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Clarification on Time Zone

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Reviewers:

This document must be reviewed by the following:

Name	Signature	Title / Responsibility	Date	Version
Martin Tallis		SCR TA	02.12.08	0.11
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Approvals:

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Keith Naylor		Head of Data Standards and Products Implementation	30.01.09	0.13

Distribution:

LSPs

ESPs

BT NASP (Spine)

BT NISP (N3)

ATOS (Choose and Book)

PACS

NHS Connecting for Health Technical Architects

Comms and Messaging Implementation Steering group (CMISG)

Spine Technical Integration Forum (STIF)

Technical Assurance Group (TAG)

Document Status:

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Related Documents:

These documents will provide additional information.

Ref no	Doc Reference Number	Title	Version
1	NPFIT-SHR-QMS-PRP-0015	Glossary of Terms Consolidated.doc	13
2	NPFIT-FNT-TO-DPM-0725	Message Implementation Manual (MIM)	7.2.02
3	NPFIT-FNT-TO-TIN-1348	External Interface Specification	11.6
4	AN 22/2007	CUI – Date and Time Input and Display for Clinical Systems within the NHS in England	1.2 Jan 2009
5	ISO 8601:2004	Data Elements and interchange formats – Information interchange – Representation of dates and times	2004

Glossary of Terms:

List any new terms created in this document. Mail the NPO Quality Manager to have these included in the master glossary above [1].

Term	Acronym	Definition
British Summer Time	BST	
Central Medication Record	CMR	A central record populated by data from the Electronic Prescription Service as well as other sources with both prescribed and dispensed data.
Data Set Change Notice	DSCN	A national directive issued from the Information Standards Board for Health and Social Care, notifying organisations of mandatory and other changes to data collection requirements.
External Interface Specification	EIS	
Electronic Business using eXtensible Markup Language	ebXML	A modular suite of specifications that enables enterprises of any size and in any geographical location to conduct business over the Internet. Using ebXML, companies now have a standard method to exchange business messages, conduct trading relationships, communicate data in common terms and define and register business processes.
Greenwich Mean Time	GMT	A term originally referring to mean solar time at the Royal Observatory, Greenwich in London. It is now often used to refer to Coordinated Universal Time (UTC) when this is viewed as a Time zone.
the Internet Engineering Task Force	IETF	The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.
Message Implementation Manual	MIM	
Personal Spine Information Services	PSIS	The Services include a health record service to store and provide information such as summary or status information, event-based information, and non-event related carer documentation.
Spine	Spine	The Spine is part of the NHS Care Records Service and supports systems and services including Personal Demographics Service, Personal Spine Information Service, Transaction Messaging Service, Clinical Spine Application, Spine Directory Service, Secondary Uses Service, Choose and Book, the Electronic Prescription Service,
Summary Care Record	SCR	The electronic summary of a patient's health records.
Secondary Use Service	SUS	A system designed to provide management and clinical information based on a pseudonymised set of NCR data. SUS is the means by which information and analysis will be available for secondary purposes like performance monitoring, service planning, commissioning and clinical audit. It will also

		provide support to Payment by Results.
Coordinated Universal Time	UTC	A high-precision atomic time standard. UTC has uniform seconds defined by International Atomic Time with leap seconds announced at irregular intervals to compensate for the Earth's slowing rotation and other discrepancies.

Contents

1 Purpose

This document is designed to provide clear requirements on the usage of time fields within MIM defined message payloads, times in messages (ebXML) as well as Audit and appropriate outputs for use within and between NHS Connecting for Health (NHS CFH) compliant systems. The document will describe the perceived problem and seek to provide an appropriate solution with justification.

1.1 Definitions

Where used in this document set, the keywords **must, should**, **may**, **must not** and **should not** are to be interpreted as described in RFC 2119.[1]

- **Must** : This word, or the terms "**required**" or "**shall**", means that the definition is an absolute requirement of the specification
- **Should**: This word, or the adjective "**recommended**", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications **must be** understood and carefully weighed before choosing a different course.
- **May**: This word, or the adjective "**optional**", means that an item is truly optional. One implementer may choose to include the item because a particular implementation requires it, or because the implementer feels that it enhances the implementation while another implementer may omit the same item. An implementation which does not include a particular option **must** be prepared to interoperate with another implementation which does include the option, perhaps with reduced functionality. In the same vein, an implementation which does include a particular option **must** be prepared to interoperate with another implementation which does not include the option (except of course, for the feature the option provides).
- **Must not**: This phrase, or the phrase "**shall not**" mean that the definition is an absolute prohibition of the specification.
- **Should not**: This phrase, or the phrase "**not recommended**" mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications **should** be understood and the case carefully weighed before implementing any behaviour described with this label.

1.2 Further Enquiries

Enquiries about the contents of this document, or any of the requirements within it should be sent to nhscfh.scg@nhs.net.

The Standards Consulting Group (SCG) information is posted at http://www.connectingforhealth.nhs.uk/systemsandservices/data/scg.

[1] http://www.faqs.org/rfcs/rfc2119.html

2 Audience

These requirements are aimed at all systems suppliers i.e. LSPs, ESPs, BT NASP (Spine), BT NISP (N3) and ATOS (Choose and Book).

3 Background

It has been identified that there is a lack of clear guidance in the usage of date/time fields within the message payloads as defined in NHS CFH MIM publications. Evidence suggests that vendor systems are populating the fields with 'local time' values which may be incorrectly interpreted by receiving systems. The systems are especially vulnerable during the changeovers to British Summer Time[2]. The Standards Consulting Group (SCG) was asked by LSP representatives at a Spine Technical Integration Forum to clarify the use of UTC (Coordinated Universal Time) / local time in message payload.

Accurate recording of time is vital not only for clinical records but also scheduling and booking for example.

It is needed to support:

- Recording of clinical events in a medico legal compliant manner
- To arrange clinical events in chronological order
- To calculate time differentials
    - Medication administrations
    - Time related pathology results e.g. serum drug levels
- Technical interoperability, e.g. retries not being sent until an hour later due to UTC/BST discrepancies

It is understood that current systems are not populating clinical records with time in a consistent manner. Currently the recommendation is to assume that time recorded in messages is UTC unless stated. When investigating any clinical errors it is important to remember that the time displayed may be the local time of the displaying system rather than that of the source system.

Time is subject to change depending upon where and when it is recorded. e.g. different time zones, daylight saving time i.e. British Summer Time (BST). It is therefore essential that the time zone offset is recorded and correct time is made available to clinicians.

3.1 British Summer Time

Since 1981 EC Directives have prescribed the start and end dates of summer time in all Member States. There have to date been eight Directives which have set summer-time arrangements for fixed periods. The Summer Time Act 1972 sets the appropriate dates in the UK and summer-time orders have been made as necessary to implement the European Directives. The “9th EC Directive” prescribes the start

[2] http://www.berr.gov.uk/employment/bank-public-holidays/bst/page12528.html

and end dates of summer time as the last Sundays in March and October respectively, starting at 1:00am GMT.

Implementation of the 9th Directive in the UK is through an Order in Council under section 2(2) of the European Communities Act 1972, which amended the relevant sections of the Summer Time Act 1972. The Order came into force on 11 March 2002.

In the UK the dates for British Summer Time are published by the Department for Business Enterprise and Regulatory Reform[3].

4 Clarification

The NASP provides a Network Time Server that is coordinated to within 250 milliseconds of GMT. (Ref. Schedule 1.1, 730.103.1) GMT (Greenwich Mean Time) is equivalent to UTC. Spine subsystems are coordinated with this time server.

All suppliers are contractually required to “ensure that all system clocks provided or utilised as part of the Service shall be synchronised to within 250 milliseconds of the NASP-provided Network Time Servers.” (Ref. Schedule 1.7, 730.103.1)

The MIM states - the *timeStamp* is sent in the "value" attribute of the Point in Time (TS) data type. Time stamp information is sent in a format that is simplest for the XML schema to validate, as follows:

- YYYYMMDDHHMMSS[+|-ZZzz], where YYYY is the year, MM the month, DD the day, HH the hour, MM the minutes, SS the seconds and +|-ZZzz is the time zone offset in hours and minutes.

The External Interface Specification version 11.6 part 2 states in section 2.9.1 Distributed Time, that:

- All Spine servers are based upon GMT/UTC.
- Note that all transport related ‘time’ attributes, i.e. all times in the ebXML headers, HL7 Wrapper and WS-Addressing headers, MUST be provided in GMT / UTC.

4.1 MIM Defined Messaging

In order to avoid the possibility of misinterpretation by receiving systems the sender **must** adhere to the following rules:

- As per IETF RFC 3339, where the time in UTC is known but the offset to local time is unknown it **must** be represented with an offset of “-0000”.[4]
    - This is of particular importance where local time is passed to the SPINE (e.g. PSIS, SUS, SCR, CMR)
- Where precision of a time stamp includes hours, the time stamp **must** include the time zone offset

[3] http://www.berr.gov.ukemployment/bank-public-holidays/bst/page12528.html

[4] http://www.ietf.org/rfc/rfc3339.txt see also http://www.faqs.org/rfcs/rfc2822.html

- Whether time is recorded in UTC, GMT or BST the time zone offset **must** be stated
- Time zone offset **must** be specified for all the following TS values in order to avoid a significant loss of precision when TS values are compared:
    - activityTime
    - availabilityTime
    - effectiveTime
    - expirationTime

    and the participation times
- Appendix 3 contains the list of TS datatypes where Time zone **must** be specified.

Note. In an administrative data context, some time values do not carry a time zone. For example, it would be incorrect to specify time zone offset for a date of birth or death in administrative data, since this may effectively change the date when converted into other time zones. For such administrative data local time **should** be used.

4.2 Display of Time

To avoid confusion and clinical errors the display of time **must** be clearly displayed in local time suitable for the consuming user's perspective, which may include accounting for BST as well as translating UTC to local time.

Standards relating to the input and display of date and time information have been developed by the Common User Interface (CUI) programme.[5] Advance Notification (AN) 22/2007 is the advance notification for CUI – Date and Time Input and Display for Clinical Systems within the NHS in England, provides the advance notification of the requirements.[6]

4.2.1 Examples

GMT example:

Message	Display Example
20071215102746+0000	15 Dec 2007 10:27:46
20071215102746+00	

[5] http://www.cui.nhs.uk/

[6] http://www.connectingforhealth.nhs.uk/dscn/dscn-2009/advance/AN%2022-2007.pdf

BST example:

Message	Display Example
20070615102746+0100	15 Jun 2007 10:27:46
20070615102746+01	

Note. Examples from when BST began and ended in 2007, remembering that clocks change at 1:00am GMT.

Message	Display Example
20070325012746+0100	25 Mar 2007 01:27:46
20070325012746+01	

Message	Display Example
20071028012746+0100	28 Oct 2007 01:27:46
20071028012746+01	
20071028012746+0000	28 Oct 2007 01:27:46
20071028012746+00	

4.3 Audit Log Time

Audit timestamps **must** be recorded using the system time i.e. UTC.

To avoid confusion and governance errors the display of audit log time **must** be clearly displayed in local time suitable for the consuming user's perspective, which may include accounting for BST as well as translating UTC to local time.

4.4 ebXML Messaging

The National Integration Centre (NIC) has provided the note in Appendix 2 on the use of BST timestamps in ebXML messages sent to Spine.

4.5 Caveats

The following exceptions / caveats apply:

- Choose and Book always submits times as local time. As such local systems (e.g. slot polls and slot requests) all use local time
- Choose and Book passes times to the Secondary Uses Service as local time
- Personal Demographics Service records local time (i.e. date only not time) as business effective dates.

5 Migration Strategy

It is realised that there are a number of systems already utilising messages with time fields and have not implemented the time zone offset indicator. Therefore the following migration plan is required:

- Existing messages (prior to and including MIM 7.2.02 / EIS 11.6) **should** remain as is
- When a system connects to the Spine using the MIM vehicle after 7.2.02 / EIS after 11.6 then the time zone offset **must** be stated in line with Section 4.
- When a system connects to the Spine using a later MIM / EIS vehicle than previously then the time zone offset **should** be stated in line with Section 4.
- Where the time zone offset is not stated then UTC **should** be assumed.
- Receiving systems **must** accept, process and display the time zone offset in a manner which is both safe from a clinical and governance perspective and in line with Section 4.

A Appendix 1 - Additional Reference Materials

Common User Interface (CUI) programme	http://www.cui.nhs.uk/
Data Set Change Notice 22/2007 – Advance Notice for Common User Interface Date and Time Input and Display for Clinical Systems within the NHS in England	http://www.connectingforhealth.nhs.uk/dscn/dscn-2009/advance/AN%2022-2007.pdf
Department for Business, Enterprise and Regulatory Reform – British Summer Time timetable	http://www.berr.gov.uk/employment/bank-public-holidays/bst/page12528.html
RFC 2119 - Key words for use in RFCs to Indicate Requirement Levels	http://www.faqs.org/rfcs/rfc2119.html
RFC 2822 – Internet Message Format	http://www.faqs.org/rfcs/rfc2822.html
IETF RFC 3339 – Date and Time on the Internet – Timestamps	http://www.ietf.org/rfc/rfc3339.txt

B Appendix 2 – National Integration Centre (NIC) note - PC time zone and timestamp in ebXML messaging

This is a note for the STIF issue on the use of BST timestamps in ebXML messages sent to Spine. It relates to the population of the ebXML "Timestamp" element:

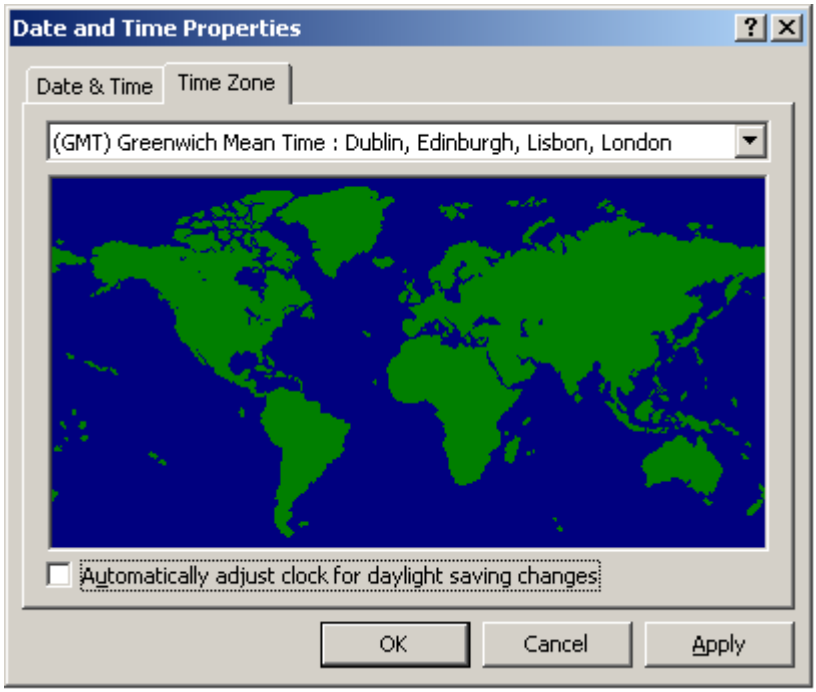
```
<eb:Timestamp>2007-05-03T09:45:40Z</eb:Timestamp>
```

This is defined in the OASIS ebXML 2.0 standard (section 3.1.6.2, p21) as using the UTC Time zone (or "Zulu", hence the "Z" in the example above). The common assumption of UTC is critical because the same standard defines (sections 6.4.5 and 6.4.6, both on p39) that the value of the Timestamp element is the basis for the calculation of TimeToLive and PersistDuration contract properties in reliable messaging.

TMS is known to be a correct implementation of these parts of the ebXML specification.

It is known that on at least some platforms (certainly Sun Java 1.5+ on Microsoft Windows XP - other combinations are currently unexplored), an error in the presentation of time from the operating system results in Timestamp values being emitted that are one hour out, when daylight savings time is in force.

On Windows XP, the "Date and Time" control panel applet, on the "Time Zone" tab, offers the option to "Automatically adjust clock for daylight savings time"



Selecting this results in Java's call to Calendar.getTime() returning the daylight savings time even when the programmer has explicitly requested an instance of Calendar for the "Zulu" Time zone:

```
Time zone tz = Time zone.getTime zone("Zulu");
Calendar c = Calendar.getInstance(tz, Locale.UK);
Date d = c.getTime();
```

When the "Automatically adjust..." checkbox is unselected, the call returns the correct Zulu time as requested.

It is currently uninvestigated, the extent to which this applies to other execution environments on Windows, or to Java on other operating systems. However, it must be recommended that on all Microsoft Windows systems that send messages to Spine, the "Automatically adjust..." option is turned off.

C Appendix 3 - MIM TS datatypes that MUST include the time Zone offset

The following analysis is baselined from MIM 7.2.00 however the requirements are appropriate regardless of the version of MIM.

S:\Standards Consultants Group\De