



TeleRenaissanceTM : *target* → Autonomic Communications



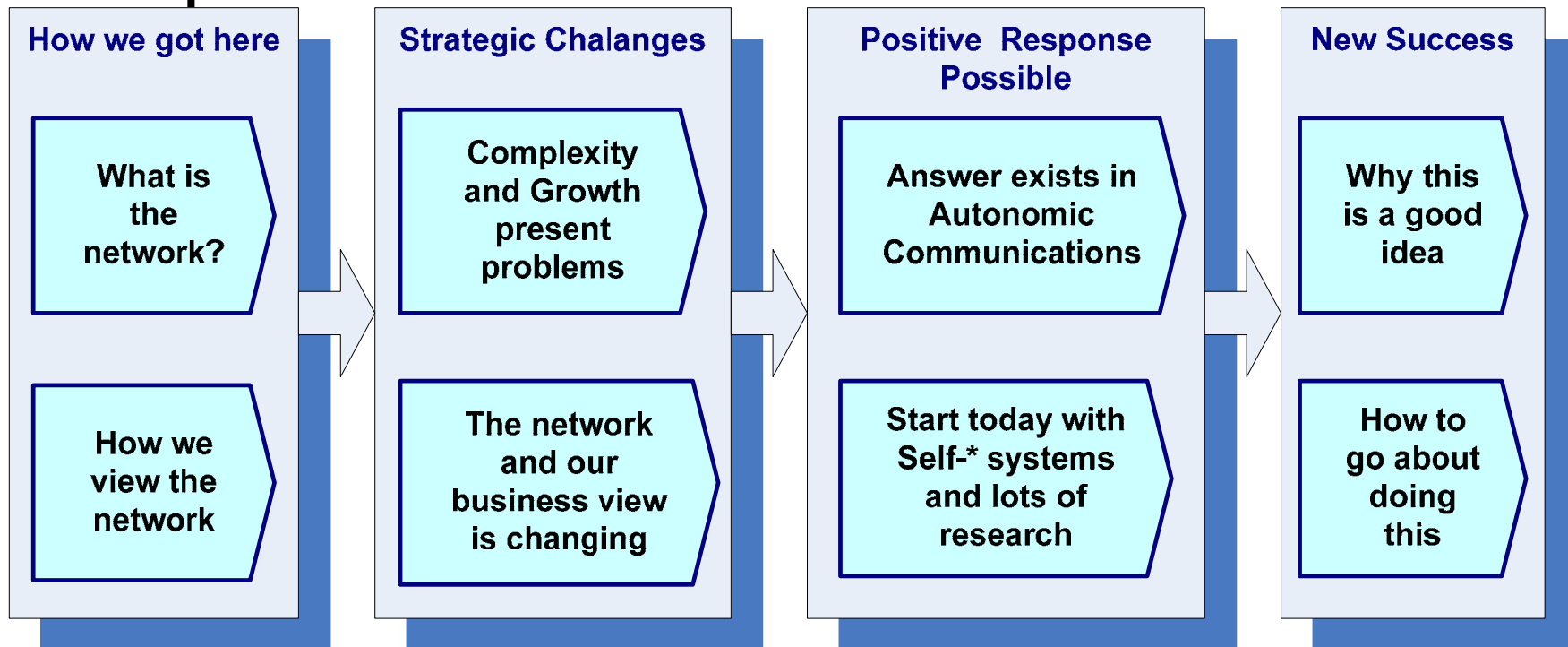
Wedge Greene *

Feb 7, 2008

* Father of NGOSS

In mathematics you don't understand things.
You just get used to them.
- Johann von Neumann

Presentation Roadmap



- This is all discussed in detail with our papers
 - [The New Telecom Ecosystem](#) parts 1 & 2
 - [Autonomic Networks - Autonomic Communication](#)
 - [Self-* Networks: Helping Networks Help Themselves](#)
 - [Architects Anonymous: Rehab for Telecom](#)

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What is the network?

From millions to billions of connections and growing →

- Yesterday (1993) the mainstream view was:
 - devices and connections
- Then it grew ...over 15 years ...to include:

Routing

Users

Processes and databases

Management software

Devices

Web of information

Peering networks

Boundaries Expanding

soon to add a billion connections a year →

- The system becomes much more complex
 - From the **connection** to the **information flowing over the connection**
- Provider corporate boundaries are expanding
 - New **end-to-end partner supply chain**
 - New **information revolution**
- Definition of Provider is expanding to OTT SPs
- Yet:
 - Forced to **free the customer** from ownership!
 - Relationship management now our goal.

What you do today will not work tomorrow

And does it even work today?

From the mouths of Operators...

- Number of connections and bandwidth is doubling now at yearly rates – and it keeps getting faster
- Facility costs just keep increasing and we are on the edge of our capability to build them in time ...and more and more keep coming.
- No one can lab test their software to scale. Are we deploying land minds?
- Our models of testing are based on our knowledge of past failures – so what happens when the unexpected disaster occurs: the Katrina of networks.
- Peering does not bring in any revenue
- We are not going to solve our problems with better metrics
- Chip industry requires generational improvements every 7 years, but telecom is so big, we have no idea how to do this?
- Annual 5-15% business case improvements will not cut it anymore
- **“My god, the train is in the tunnel” is not an effective business case.**

What is the network of Tomorrow?

The broad view

People, Presence, Location, Group

Plethora of Active Devices

Globally linked networks

Grids

Augmented Web

Supplier Ecosystems

It's no longer about **hardware**.
Now it's about all the **software**

“One great big ball of software”™

What runs the show?

Viewpoints on network design & control intelligence

External → Pragmatic → Internal → Emergence

Clockwork



Efficiency
Systems



Control
Systems



Life-like

- **External:** Create a perfect network design run by a perfect, responsive operator
- **Pragmatic:** Create good processes and clean data that describe network & customers
- **Internal:** Embed policy controlling reactions inside the devices and management services
- **Emergent:** Stable behavior arising from the interactions of services and agents

Nature as the model

Biology as a source of inspiration →

- Best practice today = NGOSS
 - Integrated
 - Framework Architecture.
 - But our networks are not nicely ordered
 - Heterogeneity, dynamism and unpredictability are problems
- Nature presents much the same view day after day.
 - Nature is messy but attractive
 - This high-level constancy, in the midst of constant low-level changes
 - The result of evolution over eons, bit of a sticky wicket

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Why care now?

Major unacceptable risk:

Global network destabilization

Uncertain future for traditional networks

Direction for Success:

Autonomic Communications is essential to...

Thrive

Be profitable

Grow revenues, profits, & wealth faster with less effort

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**Autonomic
Communications**

Autonomic Communication

Merging NGOSS and Biological inspiration →

- Evolution towards functional adaptability, extensibility and resilience.
- Many peer units receiving stimuli and responding with controlled reactions
- Exhibit **Self-*** (**self-star**) properties: systems are self-organizing and self-managing.
- Structurally self similar

Compelling Self-* Principles

Think, if you did only this, what possibilities →

- Self-configuration
- Self optimization
- Self-healing
 - self-monitoring
 - self-diagnostics
 - self-restoration

Technology exists

Can be built with
today's knowledge
and skills

Needs the will to act

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Achievable Vision

will make you more efficient and open massive new markets

Hardware & Software which :

- senses need,
- deploys itself,
- creates its own network QoS connections,
- manages its operational quality,
- re-deploying as necessary for efficiency
- and cleans up when done.

Start today with
Self-* systems

The Grail

- Discovery
- Self-similarity
- Self-protection
- Situational Awareness
- Self-defining

To do list

Vendors
must
agree

Universities
and
Consortium
at work

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Ten step program

1. No fear
2. No limitations
3. Start with a Vision
4. Gather Informed, Collaborative Teams
5. Leverage the Discontented
6. Reorganize
7. Leverage Processes
8. Start with NGOSS & Service Delivery Frameworks
9. Create Self-* Systems
10. Demand Smart Devices

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- Initiator of **NGOSS** and Fine Grain NGOSS, the first OSS SOA.
- Inventor of the Service Ecosystem

- Strategic specialist at LTC International: consulting on architecture, processes, systems, and applications.



Extra material



Complex Adaptive Systems

Biology as a source of inspiration?

- Ecosystems have no team with the job of network designer creating the pretty schematic...
- To design purposeful, complex systems:
 - (1) Design stimuli, responses, and controls;
 - (2) Deploy & watch how these affect the complex system; and then
 - (3) Reproduce & disseminate the patterns which work.



Agents & Stigmergy

- A method of indirect communication in a self-organizing emergent system where its individual parts communicate with one another by modifying their local environment.
- Active = intelligent "agent" alters its environment so as to affect the sensory input of another agent
- Passive = an agent's action alters its environment such that the environmental changes made by a different agent are also modified.

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Infrastructure

- Software Components

- Service or Agent
- Container
- Registry
- Launcher
- Discovery
- Monitor

- Controls & Behavior

- Models
- Patterns
- Policy

- Platforms

- Ubiquitous Networks
- Grids
- Cloud computing
- Self-assembling sensor networks
- Pervasive Computing
- Meshed social networks

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Where to participate

- Autonomic Communication Forum ([ACForum](#))
- [BIONETS](#) (BIOlogically inspired NETwork and Services)
- [Open Grid Forum](#) / Global Grid Forum
- The Task Force on Autonomous and Autonomic Systems ([TFAAS](#))
- Autonomic Network Architecture (ANA)
- CASCADAS: (Component-ware for Autonomic Situation-aware Communications, and Dynamically Adaptable Services)
- Serenity
- HAGGLE - An innovative Paradigm for Autonomic Opportunistic Communication