ALCATEL-LUCENT:
Consume less energy?
ICT, we need more of it

Philippe Richard

June 2013

ALCATEL-LUCENT
GETTING TO KNOW US

lightRadio™ a technology breakthrough, the size of a Rubik's cube, delivers lightning fast Internet, consumes less power than a 60W light bulb and supports 30+ users
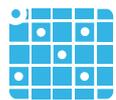
80+ power utility networks WORLDWIDE use our smart grid solution to save money, prevent outages and decrease their carbon footprint

We have laid 1.284M+ km of 100G optic fiber- enough to go around Earth 32 times

We have laid 500,000+ km of undersea cable - enough to go around Earth 12.5 times

FP3

PSE

Our FP3 and PSE chips each support speeds of 400 Gb/s, equivalent to 70,000 users each watching a HD video SIMULTANEOUSLY

80+ railway operators WORLDWIDE use our equipment to ensure millions of on-time, safe, connected journeys

1+ in 3 people WORLDWIDE connect to the Internet from home via our equipment

We even have a YELLOW SUBMARINE (ROV)!

LARGEST INSTALLED BASE IN THE WORLD – GROUND, AIR AND SEA

INDUSTRY TRENDS
A FAST-GROWING INDUSTRY

+30%
FIXED BROADBAND CONNECTIONS

532 Million — 2011
691 Million — 2015

+32%
MOBILE CONNECTIONS

5.5 Billion — 2011
7.3 Billion — 2015

+346%
WI-FI PUBLIC SPOTS

1.3 Million — 2011
5.8 Million — 2015

+990%
M2M DEVICES

1.1 Billion — 2011
12 Billion — 2015

+129%
APPLICATIONS DOWNLOADS

18.2 Billion — 2011
41.7 Billion — 2015

+134%
SMARTPHONE SALES

428 Million — 2011
1 Billion — 2015

+100%
ENTERPRISE CLOUD SERVICES*

12 Billion — 2011
25 Billion — 2015

+879%
MOBILE VIDEO CONSUMPTION

429 Million — 2011
4.2 Billion — 2015

*Source: Yankee

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INDUSTRY TRENDS
A FAST-GROWING INDUSTRY

Home & Enterprise	Access & Aggregation	Metro	Edge	Core	Service Core & Data Center
2017					
18.8 GW	62 GW	3.3GW	5.5 GW	1.2 GW	78 GW
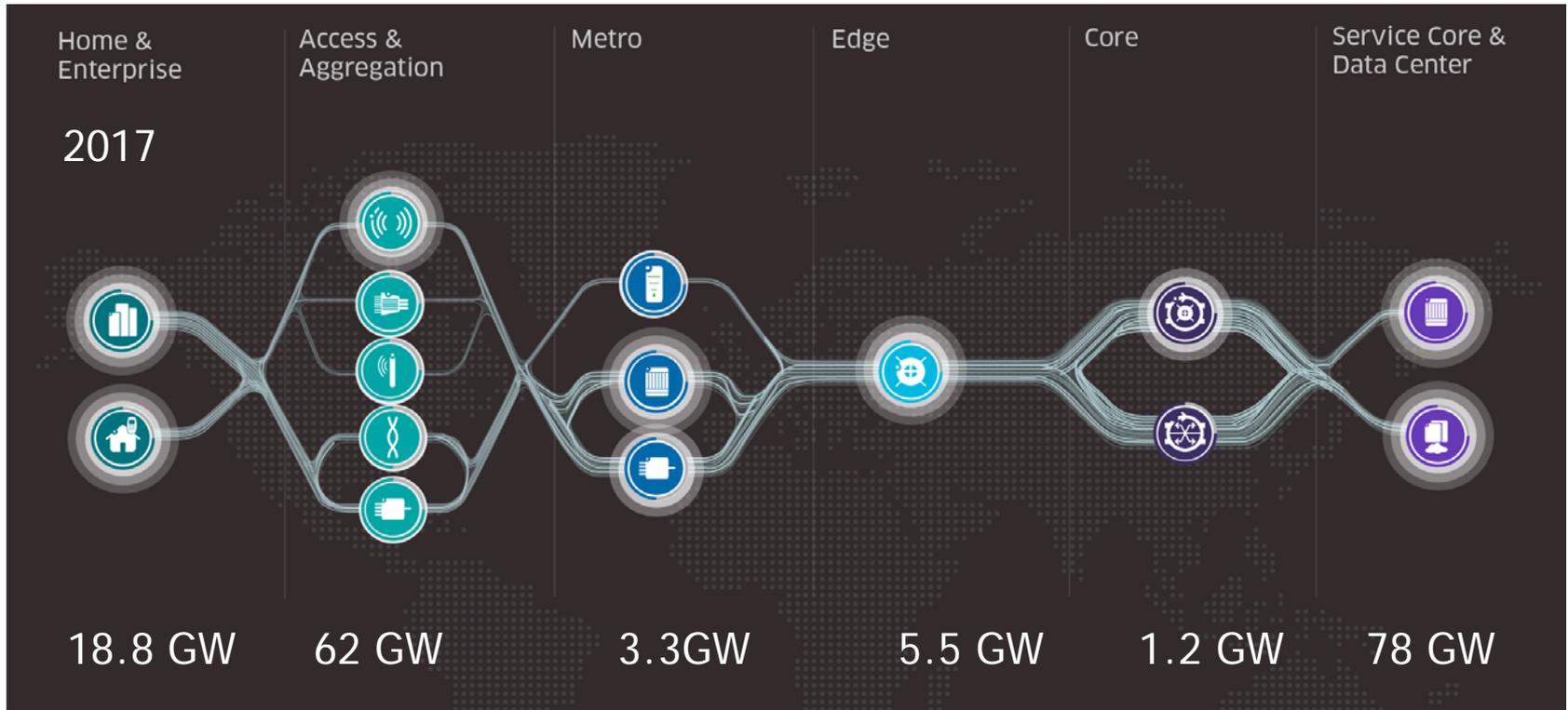
If nothing done, the internet would go from 78GW in 2013 to 169 GW with a huge increase in the access domain

DEVELOPING ECO-SUSTAINABLE NETWORKS
HOLISTIC LIFECYCLE APPROACH

Design
for
Environment

Smart
Manufacturing

Product
Stewardship

Eco
Packaging

Efficient
Transport

Alternative
Energies

Network
Optimization

Energy
Efficiency

Take-Back
/ Recycling
/ Reuse

DEVELOPMENT   MANUFACTURING   PACKAGING   DISTRIBUTION &
INSTALLATION   USE &
SERVICING   RECYCLING

Use & servicing represent 80%-90% of eco impact

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DEVELOPING ECO-SUSTAINABLE NETWORKS
REDUCING POWER CONSUMPTION METHODS

OPTIMIZED
ARCHITECTURE / SW
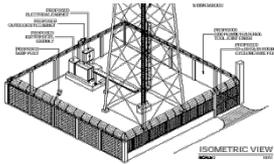
NEW
HARDWARE

BETTER
UTILIZATION

ECO-SUSTAINABLE NETWORK
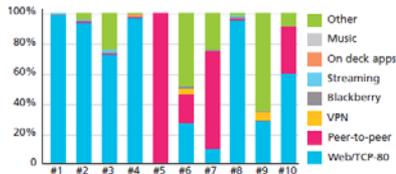
BETTER
CONTROL
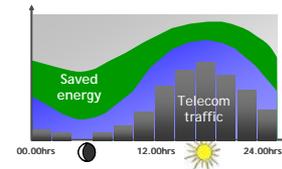
INTELLIGENT
THERMAL / COOLING

SMART
PHYSICS

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NETWORK DESIGN FOR ENERGY EFFICIENCY

SAVE

69%

POWER

Due to increased **density** and **efficiency** at the **packet transport layer**
+ Remote OA&M at the optical and IP layers: reduce truck rolls and site visits

SAVE

75%

FLOOR SPACE

SAVE

1.1M

KILOWATT-HOURS

Bell Labs study of a typical HLN approach
566 metric tons of CO2 per year
1.6 million km in an economy class car

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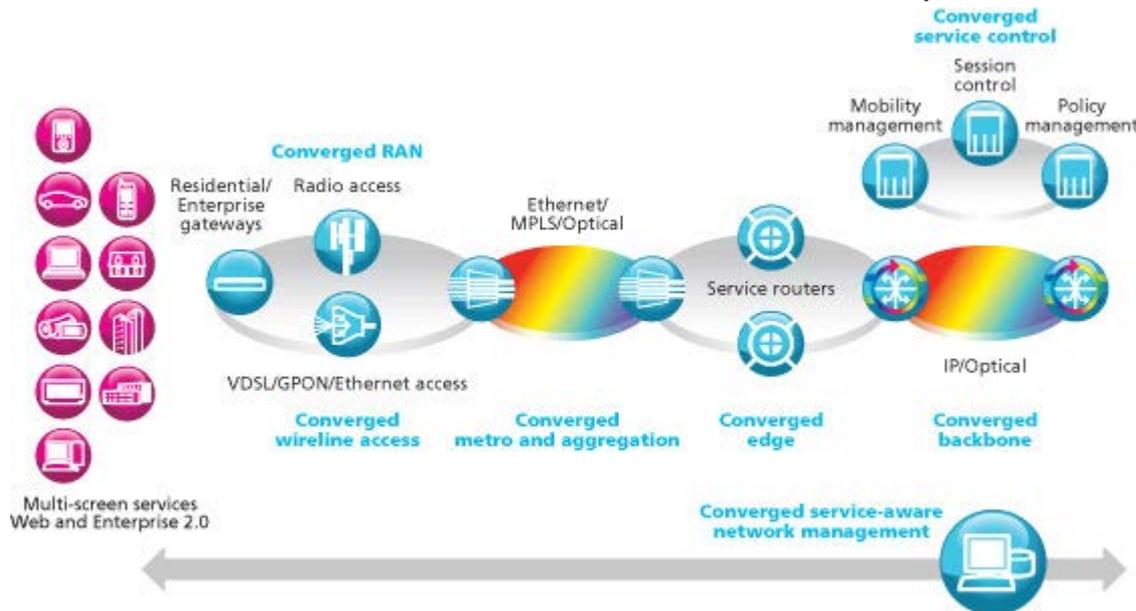
ECO-SUSTAINABLE NETWORKS: WIRELESS
NETWORK DESIGN RADICAL CHANGE

9768 METRO RADIO
OUTDOOR LTE

telecoms
LTE AWARDS
2012

TODAY

ENERGY DISTRIBUTION

CO_2

Base Stations
5 million | 1,7 kW
75 TWh | **38**Mt eq CO2/yr

Network Control
17,000 | 1 kW
<1 TWh | <0.1Mt eq CO2/yr

Core Network
2,500 | 10 kW
~2 TWh | <0.5Mt eq CO2/yr

TOMORROW

EFFICIENT NE TECHNOLOGY & C- RAN

LIGHTER SITES

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ECO-SUSTAINABLE NETWORKS: WIRELESS

Green Air Interface

- Large Scale Antenna Systems
- Very High Bandwidth
- Bandwidth and Capacity Adaptation

Network Architecture & Mgmt

- Dynamic Management for Energy Efficiency
- Small Cells, Relays and Repeaters, HetNets
- Beyond Cellular Green
- New BS Architecture – Cloud Computing for Signal Processing
- Energy Efficiency Evaluation Framework

Base Station Hardware

- Ultra Low-Power Base-Station on a Chip
- Load Adaptive Transceivers
- High Efficiency RF-Power Amplifiers
- Renewable Energy Powering
- New Architectures such as lightRadio™
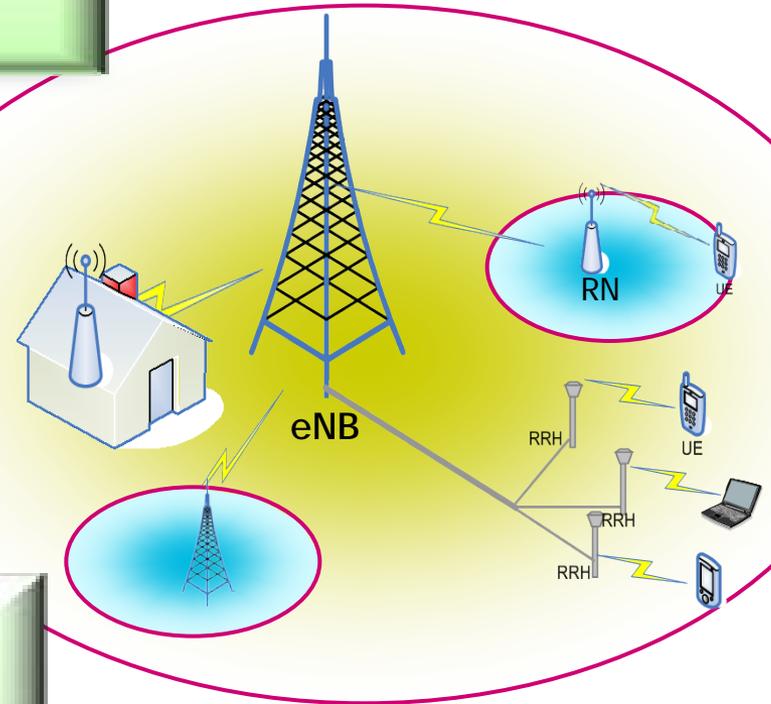
ECO-SUSTAINABLE NETWORKS: WIRELESS

Base station level

Site level

Network level

Hardware integration	Multi-carrier power amplifier
Dynamic software	Dynamic power save
No air conditioning outdoors	Direct cooling
No feeder	Remote radio head
High and focused coverage	Smart antenna
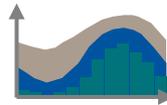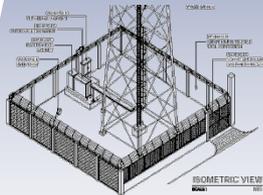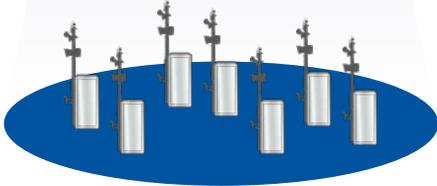
earth
Energy Aware Radio and neTwork tecHnologies

15 Partners from 10 European countries

Funding Scheme: Large scale Integrating Project (IP)

Total Cost: € 14.8 m
EC Contribution: € 9.5 m

Duration:
January 2010 - June 2012

Project Coordinator:
Dietrich Zeller, Alcatel- Lucent

Technical Manager:
Magnus Olsson. Ericsson

ECO-SUSTAINABLE TECHNOLOGIES
7950 XRS CORE ROUTER FAMILY
UNPARALLELED SCALE & EFFICIENCY, WITH FULL FLEXIBILITY TO HANDLE BROAD RANGE OF CORE NETWORKING NEEDS

-66 %
ENERGY CONSUMPTION

5X
MORE DENSITY

66%
LESS ELECTRICITY CONSUMPTION

1
PLATFORM,
NO COMPROMISES
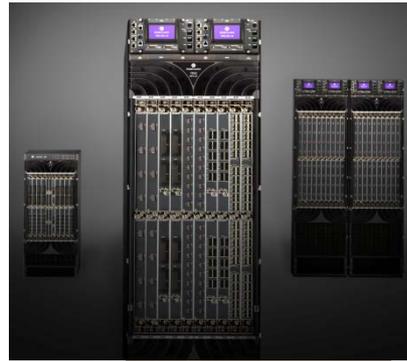
"Our routing systems sit at the massive intersections of the Internet, where billions of individual messages are directed every second. Our technology provides more capacity and more flexible traffic management with reduced energy consumption, helping to ensure better performance from global broadband networks."
Basil Alwan
President, IP Division

POWER CONSUMPTION (W/Gb)

LOCAL DISTRIBUTION AND STORAGE

NATIONAL DISTRIBUTION AND STORAGE

CORE NETWORK

| 50 Gbps | 100 Gbps | 200 Gbps | 400 Gbps | 1 Tbps |

TECHNOLOGY EVOLUTION
(GENERATIONS OF LINE CARDS)

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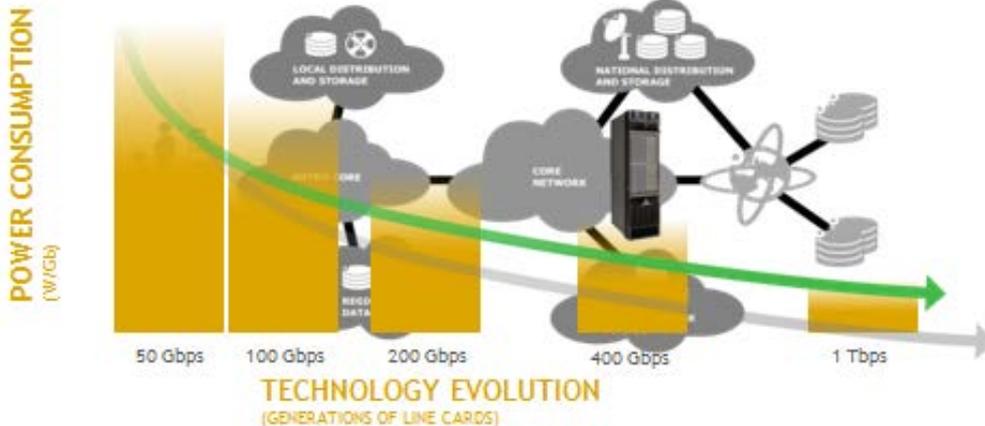
ECO-SUSTAINABILITY
ACHIEVEMENTS & COMMITMENTS

KEY ACHIEVEMENTS

+25% INCREASE IN ENERGY EFFICIENCY OF KEY PRODUCTS

-24% DECREASE IN CARBON FOOTPRINT VS 2008

Eco-innovations

- LIGHTRADIO™ : reduce energy consumption of mobile networks by **50%**

- FP3 PROCESSOR: **50%** less power

- 7950 EXTENSIBLE ROUTING SYSTEM (XRS): **66%** less power to reduce the eco impact of IP networks

Bell Labs

GreenTouch™, making networks **1,000** times more energy efficient

PERFORMANCE TARGETS

-50% DECREASE IN CARBON FOOTPRINT BY 2020

2020 -50%

Eco-innovations

+75% INCREASE IN ENERGY EFFICIENCY FOR LIGHTRADIO™ BY 2015

The Greenhouse Gas Protocol Initiative
The foundation for sound and sustainable climate strategies

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INNOVATION CHALLENGES

Lower relative VENTURE CAPITAL investments in Telecom

Telecom operators desire to minimize number of suppliers while maintaining innovation

FEWER PLAYERS

FUNDING BY LARGE SUPPLIERS

innovacom

Partnerships with startups and with customers

Direct and indirect funding

Annualized metrics:

500 startups evaluated

100 met and reviewed in detail

15 actions

AT&T FOUNDRY
WHERE IDEAS ARE MADE

"open innovation" and "co-creativity " are key

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CONCLUSIONS

TRANSFORMING ICT NETWORKS FOR A SUSTAINABLE FUTURE

ICT NETWORKS ARE GROWING RAPIDLY
- Scaling networks is becoming more difficult
- Bringing focus to energy efficiency

ICT AND RESEARCH COMMUNITIES ARE ORGANIZING TO ADDRESS CHALLENGES
- Dramatic, holistic change, but over long term evolution
- Cooperative organizations such as GreenTouch guiding (re)evolution

SEVERAL PROMISING RESEARCH DIRECTIONS AND INITIAL RESULTS HAVE BEEN OBTAINED

MORE WORK REMAINS!

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AT
THE
SPEED
OF
IDEAS™

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ECO-SUSTAINABLE TECHNOLOGIES
FP3 400G NETWORK PROCESSOR

FASTER, SMARTER AND GREENER

FP3 | *latest silicon design techniques reducing power consumption by 50% or higher for every packet processed*

4X

THE SPEED
OF TODAY'S NETWORKS

REDUCES THE IMPACT ON
ENVIRONMENT

up to **50%** less power than
equivalent chips in use today

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