

# Deployment Experience With Differentiated Services

**Bruce Davie**

**Internet Technologies Division  
Cisco Systems**

**[bsd@cisco.com](mailto:bsd@cisco.com)**

# Questions?

# Agenda

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- **Introduction**
- **Facts about Diffserv deployment**
- **Inhibiting factors**
- **Catalysts for further deployment**
- **Discussion**

# Introduction

- **Definitions of QoS**

**Application-based (e.g. can I get required latency with acceptable probability)**

**Mechanism-based – the use of policers, non-FIFO queues etc. to provide differentiation among classes**

- **Mechanisms are of interest here**

**If overprovisioning alone meets needs of applications, present and future, QoS R&D should be abandoned**

**Traffic engineering mechanisms not defined as QoS**

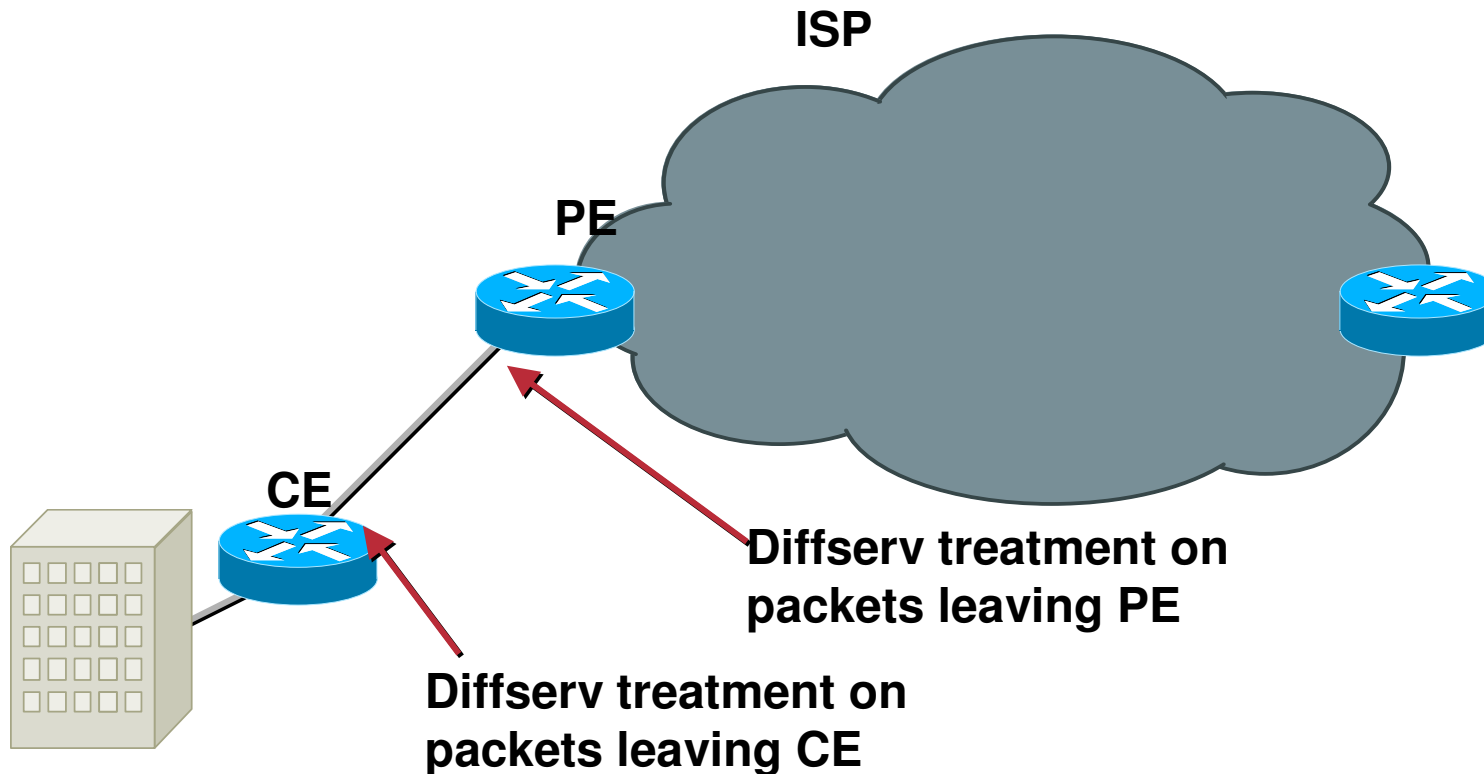
# Diffserv deployment

- **In the Internet core, essentially none**
- **There are a lot of IP networks besides the public Internet!**
- **IP-based VPNs**
  - RFC2547 (MPLS/BGP)**
  - IPSEC-based**
- **Enterprise networks**
- **Public VOIP networks**

# Diffserv deployment – IP VPNs

- **RFC2547-style and IPSEC-based VPNs**
- **Edge bandwidth is expensive enough to warrant complexity of diffserv – don't want to buy enough BW to provide voice-like QoS to all traffic**
  - No need to run bulk data at 30% utilization**
  - Relative burstiness of data makes matters worse**
- **Service often competes with/replaces Frame Relay (w/ CIR), so QoS expected**
- **About 200 providers running 2547 – a few dozen doing diffserv (but they are big)**

# Diffserv on the edge



**Observation: easier to get packets marked correctly for CE→PE than for PE→CE**

# Diffserv deployment – Public VOIP

- **Telecom Italia the most notable provider publicly announcing use of VOIP for consumer telephony**
  - **Most of the public telephony in Italy now on the same IP network as IP-VPNs**
- **Consistent policy is easy – VOIP gateways set DSCP, police at the edges**
- **No interprovider issue (today)**

# Diffserv deployment – Enterprise

- **VOIP in enterprise is very cost effective when sites are interconnected by expensive links (leased lines, FR, etc.)**
- **Relatively easy to get packet marking right**  
phones, gateways set DSCP  
police edges at “first hop”
- **Less reason to deploy QOS within the campus, but cost is low too (given that marking & policing was already needed)**

# Diffserv (non-)deployment – ISP edge

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- **BW scarcity just as in VPN case, but many important differences too**

**Not the same customer expectation of QoS – just starting to see single class SLAs (e.g. jitter guarantees)**

**Interprovider the norm**

**Unable to predict the set of communicating sites – thus hard to get consistent policy on inbound traffic**

# Inhibiting factors

- **Bandwidth glut**

**Hard to justify any extra complexity when delay is minimal**

**Hard to sell multiclass QOS when the default class is excellent (especially when **competitors'** default is sufficient for VOIP)**

- **Configuration/provisioning complexity**

**e.g., how much BW should I allocate to an AF queue?**

- **Possible mismatch between customer needs (e2e service) and what Diffserv does (PHBs)**

**Less compelling argument if edge is where the congestion is**

# Why interprovider QoS is hard

- **For ISPs with global reach, interprovider QoS opens door to competition**
- **Customers can't easily predict which ISPs their traffic will traverse**
  - With whom do I negotiate my SLA?**
  - What speed of light delay will I see?**
- **No uniform service definition**
  - Prevents comparison shopping**
  - Unable to concatenate services from multiple ISPs**

# Catalysts for further deployment

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- **BW glut subsidies**
- **Development of customer demand**
- **Regional ISPs collaborate**
- **Standard service definitions**

# Diffserv report card

- **Perfectly fine as far as it goes**
  - Well matched to enterprise and SP edge applications**
- **Admission control (e.g. RFC 2998) could increase its reach**
- **Provisioning remains a challenge**
  - “magic numbers” for utilization target**
  - Unpredictability of traffic matrix (cf. Frame Relay)**

# Summary

- **Diffserv deployment more widespread that widely acknowledged**
  - Don't assume that the public Internet is representative
- **Biggest challenges for global QoS:**
  - Interprovider issues
  - Consistent application of QoS policy
  - Provisioning
  - Adoption of admission control where needed
- **Future research should focus on deployment hurdles, not new QoS mechanisms**