



# IR optika

## **fibre local loops for Slovenian R&E**

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Arnes, p.p. 7, SI - 1001 Ljubljana

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# Arnes

- Academic and Research Network of Slovenia
- Established in 1992 by the gov. of Slovenia
- Public, non-profit institution
- Board of Directors
  - Ministry of Education, Science and Sport
  - Ministry, responsible for Information Society
  - Representative of employees
- Annual Operating Plan, Annual Report
- Technical board: technology, services, development
- Funded primarily by ministries
- Service provider for Research, Education & Culture
  - Network
  - Services



# User Community

- Closed user group
- 1.379 connected institutions:
  - Universities, Institutes, Research laboratories
  - Schools, Museums, (digital) Libraries
    - Primary/secondary schools, kindergartens
- 250.000 individual users



# Services

- Connectivity (IPv4, IPv6, multicast, point-to-point)
- Mobility (ArnesAAI, Eduroam)
- SaaS:
  - email, CMS, LMS, Filesender, IRC, NTP, FTP archives...
  - Multimedia (video conferencing, web conferencing, streaming, VoD)
- IaaS: servers, storage (iSCSI)
- NGI: National Grid Initiative + cluster
- SIX, Domain registration for .SI + DNS
- Security (Si-Cert, server certificates)
- User support : Helpdesk, NOC, Pert
- User education, conferences
- Development (International collaboration!)



# Services - specifics

- >1.000 small organizations
  - Almost no IT staff
  - Minimal IT budget
  - Need extensive user support
- Solution:
  - Simplify
  - Standardise
  - Automate
  - Self Service Web Portal
- Example: AAI federation
  - Start: each member with its own IdP/LDAP
  - Current:
    - IdP/LDAP/IdM as a hosted service
    - Simple procedure to join the federation & get hosting
    - Web portal for members: management, debugging



# Connectivity

- Enough BW?  
✓ backbone



# Backbone: leased dark fibre



# IR Optika – dark fibre LL

- Enough BW?
  - ✓ Backbone
  - ✗ Local loop
    - 12/2014: 702 over DSL/cable/wireless
    - Problem with services in a cloud
    - Labor intensive: provider changes, upgrades
- Solution:
  - Purchase of dark fibre LL
  - Equipment
    - 1 Gbit/s for schools, libraries, ...
    - 10 Gbit/s for faculties, school centres





# IR Optika – dark fibre LL

- „Overcommitment“ EU funds
  - Severe time constraints: 1,5 year
    - Official start: June 2014
    - Tenders published: August 2014
    - Contracts with fiber providers: January 2015
    - Bills: by 31.11.2015



# IR Optika – dark fibre LL

- Is it doable?
  - Market research:
    - Not willing to sell fibre
    - Only if the whole project
    - Exaggerations regarding price
  - Result:
    - 12 providers, 10 chosen
    - Prices within expectations
- A lot of work
  - Scale of the project :
    - 821 LL divided into 54 lots, 50 cities (each city one or more lots)
    - Equipment (CPE, pluggables,...)
    - New PoP in 18 cities
  - Public procurement procedures, run by ministry (!)
  - >5 FTE of non-technical work



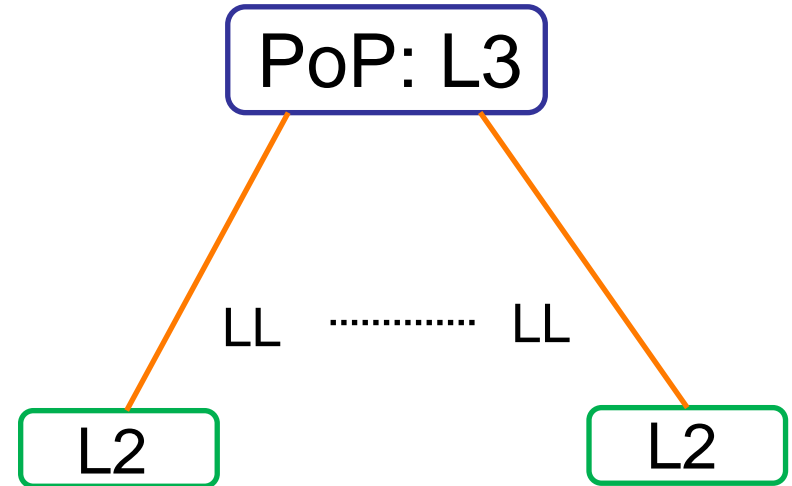
# IR Optika – dark fibre LL

- 754 LL with 25 year maintenance: 12,9M €
  - Connectivity for 850 members
  - 2.450 km of fibre
  - Average length: 3,24 km
  - Average price
    - 17k€ / LL
    - 5,27€ / meter (2,13 – 27,72 €)
- Equipment with 4 year maintenance: 1,6M €
  - L2 CPE:
    - 1 Gbit/s: 774 x Cisco 2960CX-8TC-L
    - 10 Gbit/s: 51 x Cisco WS-C2960X-24TD-L
  - L3 aggregation switch: 63 x Cisco C4500X
  - Optical equipment: pluggables, WDM muxes, patch cords
  - 18 new PoPs: rack, UPS...



# IR Optika – Cost optimization

- Sharing a L3 device



- Sharing a fibre pair

- GE/10GE

- via fibre pair
- via single fibre : 2 organizations
- CWDM/DWDM: many organizations



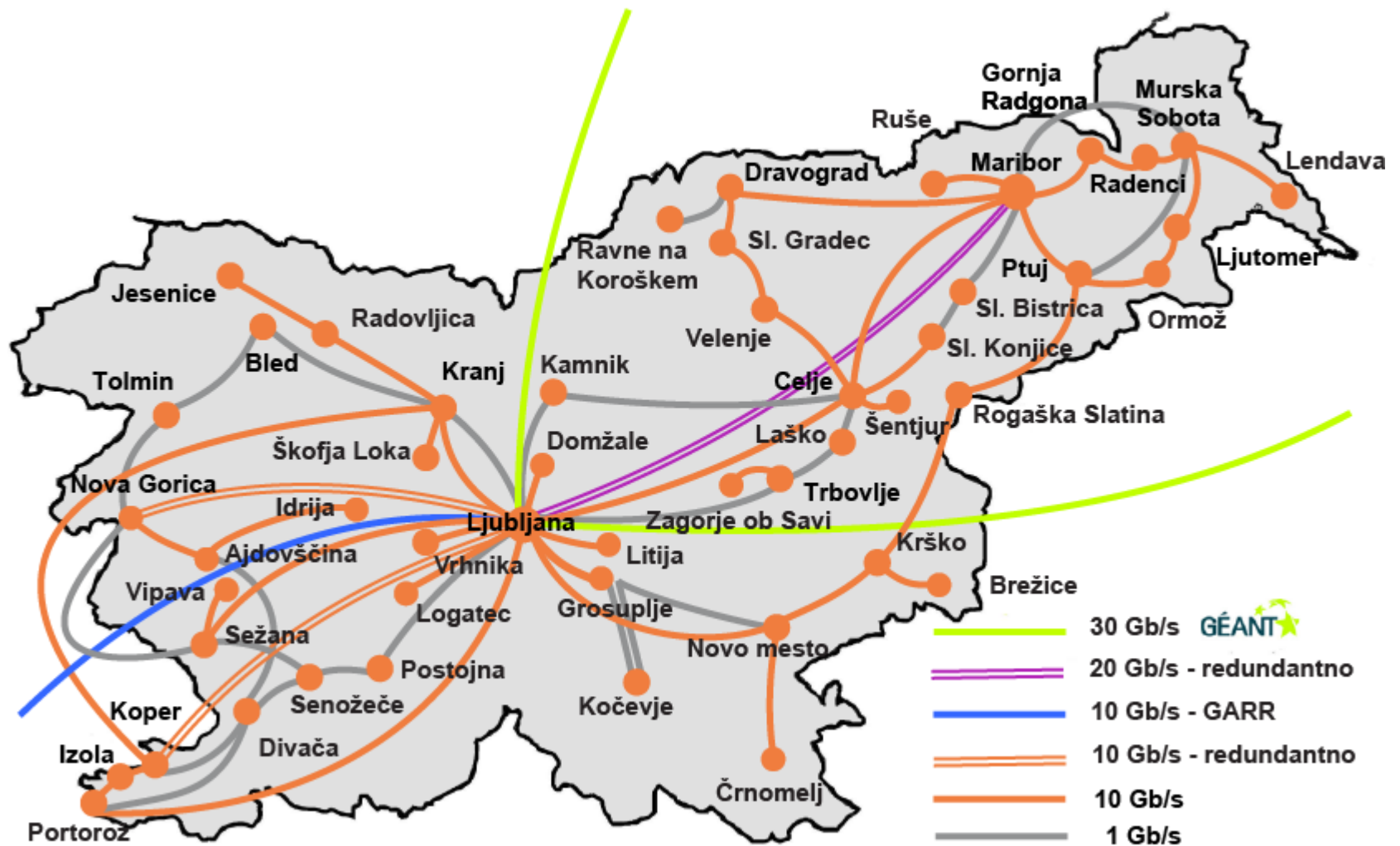
# Backbone: leased dark fibre



# Backbone: leased dark fibre 2



# Backbone: IP layer



# IR Optika – dark fibre LL

- Lessons learned:
  - Carriers are prepared to sell fibre (92% success – 754/821)
  - Importance of documentation (standardize!)
  - Once you own fibre -> involvement with construction permits
  - Automation of equipment configuration/management is a must
  - Public awareness
    - Before: why do we need fibre?
    - Now: what about us!!? Awareness among politicians!
- Savings
  - LL: leasing versus purchase: 240€/m versus 17k€/25y (**72k€ : 17k€**)
  - Equipment: economy of scale -> discounts
  - OPEX: no more transitions between providers and upgrades





# Plans for the future

- Going deeper into the LAN
  - WLAN at all schools: 2017-2020
  - 950 locations
  - Central procurement and management
- Upgrading the network
  - Aging DWDM (2007, ADVA FSP 3000)
  - Switching/routing equipment



