A (very) brief introduction to:

REALIZING THE INFORMATION FUTURE
The Internet and Beyond

a report of the
NRENAISSANCE Committee
Computer Science and Telecommunications Board
National Research Council

Plus, some Thoughts on Encountering the Outside World

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What is an NII, anyway?

We know what an Internet is.
- **A protocol suite.**
- **A shared experience.**
- **And so on....**

But what is an NII?
- **An administration vision?**
- **The phone and cable TV system?**
- **A marketing slogan?**
- **The next generation of shared experience?**
- **An international phenomenon?**

This report, requested by NSF to discuss the transition away from the NSFnet backbone, arose in this context.

A rough table of contents

- The Open Data Network -- a framework for the NII.
  - What does it mean to be open?
  - Architecture issues: scale, flexibility, security, etc.
  - Standards and compliance.
  - The role of R&D.
- A perspective from the research, education and library communities.
  - A history of usage. The success of the NREN.
  - The larger challenges, the continuing needs.
  - Common principles -- access, rights and responsibilities.
  - Issues of finance -- the commercial transition.
- Roles for the federal government.
  - Shaping the vision.
  - Balancing the viewpoints.
  - Representing the public interest.

Beyond the visions

Must have a vision of the objective.
Must get beyond vision to the technical implications.

The report develops an architecture for the NII:
- **The Open Data Network (ODN).**

With this framework, we can argue:
- **Where the interfaces should go.**
- **Where market forces will be effective.**
- **Where the government should focus.**

The vision is an objective, not just a starting point.
- **Take explicit steps to get there.**
- **Not a generally accepted viewpoint.**

The ODN

Key characteristics:

- **Openness, technology independence, scale and decentralization, security, flexible basic service, heterogeneity, accounting...**

Open nature is central:

- **To users, to network providers, to service providers, and open to change and evolution.**

Why this vision: to address the central tension in the NII

- **The NII is infrastructure -- it must be stable and long-lasting.**
- **We do not know what the range of successful services will be.**

An architecture in four layers.

Our layers:

Layer 1: technology independent bearer service.
Layer 2: transport and format
Layer 3: middleware
Layer 4: applications

Our building blocks: the network technology substrate.
ATM, LANs, subscriber loops, etc.

The bearer service is a key

Decouples network technology from application development.

- **Technology and services can evolve in parallel.**
- **Maximizes potential for innovation.**
- **Demarcation between network provider and service provider -- a point of unbundling.**

Key issue in shaping NII.

- **If not open, no easy entry for higher level providers.**
- **If wrong features, whole classes of services precluded.**
- **If too general, adds unacceptable cost.**
- **Committee concludes that market forces alone will not be sufficient to deploy a system with this vision.**

Define the lower layer, so the upper layer can grow.

An example -- access circuits

Over the next decade, there will be a major expenditure to upgrade subscriber loops in the U.S.

What vision(s) of the NII will this upgrade support?

- **500 channels of on-demand TV?**
- **An open market of ideas, products and services?**

What will make this answer come out one way or another?

- **Market forces do not offer proper incentives.**
- **An overarching vision is needed, but not enough.**
- **Some delicate market manipulation.**
  (Does <u>not</u> mean regulation!)
- **Some proof of concept demonstrations.**
  -Both technology and market demonstrations.

NII Compliance

If the NII is not just marketing, there must be a definition of what it is and what it does.

Standards will have to be evaluated to judge if they accomplish the NII functionality:

- -- NII Compliance.
- -- Based on the objective of maximizing interoperation.
- -- Approach permits a range of functionality.

Who will participate in this evaluation?

- Must have broad sector involvement.
- Not just the providers or the standards bodies.
- We see a role for the government here.

What if the government does nothing?

Timely convergence at lower levels not likely.

- **Bearer service not likely.**
- **Loss of economic opportunity and societial capability.**

Lots of money will be spent anyway.

- **Its their money...**
- **Little expectation of an open, interoperable system.**

Several incompatible networks.

- **Commerce, entertainment, "internet".**

The market cannot explore a space that the infrastructure precludes.

- **Note mismatch of market opportunity and expenditure.**
- **This is where the vision is needed.**

Specific recommendations

Embrace a vision of the NII: we stress issues of openness, decentralization, and scale.

- The Open Data Network

Extend this vision to a technical framework for the ODN:

- We propose a framework, or architecture.

Continue involvement in the standards setting process:

- Not <u>set</u>, but participate.
- Represent the public interest.
- Advocate its long-term vision.

Designate a body responsible for overseeing the evolution of the NII.

- Blend technical and policy aspects.
- Charter to function for an extended period.
- Neutral as to new or existing body.

Work with industry to find ways to encourage the deployment of NII compliant technology.

- Subscriber loops are a key example.

Some quotes

"...the appropriate future communications infrastructure for the nation will come into existence only if its development is guided by a continuing and overarching vision of its purpose and architecture."

"The challenge for the country is to shape the architecture of the network so that the NII that results meets not only just short-term commercial objectives, but also longer-term societial needs. It is important to appreciate these differences in outlook now, since progress dictates that rough agreement on an NII vision be achieved sooner rather than later."

"The process of setting standards is the only way that a high-level vision of the NII can be translated into a useful deployed infrastructure."

The outside world

This NII thing...

No agreement as to what it is. Lots of agreement it might be important.

Started a Washington feeding frenzy.
Started an industry frenzy
(to keep Washington in a box).

Lots of opportunity to take some territory.
(Some folks may see us as territory to take.)

There is a parallel between building the NII and building the Internet.

- **No one is in charge.**
- **We acted on a vision.**

Congress ,the Administration and the private sector

The National Economic Council is interested in the Internet paradigm for the NII.

All sorts of laws being proposed.

- **HR3636 Open Platform, Open settop study, etc.**
- **Regulation of pricing of the Internet.**
- **Public access setaside on switched networks.**
- **The FCC is being instructed to do a range of enquiries.**

Standards setting groups smell opportunity:

- **NIST holds a meeting on standards for the NII.**
- **ANSI holds s summit of standards defining organizations for the NII. Hits NYT.**

Industry defines interface framework(s) for NII.

Recommendations to us

Tend to our knitting.

Understand that there is an outside world that is watching us.

Understand that there is a range of visions for our future:

- **We continue to live as a "hostile overlay"; maintain independence.**
- **We become a more basic part of the infrastructure.**
  - **Give up some autonomy.**
  - **Have a bigger impact.**
  - **(I find the latter more exciting).**

Have a (big?)vision.

Tend to our knitting.

Getting the report

The printed version, properly bound as a book:

Contact the National Academy Press
1-800-624-6242
amerchan@nas.edu

On line (for Internauts):

[www,gopher,ftp].nas.edu