IOT and Advanced Communication Protocols for Energy Efficiency

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UN Regional Commissions - 11th International Forum on Energy for Sustainable Development – 21 September 2021
Today’s Number of IP addresses

The IP address space is 32-bits ($2^{32}$) in size and contains

4,294,967,296 IPv4 addresses

Tomorrow’s Number of IP addresses

The IPv6 address space is 128-bits ($2^{128}$) in size & contains

340,282,366,920,938,463,463,374,607,431,768,211,456 IPv6 addresses
Connected devices call for effective policies ...

Source: Electronic Device Network Alliance EDNA-IEA
Number of connected objects is multiplied by 48 in 15 years

<table>
<thead>
<tr>
<th>Evolution</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users (million)</td>
<td>2023</td>
<td>3185</td>
<td>4700</td>
<td>5500</td>
</tr>
<tr>
<td>Devices (million)</td>
<td>13531</td>
<td>18405</td>
<td>19041</td>
<td>20278</td>
</tr>
<tr>
<td>IoT (million)</td>
<td>1000</td>
<td>9605</td>
<td>20315</td>
<td>48272</td>
</tr>
<tr>
<td>Devices incl. IoT (million)</td>
<td>14531</td>
<td>28010</td>
<td>39356</td>
<td>68550</td>
</tr>
</tbody>
</table>

The digital world’s contribution to the GLOBAL Environmental footprint in 2019

- PRIMARY ENERGY CONSUMPTION (PE): 4.2 % \(^{[1]}\)
- GREENHOUSE GAS EMISSIONS (GHGs): 3.8 % \(^{[2]}\)
- WATER CONSUMPTION (WATER): 0.2 % \(^{[3]}\)
- ELECTRICITY CONSUMPTION (ELECTRICITY)*: 5.5 % \(^{[4]}\)


If “Digital” was a country, it would have about 2 to 3 times the footprint of France.
Possible evolution of global environmental footprint between 2010 and 2025

The share of global GHG due to ICT to double in coming years

Source: The Shift Project “LEAN ICT: TOWARDS DIGITAL SOBRIETY”
## Breakdown of digital world’s environmental footprint in 2019

<table>
<thead>
<tr>
<th>%</th>
<th>Energy</th>
<th>GHG</th>
<th>Water</th>
<th>Elec.</th>
<th>ADP</th>
</tr>
</thead>
<tbody>
<tr>
<td>User equipment</td>
<td>60%</td>
<td>63%</td>
<td>83%</td>
<td>44%</td>
<td>75%</td>
</tr>
<tr>
<td>Network</td>
<td>23%</td>
<td>22%</td>
<td>9%</td>
<td>32%</td>
<td>16%</td>
</tr>
<tr>
<td>Data centres</td>
<td>17%</td>
<td>15%</td>
<td>7%</td>
<td>24%</td>
<td>8%</td>
</tr>
</tbody>
</table>

In France, the deployment of 5G will increase GHG emissions and Electricity demand.

Source: France’s High Council for Climate, January 2021
The implementation of Smart Energy Systems will prevent an overbuild of capacity worth 16,000TWh of annual generation.

And will save emissions of 7.7 billion tons of CO2, making it responsible for over 23 per cent of global decarbonisation.
Green House Gases
1. Lifestyle & Behavior change
1. Lifestyle & Behavior change
2. Energy Efficiency

Green House Gases
1. Lifestyle & Behavior change
2. Energy Efficiency
3. Choice of energy
1. Lifestyle & Behavior change
2. Energy Efficiency
3. Choice of energy
4. Material footprint
1. Lifestyle & Behavior change
2. Energy Efficiency
3. Choice of energy
4. Material footprint

Green House Gases
Greenhouse Gases

1. Lifestyle & Behavior change
2. Energy Efficiency
3. Choice of energy
4. Material footprint
To meet the Paris Agreement we have to follow on a low carbon path.
Four wedges for a low carbon development

- Trend in Green House Gases
- Energy Efficiency
- Renewable Energy
- Improved Carbon Sinks

Today

Low Carbon Path

Tomorrow
Digital technologies influence all sectors across all economies

• Knowledge & Policy: data collection; modelling; assessing policy options and effectiveness

Source: IEA 2021
The digitalisation opportunity

**Key facts**

By 2021: **83 billion**
connected devices and sensors will be creating large, diverse datasets on a wide range of topics:

- traffic patterns
- energy consumption
- air quality
- geospatial data

Only **10%** of this data is currently being analysed and put to use.

**Digital tools can help:**

1. combine and analyse this data
2. provide information and insights
3. underpin more effective and sustainable policymaking and urban planning
4. create benefits for citizens

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Digital technologies influence all sectors across all economies

- **Knowledge & Policy**
- **Buildings**: smart building controls & thermostats; connected appliances & lighting

Source: IEA 2021
Digital technologies influence all sectors across all economies

- **Knowledge & Policy**
- **Buildings**: smart building controls & thermostats; connected appliances & lighting
- **Transport**: shared mobility services; automated & connected vehicles; freight optimization
- **Industry**: robotics; 3D printing; machine learning
- **Electricity**: IoT and automation to improve efficiency and reduce maintenance costs; machine learning to improve wind & solar forecasts, and better match supply and demand from increasingly decentralized sources
- **Oil & gas**: machine learning to reduce costs of detecting methane leaks

Source: IEA 2021
Make smart ICT a chance to the Energy Transition

• Adopt digital sufficiency as a principle of action (how much do we really need?)
• Continue to study and harvest data on ICT use and its impact
• Transform data into knowledge: Inform and spread awareness
• Enhance the eco-design & increasing the lifespan of equipment
• Eco-design of digital services: Encourage resource-efficient software for video streaming, gaming, cloud computing…
• Support «Network Zero Innovation Challenge»
• Phase out 2G and 3G networks as 5G network is being deployed
Energy Efficiency is best defined in “D”

- Decouple
  - Decarbonize
  - Digitalize
  - Decentralize
  - Disruptive
  - Desirable
Conclusion

• Digital technologies have direct and indirect effects on climate change.

• The effects of digitalization on other sectors and activities are potentially much larger than its direct footprint, but these effects are complex and difficult to quantify.

• Strong climate policies are needed to ensure digital technologies are applied to reduce emissions (and not increase them)

• The fast deployment of ICT imposes that we redouble efforts to promote energy efficiency in every sector

• Encouraging resource efficient ICT is possible, but forces us to redefine the type, the pace and the way we address policy intervention.

• International collaboration can help countries save cost and time to encourage more resource efficient ICT
Thank you for your attention!

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