P9: Collaborative Programs in Green Communications: Successful Cases and Key Remaining Research Challenges

ECO net

low Energy
COnsumption
NETworks

SEVENTH FRAMEWORK PROGRAMME

http://www.econet-project.eu

cnit National Inter-University Consortium for Telecommunications

Department of Electrical, Electronic and Telecommunications Engineering, and Naval Architecture (DITEN) – University of Genoa, Italy

TNT Telecommunication Networks and Telematics Laboratory

Energy Efficient Networking: The ECONET Project (low Energy COnsumption NETworks)

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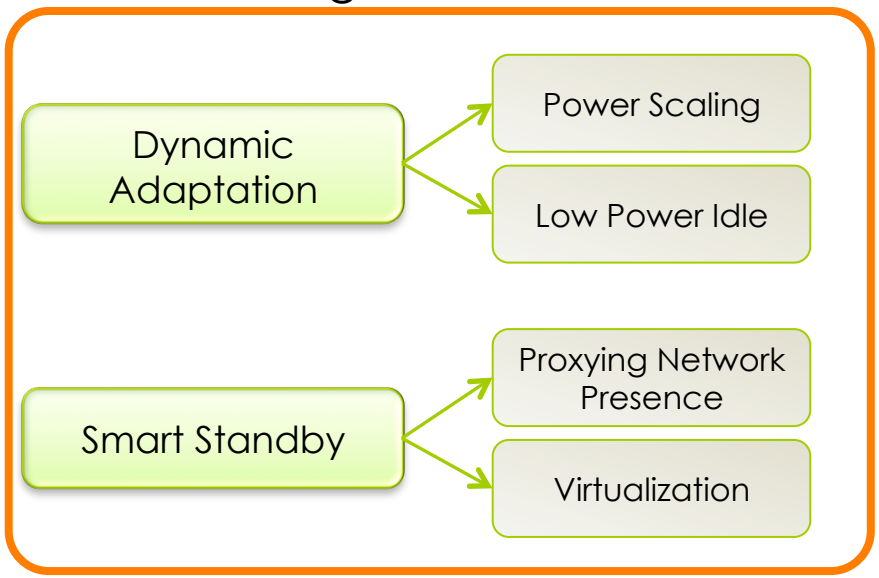
Project data at a glance	
Project Type	FP7 Integrated project
Project coordinator	Prof. **Raffaele Bolla** (CNIT, c/o University of Genoa)
Project duration	October 2010 – September 2013 (36 months)
Consortium	15 partners from 8 countries and 2 American University associated
Project budget	10.5 M€ (6.2 M€ from EU)
Resources	1168 PM (33 full time persons for three years)
Website	http://www.econet-project.eu

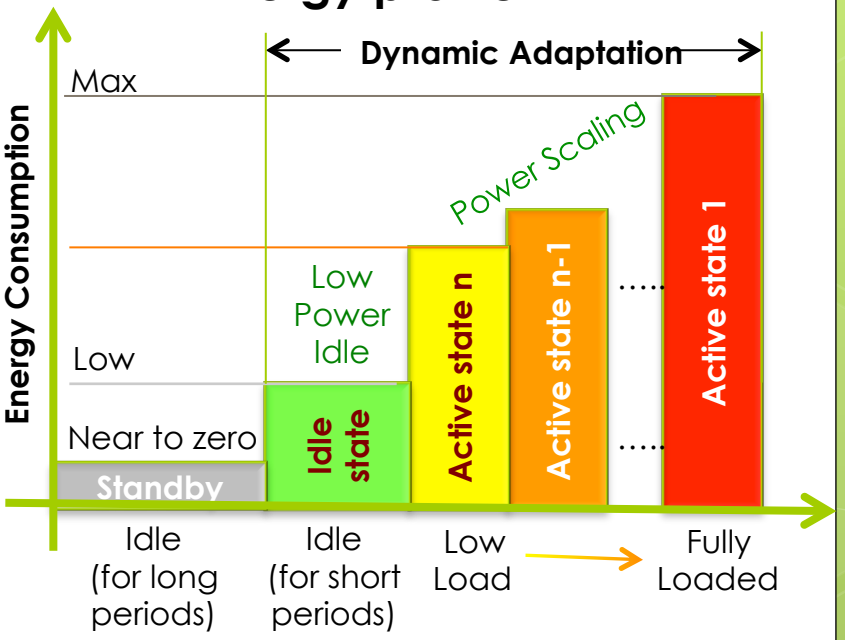
Participant organisation name	Short name	Country
Consorzio Nazionale Interuniversitario per le Telecomunicazioni – Research Unit at DITEN-University of Genoa (Coordinator)	CNIT	Italy
Mellanox Technologies	MLX	Israel
Alcatel Lucent	ALU	Italy
Lantiq	LQDE	Germany
Ericsson Telecomunicazioni S.p.A.	TEI	Italy
Telecom Italia	TELIT	Italy
Greek Research & Technology Network	GRNET	Greece
Research and Academic Computer Network	NASK	Poland
Dublin City University	DCU	Ireland
VTT Technical Research Centre	VTT	Finland
Warsaw University of Technology	WUT	Poland
NetVisor	NVR	Hungary
Ethernity	ETY	Israel
LightComm	LGT	Italy
InfoCom	INFO	Italy
Portland State University	PSU	USA
University of South Florida	USF	USA

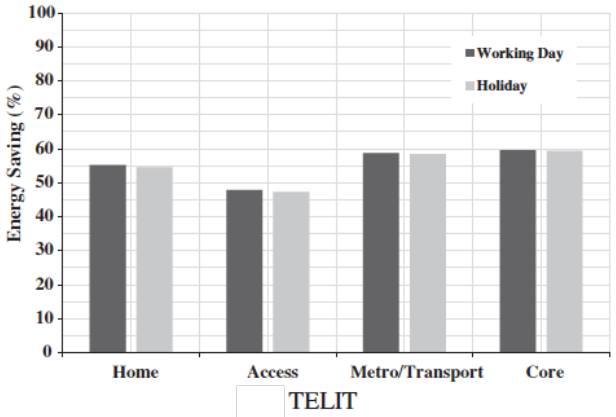
ECONET Approach

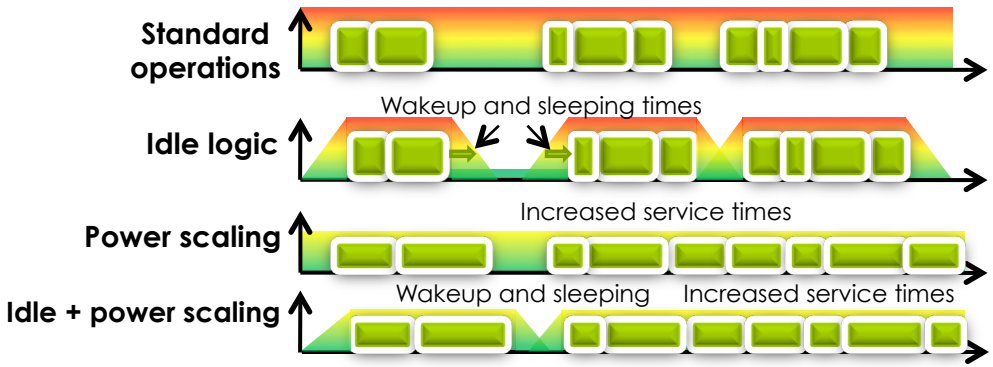
Power management



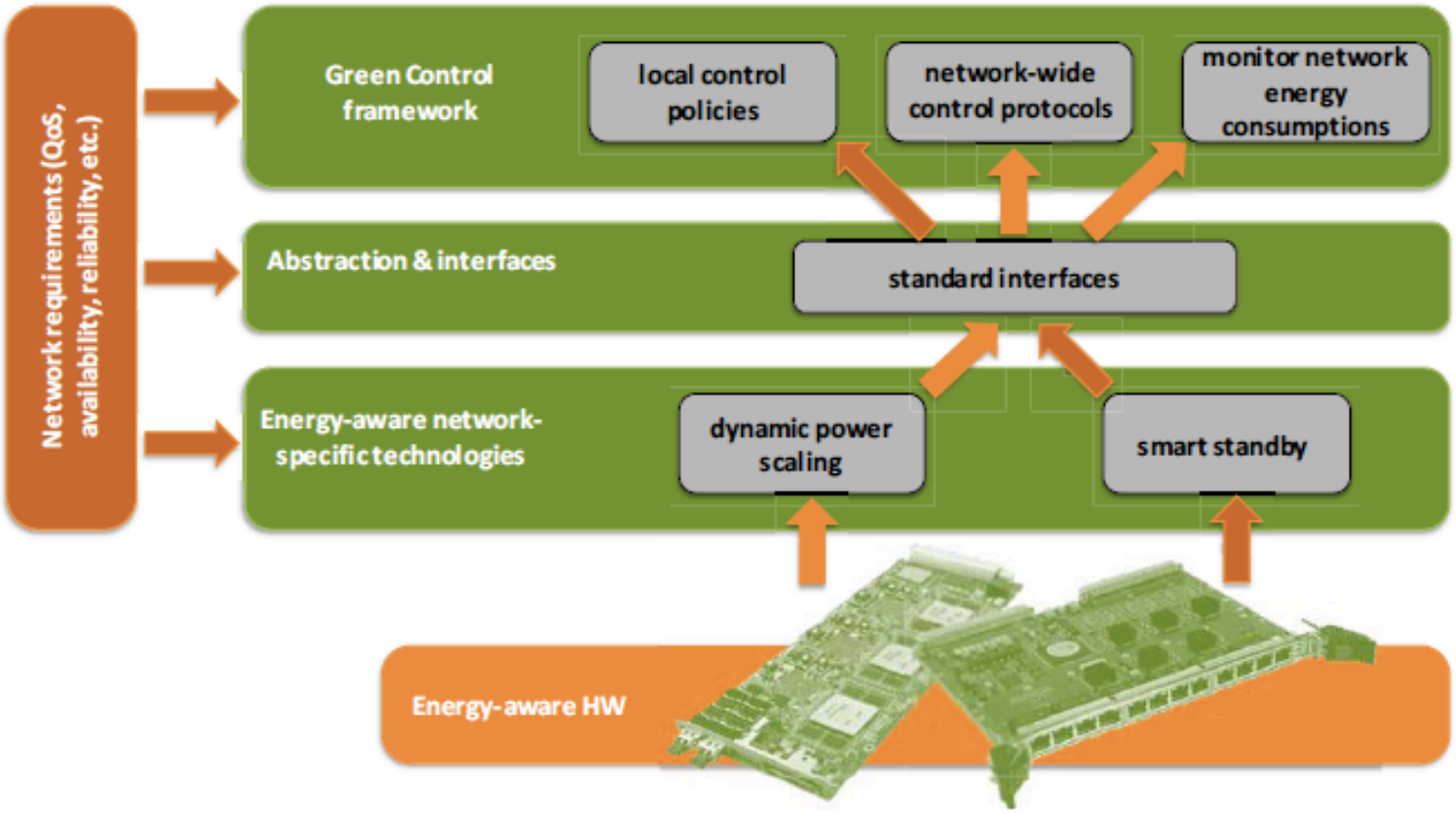
Energy profile



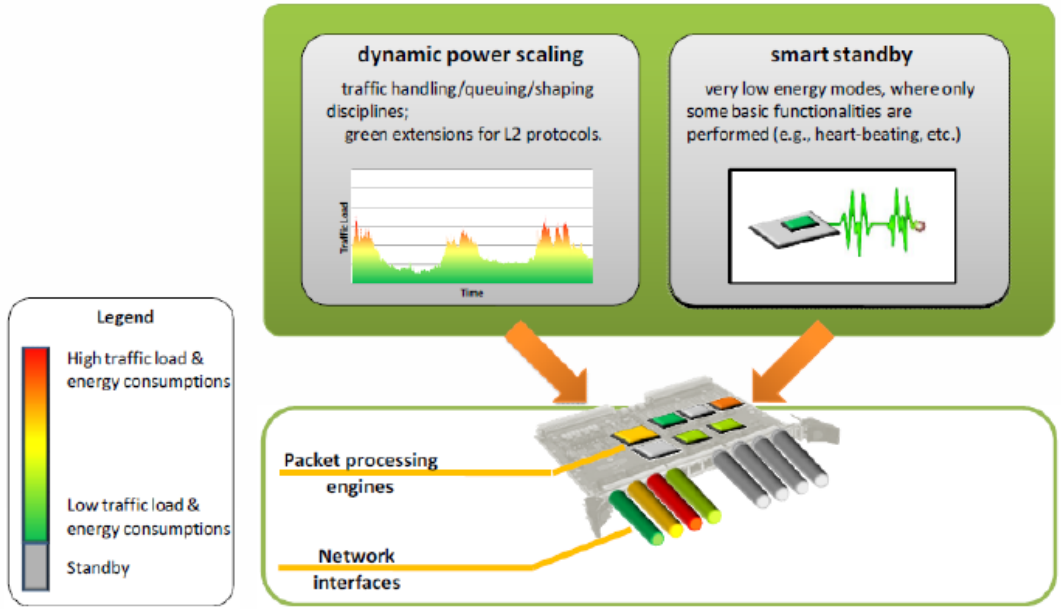


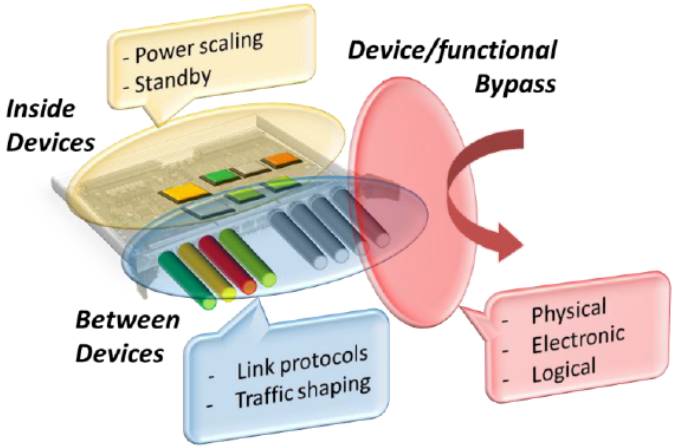


The ECONET approach

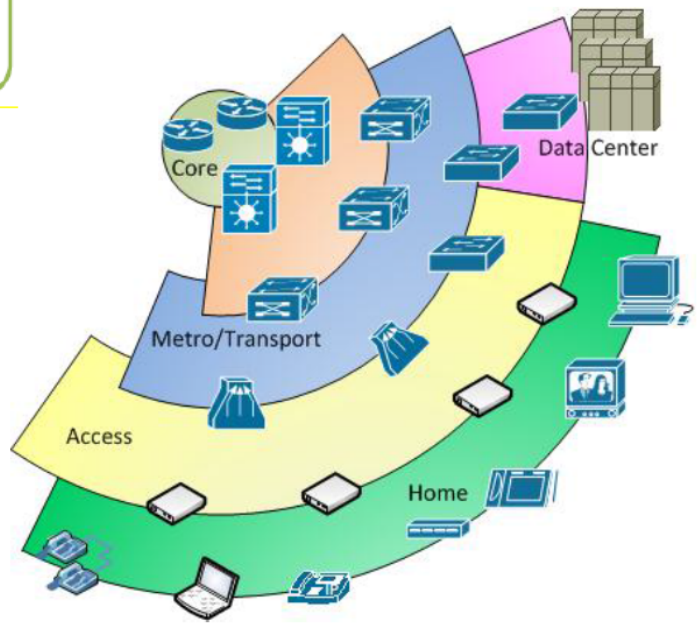


ECONET Approach

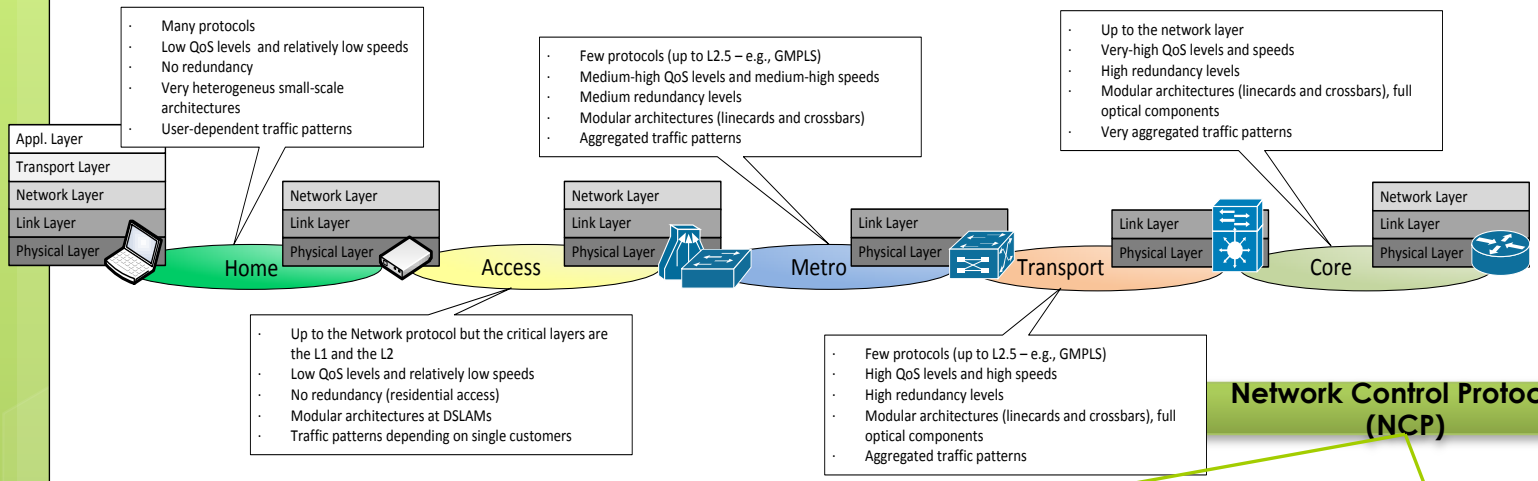




Data Plane Optimization



Network-wide approach



Network Control Protocols (NCP)

Operator-driven long-term off-line optimizations

Autonomic and short-term on-line optimizations

Routing & Traffic Engineering

Given:
- The traffic matrix
- Service requirements
- The energy-aware capabilities of network nodes and links

Dynamically move the traffic flows among network nodes in order to minimize the overall network consumption

Local Optimization Policies (LCP)

Given:
- the actual traffic workload from input links
- Local service requirements

Dynamically find the best energy-aware configuration

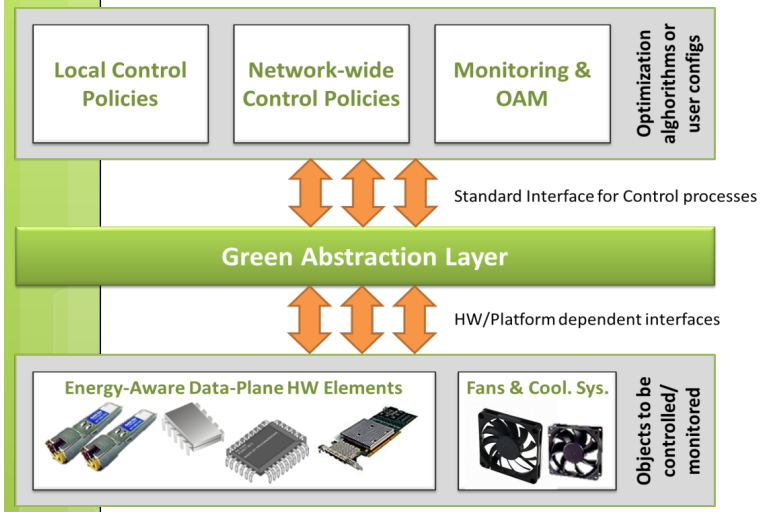
OAM

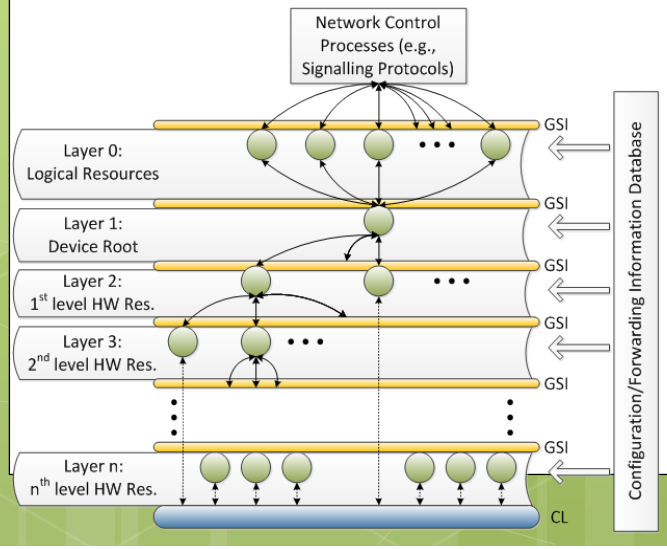
Given the history of measurements regarding:
- network performance
- energy consumption

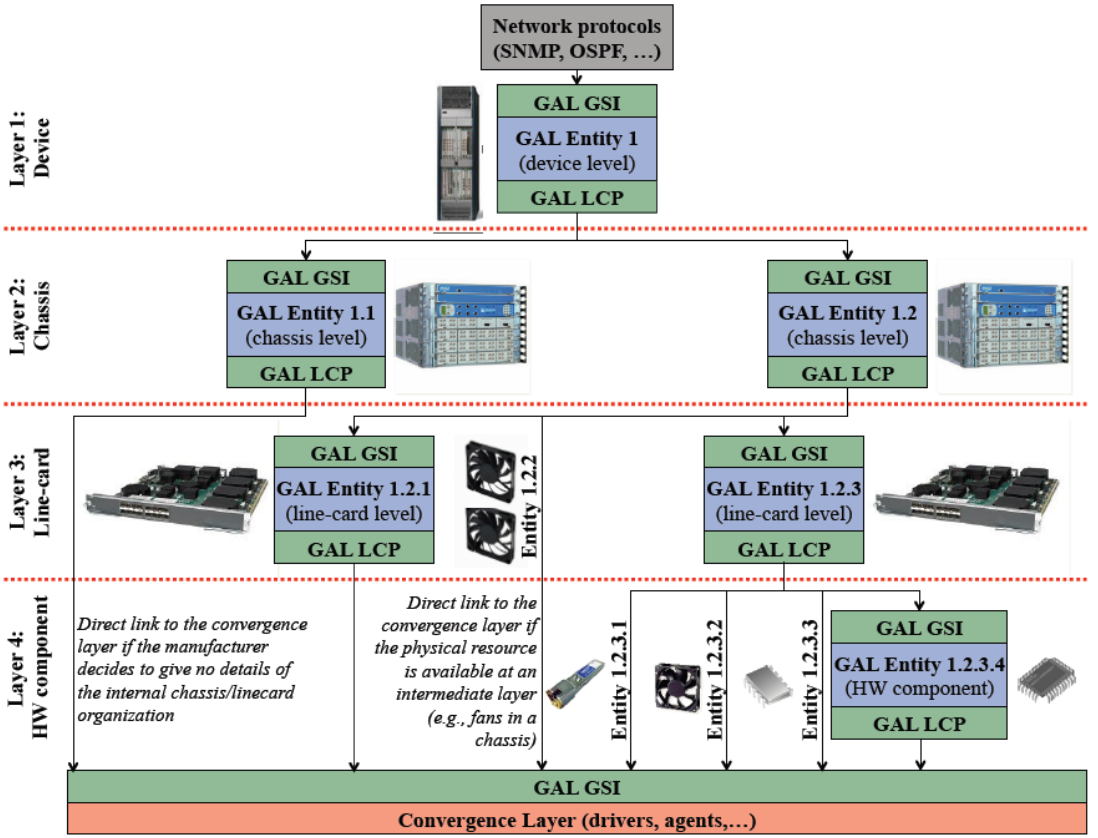
The operator can explicitly plan and/ or reconfigure the settings of:
- single device
- traffic engineering and routing.

The Network Operation Center (NOC)

Green Abstraction Layer



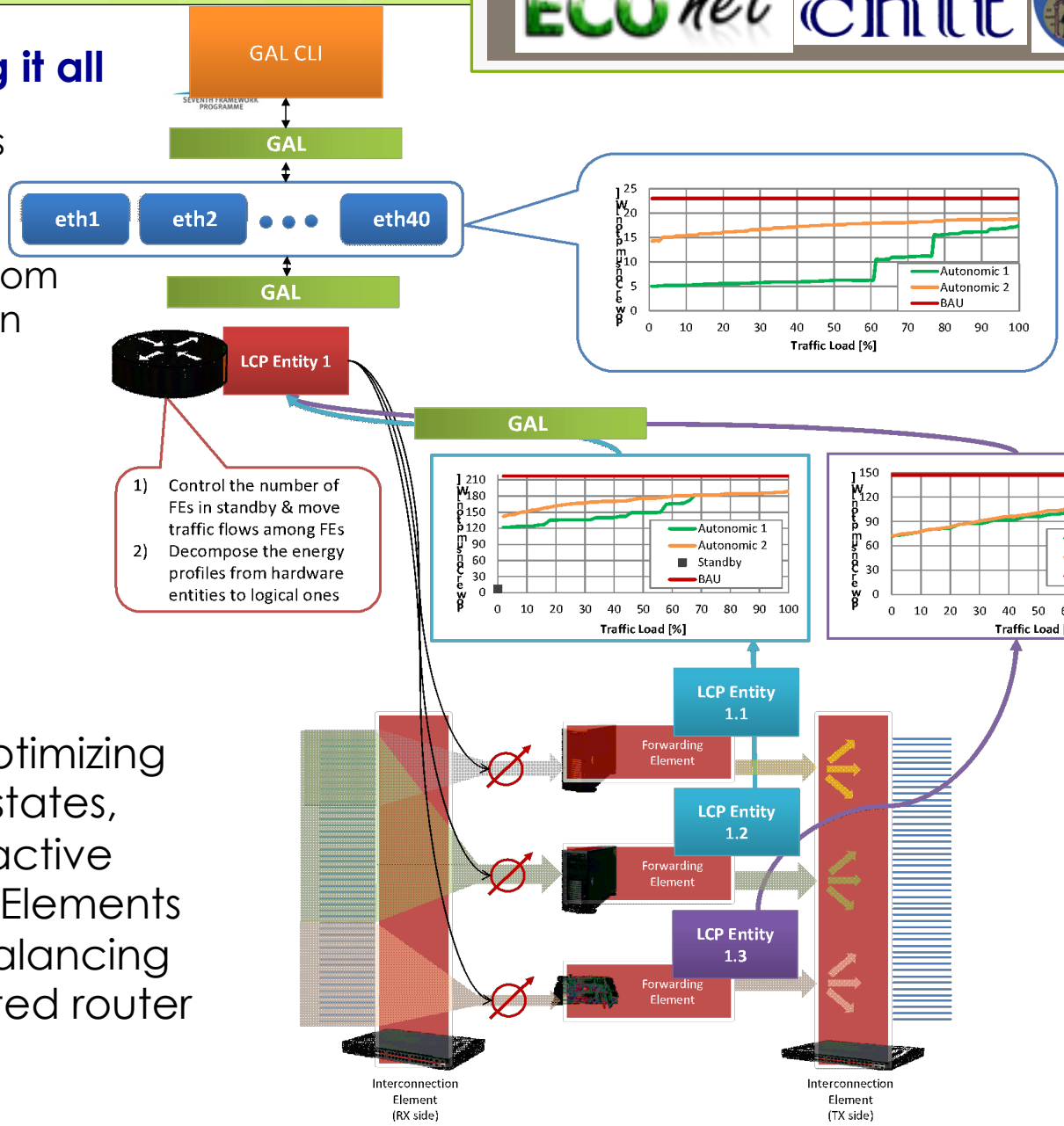




The GAL Hierarchical Architecture

Implementing it all

- 9 prototypes
- 9 demos
- Final test bench at Telecom Italia Lab in Turin



Example: optimizing AR and LPI states, number of active Forwarding Elements and load balancing in a distributed router

What next?

- Toward a unified view of virtualization
- More integration among transport network, data centers and cloud
- Network flexibility and programmability (SDN?)
- GAL standardization (Work Item open in ETSI)

Some References

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