Bill-and-keep and the economics of interconnection in next-generation networks
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Introduction

• Telecommunications networks are undergoing fundamental change.

• Telecommunications networks are being transformed into all-IP, next-generation networks (NGNs).

• Interconnection is attracting renewed regulatory debate.
Introduction

• NGN Vs. Public internet
  – NGNs: quality-of-service (QoS) standards
  – public internet: best-efforts basis

• Interconnection charging model
  – Bill and keep
    • Whereby no interconnection payments are made for either termination or origination
  – IPNP
    • Originating network pays a termination fee to the terminating network
Introduction

• We consider service provision and network investment incentives in the transition NGNs

1) the set of retail services which are affected by any given interconnection model, at least initially, will be broader than the services offered in the internet and circuit-switched networks

2) Interconnection charging will need to facilitate efficient QoS differentiation

3) NGN transit interconnection will, unlike in the current internet, not be constrained to sequential charging and will allow the establishment of dedicated paths

4) Charging for interconnection in NGN does not need to occur by packet but can also be facilitated
Introduction – Interconnection model

• we analyze the implications of the transition to NGN for the performance of alternative interconnection charging models
  1) IPNP
  2) RPNP
  3) BAK
Economic implications of the transition to all-IP networks

1. Any given interconnection arrangement will affect a broad set of retail services

2. Interconnection arrangements will be critical to ensuring efficient network utilization while at the same time providing the quality assurance necessary for consumer uptake of retail services.

3. NGNs also differ from the public internet in that they will allow a single provider to control transit.
Economic implications of the transition to all-IP networks

4. NGN intelligence allows for more flexible charging.

5. Technological evolution is likely to change how consumers access telecommunication services and could therefore change the nature and significance of termination bottlenecks that have been the basis for regulatory intervention with regard to interconnection pricing.
The economics of efficient interconnection

1. Factor which determine the efficiency of an interconnection model
2. Variation in circumstances and efficiency of multiple interconnection models
3. Efficient interconnection in NGNs
4. Welfare consequences of interconnection
The economics of efficient interconnection

1. Factor which determine the efficiency of an interconnection model
   
   1) Externalities and network costs
      Efficient interconnection charges can be derived from two elements: the nature of the externalities and the distribution of costs between the interconnecting networks

   2) Traffic balance
      The balance of traffic and/or costs is likely to be disturbed by evolving market conditions. Thus, whether BAK is indeed efficient in a situation of traffic balance depends on whether market factors could change the balance or peer status

   3) Stability of market conditions
The economics of efficient interconnection

2. Variation in circumstances and efficiency of multiple interconnection models

If a single or a small number of interconnection models were applied across the board, or if restrictions limiting the flexibility of interconnection charges were imposed, then the efficiency of the interconnection arrangements would be reduced.

In addition, limited flexibility would distort market outcomes by constraining operators’ ability to adjust interconnection charges in response to strategic behavior or market variations.
The economics of efficient interconnection

3. Efficient interconnection in NGNs
   1) Service scope in NGNs
   2) QoS differentiation
   3) Transit
   4) Charging flexibility
The economics of efficient interconnection

4. Welfare consequences of interconnection

1) The nature of interconnection inefficiencies: inefficient retail prices and cost-avoidance
   - Interconnection charges can cause inefficiencies due to a mismatch between an operator's incremental revenues and incremental costs associated with interconnection.
   - Network structure bias (hot-potato problem) occurs when investments in particular network elements are not fully rewarded through interconnection fees and where operators have the ability to determine the point of interconnection.

2) Inefficiencies caused by specific NGN interconnection model
   - Bill-and-Keep (BAK)
   - IPNP
Conclusions and policy implications

1. Intervention should be limited to situations of demonstrable market failure, and be undertaken only where the benefits of intervention outweigh its costs.

2. To enhance economic efficiency, regulators should intervene at the network layer that is closest to the market failure.

3. The principle of maintaining technological neutrality should limit the scope of intervention to addressing bottlenecks.

4. The regulatory remedy should be tailored to the specific market circumstances.