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## 最新评论

[1. Re:BMP格式详解](#)

感谢博主，对最后一句话也有感触。想了想，bmp的设计者是对

## AMF解析之数据类型定义 (转)

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# OpenRTMFP/Cumulus Primer (15) AMF解析之数据类型定义

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- Blog: [Blog.CSDN.net/Poechant](#)
- Date: April 24<sup>th</sup>, 2012

## 1 数据类型

各种数据类型的标示都在 AMF.h 中定义为宏

```
#define AMF_NUMBER           0x00    // 浮点数
#define AMF_BOOLEAN         0x01    // 布尔型
#define AMF_STRING          0x02    // 字符串
```

的，当处理图像算法的时候，需要坐标，如果做一个Y方向朝下为正的坐标系，不符合数学的习惯，更不好处理。这样看坐标系，其实更合理。最近我就需要做类...

--邢焕平

2. [Re:BMP格式详解](#)

我转载了这篇文章以作记录，链接是，如果不方便转载，请及时通知我。

--guol1003

3. [Re:BMP格式详解](#)

So great，看过之后对bmp了解很深刻。

--guol1003

4. [Re:C++ 获取特定进程的CPU使用率<转>](#)

感觉不是很准确

--小念之歌

5. [Re:MFC 打开外部EXE文件的三种方法](#)

楼主，请问在用上面哪个函数别人的工具，并且能够运行别人工具上的开始按钮呢？

--lwei2

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- [5. !\[rejected\] master -> master \(non-fast-forward\)\(3\)](#)

```
#define AMF_BEGIN_OBJECT      0x03    // 对象，开始
#define AMF_NULL              0x05    // null
#define AMF_UNDEFINED         0x06
#define AMF_REFERENCE         0x07
#define AMF_MIXED_ARRAY       0x08
#define AMF_END_OBJECT        0x09    // 对象，结束
#define AMF_BEGIN_TYPED_OBJECT 0x10
#define AMF_STRICT_ARRAY      0x0A
#define AMF_DATE              0x0B    // 日期
#define AMF_LONG_STRING       0x0C    // 字符串
#define AMF_UNSUPPORTED       0x0D

#define AMF_AVMPLUS_OBJECT    0x11
#define AMF_END               0xFF

#define AMF3_UNDEFINED        0x00
#define AMF3_NULL             0x01
#define AMF3_FALSE            0x02
#define AMF3_TRUE             0x03
#define AMF3_INTEGER          0x04
#define AMF3_NUMBER           0x05
#define AMF3_STRING           0x06
#define AMF3_DATE             0x08
#define AMF3_ARRAY            0x09
#define AMF3_OBJECT           0x0A
#define AMF3_BYTEARRAY        0x0C
#define AMF3_DICTIONARY       0x11
```

并定义了一个枚举类表示数据类型：

```
class AMF {
public:
    enum Type {
        Null=0,
        Boolean,
        Integer,
        Number,
        String,
        Date,
        Array,
        Object,
        ByteArray,
        Dictionary,
        RawObjectContent,
        End
    };
};
```

## 2 undefined Type

The undefined type is represented by the undefined type marker. No further information is encoded for this value.

## 3 null Type

---

The null type is represented by the null type marker. No further information is encoded for this value.

## 4 false type

---

The false type is represented by the false type marker and is used to encode a Boolean value of false. Note that in ActionScript 3.0 the concept of a primitive and Object form of Boolean does not exist. No further information is encoded for this value.

## 5 true type

---

The true type is represented by the true type marker and is used to encode a Boolean value of true. Note that in ActionScript 3.0 the concept of a primitive and Object form of Boolean does not exist. No further information is encoded for this value.

## 6 integer type

---

In AMF 3 integers are serialized using a variable length unsigned 29-bit integer. The ActionScript 3.0 integer types - a signed 'int' type and an unsigned 'uint' type - are also represented using 29-bits in AVM+. If the value of an unsigned integer (uint) is greater or equal to 2<sup>29</sup> or if the value of a signed integer (int) is greater than or equal to 2<sup>28</sup> then it will be represented by AVM+ as a double and thus serialized in using the AMF 3 double type.

## 7 double type

---

The AMF 3 double type is encoded in the same manner as the AMF 0 Number type. This type is used to encode an ActionScript Number or an ActionScript int of value greater than or equal to 2<sup>28</sup> or an ActionScript uint of value greater than or equal to 2<sup>29</sup>. The encoded value is always an 8 byte IEEE-754 double precision floating point value in network byte order (sign bit in low memory).

## 8 String type

---

ActionScript String values are represented using a single string type in AMF 3 - the concept of string and long string types from AMF 0 is not used.

Strings can be sent as a reference to a previously occurring String by using an index to the implicit string reference table.

Strings are encoding using UTF-8 - however the header may either describe a string literal or a string reference.

The empty String is never sent by reference.

## 9 XMLDocument type

ActionScript 3.0 introduced a new XML type (see 3.13) however the legacy XMLDocument type is retained in the language as `flash.xml.XMLDocument`. Similar to AMF 0, the structure of an XMLDocument needs to be flattened into a string representation for serialization. As with other strings in AMF, the content is encoded in UTF-8.

XMLDocuments can be sent as a reference to a previously occurring XMLDocument instance by using an index to the implicit object reference table.

## 10 Date type

In AMF 3 an ActionScript Date is serialized simply as the number of milliseconds elapsed since the epoch of midnight, 1st Jan 1970 in the UTC time zone. Local time zone information is not sent.

Dates can be sent as a reference to a previously occurring Date instance by using an index to the implicit object reference table.

## 11 Array type

ActionScript Arrays are described based on the nature of their indices, i.e. their type and how they are positioned in the Array. The following table outlines the terms and their meaning:

term	meaning
strict	contains only ordinal (numeric) indices
dense	ordinal indices start at 0 and do not contain gaps between successive indices (that is, every index is defined from 0 for the length of the array)
sparse	contains at least one gap between two indices
associative	contains at least one non-ordinal (string) index (sometimes referred to as an ECMA Array)

AMF considers Arrays in two parts, the dense portion and the associative portion. The binary representation of the associative portion consists of name/value pairs (potentially none) terminated by an empty string. The binary representation of the dense portion is the size of the dense portion (potentially zero) followed by an ordered list of values (potentially none). The order these are written in AMF is first the size of the dense portion, an empty string terminated list of name/value pairs, followed by size values.

Arrays can be sent as a reference to a previously occurring Array by using an index to the implicit object reference table.

## 12 Object type

A single AMF 3 type handles ActionScript Objects and custom user classes. The term 'traits' is used to describe the defining characteristics of a class. In addition to 'anonymous' objects and 'typed' objects, ActionScript 3.0 introduces two further traits to describe how objects are serialized, namely 'dynamic' and 'externalizable'. The following table outlines the terms and their meanings:

term	meaning
Anonymous	an instance of the actual ActionScript Object type or an instance of a Class without a registered alias (that will be treated like an Object on deserialization)
Typed	an instance of a Class with a registered alias
Dynamic	an instance of a Class definition with the dynamic trait declared; public variable members can be added and removed from instances dynamically at runtime
Externalizable	an instance of a Class that implements flash.utils.IExternalizable and completely controls the serialization of its members (no property names are included in the trait information).

In addition to these characteristics, an object's traits information may also include a set of public variable and public read-writeable property names defined on a Class (i.e. public members that are not Functions). The order of the member names is important as the member values that follow the traits information will be in the exact same order. These members are considered sealed members as they are explicitly defined by the type.

If the type is dynamic, a further section may be included after the sealed members that lists dynamic members as name / value pairs. One continues to read in dynamic members until a name that is the empty string is encountered.

Objects can be sent as a reference to a previously occurring Object by using an index to the implicit object reference table. Furthermore, trait information can also be sent as a reference to a previously occurring set of traits by using an index to the implicit traits reference table.

## 13 XML type

ActionScript 3.0 introduces a new XML type that supports E4X syntax. For serialization purposes the XML type needs to be flattened into a string representation. As with other strings in AMF, the content is encoded using UTF-8.

XML instances can be sent as a reference to a previously occurring XML instance by using an index to the implicit object reference table.

Note that this encoding imposes some theoretical limits on the use of XML. The byte- length of each UTF-8 encoded XML instance is limited to 228 - 1 bytes (approx 256 MB).

## 14 ByteArray

ActionScript 3.0 introduces a new type to hold an Array of bytes, namely ByteArray. AMF 3 serializes this type using a variable length encoding 29-bit integer for the byte- length prefix followed by the raw bytes of the ByteArray.

ByteArray instances can be sent as a reference to a previously occurring ByteArray instance by using an index to the implicit object reference table.

## 15 Usages of AMF3

### 15.1 NetConnection and AMF 3

In addition to serializing ActionScript types, AMF can be used in the asynchronous invocations of remote services. A simple messaging structure is used to send a batch of requests to a remote endpoint. The format of this messaging structure is AMF 0 (See [AMF0]). A context header value or message body can switch to AMF 3 encoding using the special avmplus-object-marker type.

### 15.2 NetConnection in ActionScript 3.0

The qualified class name for NetConnection in ActionScript 3.0 is `flash.net.NetConnection`. This class continues to use a **responder to handle result and status responses** from a remote endpoint, however, a strongly typed Responder class is now required. The fully qualified class name is **`flash.net.Responder`**. For events other than normal result and status responses NetConnection dispatches events for which the developer can add listeners. These events are outlined below:

event	operation
asyn cErr or	Dispatched when an exception is thrown asynchronously - i.e. from native asynchronous code.

event	operation
ioError	Dispatched when an input or output error occurs that causes a network operation to fail.
netStatus	Dispatched when a NetConnection object is reporting its status or error condition.
securityError	Dispatched if a call to NetConnection.call() attempts to connect to a server outside the caller's security sandbox.

To handle an AMF context header a suitable method needs to be available, matching the header name. NetConnection is now a sealed type so either it must be subclassed or an object with a suitable implementation needs to be set for the NetConnection client property.

### 15.3 ByteArray, IDataInput and IDataOutput

ActionScript 3.0 introduced a new type to support the manipulation of raw data in the form of an Array of bytes, namely flash.utils.ByteArray. To assist with ActionScript Object serialization and copying, ByteArray implements flash.utils.IDataInput and flash.utils.IDataOutput. These interfaces specify utility methods that help write common types to byte streams. Two methods of interest are IDataOutput.writeObject and IDataInput.readObject. These methods encode objects using AMF. The version of AMF used to encode object data is controlled by the ByteArray.objectEncoding method, which can be set to either AMF 3 or AMF 0. An enumeration type, flash.net.ObjectEncoding, holds the constants for the versions of AMF - ObjectEncoding.AMF0 and ObjectEncoding.AMF3 respectively.

Note that ByteArray.writeObject uses one version of AMF to encode the entire object. Unlike NetConnection, ByteArray does not start out in AMF 0 and switch to AMF 3 (with the objectEncoding property set to AMF 3). Also note that ByteArray uses a new set of implicit reference tables for objects, object traits and strings for each readObject and writeObject call.

### Reference

1. [AMF3] Adobe Systems Inc. "Action Message Format - AMF 3"

2. [AMF0] Adobe Systems Inc. "Action Message Format - AMF 0"

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