

**DIN EN 62541-7**

ICS 35.240.50; 35.200

Einsprüche bis 2014-12-24  
Vorgesehen als Ersatz für  
DIN EN 62541-7:2013-06**Entwurf****OPC Unified Architecture –  
Teil 7: Profile  
(IEC 65E/378/CDV:2014);  
Englische Fassung FprEN 62541-7:2014**OPC Unified Architecture –  
Part 7: Profiles  
(IEC 65E/378/CDV:2014);  
English version FprEN 62541-7:2014Architecture unifiée OPC –  
Partie 7: Profils  
(CEI 65E/378/CDV:2014);  
Version anglaise FprEN 62541-7:2014**Anwendungswarnvermerk**

Dieser Norm-Entwurf mit Erscheinungsdatum 2014-10-24 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter [www.entwuerfe.din.de](http://www.entwuerfe.din.de) bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter [www.entwuerfe.normenbibliothek.de](http://www.entwuerfe.normenbibliothek.de), sofern dort wiedergegeben;
- oder als Datei per E-Mail an [dke@vde.com](mailto:dke@vde.com) möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter [www.din.de/stellungnahme](http://www.din.de/stellungnahme) oder für Stellungnahmen zu Norm-Entwürfen der DKE unter [www.dke.de/stellungnahme](http://www.dke.de/stellungnahme) abgerufen werden;
- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 101 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

## Nationales Vorwort

Die Englische Fassung des europäischen Dokuments FprEN 62541-7:2014 „OPC Unified Architecture – Teil 7: Profile“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 65E/378/CDV:2014 „OPC Unified Architecture – Part 7: Profiles“ unverändert in den Entwurf FprEN 62541-7:2014 übernommen worden.

Das internationale Dokument wurde vom SC 65E „Devices and integration in enterprise systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für dieses Dokument ist das nationale Arbeitsgremium K 931 „Systemaspekte“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE ([www.dke.de](http://www.dke.de)) zuständig.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für den vorliegenden Norm-entwurf erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 62541-7 veröffentlicht. Zu deren Abschnitt 3, Begriffe, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Es wird auf die Möglichkeit hingewiesen, dass einige Elemente dieses Dokuments Patentrechte berühren können. ISO [und/oder] IEC sind nicht dafür verantwortlich, einige oder alle diesbezüglichen Patentrechte zu identifizieren.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

## Änderungen

Gegenüber DIN EN 62541-7:2013-06 wurden folgende Änderungen vorgenommen:

- a) Eine große Anzahl zusätzlicher Facetten hinzugefügt, um OPC UA neue Anwendungsfelder zu erschließen. Die wichtigsten:
  - Facetten für Zugriff auf historische Daten;
  - Facetten für Aggregate;
  - Facetten für HTTPs;
  - neue Facetten für IT-Sicherheit;
  - neue Facette für User Token, die anonymen Zugang unterstützt;
  - Facetten, die sich in der Praxis bewährt haben,
- b) neue Festlegungen für die IT-Sicherheit bei asymmetrischen Schlüssellängen größer als 2048.

## Nationaler Anhang NA (informativ)

### 3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 62541-1, IEC 62541-2, IEC 62541-3, IEC 62541-4, IEC 62541-6, IEC 62541-8 und die folgenden Begriffe.

#### 3.1.1

##### Anwendung

(en: **Application**)

ein Stück Soft- oder Hardware, das Aspekte von OPC UA umsetzt oder bearbeitet

ANMERKUNG 1 zum Begriff: Die Anwendung kann auf jeder Maschine laufen und jegliche Funktionalität ausführen. Die Anwendung kann eine Software- oder eine Hardware-Anwendung sein, die einzige Anforderung ist, dass sie OPC UA umsetzt.

#### 3.1.2

##### Konformitätseinheit

(en: **ConformanceUnit**)

definierte Menge von Eigenschaften, die als Einheit getestet werden können

ANMERKUNG 1 zum Begriff: Eine Konformitätseinheit kann eine Gruppe von Diensten, Teile von Diensten oder Informationsmodelle abdecken. Weitere Details werden in 4.2 beschrieben.

#### 3.1.3

##### Konformitätsgruppe

(en: **ConformanceGroup**)

Gruppierung von Konformitätseinheiten mit eigenständigen Namen

ANMERKUNG 1 zum Begriff: Die Gruppierung dient lediglich der Organisation von Konformitätseinheiten. Typische Konformitätsgruppen beinhalten Gruppen für jeden Satz an Diensten in OPC UA und jede der Informationsmodell-Spezifikationen.

#### 3.1.4

##### Facette

(en: **Facet**)

Profil, das eine Teilmenge der Konformitätseinheiten darstellt, die ein Server oder Client benötigen kann

ANMERKUNG 1 zum Begriff: Facetten werden typischerweise zusammengefasst, um ein vollständiges Profil zu bilden. Der Begriff Facette im Titel eines Profils zeigt an, dass das Profil nicht alleine eingesetzt werden kann.

### 3.1.5

#### **Vollausgestattetes Profil**

(en: **FullFeatured Profile**)

ein *Profil*, das alles festlegt, was zum Aufbau einer OPC UA-Anwendung notwendig ist

ANMERKUNG 1 zum Begriff: Im Besonderen enthält ein *voll ausgestattetes Profil* Festlegungen aus der Transportschicht und zur IT-Sicherheit.

### 3.1.6

#### **Profilkategorie**

(en: **ProfileCategory**)

eine Gruppierung von Profilen in wichtige funktionale Gruppen wie Server und Client

ANMERKUNG 1 zum Begriff: Diese Kategorien helfen Entwicklern und Benutzern, den Typ der Anwendung herauszufinden, in dem ein Profil verwendet werden kann. Weitere Details werden in 4.4 beschrieben.

### 3.1.7

#### **Testfall**

(en: **TestCase**)

technische Beschreibung einer Menge von Schritten, die erforderlich sind, eine bestimmte Funktion oder ein bestimmtes Informationsmodell zu testen

ANMERKUNG 1 zum Begriff: Testfälle bieten ausreichende Details für einen Entwickler, diese Testfälle zu implementieren. Ein Testfall bietet auch eine genaue Zusammenfassung der erwarteten Ergebnisse bei der Ausführung der Implementierung und alle Vorbedingungen, die erfüllt werden müssen, bevor der Testfall ausgeführt werden kann.

### 3.1.8

#### **Testlabor**

(en: **TestLab**)

Ort, der dafür ausgestattet ist, Testdienste anzubieten

ANMERKUNG 1 zum Begriff: Diese Dienste beinhalten Personal, das direkt testet, automatisierte Tests und einen formal wiederholbaren Prozess, sind aber nicht darauf beschränkt. Die OPC-Foundation stellt detaillierte Spezifikationen bereit, die OPC UA-Testlabore beschreiben sowie die Tests definieren, die diese durchführen müssen (siehe *auch Compliance Part 8 UA Server, Compliance Part 9 UA Client*).

CONTENTS

Page

|    |        |                                                      |    |
|----|--------|------------------------------------------------------|----|
| 1  |        |                                                      |    |
| 2  |        |                                                      |    |
| 3  |        |                                                      |    |
| 4  |        |                                                      |    |
| 5  | 1      | Scope .....                                          | 1  |
| 6  | 2      | Reference documents .....                            | 1  |
| 7  | 3      | Terms, definitions, and conventions .....            | 1  |
| 8  | 3.1    | Terms and definitions .....                          | 1  |
| 9  | 3.2    | Abbreviations .....                                  | 2  |
| 10 | 4      | Overview .....                                       | 4  |
| 11 | 4.1    | General .....                                        | 4  |
| 12 | 4.2    | ConformanceUnit .....                                | 4  |
| 13 | 4.3    | Profiles .....                                       | 5  |
| 14 | 4.4    | Profile Categories .....                             | 5  |
| 15 | 5      | ConformanceUnits .....                               | 5  |
| 16 | 5.1    | Overview .....                                       | 5  |
| 17 | 5.2    | Services .....                                       | 6  |
| 18 | 5.3    | Transport and Communication Related Features .....   | 14 |
| 19 | 5.4    | Information Model and Address Related Features ..... | 21 |
| 20 | 5.5    | Miscellaneous .....                                  | 36 |
| 21 | 6      | Profiles .....                                       | 38 |
| 22 | 6.1    | Overview .....                                       | 38 |
| 23 | 6.2    | Profile List .....                                   | 38 |
| 24 | 6.3    | Conventions for Profile definitions .....            | 43 |
| 25 | 6.4    | Applications .....                                   | 43 |
| 26 | 6.5    | Profile Tables .....                                 | 45 |
| 27 | 6.5.1  | Introduction .....                                   | 45 |
| 28 | 6.5.2  | Core Server Facet .....                              | 45 |
| 29 | 6.5.3  | Base Server Behaviour Facet .....                    | 45 |
| 30 | 6.5.4  | Attribute WriteMask Server Facet .....               | 46 |
| 31 | 6.5.5  | File Access Server Facet .....                       | 46 |
| 32 | 6.5.6  | Documentation Server Facet .....                     | 46 |
| 33 | 6.5.7  | Embedded DataChange Subscription Server Facet .....  | 46 |
| 34 | 6.5.8  | Standard DataChange Subscription Server Facet .....  | 47 |
| 35 | 6.5.9  | Enhanced DataChange Subscription Server Facet .....  | 47 |
| 36 | 6.5.10 | Data Access Server Facet .....                       | 47 |
| 37 | 6.5.11 | ComplexType Server Facet .....                       | 48 |
| 38 | 6.5.12 | Standard Event Subscription Server Facet .....       | 48 |
| 39 | 6.5.13 | Address Space Notifier Server Facet .....            | 49 |
| 40 | 6.5.14 | A & C Base Condition Server Facet .....              | 49 |
| 41 | 6.5.15 | A & C Address Space Instance Server Facet .....      | 49 |
| 42 | 6.5.16 | A & C Enable Server Facet .....                      | 49 |
| 43 | 6.5.17 | A & C Alarm Server Facet .....                       | 50 |
| 44 | 6.5.18 | A & C Acknowledgeable Alarm Server Facet .....       | 50 |
| 45 | 6.5.19 | A & C Exclusive Alarming Server Facet .....          | 50 |
| 46 | 6.5.20 | A & C Non-Exclusive Alarming Server Facet .....      | 50 |
| 47 | 6.5.21 | A & C Previous Instances Server Facet .....          | 51 |
| 48 | 6.5.22 | A & C Dialog Server Facet .....                      | 51 |

|    |        |                                                      |    |
|----|--------|------------------------------------------------------|----|
| 49 | 6.5.23 | A & E Wrapper Facet .....                            | 51 |
| 50 | 6.5.24 | Method Server Facet.....                             | 52 |
| 51 | 6.5.25 | Auditing Server Facet .....                          | 52 |
| 52 | 6.5.26 | Node Management Server Facet.....                    | 52 |
| 53 | 6.5.27 | Client Redundancy Server Facet.....                  | 53 |
| 54 | 6.5.28 | Redundancy Transparent Server Facet.....             | 53 |
| 55 | 6.5.29 | Redundancy Visible Server Facet .....                | 53 |
| 56 | 6.5.30 | Historical Raw Data Server Facet.....                | 53 |
| 57 | 6.5.31 | Historical Aggregate Server Facet.....               | 54 |
| 58 | 6.5.32 | Historical Access Structured Data Server Facet ..... | 55 |
| 59 | 6.5.33 | Historical Data AtTime Server Facet .....            | 55 |
| 60 | 6.5.34 | Historical Access Modified Data Server Facet .....   | 55 |
| 61 | 6.5.35 | Historical Annotation Server Facet .....             | 55 |
| 62 | 6.5.36 | Historical Data Update Server Facet .....            | 55 |
| 63 | 6.5.37 | Historical Data Replace Server Facet.....            | 56 |
| 64 | 6.5.38 | Historical Data Insert Server Facet.....             | 56 |
| 65 | 6.5.39 | Historical Data Delete Server Facet .....            | 56 |
| 66 | 6.5.40 | Base Historical Event Server Facet.....              | 56 |
| 67 | 6.5.41 | Historical Event Update Server Facet.....            | 56 |
| 68 | 6.5.42 | Historical Event Replace Server Facet .....          | 57 |
| 69 | 6.5.43 | Historical Event Insert Server Facet .....           | 57 |
| 70 | 6.5.44 | Historical Event Delete Server Facet.....            | 57 |
| 71 | 6.5.45 | Aggregate Subscription Server Facet.....             | 57 |
| 72 | 6.5.46 | Nano Embedded Device Server Profile .....            | 58 |
| 73 | 6.5.47 | Micro Embedded Device Server Profile .....           | 58 |
| 74 | 6.5.48 | Embedded UA Server Profile .....                     | 58 |
| 75 | 6.5.49 | Standard UA Server Profile .....                     | 59 |
| 76 | 6.5.50 | Core Client Facet.....                               | 59 |
| 77 | 6.5.51 | Base Client Behaviour Facet.....                     | 60 |
| 78 | 6.5.52 | Discovery Client Facet .....                         | 60 |
| 79 | 6.5.53 | AddressSpace Lookup Client Facet.....                | 60 |
| 80 | 6.5.54 | Entry-Level Support Client Facet.....                | 61 |
| 81 | 6.5.55 | Multi-Server Client Connection Facet .....           | 61 |
| 82 | 6.5.56 | File Access Client Facet.....                        | 61 |
| 83 | 6.5.57 | Documentation - Client.....                          | 61 |
| 84 | 6.5.58 | Attribute Read Client Facet .....                    | 61 |
| 85 | 6.5.59 | Attribute Write Client Facet .....                   | 62 |
| 86 | 6.5.60 | DataChange Subscriber Client Facet .....             | 62 |
| 87 | 6.5.61 | DataAccess Client Facet.....                         | 62 |
| 88 | 6.5.62 | Event Subscriber Client Facet.....                   | 62 |
| 89 | 6.5.63 | Notifier and Source Hierarchy Client Facet.....      | 63 |
| 90 | 6.5.64 | A & C Base ConditionClient Facet.....                | 63 |
| 91 | 6.5.65 | A & C Address Space Instance Client Facet.....       | 63 |
| 92 | 6.5.66 | A & C Enable Client Facet.....                       | 64 |
| 93 | 6.5.67 | A & C Alarm Client Facet .....                       | 64 |
| 94 | 6.5.68 | A & C Exclusive Alarming Client Facet.....           | 64 |
| 95 | 6.5.69 | A & C Non-Exclusive Alarming Client Facet .....      | 64 |
| 96 | 6.5.70 | A & C Previous Instances Client Facet.....           | 65 |

|     |         |                                                        |    |
|-----|---------|--------------------------------------------------------|----|
| 97  | 6.5.71  | A & C Dialog Client Facet .....                        | 65 |
| 98  | 6.5.72  | A & E Proxy Facet.....                                 | 65 |
| 99  | 6.5.73  | Method Client Facet .....                              | 66 |
| 100 | 6.5.74  | Auditing Client Facet.....                             | 66 |
| 101 | 6.5.75  | Node Management Client Facet .....                     | 66 |
| 102 | 6.5.76  | Advanced Type Programming Client Facet.....            | 66 |
| 103 | 6.5.77  | Diagnostic Client Facet .....                          | 67 |
| 104 | 6.5.78  | Redundant Client Facet .....                           | 67 |
| 105 | 6.5.79  | Redundancy Switch Client Facet.....                    | 67 |
| 106 | 6.5.80  | Historical Access Client Facet.....                    | 67 |
| 107 | 6.5.81  | Historical Annotation Client Facet .....               | 68 |
| 108 | 6.5.82  | Historical Data AtTime Client Facet.....               | 68 |
| 109 | 6.5.83  | Historical Aggregate Client Facet .....                | 68 |
| 110 | 6.5.84  | Historical Data Update Client Facet .....              | 69 |
| 111 | 6.5.85  | Historical Data Replace Client Facet.....              | 69 |
| 112 | 6.5.86  | Historical Data Insert Client Facet.....               | 69 |
| 113 | 6.5.87  | Historical Data Delete Client Facet.....               | 69 |
| 114 | 6.5.88  | Historical Access Client Server Timestamp Facet .....  | 70 |
| 115 | 6.5.89  | Historical Access Modified Data Client Facet .....     | 70 |
| 116 | 6.5.90  | Historical Structured Data AtTime Client Facet.....    | 70 |
| 117 | 6.5.91  | Historical Structured Data Access Client Facet .....   | 70 |
| 118 | 6.5.92  | Historical Structured Data Modified Client Facet ..... | 70 |
| 119 | 6.5.93  | Historical Structured Data Delete Client Facet .....   | 71 |
| 120 | 6.5.94  | Historical Structured Data Update Client Facet .....   | 71 |
| 121 | 6.5.95  | Historical Structured Data Replace Client Facet.....   | 71 |
| 122 | 6.5.96  | Historical Structured Data Insert Client Facet.....    | 71 |
| 123 | 6.5.97  | Historical Events Client Facet .....                   | 71 |
| 124 | 6.5.98  | Historical Event Update Client Facet.....              | 72 |
| 125 | 6.5.99  | Historical Event Replace Client Facet .....            | 72 |
| 126 | 6.5.100 | Historical Event Delete Client Facet .....             | 72 |
| 127 | 6.5.101 | Historical Event Insert Client Facet .....             | 72 |
| 128 | 6.5.102 | Aggregate Subscriber Client Facet.....                 | 72 |
| 129 | 6.5.103 | User Token - Anonymous Facet .....                     | 73 |
| 130 | 6.5.104 | User Token - User Name Password Server Facet .....     | 74 |
| 131 | 6.5.105 | User Token - X509 Certificate Server Facet .....       | 74 |
| 132 | 6.5.106 | User Token - Issued Token Server Facet .....           | 74 |
| 133 | 6.5.107 | User Token - Issued Token Windows Server Facet .....   | 74 |
| 134 | 6.5.108 | User Token - User Name Password Client Facet.....      | 74 |
| 135 | 6.5.109 | User Token - X509 Certificate Client Facet .....       | 74 |
| 136 | 6.5.110 | User Token - Issued Token Client Facet .....           | 75 |
| 137 | 6.5.111 | User Token - Issued Token Windows Client Facet.....    | 75 |
| 138 | 6.5.112 | UA-TCP UA-SC UA Binary .....                           | 75 |
| 139 | 6.5.113 | SOAP-HTTP WS-SC UA XML .....                           | 75 |
| 140 | 6.5.114 | SOAP-HTTP WS-SC UA Binary.....                         | 75 |
| 141 | 6.5.115 | SOAP-HTTP WS-SC UA XML-UA Binary.....                  | 76 |
| 142 | 6.5.116 | HTTPS UA Binary .....                                  | 76 |
| 143 | 6.5.117 | HTTPS UA XML .....                                     | 76 |
| 144 | 6.5.118 | Security User Access Control Full .....                | 76 |

|     |                                                       |                                               |    |
|-----|-------------------------------------------------------|-----------------------------------------------|----|
| 145 | 6.5.119                                               | Security User Access Control Base .....       | 76 |
| 146 | 6.5.120                                               | Security Time Synchronization .....           | 77 |
| 147 | 6.5.121                                               | Best Practice - Audit Events .....            | 77 |
| 148 | 6.5.122                                               | Best Practice - Alarm Handling .....          | 77 |
| 149 | 6.5.123                                               | Best Practice - Random Numbers .....          | 77 |
| 150 | 6.5.124                                               | Best Practice - Timeouts .....                | 77 |
| 151 | 6.5.125                                               | Best Practice - Administrative Access .....   | 78 |
| 152 | 6.5.126                                               | Best Practice - Strict Message Handling ..... | 78 |
| 153 | 6.5.127                                               | Best Practice - Audit Events Client .....     | 78 |
| 154 | 6.5.128                                               | SecurityPolicy - None .....                   | 78 |
| 155 | 6.5.129                                               | SecurityPolicy - Basic128Rsa15 .....          | 78 |
| 156 | 6.5.130                                               | SecurityPolicy - Basic256 .....               | 79 |
| 157 | 6.5.131                                               | SecurityPolicy - Basic256Sha256 .....         | 79 |
| 158 | 6.5.132                                               | TransportSecurity - TLS 1.0 .....             | 79 |
| 159 | 6.5.133                                               | TransportSecurity- TLS 1.1 .....              | 80 |
| 160 | 6.5.134                                               | TransportSecurity- TLS 1.2 .....              | 80 |
| 161 | Annex A (informative): Revision 1.02 Highlights ..... |                                               | 82 |
| 162 |                                                       |                                               |    |
| 163 |                                                       |                                               |    |

164  
165  
166  
167  
168  
169  
170  
171  
172

FIGURES

Figure 1 - Profile - ConformanceUnit - TestCases ..... 4

Figure 2 - HMI Client Sample ..... 43

Figure 3 - Embedded Server Sample ..... 44

Figure 4 - Standard UA Server Sample..... 44

|     |                                                                |    |
|-----|----------------------------------------------------------------|----|
| 173 | <b>TABLES</b>                                                  |    |
| 174 | Table 1 – Profile Categories .....                             | 5  |
| 175 | Table 2 - Conformance Groups.....                              | 5  |
| 176 | Table 3 - Discovery Services .....                             | 7  |
| 177 | Table 4 – Session Services .....                               | 7  |
| 178 | Table 5 – Node Management Services .....                       | 9  |
| 179 | Table 6 – View Services .....                                  | 9  |
| 180 | Table 7 – Attribute Services .....                             | 10 |
| 181 | Table 8 – Method Services .....                                | 11 |
| 182 | Table 9 – Monitored Item Services .....                        | 12 |
| 183 | Table 10 – Subscription Services .....                         | 13 |
| 184 | Table 11 – Security .....                                      | 15 |
| 185 | Table 12 – Protocol and Encoding .....                         | 21 |
| 186 | Table 13 – Base Information.....                               | 21 |
| 187 | Table 14 – Address Space Model .....                           | 23 |
| 188 | Table 15 – Data Access .....                                   | 25 |
| 189 | Table 16 – Alarms and Conditions .....                         | 25 |
| 190 | Table 17 – Historical Access .....                             | 27 |
| 191 | Table 18 – Aggregates .....                                    | 30 |
| 192 | Table 19 – Auditing .....                                      | 36 |
| 193 | Table 20 – Redundancy.....                                     | 36 |
| 194 | Table 21 - Miscellaneous.....                                  | 37 |
| 195 | Table 22 – Profile List .....                                  | 38 |
| 196 | Table 23 – Core Server Facet .....                             | 45 |
| 197 | Table 24 – Base Server Behaviour Facet.....                    | 46 |
| 198 | Table 25 – Attribute WriteMask Server Facet.....               | 46 |
| 199 | Table 26 –File Access Server Facet .....                       | 46 |
| 200 | Table 27 – Documentation Server Facet.....                     | 46 |
| 201 | Table 28 – Embedded DataChange Subscription Server Facet.....  | 47 |
| 202 | Table 29 – Standard DataChange Subscription Server Facet ..... | 47 |
| 203 | Table 30 – Enhanced DataChange Subscription Server Facet.....  | 47 |
| 204 | Table 31 – Data Access Server Facet.....                       | 48 |
| 205 | Table 32 – ComplexType Server Facet.....                       | 48 |
| 206 | Table 33 – Standard Event Subscription Server Facet.....       | 48 |
| 207 | Table 34 – Address Space Notifier Server Facet .....           | 49 |
| 208 | Table 35 – A & C Base Condition Server Facet .....             | 49 |
| 209 | Table 36 – A & C Address Space Instance Server Facet .....     | 49 |
| 210 | Table 37 – A & C Enable Server Facet .....                     | 49 |
| 211 | Table 38 – A & C Alarm Server Facet.....                       | 50 |
| 212 | Table 39 – A & C Acknowledgeable Alarm Server Facet.....       | 50 |
| 213 | Table 40 – A & C Exclusive Alarming Server Facet.....          | 50 |
| 214 | Table 41 – A & C Non-Exclusive Alarming Server Facet .....     | 51 |
| 215 | Table 42 – A & C Previous Instances Server Facet.....          | 51 |

|     |                                                                |    |
|-----|----------------------------------------------------------------|----|
| 216 | Table 43 – A & C Dialog Server Facet .....                     | 51 |
| 217 | Table 44 – A & E Wrapper Facet .....                           | 52 |
| 218 | Table 45 – Method Server Facet .....                           | 52 |
| 219 | Table 46 – Auditing Server Facet .....                         | 52 |
| 220 | Table 47 – Node Management Server Facet.....                   | 53 |
| 221 | Table 48 – Client Redundancy Server Facet.....                 | 53 |
| 222 | Table 49 – Redundancy Transparent Server Facet .....           | 53 |
| 223 | Table 50 – Redundancy Visible Server Facet .....               | 53 |
| 224 | Table 51 – Historical Raw Data Server Facet .....              | 53 |
| 225 | Table 52 – Historical Aggregate Server Facet.....              | 54 |
| 226 | Table 53 – Historical Access Structured Data Server Facet..... | 55 |
| 227 | Table 54 – Historical Data AtTime Server Facet .....           | 55 |
| 228 | Table 55 – Historical Access Modified Data Server Facet.....   | 55 |
| 229 | Table 56 – Historical Annotation Server Facet.....             | 55 |
| 230 | Table 57 – Historical Data Update Server Facet .....           | 55 |
| 231 | Table 57 – Historical Data Replace Server Facet .....          | 56 |
| 232 | Table 58 – Historical Data Insert Server Facet .....           | 56 |
| 233 | Table 59 – Historical Data Delete Server Facet .....           | 56 |
| 234 | Table 60 – Base Historical Event Server Facet.....             | 56 |
| 235 | Table 61 – Historical Event Update Server Facet .....          | 56 |
| 236 | Table 61 – Historical Event Replace Server Facet.....          | 57 |
| 237 | Table 62 – Historical Event Insert Server Facet.....           | 57 |
| 238 | Table 63 – Historical Event Delete Server Facet.....           | 57 |
| 239 | Table 64 – Aggregate Subscription Server Facet.....            | 57 |
| 240 | Table 65 – Nano Embedded Device Server Profile .....           | 58 |
| 241 | Table 66 – Micro Embedded Device Server Profile .....          | 58 |
| 242 | Table 67 – Embedded UA Server Profile .....                    | 59 |
| 243 | Table 68 – Standard UA Server Profile .....                    | 59 |
| 244 | Table 69 – Core Client Facet.....                              | 59 |
| 245 | Table 70 – Base Client Behaviour Facet.....                    | 60 |
| 246 | Table 71 – Discovery Client Facet .....                        | 60 |
| 247 | Table 72 – AddressSpace Lookup Client Facet .....              | 60 |
| 248 | Table 73 – Entry-Level SupportClient Facet .....               | 61 |
| 249 | Table 74 – Multi-Server Client Connection Facet.....           | 61 |
| 250 | Table 75 –File Access Client Facet .....                       | 61 |
| 251 | Table 76 – Documentation - Client .....                        | 61 |
| 252 | Table 77 – Attribute Read Client Facet .....                   | 61 |
| 253 | Table 78 – Attribute Write Client Facet .....                  | 62 |
| 254 | Table 79 – DataChange Subscriber Client Facet .....            | 62 |
| 255 | Table 80 – DataAccess Client Facet.....                        | 62 |
| 256 | Table 81 – Event Subscriber Client Facet.....                  | 63 |
| 257 | Table 82 – Notifier and Source Hierarchy Client Facet .....    | 63 |
| 258 | Table 83 – A & C Base Condition Client Facet.....              | 63 |

|     |                                                                    |    |
|-----|--------------------------------------------------------------------|----|
| 259 | Table 84 – A & C Address Space Instance Client Facet.....          | 63 |
| 260 | Table 85 – A & C Enable Client Facet .....                         | 64 |
| 261 | Table 86 – A & C Alarm Client Facet .....                          | 64 |
| 262 | Table 87 – A & C Exclusive Alarming Client Facet.....              | 64 |
| 263 | Table 88 – A & C Non-Exclusive Alarming Client Facet .....         | 64 |
| 264 | Table 89 – A & C Previous Instances Client Facet.....              | 65 |
| 265 | Table 90 – A & C Dialog Client Facet .....                         | 65 |
| 266 | Table 91 – A & E Proxy Facet .....                                 | 65 |
| 267 | Table 92 – Method Client Facet.....                                | 66 |
| 268 | Table 93 – Auditing Client Facet.....                              | 66 |
| 269 | Table 94 – Node Management Client Facet .....                      | 66 |
| 270 | Table 95 – Advanced Type Programming Client Facet.....             | 67 |
| 271 | Table 96 – Diagnostic Client Facet .....                           | 67 |
| 272 | Table 97 – Redundant Client Facet .....                            | 67 |
| 273 | Table 98 – Redundancy Switch Client Facet.....                     | 67 |
| 274 | Table 99 – Historical Access Client Facet.....                     | 67 |
| 275 | Table 100 – Historical Annotation Client Facet .....               | 68 |
| 276 | Table 101 – Historical Data AtTime Client Facet.....               | 68 |
| 277 | Table 102 – Historical Aggregate Client Facet.....                 | 68 |
| 278 | Table 103 – Historical Data Update Client Facet .....              | 69 |
| 279 | Table 103 – Historical Data Replace Client Facet.....              | 69 |
| 280 | Table 104 – Historical Data Insert Client Facet.....               | 69 |
| 281 | Table 105 – Historical Data Delete Client Facet .....              | 69 |
| 282 | Table 106 – Historical Access Client Server Timestamp Facet .....  | 70 |
| 283 | Table 107 – Historical Access Modified Data Client Facet .....     | 70 |
| 284 | Table 108 – Historical Structured Data AtTime Client Facet .....   | 70 |
| 285 | Table 109 – Historical Structured Data Access Client Facet .....   | 70 |
| 286 | Table 110 – Historical Structured Data Modified Client Facet ..... | 70 |
| 287 | Table 111 – Historical Structured Data Delete Client Facet .....   | 71 |
| 288 | Table 112 – Historical Structured Data Update Client Facet .....   | 71 |
| 289 | Table 112 – Historical Structured Data Replace Client Facet.....   | 71 |
| 290 | Table 113 – Historical Structured Data Insert Client Facet.....    | 71 |
| 291 | Table 114 – Historical Events Client Facet .....                   | 71 |
| 292 | Table 115 – Historical Event Update Client Facet.....              | 72 |
| 293 | Table 115 – Historical Event Replace Client Facet .....            | 72 |
| 294 | Table 116 – Historical Event Delete Client Facet.....              | 72 |
| 295 | Table 117 – Historical Event Insert Client Facet .....             | 72 |
| 296 | Table 118 – Aggregate Subscriber Client Facet.....                 | 72 |
| 297 | Table 119 – User Token - Anonymous Facet .....                     | 73 |
| 298 | Table 120 – User Token - User Name Password Server Facet .....     | 74 |
| 299 | Table 121 – User Token - X509 Certificate Server Facet .....       | 74 |
| 300 | Table 122 – User Token - Issued Token Server Facet .....           | 74 |
| 301 | Table 123 – User Token - Issued Token Windows Server Facet .....   | 74 |

|     |                                                                  |    |
|-----|------------------------------------------------------------------|----|
| 302 | Table 124 – User Token - User Name Password Client Facet.....    | 74 |
| 303 | Table 125 – User Token - X509 Certificate Client Facet .....     | 74 |
| 304 | Table 126 – User Token - Issued Token Client Facet .....         | 75 |
| 305 | Table 127 – User Token - Issued Token Windows Client Facet ..... | 75 |
| 306 | Table 128 – UA-TCP UA-SC UA Binary .....                         | 75 |
| 307 | Table 129 – SOAP-HTTP WS-SC UA XML .....                         | 75 |
| 308 | Table 130 – SOAP-HTTP WS-SC UA Binary .....                      | 75 |
| 309 | Table 131 – SOAP-HTTP WS-SC UA XML-UA Binary.....                | 76 |
| 310 | Table 132 – HTTPS UA Binary .....                                | 76 |
| 311 | Table 133 – HTTPS UA XML .....                                   | 76 |
| 312 | Table 134 – Security User Access Control Full .....              | 76 |
| 313 | Table 135 – Security User Access Control Base .....              | 77 |
| 314 | Table 136 – Security Time Synchronization .....                  | 77 |
| 315 | Table 137 – Best Practice - Audit Events.....                    | 77 |
| 316 | Table 138 – Best Practice - Alarm Handling .....                 | 77 |
| 317 | Table 139 – Best Practice - Random Numbers .....                 | 77 |
| 318 | Table 140 – Best Practice - Timeouts .....                       | 78 |
| 319 | Table 141 – Best Practice - Administrative Access .....          | 78 |
| 320 | Table 142 – Best Practice - Strict Message Handling .....        | 78 |
| 321 | Table 143 – Best Practice - Audit Events Client.....             | 78 |
| 322 | Table 144 – SecurityPolicy - None.....                           | 78 |
| 323 | Table 145 – SecurityPolicy - Basic128Rsa15.....                  | 79 |
| 324 | Table 146 – SecurityPolicy - Basic256.....                       | 79 |
| 325 | Table 147 – SecurityPolicy - Basic256Sha256.....                 | 79 |
| 326 | Table 148 – TransportSecurity- TLS 1.0 .....                     | 80 |
| 327 | Table 149 – TransportSecurity- TLS 1.1 .....                     | 80 |
| 328 | Table 150 – TransportSecurity- TLS 1.2 .....                     | 80 |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## OPC Unified Architecture –

## Part 7: Profiles

## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62541-7 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this standard is based on the following documents:

|             |                  |
|-------------|------------------|
| FDIS        | Report on voting |
| 65E/XX/FDIS | 65E/XX/RVD       |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62541 series, published under the general title *OPC Unified Architecture*, can be found on the IEC website.

378 The committee has decided that the contents of this publication will remain unchanged until the  
379 stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the  
380 specific publication. At this date, the publication will be

- 381 • reconfirmed,  
382 • withdrawn,  
383 • replaced by a revised edition, or  
384 • amended.

385

386 The National Committees are requested to note that for this publication the stability date is 2017.

387 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT  
388 THE PUBLICATION STAGE.

389

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

390

## OPC Unified Architecture Specification

### Part 7: Profiles

#### 1 Scope

This document describes the OPC Unified Architecture (OPC UA) *Profiles*. The *Profiles* in this document are used to segregate features with regard to testing of OPC UA Products and the nature of the testing (tool based or lab based). This includes the testing performed by the OPC Foundation provided OPC UA CTT (a self-test tool) and by the OPC Foundation provided Independent Certification Test Labs. This could equally as well refer to test tools provided by another organization or a test lab provided by another organization. What is important is the concept of automated tool based testing versus lab based testing. The scope of this standard includes defining functionality that can only be tested in an a lab and defining the grouping of functionality that is to be used when testing OPC UA products either in a lab or using automated tools. The definition of actual *TestCases* is not within the scope of this document, but the general categories of *TestCases* are within the scope of this document.

Most OPC UA applications will conform to several, but not all of the *Profiles*.

#### 2 Reference documents

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- IEC/TR 62541-1, *OPC Unified Architecture* – Part 1: Concepts
- IEC/TR 62541-2, *OPC Unified Architecture* – Part 2: Security Model
- IEC 62541-3, *OPC Unified Architecture* – Part 3: Address Space Model
- IEC 62541-4, *OPC Unified Architecture* – Part 4: Services
- IEC 62541-5, *OPC Unified Architecture* – Part 5: Information Model
- IEC 62541-6, *OPC Unified Architecture* – Part 6: Mappings
- IEC 62541-8, *OPC Unified Architecture* – Part 8: Data Access
- IEC 62541-9, *OPC Unified Architecture* – Part 9: Alarms & Conditions
- IEC 62541-10, *OPC Unified Architecture* – Part 10: Programs
- IEC 62541-11, *OPC Unified Architecture* – Part 11: Historical Access
- IEC 62541-12, *OPC Unified Architecture* – Part 12: Discovery
- IEC 62541-13, *OPC Unified Architecture* – Part 13: Aggregates

#### 3 Terms, definitions, and conventions

##### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC/TR 62541-1, IEC/TR 62541-2, IEC 62541-3, IEC 62541-4, IEC 62541-6, and IEC 62541-8 as well as the following apply. An overview of the terms defined in this standard and their interaction can be viewed in Figure 1.

431 **3.1.1**  
432 **Application**

433 a software program that executes or implements some aspect of OPC UA.

434 Note: The application could run on any machine and perform any function. The application could be software or it could  
435 be a hardware application, the only requirement is that it implements OPC UA

436 **3.1.2**  
437 **ConformanceUnit**

438 a specific set of OPC UA features that can be tested as a single entity.

439 Note: A *ConformanceUnit* can cover a group of services, portions of services or information models. For additional  
440 detail see clause 5.

441 **3.1.3**  
442 **ConformanceGroup**

443 a group of *ConformanceUnits* that is given a name.

444 Note: This grouping is only to assist in organizing *ConformanceUnits*. Typical *ConformanceGroups* include groups for  
445 each of the service sets in OPC UA and each of the Information Model standards.

446 **3.1.4**  
447 **Facet**

448 a *Profile* dedicated to a specific feature that a *Server* or *Client* may require.

449 Note: *Facets* are typically combined to form higher-level *Profiles*. The use of the term *Facet* in the title of a *Profile*  
450 indicates that the given *Profile* is not a standalone *Profile*.

451 **3.1.5**  
452 **FullFeatured Profile**

453 a *Profile* that defines all features necessary to build a functional OPC UA *Application*.

454 Note: A *FullFeatured Profile* in particular adds definitions of the transport and security requirements.

455 **3.1.6**  
456 **ProfileCategory**

457 arranges *Profiles* into application classes, such as *Server* or *Client*.

458 Note: These categories help determine the type of *Application* that a given *Profile* would be used for. For additional  
459 details see section 4.4

460 **3.1.7**  
461 **TestCase**

462 a technical description of a set of steps required to test a particular function or information model.

463 Note: *TestCases* provide sufficient details to allow a developer to implement them in code. *TestCases* also provide a  
464 detailed summary of the expected result(s) from the execution of the implemented code and any precondition(s) that must  
465 be established before the *TestCase* can be executed.

466 **3.1.8**  
467 **TestLab**

468 a facility that is designated to provide testing services.

469 Note: These services include but are not limited to personal that directly perform testing, automated testing and a  
470 formal repeatable process. The OPC Foundation has provided detailed standard describing OPC UA TestLabs and the  
471 testing they are to provide (see Compliance Part 8 UA *Server*, Compliance Part 9 UA *Client*.)

472

473 **3.2 Abbreviations**

474 API Application Programming Interface  
475 DA Data Access

|     |      |                                               |
|-----|------|-----------------------------------------------|
| 476 | HA   | Historical Access                             |
| 477 | HMI  | Human Machine Interface                       |
| 478 | NIST | National Institute of Standard and Technology |
| 479 | PKI  | Public Key Infrastructure                     |
| 480 | RSA  | Rivest-Shamir-Adleman                         |
| 481 | UA   | Unified Architecture                          |
| 482 |      |                                               |

## 4 Overview

### 4.1 General

The OPC Unified Architecture multipart standard describes a number of *Services* and a variety of information models. These *Services* and information models can be referred to as features of a *Server* or *Client*. *Servers* and *Clients* need to be able to describe which features they support and wish to have certified. This document provides a grouping of these features. The individual features are grouped into *ConformanceUnits* which are further grouped into *Profiles*. Figure 1 provides an overview of the interactions between *Profiles*, *ConformanceUnits* and *TestCases*. The large arrows indicate the components that are used to construct the parent. For example a *Profile* is constructed from *Profiles* and *ConformanceUnits*. The figure also illustrates a feature of the OPC UA compliance test tool, in that it will test if a requested *Profile* passes all *ConformanceUnits*. It will also test all other *ConformanceUnits* and report any other *Profiles* that pass conformance testing. The individual *TestCases* are defined in separate documents see Compliance Part 8 UA Server and Compliance Part 9 UA Client. The *TestCases* are related back to the appropriate *ConformanceUnits* defined in this standard. This relationship is also displayed by the OPC UA Compliance Test Tool.

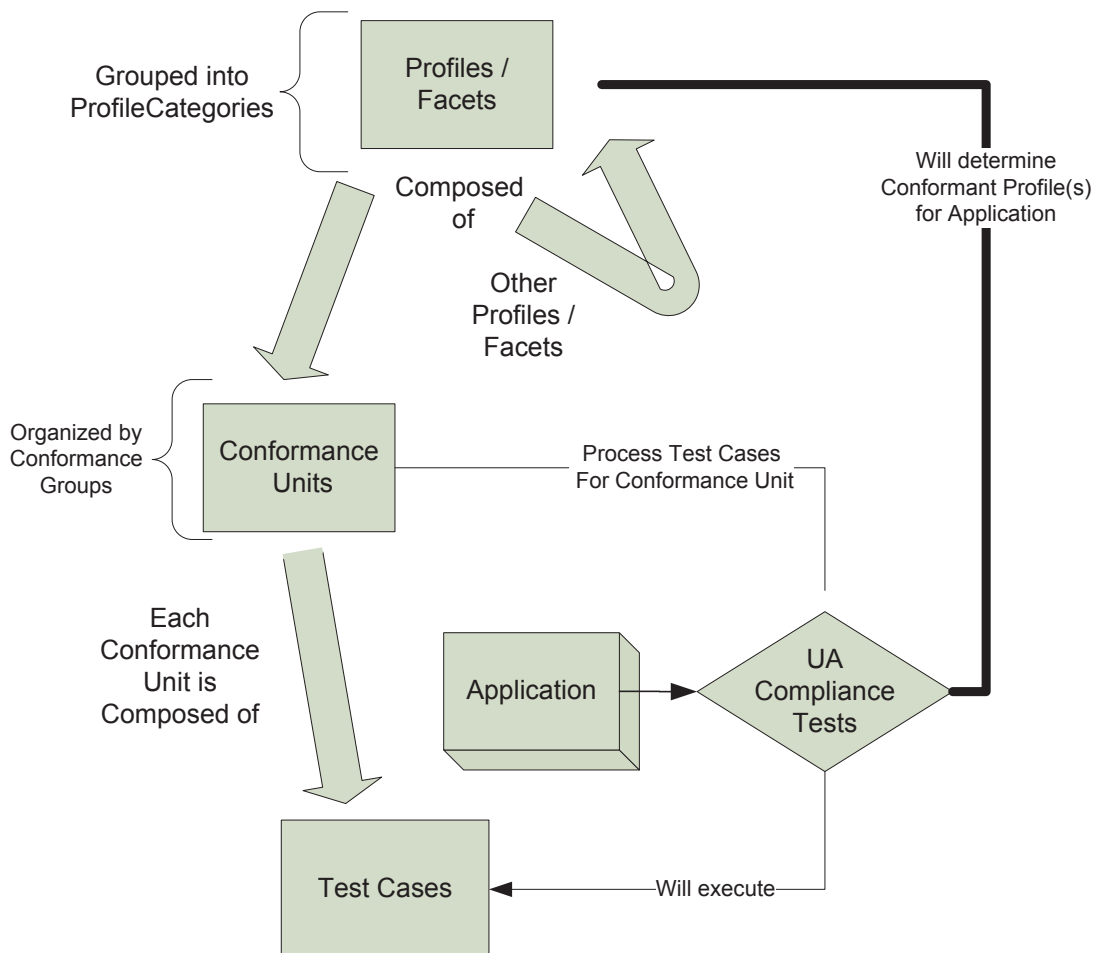


Figure 1 - Profile - ConformanceUnit - TestCases

### 4.2 ConformanceUnit

Each *ConformanceUnit* represents a specific set of features (e.g. a group of services, portions of services or information models) that can be tested as a single entity. *ConformanceUnits* are the building blocks of a *Profile*. Each *ConformanceUnit* can also be used as a test category. For each *ConformanceUnit*, there would be a number of *TestCases* that test the functionality described by

the *ConformanceUnit*. The description of a *ConformanceUnit* is intended to provide enough information to illustrate the required functionality, but in many cases to obtain a complete understanding of the *ConformanceUnit* the reader may be required to also examine the appropriate part of IEC 62541. Additional Information regarding testing of a *ConformanceUnit* are provided in the Compliance Part 8 UA Server or Compliance Part 9 UA Client test standards.

The same features do not appear in more than one *ConformanceUnit*.

### 4.3 Profiles

A *Profile* is a named aggregation of *ConformanceUnits* and other *Profiles*. To support a *Profile*, an application has to support the *ConformanceUnits* and all aggregated *Profiles*. The definition of *Profiles* is an ongoing activity, in that it is expected that new *Profiles* will be added in the future.

An OPC UA Application will typically support multiple *Profiles*.

Multiple *Profiles* may include the same *ConformanceUnit*.

Testing of a *Profile* consists of testing the individual *ConformanceUnits* that comprise the *Profile*.

*Profiles* are named based on naming conventions (see clause 6.3 for details).

### 4.4 Profile Categories

*Profiles* are grouped into categories to help vendors and end users understand the applicability of a *Profile*. A *Profile* can be assigned to more than one category.

Table 1 contains the list of currently defined *ProfileCategories*.

Table 1 – Profile Categories

| Category  | Description                                                                                                                                                                                                                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Client    | <i>Profiles</i> of this category specify functions of an OPC UA <i>Client</i> . The URI of such <i>Profiles</i> can be part of a Software <i>Certificate</i> passed in the <i>ActivateSession</i> request.                                                                                                            |
| Security  | <i>Profiles</i> of this category specify security related functions. Security policies are part of this category. The URI of security policies has to be part of an Endpoint Description returned from the <i>GetEndpoints</i> service. <i>Profiles</i> of this category apply to <i>Servers</i> and <i>Clients</i> . |
| Server    | <i>Profiles</i> of this category specify functions of an OPC UA <i>Server</i> . The URI of such <i>Profiles</i> can be part of a Software <i>Certificate</i> returned with the <i>CreateSession</i> service response and exposed in the server capabilities..                                                         |
| Transport | <i>Profiles</i> of this category specify specific protocol mappings. The URI of such <i>Profiles</i> has to be part of an Endpoint Description. These <i>Profiles</i> apply to <i>Servers</i> and <i>Clients</i> .                                                                                                    |

525

## 5 ConformanceUnits

### 5.1 Overview

A *ConformanceUnit* represents an individually testable entity. For improved clarity, the large list of *ConformanceUnits* is arranged into named *ConformanceGroups*. These groups reflect the *Service Sets* in IEC 62541-4 and the OPC UA information models. Table 2 lists the *ConformanceGroups*. These groups and the *ConformanceUnits* that they describe are detailed in the following sections. *ConformanceGroups* have no impact on testing; they are used only for organizational reasons, i.e. to simplify the readability of this document.

Table 2 - Conformance Groups

| Group               | Description                                                                              |
|---------------------|------------------------------------------------------------------------------------------|
| Address Space Model | Defines <i>ConformanceUnits</i> for various features of the OPC UA <i>AddressSpace</i> . |

| Group                    | Description                                                                                                                                                                                                          |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aggregates               | All <i>ConformanceUnits</i> that are related to Aggregates, including individual <i>ConformanceUnits</i> for each supported Aggregate as described in IEC 62541-13.                                                  |
| Alarms and Conditions    | All <i>ConformanceUnits</i> that are associated with the OPC UA information model for <i>Conditions</i> , acknowledgeable <i>Conditions</i> , confirmations and <i>Alarms</i> as specified in IEC 62541-9.           |
| Attribute Services       | Includes <i>ConformanceUnits</i> to Read or Write current or historical <i>Attribute</i> values.                                                                                                                     |
| Auditing                 | User level security includes support for security audit trails, with traceability between <i>Client</i> and <i>Server</i> audit logs.                                                                                |
| Base Information         | All information elements as defined in IEC 62541-5.                                                                                                                                                                  |
| Data Access              | <i>ConformanceUnits</i> specific to <i>Clients</i> and <i>Servers</i> that deal with the representation and use of automation data as specified in IEC 62541-8.                                                      |
| Discovery Services       | <i>ConformanceUnits</i> which focus on <i>Server Endpoint Discovery</i> .                                                                                                                                            |
| Historical Access        | Access to archived data of node <i>Attribute</i> values or Events.                                                                                                                                                   |
| Method Services          | Methods represent the function calls of <i>Objects</i> . Methods are invoked and return only after completion (successful or unsuccessful).                                                                          |
| Miscellaneous            | This group contains <i>ConformanceUnits</i> that cover miscellaneous subjects, such as recommended behaviours, documentation etc. These <i>ConformanceUnits</i> typically do not fit into any of the other groups.   |
| Monitored Item Services  | <i>Clients</i> define <i>MonitoredItems</i> to subscribe to data and Events. Each <i>MonitoredItem</i> identifies the item to be monitored and the <i>Subscription</i> to use to send <i>Notifications</i> .         |
| Node Management Services | Bundles <i>ConformanceUnits</i> for all <i>Services</i> to add and delete OPC UA <i>AddressSpace Nodes</i> and <i>References</i> .                                                                                   |
| Protocol and Encoding    | Covers all transport and encoding combinations that are specified in IEC 62541-6.                                                                                                                                    |
| Query Services           | A Query may be used to provide advanced filtering and return a subset of data.                                                                                                                                       |
| Redundancy               | The design of OPC UA ensures that vendors can create redundant <i>Clients</i> and redundant <i>Servers</i> in a consistent manner. Redundancy may be used for high availability, fault tolerance and load balancing. |
| Security                 | Security related <i>ConformanceUnits</i> that can be profiled this includes all aspects of security.                                                                                                                 |
| Session Services         | An (OPC UA) <i>Session</i> is an application layer connection.                                                                                                                                                       |
| Subscription Services    | Subscriptions are used to report <i>Notifications</i> to the <i>Client</i> .                                                                                                                                         |
| View Services            | <i>Clients</i> use the View <i>Service Set</i> to navigate through the OPC UA <i>AddressSpace</i> or through a View (a subset) of the OPC UA <i>AddressSpace</i> .                                                   |

535

## 536 5.2 Services

537 The following tables describe *ConformanceUnits* for the *Services* specified in IEC 62541-4. The  
538 tables correlate with the *Service Sets*.

539 A single *ConformanceUnit* can reference several *Services* (e.g. CreateSession, ActivateSession  
540 and CloseSession) but can also refer to individual aspects of *Services* (e.g. the use of  
541 ActivateSession to impersonate a new user).

542 Each table includes a listing of the *Profile Category* to which a *ConformanceUnit* belongs, the title  
543 and description of the *ConformanceUnit* and a column that indicates if the *ConformanceUnit* is  
544 derived from another *ConformanceUnit*. A *ConformanceUnit* that is derived from another  
545 *ConformanceUnit* includes all of the same tests as its parent plus one or more additional  
546 TestCases. These TestCases can only further restrict the existing TestCases. An example would be  
547 one in which the number of connections is tested, where the TestCase of the parent required at  
548 least one connection and the derived *ConformanceUnit* would require a TestCase for at least five  
549 connections.

550 The *Discovery Service Set* is composed of multiple *ConformanceUnits* (see Table 3). All *Servers*  
 551 provide some aspects of this functionality; see *Profiles* categorized as *Server Profiles* for details.  
 552 *Clients* may support some aspects of this functionality; see *Profiles* categorized as *Client Profiles*  
 553 for details.

554 **Table 3 - Discovery Services**

| Category | Title                                  | Description                                                                                                                                                                             | Derived |
|----------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Discovery Get Endpoints                | Support the GetEndpoints <i>Service</i> to obtain all Endpoints of the <i>Server</i> . This includes filtering based on <i>Profiles</i> .                                               |         |
| Server   | Discovery Find Servers Self            | Support the FindServers <i>Service</i> only for itself.                                                                                                                                 |         |
| Server   | Discovery Register                     | Call the RegisterServer <i>Service</i> to register itself (OPC UA <i>Server</i> ) with an external <i>Discovery Service</i> via a secure channel with a SecurityMode other than "None". |         |
| Server   | Discovery Configuration                | Allow configuration of the <i>Discovery Server</i> URL where the <i>Server</i> will register itself. Allow complete disabling of registration with a <i>Discovery Server</i> .          |         |
| Client   | Discovery Client Find Servers Basic    | Uses the FindServers <i>Service</i> to obtain all <i>Servers</i> installed on a given platform.                                                                                         |         |
| Client   | Discovery Client Find Servers with URI | Use FindServers <i>Service</i> to obtain URLs for specific <i>Server</i> URIs.                                                                                                          |         |
| Client   | Discovery Client Find Servers Dynamic  | Detect new <i>Servers</i> after an initial FindServers <i>Service</i> call.                                                                                                             |         |
| Client   | Discovery Client Get Endpoints Basic   | Uses the GetEndpoints <i>Service</i> to obtain all Endpoints for a given <i>Server</i> URL.                                                                                             |         |
| Client   | Discovery Client Get Endpoints Dynamic | Detect changes to the Endpoints after an initial GetEndpoints <i>Service</i> call.                                                                                                      |         |
| Client   | Discovery Client Configure Endpoint    | Allow specification of an Endpoint without going through the <i>Discovery Service Set</i> .                                                                                             |         |

556

557 The *Session Service Set* is composed of multiple *ConformanceUnits* (see Table 4). The  
 558 CreateSession, ActivateSession, and CloseSession services are supported as a single unit. All  
 559 *Servers* and *Clients* provide this functionality.

560 **Table 4 – Session Services**

| Category | Title                             | Description                                                                                                                                                                                                                                                                                   | Derived |
|----------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Session General Service Behaviour | Implement basic <i>Service</i> behaviour. This includes in particular:<br>- checking the authentication token<br>- returning the requestHandle in responses<br>- returning available diagnostic information as requested with the 'returnDiagnostics' parameter<br>- respecting a timeoutHint |         |

| Category | Title                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Derived |
|----------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Session Base                             | Support the <i>Session Service Set</i> (CreateSession, ActivateSession, CloseSession) except the use of ActivateSession to change the <i>Session</i> user. This includes correct handling of all parameters that are provided.<br>Note that for the CreateSession and ActivateSession services, if the SecurityMode = None then:<br>1) The Application <i>Certificate</i> and Nonce are optional.<br>2) The signatures are null/empty.<br>The details of this are described in IEC 62541-4 |         |
| Server   | Session Change User                      | Support the use of ActivateSession to change the <i>Session</i> user.                                                                                                                                                                                                                                                                                                                                                                                                                      |         |
| Server   | Session Cancel                           | Support the Cancel <i>Service</i> to cancel outstanding requests.                                                                                                                                                                                                                                                                                                                                                                                                                          |         |
| Server   | Session Minimum 1                        | Support minimum 1 <i>Session</i> (total).                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |
| Server   | Session Minimum 2 Parallel               | Support minimum 2 parallel Sessions (total for all <i>Clients</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                       |         |
| Server   | Session Minimum 50 Parallel              | Support minimum 50 parallel Sessions (total for all <i>Clients</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                      |         |
| Client   | Session Client General Service Behaviour | Implement basic <i>Service</i> behaviour. This includes in particular:<br>- including the proper authentication token of the <i>Session</i><br>- creating a requestHandle if needed<br>- requesting diagnostic information with the 'returnDiagnostics' parameter<br>- evaluate the serviceResult and operational results                                                                                                                                                                  |         |
| Client   | Session Client Base                      | Use the <i>Session Service Set</i> (CreateSession, ActivateSession, and CloseSession) except the use of ActivateSession to change the <i>Session</i> user. This includes correct handling of all parameters that are provided.<br>Note that for the CreateSession and ActivateSession services, if the SecurityMode = None then:<br>1) The Application <i>Certificate</i> and Nonce are optional.<br>2) The signatures are null/empty.                                                     |         |
| Client   | Session Client Multiple Connections      | Support unlimited connections (client side) with multiple <i>Servers</i> . Any limit on numbers of connections is from server side. May have a memory based limit, but not a software constraint limit.                                                                                                                                                                                                                                                                                    |         |
| Client   | Session Client Renew NodeIds             | This <i>ConformanceUnit</i> applies to <i>Clients</i> that allow persisting NodeIds.<br>Verify that the Namespace Table has not changed for NodeIds that the <i>Client</i> has persisted and is going to re-use beyond a <i>Session</i> lifetime. If changes occurred the <i>Client</i> has to recalculate the Namespace Indices of the respective NodeIds.                                                                                                                                |         |
| Client   | Session Client Impersonate               | Uses ActivateSession to change the <i>Session</i> user (impersonation).                                                                                                                                                                                                                                                                                                                                                                                                                    |         |
| Client   | Session Client KeepAlive                 | Make periodic requests to keep the <i>Session</i> alive.                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |
| Client   | Session Client Detect Shutdown           | Read or monitor the ServerStatus/State <i>Variable</i> to recognize a potential shutdown of the <i>Server</i> and clean up resources.                                                                                                                                                                                                                                                                                                                                                      |         |
| Client   | Session Client Cancel                    | Use the Cancel <i>Service</i> to cancel outstanding requests.                                                                                                                                                                                                                                                                                                                                                                                                                              |         |

| Category | Title                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                             | Derived |
|----------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Client   | Session Client Auto Reconnect | Automatic <i>Client</i> reconnect including:<br>- ActivateSession with new SecureChannel if SecureChannel is no longer valid but <i>Session</i> is still valid<br>- Creation of a new <i>Session</i> only if <i>Session</i> is no longer valid                                                                                                                                                                                                          |         |
| Client   | Client Entry-Level Support    | The <i>Client</i> is able to interoperate with <i>Servers</i> with lowest level functionality. This includes the ability to operate with a single <i>Session</i> , a pre-knowledge of the OPC UA Types (the <i>Server</i> may not expose them in the <i>AddressSpace</i> ), and the ability to use Read vs. <i>Subscriptions</i> for monitoring.<br>There may be further restrictions provided by the <i>Server</i> via the <i>Server</i> capabilities. |         |

561

562 The *Node Management Service* Set is composed of multiple *ConformanceUnits* (see Table 5).  
 563 *Servers* may provide some aspects of this functionality; see *Profiles* categorized as *Server Profiles*  
 564 for details. *Clients* may support some aspects of this functionality; see *Profiles* categorized as  
 565 *Client Profiles* for details.

Table 5 – Node Management Services

| Category | Title                       | Description                                                                                                                                               | Derived |
|----------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Node Management Add Node    | Support the AddNodes <i>Service</i> to add one or more <i>Nodes</i> into the OPC UA <i>AddressSpace</i> .                                                 |         |
| Server   | Node Management Delete Node | Support the DeleteNodes <i>Service</i> to delete one or more <i>Nodes</i> from the OPC UA <i>AddressSpace</i> .                                           |         |
| Server   | Node Management Add Ref     | Support the AddReferences <i>Service</i> to add one or more <i>References</i> to one or more <i>Nodes</i> in the OPC UA <i>AddressSpace</i> .             |         |
| Server   | Node Management Delete Ref  | Support the DeleteReferences <i>Service</i> to delete one or more <i>References</i> of a <i>Node</i> in the OPC UA <i>AddressSpace</i> .                  |         |
| Client   | Node Management Client      | Uses <i>Node Management Services</i> to add or delete <i>Nodes</i> and to add or delete <i>References</i> in <i>Server's</i> OPC UA <i>AddressSpace</i> . |         |

567

568 The *View Service* Set is composed of a multiple *ConformanceUnits* (see Table 6). All *Servers*  
 569 support some aspects of this conformance group. *Clients* may support some aspects of this  
 570 functionality; see *Profiles* categorized as *Client Profiles* for details.

Table 6 – View Services

| Category | Title                              | Description                                                                                                                                                                                                     | Derived |
|----------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | View Basic                         | Support the View <i>Service</i> Set (Browse, BrowseNext).                                                                                                                                                       |         |
| Server   | View TranslateBrowsePath           | Support TranslateBrowsePathsToNodeIds <i>Service</i> .                                                                                                                                                          |         |
| Server   | View RegisterNodes                 | Support the RegisterNodes and UnregisterNodes <i>Services</i> as a way to optimize access to repeatedly used <i>Nodes</i> in the <i>Server's</i> OPC UA <i>AddressSpace</i> .                                   |         |
| Server   | View Minimum Continuation Point 01 | Support minimum 1 continuation point per <i>Session</i> .                                                                                                                                                       |         |
| Server   | View Minimum Continuation Point 05 | Support minimum 5 continuation points per <i>Session</i> . This number has to be supported for at least half of the minimum required sessions.                                                                  |         |
| Client   | View Client Basic Browse           | Uses Browse and BrowseNext <i>Services</i> to navigate through the <i>Server's</i> OPC UA <i>AddressSpace</i> . Make use of the referenceTypeId and the nodeClassMask to specify the needed <i>References</i> . |         |

| Category | Title                                 | Description                                                                                                                                                                                                                       | Derived |
|----------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Client   | View Client Basic ResultSet Filtering | Makes use of the resultMask parameter to optimize the result set to be returned by the <i>Server</i> .                                                                                                                            |         |
| Client   | View Client TranslateBrowsePath       | Uses the TranslateBrowsePathsToNodeIds <i>Service</i> to identify the NodeIds for <i>Nodes</i> where a starting <i>Node</i> and a BrowsePath is known. Makes use of bulk operations rather than multiple calls whenever possible. |         |
| Client   | View Client RegisterNodes             | Uses the RegisterNodes <i>Service</i> to optimize access for <i>Nodes</i> that are used repeatedly. Use UnregisterNodes when <i>Nodes</i> are not used anymore.                                                                   |         |

572

573 The *Attribute Service Set* is composed of multiple *ConformanceUnits* (see Table 7). The majority of  
 574 the *Attribute* service set is a core functionality of OPC UA and as such is supported by most  
 575 *Servers*. Most *Clients* will also support some aspects of the *Attribute Service Set*

576

**Table 7 – Attribute Services**

| Category | Title                                  | Description                                                                                                                                                                                                                                                                                                                                                             | Derived |
|----------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Attribute Read                         | Supports the Read <i>Service</i> to read one or more <i>Attributes</i> of one or more <i>Nodes</i> . This includes support of the IndexRange parameter to read a single element or a range of elements when the <i>Attribute</i> value is an array.                                                                                                                     |         |
| Server   | Attribute Read Complex                 | Supports reading and encoding Values with Structured DataTypes.                                                                                                                                                                                                                                                                                                         |         |
| Server   | Attribute Write Values                 | Supports writing to values to one or more <i>Attributes</i> of one or more <i>Nodes</i> .                                                                                                                                                                                                                                                                               |         |
| Server   | Attribute Write Complex                | Supports writing and decoding Values with Structured DataTypes.                                                                                                                                                                                                                                                                                                         |         |
| Server   | Attribute Write StatusCode & Timestamp | Supports writing of StatusCode and Timestamps along with the Value.                                                                                                                                                                                                                                                                                                     |         |
| Server   | Attribute Write Index                  | Supports the IndexRange to write a single element or a range of elements when the <i>Attribute</i> value is an array.                                                                                                                                                                                                                                                   |         |
| Server   | Attribute Alternate Encoding           | Supports alternate Data Encoding when reading value <i>Attributes</i> .<br>By default, every <i>Server</i> has to support the Data Encoding of the currently used Stack <i>Profile</i> (i.e. binary with UA Binary Encoding and XML with XML Encoding). This <i>ConformanceUnit</i> - when supported - specifies that the other Data Encoding is supported in addition. |         |
| Server   | Attribute Historical Read              | Supports the HistoryRead <i>Service</i> . The details of what aspects of this service are used are listed in additional <i>ConformanceUnits</i> , but at least one of ReadRaw, ReadProcessed, ReadModified, ReadAtTime or ReadEvents must be supported.                                                                                                                 |         |
| Server   | Attribute Historical Update            | Supports the HistoryUpdate service. The details of the supported features of this service are described by additional <i>ConformanceUnits</i> , but at least one of the following must be supported: InsertData, InsertEvents, ReplaceData, ReplaceEvents, UpdateData, UpdateEvents, DeleteData, DeleteEvents or DeleteAtTime.                                          |         |

| Category | Title                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                 | Derived |
|----------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Client   | Attribute Client Read Base                 | Use the Read <i>Service</i> to read one or more <i>Attributes</i> of one or more <i>Nodes</i> . This includes use of an <i>IndexRange</i> to select a single element or a range of elements when the <i>Attribute</i> value is an array. <i>Clients</i> shall use bulk operations whenever possible to reduce the number of <i>Service</i> invocations.                                                     |         |
| Client   | Attribute Client Read with proper Encoding | This <i>ConformanceUnit</i> refers to the ability of a <i>Server</i> to support more than one Data Encoding for <i>Attribute</i> values. <i>Clients</i> can discover the available encodings and can explicitly choose one when calling the Read <i>Service</i> .                                                                                                                                           |         |
| Client   | Attribute Client Read Complex              | Read and decode Values with Structured DataTypes.                                                                                                                                                                                                                                                                                                                                                           |         |
| Client   | Attribute Client Write Base                | Use the Write <i>Service</i> to write values to one or more <i>Attributes</i> of one or more <i>Nodes</i> . This includes use of an <i>IndexRange</i> to select a single element or a range of elements when the <i>Attribute</i> value is an array. <i>Clients</i> shall use bulk operations whenever possible to reduce the number of <i>Service</i> invocations.                                         |         |
| Client   | Attribute Client Write Complex             | Write and Encode Values with Structured DataTypes.                                                                                                                                                                                                                                                                                                                                                          |         |
| Client   | Attribute Client Write Quality & TimeStamp | Use the Write <i>Service</i> to also write <i>StatusCode</i> and/or <i>Timestamps</i> along with a <i>Value</i> .                                                                                                                                                                                                                                                                                           |         |
| Client   | Attribute Client Historical Read           | The <i>Client</i> makes use of the <i>HistoryRead</i> service. The details of which aspect of this service are used are provided by additional <i>ConformanceUnits</i> , but at least one or more of the following is used <i>ReadRaw</i> , <i>ReadAtTime</i> , <i>ReadProcessed</i> , <i>ReadModified</i> or <i>ReadEvents</i> .                                                                           |         |
| Client   | Attribute Client Historical Updates        | The <i>Client</i> makes use of the <i>HistoryUpdate</i> service. The details of this usage are provided by additional <i>ConformanceUnits</i> , but at least one or more of the following must be provided: <i>InsertData</i> , <i>InsertEvent</i> , <i>ReplaceData</i> , <i>ReplaceEvent</i> , <i>UpdateData</i> , <i>UpdateEvents</i> , <i>DeleteData</i> or <i>DeleteEvents</i> or <i>DeleteAtTime</i> . |         |

577

578 The *Method Service* Set is composed of *ConformanceUnits* (see Table 8). The primary  
579 *ConformanceUnits* provide support for the call functionality. *Servers* may provide some aspects of  
580 this functionality; see *Profiles* categorized as *Server Profiles* for details. *Clients* may support some  
581 aspects of this functionality; see *Profiles* categorized as *Client Profiles* for details.

582

Table 8 – Method Services

| Category | Title              | Description                                                                                                            | Derived |
|----------|--------------------|------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Method Call        | Support the Call <i>Service</i> to call (invoke) a <i>Method</i> which includes support for <i>Method Parameters</i> . |         |
| Client   | Method Client Call | Use the Call <i>Service</i> to call one or several <i>Methods</i> .                                                    |         |

583

584 The *MonitoredItem Service* Set is composed of multiple *ConformanceUnits* (see Table 9). *Servers*  
585 may provide some aspects of this functionality; see *Profiles* categorized as *Server Profiles* for  
586 details. *Clients* may support some aspects of this functionality; see *Profiles* categorized as *Client*  
587 *Profiles* for details.

588

Table 9 – Monitored Item Services

|        |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
|--------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Server | Monitor Basic                   | Support the following <i>MonitoredItem</i> Services: CreateMonitoredItems, ModifyMonitoredItems, DeleteMonitoredItems and SetMonitoringMode.                                                                                                                                                                                                                                                                                          |  |
| Server | Monitor Value Change            | Support creation of <i>MonitoredItems</i> for <i>Attribute</i> value changes. This includes support of the <i>IndexRange</i> to select a single element or a range of elements when the <i>Attribute</i> value is an array.                                                                                                                                                                                                           |  |
| Server | Monitored Items Deadband Filter | Supports an absolute Deadband filter as a <i>DataChangeFilter</i> for numeric data types.                                                                                                                                                                                                                                                                                                                                             |  |
| Server | Monitor Aggregate Filter        | Support for Aggregate filters for <i>MonitoredItems</i> . The result of this <i>ConformanceUnit</i> includes a list of Aggregates that are supported as part of the <i>Profile Certificate</i> .                                                                                                                                                                                                                                      |  |
| Server | Monitor Alternate Encoding      | Support alternate encoding when monitoring value <i>Attributes</i> .<br>By default, every <i>Server</i> has to support the encoding of the currently used <i>Stack Profile</i> (i.e. binary with UA Binary Encoding and XML with XML Encoding). This <i>ConformanceUnit</i> - when supported - specifies that the other encoding is supported in addition.                                                                            |  |
| Server | Monitor Items 2                 | Support at least 2 <i>MonitoredItems</i> per <i>Subscription</i> .                                                                                                                                                                                                                                                                                                                                                                    |  |
| Server | Monitor Items 10                | Support at least 10 <i>MonitoredItems</i> per <i>Subscription</i> .                                                                                                                                                                                                                                                                                                                                                                   |  |
| Server | Monitor Items 100               | Support at least 100 <i>MonitoredItems</i> per <i>Subscription</i> . This number has to be supported for at least half of the required <i>Subscriptions</i> for half of the required <i>Sessions</i> .                                                                                                                                                                                                                                |  |
| Server | Monitor Items 500               | Support at least 500 <i>MonitoredItems</i> per <i>Subscription</i> . This number has to be supported for at least half of the required <i>Subscriptions</i> for half of the required <i>Sessions</i> .                                                                                                                                                                                                                                |  |
| Server | Monitor QueueSize_1             | This <i>ConformanceUnit</i> does not require queuing when multiple value changes occur during a “publish period”.<br>I.e. the latest change will be sent in the <i>Notification</i> .                                                                                                                                                                                                                                                 |  |
| Server | Monitor MinQueueSize_02         | Support at least 2 queue entries for <i>MonitoredItems</i> . <i>Servers</i> often will adapt the queue size to the number of currently <i>MonitoredItems</i> . However, it is expected that <i>Servers</i> support this minimum queue size for at least one third of the supported <i>MonitoredItems</i> .                                                                                                                            |  |
| Server | Monitor MinQueueSize_05         | Support at least 5 queue entries for <i>MonitoredItems</i> . <i>Servers</i> often will adapt the queue size to the number of currently <i>MonitoredItems</i> . However, it is expected that <i>Servers</i> support this minimum queue size for at least one third of the supported <i>MonitoredItems</i> .                                                                                                                            |  |
| Server | Monitor QueueSize_ServerMax     | This <i>ConformanceUnit</i> is for events. When the Client requests queueSize=MAXUInt32 the <i>Server</i> is to return the maximum queue size that it can support for event notifications as the revisedQueueSize.                                                                                                                                                                                                                    |  |
| Server | Monitor Triggering              | Support the SetTriggering <i>Service</i> to create and/or delete triggering links for a triggering item.                                                                                                                                                                                                                                                                                                                              |  |
| Server | Monitor Events                  | Support creation of <i>MonitoredItems</i> for an “ <i>EventNotifier Attribute</i> ” for the purpose of <i>Event Notification</i> . The subscription includes supporting a filter that includes SimpleAttribute Operands and a select list of Operators. The list of Operators includes: Equals, IsNull, GreaterThan, LessThan, GreaterThanorEqual, LessThanorEqual, Like, Not, Between, InList, And, Or, Cast, BitwiseAnd, BitwiseOr. |  |

|        |                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|--------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Server | Monitor Complex Event Filter        | Support for complex <i>Event</i> filters, where complex is defined as supporting the complex filter operator (TypeOf).                                                                                                                                                                                                                                                                                                                      |  |
| Client | Monitor Client Value Change         | Use the <i>MonitoredItem Service</i> Set to register items for changes in <i>Attribute</i> value.<br>Use <i>CreateMonitoredItems</i> to register the <i>Node/Attribute</i> tuple. Set proper sampling interval, Deadband filter and queuing mode.<br>Use disabling / enabling instead of deleting and re-creating a <i>MonitoredItem</i> .<br>Use bulk operations rather than individual service requests to reduce communication overhead. |  |
| Client | Monitor Client Deadband Filter      | Uses Absolute Deadband filters for subscriptions.                                                                                                                                                                                                                                                                                                                                                                                           |  |
| Client | Monitor Client by Index             | Use the <i>IndexRange</i> to select a single element or a range of elements when the <i>Attribute</i> value is an array.                                                                                                                                                                                                                                                                                                                    |  |
| Client | Monitor Client Aggregate Filter     | Uses Aggregate filters for Subscriptions.                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| Client | Monitor Client Events               | Use the <i>MonitoredItem Service</i> Set to create <i>MonitoredItems</i> for <i>Event</i> notifications.                                                                                                                                                                                                                                                                                                                                    |  |
| Client | Monitor Client Event Filter         | Use the <i>Event</i> filter when calling <i>CreateMonitoredItems</i> to filter the desired Events and to select the columns to be provided for each <i>Event Notification</i> .                                                                                                                                                                                                                                                             |  |
| Client | Monitor Client Complex Event Filter | Uses complex <i>Event</i> filters.                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| Client | Monitor Client Modify               | Use <i>ModifyMonitoredItems Service</i> to change the configuration setting.<br>Use <i>SetMonitoringMode Service</i> to disable / enable sampling and / or publishing.                                                                                                                                                                                                                                                                      |  |
| Client | Monitor Client Trigger              | Use the <i>Triggering Model</i> if certain items are to be reported only if some other item triggers.<br>Use proper monitoring mode for these items.<br>Use <i>SetTriggering Service</i> to link these items to the trigger item.                                                                                                                                                                                                           |  |

589

590 The *Subscription Service* Set is composed of multiple *ConformanceUnits* (see Table 10). *Servers*  
591 may provide some aspects of this functionality; see *Profiles* categorized as *Server Profiles* for  
592 details. *Clients* may support some aspects of this functionality; see *Profiles* categorized as *Client*  
593 *Profiles* for details.

594

Table 10 – Subscription Services

| Category | Title                   | Description                                                                                                                                                                                                | Derived |
|----------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Subscription Basic      | Support the following <i>Subscription Services</i> : <i>CreateSubscription</i> , <i>ModifySubscription</i> , <i>DeleteSubscriptions</i> , <i>Publish</i> , <i>Republish</i> and <i>SetPublishingMode</i> . |         |
| Server   | Subscription Minimum 1  | Support at least 1 Subscriptions per <i>Session</i> . This number has to be supported for all of the minimum required sessions.                                                                            |         |
| Server   | Subscription Minimum 02 | Support at least 2 Subscriptions per <i>Session</i> . This number has to be supported for at least half of the minimum required sessions.                                                                  |         |
| Server   | Subscription Minimum 05 | Support at least 5 Subscriptions per <i>Session</i> . This number has to be supported for at least half of the minimum required sessions.                                                                  |         |

| Category | Title                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Derived |
|----------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Server   | Subscription Publish<br>Min 02               | Support at least 2 Publish <i>Service</i> requests per <i>Session</i> .<br>This number has to be supported for all of the minimum required sessions. Support of republish is optional and no notification retransmission queue has to be provided however the republish service must be provided and will return the appropriate operation level results.                                                                                                                                                                               |         |
| Server   | Subscription Publish<br>Min 05               | Support at least 5 Publish <i>Service</i> requests per <i>Session</i> .<br>This number has to be supported for at least half of the minimum required sessions. Support, as a minimum, the number of Publish requests per session as the size of the NotificationMessage retransmission queue for Republish.                                                                                                                                                                                                                             |         |
| Server   | Subscription Publish<br>Min 10               | Support at least 10 Publish <i>Service</i> requests per <i>Session</i> .<br>This number has to be supported for at least half of the minimum required sessions. Support as a minimum, the number of Publish requests per session as the size of the NotificationMessage retransmission queue for Republish.                                                                                                                                                                                                                             |         |
| Server   | Subscription Publish<br>Discard Policy       | Respect the specified policy for discarding Publish <i>Service</i> requests. If the maximum number of Publish <i>Service</i> requests has been queued and a new Publish <i>Service</i> request arrives, the "oldest" Publish request has to be discarded by returning the proper error.                                                                                                                                                                                                                                                 |         |
| Server   | Subscription Transfer                        | Support TransferSubscriptions <i>Service</i> to transfer a <i>Subscription</i> from one <i>Session</i> to another.                                                                                                                                                                                                                                                                                                                                                                                                                      |         |
| Client   | Subscription Client<br>Basic                 | Use the <i>Subscription</i> and <i>MonitoredItem</i> <i>Service</i> Set as an efficient means to detect changes of <i>Attribute</i> values and / or to receive <i>Event</i> occurrences.<br>Set appropriate intervals for publishing, keep alive notifications and total <i>Subscription</i> lifetime.<br>Supply a sufficient number of Publish requests to the <i>Server</i> so that <i>Notifications</i> can be sent whenever a publish timer expires.<br>Acknowledge received <i>Notifications</i> with subsequent Publish requests. |         |
| Client   | Subscription Client<br>Republish             | Evaluate the sequence number in <i>Notifications</i> to detect lost <i>Notifications</i> .<br>Use Republish to request missing <i>Notifications</i> .                                                                                                                                                                                                                                                                                                                                                                                   |         |
| Client   | Subscription Client<br>Modify                | Allow modification of the <i>Subscription</i> configuration using the ModifySubscription <i>Service</i> .                                                                                                                                                                                                                                                                                                                                                                                                                               |         |
| Client   | Subscription Client<br>TransferSubscriptions | The <i>Client</i> supports transferring <i>Subscription</i> from other <i>Clients</i> . This <i>ConformanceUnit</i> is used as part of redundant <i>Clients</i> .                                                                                                                                                                                                                                                                                                                                                                       |         |
| Client   | Subscription Client<br>Multiple              | Use multiple Subscriptions to reduce the payload of individual <i>Notifications</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |
| Client   | Subscription Client<br>Publish Configurable  | Send multiple Publish <i>Service</i> requests to assure that the <i>Server</i> is always able to send <i>Notifications</i> .<br>The number of parallel Publish <i>Service</i> requests per <i>Session</i> shall be configurable.                                                                                                                                                                                                                                                                                                        |         |

595

596

### 597 5.3 Transport and Communication Related Features

598 Table 11 describes Security related *ConformanceUnits*. All of these *ConformanceUnits* apply  
 599 equally to both *Clients* and *Servers*, where a *Client* uses the related security unit and a *Server*.

600 supports the use of it. These items are defined in detail in IEC 62541-6. It is recommended that a  
 601 *Server* and *Client* support as many of these options as possible in order to achieve increased levels  
 602 of interoperability. It is the task of an administrator to determine which of these *ConformanceUnits*  
 603 are exposed in a given deployed *Server* or *Client* application.

604

Table 11 – Security

| Category | Title                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Derived |
|----------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Security | Security Certificate Validation                | A certificate will be validated as specified in IEC 62541-4. This includes among others structure and signature examination. Allowing for some validation errors to be suppressed by administration directive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |
| Security | Security None                                  | A suite of algorithms that does NOT provide any security settings:<br>-> SymmetricSignatureAlgorithm - Not Used<br>-> SymmetricEncryptionAlgorithm - Not Used<br>-> AsymmetricSignatureAlgorithm - Not Used<br>-> SymmetricKeyWrapAlgorithm - Not Used<br>-> AsymmetricEncryptionAlgorithm - Not Used<br>-> KeyDerivationAlgorithm - Not Used<br>-> DerivedSignatureKeyLength - 0<br>The use of this suite of algorithms must be able to be enabled or disabled by an administrator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |
| Security | Security None CreateSession<br>ActivateSession | When SecurityPolicy=None, the CreateSession and ActivateSession service allow for a NULL/empty signature and do not require Application <i>Certificates</i> or a Nonce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |
| Security | Security Basic 128Rsa15                        | A suite of algorithms that uses RSA15 as Key-Wrap-algorithm and 128-Bit for encryption algorithms.<br>-> SymmetricSignatureAlgorithm - HmacSha1 -<br>( <a href="http://www.w3.org/2000/09/xmlsig#hmac-sha1">http://www.w3.org/2000/09/xmlsig#hmac-sha1</a> ).<br>-> SymmetricEncryptionAlgorithm - Aes128 -<br>( <a href="http://www.w3.org/2001/04/xmlenc#aes128-cbc">http://www.w3.org/2001/04/xmlenc#aes128-cbc</a> ).<br>-> AsymmetricSignatureAlgorithm - RsaSha1 -<br>( <a href="http://www.w3.org/2000/09/xmlsig#rsa-sha1">http://www.w3.org/2000/09/xmlsig#rsa-sha1</a> ).<br>-> AsymmetricKeyWrapAlgorithm - KwRsa15 -<br>( <a href="http://www.w3.org/2001/04/xmlenc#rsa-1_5">http://www.w3.org/2001/04/xmlenc#rsa-1_5</a> ).<br>-> AsymmetricEncryptionAlgorithm - Rsa15 -<br>( <a href="http://www.w3.org/2001/04/xmlenc#rsa-1_5">http://www.w3.org/2001/04/xmlenc#rsa-1_5</a> ).<br>-> KeyDerivationAlgorithm - PSha1 -<br>( <a href="http://docs.oasis-open.org/ws-sx/ws-secureconversation/200512/dk/p_sha1">http://docs.oasis-open.org/ws-sx/ws-secureconversation/200512/dk/p_sha1</a> ).<br>-> DerivedSignatureKeyLength - 128.<br>-> MinAsymmetricKeyLength - 1024<br>-> MaxAsymmetricKeyLength - 2048<br>-> CertificateSignatureAlgorithm - Sha1 |         |

| Category | Title              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Derived |
|----------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Security | Security Basic 256 | <p>A suite of algorithms that are for 256-Bit encryption, algorithms include:</p> <ul style="list-style-type: none"> <li>-&gt; SymmetricSignatureAlgorithm - HmacSha1 - (<a href="http://www.w3.org/2000/09/xmlsig#hmac-sha1">http://www.w3.org/2000/09/xmlsig#hmac-sha1</a>).</li> <li>-&gt; SymmetricEncryptionAlgorithm - Aes256 - (<a href="http://www.w3.org/2001/04/xmlenc#aes256-cbc">http://www.w3.org/2001/04/xmlenc#aes256-cbc</a>).</li> <li>-&gt; AsymmetricSignatureAlgorithm - RsaSha1 - (<a href="http://www.w3.org/2000/09/xmlsig#rsa-sha1">http://www.w3.org/2000/09/xmlsig#rsa-sha1</a>).</li> <li>-&gt; AsymmetricKeyWrapAlgorithm - KwRsaOaep - (<a href="http://www.w3.org/2001/04/xmlenc#rsa-oaep-mgf1p">http://www.w3.org/2001/04/xmlenc#rsa-oaep-mgf1p</a>).</li> <li>-&gt; AsymmetricEncryptionAlgorithm - RsaOaep - (<a href="http://www.w3.org/2001/04/xmlenc#rsa-oaep">http://www.w3.org/2001/04/xmlenc#rsa-oaep</a>).</li> <li>-&gt; KeyDerivationAlgorithm - PSha1 - (<a href="http://docs.oasis-open.org/ws-sx/ws-secureconversation/200512/dk/p_sha1">http://docs.oasis-open.org/ws-sx/ws-secureconversation/200512/dk/p_sha1</a>).</li> <li>-&gt; DerivedSignatureKeyLength - 192.</li> <li>-&gt; MinAsymmetricKeyLength - 1024</li> <li>-&gt; MaxAsymmetricKeyLength - 2048</li> <li>-&gt; CertificateSignatureAlgorithm - Sha1</li> </ul> |         |