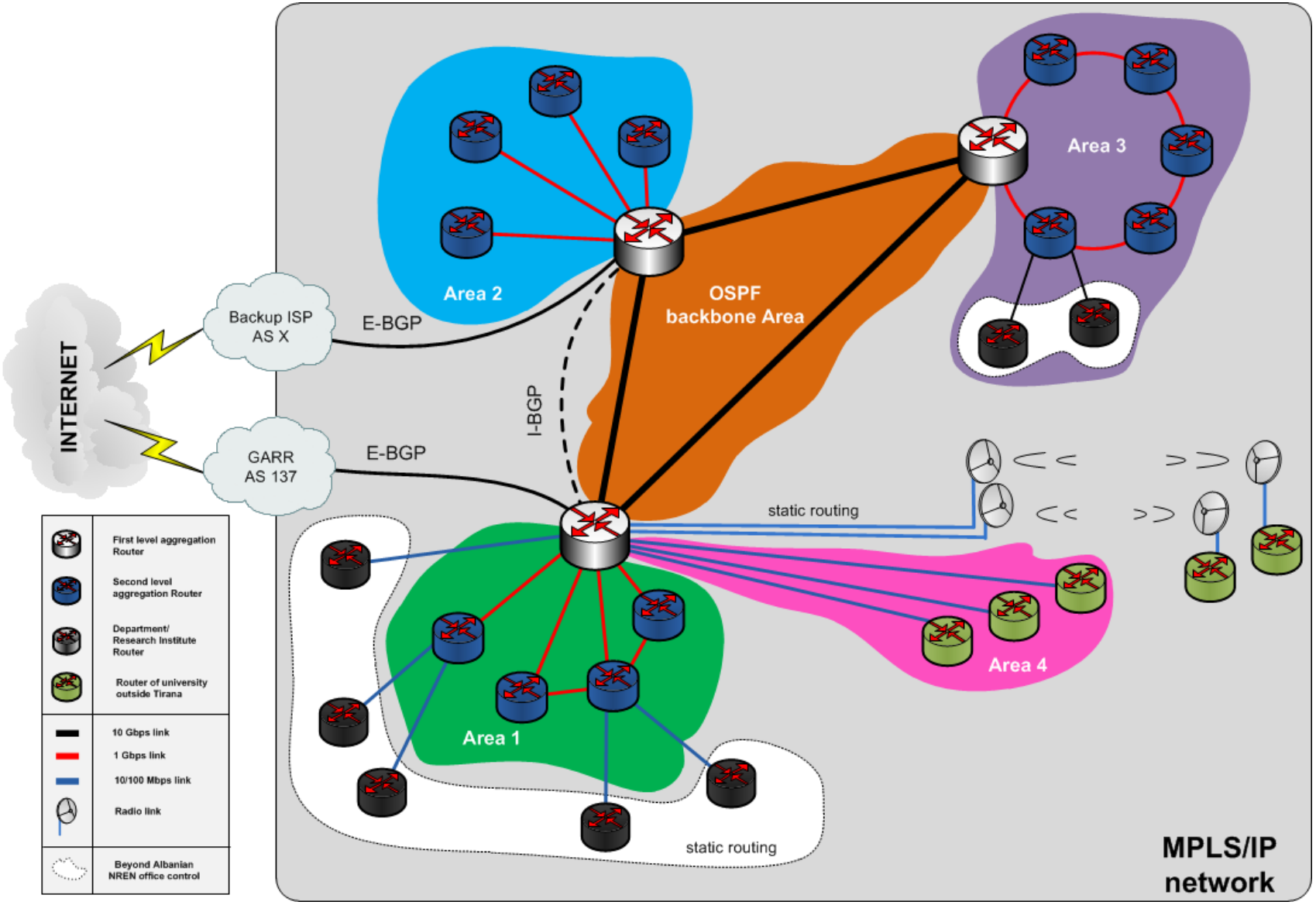
- Dual-Stack IPv4/IPv6
  - on every network device
  - every department will be connected with one or both protocols
- IPv4 addressing
  - ANA is a LIR
  - Private addresses for point-to-point backbone links and management
  - Private subnets for department LANs (already existing)
  - Public IP addresses assigned to the departments
- IPv6 addressing: public addressing by default
  - Private IPv6 unique-local addresses will be used for management
- MPLS technology used for:
  - Routing optimization
  - L2 MPLS VPN deployment
  - Future network services (e.g. L3 VPN, traffic engineering, etc.)

IP network

Routing

- OSPF as Interior Gateway Protocol (IGP)
  - Between backbone aggregation PoPs (backbone area)
  - Between backbone and edge aggregation PoPs (edge areas)
    - Both inside and outside Tirana
- BGP as Exterior Gateway Protocol (EGP)
  - Two upstream providers
    - GARR (access to the European Research Network)
    - Local ISP (for local-bound traffic)
  - Partial BGP Mesh
    - To allow the distribution of BGP routes inside the AS

MPLS/IP network



Network: Main Issues

- **Mostly cost issues (***to be taken into account for the tender***)**
  - Overseas connectivity: point-to-point links between ANA (Albania) and GARR (Italy) are very expensive
    - Both submarine and via land
  - Inter-city connectivity: inter-city fiber is unprotected
    - Alternative: radio links
  - MAN in Tirana: new fiber can be laid or dark fiber can be obtained
  - Possibly not everything from the initial project can be put in the first tender

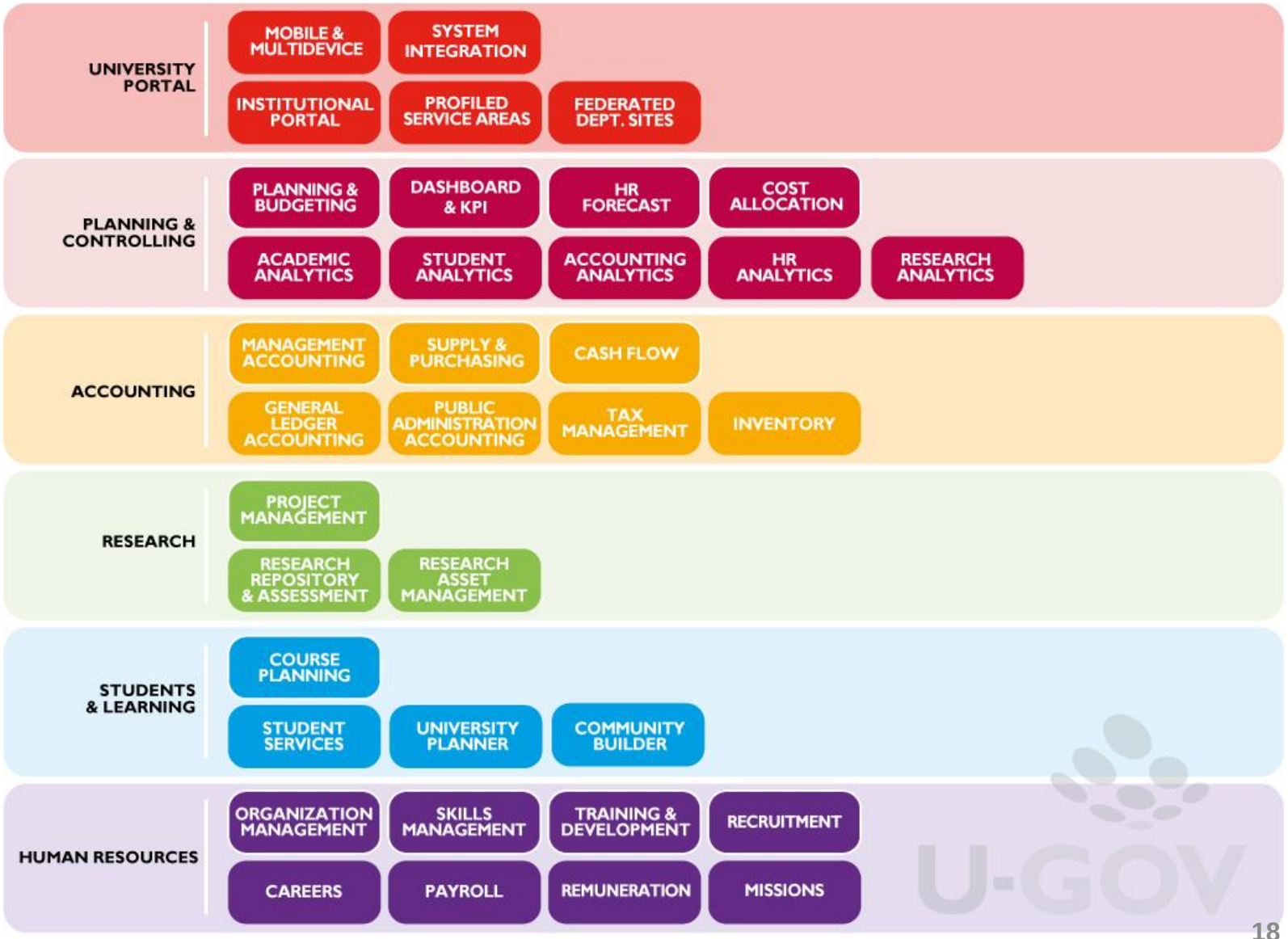
SERVICES

UGOV Albania

- U-GOV, is a integrated information system designed uniquely for Higher Education Institutions. It's aimed at defining objectives, strategies and means for achieving and monitoring results.
- U-GOV combines applications for the management of the main administration areas of Universities in a single systemic vision:

Personnel, accounting, research, learning and student services coexist in a unique and integrated architectural environment, together with decision support tools.

UGOV Albania (2)



VoIP

- **Ideal requirements**
  - Seamless integration with the PSTN
    - No disruption with the current telephone system
    - Every new “phone terminal” (POTS phone, IP phone, SIP client on PC) has to be reachable by every other terminal
  - Use of standards
    - Proprietary systems are very expensive, hard to replace and do not interact with other systems
  - Ease of use for the final user
    - Users should be able to continue using the old system if they want
    - No user training should be necessary
  - Reliability
  - Savings
    - Calls between universities should be “free” (i.e. go through the IP network)

VoIP (2)

- **Problems:**

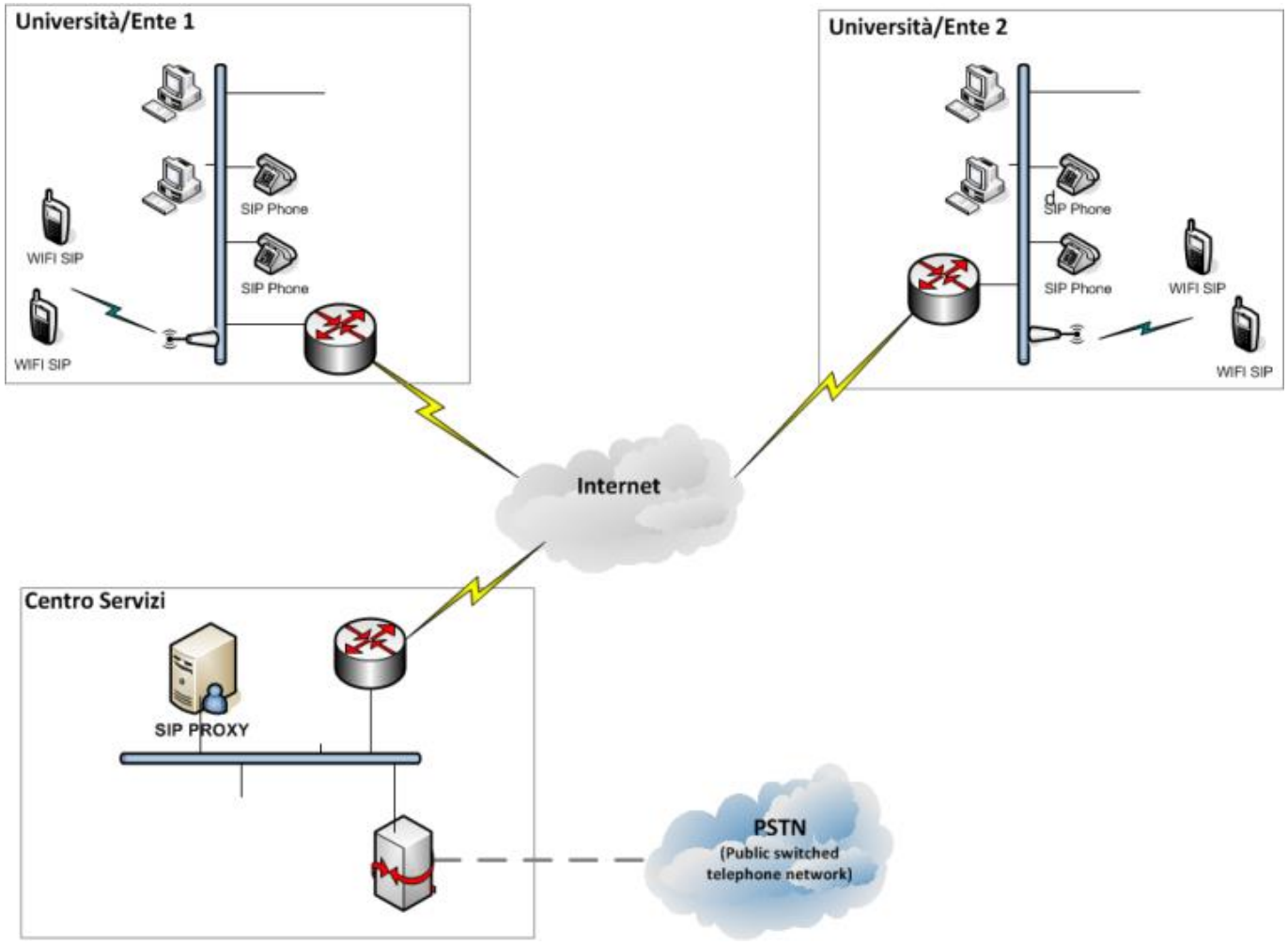
  there is a very heterogeneous telephone environment

  - In many universities there is no telephone switch
  - Most only have a few independent lines
  - Some have a switch with internal phones that can't call outside
  - To design a VoIP system for each University/Faculty/Building would be
  - Complex
  - Expensive
  - Tortuous to implement

VoIP (3)

- **Proposed solution**
  - **Centralized system, in addition to the current setup**
    - The Universities will still keep their current system
    - Some preconfigured VoIP phones could be given out to Universities
    - The VoIP phones can be seen as new, separate lines
  - **Advantages for Universities**
    - Calls to other Albanian universities would be free
    - Calls to European Universities of countries adopting NRENUM would be free
    - Bulk phone traffic agreements could be set up for cheaper fees
  - **Advantages for ANA**
    - Centralized service, recognized importance
    - Revenues

VoIP (4)


Università/Ente 1
SIP Phone
SIP Phone
WIFI SIP
WIFI SIP
Università/Ente 2
SIP Phone
SIP Phone
WIFI SIP
WIFI SIP
Internet
Centro Servizi
SIP PROXY
PSTN
(Public switched telephone network)

NOC/SOC

- **Core management services**
- **Monitoring services**

- The project has include
  - Organizational structure
  - Procedures
    - How to set up a connection to ANA
    - How to request services
    - Interfacing between ANA and local sites
    - Guidelines for Maintenance and Security
    - Requests for Support
    - Incident Handling
  - Trouble Ticketing System
  - Monitoring software
    - Statistics
    - Troubleshooting
    - Diagnostic Tools

Thank You

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