

Network Support for Grid Computing

... a new research direction!

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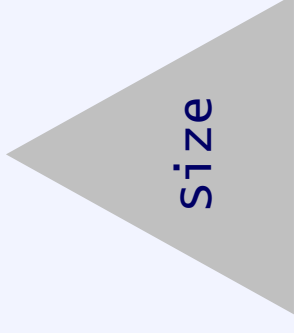
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Scope

- Grid history: parallel processing at a growing scale
 - Parallel CPU architectures
 - Multiprocessor machines
 - Clusters
 - (“Massively Distributed”) computers on the Internet



- Traditional goal: **processing power**
 - **Grid people = parallel people**; thus, main goal has not changed much
- (Probably) today’s most important Grid requirement:
Efficiency + ease of use
 - Programmer should not worry about the Grid
 - Ideally, applications should automatically be distributed
(= automatic scheduling, resource brokerage, AAA and many other functions)
⇒ **Autonomic Grid Computing!**

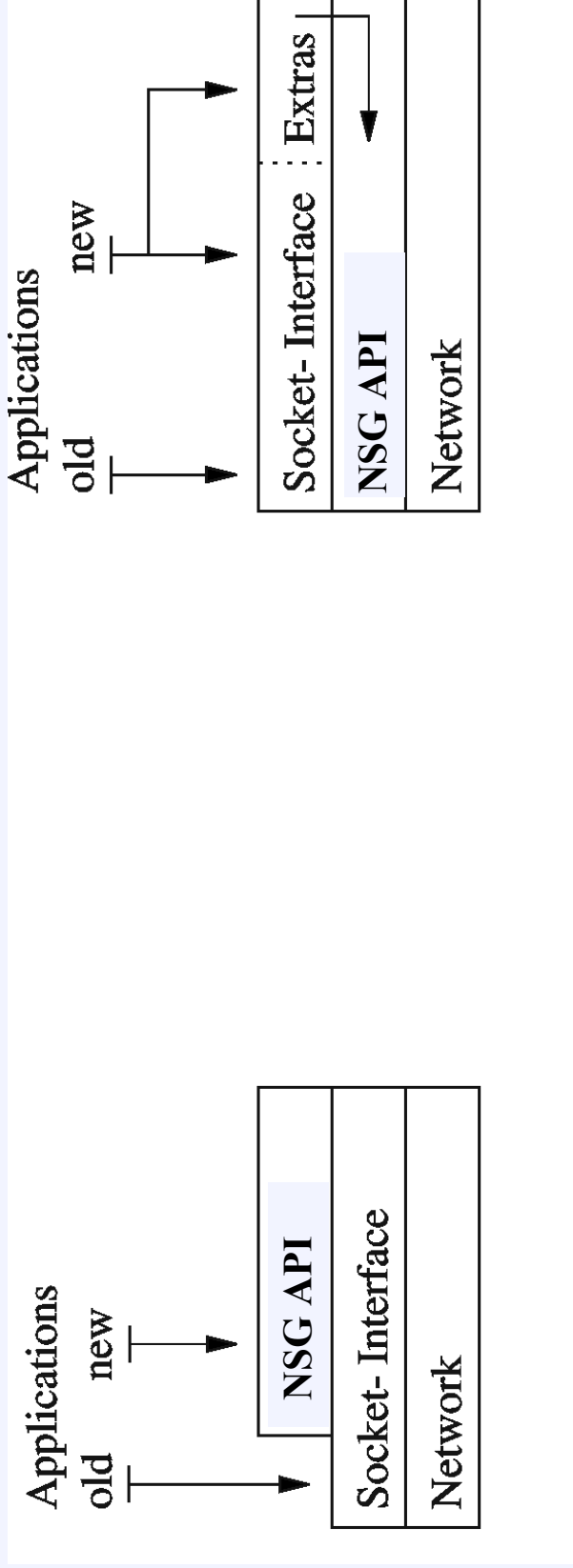
Reasonable to focus on this.

Grid-network peculiarities

- **Special behavior**
 - Predictable traffic pattern - this is totally new to the Internet!
 - Web: users create traffic
 - FTP download: starts ... ends
 - Streaming video: either CBR or depends on content! (head movement, ..)
 - Could be exploited by congestion control mechanisms
 - **Distinction:** Bulk data transfer (e.g. GridFTP) vs. control messages (e.g. SOAP)
 - File transfers are often “pushed” and not “pulled”
- **Special requirements**
 - Predictions
 - Latency bounds, bandwidth guarantees (“advance reservation”) => QoS
- **Distributed system, active for a certain duration**
 - Can use distributed overlay network strategies (done in P2P systems!)
 - Multicast
 - P2P paradigm: “do work for others to enhance the total system” (for your own good) - e.g. transcoding, act as a PEP, ..
 - Can exploit highly sophisticated network measurements!
 - some take a long time, some require a distributed infrastructure

Some issues: application interface...

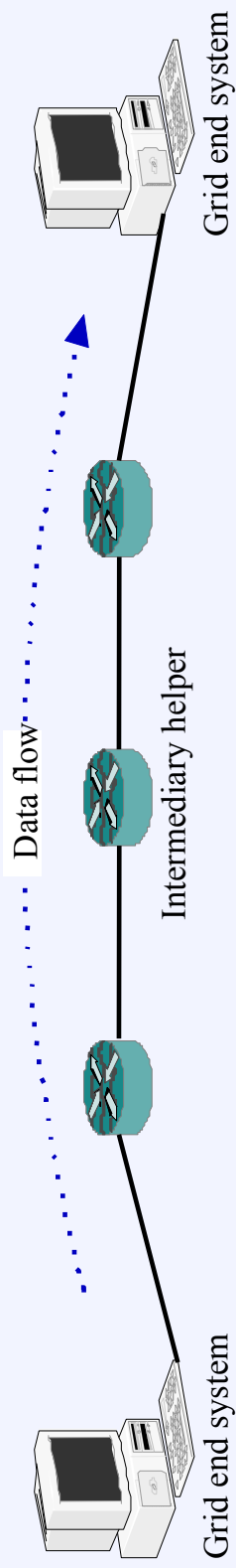
- How to specify properties and requirements
 - Should be simple and flexible - use QoS specification languages?
 - Should applications be aware of this?
 - ⇒ Trade-off between service granularity and transparency!



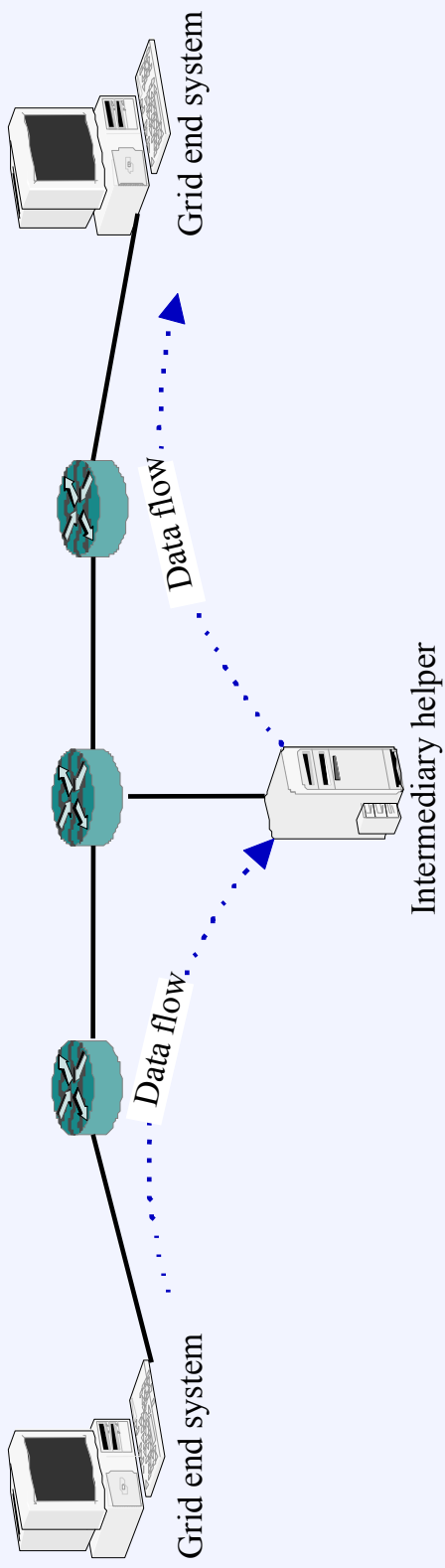
Traditional method

Alternative approach

... and peer awareness



(a) Traditional PEP



(b) Grid PEP

Problem magnitude

- Grid applications show special requirements and properties from a network perspective
 - and it is reasonable to develop tailored network technology for them.
- There is another class of such applications...
- **Multimedia.**
- For multimedia applications, an immense number of network enhancements (even IETF standards) exist.
- For the Grid, there is nothing.
- **This is a research gap!**

Problem: How Grid folks see the Internet

- Abstraction - simply use what is available
 - still: performance = main goal

Just like Web Service community



conflict!

- Existing transport system (TCP/IP + Routing + ..) works well

Absolutely not like Web Service community !

- QoS makes things better, the Grid needs it!
 - we now have a chance for that, thanks to IPv6

Wrong.

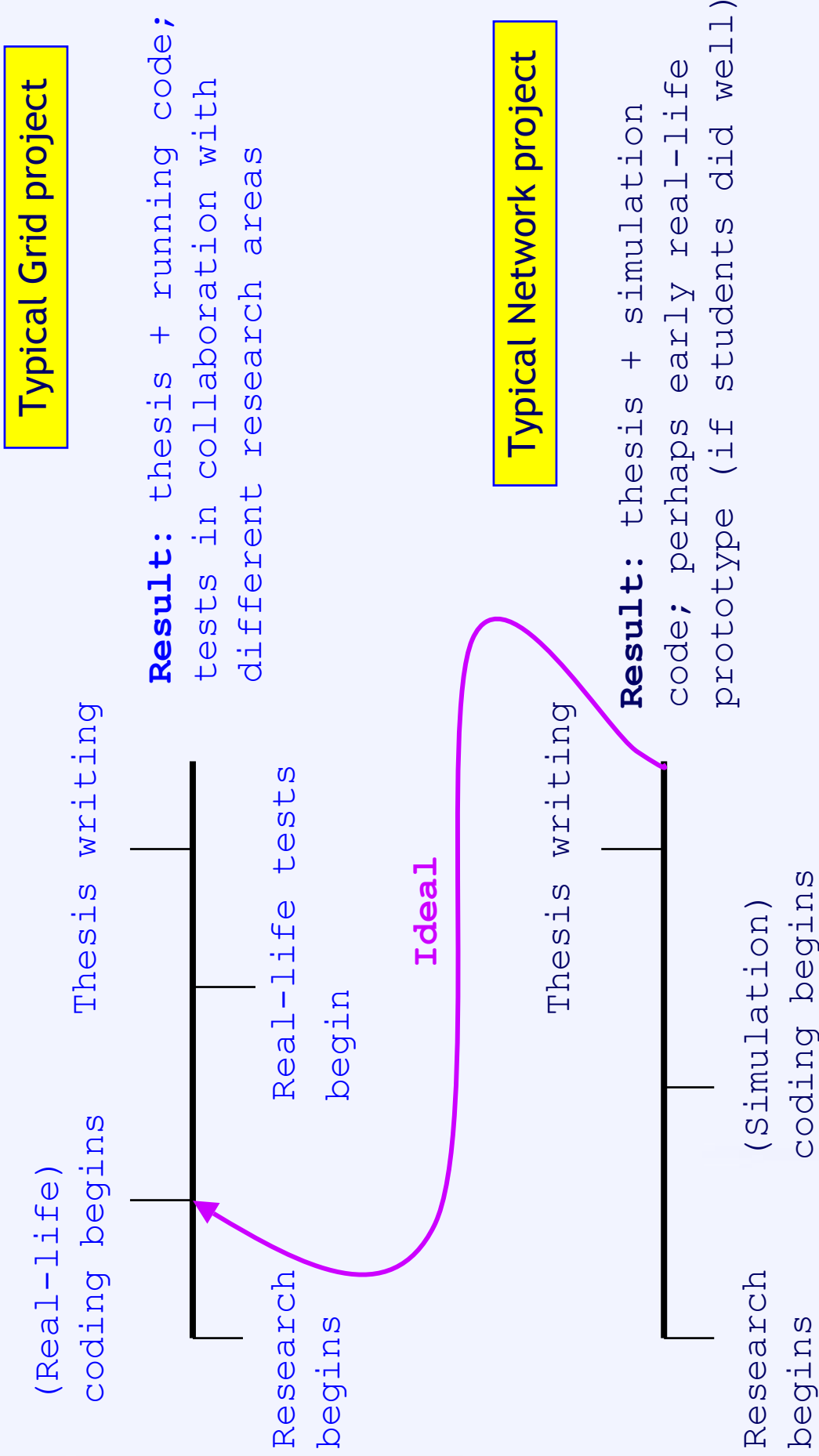
- Quote from a paper review:

“In fact, any solution that requires changing the TCP/IP protocol stack is practically unapplicable to real-world scenarios, (..).”

- How to change this view: GGF GHPN-RG

- documents such as “net issues with grids”, “overview of transport protocols”
- also, some EU projects, workshops, ..

A time-to-market issue



Bottom line:

it's up to us.

