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English Version

Health informatics - Quality of service requirements for health information interchange

Informatique de santé - Exigences de qualité de service
pour les échanges d'information de santé

Medizinische Informatik - Anforderungen an die Service-
Qualität für den Austausch von medizinischen
Informationen

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Foreword

This Technical Report (CEN/TR 15253:2005) has been prepared by Technical Committee CEN/TC 251, "Health informatics" the secretariat of which is held by NEN.

This document has been developed by the Expert Group for Healthcare within the European Workshop for Open Systems (EWOS/EG MED). The editor of the document is Dr A J Kerr of Level-7 Ltd, a member of EWOS/EG MED. Thanks are due to all who have contributed ideas, text and scenarios to assist in the production of this report. Special appreciation is expressed to Jeremy Tucker, who has provided liaison with the ISO/IEC JTC/1 OOS Group and provided much of the text for Clause 9.

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Introduction

Background

This report considers user requirements for Quality of Service (QoS) specifically in the healthcare Information Technology (IT) environment.

QoS is defined in [4] as: "A set of qualities related to the collective behaviour of one or more objects." Thus the definition is very broad, even when restricted to the healthcare IT environment.

CR 12161 (EWOS/ETG 021): "A Method for Defining Profiles for Health Care" [7] deals with the general categorisation of user requirements for healthcare information interchange. It assesses the suitability of profiles of standards from the domains of Open Systems Interconnection / Open Systems Environment (OSI/OSE) to satisfy those user requirements.

The method defined in CR 12161 was subsequently applied (by EWOS project team PT N024) to the specific domain of medical image interchange, and the findings were recorded in CR 12069 (EWOS/ETG 045): "Profiles for Medical Image Interchange". [8]. In performing this work, a number of requirements were identified which could not adequately be mapped to the services provided by standardised OSI profiles. Some of these requirements could be considered as QoS issues.

With this in mind, the Healthcare Expert Group of the European Workshop for Open Systems (EWOS/EG MED) initiated a work item in May 1995 to identify QoS requirements for healthcare information interchange which need to be supported by standardised communications services. This report is the result of that activity.

At the same time, international IT standards have been under development (by ISO/IEC JTC1/SC21 and ITU-T SG7) to define a QoS Framework [2] of terminology and concepts, in order to assist those wishing to specify or procure systems in which QoS is important, and to publish a Guide to QoS Methods and Mechanisms [3], which is intended to be a source-book of references and widely-applicable mechanisms that can be used by systems designers and implementors. The scope of the activity is all terms of interaction between elements of distributed systems.

The QoS work in ISO has been applied to the development of time-critical communications and to enhanced communications transport service and protocol (ECTS & P) for multicast. It is now being applied to Open Distributed Processing (ODP) and to the specifications produced by the Object Management Group (OMG).

This Technical Report attempts to apply the concepts in the developing international standards for QoS to the healthcare IT domain in order to address the issues identified in the above-mentioned CEN Reports.

Purpose

The purpose of this document is specifically to identify QoS requirements for healthcare information interchange, and to investigate possible extensions to the Method for Defining Profiles for Health Care defined in CR 12161 to point to possible ways to satisfy user QoS requirements.

This report is intended to provide assistance to those specifying and procuring systems in the healthcare environment. It is also potentially a contribution to the ISO/ITU-T activity described above.

0 Scope

This Technical Report is concerned with QoS as it applies to interactions between components of distributed healthcare IT systems. The scope is not limited to network infrastructures; it includes the QoS requirements of information storage and processing IT systems. The related areas of security and financial cost considerations are not within the primary scope of the document, although they are considered briefly.

Of course, an informatics system with a high QoS does not guarantee a high standard of healthcare in terms of clinical outcomes or patient care. The quality of healthcare delivered to patients (the ultimate "users") depends upon a number of external factors such as the experience and competence of the healthcare professional(s) or institution(s) involved. Potential QoS characteristics for the total healthcare delivery process such as mortality rate, clinical outcome, etc. are therefore not within the scope of this report.

The report contains no provisions to avoid the incorporation of bad or dangerous practice into healthcare IT systems. It is possible to circumvent good clinical practice with technical solutions which may cause bad practice. This vital issue is not covered by this report. To take an example scenario:

A patient consults a doctor, who takes a blood sample and arranges to see the patient again in two weeks.

- a) A "good" practice doctor sees and reviews the blood test result as soon as it comes back from the laboratory and then files it if no action is required.
- b) A "bad" practice doctor sees and reviews the blood test results only when he reviews the patient's case on the patient's next visit. This case is not defensible if the patient has a preventable adverse event and takes legal action (source: MPS Casebook Summer 1997).

The healthcare information system put into the medical practice in electronic form could build-in either practice (a) or practice (b). This report does not consider the clinical quality assurance mechanism for the IT system.

1 Structure of this document

Introduction - defines the scope and background of the work on QoS for Healthcare Information Interchange, and gives a list of references and acronyms.

Clause 5 - Quality of Service Concepts - summarises QoS concepts from existing work.

Clause 6 - Current Relevant Work in Healthcare Informatics Standardisation - provides a brief survey of known work related to QoS requirements and mechanisms in the international healthcare community.

Clause 7 - Typical Healthcare QoS Scenarios- defines a number of User Scenarios demonstrating situations in which QoS is of importance.

Clause 8 - Healthcare QoS Categories- draws together QoS requirements in the Healthcare sector, derived from the examples in Clause 7, and from elsewhere. It gives some guidance on what solutions may be appropriate.

Clause 9 - Development of ETG 021 Method - considers how the "Method for Defining Profiles for Health Care" defined in [7], and used in [8] and [9], might be extended to cover QoS requirements.

Clause 10 - Summary and Conclusions - summarises the main points of the document and provides recommendations on how to proceed.

Annex A - Application of QoS Concepts - contains examples of applications of the concepts in Clause 5, including aspects such as QoS in OSI and QoS in time-critical communications, in order to provide background information for the discussion of Attributes in Clause 9.

2 References

2.1 Primary references

- [1] ISO/IEC 7498-1:1994, *Information technology - Open Systems Interconnection - Basic Reference Model: the Basic Model*
- [2] ISO/IEC 13236:1998, *Information technology – Quality of service – Framework [ITU-T Recommendation X.641]*
- [3] ISO/IEC TR 13243:1999, *Information technology – Quality of service - Guide to methods and mechanisms [ITU-T Recommendation X.642]*
- [4] ISO/IEC 10746-2:1996, *Information technology - Open Distributed Processing - Reference Model: Foundations [ITU-T Recommendation X.902]*
- [5] RFC 1821 *Integration of Real-time Services in an IP-ATM Network Architecture*, Borden et al (August 1995)
- [6] CEN/TC 251 *Directory of the European Standardisation Requirements for Healthcare Informatics and Telematics - Programme for the Development of Standards. Version 2.1 (1996-08-15)*
- [7] EWOS/ETG 021 (CR 12161:1995), *A method for defining profiles for healthcare*
- [8] EWOS/ETG 045 (CR 12069:1995), *Profiles for medical image interchange*
- [9] EWOS/ETG 068 *Multimedia Medical Data Interchange*
- [10] IEEE Std 1073-1996, *IEEE Standard for Medical Device Communications - Overview and Framework*
- [11] Metz CE 1986, *ROC methodology in medical imaging. Investigative Radiology 21:720-733*
- [12] ISO/IEC 11172, *Information technology - Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s (MPEG-1)*
- [13] ISO/IEC DIS 13818, *Information technology – Generic coding of moving pictures and associated audio information (MPEG-2)*
- [14] IEEE Std 1073.3.1-1994, *IEEE Standard for Medical Device Communications - Transport Profile - Connection Mode (ANSI)*

2.2 Supplementary references

The following references may also be of interest to the reader:

ISO 13485 *Medical devices - Quality management systems – Requirements for regulatory purposes*

ISO 13488 *Quality systems – Medical devices – Particular requirements for the application of ISO 9002*

Papers on QoS by Klara Nahrstedt, which can be found at the University of Illinois Department of Computer Science WWW site:

http://cs.uiuc.edu/CS_INFO_SERVER/DEPT_INFO/CS_FACULTY/FAC_HTMLS/nahrstedt.html