

**Challenges for a Green  
and Yellow Internet**

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# Explain the Next Internet

- To a student
- A worker, an astronomer, a weather forecaster, ..
- A doctor, a patient, a
- A Government servant, a teacher, ...
  - Can you tell each how they would benefit?
- We have the technology or know how to proceed to achieve it → we lack clear goals
  - **We need to talk more about minimizing the negatives!!**



# The IETF Way → KISS

**We reject presidents,  
kings and voting**

**We believe in rough consensus  
and running code**

**David Clark**



# Not about ...

- A bigger horse (H. Ford) → New ideas!!
- Avoid a Blind approach
  - Taking things as granted
  - Looking where others have already looked
    - Must take time to think
- A pot where “everything” melts
- Distant from its users
- A hat that fits everyone
  - Regional changes, contexts, ...
- Unpredictable → Vivo Experience in the NE



# Some Architectural Design Views

- Cross layer cooperation
- New structures: Contexts, Turfs, Societies, Federations, ...
  - Do not know how to negotiate
- New x-operation modes: delay tolerant, disruptive, based on believe, **willingness** to learn, **willingness** to share, P2P paradigm, ..
- Dynamic creation of networks → ambient networks
- Dynamic composition of services: how can I create a service by composing existing ones over the Internet? →  
Cut Time to Market
- Support for network Coding → Optimize transport



# More Architectural Design Views

- Opportunistic communications
  - At the radio level (CR) → **important for BR**
  - At the service level → use someone else's application, connectivity, web service (Haggle)
- Scalability: new DNS, DHT;
- Dynamic Negotiation: how can CDNs negotiate? ISPs? Users? Communities? Clouds? Policies?
- Closer to users: new naming schemes, deal with users rather than end systems, semantic conversation;



# More views ....

- All networks, objects, things, applications, must be self-managed;
- Location information should be available whenever needed
- Virtualization of Services
  - Data Centers, Clouds, Content Networks;
- Support for Service Brokers

**A diverse Internet and loosely unifying: with support for different Business models**



# More views .... Lack of Focus

- Delayed Cooperation
- Tele-immersion
- Remote instrument control
- **Environment Crisis Management**
- Distributed Simulation
- Public Information Access
- Distributed R&D (e.g: Astronomy)
- Mobility, Location and Binding
- **Autonomous Computing: self-identification, self-healing, self-configuration, etc...**
- Support for different business models

# What could be missing from the proposals?



- More of the same → increase positive (technology short-sighted)
- May miss a unique chance to adapt the Internet to the reality of a society a country, human users, difficulties;
- Could we take a top down approach?
  - Think of **where** we want to get;
  - Then **how** we get there
- Related initiatives and projects could fail because of a lack of clear goals



# Let us think of our context - Brazil

- **Huge** geographic areas;
  - Interconnect with postal office, Terrestrial Transport and other DTNs
  - Interconnect with Government **School Boats**
  - Take advantage of VANETs for delivery
- Inline with a National **Security** Mission
- The next Internet should be:
  - a personal virtual teacher to a school child in a remote area;
  - No content, no object, ..., is put into the network without a user manual → standard object description
    - Ex: This content is useful for 2<sup>nd</sup>. Grade students
    - The content provider thinks of the application mining designer



# Let us think of our context - Brazil

- Reflect the structure into societies, contexts, turfs, federations, domains, with common interest
- a space where all user activities can be synchronized in real-time.
  - Between home, car, office, etc..
  - Phone Joao by saying "Call Joao", "send this message to Joao", he lives 50 km from Macapa, and things just happen;



# Let us think of our context - Brazil

## ■ The Brazilian context should:

- Make it easy to obtain statistics on industry, education, user interests, etc..
- Tell me what is a hot scientific topic in the area of networking today?
- Create Internet communities to coordinate their activities, deal with local problems,..
- Assist farmers intelligently:
  - Who can help me export beans from MT?



# Let us think of our context - Brazil

- Reach regional and rural areas with broadband low cost services:
  - Using technologies such as cognitive radio;
- Seamless connection of every citizen
  - They already have phones! A smart terminal is as necessary as a CPF number.
- Environment Crisis Management
- E-government nearer to its citizens;
- We must give the new Internet a local flavor, otherwise we may just waste our time and resources



# Did we deliver on our promise?

- First think services/clear vision/scenarios then technology
  - Top down approach
  - Take the necessary long view
- Define and Build Aggressive Scenarios
- **Consult** with users (academia, industry, agriculture, ..)
- Set clear goals → then select a subset
- Achieve those goals (choose and develop technology) and conduct real testing
- **Methodology**: At the end of the project we measure the achieved gain before and after the new architecture for:
  - students, farmers, civil servants, researchers, resident of popular areas, other segments of the population..
  - Evaluate a utility function
- Did we deliver on our promise?



# Summary

We need a vision that we can sell to anyone

If its is technical, then it is not a good one

The NICT (Japanese) Appraoch is an interesting example to learn from Share your thoughts on a Green and Yellow Internet



# Some Questions

- Q1: We have the technology and lack a clear view of the final picture.
- Q2: Do we need to talk to different present and future users and ask them what they see missing?
- Q3: What can we learn from existing initiatives? Failures?
- Q4: Can Brazil have its own Internet brand (turf or context)?
- Q5: How can we sell the idea to the nation? What can be promised to each user?



# More questions

- Q6: How do we know we are there?
- Q7: What sort of time frame are we talking about?
- Q8: Are there any risks? Can some players be alienated? Can others dominate the scene?
- Q9: What about Privacy and security concerns?
- Q10: how would you divide up such a big problem to conquer it?