Shaping the Future Internet: opportunities and risks

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We are living in exponential times…

There are over 110 million registered users of MySpace, and 300,000 new people sign-up every day.

If MySpace were a country, it would be the 11th-largest in the world (between Japan and Mexico)

There are 8 million images and 60,000 new videos uploaded on MySpace per day.

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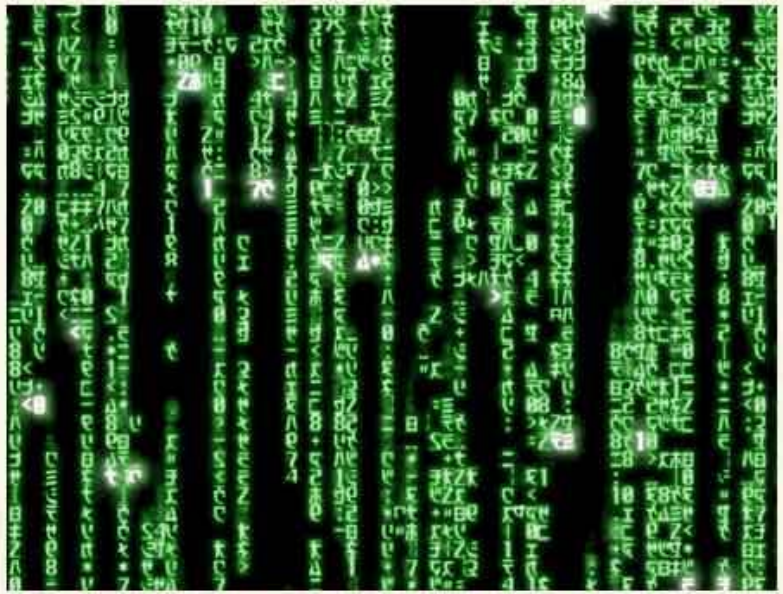
We are living in exponential times…

There are over 2.7 billion searches performed on Google each month.

The number of text messages sent and received every day exceeds the population of the planet.

We are living in exponential times…

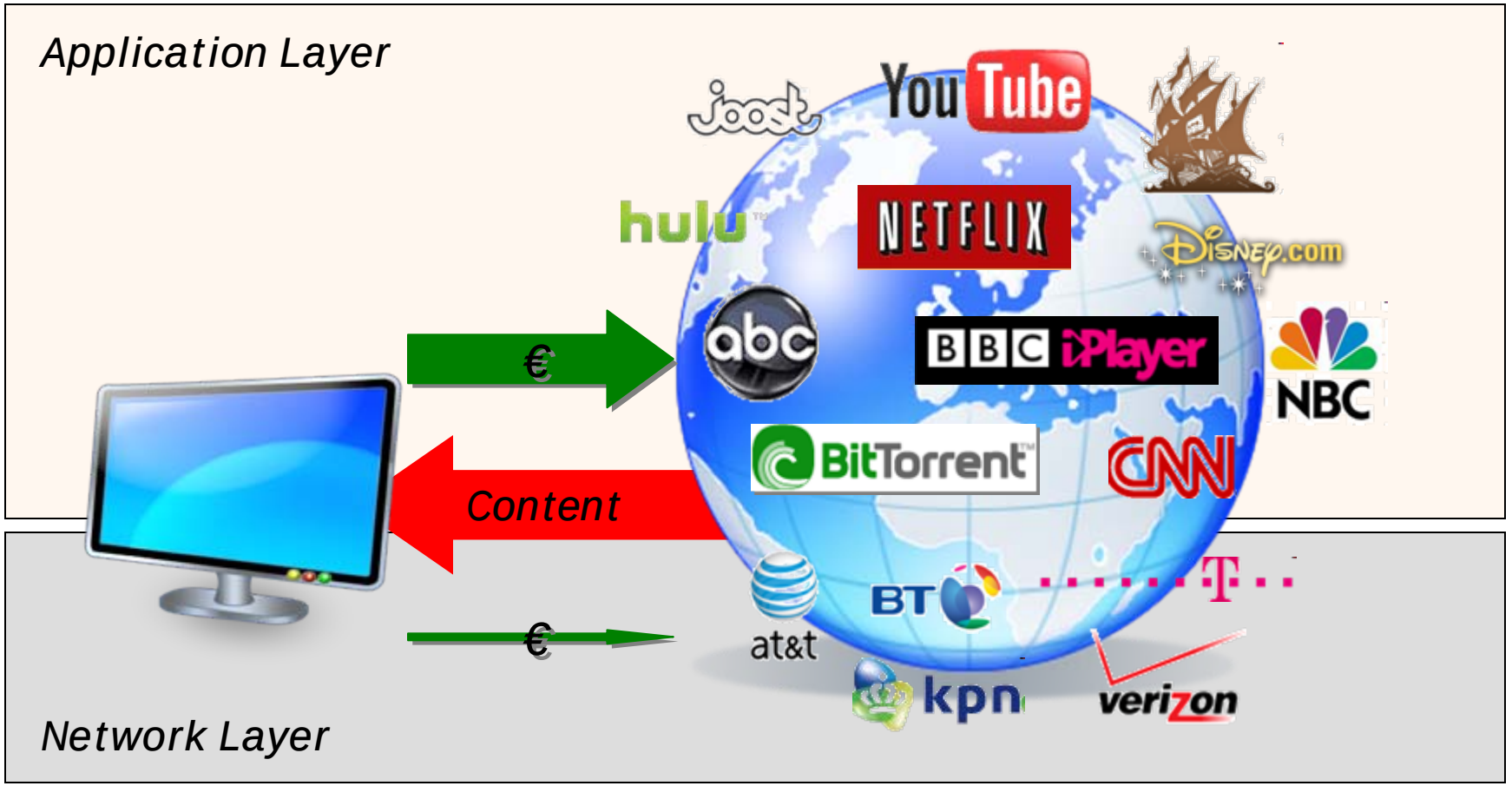
The amount of new technical information is doubling every 2 years.



It is estimated that 1.5 exabytes (1.5×10^{18}) of unique new information will be generated Worldwide this year.

That's estimated to be more than in the previous 5,000 years.

The Amount of Content Consumed by Users is Exploding…



… but the content creates modest growth to network provider profits.

An unstable model

Value and Experience

Applications & Content

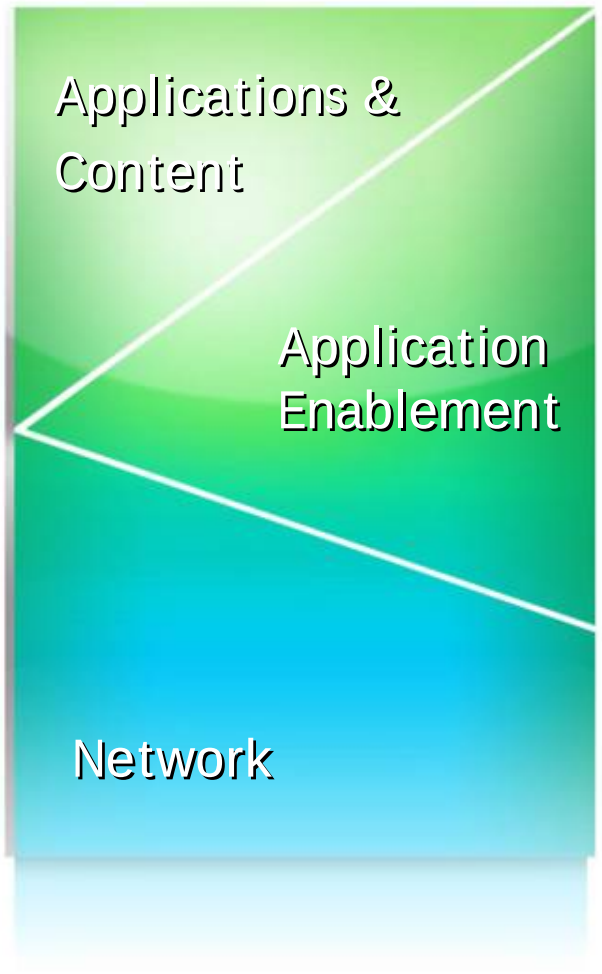
Network

Investment and Connectivity

Experience, transact, search, share, store and manage

Access and connect

Enabling a trusted web experience



Open innovation

- Ecosystem
- App Developers
- New Services

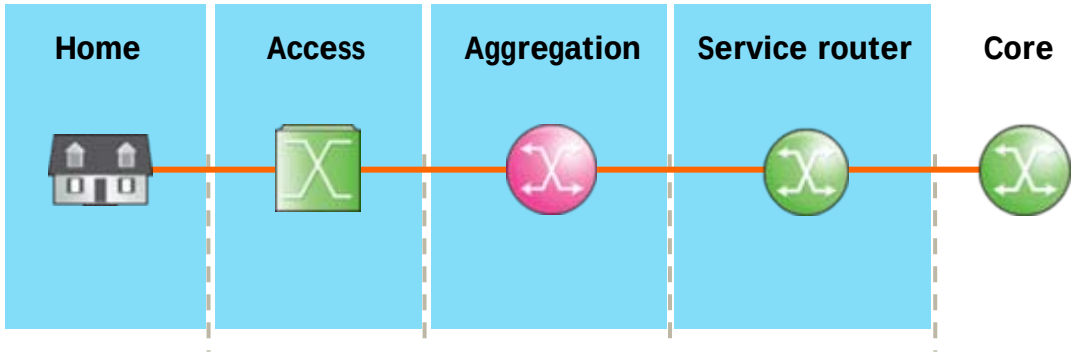
Better Experience = More Customers, More Value

Trust

- Security
- Reliability
- Billing
- Privacy

Bandwidth requires changing scale and investment

Network Impact



Today's Average Bandwidth consumption:	1.5 Mb	.1 Mb	.1 Mb	.05 Mb
Tomorrow's Average Bandwidth consumption:	20.0 Mb	10.0 Mb	3.0 Mb	1.50 Mb
Scale Multiplier:	**1,500%**	**10,000%**	**3,000%**	**3,000%**

As bandwidth requirements accelerate, the current unstable industry model will come under increasing pressure, requiring significant scaling of the network and further investment

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Research points to new sources of revenue from application enablement

Brands, Sponsors, Content Owners

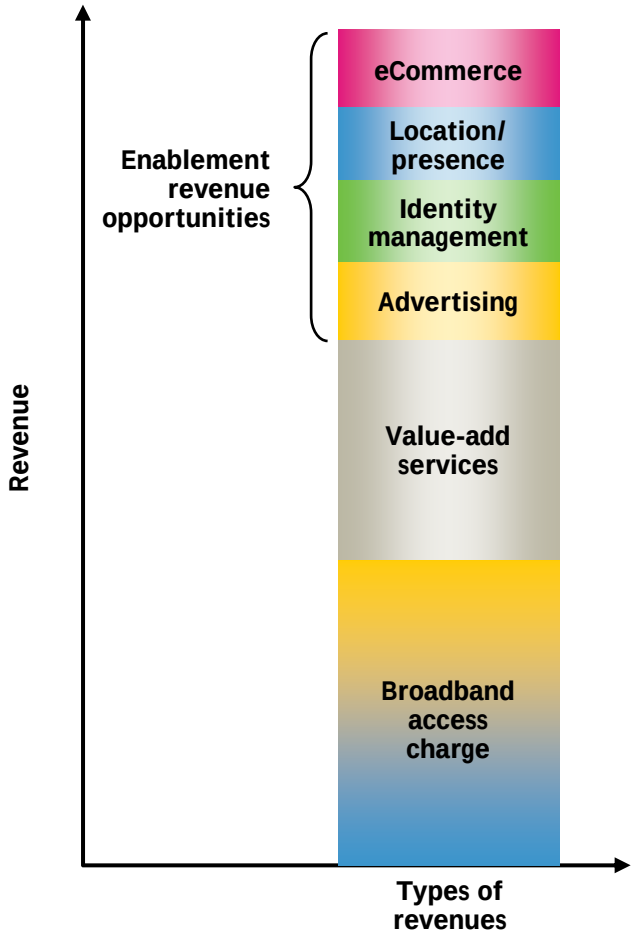
- Broader Audience with more Customers
- Service Quality Enhancements (e.g. logo not pixilated)
- Targeting Advertising, Aggregate User Data
- Simplified Fulfillment — Digital Content
- Secure Commerce — Billing and Settlement, Transactions

Non-Traditional Services — Vertical Services

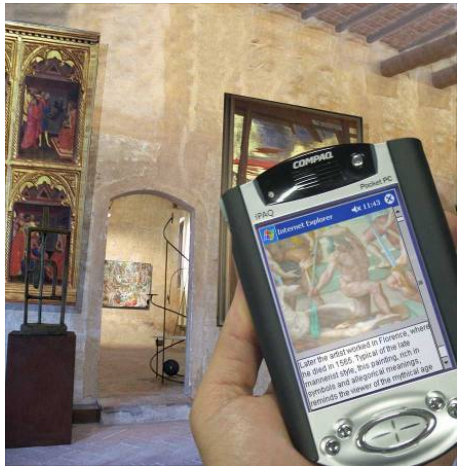
- eHealthcare and eGovernment — better svc, lower cost
- Remote/Home Energy Management
- Remote/Home Safety and Security
- Home Education, Media and Entertainment

End Users

- On-demand and Per Use Services Bundled With Content/Product
- Security, Privacy, Continuity, Digital Life/

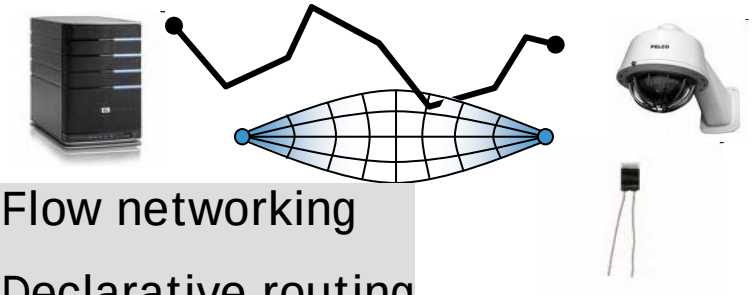


Ambient Intelligence is a long-standing promise
Standalone Technology Islands
Not beyond personalization
Not embedded in real life



Key Research Directions: ICT Strength

Virtualization



- Flow networking
- Declarative routing

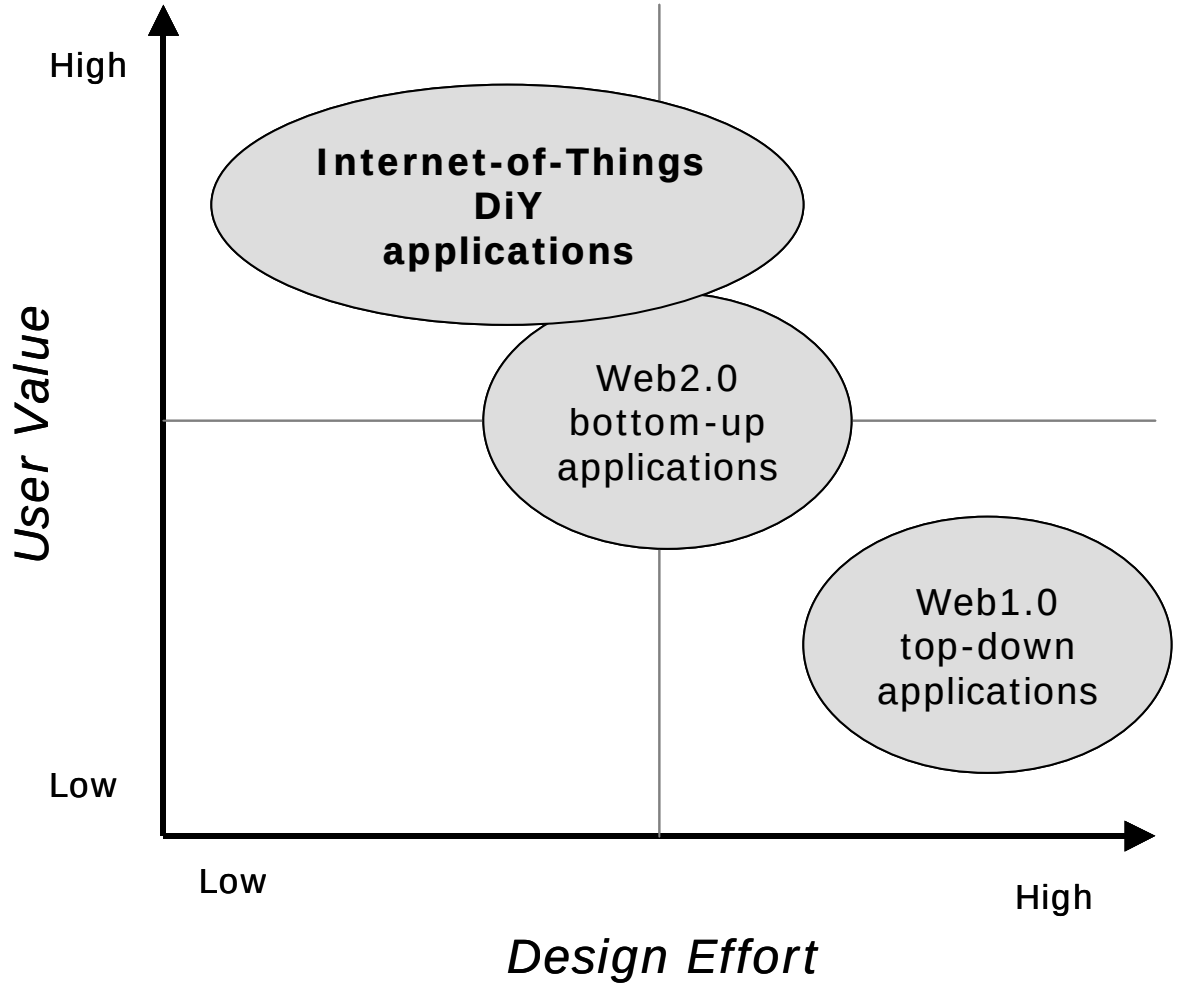
Simplification

- Autonomous networking
- Data fusion

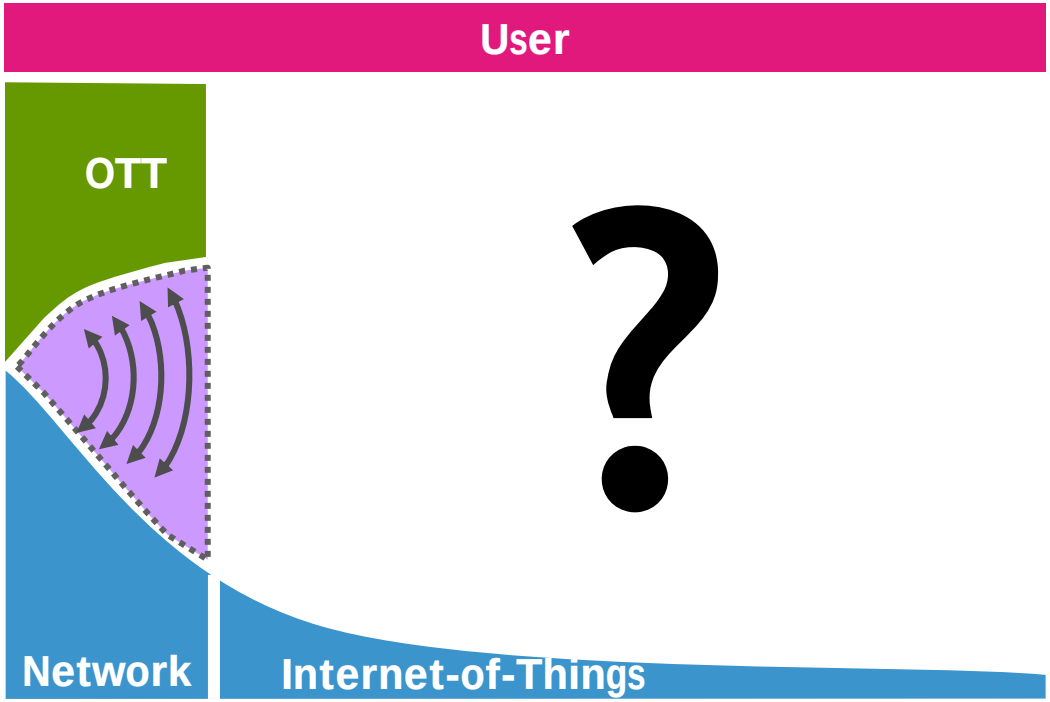
Commonality

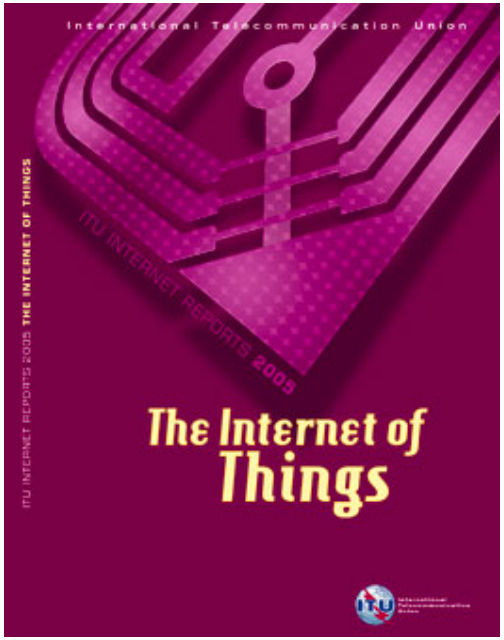
- Common architecture
- Common interfaces
- Business case platform

End-user Creation of Internet-of-Things Applications



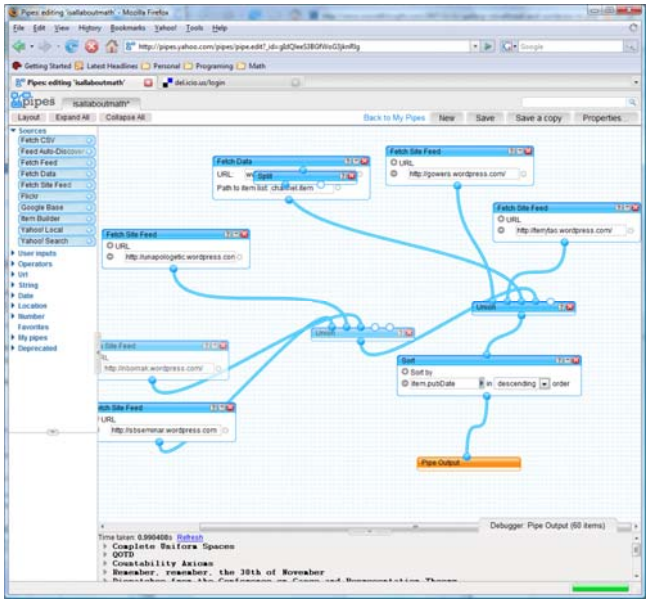
The Internet-of-Things introduces a paradigm shift in the eco-system

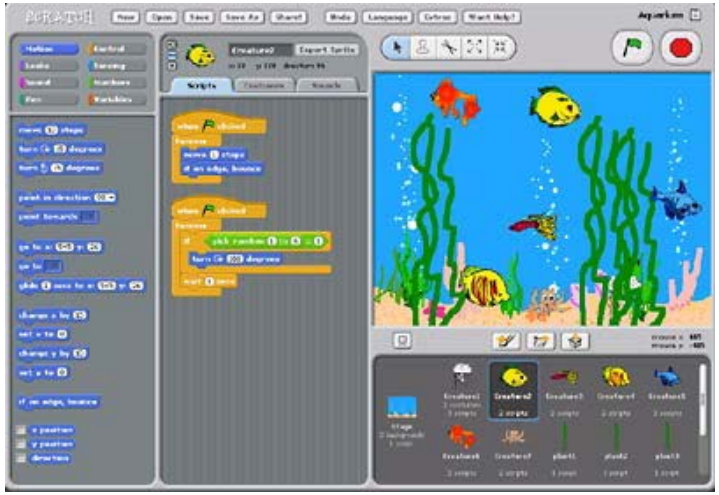


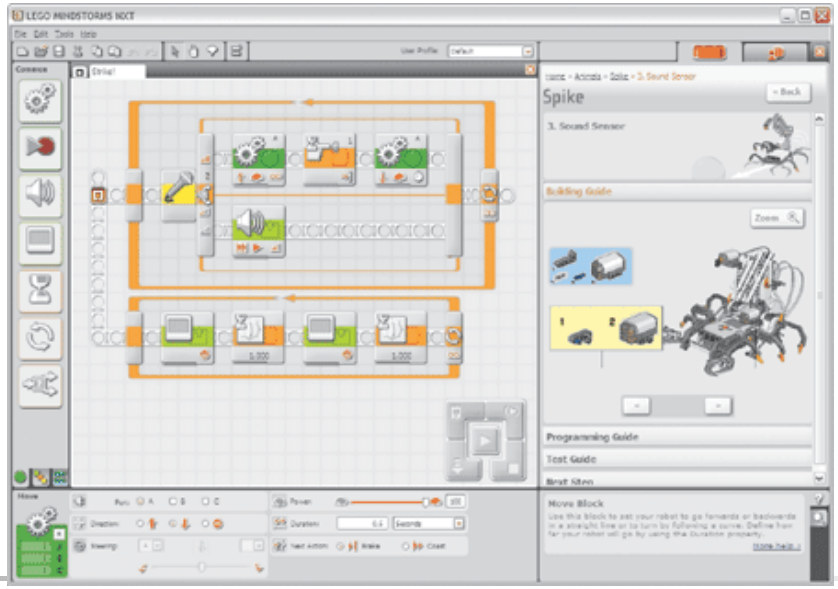


What about easy application creation in the Internet-of-Things ?

Tools, tools, …







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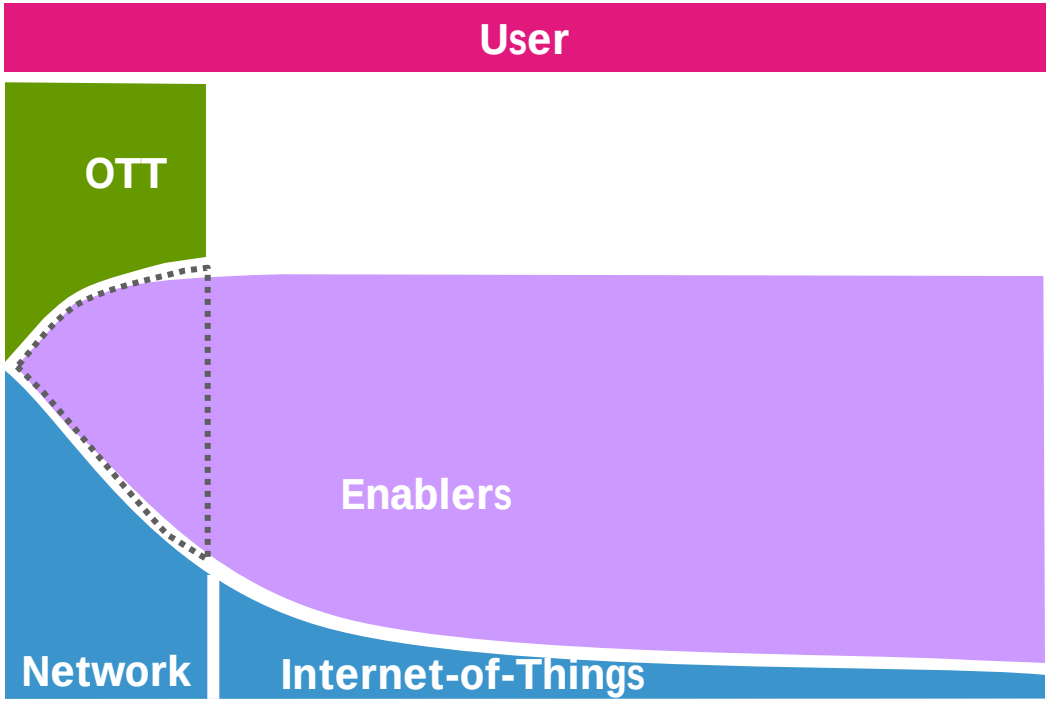
The Internet-of-Things introduces a paradigm shift in the eco-system



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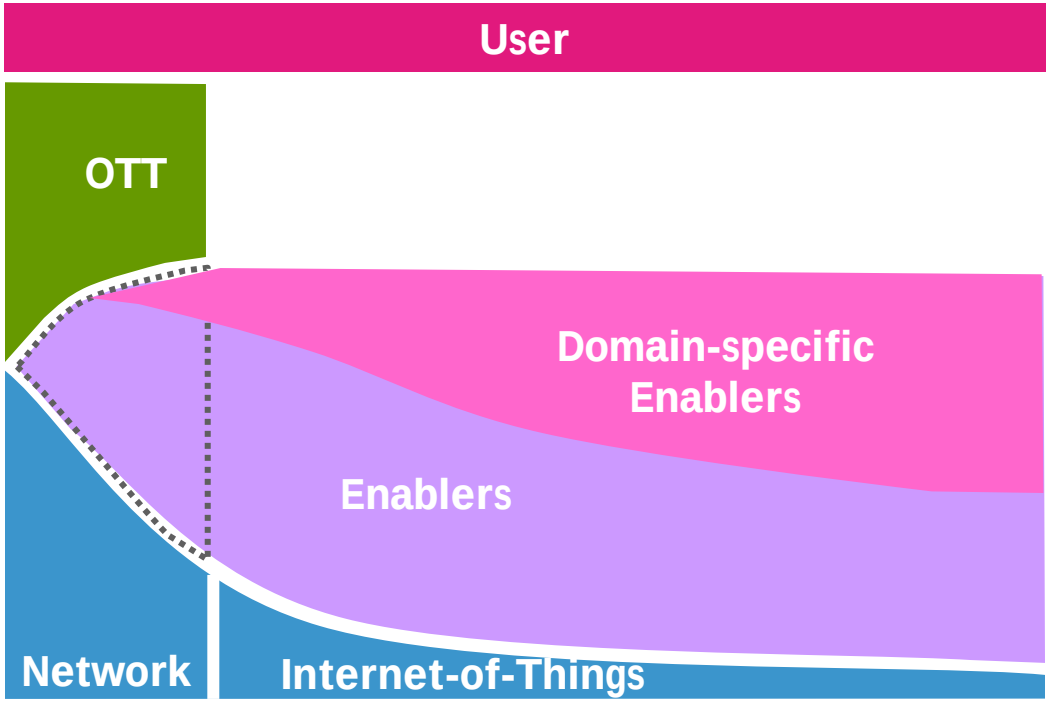

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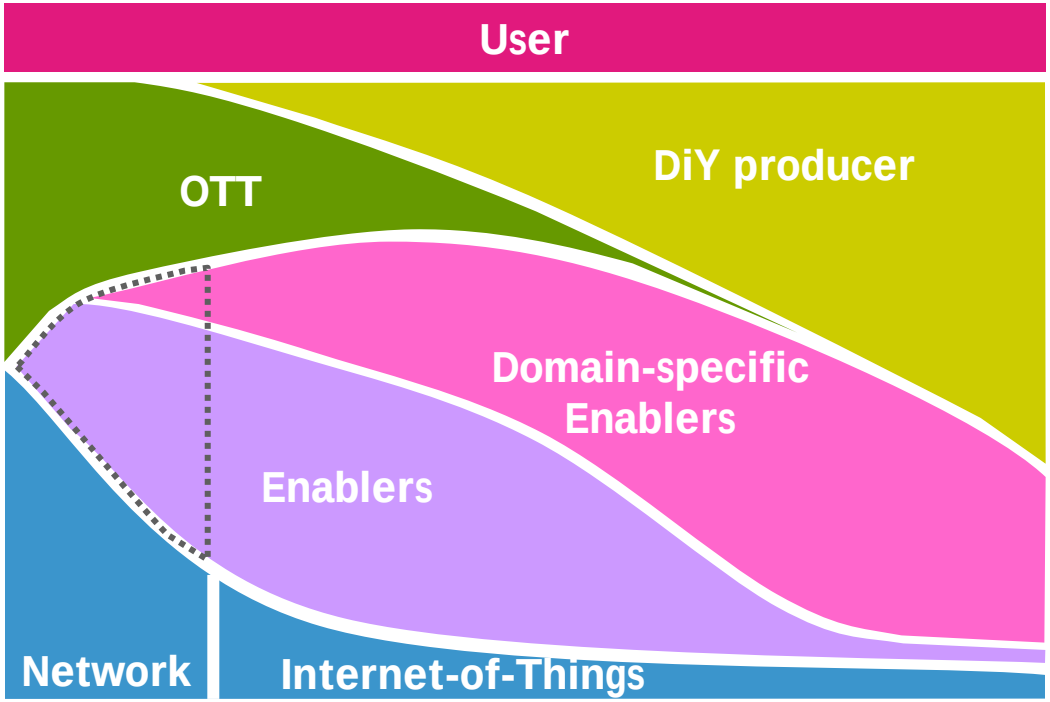


Objective

Allow non-technical users to create and share Internet-of-Things Applications in their Home and City

Technological challenges

Internet-of-Things Application creation by non-technical users

- End-user programming ? Scripting versus composition versus …
- Expressiveness versus abstraction
- Evolving Languages. New operators for Ambient Programming ?
- Ontology engineering, mapping & instantiation

Ambient Programming

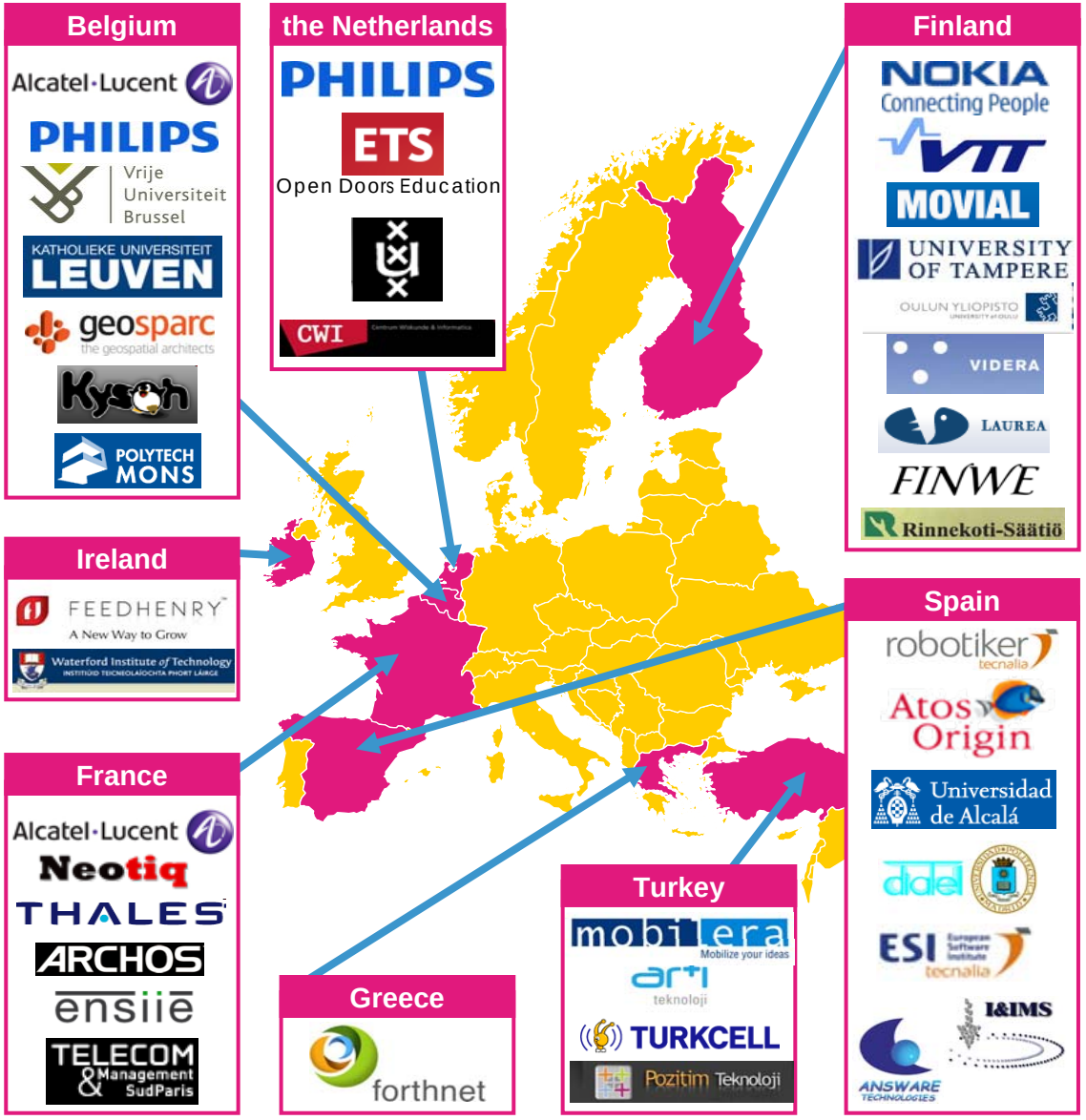
- Concurrency, resource sharing
- Ad-hoc dynamic resources
- Distributed resources and UI

Architecture (and hence value-network)

- Distributed/central, Webx.0
- Service/enabler broker ?

Open Innovation in a Research Consortium (> 47 Partners), led by Bell-Labs

Do-it-Yourself Smart Experiences Research consortium (ITEA2)



>47 partners
Led by Bell-Labs

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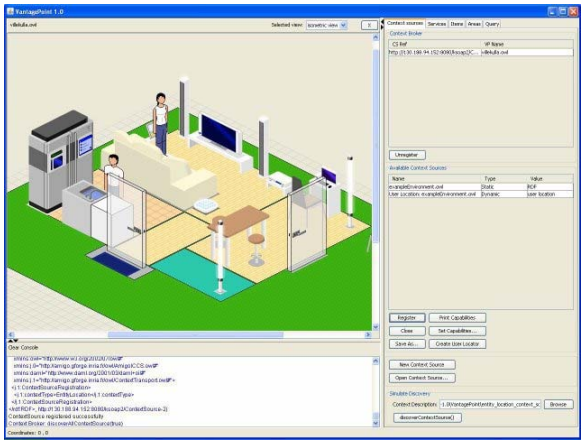
New, more easy ways for rule editing

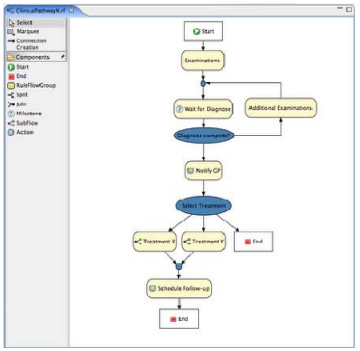
Text based with auto completion

Tangible representation

Physical world



3D visualization



Graphical