

Quality of Service

18-849b Dependable Embedded Systems

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Required Reading: **The QoS Broker, Klara Nahrstedt and Jonathan M. Smith**

Tutorial **:** **Fourth International IFIP Workshop on Quality of Service ,
IWQoS'96**


**Carnegie
Mellon**

Overview: QoS

◆ Introduction

- What is Quality of Service ?

◆ Key concepts

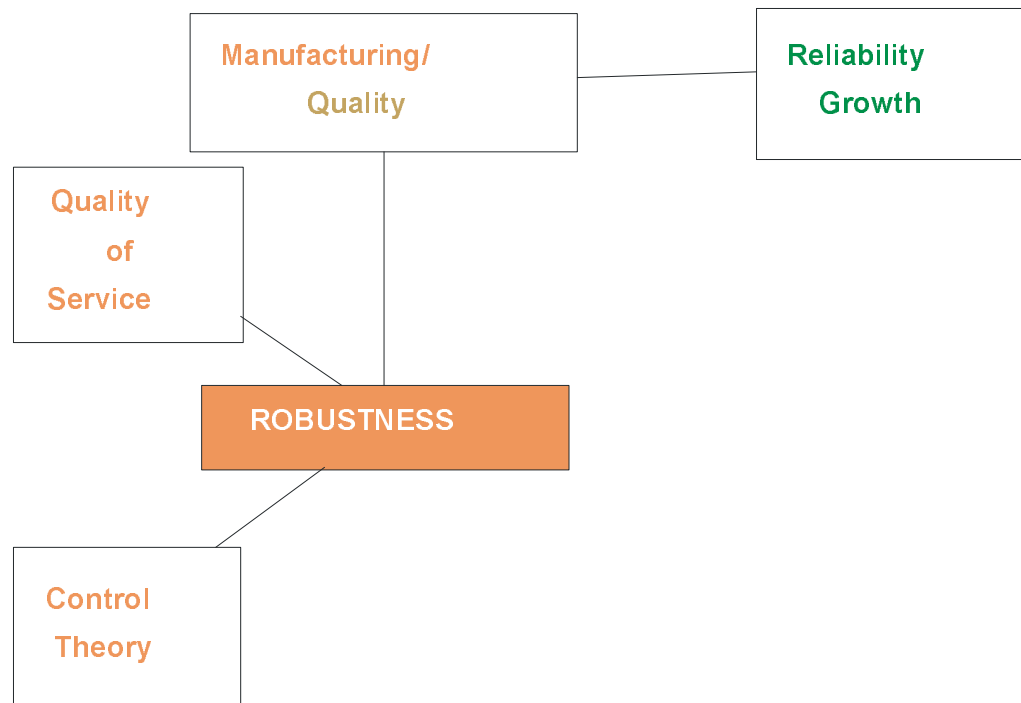
- QoS Metrics
- Fundamental Research Issues
- Current QoS Research
- AMARANTH (CMU) 

◆ Tools / techniques / metrics

- Operating System Support
- Middleware Toolkits


◆ Conclusions & future work

YOU ARE HERE MAP



What is QoS ?

◆ QoS in real-life

- Telephone Systems 
- Daily business transactions
- TVs

◆ Can we apply the above notion to Computer Systems ?

- Better Throughput
- High Availability 
- Timeliness 
- Reliability
- Security 

Quantitative or Qualitative

◆ Both

- Overall Utility determines the QoS of an application
 - Multiple dimensions
- Quantitative Metrics measure the utility



◆ QoS Dimensions and Metrics

- Timeliness
 - Delay, Delay Jitter
- Dependability
- Security
- Resolution
- Sampling Rate
 - Video Sampling Rate
 - Audio Sampling Rate

Fundamental Research Issues

◆ Different Types of Applications

- Telephony
- Videoconferencing
- E-Commerce

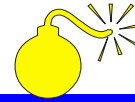
◆ User Preferences




- Audio or Video or Text
- Dependability
- Cost
- Reliability
- Ultimately quality is the end user's satisfaction

◆ Is it almost difficult to provide the unifying framework for these orthogonal issues

Current research on QoS



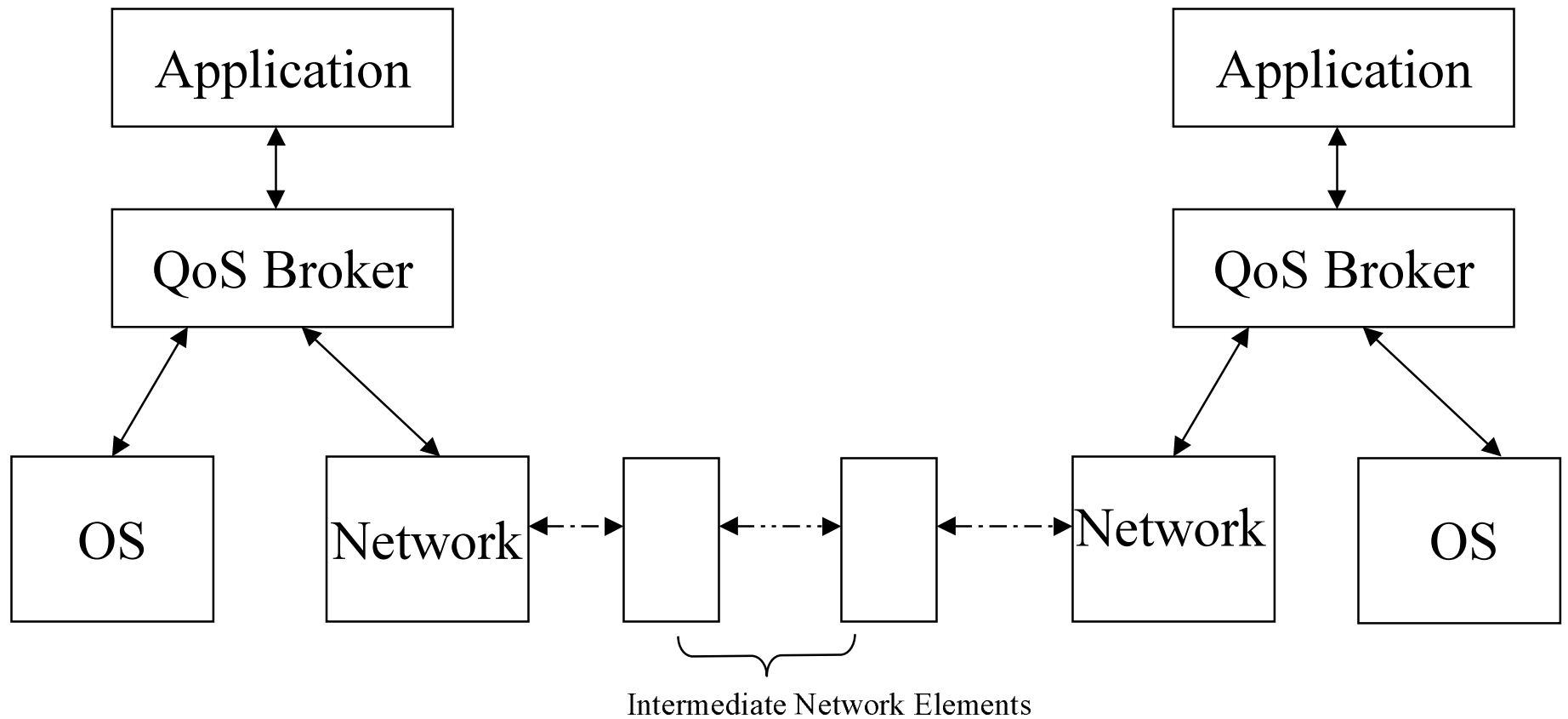
◆ Operating System QoS

- Brokers are employed to negotiate and renegotiate the QoS
 - How much QoS can be provided to each user/application
 - There are finite resources in practice 
 - Tradeoffs have to be worked out
- Translate QoS ----> Resource Requirements
- Assurance of the Quality
 - Best-effort services
 - Guaranteed services

◆ Network QoS

- ISPs employ differential Services
- Application-oriented Services

QoS Broker - One Approach




QoS Broker contd...

◆ Broker is an end-point resource manager

- The resources are described through application QoS parameters
 - { Sample Size, Sample Rate, Priority/Criticality, End-to-End delay bound..}
- Network QoS parameters
 - {Round trip delay, jitter, packet loss rate, packet ordering, topology, cost..}
- OS (System) Parameters are processing times required for tasks
- The above parameters are stored in profile/databases

◆ Brokerage Process

- Automates the choice of tradeoffs
 - eg. Burstiness in the network could be accommodated by an elastic buffer with an acceptable end-to-end delay
 - Similarly Jitter
 - The profiles define the space in which decisions can be made
 - Global optimization of multiple resources among applications 

Tools

◆ Operating System Support

- QoS Extension to Solaris and NT (UIUC)
- Application Independent QoS - EPIQ (UIUC)
 - Provides mechanisms capable of supporting application-specific policies
 - Open Kernel

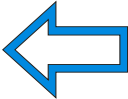

◆ XENA: Service Broker (CMU)

- Network QoS
- Application and service providers use XENA to identify the network resources needed to meet QoS and cost objectives.

◆ Quo (BBN)

- Provides tools for specifying and enforcing QoS contracts between service providers and clients

Conclusions & Future Work

- ◆ QoS is in research phase
- ◆ Amaranth (CMU)
- ◆ QoS is Multidimensional 
- ◆ There is no unifying framework to address all the issues
- ◆ Tradeoffs will have to be made 
- ◆ Operating System and Network support will be required
 - QoS and Resource Brokers can be one of the approaches
- ◆ Application to Embedded Systems

THE READING PAPER: QoS Broker

- ◆ **QoS in networked multimedia systems**
- ◆ **End-point design for resource orchestration**
- ◆ **Broker negotiates resource guarantees using databases**
- ◆ **Contribution**
 - A system architecture for translation, admission tests and negotiation
- ◆ **Prototype and testing with an application**