BEFORE STARTING

HOUSEKEEPING

- Turn on your system’s sound to hear the streaming presentation
- **Questions?** Submit them into the question box!
- The webinar on Twitter @ICTFOOTPRINT.eu
Webinar: Decreasing ICT energy consumption – the power of data centres and people’s will

In partnership with: Asperitas Immersed Computing

Wednesday, 18th July 2018
Speakers

Maikel Bouricius
Marketing Manager
Asperitas

Daniel Frohnmaier
Project Manager
START2ACT & Geonardo
Environmental Technologies

Rita Meneses - Moderator
Marketing Analyst & Researcher, Project Manager
Trust-IT Services
The ICTFOOTPRINT.eu initiative, in a nutshell

**Mission**

Become “THE” consolidated effort that, at European level, raises awareness on metrics, methodologies & best practices in measuring the energy and environmental efficiency of the ICT-sector, to facilitate their broad deployment & uptake.

**Partners**

- Trust-IT Services
- Deloitte
- Eurocities

**Stakeholders**

- ICT Intensive SME
- Standard Development Organisations
- Cities & Public Administration
- ICT Suppliers

Helping you choose your Low Carbon & Energy Efficiency in ICT
ICTFOOTPRINT.eu Results so far

- +4,000 Community Members
- 24 ICT Sustainable Suppliers from 8 different countries
- 13 Advisory Group members from 7 different countries
- 5 languages helpdesk (ENG, FR, DE, IT, ES)
- 1 Paper published in Scientific Event proceedings

- 2 user-friendly Self-Assessment Tool (SAT-O & SAT-S)
- 44 Success Stories on Green ICT
- Map of ICT Standards with 20 factsheets
- 9 webinars with 25 different speakers & +420 registrations
- Active Presence in 16 ICT & energy-aware events, plus visibility in 5 events

Consolidated community of +4,000 through an effective marketplace, dynamic Map of ICT Standards and communication & dissemination actions

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Decreasing ICT energy consumption – the power of data centres and people’s will
## Main Outputs for our stakeholders

### Marketplace
- **Buyer:** Find sustainable ICT suppliers & publish ICT sustainable needs.
- **Seller:** publish ICT sustainable services or procurements & search for clients.

### Webinars
Know more on sustainable ICT: get practical guides from a highly qualified experts in the Sustainable ICT sector and learn how to apply them in your organisation.

### Help Desk
- **In 5 languages**
- Get support about how to decrease your carbon footprint & implement ICT energy efficiency standards with Online Assistance (EN, FR, ES, DE, IT).

### Success Stories
Best practices in Sustainable ICT. Search how players like you got energy savings & carbon footprint reduction. Or even showcase your success story!

### SAT-S & SAT-O
Measure your own carbon footprint and start learning how to become sustainable thanks to ICT standards & methodologies.

### Map of ICT Methodologies
20 downloadable fact-sheets of ICT methodologies & standards, understand & measure your ICT goods, services organisations & cities’ carbon footprint.

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**Join us and get energy savings by choosing low carbon ICT**

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18th July 2018

ICTFOOTPRINT.eu Webinar

Decreasing ICT energy consumption – the power of data centres and people’s will
A Low Carbon ICT engaged community

ICTFOOTPRINT.eu Community 1.900 members

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMEs</td>
<td>53%</td>
</tr>
<tr>
<td>Large Enterprises</td>
<td>12%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>5%</td>
</tr>
<tr>
<td>NPO</td>
<td>24%</td>
</tr>
<tr>
<td>SDO</td>
<td>0,6%</td>
</tr>
<tr>
<td>Media</td>
<td>2,20%</td>
</tr>
<tr>
<td>Academia &amp; Research Centre</td>
<td>3,3%</td>
</tr>
</tbody>
</table>

Amongst the connections that count (multipliers/influencers)

- 6,700 Followers
- 1,100 Followers
- 1,400 Followers
- 3,000 Followers

- +430 Connections
- +500 Connections
- +400 Connections

8 webinars with reputable speakers

21 sustainable ICT sellers

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Get to action! How Policy can support Green IT?

Why?

- Sensibilise people to on policy actions that support the development of green ICT in Europe
- Learn how ecodesign principles can be applied in ICT sector
- Develop your organisation’s Green ICT assessment during the hands-on session with ICTFOOTPRINT.eu SAT-O

Who?

Public Authorities, ICT companies, NGO on sustainability and ICT

Key priorities, insights & further conclusions to be included in “Policy Action Plan & ICTFOOTPRINT.eu Sustainability Roadmap” Report for the European Commission

REGISTER ON https://ictfootprint.eu/user/register TO GET THE REPORT AS SOON AS IS AVAILABLE
How sustainable is your ICT company?


SAT-O (for Organisations) – Free & simple tool to calculate the overall carbon footprint of your organisation

- Digital services provided & used by the organisation
- Structural impact of the building and personnel’s
- Your own personalised report, with a light reading style, that shows the approximate climate change and primary energy footprint of your ICT-intensive organisation assessed over one year

Assess the ICT carbon footprint of your organisation, for sustainable ICT decisions

TRY “SAT-O” TOOL & MAKE INFORMED DECISIONS ON HOW TO MAKE YOUR ICT SUSTAINABLE & ENERGY EFFICIENT
Energy Producing datacenters with Immersed Computing®

Name Maikel Bouricius

18-07-2018
THE NEW SUSTAINABILITY FOR DATACENTERS

“DATACENTRES ARE BIG ELECTRICAL HEATERS WITH LIMITS AND WE COOL THEM. WHY NOT MAKE THEM MORE EFFECTIVE HEATERS?”

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THE GLOBALALAL CHALLENGE

ENERGY FOOTPRINT OF INFORMATION FACILITIES

Datacentres, Server rooms, Network hubs etc.

Estimated **4%** Global Electricity Production (25 PWh)

\[ 4\% = 1 \text{ PWh} \]

\[ 1,000,000,000,000,000,000 \text{ Wh} \ (10^{15}) \]
THE LOCAL REALITY

THE CHALLENGE

“Is Singapore’s audacious vision of a green, high-rise data center even possible?”

“Apple’s Ireland data center could use more energy than the city of Dublin.”

“The world’s cryptocurrency mining uses more electricity than Iceland.”

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THE URGENCY

THE CHALLENGES

INCREASE IN INFORMATION FOOTPRINT
DEMAND FOR HIGH DENSITY CLOUD
CONSOLIDATION OF POWER DEMAND
OVERLOADING OF OUTDATED POWER GRID
GLOBAL NETWORK LOAD
CREATING EXERGY
IMMERSED COMPUTING®

IMMERSED COMPUTING® HAS BEEN DEVELOPED FOR

Sustainability  Flexibility  Efficiency

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SUSTAINABILITY IS NOT A COMPROMISE
LET’S DO IT DIFFERENTLY

WHERE IS THE LIMIT?

AIR

VS

LIQUID

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LET’S DO IT DIFFERENTLY
IT’S SCIENCE

83333 L/s AIR VS WATER

1 MJ/s

Water required for ΔT of 5 °C

4187 J/kg°C * 1 kg/L = 4187 J/L/s per 1°C

5°C with 1 MJ/s: 48 L/s

Liquid can travel 200 TIMES THE DISTANCE with same thermal losses

IMMERSED COMPUTING® DATACENTRE: 6 L/s by temperature chaining CAN BE AN ENERGY PRODUCER...

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European Framework Initiative for Energy & Environmental Efficiency in the ICT Sector

DATACENTRE IN A BOX

IMMERSED COMPUTING®: AIC24

- 100% Removal of heat from the IT
- Highest IT efficiency by eliminated fans
- No airflow required
- Level of intelligence
  - Management control and insight
  - Automatic optimisation of the water circuit
- Optimised for high density cloud/HPC nodes
  - Varying servers
  - Flexible IT hardware
- Feed: 18-40°C / 55°C Extreme / max ΔT 10°C

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NATURAL CONVECTION

ENCLOSED IMMERSION TECHNOLOGY

- Self Sustained
  - Driven by gravity, Thermal expansion
  - Self regulating
- Reliable
  - No moving parts
  - No oxygen
  - High heat capacity, less thermal shock
- Efficient
  - IT energy reduction
  - No chiller requirements

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OUR APPROACH

FOCUS ON CONTAINMENT

- Liquid containment
  - Double hull
  - Capillary effect
- Usability
  - Serviceable cabling
  - Integrated power and network
- Optimised for liquid
  - Optimised chassis
  - Minimised IT
- Serviceability
  - Way of work
  - Liquid tooling and Service trolley

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DATACENTRE IN A BOX

IMMERSED COMPUTING®

- Plug and Play
  - Power (2x 22 kW)
  - Water cooled (2x 0.3 L/s)
  - Data connectivity
- Self contained
  - Integrated managed PDU’s
  - Integrated switching
  - 48 high capacity nodes
- Modular
  - Stackable
  - Shared water infrastructure

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CIRCULARITY

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THE IMPACT

LIQUID VALUE CHAIN

- Software efficiency
  - Reduced OS and CPU licenses
- IT Hardware
  - Less IT, more IT power
- Datacentre Operations
  - Reduced cooling, reduced IT failures
- Datacentre Facilities
  - Minimised cooling and UPS sizing
- Datacentre Build
  - Reduced floorspace, no raised floors

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OUR APPROACH

DATA CENTRE DESIGN

DESIGNED FOR AIR

- Cooling options:
  - 100% Chillers
  - 100% Free air/adiabatic + 100% Chillers (off)
  - High volume, low ΔT (5-20 °C)

- Fluid handling
  - Spacious high capacity air ducting
  - Air filtration / water storage quality mmt
  - Hot/Cold aisle separation

- Information density (avg) 1.5 kW/m²

- Concrete floor + Raised floors

- Power
  - UPS (IT only): 100%
  - Gensets (facility): 100%

DESIGNED FOR LIQUID

- Cooling options:
  - External cold water supply by re-user
  - 100% Free air/adiabatic
  - Low volume, high ΔT (20+°C)

- Fluid handling
  - Normal capacity water circuit
  - Closed/open circuit, no storage quality mmt
  - Minimal “fresh-air” ventilation

- Information density (mixed) 12+ kW/m²

- Bare concrete floor

- Power (compared to air)
  - UPS (IT only): 85%
  - Gensets: 50%

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A CASE

750 KW AIR COOLED
+/- 1400 M2

Built as PoP/Local DC in 1999
Refurbished to Colo DC in 2013
Classic DX cooling
Expanded with Direct FreeAIR cooling

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A CASE

- Customer 1
  - Hosting
  - High availability requirements
  - +/- 16 kW/module

- Customer 2
  - GPU based cloud cluster
  - Low availability requirements
  - +/- 32 kW/module

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THE OPPORTUNITY

ASPERITAS DATACENTRE CONCEPTS

Immersed Computing®
Temperature chaining
Datacentre of the Future

FOCUS ON 24/7 HEAT CONSUMERS
THE NEW SUSTAINABILITY
ENERGY PRODUCING DATACENTERS

- Multiple datacentre projects
  - 2-100 MW facilities
  - Heating city blocks
- Primary cooling by heat reuse
- No cooling energy
- Reusable heat
  - Challenge for 70°C
  - Current experimental 65°C
  - Current Implementations 50°C

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ENERGY PRODUCING DATACENTERS

DISTRIBUTED MICRO EDGE NODES

EDGE ENERGY REUSE

- Spas, swimming pools (100% reuse)
- Hospitals, hotels with hot water loops (100% reuse)
- Urban fish/vegetable farms with aquaponics (100% reuse)
- District heating (100% reuse)
- Aquifers for heat storage (75% reuse)
- Water mains (29% reuse)
- Canals, lakes and sewage (exergy destruction)

• 10-100 kW
• Edge of network, within urban areas
  - IoT capture and processing
  - Data caching (Netflix, Youtube, etc.)
  - Localised cloud services (SaaS, Paas, IaaS)
• Minimised facilities
  - External cooling input
  - 24/7 energy rejection for reuse
  - Geo redundant
  - Tesla Powerpack for controlled failover
  - District data hub

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THE NEW SUSTAINABILITY

DATA CENTER & URBAN FARM

THE ULTIMATE SUSTAINABLE SMART CITY SOLUTION
GREEN COMPUTING + URBAN FARMING = CIRCULAR

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Thank you for your attention

Contact: MAIKEL BOURICIUS, MARKETING MANAGER, LEAD ASPERITAS ENERGY INNOVATION
email: MAIKEL.BOURICIUS@ASPERITAS.COM
Engaging businesses in sustainable energy – the human factor

Daniel Frohnmaier, Geonardo Environmental Technologies Ltd., START2ACT
Agenda

- Background, the role of people in energy efficiency
- START2ACT project purpose and methods
- Activities for businesses to decrease energy consumption
- START2ACT activities
- Conclusion
Background

(A) Projection of global electricity usage by ICT 2010-2013\(^1\).

Selling numbers of all ICT devices (except PC and set top boxes) are predicted to grow significantly.

The ICT ‘technology’ challenge: achieve more transparency between system stack levels to design for more energy efficient operation\(^2\).
Background

People must be an integral part of the ICT system.

“*A machine is only as efficient as its operator*”
Drivers and benefits of Environmental Efficiency – the company perspective

- Reduce Carbon Footprint
- Optimise Resources
- Advance Competition
- Save Costs
START2ACT – our Mission

- Increase Energy Efficiency on ICT and office equipment in young SMEs and Startups

- 20% savings, possible through behavior change. ³, ⁴

- 14% of global emissions by 2040 from ICT ¹. Fastest Growing energy user in the business world ⁵.

- 2/3 of SMEs operating in the EU are lacking simple rules or devices for saving energy ⁶.

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our methods

Support package to young SMEs and startups

- On-site consultancy and mentoring
- Online tools & resources
START2ACT Monitoring

Monitoring surveys before and after the mentoring/training sessions filled in by the participants from young SMEs and startups.

Analysed by partner CentERdata (NL) → improvement of the activities, relevant scientific findings.
Activity: Stimulating norms (I)

Declare corporate commitment to Energy/Environmental Efficiency

Content: Objectives & goals. Quantitative targets, corporate agreements, support for/from employees

Form: Available internally or externally, publish regular results. Review and approval by senior management.
Activity: Stimulating norms (II)

Results from the START2ACT monitoring survey \((N_{\text{startups}} = 167, N_{\text{SMEs}} = 96)\)
Rating (1 = strongly disagree; 5 = strongly agree)

<table>
<thead>
<tr>
<th>Personal attitudes towards energy efficiency</th>
<th>Rating SME</th>
<th>Rating Startups</th>
</tr>
</thead>
<tbody>
<tr>
<td>I consider it important to help my company to conserve energy.</td>
<td>4.33</td>
<td>4.06</td>
</tr>
<tr>
<td>It is the company norm to switch off office equipment (e.g. PCs, lights) when not in use.</td>
<td>3.84</td>
<td>3.89</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company attitudes towards energy efficiency</th>
<th>Rating SME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy saving is <strong>not</strong> a priority in my company.</td>
<td>2.13</td>
</tr>
<tr>
<td>By saving energy, me and my colleagues can contribute to lowering the energy bill of the company.</td>
<td>4.06</td>
</tr>
</tbody>
</table>
Activity: Involve Employees (I)

- Research, Plan
- Delivery
- Monitoring

Company’s needs and abilities.

Identify actions (walk around checklist...)

- Evaluate staff awareness
- Feedback

Decreasing ICT energy consumption – the power of data centres and people’s will
Activity: Involve Employees (II)

Results from the START2ACT monitoring survey ($N_{\text{startups}} = 167$, $N_{\text{SMEs}} = 96$)
Rating (1 = strongly disagree; 5 = strongly agree)

<table>
<thead>
<tr>
<th>Personal attitudes and current behaviour.</th>
<th>Rating SME</th>
<th>Rating Startup</th>
</tr>
</thead>
<tbody>
<tr>
<td>I encourage my colleagues (work) / friends (home) to behave in an environmentally friendly way.</td>
<td>3.9</td>
<td>3.7</td>
</tr>
<tr>
<td>I consider it important to help my company to conserve energy.</td>
<td>4.33</td>
<td>4.06</td>
</tr>
<tr>
<td>By saving energy, me and my colleagues can contribute to lowering the energy bill of the company.</td>
<td>4.06</td>
<td>-</td>
</tr>
</tbody>
</table>

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Activity: Involve Employees (III) 
Scientific evidence

Economic reasons may weigh less

Environmental, social and justice reasons may weigh more

1. I act eco-friendly
2. I am eco-friendly
3. I am a good person

7 Bolderdijk, Steg, Geller, Lehman and Postmes (2012)  
8 Umpfenbach (2014)  
9 Venhoeven, Bolderdijk, Steg (2016)
START2ACT On-site

Training to young SMEs

Focus: Low and no cost energy saving measures

- Understand your company’s energy use
- Implement energy saving quick wins

VISIT 1

- Conduct opportunities assessment
- Implement low-cost and policy opportunities

VISIT 2

- Receive implementation support
- Consider larger opportunities

VISIT 3

Mentoring of Startups

Format: partnering with incubators and accelerators to deliver mentoring.

Focus: Greening products and services; Promoting green credentials, sustainable procurement policies, choose energy efficient premises.

Business Breakfasts for young SMEs

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START2ACT Online

Are you energy efficient at work?
Show us and win awesome prizes!
Summer edition

Despite the energy saving actions of Peter's employers, the energy bill has not been reduced as much as he expected.

How frequently should he analyse the collected data to identify energy wastage hot spots?

Monthly  Weekly  Daily

Networking, Monitoring, and Energy Efficiency

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START2ACT Online

Knowledge base

I work at an SME

I work at a Startup

Please make your choice above and access the repository of START2ACT where all knowledge is stored.

You can tap into the pool of advice, documents, solutions, tools, products on energy efficiency in the office environment as well as at home.

Decision tree: SME → Manager/Employee
Startup → own space/rented space

Different decisions result in relevant topic pages – detailed advice, external tools and references.
Conclusion

Technology is not enough, people need to invest efforts & act.
The efficient use of our resources pays off.
Introducing corporate norms → frame for all environmental/social efforts in a business; powerful tool on the competitive market.
Include all people in a business, win-win
References

Thank you for your attention

Contact: Daniel Frohnmaier
email: daniel.frohnmaier@geonardo.com
Project website: http://start2act.eu/
THANK YOU!

STAY TUNED FOR REGULAR UPDATES

the future is sustainable!

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- Find out our next events: www.ictfootprint.eu/en/all-event
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