



The ANA Project: "Federating networks"


EuroView Workshop
Würzburg, July 2008

Project Outlook




- ANA is funded by the European Union in FP6.
 - 4 years: January 2006 to December 2009.
 - 10 European partners, 1 Canadian partner.
 - Initiated by UBasel, coordinated by ETHZ.
- A Future and Emerging Technologies (FET) project.
 - Forward looking and "risky" research.
- Proactive initiative on Situated and Autonomic Communications (SAC).
 - New paradigms for communication/networking systems.
 - 4 projects: ANA, BIONETS, Haggler, Cascadas.
 - <http://cordis.europa.eu/ist/fet/comms.htm>

Consortium




ana
autonomic network architecture


- ETH Zurich (CH)
- University of Basel (CH)
- NEC (DE)
- Lancaster University (UK)
- Fraunhofer Fokus (DE)
- University of Liege (BE)
- University Pierre et Marie Curie (FR)
- NKUA (GR)
- University of Oslo (NO)
- Telekom Austria (AU)
- University of Waterloo (CA)




ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich




UNI
BASEL




NEC
Empowered by Innovation




LANCASTER
UNIVERSITY
Computing Department
Faculty of Applied Sciences




Fraunhofer **FOKUS**
Institute for Open
Communication Systems




ULg
UNIVERSITÉ de Liège




ΕΘΝΙΚΟ & ΚΑΠΟΔΙΣΤΡΙΑΚΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ
NATIONAL & KAPODISTRIAN
UNIVERSITY OF ATHENS




UNIVERSITY
OF OSLO



LIP



University of
Waterloo




TELE
KOM
AUS
TRIA

ANA Project - EuroView Workshop - Wuerzburg, July 2008

3

ANA: a timely initiative, in good company



ana
autonomic network architecture

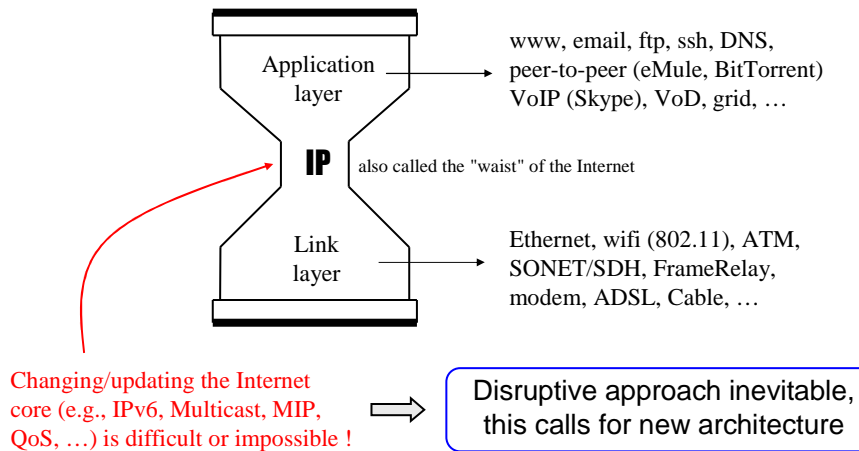
- Projects and initiatives such as
 - GENI, FIND.
 - FIRE: 4WARD, Trilogy, Onelab2, etc ...
- In the literature:
 - Plutarch, NewArch (RBA, FARA), Turfnet, Selnet.
 - Ambient Networks.
 - RNA: Recursive Network Architecture at ISI.
 - ... and many more (old and new).
- Partial proofs of concept, no full architecture (yet).
 - Selnet, M-FARA, Ambient Networks.

ANA Project - EuroView Workshop - Wuerzburg, July 2008

4

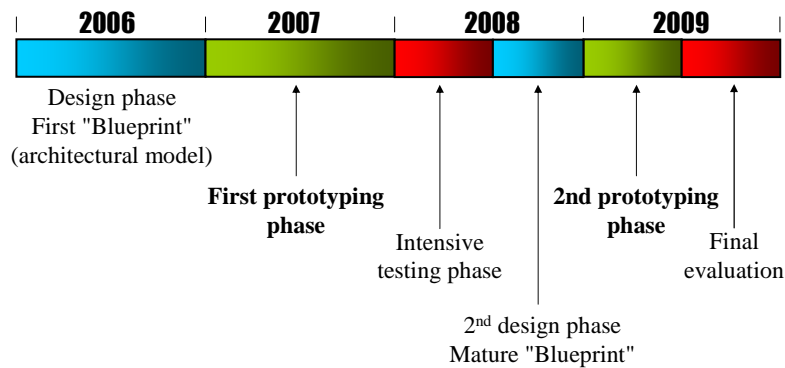
Motivation

- Variability in the Internet is above and below IP: it's the "hour-glass" model.



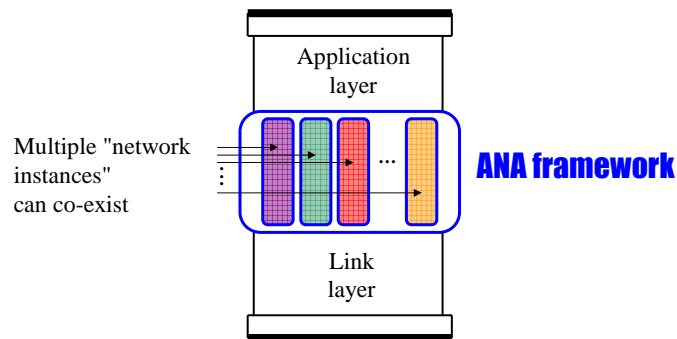
You can't "build" an architecture, you have to "grow" it

- Project is articulated around 2 prototyping cycles.
 - Methodology: design, test/validate, refine.



ANA ≠ "one-size-fits-all"

- ANA does not want to propose another "one-size-fits-all network waist".
 - ANA is a **meta-architecture** to host, interconnect, and federate multiple heterogeneous networks.



Core design principles

ANA offers a flexible and evolvable framework.

- It allows variability at all levels of the architecture: multiple
 - functionalities,
 - variants to perform a given task,
 - and network "instances"co-exist and (can) compete, open for extensions (evolution).
- Desired side effect: contribute to future Internet discussions (e.g., FIRE).

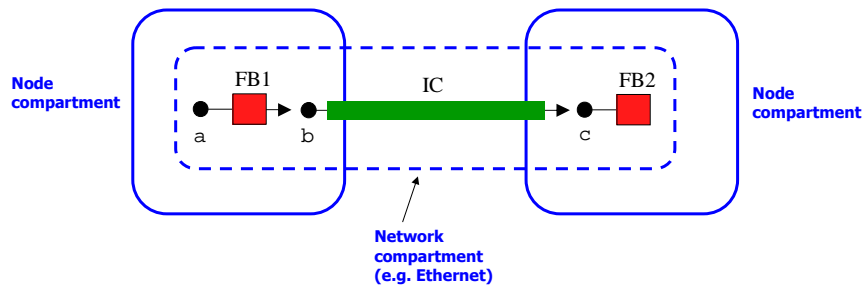
ANA explicitly avoids imposing

- Static/rigid standards imposing how networks should operate
- Built-in address dependency (i.e. address-centric architecture)
- A global address space (requiring global coordination)

The ANA framework specifies how networks interact

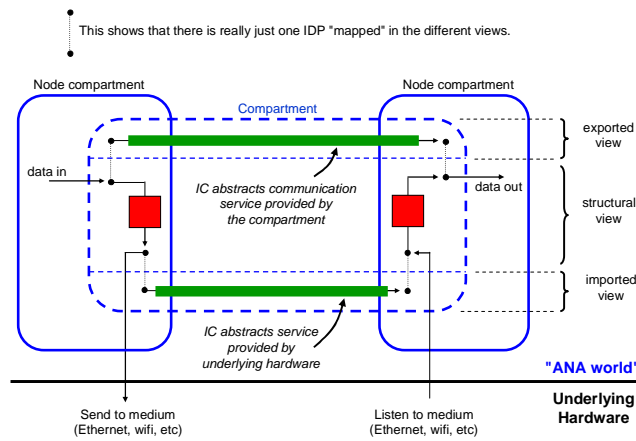
Core abstractions

- Core ANA abstractions:
 - **Compartment**: "wrapper" for networks
 - **Information Channel (IC)**: generic communication channel.
 - **Information Dispatch Point (IDP)**: generic indirection system.
 - **Functional Block (FB)**: packet processing entity.



Core abstractions

All network compartment export the same abstractions



The core ANA API



The generic "glue" for all interactions in ANA

- The API offers 5 fundamental primitives.

```
IDPp publish(IDPc, CONTEXT, SERVICE)
```

```
int unpublish(IDPc, IDPp, SERVICE)
```

```
IDPr resolve(IDPc, CONTEXT, SERVICE)
```

```
void* lookup(IDPc, CONTEXT, SERVICE)
```

```
int send(IDPr, DATA)
```

ANA prototype, take 1



- First prototype released in summer 2008
 - check www.ana-project.org for code and documentation.
- Written in C, for Linux. Same code, 3 versions: each component can compile as:
 - a userspace .so plugin of the main core component.
 - a standalone userspace process.
 - a standalone Linux kernel module.
- Available components in 1st release:
 - ANA Core (called MINMEX).
 - Full API for developing additional components.
 - Compartments: Ethernet, light-IP, FBR (Field-Based Routing).
 - Misc: cfinder, ip2ana, vlink, chat.

What's next in 2008?



- Deployment of a testbed to run experiments.
 - Two parts: ANALab (for ANA partners) and ANA@Home for external participants.
- Development of additional components:
 - Network monitoring system, inter-compartment routing, service discovery, content-based routing, functional composition, self-addressing scheme, remote stack access.
- Refinement and revision of ANA Blueprint.
- 2nd prototype release in January 2009.

ANA Project



Thank you for your attention

www.ana-project.org

Give it a try!
ANA is a really flexible framework
for developing and federating
new protocols and networks.