

Value-of-Service (VoS)

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**Introduction
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Summary**



Introduction

- ❑ Mobile devices are very popular

- ❑ Novel mobile applications emerge
 - Enhanced messaging (pictures, videos)
 - Media streaming

- ❑ Network capacity is limited
 - User satisfaction is reduced

Introduction II

- There are two concepts for describing IP network performance
 1. Quality-of-Service (QoS)
 - Uses metrics (delay, packet loss, jitter)
 - Measured by applications
 2. Quality-of-Experience (QoE)
 - Uses mean opinion score (1=bad, 5=excellent)
 - Based on user opinion

Introduction III

- Assumption: Users prefer
 - ... higher QoS and better QoE
 - ... lower prices

- Missing: Concept for capturing the price-performance ratio of an IP network

- Benefits:
 - IP Networks can be compared
 - Transparency in the marketplace

Idea

- The Value-of-Service (VoS) concept describes the price-performance ratio of an IP network

$$\rightarrow \text{Price-Performance Ratio} = \begin{cases} \frac{\text{QoS Metric}}{\text{Price}} \\ \frac{\text{QoE Metric}}{\text{Price}} \end{cases}$$

Price Normalization

- Prices of different operators must be made comparable
- Two common schemes for Internet access:
 - 1) Volume Restriction (e.g. mobile data plans)
 - Provider A charges p_A for traffic volume v_A
 - Normalized price: $p_{n_A} =$
 - 2) Bandwidth Restriction (e.g. Cable, DSL, FTTH)
 - Provider B charges p_B for bandwidth b_B
 - Implicit limit: Billing period t
 - Normalized price = $p_{n_B} =$

Example: Delay

- ❑ Packets sent from source to destination experience a certain delay
- ❑ General:

→ Price-Performance Ratio =

- ❑ Specific to Delay:

→ VoS of Delay =

Example: Delay

□ Let

- ... D_{AB} the one-way delay from IP A to IP B
- ... $D_{AB_{max}}$ the maximum waiting time
- ... p_{n_X} the normalized price charged by X

□ We then define

- $$VoS_{D_{AB}} = \max \left(\frac{D_{AB_{max}} - D_{AB}}{p_{n_X}}, 0 \right)$$

Illustration

- $$\text{VoS}_{D_{AB}} = \max \left(\frac{D_{AB_{\max}} - D_{AB}}{\rho_{n_X}}, 0 \right)$$

- Provider A charges less than provider B

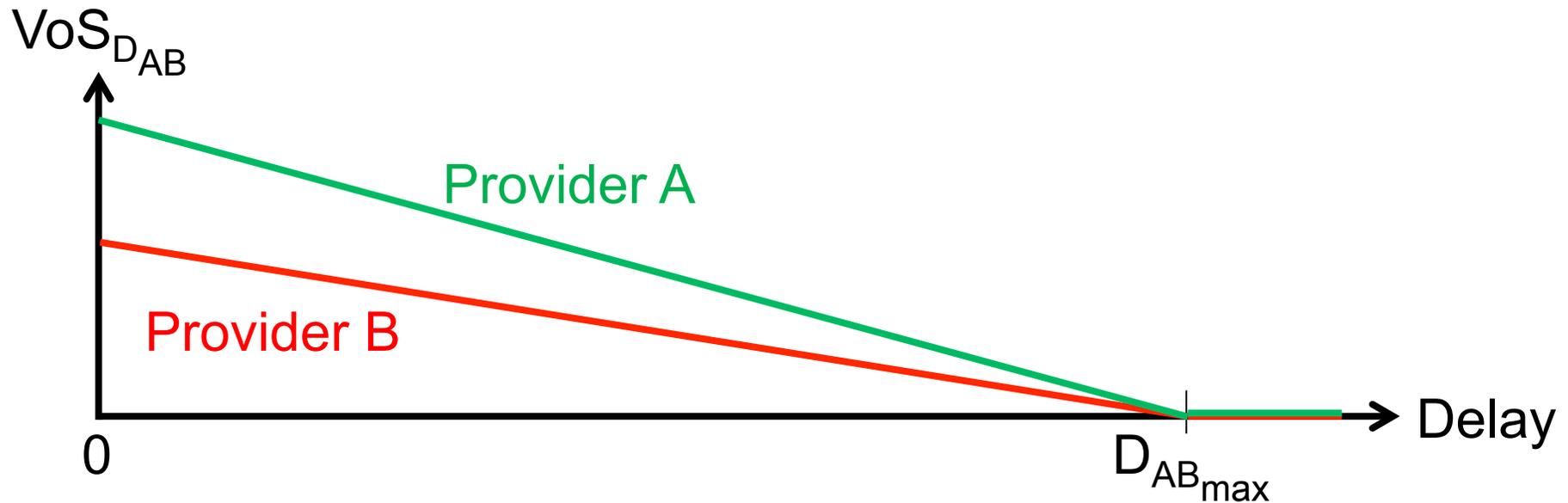


Figure 1: VoS_{D_{AB}} Plot

Summary

- The VoS concept is a means to capture the price-performance ratio of an IP network

- Idea:

$$\text{Price-Performance Ratio} = \begin{cases} \frac{\text{QoS Metric}}{\text{Price}} \\ \frac{\text{QoE Metric}}{\text{Price}} \end{cases}$$

- Benefits:

- IP Networks can be compared
- Transparency in the marketplace

Questions



References

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