

Health informatics—Personal health device communication

Part 20601: Application profile— Optimized Exchange Protocol

Amendment 1

IEEE Engineering in Medicine and Biology Society

Sponsored by the
IEEE 11073™ Standards Committee

IEEE
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(Amendment to
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Part 20601: Application profile— Optimized Exchange Protocol

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IEEE Engineering in Medicine and Biology Society

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Abstract: Issues found within IEEE Std 11073-20601-2008 while implementing the standard and/or testing and certifying products are addressed in this amendment.

Keywords: 11073, medical device communication, personal health devices

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This introduction is not part of IEEE Std 11073-20601a-2010, Health informatics—Personal health device communication—Part 20601: Application profile—Optimized Exchange Protocol—Amendment 1.

This amendment addresses issues found while implementing the standard and/or testing and certifying products.

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Health informatics—Personal health device communication

Part 20601: Application profile— Optimized Exchange Protocol

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1.3 Context

Insert the following text between the current sixth and seventh paragraphs:

Some device specializations describe broad categories of device types (e.g., the IEEE 11073-10441 model device types that promote cardiovascular activity such as step counters or exercise cycles). Other device

¹ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

specializations have a narrow focus on a single device type (e.g., IEEE 11073-10408 model thermometers). Specializations that address one or more device types may also define *profiles*. A profile further constrains the model defined in a specialization to increase interoperability (e.g., the step counter profile utilizes a limited portion of IEEE 11073-10441 modeling).

The ISO/IEEE P11073-00103 [B8]¹ technical report describes the overall personal health space with further definition of the underlying use cases and usage models.

3. Definitions, acronyms, and abbreviations

3.1 Definitions

Change the first paragraph and insert new footnote as shown. Delete [B6] from Annex K and renumber subsequent references in Annex K:

For the purposes of this standard, the following terms and definitions apply. ~~The *Authoritative Dictionary of IEEE Standards* [B6]~~The *IEEE Standards Dictionary: Glossary of Terms & Definitions* should be referenced consulted for terms not defined in this clause.²

Changes existing definitions and insert new definitions as shown:

3.1.1 agent: A node that collects and transmits personal health data to an associated manager.

attribute: Data representing a property of an object. Attributes, together with actions, define an object.

AttributeChangeSet: The set of attribute value changes that represents an atomic update of an object. The MDS or scanner is notified when an AttributeChangeSet is completed. Collections of these AttributeChangeSets are mapped by the MDS or scanner into one of the ObservationScan structures in a scan event report that gets sent to the manager. The manager updates its object with the set of attribute value changes contained in the ObservationScan before deriving any semantic behavior.

3.1.2 compute engine: *See: manager.*

3.1.3 confirmed: An application-level, completion notification service mechanism. For EVENT REPORT services (i.e., the data plane), confirmation allows the agent to know when the manager has “accepted responsibility” for a piece of data so that the agent can delete that data. For the ACTION, GET, and SET services (i.e., the control plane), confirmation allows the manager to know when the agent has “completed” the requested transaction.

3.1.4 device: A physical device implementing either an agent or manager role.

dynamic attribute: An attribute with a value that may change during an association. The attribute value should be sent at configuration time and shall be sent at or before the time when the value would be needed for interpreting a reported observation. The value may be updated later (e.g., in a scan or segment data event report). The attribute value remains in effect until updated by a later scan or segment data event report or the system exits the association.

3.1.5 handle: An unsigned 16-bit number that is locally unique and identifies one of the object instances within an agent.

¹ The numbers in brackets correspond to the numbers of the bibliography in Annex K.

² *The IEEE Standards Dictionary: Glossary of Terms & Definitions* is available at <http://shop.ieee.org/>.

3.1.6 manager: A node receiving data from one or more agent systems. Examples of managers include a cellular phone, health appliance, set top box, or computer system.

metric: A metric object models different forms of measurements.

observational attribute: An attribute value that may change during the life of an association. The value may be sent in a scan or segment data event report. When a set of observational attribute values are received, these values are combined with the available context information (i.e., all related dynamic and static attribute values) to represent the observation at the observation time. Unlike dynamic and static attribute values, the observational attribute values are combined only once with context information (i.e., the observational attribute values are not reused when any new attribute values are received in the future).

object: A unit that represents some functionality or item in a device whose properties are described by attributes. Metric objects represent measurements (such as blood pressure, weight, or temperature), the MDS represents the device, PM-store objects represent the permanent storage mechanisms on an agent, and Scanners represent a control and reporting mechanism.

3.1.7 personal health device: A device used in personal health applications.

3.1.8 personal telehealth device: *See:* personal health device.

static attribute: An attribute value that does not change (its value remains fixed) during the life of an association. The value is sent in the configuration event report. The value remains in effect until the system exits the associated state. ~~An attribute value that does not change (its value remains fixed) during the life of an association.~~

NOTE—Do not confuse the use of static in this document with static as used in the C programming language.

3.2 Acronyms and abbreviations

Change as shown and insert the following new lines in alphabetical order:

ECG	<u>electrocardiogram or electrocardiograph</u>
FIFO	<u>first-in, first-out</u>
PM	<u>persistent metric</u>
UTC	<u>coordinated</u> universal time ~~coordinated~~

6. Personal health device DIM

6.2 Nomenclature usage

Change Table 1 as shown:

Table 1—Partitions in the nomenclature

Partition number	Nomenclature category
<u>0</u>	<u>Unspecified</u>
1	Object-oriented (OO)
2	Supervisory control and data acquisition (SCADA)
3	Events
4	Dimensions (units of measurement)
5	Virtual attributes
6	Parameter groups
7	[Body] sites
8	Infrastructure
<u>9</u>	<u>File Exchange Format</u>
<u>10</u>	<u>ECG Extensions</u>
<u>11</u>	<u>IDCO Extensions</u>
<u>129–127</u>	Reserved
128	Personal health devices disease management
129	Personal health devices health and fitness
130	Personal health devices aging independently
131–254	Reserved
255	Return codes
256	External nomenclature references
257–1023	Reserved
1024	Private
1025–65 535	Reserved

6.3 Personal health object class definitions

6.3.1 General

Replace Figure 4 with the following figure:

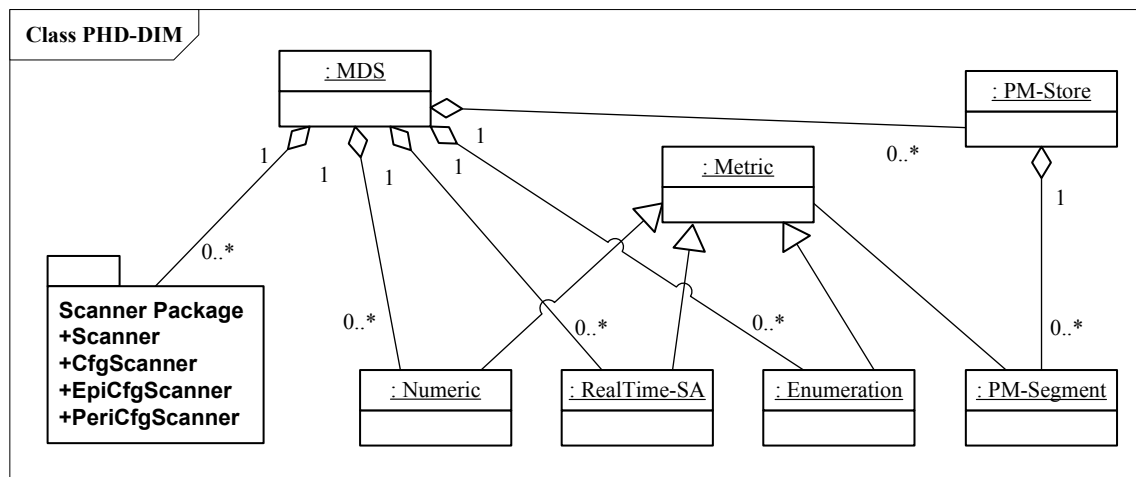


Figure 4—Personal health device—DIM

Change the following paragraphs as shown:

The attributes for each class are defined in tables that specify the name of the attribute, its nomenclature reference ID, its type, a description of the attribute, and its qualifiers. The qualifiers Conditional, Optional, and Mandatory identify when the attribute is to be implemented in the object. A conditional attribute is

~~implemented based on the condition(s) stated in the Remark column. Conditional attributes shall be implemented if the condition remark applies and may be implemented otherwise. Optional attributes may be implemented on by an agent. Mandatory attributes shall be implemented by an agent.~~

~~An attribute is further qualified as static, dynamic, or observational. Static attributes shall not change value during the life of an association. The value is sent in the configuration event report. The value remains in effect until the system exits the associated state. The attribute shall have a fixed value from the time the operating state is reached until the system exits the associated state. Dynamic attributes have a value that may change during the life of an association. The attribute value should be sent at configuration time and shall be sent at or before the time when the value would be needed for interpreting a reported observation. The value may be updated later (e.g., in a scan or segment data event report). The attribute value remains in effect until updated by a later scan or segment data event report by a later scan report (a state) or the system exits the association state. Attributes are further qualified based on the persistence of the attribute when reported to a manager. A persistent attribute has a value that remains valid until that value is updated (a state). Observational attributes have a value that may change during the life of an association. The value may be sent in a scan or segment data event report. When a set of observational attribute values are received, these values are combined with the available context information (i.e., all related dynamic and static attribute values) to represent the observation at the observation time. Unlike dynamic and static attribute values, the observational attribute values are combined only once with context information (i.e., the observational attribute values are not reused when any new attribute values are received in the future). In the metric object tables, attributes that are labeled as observations may be additionally flagged as a (1) setting, (2) manual entry, or (3) calculation entirely from manual and/or setting entry attributes. In those three cases, the attribute is to be treated by the manager as dynamic. The agent sets these flags in the Metric-Spec-Small attribute. The attribute types are summarized in Table 1a.~~

Insert the following new table:

Table 1a—Attribute types

<u>Attribute type</u>	<u>Can be reported by...</u>	<u>Attribute value remains in effect until...</u>
<u>dynamic attribute</u> <u>may change during the life</u> <u>of an association</u>	• <u>Should be reported in a configuration event report and shall be sent at or before the time when the value would be needed for interpreting a report observation</u> • <u>May be reported in a scan or segment data event report</u>	• <u>updated by a later scan or segment data event report</u> • <u>the system exits the association state</u>
<u>observational attribute</u> <u>may change during the life</u> <u>of an association</u>	• <u>Shall be reported in a scan or segment data event report</u>	• <u>these values are combined with the available context information (i.e., all related dynamic and static attribute values) to represent the observation at the observation time.</u>
<u>static attribute</u> <u>shall not change during the life</u> <u>of an association</u>	• <u>Shall be reported in the configuration event report</u>	• <u>the system exits the association state</u>

6.3.2 MDS class

6.3.2.3 MDS class attributes

Change Table 2 as shown and insert the following text after the table:

Table 2—MDS attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Handle	MDC_ATTR_ID_HANDLE	HANDLE	The Handle attribute represents a reference ID for this object. The value of the MDS Handle attribute shall be 0.	<u>Mandatory Static</u>
System-Type	MDC_ATTR_SYS_TYPE	TYPE	This attribute defines the type of the agent, as defined in nomenclature (e.g., weighing scale). The values shall come from ISO/IEEE 11073-10101 [B12], nom-part-object partition, and subpartition MD-Gen (Medical Device – Generic). ~~Either this attribute or~~ <u>One and only one of System-Type or System-Type-Spec-List shall be present. This attribute shall remain unchanged after the configuration is agreed upon.</u>	<u>Conditional Static</u>
System-Model	MDC_ATTR_ID_MODEL	SystemModel	This attribute defines manufacturer and model number of the agent device. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>

Table 2—MDS attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers ³
System-Id	MDC_ATTR_SYS_ID	OCTET STRING	This attribute is an IEEE EUI-64, which consists of a 24-bit unique organizationally unique identifier (OUI) followed by a 40-bit manufacturer-defined ID. The OUI shall be a value assigned by the IEEE Registration Authority (http://standards.ieee.org/regauth/index.html) and shall be used in accordance with IEEE Std 802-2001. ³ ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>
Dev-Configuration-Id	MDC_ATTR_DEV_CONFIG_ID	ConfigId	This attribute defines the identification of the agent device configuration. This Dev-Configuration-Id is static during the lifetime of an association; it is normally exchanged during the association procedure. The manager can GET this attribute during operation. If this attribute is queried prior to when the agent and manager agree upon a configuration, the agent shall return the configuration ID that is being offered at that time. For more information on this attribute, see 8.8. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>
Attribute-Value-Map	MDC_ATTR_ATTRIBUTE_VAL_MAP	AttrValMap	This attribute defines the attributes that are reported in the fixed format data update messages (see 7.4.5 for more information). ~~Usage of this attribute is mandatory if the agent device uses fixed format value messages to report dynamic data for the object, this attribute shall be set prior to sending such a report. This attribute value may change in between sending such event reports and shall be sent in an event report if it changes while associated.~~	<u>Conditional Dynamic</u>
Production-Specification	MDC_ATTR_ID_PROD_SPECN	ProductionSpec	This attribute defines component revisions, serial numbers, and so on in a manufacturer-specific format. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Optional Static</u>
Mds-Time-Info	MDC_ATTR_MDS_TIME_INFO	MdsTimeInfo	This attribute defines the time handling capabilities and the status of the MDS. Usage of this attribute is required if synchronization or settable time is supported.	<u>Conditional Dynamic</u>
Date-and-	MDC_ATTR_TIME_ABS	AbsoluteTime	This attribute defines the date and	<u>Conditional</u>

³ For information on references, see Clause 2.

Table 2—MDS attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Time			time of an agent with resolution of 1/100 of a second, if available. For more information on this attribute, see 8.12. If the agent reports AbsoluteTime in any ~~other~~ message, it shall report its current value of AbsoluteTime in this attribute. <u>If this attribute is used the Base-Offset-Time attribute shall not be used.</u>	<u>Observational</u>
<u>Base-Offset-Time</u>	<u>MDC_ATTR_TIME_BO</u>	<u>BaseOffsetTime</u>	<u>This attribute defines the date and time of an agent as a base time with the offset in minutes to local time. For more information on this attribute, see 8.12. If the agent reports BaseOffsetTime in any message, it shall report its current value of base time in this attribute. If this attribute is used the Date-and-Time attribute shall not be used.</u>	<u>Conditional</u> <u>Observational</u>
Relative-Time	MDC_ATTR_TIME_REL	RelativeTime	If the agent reports RelativeTime in any ~~other~~ message, it shall report its current value of RelativeTime in this attribute.	<u>Conditional</u> <u>Observational</u>
HiRes-Relative-Time	MDC_ATTR_TIME_REL_HI_RES	HighResRelativeTime	If the agent reports HighResRelativeTime in any ~~other~~ message, it shall report its current value of HighResRelativeTime in this attribute.	<u>Conditional</u> <u>Observational</u>
Date-and-Time-Adjustment	MDC_ATTR_TIME_ABS_ADJUST	AbsoluteTimeAdjust	This attribute reports any date and time adjustments that occur either due to a person's changing the clock or events such as daylight savings time. This is used in event reports only. If queried with Get MDS Object command, this value shall be not present or 0. If the agent ever adjusts the date and time, this attribute is used in an event report to report such adjustment.	<u>Conditional</u> <u>Observational</u>
Power-Status	MDC_ATTR_POWER_STAT	PowerStatus	This attribute reports whether power is being drawn from battery or main power lines and the status of charging.	<u>Optional</u> <u>Dynamic</u>
Battery-Level	MDC_ATTR_VAL_BATT_CHARGE	INT-U16	This attribute reports the percentage of battery capacity remaining, which is undefined if value > 100.	<u>Optional</u> <u>Observational</u>
Remaining-Battery-Time	MDC_ATTR_TIME_BATT_REMAIN	BatMeasure	This attribute represents the predicted amount of operational time left on the batteries. The BatMeasure's unit shall be set to one of MDC_DIM_MIN, MDC_DIM_HR, or MDC_DIM_DAY for minutes, hours, or days, respectively.	<u>Optional</u> <u>Observational</u>
Reg-Cert-Data-List	MDC_ATTR_REG_CERT_DATA_LIST	RegCertDataList	This attribute lists various regulatory and/or certification compliance items to which the agent claims adherence as an informative statement. The	<u>Optional</u> <u>Static</u>

Table 2—MDS attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
			Implementation Conformance Statements (see Clause 9) take precedence over this attribute and are the legally binding claims. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	
System-Type-Spec-List	MDC_ATTR_SYS_TYPE_SPEC_LIST	TypeVerList	This attribute reports the type(s) of the agent, as defined in nomenclature (e.g., weighing scale). The values shall come from ISO/IEEE 11073-10101 [B12], nom-part-infrastruct partition, subpartition DEVspec, and reference ISO/IEEE 11073-104zz specializations. If an agent does not follow any specialization, the list shall be left blank. <u>If an agent follows a profile within a specialization, it shall report both the specialization and the profile nomenclature values in this list.</u> This list shall also contain the version of the specialization(s)/profile(s). <u>One and only one of System-Type or System-Type-Spec-List shall be present. Either this attribute or System-Type shall be present.</u> If the agent is multifunction, this attribute shall be present. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Conditional</u> <u>Static</u>
Confirm-Timeout	MDC_ATTR_CONFIRM_TIMEOUT	RelativeTime	This informational timeout attribute defines the minimum time that the agent shall wait for a Response message from the manager after issuing a Confirmed Event Report invoke message before timing out and transitioning to the Unassociated state. This is an informational attribute for the benefit of the manager. If this attribute is supplied, it shall match the actual timeout value that the agent uses for the Confirmed Event Report generated from the MDS object. This attribute is informational for the manager in the sense that the manager does not use this attribute in an actual implementation of the protocol (i.e., the manager does not time out on an agent-generated Confirmed Event Report). However, the manager might wish to use this information to prioritize its handling	<u>Optional</u> <u>Dynamic</u>

Table 2—MDS attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
			of a “short” timeout agent over that of a “long” timeout agent. <u>Currently the attribute is Dynamic, but agent implementations should treat as Static since it is likely this will change to Static in the future. If this attribute value is changed, it shall be changed only when the scanner is disabled. The attribute value change is communicated to the manager using an agent-initiated event report from the MDS object.</u>	

Note that the attribute System-Type is independent of the similarly named System-Type field in the PhdAssociationInformation structure of an association request.

The MDS attributes represent a device level view and are independent of the particular configuration that has been offered or accepted. For instance, the System-Type-Spec-List or Reg-Cert-Data-List provide all capabilities that the device may offer. The current configuration may or may not provide everything listed in the attribute.

6.3.2.4 MDS object methods

Insert a new row in Table 3 as shown:

Table 3—MDS object methods

Method/Action	Mode	Action-type	action-info-args	Resulting action-info-args
MDS-Data-Request	Confirmed	MDC_ACT_DATA_REQUEST	DataRequest	DataResponse
Set-Time	Confirmed	MDC_ACT_SET_TIME	SetTimeInvoke	None
Set-Base-Offset-Time	Confirmed	MDC_ACT_SET_BO_TIME	SetBOTimeInvoke	None

Insert the following text:

— **Set-Time:**

This method allows the manager system to set a real-time clock (RTC) with the absolute time. The agent indicates whether the Set-Time command is valid by using the mds-time-capab-set-clock bit in the Mds-Time-Info attribute (see Table 2). If the agent supports Set-Time, it shall respond with a rors-cmip-confirmed-action, but the action-info-args is empty in this response. If the agent does not support Set-Time, it shall respond with a no-such-action error (roer).

— **Set-Base-Offset-Time:**

This method allows the manager system to set a real-time clock (RTC) with a base time and the offset in minutes to local time. The agent indicates whether the Set-Base-Offset-Time command is valid by using the mds-time-capab-set-clock bit in the Mds-Time-Info attribute (see Table 2). If the agent supports Set-Base-Offset-Time, it shall respond with a rors-cmip-confirmed-action, but the action-info-args is empty in this response. If the agent does not support Set-Base-Offset-Time, it shall respond with a no-such-action error (roer). If the base time seconds field and base time fraction of a second field are set to 0x0 in the arguments of the Set-Base-Offset-Time action (these values being undefined in NTP), then only the offset to local time shall be set. An agent may support either the absolute time or the base time but not both. If the base time (seconds field) is aligned with UTC (with an accuracy

appropriate to the application), then this shall be designated by setting the mds-time-bo-time-utc-aligned bit in the Mds-Time-Info attribute.

An agent may support either absolute time or base time but not both.MDS object events.

6.3.2.5 MDS object events

Change Table 4 as shown:

Table 4—MDS object events

Event	Mode	Event-type	Event-info parameter	Event-reply-info
MDS-Configuration-Event	~~Confirmed or~~ ~~unconfirmed~~	MDC_NOTI_CONFIG	ConfigReport	ConfigReportRsp
MDS-Dynamic-Data-Update-Var	Confirmed or unconfirmed	MDC_NOTI_SCAN_REPORT_VAR	ScanReportInfoVar	-
MDS-Dynamic-Data-Update-Fixed	Confirmed or unconfirmed	MDC_NOTI_SCAN_REPORT_FIXED	ScanReportInfoFixed	-
MDS-Dynamic-Data-Update-MP-Var	Confirmed or unconfirmed	MDC_NOTI_SCAN_REPORT_MP_VAR	ScanReportInfoMPVar	-
MDS-Dynamic-Data-Update-MP-Fixed	Confirmed or unconfirmed	MDC_NOTI_SCAN_REPORT_MP_FIXED	ScanReportInfoMPFixed	-

6.3.2.6 Other MDS services

6.3.2.6.1 GET service

Change the subclause and insert new text as shown:

Any agent supporting two-way communication links shall support the GET service to retrieve the values of all implemented MDS object attributes. The GET service can be invoked as soon as the agent receives the Association Response and moves to the Associated state, including the Operating and Configuring substates. With the exception of the date-time-adjustment attribute, if a manager does not have the current value of a needed MDS attribute, then the GET service shall be used. An agent may also send scan event reports providing the manager with updates of the current attribute values, but this is not a mandated agent behavior with the exceptions described for attribute-value-map and date-and-time-adjustment in Table 2.

The manager may request the MDS object attributes of the agent in which case the manager shall send the “Remote Operation Invoke | Get” command (see roiv-cmip-get in A.10.2) with the reserved handle value of 0. The agent shall respond by reporting its MDS object attributes to the manager using the “Remote Operation Response | Get” response (see rors-cmip-get in A.10.2). In the response to a Get MDS Object command, only attributes implemented by the agent are returned. See 8.9.3.2 for a full explanation of the GET operation.

NOTE—Requirements, such as the need for an agent to request a manager to set its time, may necessitate that a manager request the MDS object from an agent immediately after the manager has entered the Associated state (see 8.12.2).

Due to the nature of the attributes reported in the MDS Object, the manager should send the Get MDS Object request right after sending the Association Response.

6.3.2.6.2 SET service

Change the following paragraph as shown:

There are currently no ~~settable attributes~~ uses of the MDS SET service defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist.

6.3.3 Metric class

6.3.3.3 Metric class attributes

Change Table 5 as shown:

Table 5—Metric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qual-ifiers
Handle	MDC_ATTR_ID_HANDLE	HANDLE	The Handle attribute represents a reference ID for this object. Each object shall have a unique ID assigned by the agent. The handle identifies the object in event reports sent to the manager. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>
Type	MDC_ATTR_ID_TYPE	TYPE	This attribute defines a specific static type of this object as defined in the nomenclature (e.g., pulse rate for a specific numeric object instance). The Type attribute contains the nomenclature partition and term code IDs for context-free, extensible identification. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>
Supplemental-Types	MDC_ATTR_SUPPLEMENTAL_TYPES	SupplementalTypeList	This attribute may be used to convey supplemental information about the object beyond the Type and Metric-Id attributes. Supplemental information covers conditions like the location of the sensor or the rate at which the object reacts to changes. Device specializations define the expected usage of this attribute. For example, IEEE Std 11073-10471 [B5] defines location nomenclature for specifying the location of a sensor in a home and ISO/IEEE P11073-10404 [B9] defines three supplemental types for fast response, slow response, and spot checking of the pulse rate or blood oxygenation. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Optional Static</u>

Table 5—Metric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qual-ifiers
Metric-Spec-Small	MDC_ATTR_METRIC_SPE C_SMALL	MetricSpecSmall	This attribute describes the characteristics of the measurements. <u>This attribute is dynamic to allow an agent to alter the bit settings prior to sending the first observation (e.g., to adjust a standard configuration). Once an observation is sent the agent shall not update this attribute's value.</u>	<u>Mandatory</u> <u>Dynamic</u>
Metric-Structure-Small	MDC_ATTR_METRIC_ STRUCT_SMALL	MetricStructureS mall	This attribute describes the structure of the measurement. If not present, the manager shall assume MetricStructureSmall := {ms-struct-simple, 0}. <u>This attribute is dynamic to allow an agent to alter the settings prior to sending the first observation (e.g., to adjust a standard configuration). Once an observation is sent the agent shall not update this attribute's value.</u>	<u>Optional</u> <u>Dynamic</u>
Measurement-Status	MDC_ATTR_MSMT_STAT	MeasurementStat us	This attribute indicates the validity of a particular value or set of samples. <u>If a scanner reports an RTSA and there is a possibility that the scanner may need to report missing observations (see 6.3.9.2) this attribute shall be present.</u>	<u>Conditional</u> <u>Observational</u>

Table 5—Metric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Metric-Id	MDC_ATTR_ID_PHYSIO	OID-Type	This attribute may be used to hold an identification that is more specific than the generic ID in the Type attribute. If the Metric-Id-Partition attribute is valued, it defines the nomenclature partition for this attribute. Otherwise, the OID-Type is taken from the same nomenclature partition as defined in the partition field of the Type attribute. This attribute is needed only if identification changes during operation and the Type attribute does not contain full identification. For example, if the Type attribute contains a generic temperature code (MDC_TEMP), this attribute could report a specific, but changing, identification such as MDC_TEMP_ORAL or MDC_TEMP_RECT. Only one attribute of Metric-Id and Metric-Id-List shall be present.	<u>Optional</u> <u>Dynamic</u>
Metric-Id-List	MDC_ATTR_ID_PHYSIO_LIST	MetricIdList	This attribute shall be used if a compound observed value is used and does not incorporate the Metric-Id directly (e.g., Compound-Simple-Nu-Observed-Value or Compound-Basic-Nu-Observed-Value) so that elements in the observed value list can be identified individually. The order of the Metric-Id-List shall correspond to the order of the elements in the compound observed value. Only one attribute of Metric-Id and Metric-Id-List shall be present.	<u>Conditional</u> <u>Dynamic</u>
Metric-Id-Partition	MDC_ATTR_METRIC_ID_PART	NomPartition	This attribute may be used to define the partition from which the Metric-Id or Metric-Id-List nomenclature terms were taken. If not present, the partition is the same as the nomenclature partition defined in the partition field of the Type attribute.	<u>Optional</u> <u>Dynamic</u>
Unit-Code	MDC_ATTR_UNIT_CODE	OID-Type	This attribute defines the nomenclature code for the units of measure from the nom-part-dim partition (e.g., MDC_DIM_KILO_G).	<u>Optional</u> <u>Dynamic</u>

Table 5—Metric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qual-ifiers
Attribute-Value-Map	MDC_ATTR_ATTRIBUTE_VAL_MAP	AttrValMap	This attribute defines the attributes that are reported in the fixed format data update messages. ~~Usage of this attribute is mandatory.~~ If the agent uses fixed format value messages to report dynamic measurement data for the object, <u>this attribute shall be set prior to sending such a report. This attribute value may change in between event reports.</u>	<u>Conditional</u> <u>Dynamic</u>
Source-Handle-Reference	MDC_ATTR_SOURCE_HANDLE_REF	HANDLE	This attribute establishes a relation of this object instance to a source object (e.g., pulse references sourcing SpO2). This attribute is used whenever it is required to model an explicit relation between object instances to define dependencies. The usage of this attribute is defined by device specializations.	<u>Optional</u> <u>Dynamic</u>
Label-String	MDC_ATTR_ID_LABEL_STRING	OCTET STRING	This attribute defines the textual representation of Type attribute in printable ASCII. The value of this attribute is at the complete discretion of the agent's manufacturer. It could potentially be useful for a manager as a display string or as an aid in deciding how to behave when it does not understand the MDC_ATTR_ID_TYPE as reported by the agent.	<u>Optional</u> <u>Dynamic</u>
Unit-LabelString	MDC_ATTR_UNIT_LABEL_STRING	OCTET STRING	This attribute defines the textual representation of Unit-Code dimension in printable ASCII. The value of this attribute is at the complete discretion of the agent's manufacturer. It could potentially be useful for a manager as a display string or as an aid in deciding how to behave when it does not understand the MDC_ATTR_UNIT_CODE as reported by the agent.	<u>Optional</u> <u>Dynamic</u>

Table 5—Metric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qual-ifiers
Absolute-Time-Stamp	MDC_ATTR_TIME_STAMP_ABS	AbsoluteTime	This attribute defines the date and time of observation with resolution of 1/100 of a second, if available. For more information on this attribute, see 8.12. If an agent stores data (either in a PM-store object or as a “temporarily stored measurement”), it shall associate a time stamp (Absolute-Time-Stamp, <u>Base-Offset-Time-Stamp</u> , Relative-Time-Stamp, or HiRes-Time-Stamp) with the data. <u>If this attribute is used the Base-Offset-Time-Stamp attribute shall not be used.</u>	<u>Conditional</u> <u>Observational</u>
<u>Base-Offset-Time-Stamp</u>	<u>MDC_ATTR_TIME_STAMP_BO</u>	<u>BaseOffsetTime</u>	<u>This attribute defines the base date and time of observation and the offset in minutes to local time. For more information on this attribute, see 8.12. If an agent stores data (either in a PM-store object or as a “temporarily stored measurement”), it shall associate a time stamp (Absolute-Time-Stamp, Base-Offset-Time-Stamp, Relative-Time-Stamp, or HiRes-Time-Stamp) with the data. If this attribute is used, the Absolute-Time-Stamp attribute shall not be used.</u>	<u>Conditional</u> <u>Observational</u>
Relative-Time-Stamp	MDC_ATTR_TIME_STAMP_REL	RelativeTime	This attribute defines the time of observation (time stamp in a relative time format/number of clock ticks as defined by RelativeTime data type). If an agent stores data, it shall associate a time stamp (Absolute-Time-Stamp, <u>Base-Offset-Time-Stamp</u> , Relative-Time-Stamp, or HiRes-Time-Stamp) with the data.	<u>Conditional</u> <u>Observational</u>
HiRes-Time-Stamp	MDC_ATTR_TIME_STAMP_REL_HI_RES	HighResRelativeTime	This attribute defines the time of observation (time stamp in a high-resolution relative time format/number of clock ticks as defined by a HighResRelativeTime data type). If an agent stores data, it shall associate a time stamp (Absolute-Time-Stamp, <u>Base-Offset-Time-Stamp</u> , Relative-Time-Stamp, or HiRes-Time-Stamp) with the data.	<u>Conditional</u> <u>Observational</u>
Measure-Active-Period	MDC_ATTR_TIME_PD_MSMT_ACTIVE	FLOAT-Type	This attribute defines the time duration of the observation period in seconds.	<u>Optional</u> <u>Dynamic</u>

6.3.3.4 Metric object methods

Change as shown:

There are currently no metric object methods defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist.

None

6.3.3.6 Other metric services

Change as shown:

There are currently no uses of the metric SET or GET services defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist.

None

6.3.4 Numeric class

6.3.4.3 Numeric class attributes

Change Table 6 as shown:

Table 6—Numeric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers:
Simple-Nu-Observed-Value	MDC_ATTR_NU_VAL_OBS_SIMP	SimpleNuObsValue	This attribute defines the numerical observed value of the object, without any further embedded status information as found in Nu-Observed-Value. One <u>and only one</u> of Simple-Nu-Observed-Value, Basic-Nu-Observed-Value, Nu-Observed-Value, Compound-Nu-Observed-Value, Compound-Simple-Nu-Observed-Value, or Compound-Basic-Nu-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>

Table 6—Numeric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Compound-Simple-Nu-Observed-Value	MDC_ATTR_NU_CMPD_VAL_OBS_SIMP	SimpleNuObsValue Cmp	This attribute represents an array of Simple-Nu-Observed-Values. One <u>and only one</u> of Simple-Nu-Observed-Value, Basic-Nu-Observed-Value, Nu-Observed-Value, Compound-Nu-Observed-Value, Compound-Simple-Nu-Observed-Value, or Compound-Basic-Nu-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Basic-Nu-Observed-Value	MDC_ATTR_NU_VAL_OBS_BASIC	BasicNuObsValue	This attribute defines the numerical observed value of the object, without any further embedded status information, but with a smaller numerical representation compared to Simple-Nu-Observed-Value. One <u>and only one</u> of Simple-Nu-Observed-Value, Basic-Nu-Observed-Value, Nu-Observed-Value, Compound-Nu-Observed-Value, Compound-Simple-Nu-Observed-Value, or Compound-Basic-Nu-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Compound-Basic-Nu-Observed-Value	MDC_ATTR_NU_CMPD_VAL_OBS_BASIC	BasicNuObsValue Cmp	This attribute represents an array of Basic-Nu-Observed-Values. One <u>and only one</u> of Simple-Nu-Observed-Value, Basic-Nu-Observed-Value, Nu-Observed-Value, Compound-Nu-Observed-Value, Compound-Simple-Nu-Observed-Value, or Compound-Basic-Nu-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Nu-Observed-Value	MDC_ATTR_NU_VAL_OBS	NuObsValue	This attribute defines the numerical observed value of the object and combines it with measurement status and unit information. It is used when status/unit are dynamic and are always provided together with the value. One <u>and only one</u> of Simple-Nu-Observed-Value, Basic-Nu-Observed-Value, Nu-Observed-Value, Compound-Nu-Observed-Value, Compound-Simple-Nu-Observed-Value, or Compound-Basic-Nu-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>

Table 6—Numeric attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Compound-Nu-Observed-Value	MDC_ATTR_NU_CMPD_VAL_OBS	NuObsValueCmp	This attribute combines an array of value, status, and unit. This attribute is available for use only in variable format event reports. <u>One and only one</u> of Simple-Nu-Observed-Value, Basic-Nu-Observed-Value, Nu-Observed-Value, Compound-Nu-Observed-Value, Compound-Simple-Nu-Observed-Value, or Compound-Basic-Nu-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Accuracy	MDC_ATTR_NU_ACCUR_MSMT	FLOAT-Type	This attribute defines the maximum deviation of actual value from reported observed value (if it can be specified). ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Optional</u> <u>Static</u>

6.3.4.4 Numeric object methods

Change as shown:

There are currently no numeric object methods defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist. ~~None~~

6.3.4.5 Numeric object events

Change as shown:

There are currently no numeric object events defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist. ~~None~~

6.3.4.6 Other numeric services

Change as shown:

There are currently no uses of the numeric SET or GET services defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist. ~~None~~

6.3.5 RT-SA class

6.3.5.3 RT-SA class attributes

Change Table 7 as shown:

Table 7—RT-SA attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Sample-Period	MDC_ATTR_TIME_PD_SAMP	RelativeTime	This attributes defines time interval between successive samples given in 1/8 of a millisecond. Thus, 8000 = 1 s. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>
Simple-Sa-Observed-Value	MDC_ATTR_SIMP_SA_OBS_VAL	OCTET STRING	This byte array contains the samples that are reported by the agent in the format that is described by the Sa-Specification and Scale-and-Range-Specification. The length shall be even with padding bytes at the end. Sa-Specification defines the actual number of utilized bytes.	<u>Mandatory Observational</u>
Scale-and-Range-Specification	MDC_ATTR_SCALE_SPEC_N_I8 MDC_ATTR_SCALE_SPEC_N_I16 MDC_ATTR_SCALE_SPEC_N_I32	ScaleRangeSpec 8 ScaleRangeSpec 16 ScaleRangeSpec 32	This attribute defines mapping between samples and actual values as well as measurement range. The type depends on sample resolution (sample-size field within sample-type field of Sa-Specification). Exactly one of the three specifications shall be included. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>
Sa-Specification	MDC_ATTR_SA_SPECN	SaSpec	This attribute describes the sample array and sample types. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Mandatory Static</u>

6.3.5.4 RT-SA object methods

Change as shown:

There are currently no RT-SA object methods defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist. ~~None~~

6.3.5.5 RT-SA object events

Change as shown:

There are currently no RT-SA object events defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist. ~~None~~

6.3.5.6 Other RT-SA services

Change as shown:

There are currently no uses of the RT-SA SET or GET services defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist. ~~None~~

6.3.6 Enumeration class

6.3.6.3 Enumeration class attributes

Change Table 8 as shown:

Table 8—Enumeration attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Enum-Observed-Value-Simple-OID	MDC_ATTR_ENUM_OBS_VAL_SIMP_OID	OID-Type	The value is reported as a nomenclature code. If the Enum-Observed-Value-Partition attribute is valued, it defines the nomenclature partition for this attribute. Otherwise, the OID-Type is taken from the same nomenclature partition as defined in the partition field of the Type attribute. <u>One and only one</u> of Enum-Observed-Value-Simple-OID, Enum-Observed-Value-Simple-Bit-Str, Enum-Observed-Value-Basic-Bit-Str, Enum-Observed-Value-Simple-Str, or Enum-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Enum-Observed-Value-Simple-Bit-Str	MDC_ATTR_ENUM_OBS_VAL_SIMP_BIT_STR	BITS-32	The value is reported as a bit string of 32-bits. <u>One and only one</u> of Enum-Observed-Value-Simple-OID, Enum-Observed-Value-Simple-Bit-Str, Enum-Observed-Value-Basic-Bit-Str, Enum-Observed-Value-Simple-Str, or Enum-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Enum-Observed-Value-Basic-Bit-Str	MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR	BITS-16	The value is reported as a bit string of 16-bits. <u>One and only one</u> of Enum-Observed-Value-Simple-OID, Enum-Observed-Value-Simple-Bit-Str, Enum-Observed-Value-Basic-Bit-Str, Enum-Observed-Value-Simple-Str, or Enum-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Enum-Observed-Value-Simple-Str	MDC_ATTR_ENUM_OBS_VAL_SIMP_STR	EnumPrintableString	The value is reported as an ASCII printable string. <u>One and only one</u> of Enum-Observed-Value-Simple-OID, Enum-Observed-Value-Simple-Bit-Str, Enum-Observed-Value-Basic-Bit-Str, Enum-Observed-Value-Simple-Str, or Enum-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>

Table 8—Enumeration attributes

Attribute name	Attribute ID	Attribute type	Remark	Qualifiers
Enum-Observed-Value	MDC_ATTR_VAL_ENUM_OBS	EnumObsValue	This attribute defines a structured observed value that permits additional flexibility about the data type of the reported value. <u>One and only one</u> of Enum-Observed-Value-Simple-OID, Enum-Observed-Value-Simple-Bit-Str, Enum-Observed-Value-Basic-Bit-Str, Enum-Observed-Value-Simple-Str, or Enum-Observed-Value shall be present.	<u>Conditional</u> <u>Observational</u>
Enum-Observed-Value-Partition	MDC_ATTR_ENUM_OBS_VAL_PART	NomPartition	This attribute may be used to define the partition from which the Enum-Observed-Value-Simple-OID or the Enum-Observed-Value's observation OID nomenclature term was taken. If not present, the partition is the same as the nomenclature partition defined in the partition field of the Type attribute.	<u>Optional</u> <u>Dynamic</u>

6.3.6.4 Enumeration object methods

Change as shown:

There are currently no enumeration object methods defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist.~~None~~

6.3.6.5 Enumeration object events

Change as shown:

There are currently no enumeration object events defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist.~~None~~

6.3.6.6 Other enumeration services

Change as shown:

There are currently no uses of the enumeration SET or GET services defined in this standard; however, ISO/IEEE 11073-104zz device specializations or proprietary definitions may exist.~~None~~

6.3.7 PM-store class

6.3.7.1 General

Change as shown and insert a new paragraph:

An instance of the Persistent Metric store (PM-store) class provides long-term storage capabilities for metric data. Data are stored in a variable number of PM-segment objects (see 6.3.8). The stored data of the PM-store object are requested from the agent by the manager using object access services (see 7.3). Anybody not familiar with the PM-store concept may wish to read Annex C for a conceptual overview prior to reading the following subclauses.

Attribute values stored in a PM-segment may require the use of additional attributes from that object to describe the measurement; a common example being the unit of measure. If an attribute value in a PM-segment depends on another attribute value not stored in the PM-segment, then that dependent attribute shall not change value during the lifetime of the PM-segment. Otherwise, the agent shall store the dependent attribute value in the PM-segment.

6.3.7.3 PM-store class attributes

Change Table 9 as shown:

Table 9—PM-store attributes

Attribute name	Attribute ID	Attribute type	Remark	Qual-ifiers
Handle	MDC_ATTR_ID_HANDLE	HANDLE	The Handle attribute represents a reference ID for this object. Each object shall have a unique ID assigned by the agent. The handle identifies the object in event reports sent to the manager and to address the object instance in messages invoking object methods. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	Mandatory Static
PM-Store-Capab	MDC_ATTR_PM_STORE_CAPAB	PmStoreCapab	This attribute defines basic capabilities of the PM-store object instance. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	Mandatory Static
Store-Sample-Algorithm	MDC_ATTR_METRIC_STORE_SAMPLE_ALG	StoSampleAlg	This attribute describes how the sample values stored in the PM-segment have been processed. The StoSampleAlg structure describes the available sampling algorithms. If there is no specific sampling algorithm used (in other words the sample values are raw data), then this attribute shall have a value of st-alg-no-downsampling. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	Mandatory Static

Table 9—PM-store attributes

Attribute name	Attribute ID	Attribute type	Remark	Qual-ifiers
Store-Capacity-Count	MDC_ATTR_METRIC_STORE_CAPAC_CNT	INT-U32	This attribute is the maximum number of stored PM-segment entries (entries in all contained PM-segments). ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Optional Static</u>
Store-Usage-Count	MDC_ATTR_METRIC_STORE_USAGE_CNT	INT-U32	This attribute is the actual number of currently stored PM-segment entries (entries in all contained PM-segments).	<u>Optional Dynamic</u>
Operational-State	MDC_ATTR_OP_STAT	OperationalState	The attribute indicates if new entries are currently being inserted in any of the contained PM-segments. If any PM-segment contained by this PM-store is having data actively added to it, this attribute shall be set to enabled. Otherwise, it shall be set to disabled.	<u>Mandatory Dynamic</u>
PM-Store-Label	MDC_ATTR_PM_STORE_LABEL_STRING	OCTET STRING	This attribute is an application-dependent label for the PM-store in printable ASCII to indicate its intended use and may be used for display purposes. ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Optional Static</u>
Sample-Period	MDC_ATTR_TIME_PD_SAMP	RelativeTime	This attribute determines the frequency at which entries are added to the PM-segments. <u>If values are sampled periodically,</u> ~~This attribute shall be present either in the PM-store (in which case it applies to all periodically storing PM-segments in the PM-store) or alternatively in each PM-segment, if values are sampled periodically,~~ so the time difference for two entries in the Fixed-Segment-Data is constant (i.e., the pmsc-peri-seg-entries bit in the Pm-Store-Capab attribute is set). ~~This attribute shall remain unchanged after the configuration is agreed upon.~~	<u>Conditional Static</u>
Number-Of-Segments	MDC_ATTR_NUM_SEG	INT-U16	This attribute is the number of currently instantiated PM-segments contained in the PM-store. Note that the PM-segment attribute Instance-Number is NOT related to this number (i.e., does not need to be in the range from 0 to Number-Of-Segments), but shall be retrieved with the Get-Segment-Info method.	<u>Mandatory Dynamic</u>