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Data as a service (DaaS) application programming interface (API) design and implementation

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Contents

Page

CLAUSES

ANNEXES

TABLES

Page

FIGURES

Foreword

This Technical Reference was prepared by the Data as a Service Application Programming Interface Working Group (DaaS API WG) of the Cloud Computing Standards Coordinating Task Force (CCSCTF) under the direction of the Information Technology Standards Committee (ITSC). The ITSC endorsed the TR on behalf of the Singapore Standards Council on 22 February 2013.

In recent years, there has been an increasing demand for web and mobile-based applications that provide value-added services on top of data provided by one or more third-parties. The demand is so strong that these applications have proliferated despite practical issues inhibiting the provision and usage of such data. Specifically, the interoperability of these data services and also the discoverability and accessibility of data assets could be improved. Improvements in these areas would reduce the cost and effort involved in the implementation, operation and adoption of such data services.

This Technical Reference aims to define principles and establish guidelines that would alleviate the practical issues outlined above. Facilitating data access and promoting interoperability amongst DaaS providers can improve productivity and the quality of the applications and related services. This would mean that consumers and the public potentially enjoy better and more value-added applications and services.

This Technical Reference is not to be regarded as a Singapore Standard. This Technical Reference is made available for provisional application over a period of two years, but does not have the status of a Singapore Standard. The aim is to use the experience gained to modify the Technical Reference so that it can be adopted as a Singapore Standard. Users of the Technical Reference are invited to comment on its technical content, ease of use and any ambiguities or anomalies. These comments can be submitted using the feedback form provided at the end of the Technical Reference and will be taken into account in the review of the publication. At the end of the two years, the Technical Reference will be reviewed by the WG to discuss the comments received and to determine its suitability as a Singapore Standard. Submission for approval by the Singapore Standards Council as a Singapore Standard will be carried out only upon agreement after review.

In preparing this TR, reference was made to the doctoral dissertation by Roy Thomas Fielding on "Architectural Styles and the Design of Network-based Software Architectures" (University of California, Irvine, 2000). Annex B – 'Implementation checklist' was contributed by the Infocomm Development Authority of Singapore (IDA).

Acknowledgement is made for the use of the information from the above documents.

Attention is drawn to the possibility that some of the elements of this Technical Reference may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

Technical Reference for Data as a Service (DaaS) Application Programming Interface (API) design and implementation

0 Introduction and objectives

0.1 Introduction

Data as a Service (hereafter referred to as DaaS) allows organisations to share, commoditise or monetise data as an on-demand service. Users may then, directly or through applications, analyse, process, combine and present these data as information or as part of other value-added services.

In the DaaS model, data is packaged and delivered as specific records, a collection of records, hypermedia links, or as a combination of records and hypermedia links in response to a received query. These data services are made available on-demand over a network, usually an open network, such as the Internet. DaaS allows users to access the data without need for a proprietary system or software.

DaaS makes use of HTTP operations to allow users to interact with the data using operations such as Create, Read, Update, and Delete (CRUD). The use of open standards such as HTTP, XML and JSON helps to encourage the proliferation of applications that make use of the data provided.

Low barriers to entry and typically low payloads for transporting data in discrete elements via DaaS means that as long as a data consumer is connected to the Internet, data resources may be accessed via a variety of devices. These devices can have varying computational power, ranging from web browsers on desktop computers to mobile phones, tablets, etc.

DaaS providers commoditise their data by creating virtual storefronts to offer data packaged in an API that is independent from the physical system or repository where that data resides. Figure 1 depicts end users and application developers using DaaS APIs to access datasets from DaaS providers. To encourage use of these data assets, DaaS providers should ensure that the APIs they provide facilitate easy implementation and maintenance.

This Technical Reference (TR) recommends a set of best practices in the implementation of data APIs. It also includes an example of how an API for a DaaS site shall be documented (see Annex A) as well as an implementation checklist (see Annex B.) These recommendations and supporting documentation are designed to give developers or independent software vendors (ISVs) as much agility as possible when rolling out new services, and ensuring that these services can easily be maintained even as changes are made to source datasets.

NOTE – The websites and URIs given as examples in the TR are fictitious, and are referenced solely for the purposes of illustrating the recommendations.

0.2 Objectives

The objective of this Technical Reference is to define a set of best practices in the design and implementation of APIs. Standardisation, where possible, will help cut down on complexity. It will lower entry barriers for the implementation of new services, especially those that use a mash-up of data across multiple DaaS providers. The recommendations in this Technical Reference aim to:

- reduce the variations in the design principles and mechanisms in DaaS APIs;
- simplify data access, particularly across multiple DaaS providers, through the adoption of standardised DaaS APIs;
- address architectural issues arising from implementing multi-party client-server interactions over open and unreliable networks.

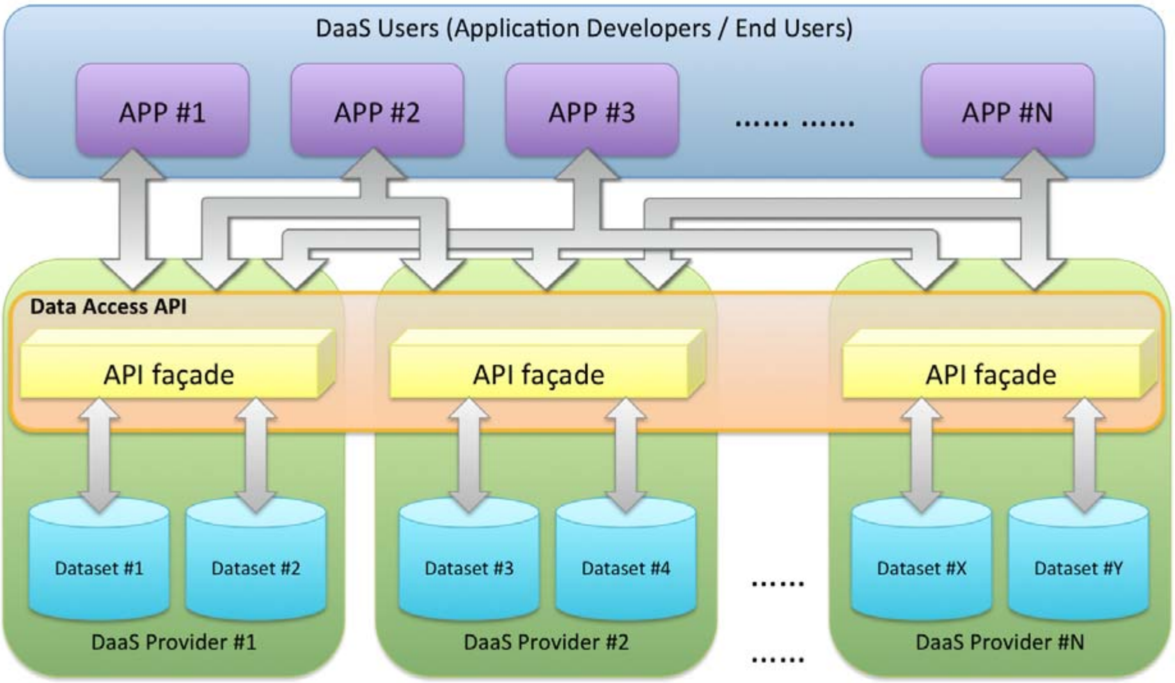

Figure 1 – DaaS interactions

1 Scope

The TR will articulate the technical issues affecting the provision and usage of data services from the perspective of both DaaS providers and data consumers. It will:

- provide guidelines for the design of data APIs and access protocols that are in line with best practices as identified by the working group;
- provide recommendations and technical references for the implementation of such Data APIs and protocols;
- suggest best practices for delivering synchronous data access. Asynchronous access types are not within the scope of this TR;

This TR will not address social-political issues such as privacy and intellectual property protection as they are not within the scope defined by the working group.

2 Normative references

The following referenced documents are indispensable for the application of this standard. The latest edition of the referenced document (including any amendments) applies.

IETF RFC 2616	Definition of HTTP/1.1 protocol.
IETF RFC 2617	Standards for HTTP authentication.
IETF RFC 3986	Syntax for Uniform Resource Identifier (URI)
IETF RFC 6749	The OAuth 2.0 Authorisation Framework
IETF RFC 6750	The OAuth 2.0 Authorisation Framework: Bearer Token Usage