tetherless industry structure

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affiliations & acknowledgements

edge Lab, BTexact Research

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"The communications industry will stagnate unless we stick rigorously to the perverse and difficult principle of a dumb network with control around the edge:
security, protection, QoS, everything... pushed to the edge"

Market Managed Multiservice Internet

M3I

M3I - Market Managed Multi-service Internet

- consortium: BT, HP, Telenor, Athens UEB, ETH Zurich, TU Darmstadt
- co-funded under the EU Vth Framework Information Society Technologies Programme Project No 11429
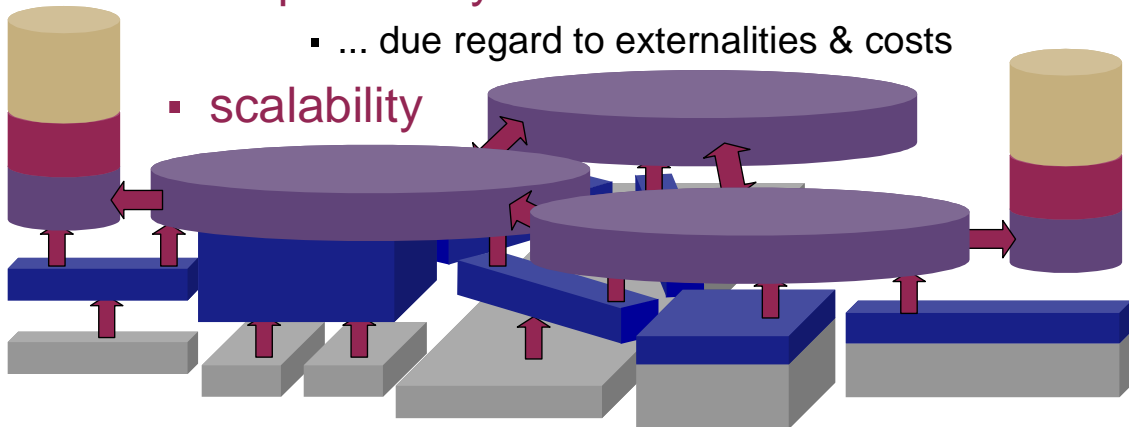
ist
information society technologies

tetherless industry structure

ITC

simultaneously promoting...

- freedom
  - ...to innovate - "just do it"
- responsibility
  - ... due regard to externalities & costs
- scalability

app
trans
net
link
phys

- context: network layer market

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design principles - I

- end to end principle
  - "minimise in the middle then synthesise at the edge"

- synthesise quality not just connection (cf. TCP)
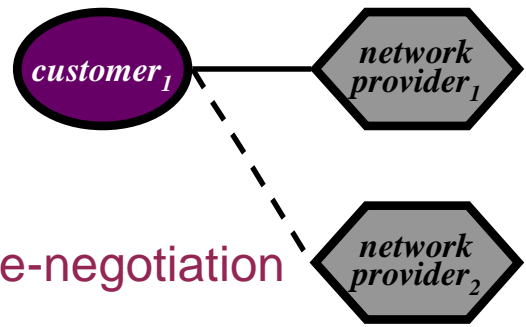
☑ QoS controlled by the ends

QoS   QoS

☒ not just QoS deployed along the path

QoS   QoS   QoS
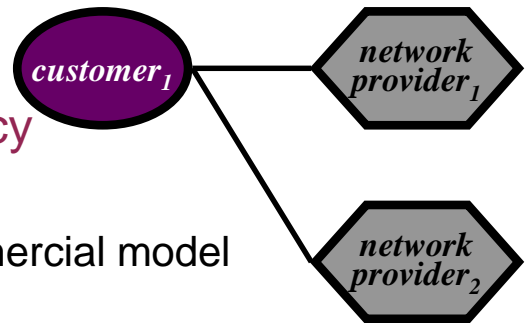
design principles - II

contractual interfaces

☑ strictly 1:1 during use

☑ standard framework for re-negotiation

☒ <u>any</u> 3rd party dependency

   ☒→ death of innovation

   ☒→ industry standard commercial model
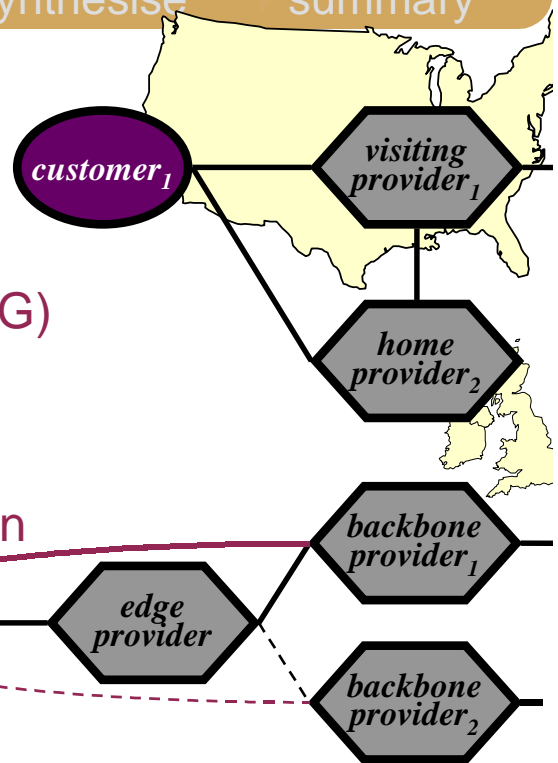
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broken examples

e2e	1:1	
☑	☒	roaming (2.5/3G)
☒	☒	carrier selection
☒	☒	'1-800', termination charges etc

(cont...)

PSTN Int'l Accounting Rate System

→ money

cust₁

cust₂

100 **54** **51** **44**

3 7 44 46
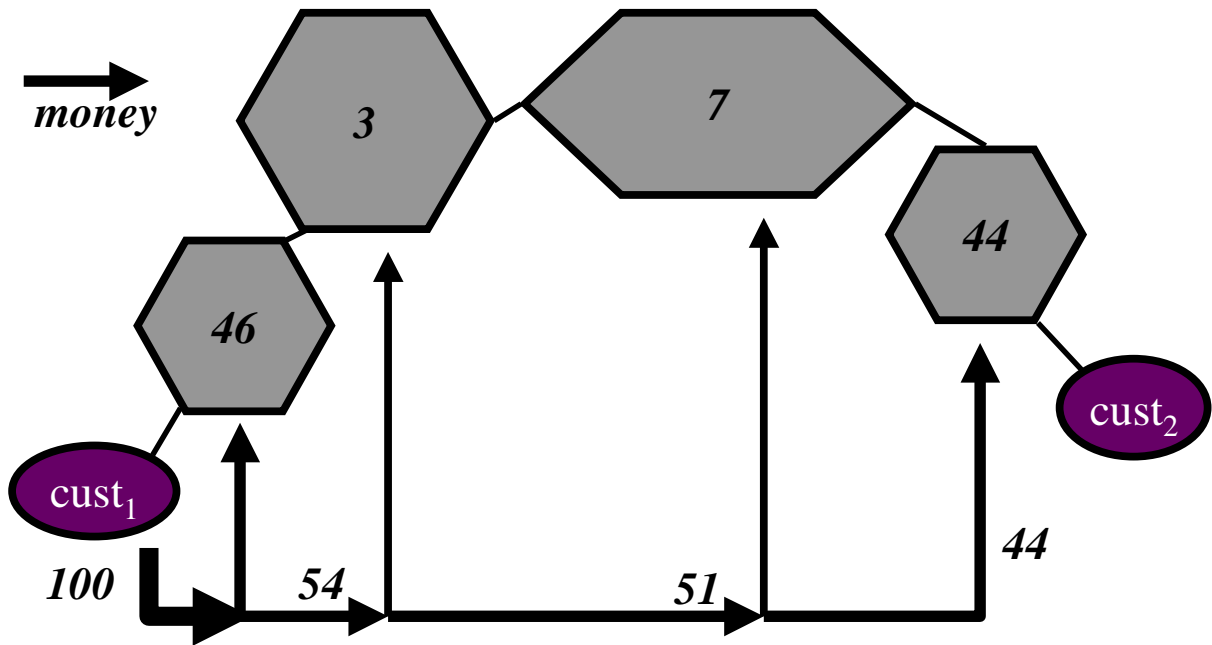
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minimise

in the middle

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split-edge pricing structure
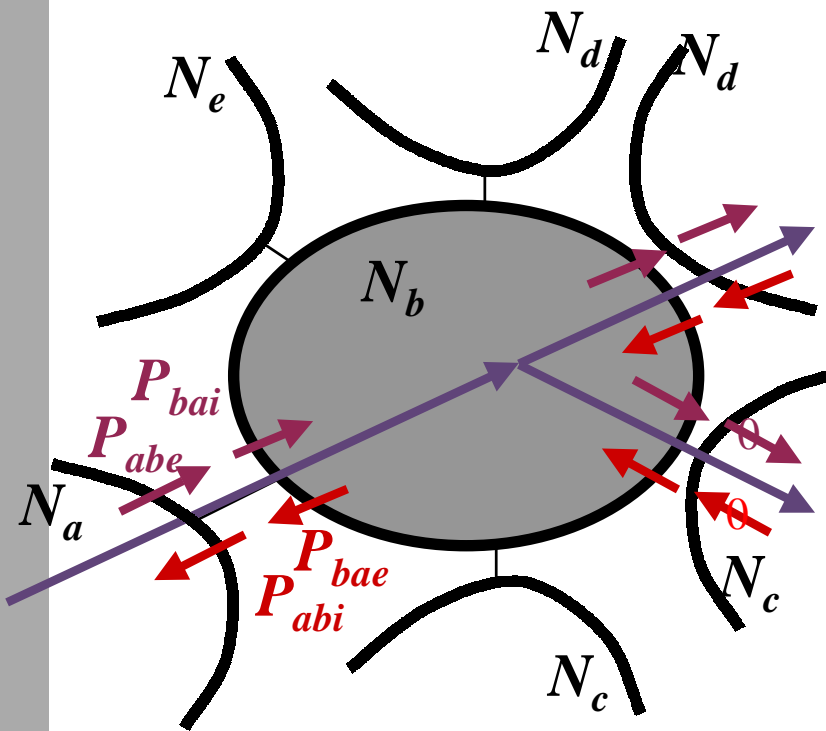
N_e N_d N_d

N_b

P_{bai}

P_{abe}

N_a

P_{bae}

P_{abi}

N_c

N_c

- **all pricing in bulk**
- **price in & out separately**
- **each price between boundary and remote edge**
- **separate charges raised crossing each border**
- price effects localised
- contracts localised
- global standards unnecessary
- **extends edge-pricing [Shenker96]**

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split-edge price setting

N_e N_d N_d

vol

N_b

congestion

p_{bai}

N_a

N_c

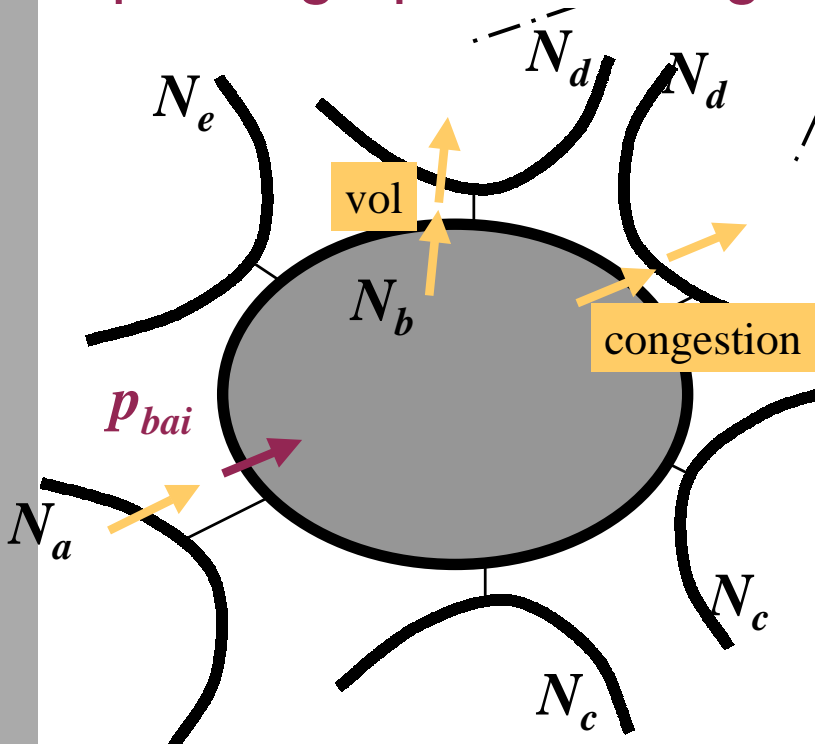N_c

- all pricing in bulk
- price in & out separately
- each price between boundary and remote edge
- separate charges raised crossing each border
- **price effects localised**
- **contracts localised**
- **global standards unnecessary**
- **extends edge-pricing [Shenker96]**
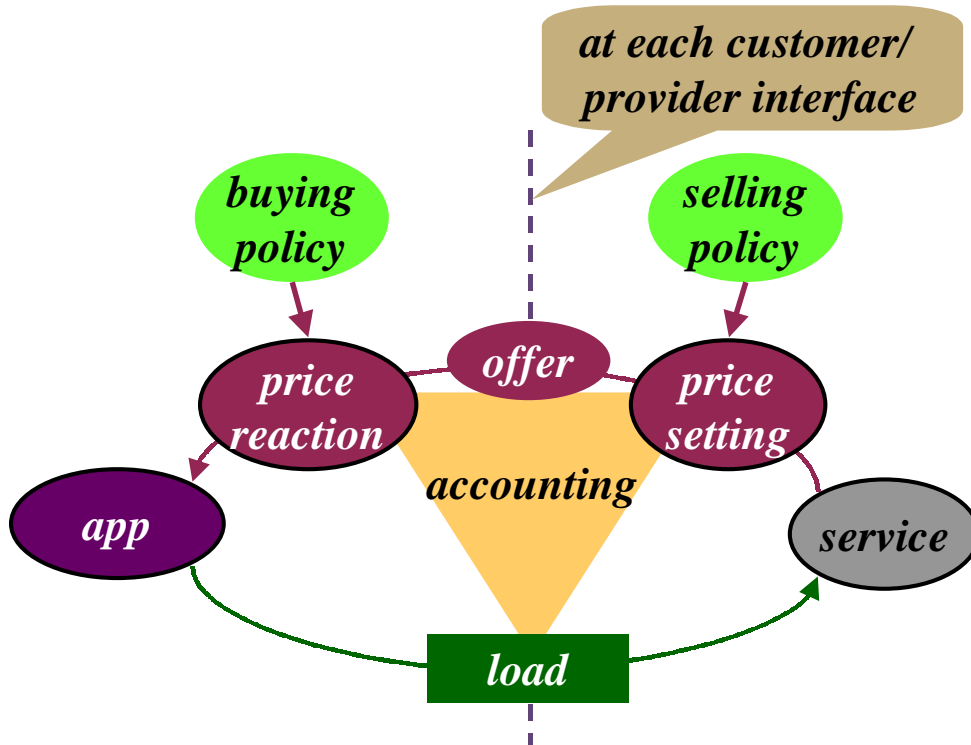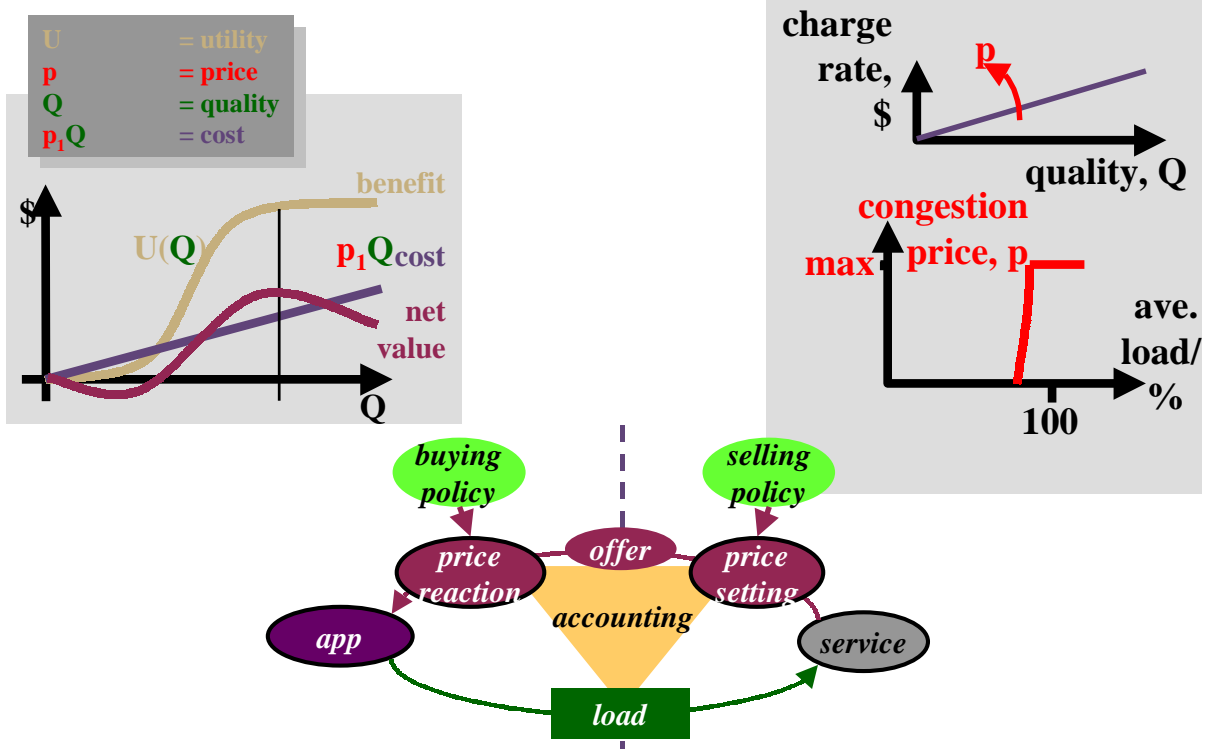
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market mechanism components

at each customer/
provider interface

buying
policy

selling
policy

offer

price
reaction

price
setting

accounting

app

service

load

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market mechanism components

U	= utility
p	= price
Q	= quality
p_1Q	= cost

benefit

$U(Q)$

p_1Q cost

net
value

$Q

charge
rate,
$

p

quality, Q

congestion
price, p

max

ave.
load/
%

100

buying
policy

selling
policy

price
reaction

offer

price
setting

accounting

app

service

load

explicit congestion notification (ECN)

probability

1

mark **drop**

ave queue length

data

network
transport
data

ACK

IETF RFC3168 Proposed standard: Jun 2001

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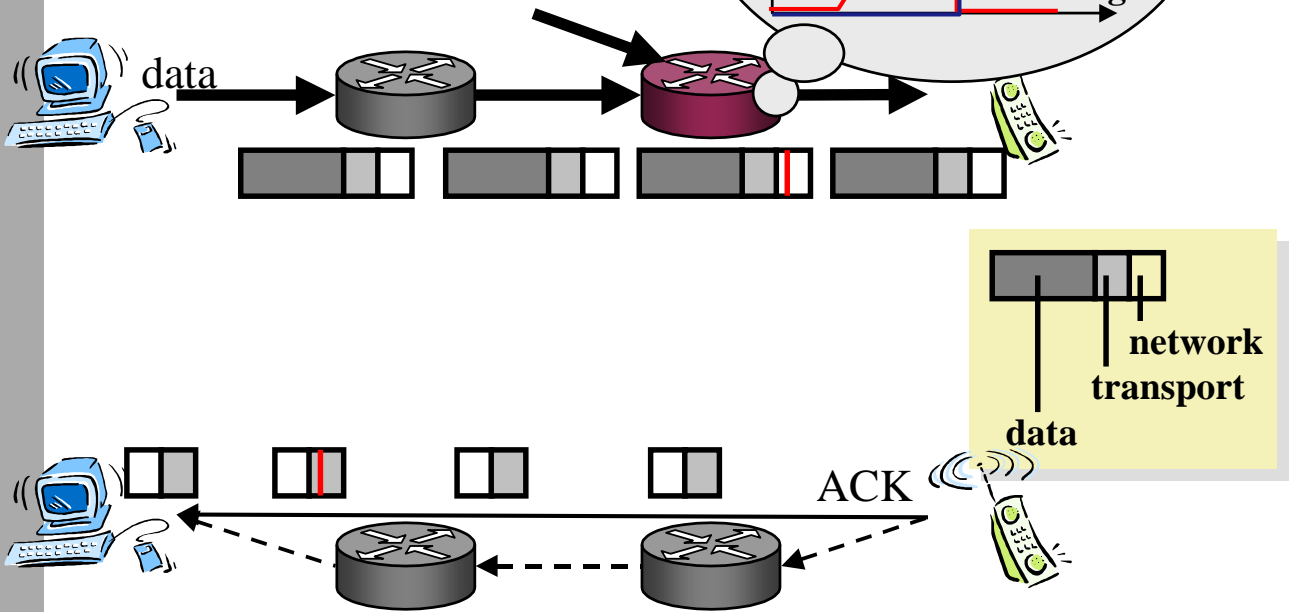
seamless resource control

explicit congestion notification

- seamless currency for per-packet QoS
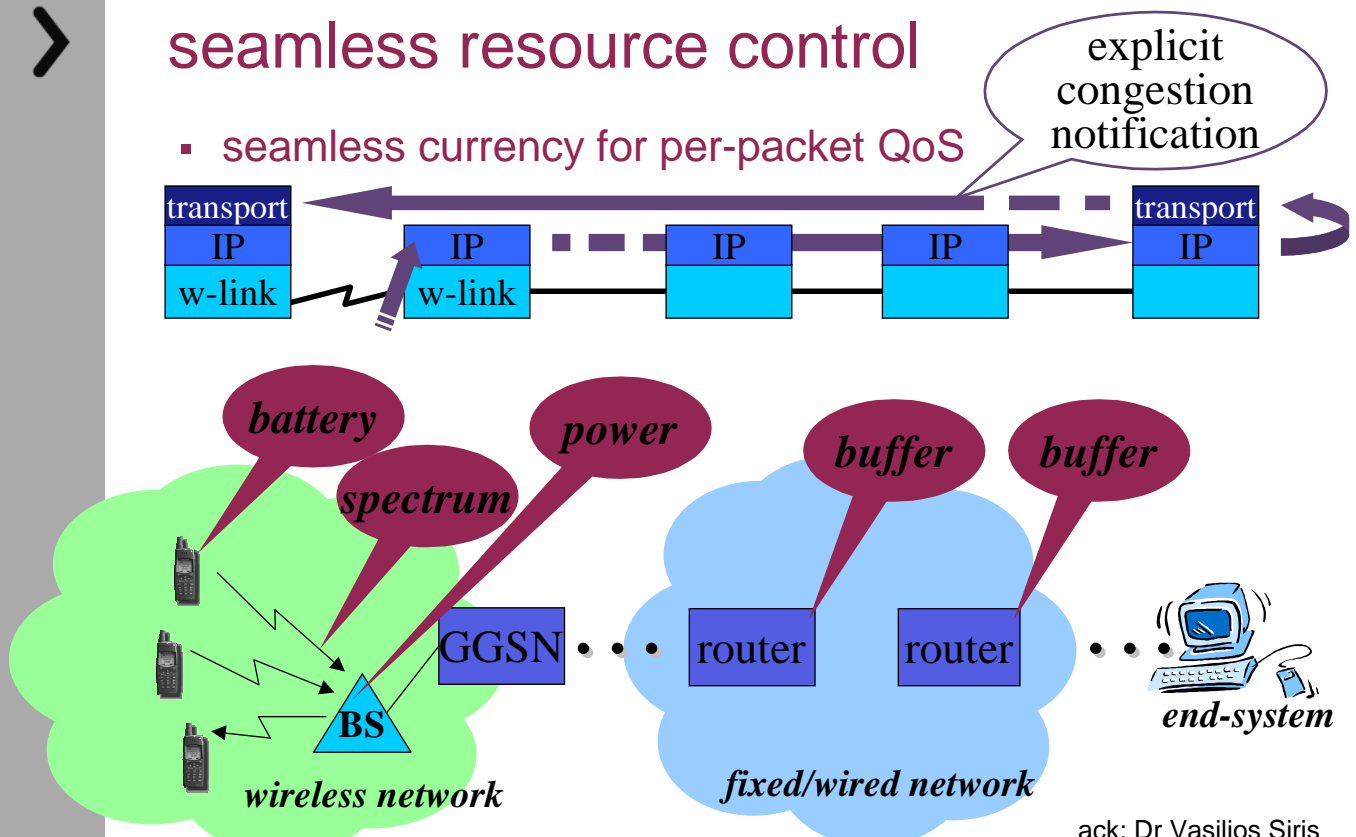
transport
IP
w-link

IP
w-link

IP

IP

transport
IP

battery

power

spectrum

buffer

buffer

GGSN • • • router router • • •

BS

wireless network

fixed/wired network

end-system

ack: Dr Vasilios Siris

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then synthesise

at the edge
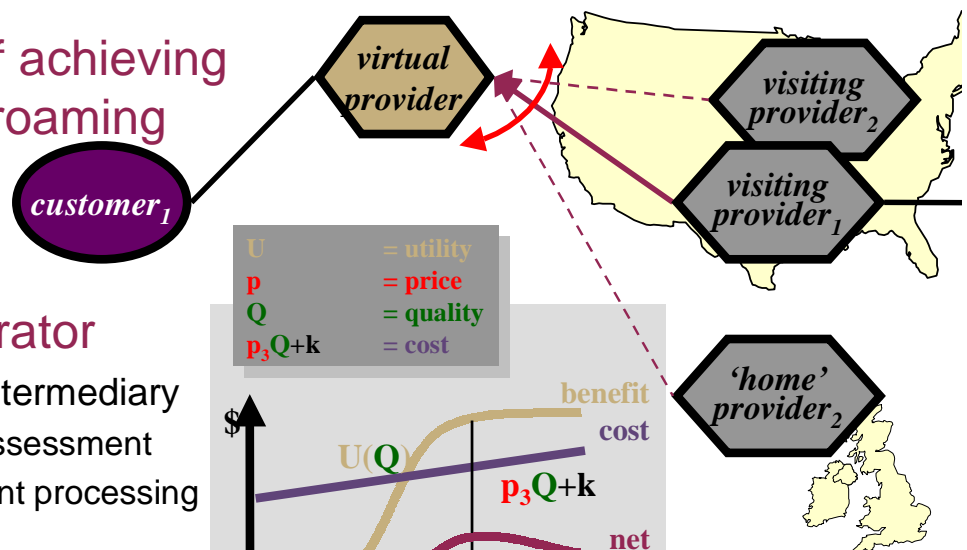
re-synthesise roaming

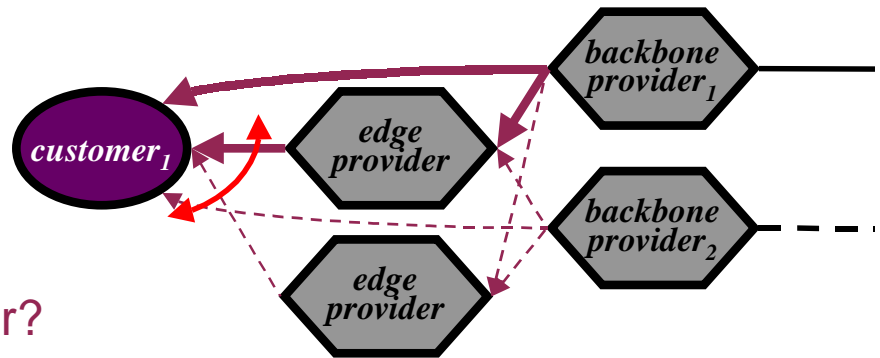- <u>one</u> way of achieving seamless roaming

- virtual operator
  - financial intermediary
    - tariff assessment
    - payment processing

customer$_1$

virtual provider

visiting provider$_2$

visiting provider$_1$

'home' provider$_2$

U	= utility
p	= price
Q	= quality
p_3Q+k	= cost

$\$$

benefit

cost

U(Q)

p_3Q+k

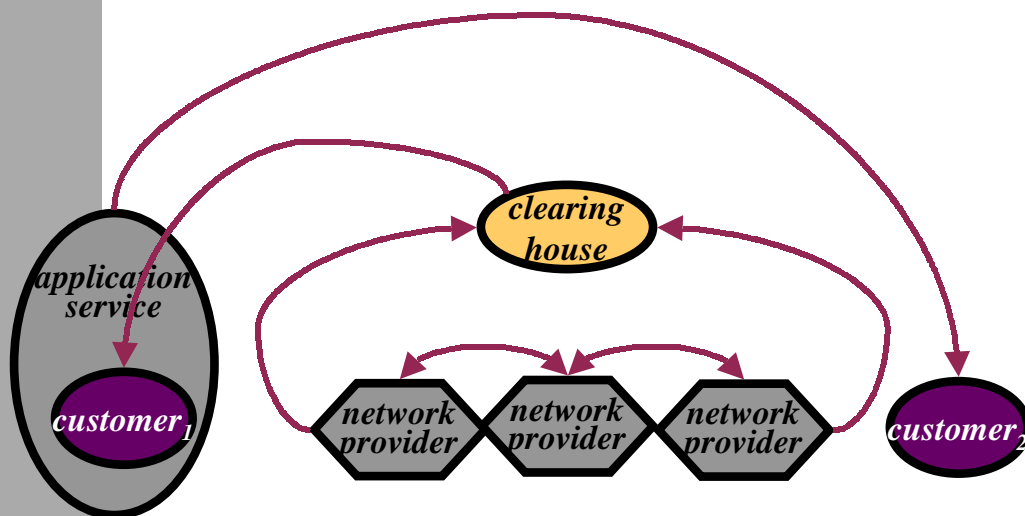**net value**

Q

re-synthesise carrier selection

- best carrier?
  - why not selected by edge provider?
    - alliances, vertical integration etc.
- possible fixes
  - carrier selection
    - destroys flexibility in industry structure
  - facilitate access provider selection
    - true competition

accepted offer →

rejected offer →

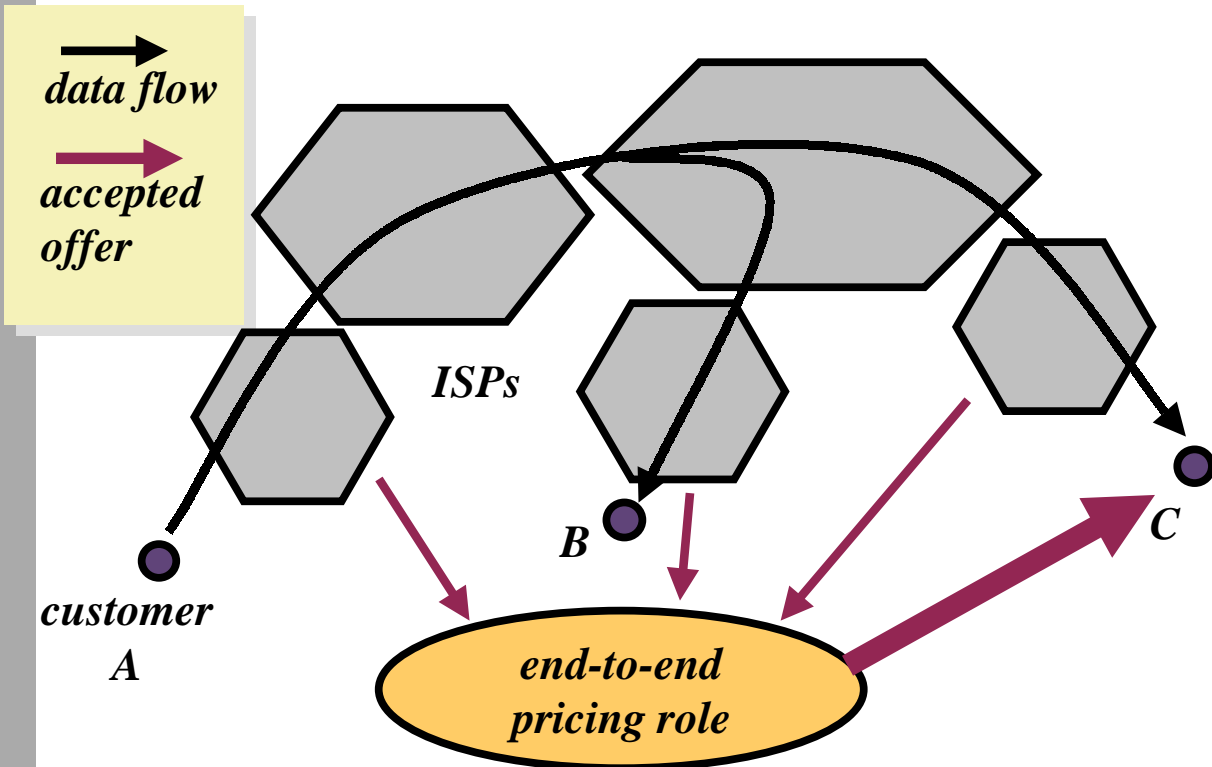tetherless industry structure   © BT Group plc 2002   17

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re-synthesise '1-800'

half circuit QoS → end-to-end QoS

accepted offer →

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re-synthesise conferencing

data flow

accepted offer

ISPs

B

C

customer A

end-to-end pricing role

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re-synthesise telephony

dynamic pricing → call acceptance control

packet QoS → session QoS

stable   dynamic   dynamic   stable

risk broker

risk broker

customer₁

network provider

network provider

customer₂
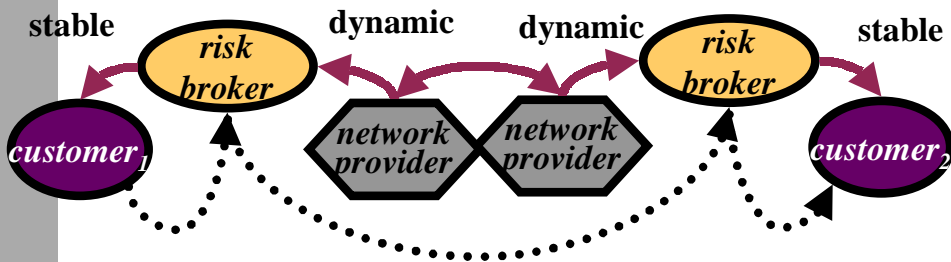
legend

offer

session QoS request

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innovation based on principles

- can even synthesise single provider QoS
  - but by commercial choice
  - <u>not</u> by business model embedded in technology
- not just re-synthesis of old models...
- ...innovative new models
  - actual and potential
  - but with no change of technology

now   next   future

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summary

- minimise in the middle
  - split-edge pricing, ECN
- then synthesise at the edge
  - roaming, carrier selection, 1-800
  - quality of a service controlled by its customers!
- implementing these the obvious way
  - *is* stagnating the industry, particularly roaming
  - *will* stagnate the industry, particularly QoS
- keep strictly to principles
  - end to end principle
  - 1:1 contracts

more info

- ## M3I consortium
  - Jan 2000 - Mar 2002
  - contacts, background and first deliverables:
  - www.m3i.org/
- ## Bob Briscoe:
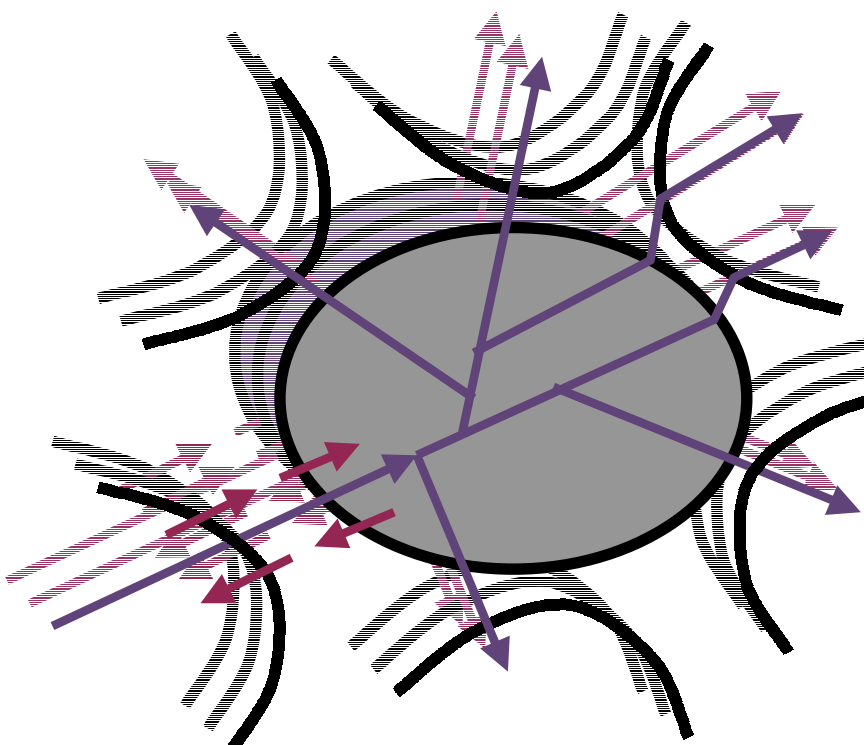 - www.btexact.com/people/briscorj/
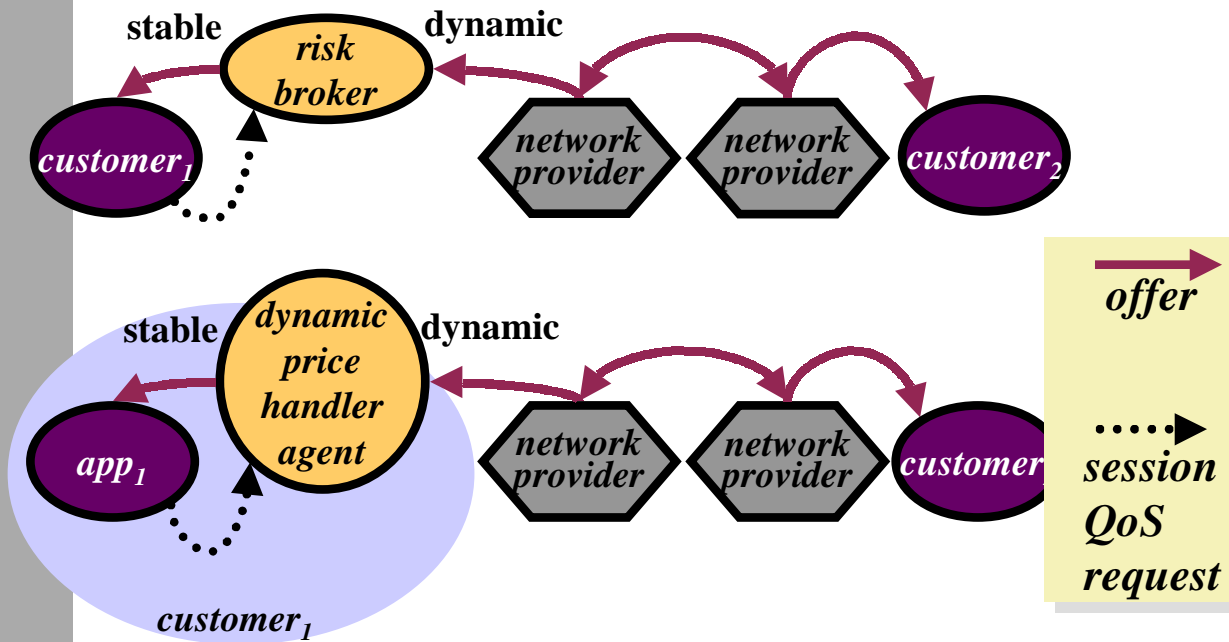
spare slides

M3I

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split edge pricing - per class

- each class of service has a market
- class mismatch effects localised

re-synthesise telephony

packet QoS → session QoS

stable   *risk broker*   dynamic

customer₁

network provider — *network provider* — *customer₂*

stable   *dynamic price handler agent*   dynamic

app₁

network provider — *network provider* — *customer*

customer₁

offer

session QoS request

QoS-value control plane

Market mechanism

customer

offer B

VISP

offer D

offer C

customer

customer

offer A

Virtual ISP

network providers

offer E

Multiservice Internet

end system

N

end system

end system

ECN+diffserv

diffserv

intserv

N