IRoNet Seminar

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Sensible design principles
for new networks and services

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Terms...

- Sensible?
    - Showing reason or sound judgment
    - Able to feel or perceive
    - Acting with or showing thought and good sense
    - Marked by the exercise of good judgment or common sense in practical matters
    - Readily perceived by the senses
    - Aware intuitively or intellectually of something sensed
    - Proceeding from good sense or judgment
- Design principle?
    - Fundamental truth, law, doctrine, or motivating force, upon which design decisions are based
    - Essential objective that provides a theoretical framework for design decisions

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Why?

- Is there something wrong with some network or service design?
  - Should we be more sensible in future?
    - In my opinion, yes...

- Personal experience
  - 9 years with ATM, another 9 years with other QoS issues
  - What have been the effects in real networks?
    - not much -- maybe something useful related to DiffServ
- Somewhat frustrating, but I was not alone
  - IEEE database: 8770 papers about ATM, 6470 about QoS, 1294 both ATM and QoS
    - rough estimation: > 100 000 person years for ATM research

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Papers in IEEE journals and conferences
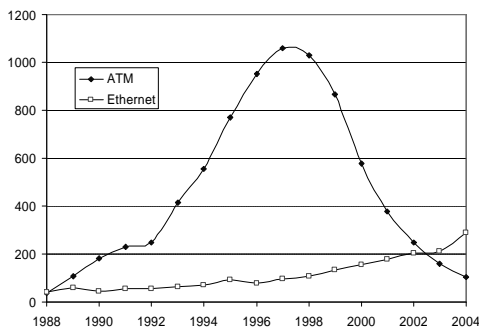
Papers per year
with keyword in abstract
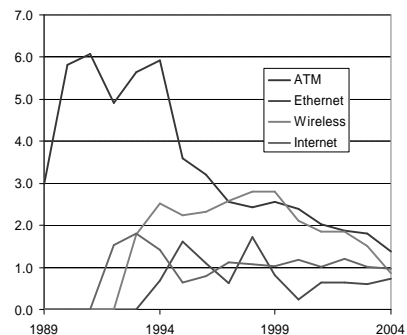
Share of QoS papers
of all papers with the keyword
compared to average
share of QOS papers

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Failures of ATM and QoS

- Something went wrong with ATM and QoS, but what, why and how?
- ATM and QoS has been failures as an end-to-end service for consumers
  - use for traffic engineering purposes is another matter
- Analysis about these failures
  - Odlyzko (2000): ATM was designed for long-lived flows with well-defined bandwidth and QoS requirements, whereas in reality most flows are small and do not require any specific bandwidth or QoS.
  - Welzl (2004): end-to-end QoS requires everything between end-points to fulfill the same service guarantees, which is extremely difficult in heterogeneous networks.
  - Clark et al. (2002): QoS means operational and management cost while there is no guarantee of increased revenues.
  - Burgstahler et al. (2003): the price of advanced technologies, like ATM, is too high compared to the business benefits they are able to offer.
  - Bell (2003): the broken feedback loop between network operations and research leads to an unacceptable level of complexity.
  - Schulzrinne (2004) stressed problems with protocol and network design

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End-to-end QoS – WHY?

- Why is end-to-end QoS repeatedly selected?
  - regardless of obvious technical and business problems

> "... if someone invents a service, that is really interesting for private users, the market could suddenly explode. What is such a service? Really active choice of entertainment such as "Dial up your favorite Fellini", "Get your grandchildren right into your living room", or a multimedia encyclopedia, where a subject is demonstrated optimally on a combination of words, sound and interactive video."
>
> *Carsten Rasmussen, NTS-9, 1990*

- Movies, videotelephone, multimedia – exactly as nowadays, except encyclopedias have come already without ATM and QoS
- Is video streaming the sole reason for e2e QoS?

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Misleadings?

1. Content is not king

2. Creeping featurism

3. Real network evolution is selfish

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Content is not king

- Revenues in US in 2003
  - Telecom in total $300 B
    - Cellular $80 B, Internet $35 B
  - Content business
    - Music sales $12 B
    - Movies for the home $14 B
- Content owner always has strong position, so:
  - 50 % of sales through telecom networks
  - 10 % of revenues for network operator
    - = $1.3 B = 0.4 % of telecom business
- Creating new content?
  - Requires expensive marketing, personnel, success is anything but sure
  - unless customers create the content for free...

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Content is not king - remedy

Think primarily every-day uses
for ordinary people
and
design networks primarily for those uses

- Services shall be able to promote social contacts, visibility, group forming etc.
  - valid with all recent success stories: GSM, SMS, e-mail,
  - even P2P file sharing is more about social behavior than economic calculations

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Creeping featurism

- How many features were developed for end-to-end QoS in ATM networks?

- How many were used in reality?

"There are no considerations that go beyond the obvious desirability of specific capabilities. A "capability", merely considered as such, will always seem better to have than not to have."   *Stephen Talbott*

- This desirability will prevail forever, but it may also lead to miserable results

- Similarly, detailed control always is attractive, however

"Designing a network that is intelligently tuned (optimized) for a particular type of data or service — such as TV or financial transactions — inevitably makes that network less open. As software engineers say, "Today's optimization is tomorrow's bottleneck." "
                                    David Isenberg and David Weinberger

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Creeping featurism - remedy

Start from the simplest possible approach,
carefully consider the effects of any additional
feature on user experience and business

- These are very difficult tasks but absolutely necessary,
  - technical performance analysis is never enough

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Selfish evolution

Scenario 1:

- A traffic control mechanisms would offer great benefits for some operators,
  but only if all operators are using the the same mechanism,
  but no benefits for some other operators.
  - => nothing happens, unless the later operators are stupid
    (or regulatory intervention, of something similar happens)

Scenario 2:

- A traffic control mechanisms would offer great benefits for one operator,
  when other operators are not using the mechanisms, but every operator will
  suffer if all operators will adopt the mechanisms.
  - => very probably the mechanisms will be used

- Thus, an analysis concerning only a situation where all operators are using
  a mechanisms, is badly limited...

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Selfish evolution - remedy

New methods and mechanisms have to serve both
the interest of key stakeholders and
the common good

The only way to carry out this is to gather
experiences in real networks before anything
is accepted as a part of a standard

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Sensible design process

1. Concentrate on every-day uses for ordinary people

2. Design a simplest possible network and service model that can effectively support those uses

3. When a new feature is proposed

   a. check carefully whether it can truly offer additional value from the perspective of all customers, and

   b. check carefully whether it can significantly improve the service providers business

4. If the feature passes both phase 3a and phase 3b, test whether key stakeholders are ready to adopt the mechanisms in reality.

5. Only if the feature passes phase 4, it can be accepted as a part of a standard

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