Digital Inclusion for Sustainable Developments

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Executive Summary

- Knowledge is the basis for education, health and entrepreneurship
- Basic Internet is access to text and pictures – for 300-400 people on a thin satellite link – no need for broadband
- develops the market, complementary to market actors
- roll-out through local partners
- Foundation by experienced people
- Now: – Norwegian Development Agency contract with Orange for pilot in Mali

1973: Internet to Kjeller/Europe
1994: Opera Software
2014: Basic Internet «half a dollar is enough»
Outline

• History and Motivation
• Knowledge is the basis for education, health and entrepreneurship
• Digital Inclusion
  – Basis for Innovation
  – United Nations Sustainability Goals
• Basic Internet is access to text and pictures
  – for 300-400 people on a thin satellite link
  – no need for broadband
• Economy
• Technology challenges
• Conclusions
• Research and Education at Kjeller
• Close relation to FFI, IFE, NILU,...
• Professors from UiO (Oslo) and NTNU (Trondheim)

• The building where the Internet (Arpanet) came to Europe in June 1973

1971 (at which point 23 hosts, at universities and government research centers, were connected to the ARPANET); 29 by August, 1972, and 40 by September, 1973.

At that point, two satellite links, across the Pacific and Atlantic Oceans to Hawaii and Norway (NORSAR) had been added to the network. From Norway, a terrestrial circuit added an IMP in London to the growing network.

The Internet and Scandinavia

- The first connection of Arpanet outside of the USA (and Hawaii) was to **Scandinavia** (Kjeller, June 1973)
- List_of_Internet_pioneers [Wikipedia]
  - Yngvar Lundh, Paal Spilling
- Application development
  - .php, OpenSource, Linux, Skype, Spotify
  - OperaSoftware, FAST Search
  - Nokia, Ericsson
  - Telenor, TeliaSonera
- Mobile Internet:
  - GSM
  - Adaptation

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Josef Noll, Oct2015
Internet usage in Scandinavia

[Robert Madelin, Directorate-General for Information Society and Media, EU commission, Aug 2011]

* “use of IT in a proper way can increase effectiveness with 30-40%”
* “we are good in technology development. But access to venture capital is bad in Europe as compared to the USA”.

[Aftenposten, 3. October 2011] gunhild@aftenposten.no

% of people used the Internet

HE 47,5%  
IT 58,8%  
EU 73,7%  
DK 90,7%  
NO 94,8%  
IS 95,1%

Tyrkia  
Romania  
Bulgaria  
Portugal  
Kypios  
Kroatia  
Italia  
Malta  
Litauen  
Polen  
Ungarn  
Spania  
Latvia  
Slovenia  
Tsjekkia  
Irland  
EU snitt  
Østerike  
Estland  
Frankrike  
Belgia  
Slovenia  
Tyskland  
Storbritania  
Finland  
Danmark  
Luxembourg  
Nederland  
Sverige  
Norge  
Island
Internet service usage

- Private homes with broadband
- Wireless PC used outside of home
- Internet Banking
- Online contact to public services
- eCommerce - bought

Greece
Norway
EU-average

<table>
<thead>
<tr>
<th>Service</th>
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<th>Norway</th>
<th>EU-average</th>
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<tbody>
<tr>
<td>Private homes with broadband</td>
<td>41</td>
<td>61</td>
<td>40</td>
</tr>
<tr>
<td>Wireless PC used outside of home</td>
<td>3</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Internet Banking</td>
<td>6</td>
<td>36</td>
<td>39</td>
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<tr>
<td>Online contact to public services</td>
<td>16</td>
<td>41</td>
<td>71</td>
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<tr>
<td>eCommerce - bought</td>
<td>12</td>
<td>40</td>
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</table>
Human perspective in
The IoT ecosystem

- Creating business
  - openness, competitive
  - climate for innovation
- Public authorities
  - trust, confidence
  - demand
- Consumers
  - (early) adapters
  - education
- Infrastructure
  - broadband, mobile
  - competition
Internet-driven services

• App economy
  – «All services» come through mobile devices
  – from «parts» to services

• Ambient Assisted Living (AAL)
  – Sensors supporting care information
  – Proactive Health professionals
    • call if you have not taken your medicine
    • call if your blood pressure is too high

• Hospital access
  – BasicInternet at 5 hospitals

• Producing sensors vs analysing data
  – sensor producers don’t see the use of their sensors

• Information providers (Google)
  – become industry suppliers

«Free basic access for low capacity services»
The Basic Internet Vision @Basic4all
MIT and the global GDP

- 50% of U.S. economic growth after 1945 attributed to technological innovation

MIT alumni startups (2011 numbers)
- 25,800 active companies
- 3.3 million people employed
- $2 trillion gross domestic product
- 10th world rank in GDP
- 19% higher per capita income than California (27% higher than USA)

Role of education
- 75% of the world’s GDP growth in developing countries

25 largest economies by GDP (PPP) in 2015 in Billions

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>GDP (PPP)</th>
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<tr>
<td>1</td>
<td>China</td>
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<td>France</td>
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Industrie 4.0 vision

Source: Trumpf / Forschungsunion Wirtschaft & Wissenschaft
EU Commission activities

• Four focus areas for Industrie 4.0
  – Digital Innovation Hubs
  – Leadership in digital platforms
  – Closing the digital divide gap
  – Providing framework conditions
• Collaboration with regional/structural funds (ESIF) and Juncker package (EPIF)
• Connectivity is the challenge both in terms of
  – Availability/Security and
  – Affordability
Digital Divide & Digital Inclusion

- **Basic school in education**
  - 3 basics: read, write, mathematics,
  - +2 innovation drivers: express, ICT

- **University education**
  - basics: analysis, problem solving, evaluation
  - innovation by: english writing, innovation management

- **the Global World perspective for beyond 2050**
  - Human-Bond-driven systems
  - Knowledge-, sustainability-driven economy
2/3 of the World’s population have no access

• Knowledge is the basis for health, education and entrepreneurship
• Provide access to basic information, means
  – access to education
  – access to health information
  – opportunity for entrepreneurship
United Nations Sustainable Development Goals

GOAL 1
Poverty
End poverty in all its forms everywhere

GOAL 2
Hunger & Food
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

GOAL 5
Empower Women
Achieve gender equality and empowering all women and girls

GOAL 6
Water
Ensure availability and sustainable management of water and sanitation for all

GOAL 7
Energy
Ensure access to affordable, reliable, sustainable and modern energy for all

GOAL 3
Health
Ensure healthy lives and promote well-being for all at all ages

GOAL 4
Education
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

GOAL 8
Growth & Employment
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

GOAL 9
Infrastructure & Innovation
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

GOAL 10
Inequalities
Reduce inequality within and among countries

GOAL 11
Inclusive cities
Make cities and human settlements inclusive, safe, resilient and sustainable

GOAL 12
sustainable consumption
Ensure sustainable consumption and production patterns

GOAL 13
climate change
Take urgent action to combat climate change and its impacts

GOAL 14
marine resources
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

GOAL 15
biodiversity
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

GOAL 16
inclusive societies
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Sustainable development

Oct 2015, Josef Noll
#Basic4All

The Role of Free Access

## GOAL 4
Education & Lifelong

- Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

## GOAL 3
Health & Well-Being

- Ensure healthy lives and promote well-being for all at all ages

## GOAL 5
Empower Women & Girls

- Achieve gender equality and empower all women and girls

## GOAL 8
Growth & Employment

- Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

## GOAL 9
Infrastructure & Innovation

- Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

## GOAL 16
Sustainable development

- Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
#Basic4All
Access to basic information to everyone

• A typical situation in Africa
• Need for
  – those who don’t have Internet coverage
  – those who don’t have income for access
  – those who don’t have rich parents
• We develop the market
  – Basic Internet is complementary to traditional industry

• The World
  – Internet access spammed by video and gaming
  – Roaming (3G/4G) - affordability
  – Authentication (WLAN) - availability

health education entrepreneurship through Basic Internet
The role of information

Information
- knowledge that you get about someone or something
- facts or details about a subject

[source: merriam-webster.com/dictionary]

- Net Neutrality
- Basis for economic development
- «Children are good in using IT» – video, gaming, snapchat,…
- «Children are bad in retrieving information»
#Basic4All

Development Focus

- **Education**
  - Digital Inclusion
  - Free access to Basic Information

- **Health**
  - sensor/app supported health information
  - new role of health professionals

- **Innovation**
  - Women entrepreneurship
  - Knowledge-based
Free Information access: Removing the digital divide

• Societal aspects
  – everyone has access to information
  – on all WLAN (&mobile) networks

• Technical requirements
  – browser with just text & picture
  – compressed content to be transmitted over radio
  – proxy-based splitting of information

• Example: Opera Mini
  – encrypted request from Opera Mini browser
  – Opera access Web page, removes animations, and compresses the page
  – Compressed page is sent to device
  – typical 80% reduction

• Usage results
  – 4 MByte average user
  – 20 MByte max user/month

[Opera Software, Nigeria, 2011]
Basic Internet provision through Partners

- Satellite, radio or mobile link
  - local roll-out
  - with partners in Africa
- Mobile Operators: extend the reach, prepare the market
- CSR: increase innovation
- Own deployment: hot-spot owner
- AID organisations: education, health information
- Sponsored access
- Higher education: educate teachers
Technological challenges

- **Goal**: free information to everyone
  - compressed text
  - low/medium-size pictures
- **Information type filtering**
  - filter dynamic elements
  - Web browser
    - Opera Mini
    - http2 standard
  - Basic Internet App Store
    - traffic amount, capacity
- **Network protocol**
  - signalling versus data amount
  - mobile network load
- **Centralised management**
  - open protocols, e.g. TR-069
  - Customer premise equipment (CPE) and Auto-configuration server (ACS)
  - auto-configuration
  - software management, modules
  - status and performance
  - diagnostics
- **IoT extension**
  - set-up, configuration of communication
  - secure (encrypted) communication
  - update/revoke security certificates
Technology
High-level challenges

v3.0 Business Extensions: IoT, App
v2.5 IoT and App extension
v2.0 Technology extensions
v1.5 Market agreements Africa
v1.2 Market agreements Pilot markets
v1.1 Operational Kjeller Innovation
v1.0 Operational Demonstration Kongo
v0.9 Technology demonstration at UNH

#Basic4All
let us know your interest to become part of BasicInternet

v2.5 IoT and App extension [edit]

- Define App requirements to be able to use "Basic Internet"
- Define use-case IoT
- IoT-app (Summary low-cost application for IoT sensor supply, - New, - v2.7)
- Basic Internet App requirements (Summary business for Apps with own proxy access, - Answer, - v2.5)
- PowerConsumption Links (Summary Provide documentation on Power Consumption of connected devices)
- AP monitoring through Mikrotik (Summary Add local monitoring on the «client side» of the solution is that we in the Mikrotik a «monitoring» of IP addresses who provide traffic. No set-up allowing us to provide a «busy hour» and other measures., - Open, Answer, - v2.5
- Cache for Base Stations (Summary Add a cache at our base stations to increase "virtual"

v2.0 Technology extensions [edit]

- TR-069 on MikroTik RouterOS (Summary TR-069 protocol implemented on MikroTik RouterOS)
- Video in Opera Mini redirected to accounting unit (Summary Currently Opera Mini does not requested video should point to an accounting page, - New)
- Own infrastructure for Basic Internet (Summary Customers provide their own infrastructure)
Basic Internet Core Network at Kjeller

Internet services through vouchers

Education
Health

BasicInternet.org  BasicInternet.foundation  Basic Internet  @Basic4all  Josef Noll, Oct2015
Examples of challenges

Network infrastructure

- DHCP lease time
  - IP addresses
  - 20,000 students
  - mobile network

- Intelligent compression

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<td>Video [kB]</td>
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Internet provision
International Activities

• Latvia - «free Wifi European capital»
• Germany - Government vs Freifunk
• Romania - E-NET
• Wireless Cities
  – Bologna, Bristol, Dublin, …
  – Municipal_wireless_network [wikipedia.org]
• IT-industry
  – Google, Microsoft, Yahoo - Wifi
  – Internet.org
  – zero rated content

• Access
  – Google Loom
  – Facebook Solar Aircrafts
  – Thales/Alenia Zepelin
  – Satellite
  – Fibre/Virtual Fibre
Our extended partner network: Business Ecosystem
Society costs
Cost of ICT development

Basic Internet
Costs/user/month [US$]

- local Wifi spots
- based on Satellite connectivity

Source: UK GOVERNMENT UNIT COST DATABASE
www.data.gov.uk/sib_knowledge_box/toolkit

half a dollar is enough*

* Job Seekers Allowance per claimant per year

£64,819

£10,025

£28,132

£11,192

CAPEx/new person

OPEX/person

Year 1

Year 2

Year 3

Year 4

Year 5
Activities - DRC (Congo) Implementation

• Internet access
  – University of Lisala
  – Deployment at 4 other universities in Kinshasa (DRC)
  – 10 additional implementations

• IPXextenso, Orange
  – 2 successful pilots
  – 570 planned installations
  – expected: 2000 villages

• upcoming pilots in Mali++
#Basic4All Conclusions

- Digital Inclusion is the key for sustainable development
  - Complementary to traditional industry
  - Relevant for Africa (and the World)

- Net neutrality
  - Access to information, compressed text and pictures
  - Reach of 300-400 people on a 1 Mbit/s thin satellite link

- Technology challenges
  - Information type filtering
  - Network load (DHCP, data vs signalling)
  - Remote maintenance (TR-069)
  - Browser development (http2)
  - IoT extension (App store)

- A collaborative foundation from Kjeller (Norway)