

# **Carrier Grade Middleware PROFILE**

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## 1. PURPOSE

The SCOPE alliance was established early in 2006 to foster the growth of the carrier grade base platform COTS supply chain ecosystem. The carrier grade base platform includes Carrier Grade hardware, operating systems, and middleware. One obstacle in the development of commercial carrier-grade base platforms has been the multitude of options in the open specifications that define them resulting in fragmentation, increased cost and delayed product availability. SCOPE defines profiles that describe the options and features of the underlying specifications that the Alliance considers to be necessary and sufficient in implementing Carrier Grade Base Platforms.

This document covers the Carrier-Grade Base Platform Middleware as defined in the SCOPE reference architecture [3] and in SA Forum documentation [1]. This does not include the hardware interfaces such as HPI. SCOPE carrier-grade middleware also does not include application services such as databases or application servers.

For the sake of clarity, the terms “middleware”, “service”, “component” and “application” as used in this document will, to the extent possible, be consistent with the SA Forum usage of the terms:

- Middleware – carrier-grade base platform middleware as defined in [3]. This contains platform-level services such as support for service availability, but not application services such as databases or application servers.
- Component - represents a set of resources including hardware and software resources. It is realized by processes. [1]
- Application – Aggregates components to provide a higher level of service [1]
- Service –refers to the SAF high-level services (CLM, CKPT, EVT, MSG, LCK, NTF, LOG, and IMM) [1].
- Service availability - refers to the ability of the user community to access the services of a system, whether to submit new work, update or alter existing work, or collect the results of previous work with a certain likelihood. (adapted from [6]). In this document, service availability implies carrier-grade availability, i.e., a high enough availability to fit a telecommunications system [5].

The baseline for this profiling is the SA Forum Release 2005 version B.02.01 from January 2006 [4].

## 2. AUDIENCE

This document is intended for the following audiences:

- Developers of carrier-grade service-availability middleware services
- Third-party component developers, suppliers, and consumers

- Developers, suppliers, and consumers of integrated product platforms that include the service availability layer
- Developers of service availability interface specifications.

The requirements for the two first sets are explicitly detailed in sections 6.1 and 6.2. The requirements for the third set are to be deduced from these.

### 3. REFERENCES

1. AIS Tutorial. Available at [http://www.saforum.org/press/presentations/AIS\\_Tutorial\\_final\\_Nov.pdf](http://www.saforum.org/press/presentations/AIS_Tutorial_final_Nov.pdf)
2. Application Interface Specification. Availability Management Framework. Service Availability Forum Application Interface Specification SAI-AIS-AMF-B.02.01.
3. SCOPE Technical Position Paper. Available at <http://www.scope-alliance.org/scope-technical-position.pdf>
4. Service Availability Interface. Overview. Service Availability Forum Application Interface Specification SAI-Overview-B.02.01
5. Wikipedia definition for Carrier Grade Linux. Available at [http://en.wikipedia.org/wiki/Carrier\\_Grade\\_Linux](http://en.wikipedia.org/wiki/Carrier_Grade_Linux)
6. Wikipedia definition for High availability. Available at [http://en.wikipedia.org/wiki/High\\_availability](http://en.wikipedia.org/wiki/High_availability).

### 4. INTRODUCTION

The Service Availability (SA) Forum is the primary organization specifying service-availability middleware interface specifications for the Network Equipment industry. The members of SA Forum include HW manufacturers, IT companies, NEPs and ISVs. Due to this broad spectrum of companies represented at the SAForum the resultant interface specifications contain many options and features either not necessary, redundant or not sufficient for use in carrier grade base platforms used by Network Equipment Providers. This profile presents the priorities that SCOPE members assign to the features defined within the SAF specifications.

Network Equipment Providers benefit from service-availability specifications in the following ways:

- The availability of open, specifications-compliant, carrier-grade middleware simplifies product development by reducing the need to develop, maintain, and test this functionality in a proprietary and vendor-specific manner
- These open specifications encourage competition and innovation in service availability middleware
- Heterogeneous components can be managed in a unified way and in particular SAF-compliant 3<sup>rd</sup> Party ISV content is easier to integrate into the HA environment of the target NEP product. Also, this allows for greater integration of standards-compliant and consistent products by solution providers.
- An ISV needs to adapt its third-party products only once to ensure proper behavior. This will reduce the cost of third-party product integration and also spread the

cost (lowering it) among all users rather than requiring the ISV to do specific adaptations for each existing HA system.

The carrier-grade middleware profile is based on the SA Forum specifications with emphasis on the Application Interface Specification (AIS - see [1]). It has two purposes:

- It ranks the SA Forum services that any carrier-grade middleware services implementation should have
- It records requirements for third-party applications and components that execute within a system that uses SAF compliant middleware.

The rationale for the second list of requirements is that a NEP that uses SAF-compliant software to control its network elements – start, stop, keep running, health check etc. - would also like to use the same system to control third-party applications/components as well.

The rankings and priorities provided in this profile are the consensus of the SCOPE Alliance companies. Since the ranking (“high/medium/low”) is a crude measure of the importance of a service in network elements, the short comments associated with each should be read along with the ranking.

For those services that were deemed most important, we went one step further and looked at the individual *features* and functions of each service. Most features that compose a given service also got the same ranking as the service overall; however, there are a few features that are considered to be less important than others, and these are detailed in section 8. Rather than publish the detailed matrix of features and associated rankings, we publish the priorities for those key functions that the ecosystem implementers suggested would be beneficial to qualify.

Besides the service ranking, the SCOPE Alliance has also identified missing features and services from the current service availability specifications and where additional specification effort might be of greatest value. These results (gaps) will be prioritized and published at a later date,

## 5. TERMS AND DEFINITIONS

<b>AIS</b>	Application Interface Specification (SA Forum term)
<b>AMF</b>	Availability Management Framework (SA Forum term)
<b>CKPT</b>	Checkpoint Service (SA Forum term)
<b>CLM</b>	Cluster Membership Service (SA Forum term)
<b>EVT</b>	Event Service (SA Forum term)
<b>HPI</b>	Hardware Platform Interface (SA Forum term)
<b>IMM</b>	Information Model Management Service (SA Forum term)
<b>ISV</b>	Independent Software Vendor
<b>LCK</b>	Lock Service (SA Forum term)
<b>LOG</b>	Log Service (SA Forum term)
<b>MSG</b>	Message Service (SA Forum term)
<b>NTF</b>	Notification Service (SA Forum term)
<b>NEP</b>	Network Equipment Provider
<b>SAF</b>	Service Availability Forum, <a href="http://www.saforum.org">http://www.saforum.org</a>

## 6. SAF SERVICE PRIORITIZATION

This section discusses the priorities for SAF specified services. Priorities for other SAF features are listed in section 8 .

A challenge in this kind of work is that the results tend to indicate that most features are very important. Since the useful information for the target audience of this document is the identification of non-essential features, we have used the following ranking:

- **High** – An essential, non-negotiable feature or function that must be supported. Most, if not all, telecommunications applications require this functionality.
- **Medium** – A differentiating feature or function that is necessary and/or useful but it is possible to develop systems without it.
- **Low** – There is currently no need for this feature or function.

A related issue in priorities is their interdependence: if there is a high-priority feature that is tied to another in such a way that using them separately is not feasible, then most of the time both features have been marked as high priority. When, in our judgment, a feature can be implemented using the capabilities of another feature, but it is feasible to do the implementation in some other way also, then these kinds of features can have independent priorities.

Service availability specifications have two distinct sets of consumers with unique perspectives: (1) producers of service availability middleware services, and (2) third-party application and component vendors.

The first set of consumers defines the priority, from the NEPs' perspective, of developing telecommunication applications (i.e., the priority of the services required for NEP application development). This includes both stand-alone middleware software component makers and companies that produce carrier-grade platforms including hardware, operating system, and carrier-grade middleware.

The second set of consumers recognizes that third-party applications and components use HA middleware but, more importantly, their components should also be manageable using the same mechanisms as the 'native' components. This classification defines the priority of the SAF services from the perspective allowing the NEPs to integrate 3<sup>rd</sup> Party applications and components.

The associated priorities from each of these perspectives are discussed in the next two sections.

### 6.1 Requirements for carrier-grade service availability middleware services

The priorities for SAF services for service availability middleware components are as below.

**High:** AMF, IMM, CLM, NTF

**Medium:** LOG, EVT, CKPT, MSG

**Low:** LCK

The core services AMF, IMM, and CLM are obviously the most important, with NTF almost as important. Hence, these are the high priority group.

The medium group consists of LOG, EVT, CKPT, and MSG. LOG and EVT are important because having these unified system-wide services is important. However, if existing source code is not built to use them, converting it can be a difficult task.

CKPT is a core service, but the current specification does not match telecom application requirements well.

MSG has currently defined characteristics which make it difficult to implement so that it would meet the stringent performance requirements of telecom applications. MSG as it is currently specified has some important use cases but, additionally, a need exists for another messaging system with less strict persistence requirements but higher performance. This is currently realized in a NEP-specific, proprietary implementation.

LCK is unanimously the least important.

## **6.2 Requirements for third-party components and applications in SAF-compliant highly available systems**

For prioritizing the requirements for third-party components in highly available systems, the principle has been the following:

- Requirements that are needed to manage the component or application with a SAF-compliant management system are 'high'
- Requirements that would benefit the component user, as well as the component maker, but that are not absolutely necessary are 'medium'
- The features that merely help bring down the cost of component development are 'low'

The results are as follows.

**High:** AMF, IMM, NTF

**Medium:** LOG

**Low:** MSG, CKPT, CLM, LCK, EVT

For IMM, it is important that configuration data can be in an IMM-compliant format, not that a third-party component can be managed through IMM compliant interfaces.

EVT is very similar to MSG in the sense that it is only a carrier for unstructured information.

## 7. PRIORITIZATION OF REDUNDANCY MODELS

The SA Forum's Availability Management Framework specification defines a number of different redundancy models. The most useful ones are 'No redundancy', and N+M, with 2N nearly as useful. N-Way was ranked important mainly because the future Java support will use that model. The N-Way Active model is not used as much.

**High:** No redundancy, N+M, 2N, N-Way

**Medium:**

**Low:** N-Way Active

"No redundancy" and 2N are on the high list because they are so fundamental and also the easiest to implement.

## 8. SOME LOW OR MEDIUM PRIORITY FEATURES

### 8.1 Service group redundancy models

The "auto-adjust" option is less important than the others. This option allows to set preferences on where services instances run, so that when a higher-ranked service unit becomes available, service instances are transferred back to it (see SAI-AIS-AMF-B.02.01 p. 72).

### 8.2 Component monitoring

Component-invoked internal active monitoring has low priority. Currently, a component is allowed to dynamically start and stop a specific health check [2, .p.159]. The ability of a component to influence its own monitoring is a low priority – in fact, it should not be possible at all.

## 9. CONCLUSION

The real value of any standard is not in the specification itself, but in implementations of the specifications and the usage of them in commerce. By providing guidance on the priorities of middleware services, redundancy models and certain features, the SCOPE alliance hopes to accelerate the availability of robust and workable implementations of the SA Forum specifications. This document is a first step in that direction, with more guidance on gaps in the specification to come.