

ana

autonomic network architecture

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, Haggie, Cascadas.
 - <http://cordis.europa.eu/ist/fet/comms.htm>

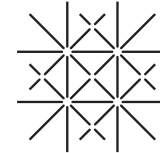
Consortium



- 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)



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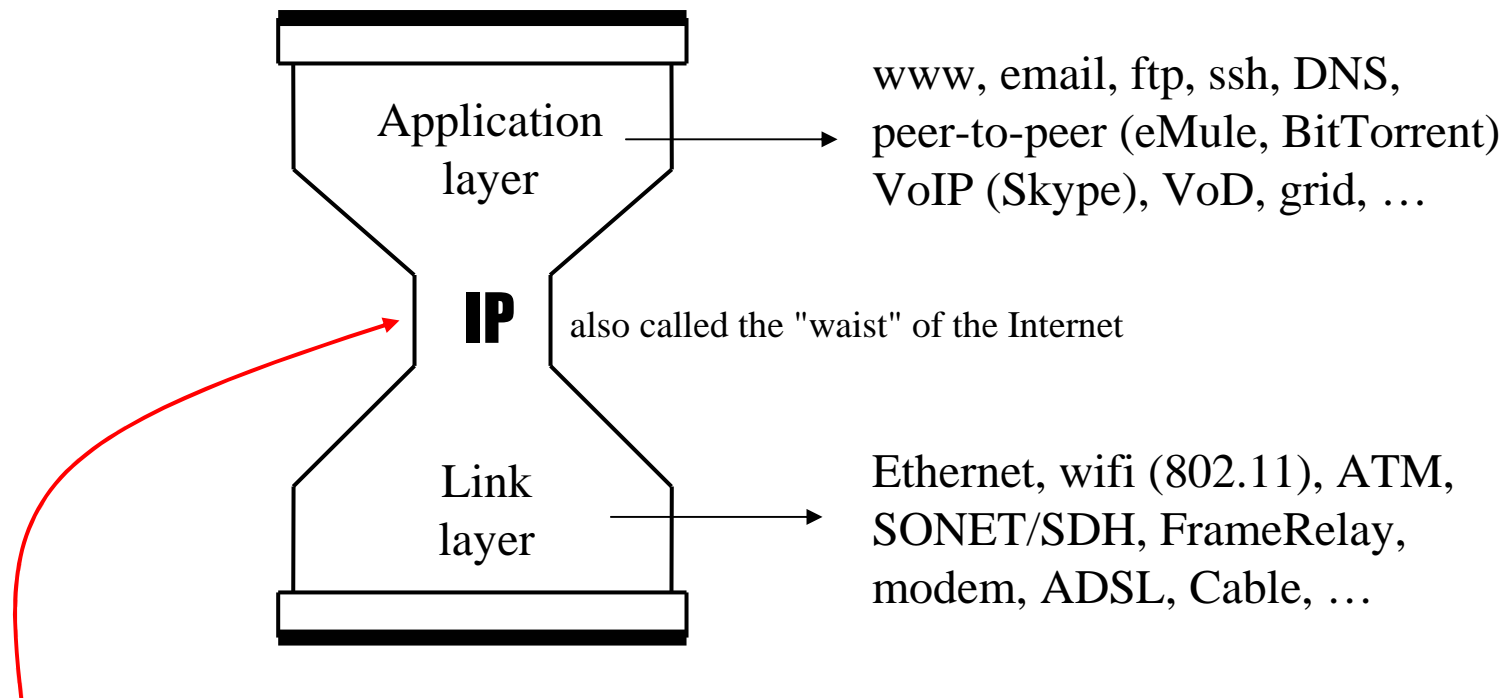
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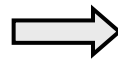
- Projects and initiatives such as
 - GENI, FIND.
 - FIRE: 4WARD, Trilogy, Onelab2, etc ...
- In the literature:
 - Plutarch, NewArch (RBA, FARA), Turfnet, Selnet.
 - Ambient Networks.
 - RNA: Recursive Network Architecture at ISI.
 - ... and many more (old and new).
- Partial proofs of concept, no full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

Motivation

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



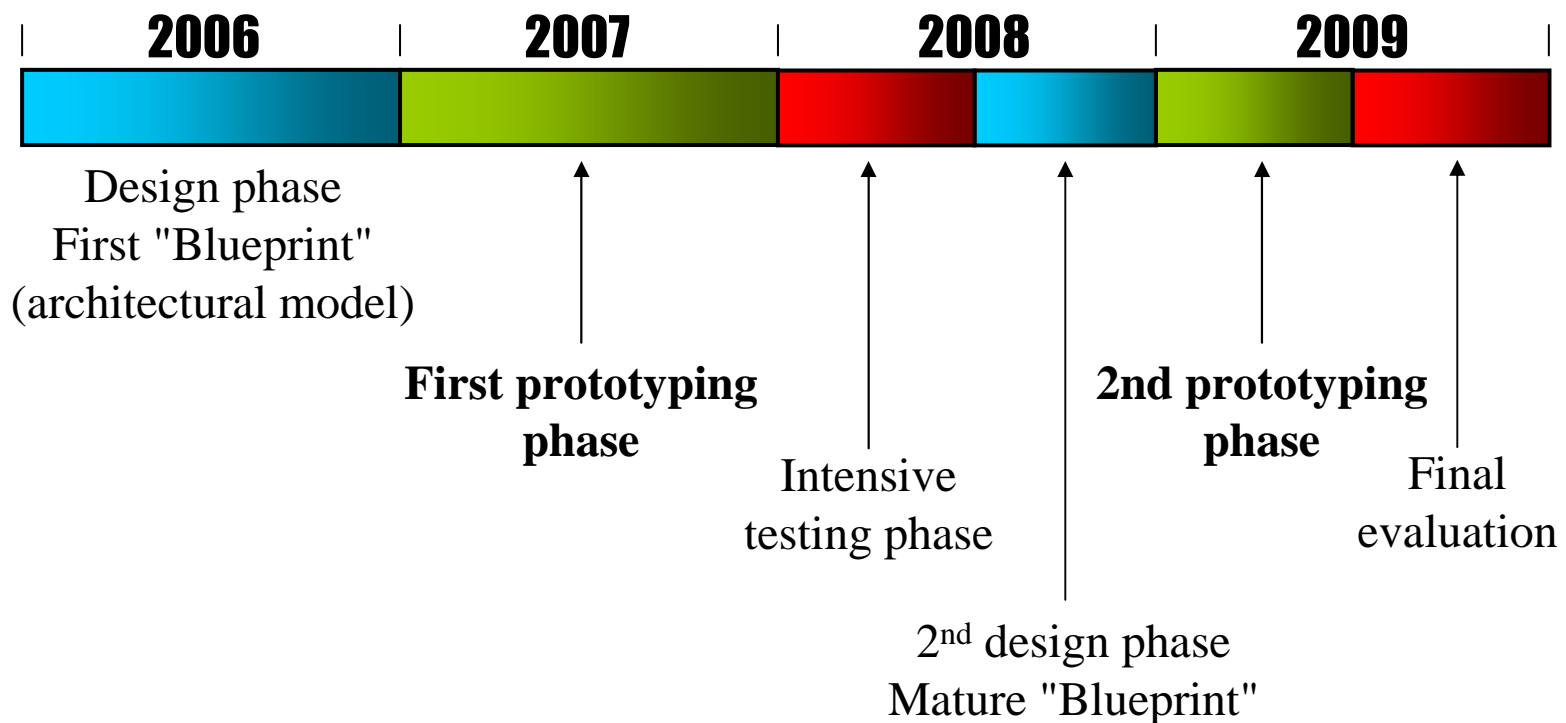
Changing/updating the Internet core (e.g., IPv6, Multicast, MIP, QoS, ...) is difficult or impossible !



Disruptive approach inevitable, this calls for new architecture

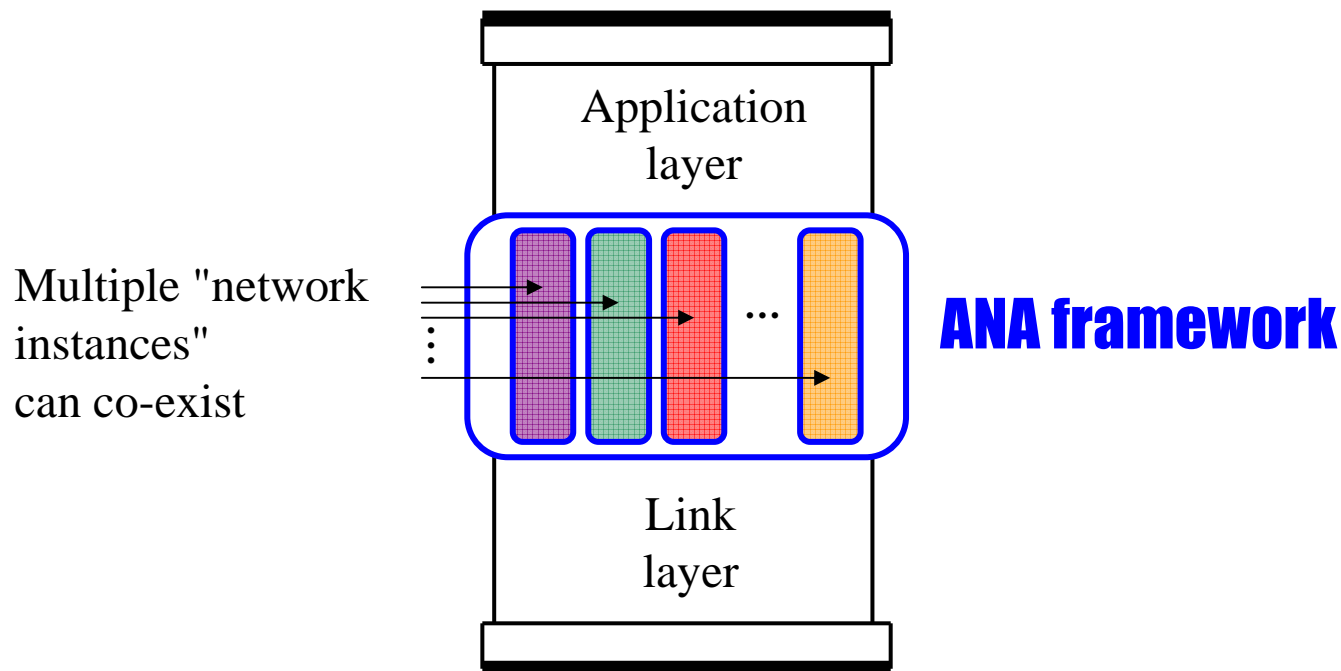
You can't "build" an architecture, you have to "grow" it

- 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.



ANA offers a flexible and evolvable framework.

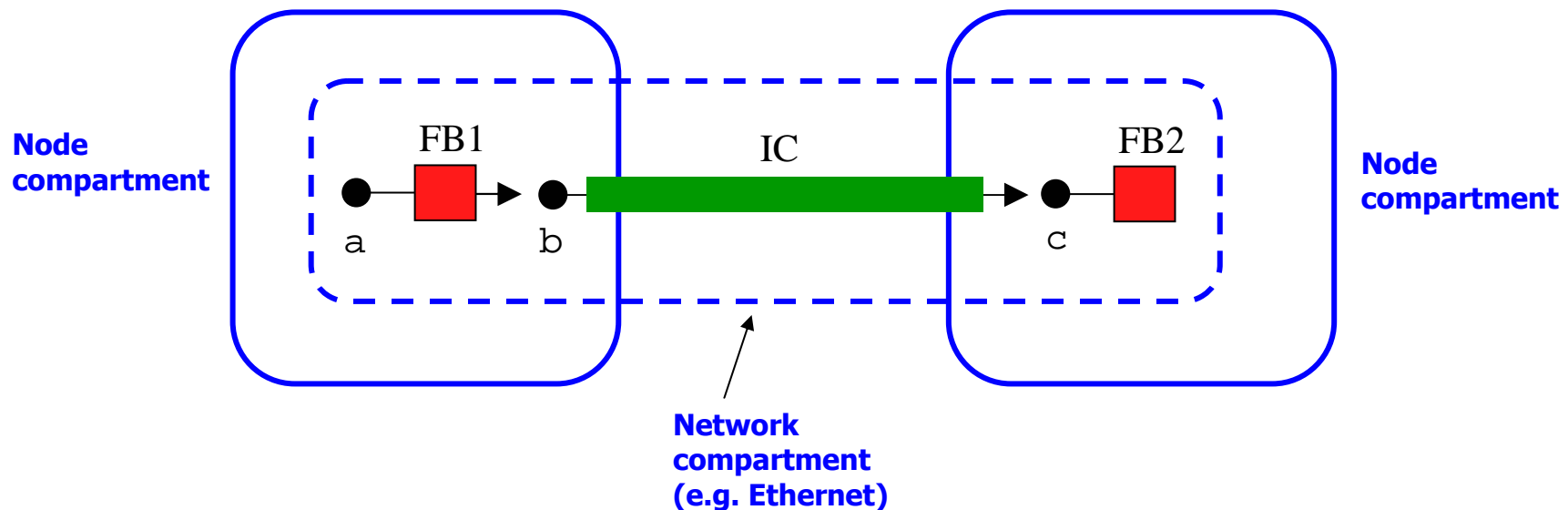
- It allows variability at all levels of the architecture: multiple
 - functionalities,
 - variants to perform a given task,
 - and network "instances"co-exist and (can) compete, open for extensions (evolution).
- Desired side effect: contribute to future Internet discussions (e.g., FIRE).

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)

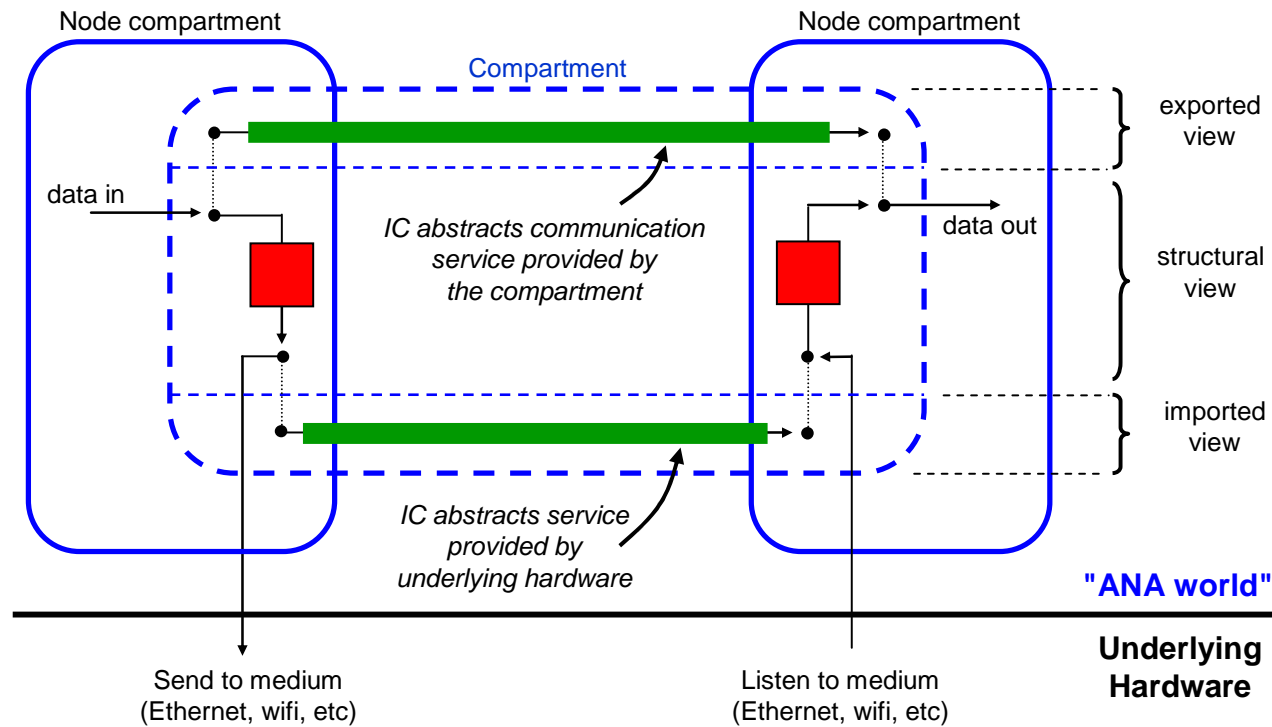
The ANA framework specifies how networks interact

- Core 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.



All network compartment export the same abstractions

This shows that there is really just one IDP "mapped" in the different views.



The generic "glue" for all interactions in ANA

- The API offers 5 fundamental primitives.

IDP_p publish(IDP_c , CONTEXT, SERVICE)

int unpublish(IDP_c , IDP_p , SERVICE)

IDP_r resolve(IDP_c , CONTEXT, SERVICE)

void* lookup(IDP_c , CONTEXT, SERVICE)

int send(IDP_r , DATA)

- 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.

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.