Usage Measurement Model
for Connected Television

DRAFT A
30 June 2010

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Revision History

Rev.	Date	Author	Comment
DRAFT A	30/06/10	BBC	Initial draft.

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1 Introduction

1.1 Context

Usage measurement relates to the collection of information about the discovery and consumption of content and services.

Collection of usage data is valuable to content providers as it allows them to optimise their services for maximum benefit. Collection of usage data can also be advantageous for the viewer as it can be used to optimise their experience, e.g. tailored recommendations.

In some cases usage data can be collected in an anonymous manner – tied to a particular device but not an individual or location.

In other cases usage data can be linked to a known individual(s), forming part of a controlled demographic. Due to the management overhead, this is normally based on a sample of the overall audience.

The scope of usage measurement includes:

- **Linear service consumption (broadcast & IP delivery)**
- **On Demand consumption (IP, timeshift and DVR)**
- **Application consumption, including user interface interaction**

This specification describes a model to support all these modes of operation.

1.2 An Evolving Landscape

The current free-to-air broadcast environment in the UK relies on BARB for official television viewing figures. The BARB methodology is based on capturing the usage from a known sample, scaling this to provide an indication of the viewing patterns of the audience as a whole. Reports based on these measurements are released to content providers daily providing them with insight into the popularity of their content.

The migration to a connected television environment greatly increases the complexity of the environment:

- The same item of content can be available from more than one source and reliably being able to determine which will be crucial to understanding viewer behaviour.

- Given the huge increase in the volume of content on offer – enabled by IP delivery - knowing how content is discovered will enable crucial optimisation of user interfaces.

- Applications will become an increasingly used content format and knowing how they are used will allow for the refinement of existing and inform the development of new services.

To satisfy the needs of this evolving environment a more fully featured and adaptable usage measurement capability will be required.

2 Usage Environmental Model

2.1 Overview

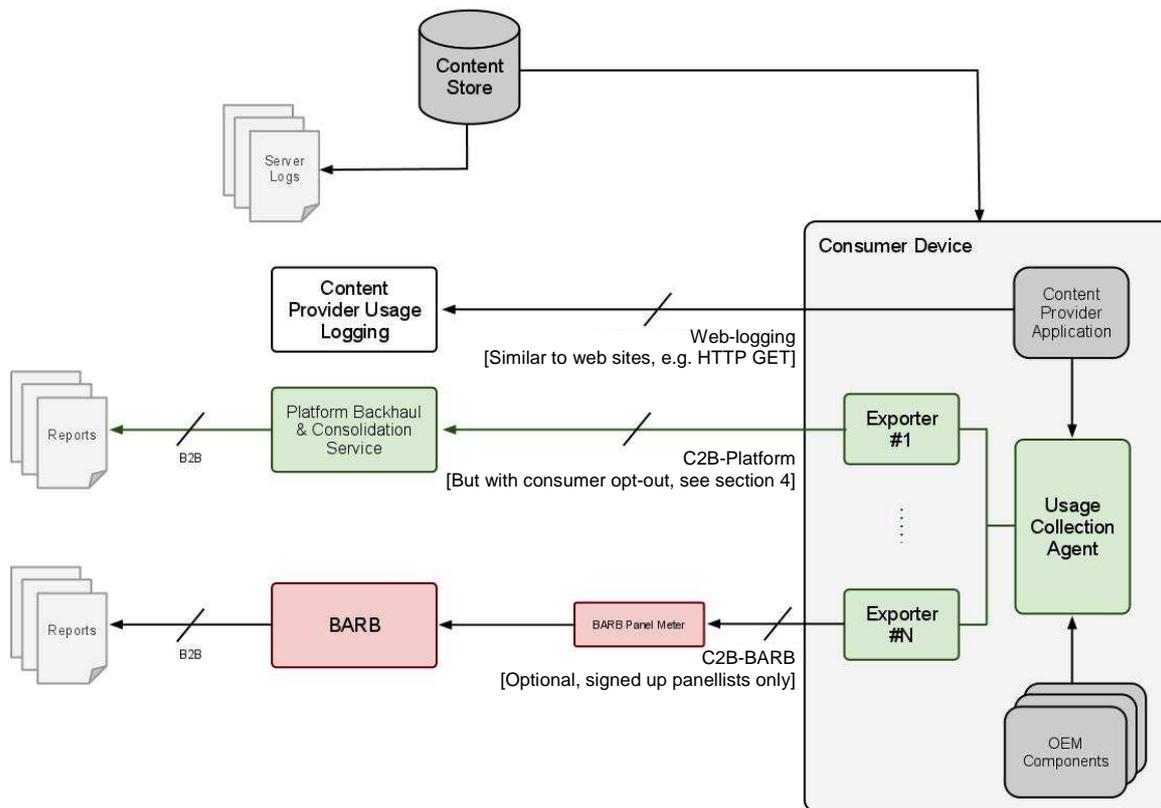Figure 1 below illustrates the usage environment the consumer device inhabits.

Figure 1: Usage environment

2.2 Usage Measurement by a Content Provider

In this environment, it is assumed that a Content Provider application running on the device is able to access remote servers via the IP network. The requests it makes for media and other data can be logged by the server. These logs can be used by a content provider to understand how their content and services have been used.

An issue with this approach is the immediacy with which such logs are accessible to the content provider, particularly if a third party is being used for content distribution.

Where more immediate logging is required the content provider can build functionality into their own application, which can log usage immediately to a server under its direct control, e.g. using a simple HTTP GET.

The presence of any platform centric usage capture system does not prevent the logging of usage measurements directly by a Content Provider's application to an HTTP endpoint of their own.

2.3   Usage Measurement by the Platform Operator

For an individual content provider's portal the methods described in the previous section can be very effective. However:

- They do not readily provide a view over all content providers, which can be advantageous for tailoring viewer experience.

- The approach adopted by different content providers can vary, making reporting across multiple content providers difficult.

- They do not cover the usage of a device beyond an individual content provider's portal, e.g. the DVR functionality of a device.

- Content providers are not always able to measure or use complex network management data.

Hence, there is a need for a platform centric usage measurement capability.

At the heart of this capability is a Usage Collection Agent, which is a central point for the capture of device usage. Associated with this are one or more Exporters, which manage the export of a sub-set of usage data to a known end-point as a Usage Record. Exporters can be independently configured to export different sub-sets and to do this according to different export patterns, e.g. daily, every Sunday, every 15 minutes, at 2am. These elements are described more fully in section 3.

The end-point for an Exporter will typically be a server in the network. *The implementation of this is outside the scope of the present document.* However, typical functionality may include:

- Authentication and verification of received Usage Records to avoid spoofing by third parties.

- Reconciliation of usage data with local information not available to the consumer device.

- Aggregation and filtering of usage data from different consumer devices as required for report generation, e.g. across the audience by content provider, by day etc.

3   Usage Collection Agent and Exporters

3.1   Core Functionality

The Usage Collection Agent resides on the consumer device and logs usage information generated by content provider applications running on the device and OEM components providing low-level functionality, e.g. AV playback.

The benefit of having the UCA is that it allows both these sources of usage data to be merged for backhaul in a common manner. It also hides the detail of usage data filtering and export from the individual usage sources. This allows the number and nature of exports to be more easily changed over time.

> *Logging of usage by a content provider application is based on the use of a well defined API.*

> *Logging of usage by an OEM component is via an interface that is internal to the consumer device and hence private to the consumer device implementation.*

Associated will be one or more Exporters. Each Exporter should be independently configurable to the requirements of the relevant backhaul target. This includes:

- The export pattern, e.g. daily, weekly, every 15 minutes, at 2am.

- The sub-sets of usage data to export.

- The export format, e.g. plain-text, XML.

- The physical interface for the export, e.g. IP network, USB etc.

- The backhaul target location, e.g. URL.

- Any security measures, e.g. authentication.

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Whilst the best case for the device is the immediate backhaul of usage data as soon as it is generated, such an approach is likely to present scalability challenges to the backend systems as the platform install base grows over time.

Instead it may be more practical for the backhaul to occur at a more periodic rate, controlled by a configuration setting held in the common configuration for the device. This can then be adjusted as the number of devices increases. Other techniques can be used to stagger when the backhaul occurs, further reducing the load on backend infrastructure.

It may also be necessary for a particular Exporter to have more than one combination of these patterns, e.g. export some usage data as soon as it is logged by the UCA and the remainder once an hour.

So, for example, on a device in a BARB panellist's home there would be 2 active Exporters, one that exports to the platform operator's servers in the network and one that exports to a BARB Panel Meter in the home.

Exporters are sand boxed from each other and shall only be able to access usage data via the UCA. This ensures that there is a control point for what usage data can go outside of the consumer device – for example, in the case of a device in a BARB panellist's home it is vital to the integrity of the reports generated by BARB that their panellists remain anonymous. It also ensures that third party applications are not able to directly influence what gets exported.

> *Note: The definition of individual Exporters will typically be private to a particular situation. However, there may be benefit in standardising the core characteristics for both a platform operator Exporter and a BARB Exporter due to the likelihood of their presence in a number of connected television solutions. Illustrative Exporter definitions for these are defined in Annex A.*

3.2   Configuration Management

The export requirements for individual backhaul targets are certain to evolve over time and the usage measurement system needs to be able to respond to this. It should be possible for the platform operator to change the configuration for a particular Exporter across the population of devices on the platform without requiring a full software upgrade for the device.

4   Privacy Considerations

As with any situation where data is to be collected, issues of trust and the privacy of the individual is an important consideration.

For those viewers who simply decided that they do not which to provide any usage measurement data a configuration option on the device may be provided which will effectively turn off all export of usage data.

This configuration option should be present in an easily navigable set-up menu for the device, and should not be a one-time only option, i.e. ability for the viewer to turn on measurements at a later date.

The management of usage data once it has been backhauled is beyond the scope of the present document.

The implementation of usage measurement on the consumer device must ensure that third party applications can not gain access to the temporarily stored usage data contained on the device.

Annex A.1 Illustrative Exporter Definition: To Platform Operator

The backhaul target for the Exporter will almost certainly be a server in the network. Given the potential traffic volumes it is sensible to allow commodity web-serving infrastructure to be exploited, and hence use HTTP for the export protocol.

Avoiding having to protect the Usage Records during backhaul will reduce both the client and server side processing. This should be possible with careful control over what gets exported.

Even where the usage data is not protected during the backhaul, it is likely that it will be necessary to authenticate and verify received Usage Records to avoid spoofing attacks. This could be achieved by hashing and signing the Usage Record, say using a device certificate.

The format for the Usage Record could be XML or CSV, with the latter more bandwidth efficient.

Annex A.2 Illustrative Exporter Definition: To BARB Panel Meter

This section will be added in a future revision of this specification.

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