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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Next Generation Networks

Carrier grade open environment components

ITU-T Recommendation Y.2902

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ITU-T Recommendation Y.2902

Carrier grade open environment components

Summary

ITU-T Recommendation Y.2902 describes carrier grade open environment (CGOE) components, assigned to specific categories of the CGOE reference model, which may be used in commercial off the shelf components, suitable for implementation in next generation networks (NGN). The characteristics of each individual CGOE component are to be collected and presented as a separate annex to this Recommendation.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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ITU-T Recommendation Y.2902

Carrier grade open environment components

1 Scope

This Recommendation provides a set of carrier grade open environment (CGOE) components, each of which can be related to a CGOE category identified in the CGOE model that is defined in [ITU-T Y.2901]. These CGOE components are intended for use by vendors to assist them in developing commercial off the shelf (COTS) components. It is recognized that CGOE components will continue to be identified on a going forward basis and annexes will be added to capture these additions. Additionally, to ensure that a consistent approach is used in the generation of future annexes, a framework for the specification of new CGOE components is provided.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.2901]   ITU-T Recommendation Y.2901 (2006), *The carrier grade open environment reference model*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application [ITU-T Y.2901]: An application is a piece of software answering a set of user's requirements using telecommunication network services via an IT system.

3.1.2 carrier grade [ITU-T Y.2901]: Colloquially, a "carrier grade" implementation of a solution, building block, or a COTS component exhibits particular qualities beyond regular information technology (IT) reliability, availability, serviceability and manageability (RASM) features enabling its mission-critical use in a service provider's offering.

3.1.3 CGOE category [ITU-T Y.2901]: A unit of description of the CGOE reference model. It comprises one or more CGOE components.

NOTE – This method of abstraction keeps the size of the framework manageable and understandable. It avoids being too specific or leaning towards the needs of a certain building block. For example, the alarm management category consists of several components, e.g., alarm generation and alarm clearance.

3.1.4 CGOE component [ITU-T Y.2901]: A CGOE component is an abstract description of technical tasks, interfaces and properties.

3.1.5 CGOE reference model [ITU-T Y.2901]: A model that organizes the CGOE categories.

NOTE 1 – Each category is intended to be independent in the sense that it does not require the existence of the categories above it; however, to produce carrier grade functionality, functions may be needed from more than one category.

NOTE 2 – Multiple categories are logically grouped and referred to as the server hardware and the operating platform.

3.1.6   COTS component [ITU-T Y.2901]: A hardware or a software component instantiation of one or more CGOE components.

NOTE 1 – Existing or new components may instantiate CGOE components.

NOTE 2 – The following are examples of components: database system, operating system, and management middleware.

3.1.7   component instance [ITU-T Y.2901]: A component instance is a specific representation of a component, which satisfies the specific needs of building a specific building block.

NOTE – Technology providers develop component instances. During the engineering process within the solution providers, instances are chosen according to the requirements and integrated to eventually stage the entire building block. Examples of component instances: Linux, management middleware for an NGN Q management interface.

3.1.8   framework [ITU-T Y.2901]: A framework is an environment that provides a partial solution, usually automating a particularly tedious or difficult part of an application project.

3.1.9   middleware [ITU-T Y.2901]: The mediating entity between two information elements. Such an element can be, for example, an application, infrastructure component, or another mediating entity.

3.1.10   non-functional property: A property that does not relate to the function performed by a device or component, e.g., scalability and availability.

4   Abbreviations

This Recommendation uses the following abbreviations:

CGOE   Carrier Grade Open Environment

COTS   Commercial Off-The Shelf

HTTP   Hyper Text Transfer Protocol

SIP   Session Initiation Protocol

UML   Unified Modelling Language

5   Conventions

5.1   Terms

This Recommendation uses a number of terms and it is important that the relationship between these terms is clearly understood. The CGOE reference model in [ITU-T Y.2901] defines CGOE categories. Each CGOE category will be comprised of one or more CGOE components defined in this Recommendation. Each COTS component will be comprised of one or more CGOE components. Usually a CGOE category is not equivalent to a COTS component.

5.2   CGOE component diagrams

This Recommendation uses the following CGOE component diagram conventions.

5.2.1   Unified modelling language

The unified modelling language (UML) as defined by the object management group (OMG) for CGOE component diagrams is used. UML is a visual modelling language using views, modelling elements, and diagrams to model systems of various kinds.

•   The UML version used is specification version 2.0.

•   A very circumscribed set of modelling elements and diagrams are used. The intent is that complicated modelling tools are not a prerequisite for this application of UML.

- Other modelling elements and diagrams *may* be used as desired to show other aspects of components and their environment.

- Terms shown in ***bold italic*** type are used in the way they are used and defined in the UML specification.

5.2.2 Key modelling elements

- The ***component*** – This modelling element represents a CGOE component (the tabs on the side are intended to suggest a "pluggable" element). The component name is placed on the inside of the component. Components ***implement*** or export interfaces.
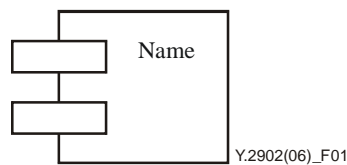
Name

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Figure 1 – Component

- The ***interface*** – An interface is a well-defined means of accessing a logical grouping of functional behaviour. Interfaces are *freestanding* objects that are not *necessarily* associated with *specific* components: multiple components can implement the same interface. Each interface is named and the name is placed near the interface. Interfaces that are exported by a component are referred to as primary interfaces. Interfaces that are imported by a component are referred to as secondary interfaces.
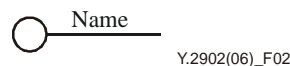
Name

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Figure 2 – Interface

- The ***dependency*** – A dependency element represents a relationship between two modelling elements. In the CGOE, this dependency relationship is (generally) unnamed and represents a "uses" relationship between components and interfaces.

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Figure 3 – Dependency

- The ***category*** – The CGOE uses a ***stereotype*** of the UML ***package*** modelling element to represent the CGOE categories used in the CGOE model (which is indicated by the "<<Category>>" marking). The name of the category is placed inside the category modelling element. The tabbed shape of the package symbol is intended to suggest a file folder.
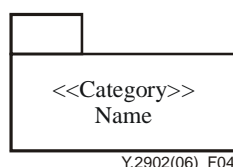
<<Category>>
Name

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Figure 4 – Category

- The *note* – The note element is used to convey plain-text information of any kind that is not otherwise conveyed by the UML elements in the diagram.
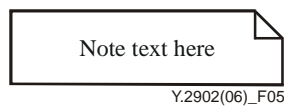
Note text here

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Figure 5 – Note

5.2.3 Use of modelling elements

- Modelling elements should only be used when they serve an explanatory purpose in the environment where they are used. For example, it is not necessary to use the category element unless its use somehow explains something in the context of the diagram.
- Over cluttered diagrams can confuse rather than educate. Consider breaking large diagrams into smaller pieces.
- Names can be left off elements when the meaning of the diagram is not harmed by doing so. For example, it is common practice to leave the name off "generic" components when showing how an arbitrary component fits into a scenario with specific ones.

5.2.4 Diagrams

The CGOE uses component diagrams to describe relationships between components and scenarios of component use. For example:

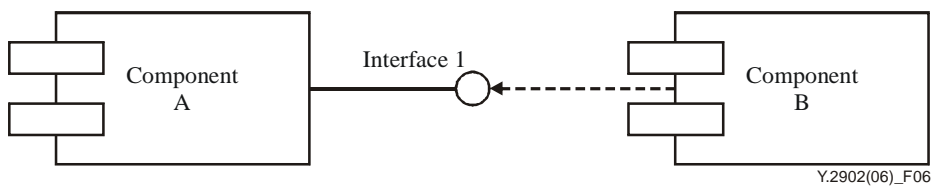Component A   Interface 1   Component B

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Figure 6 – Relationship (Example)

Figure 6 shows that component A implements (or exports) interface 1 and that component B uses (or imports) this interface.

- Components can implement multiple interfaces and use multiple interfaces.
- Different components can implement the same interface.

A more extensive figure that shows all the modelling elements described above is shown in Figure 7:
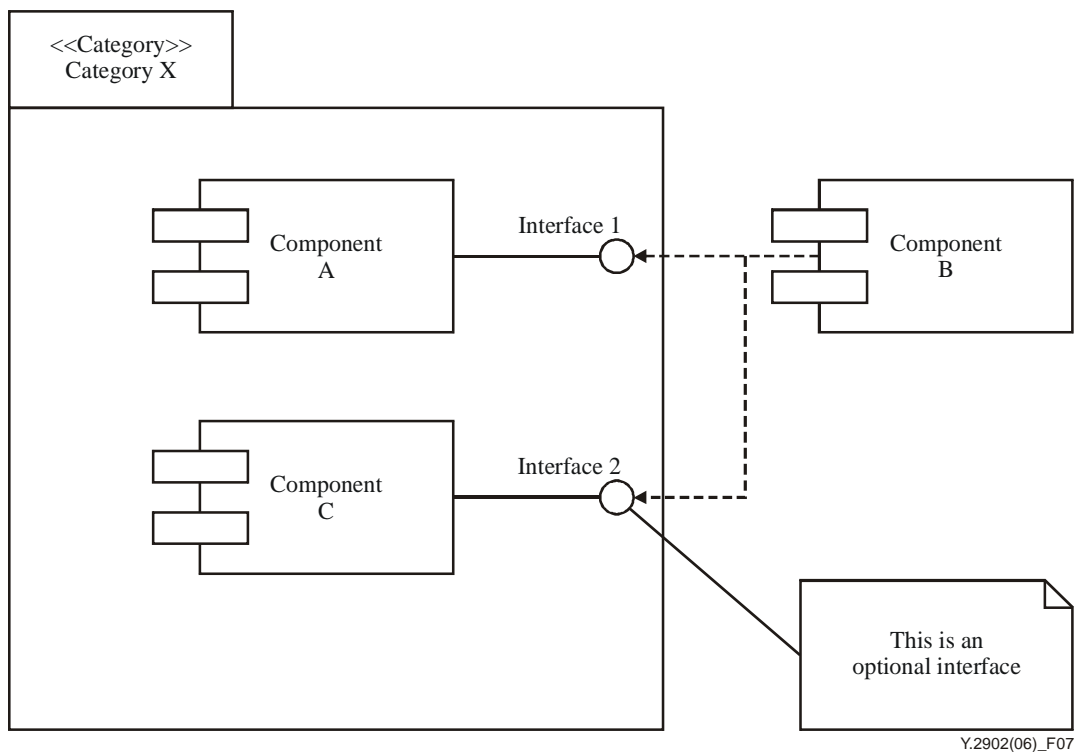

Figure 7 – Relationships (Example)

Figure 7 shows that components A and C are part of CGOE category "X" and implement interfaces 1 and 2, respectively. Interface 2 is noted as being "optional" (this example is for didactic purposes only and no meaning is ascribed here to the term "optional"). Component B uses interfaces 1 and 2.

6   CGOE components

This Recommendation defines CGOE components which align with the categories of the CGOE reference model. Each CGOE component is defined by:

•   A category which ties it to the CGOE reference model.

•   Programmatic interfaces used and exported.

        (These interfaces typically reference existing standards or, should it be impossible to identify an interface standard because none exists, they identify gaps in the set of relevant existing standards.)

•   Internal functional properties which describe what a component *does* beyond that which the interfaces describe. These properties may also be the subject of standards or gaps in standards.

•   Non-functional properties. These are properties that are expected to be documented by the provider of a component instance (see definitions).

NOTE – To foster the CGOE operating environment and to limit the number of types of interfaces that must be supported by CGOE components, an attempt is made to limit the number of interface types to be supported when there is a set of different interfaces that could be used.

In some instances, it will be determined that standards do not exist for a particular interface type. In those instances, it may be appropriate to initiate a work item within the ITU-T to develop the standard for this interface or to identify this specification shortcoming to another standards development organization.

As the number of CGOE components will increase over time, this Recommendation has been structured to allow addition of defined CGOE components without requiring the need to re-approve the entire Recommendation when a new CGOE component is to be added. In that regard, each CGOE component that is presented will be added as an annex to this Recommendation. Thus, on a going forward basis, an unlimited number of CGOE components may be added to this Recommendation. This Recommendation also provides the methodology that should be followed when identifying and adding new CGOE components.

7 CGOE framework

The CGOE framework can be viewed at several levels of scale or detail. At the least detailed level, Figure 8 categorizes the technology usage and basic functions.
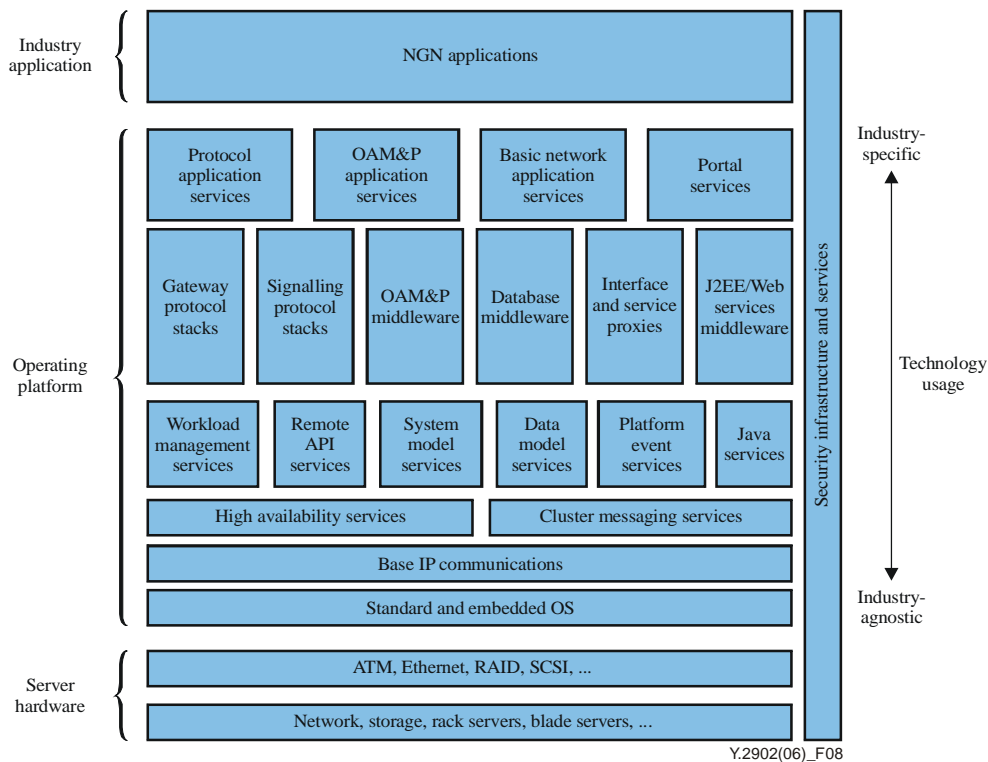
Figure 8 – Carrier grade open environment reference model

At an intermediate level, Figure 9 illustrates how a subset of CGOE components could be presented using an interface-oriented view of the CGOE categories and collecting the CGOE components into categories. At this level only the major interfaces (which fall into the first category defined above) are exposed and the interfaces used by components within a category are hidden, as well as the interfaces that allow interaction with the operating system. The illustration also does not present the external non-programmatic interfaces (like protocols). The network of interfaces to these CGOE components defines the relationships between the components. Further, when a particular CGOE component is selected, e.g., logging, all other CGOE components out of the CGOE reference model should use the interfaces exported by this component, as appropriate.

Also the CGOE reference model may be used to engage other ITU-T Study Groups or other standards development organizations on gaps in their specifications for standards and interfaces and to stimulate creation of a comprehensive eco-system of COTS components that satisfy NGN services.

This intermediate level of definition can be used to navigate the CGOE. For example, consider the "OAM&P middleware" component:

• It uses the "requests" interface of the "HTTP" component. The detailed HTTP component description contains the programmatic interface, the external interactions, etc.

• It abstracts the variety of access mechanisms (HTTP, FTP, SNMP) and presents a "query" interface to other CGOE components and to the application. The detailed OAM&P middleware component description explains how this is done.

This Recommendation is a (mostly) *technology independent* example use of the CGOE framework. The programmatic interfaces could be expressed in any computer language, e.g., JAVA or C++. The detailed component descriptions reference standards for specific instances of these interfaces.

Figure 9 – Example usage of the CGOE component framework

At the most detailed level, each individual component can be examined and each interface, functional property, and non-functional property exposed.

8 Security considerations

Although there is no security consideration detailed here, each associated annex will contain the necessary security considerations.

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