1. CITP protocol suite specification

1.1 History

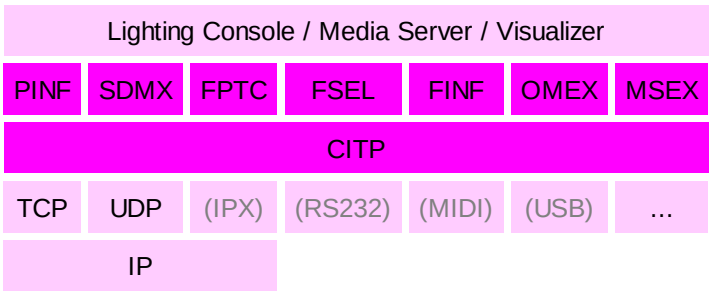
2007-09-16	Revised documentation into a single document.
2007-09-28	Added first comments for MSEX revision, highlighted in red.
2008-01-25	Cleaned up MSEX 1.1 changes for element libraries.
2008-05-28	Minor corrections and clarifications in MSEX.
2008-08-21	Completed MSEX element types 4 - 8, accompanied by the Generic Element Information packet.
2008-10-11	Added BSR E1.31 to the DMX connection strings table.
2008-11-08	Added first OMEX packet suggestions.
2009-02-14	OMEX packet suggestion update and general revision of the introduction section.

1.2 Introduction

The CITP (Controller Interface Transport Protocol) is a dual layer protocol suite that has been designed for communication between lighting consoles, media servers and visualizers. This document describes how it is used on top of an IP stack, but the packets could easily be used over other media as well, such as USB links.

The top layer, CITP, consists of a single message header with content information and support for fragmentation and stream synchronization. This message header is used in the beginning of all CITP protocol suite packets.

The second layer of CITP consists of the PINF, SDMX, FPTC, FSEL, FINF, MSEX and OMEX protocols. Each of these have been designed for a specific purpose, but some of them are closely related (such as FPTC, FSEL and FINF that all operate on a given set of lighting fixtures). Any manufacturer can extend the CITP protocol at the second layer level using a non-reserved layer identifier.



The layers of CITP and surrounding layers

1.3 Lighting console behaviour

Datagram (UDP) socket, port 4809, joined to multicast address 224.0.0.180:
- Regularly send a CITP/PINF/PLoc message with no listening port.
- Receive CITP/PINF/PLoc messages to be aware of available visualizers and media servers.
- Connect either automatically or on user demand to an available visualizer and/or media server.
- Receive CITP/MSEX/StFr Stream Frame video content from media server video subscriptions.

For all TCP connections to a media server:
- Receive CITP/MSEX/SInf Server information and CITP/MSEX/LSta layer status messages.
- Send CITP/MSEX/GELI Get Element Library Information message(s) and initiate element library update.

Request all libraries of relevant type to the media server in question (as identified by the CITP/PINF/PLoc Name field).
- Send CITP/MSEX/GVsr Get Video Sources message to retrieve information about available video feeds.

For all TCP connections to a visualizer:
- Send a CITP/SDMX/UNam Universe Name for each DMX universe controlled to provide display names.
- Either Send CITP/SDMX/ChBk Channel Block messages with DMX data,
- or Send a CITP/SDMX/SXSr Set External Source message to specify an alternative DMX transfer method.
- Receive CITP/SDMX/ChBk messages for "autofocus" purposes.
- Send and receive CITP/FPTC, CITP/FSEL and CITP/FINF messages when fit.

1.4 Media server behaviour

TCP listening socket on any (known) port:
- Accept incoming connections from any lighting console or visualizer.

Datagram (UDP) socket, port 4809, joined to multicast address 224.0.0.180:
- Regularly send a CITP/PINF/PLoc message containing the port on which the listening socket is listening.

For all accepted incoming TCP connections from a lighting console or visualizer:
- Send a CITP/MSEX/SInf Server Information message.
- Regularly send a CITP/MSEX/LSta Layer Status message.
- Receive and respond to CITP/MSEX element library browsing messages.
- Send CITP/MSEX element library information messages on library changes.
- Receive and respond to CITP/MSEX video stream browsing and subscription messages.

1.5 Visualizer behaviour

TCP listening socket on any (known) port:
- Accept incoming connections from any lighting console.

Datagram (UDP) socket, port 4809, joined to multicast address 224.0.0.180:
- Regularly send a CITP/PINF/PLoc message containing the port on which listening socket is listening.
- Receive CITP/PINF/PLoc message to be aware of available media servers.
- Connect either automatically or on user demand to an available media server.
- Receive CITP/MSEX/StFr Stream Frame video content from media server video subscriptions.

For all accepted incoming TCP connections from a lighting console:
- Receive CITP/SDMX/UNam Universe Name messages.
- Receive CITP/SDMX/ChBk messages with DMX data.
- Optionally support CITP/SDMX/SXSr messages and receive DMX data over other protocols.
- Send CITP/SDMX/ChBk messages for "autofocus" purposes.
- Send and receive CITP/FPTC, CITP/FSEL and CITP/FINF messages when fit.

For all TCP connections to a media server:
- Receive CITP/MSEX/SInf Server Information and CITP/MSEX/LSta layer status messages.
- Send CITP/MSEX/GVSr Get Video Sources message to retrieve information about available video feeds.

1.6 Device status / Operations management servers

Work in progress.

1.7 General IP notes and hints

PC based applications must choose listening ports and set socket address reusability flags as necessary to avoid blocking eachother when run on the same network interface. Achieve this by calling listen() for port 0 and retrieving the port chosen by the operating system with getsockname(), and by setting the SO_REUSEADDR (and possibly also SO_REUSEPORT) option on the multicast socket before joining the multicast address.

To join a multicast address, use setsockopt() with IPPROTO_IP and IP_ADD_MEMBERSHIP.

2. Definitions

These specifications target lighting software developers. It contains C style types and annotation, although mostly on a pseduo-code level.Data types

All structures and variables of CITP use little endian byte order (least significant byte first, "PC standard") and 1-byte packing of C-structures.

```
int8, int16, int32, int64       // 8-bit, 16-bit, 32-bit and 64-bit signed integers
uint8, uint16, uint32, uint64   // 8-bit, 16-bit, 32-bit and 64-bit unsigned integers
ucs1, ucs2                      // 8-bit and 16-bit unicode characters (character types
                                   correspond to uint8 and uint16)
float32                         // 32-bit IEEE floating point (8-bit exp., 23-bit mant.)
float64                         // 64-bit IEEE floating point (11-bit exp., 52-bit mant.)
```

Open arrays of ucs1 or ucs2 are null terminated strings.

2.1 Cookies

The Cookie (and ContentType) fields can be found in CITP headers in both layers. The constant values of these fields are documented using string notation, for instance “CITP” for the CITP header Cookie field. This should be interpreted as sending ‘C’,‘I’,‘T’,‘P’ over the network.

2.2 DMX Connection Strings

Instead of defining constants and fixed field for various DMX source protocols, a connection string approach is used instead. The following table illustrates well-defined DMX connection strings in CITP:

Protocol	Format	Examples
ArtNet	"ArtNet/<net>/<universe> /<channel>"	"ArtNet/0/0/1" - The first channel of the first universe on the first network.
Avab IPX	"AvabIPX/<net>/<universe> /<channel>"	"AvabIPX/0/0/1" - The first channel of the first universe on the first network.
BSR E1.31	"BSRE1.31/<universe>/<channel>"	"BSRE1.31/0/1" - The first channel of the first universe.
ETC Net2	"ETCNet2/<channel>"	"ETCNet2/1" - The first ETCNet2 channel.

3. CITP, base layer

The base layer as such does not define any packages, it merely adds a header that encapsulate all messages.

3.1 Header definitions

3.1.1 The CITP header

The CITP layer provides a standard, single, header used at the start of all CITP packets:

```
struct CITP_Header
{
    uint32      Cookie;                     // Set to "CITP".
    uint8       VersionMajor;               // Set to 1.
    uint8       VersionMinor;               // Set to 0.
    uint8       Reserved[2];                // 4-byte alignment
    uint32      MessageSize;                // The size of the entire message, including
                                               this header.
    uint16      MessagePartCount;           // Number of message fragments.
    uint16      MessagePart;                // Index of this message fragment (0-based).
    uint32      ContentType;                // Cookie identifying the type of contents
                                              (the name of the second layer).
};
```

4. CITP/PINF, Peer Information layer

The Peer Information layer is used to exchange peer information, both when connected and when locating peers on the network.

The PINF/PNam message was previousley broadcasted on UDP port 4810 but has now been deprecated. Instead, the PINF/PLoc message is multicasted on address 224.0.0.180, port 4809.

4.1 Header definitions

4.1.1 The PINF header

The PINF layer provides a standard, single, header used at the start of all PINF packets:

```
struct CITP_PINF_Header
{
    CITP_Header CITPHeader;    // The CITP header. CITP ContentType is "PINF".
    uint32      ContentType;   // A cookie defining which PINF message it is.
};
```

4.2 Message definitions

4.2.1 PINF / PNam - Peer Name message DEPRECATED - use PLoc instead

The PeerName message provides the receiver with a display name of the peer:

```
struct CITP_PINF_PNam
{
    CITP_PINF_Header  CITPPINFHeader;   // The CITP PINF header. PINF ContentType is "PNam".
    ucs1              Name[];           // The display name of the peer (null terminated).
                                           This could be anything from a
                                        // user defined alias for the peer of the name of the
                                           product, or a combination.
};
```

4.2.2 PINF / PLoc - Peer Location message

The PeerLocation message provides the receiver with connectivity information. If the ListeningTCPPort field is non-null, it is possible to connect to the peer on that port using TCP. The Type field instructs the receiver what kind of peer it is and the Name and State fields provide display name and information.

```
struct CITP_PINF_PLoc
{
    CITP_PINF_Header  CITPPINFHeader;     // The CITP PINF header. PINF ContentType is "PLoc".
    uint16            ListeningTCPPort;   // The port on which the peer is listening for
                                             incoming TCP connections. 0 if not listening.
    ucs1              Type[];             // Can be "LightingConsole", "MediaServer",
                                             "Visualizer" or "OperationHub".
    ucs1              Name[];             // The display name of the peer. Correspons to the
                                             PINF/PNam/Name field.
    ucs1              State[];            // The display state of the peer. This can be any
                                             descriptive string presentable to the user such
                                             as "Idle", "Running" etc.
};
```

5. CITP/SDMX, Send DMX layer

The SDMX layer is used to transmit DMX information. CITP supports transmitting a single - wide - universe of DMX channels with at most 65536 channels. It also supports designating an alternative DMX source such as ArtNet or ETCNet2 (see "connection strings" in the Definitions section).

5.1 Header definitions

5.1.1 The SDMX header

The SDMX layer provides a standard, single, header used at the start of all SDMX packets:

```
struct CITP_SDMX_Header
{
    CITP_Header CITPHeader;    // CITP header. CITP ContentType is "SDMX".
    uint32      ContentType;   // Cookie defining which SDMX message it is.
};
```

5.2 Message definitions: Transfer of DMX channel levels

5.2.1 SDMX / EnId - Encryption Identifier message

The EncryptionIdentifier message is used to agree on encryption schemes when transferring DMX channels. The usage of this message depends completely on the peers communicating it; the contents and results of this message is not part of the CITP specification - it must be agreed upon a priori.

```
struct CITP_SDMX_EnId
{
    CITP_SDMX_Header  CITPSDMXHeader;    // CITP SDMX header. SDMX ContentType is "EnId".
    ucs1              Identifier[];      // Encryption scheme identifier.
};
```

5.2.2 SDMX / UNam - Universe Name message

The Universe Name message can be sent by a DMX transmitting peer in order to provide the other end with a displayable name of a universe.

```
struct CITP_SDMX_UNam
{
    CITP_SDMX_Header  CITPSDMXHeader;    // CITP SDMX header. SDMX ContentType is "UNam".
    uint8             UniverseIndex;     // 0-based index of the universe.
    ucs1              UniverseName[];    // Name of the universe.
};
```

5.2.3 SDMX / ChBk - Channel Block message

The Channel Block message transmits raw DMX levels to the recipient. How to handle Blind DMX levels is up to the recipient, but the recommended procedure for a visualizer is to switch over to blind DMX whenever such is present and to revert back after some short timeout when it is no longer transmitted.

```
struct CITP_SDMX_ChBk
{
    CITP_SDMX_Header  CITPSDMXHeader;    // CITP SDMX header. SDMX ContentType is "ChBk".
    uint8             Blind;             // Set to 1 for blind preview dmx, 0 otherwise.
    uint8             UniverseIndex;     // 0-based index of the universe.
    uint16            FirstChannel;      // 0-based index of first channel in the universe.
    uint16            ChannelCount;      // Number of channels.
    uint8             ChannelLevels[];   // Raw channel levels.
};
```

5.3 Message definitions: Alternate DMX source management

5.3.1 SDMX / SXSr - Set External Source message

The Set External Source message can be sent as an alternative to section 2 above, when DMX should be tapped from another protocol on the other end.

```
struct CITP_SDMX_SXSr
```

```
{
    CITP_SDMX_Header  CITPSDMXHeader;       // CITP SDMX header. SDMX ContentType is "SXSr".
    ucs1              ConnectionString[];   // DMX-source connection string. See DMX
                                               Connection Strings in Definitions.
};
```

6. CITP/FPTC, Fixture patch layer

The Fixture Patch layer is used to communicate fixture existence and patch information. Fixtures are identified by 16-bit unsigned integeres with a range of valid values between 1 and 65535. In most consoles this value maps directly to a "Channel", "Unit" or "Device".

The FPTC layer is built on the following design decisions:

- Unpatched fixtures do not exist from the FPTC layers's point of view. When a fixture is unpatched using the UnPatch message, it is deleted and seizes to exist. However, the fixture may continue to live in the visualizer or the console, without association to a universe. Whenever the fixture is associated with a universe again, it is reintroduced through the Patch message.
- When a fixture is repatched (ie moved to another channel or universe) it does not pass through an unpatched state.
- In the visualizer, it may possible to change the mode of a fixture. Different modes for one fixture usually use different amounts of channels, however sometimes a different mode only changes the interpretation of one or more control channels. When a mode is changed in the visualizer, an unpatch message is not sent, only a new patch message. If the new mode consumes a different amount of channels, this can be told by the ChannelCount field of the patch message. If it does not, there is no way of telling.
- A fixture can change its patch and mode, but never its make or name. The visualizer attempts to map the fixture make and name against its library.
- Fixture identifiers must be persistent. When both the visualizer and the console have reloaded a pair of matching projects, the fixture identifiers must still be the same.
- When a project is closed on either side, fixtures are not unpatched. The same applies to when a universe in the visualizer is deleted or unassociated with a console.
- No synchronisation mechanism exists in CITP, which communicates project closing/opening information. This must be handled by the user by opening and closing matching projects simultaneously.
- When the visualizer or console takes automatic actions as a result of incoming patch messages, it must not result in an echo.

6.1 Header definitions

6.1.1 The FPTC header

The FPTC layer provides a standard, single, header used at the start of all FPTC packets:

```
struct CITP_FPTC_Header
{
    CITP_Header CITPHeader;    // The CITP header. CITP ContentType is "FPTC".
    uint32      ContentType;   // A cookie defining which FSEL message it is.
    uint32      ContentHint;   // Content hint flags.
                               // 0x00000001    Message part of a sequence of messages.
                               // 0x00000002    Message part of and ends a sequence of
                                                messages.
};
```

6.2 Message definitions

6.2.1 FPTC / Ptch - Patch message

Patch messages are sent when fixtures are introduced or repatched. The patch message contains the identifier of the fixture added, the sender fixture (library) type make and name of the fixture added and the patching information..

```
struct CITP_FPTC_Ptch
{
    CITP_FPTC_Header  CITPFPTCHeader;      // The CITP FPTC header. FPTC ContentType
                                              is "Ptch".
    uint16            FixtureIdentifier;   // Fixture identifier.
    uint8             Universe;            // Patch universe (0-based).
    uint8             Reserved[1];         // 4-byte alignment.
    uint16            Channel;             // Patch channel (0-based).
    uint16            ChannelCount;        // Patch channel count (1-512).
    ucs1              FixtureMake[];       // Fixture make (only null if omitted).
    ucs1              FixtureName[];       // Fixture name (never omitted).
};
```

6.2.2 FPTC / UPtc - Unpatch message

Unpatch messages are sent when fixtures are deleted or unpatched. The unpatch message only contains the identifiers of the fixtures removed. An empty fixture identifier array indicates complete unpatching..

```
struct CITP_FPTC_UPtc
{
    CITP_FPTC_Header  CITPFPTCHeader;          // The CITP FPTC header. FPTC ContentType
                                                  is "UPtc".
    uint16            FixtureCount;            // Fixture count (0 to unpatch all).
    uint16            FixtureIdentifiers[];    // Fixture identifiers
};
```

6.2.3 FPTC / SPtc - SendPatch message

The SendPatch message instructs the receiver to send Patch messages in response, one for each fixture specified in the FixtureIdentifiers array. If no fixture identifiers are specified, the entire Patch should be transferred in response. This procedure can be used for testing the existence of fixtures on the remote side or to synchronize the entire patch information..

```
struct CITP_FPTC_SPtc
{
    CITP_FPTC_Header  CITPFPTCHeader;          // The CITP FPTC header. FPTC ContentType
                                                  is "SPtc".
    uint16            FixtureCount;            // Fixture count (0 to request all).
    uint16            FixtureIdentifiers[];    // Fixture identifiers.
};
```

7. CITP/FSEL, Fixture Selection layer

The Fixture Selection layer is used to carry fixture selection information. Fixture identification is discussed in the CITP/FPTC section.

7.1 Header definitions

7.1.1 The FSEL header

The FSEL layer provides a standard, single, header used at the start of all FSEL packets:

```
struct CITP_FSEL_Header
{
    CITP_Header CITPHeader;    // The CITP header. CITP ContentType is "FSEL".
    uint32      ContentType;   // A cookie defining which FSEL message it is.
};
```

7.2 Message definitions

7.2.1 FSEL / Sele - Select message

The Select message instructs the receive to select a number of fixtures. If the Complete field is non-zero, only the fixtures identified in the message should be selected and all others should be deselected, thus achieving a full synchronization.

```
struct CITP_FSEL_Sele
{
    CITP_FSEL_Header  CITPFSELHeader;          // The CITP FSEL header. FSEL ContentType
                                                  is  "Sele".
    uint8             Complete;                // Set to non-zero for complete selection
    uint8             Reserved[1];             // 4-byte alignment
    uint16            FixtureCount;            // Greater than 0
    uint16            FixtureIdentifiers[];    // Fixture identifiers
};
```

7.2.2 FSEL / DeSe - Deselect message

The Deselect message acts similarly to the Select message. However, a Deselect message deselects the fixture specified, rather than selectin them. A Deselect with no fixture specified should deselect all fixtures.

```
struct CITP_FSEL_DeSe
{
    CITP_FSEL_Header  CITPFSELHeader;          // The CITP FSEL header. FSEL ContentType
                                                  is  "DeSe".
    uint16            FixtureCount;            // 0 for complete deselection
    uint16            FixtureIdentifiers[];    // Fixture identifiers
};
```

8. CITP/FINF, Fixture Information layer

The Fixture Information layer is used to carry additional fixture information. Fixture identification is discussed in the CITP/FPTC.

8.1 Header definitions

8.1.1 The FINF header

The FINF layer provides a standard, single, header used at the start of all FINF packets:

```
struct CITP_FINF_Header
{
    CITP_Header CITPHeader;    // The CITP header. CITP ContentType is "FINF".
    uint32      ContentType;   // A cookie defining which FINF message it is.
};
```

8.2 Message definitions

8.2.1 FINF / SFra - Send Frames message

This messages informs the receiver to send frame messages for the specified fixtures.

```
struct CITP_FINF_SFra
{
    CITP_FINF_Header  CITPFINFHeader;          // The CITP FINF header. FINF ContentType
                                                  is "SFra".
    uint16            FixtureCount;            // Fixture count (0 to request all).
    uint16            FixtureIdentifiers[];    // Fixture identifiers.
};
```

8.2.2 FINF / Fram - Frames message

This messages informs the receiver about the filters & gobos of a fixture.

```
struct CITP_FINF_Fram
{
    CITP_FINF_Header  CITPFINFHeader;          // The CITP FINF header. FINF ContentType
                                                  is "Fram".
    uint16            FixtureIdentifier;       // Fixture identifier.
    uint8             FrameFilterCount;        // Number of filters in the FrameNames field.
    uint8             FrameGoboCount;          // Number of gobos in the FrameNames field.
    ucs1              FrameNames[];            // List of (first) filters and (last) gobos,
                                                  newline separated (\n) & null terminated.
                                                  Contains at least the null.
};
```

8.2.3 FINF / LSta - Live status message **PRELIMINARY**

This message can be sent in any direction on a regular basis. The flag mask and flag fields size is dynamic in order to allow future expansion without redifinition.

```
struct CITP_FINF_LSta
{
    CITP_FINF_Header  CITPFINFHeader;          // The CITP FINF header. FINF ContentType
                                                  is "LSta".
    uint16            LiveStatusCount;         // Fixture identifier.
    uint8             FlagSize;                // Number of bytes in the flag field.
    struct LiveStatus
    {
        uint16        FixtureIdentifier;       // Fixture identifier.
        uint8         FlagMask[FlagSize];      // Flag mask.
        uint8         Flags[FlagSize];         // Flags.
                                               //      0x01 TBD
    }[];
};
```

9. CITP/OMEX, Operations Management layer
PRELIMINARY

The Operations Management EXtensions layer is used for metadata communication.

9.1 Header definitions

The OMEX layer provides a standard, single, header used at the start of all OMEX packets:

```
struct CITP_OMEX_Header
{
    CITP_Header         CITPHeader;             // CITP header. CITP ContentType is "OMEX".
    uint8               VersionMajor;           // Set to 1.
    uint8               VersionMinor;           // Set to 0.
    uint32              ContentType;            // Cookie defining which OMEX message it is.
};
```

9.2 Message definitions: DMX device status signalling

Status signalling of DMX devices is ....

9.2.1 OMEX / SDDS - Signal DMX Device Status

Sent to signal a status for one or more devices. A status is identified by a short string which is used again when clearing or updating the status (by sending a new SDDS message). It is typically a short string, such as "Offline", "On fire" or "Lamp fail".

```
struct CITP_OMEX_SDDS
{
    CITP_OMEX_Header    CITPOMEXHeader;         // CITP OMEX header. OMEX ContentType
                                                   is "SDDS".
    ucs2                StatusIdentifier[];     // Displayable status tag.
    uint8               Severity;               // 50 = Info, 100 = Warning, 150 = Error
    ucs2                Category[];             // Category identifier.
    ucs2                ShortText[];            // Short descriptive text.
    ucs2                LongText[];             // Long descriptive text.
    uint16              DeviceCount;            // The number of following device information
                                                   blocks for which to set this status.
    struct DeviceInformation
    {
        ucs1            DMXConnectionString;    // A DMX connection string.
    };
};
```

9.2.2 OMEX / CDDS - Clear DMX Device Status

Sent to clear a specific status from a set of devices. It is not necessary that the status is cleared from all deviced that have it set, but it is possible. If a status clear is requested for a device that is not known to have status, the request is silently ignored.

```
struct CITP_OMEX_CDDS
{
    CITP_OMEX_Header    CITPOMEXHeader;         // CITP OMEX header. OMEX ContentType
                                                   is "CDDS".
    ucs2                StatusIdentifier[];     // Displayable status tag.
    uint16              DeviceCount;            // The number of following device information
                                                   blocks.
    struct DeviceInformation
    {
        ucs1            DMXConnectionString;    // A DMX connection string.
    };
};
```

10. CITP/MSEX, Media Server Extensions layer

The Media Server EXtensions layer is used for communication with Media Servers.

For information about how peers find eachother and connect, see the Connectivity section. Typically all packets are sent over a peer-to-peer TCP socket connection, except for the MSEX/StFr message which is sent over the multicast address for all to process.

10.1 Header definitions

10.1.1 The MSEX header

The MSEX layer provides a standard, single, header used at the start of all MSEX packets:

```
struct CITP_MSEX_Header
{
    CITP_Header         CITPHeader;             // CITP header. CITP ContentType is "MSEX".
    uint8               VersionMajor;           // See below.
    uint8               VersionMinor;           // See below.
    uint32              ContentType;            // Cookie defining which MSEX message it is.
};
```

Currently acknowledged versions of MSEX are 1.0 and 1.1. During a session messages of varying MSEX versions may be sent and received. See the MSEX / SInf message also regarding supported version signalling.

10.2 Message definitions: General media server information

10.2.1 MSEX / SInf - Server Information message

The ServerInformation provides the receiver with product and layer information. The version field of the MSEX header should be set to the highest supported version of MSEX messages.

```
struct CITP_MSEX_SInf
{
    CITP_MSEX_Header    CITPMSEXHeader;         // CITP MSEX header. MSEX ContentType
                                                   is "SInf". See above on version.
    ucs2                ProductName[];          // Display name of the product.
    uint8               ProductVersionMajor;    // Major version number of the product.
    uint8               ProductVersionMinor;    // Minor version number of the product.
    uint8               LayerCount;             // Number of following layer information blocks.
    struct LayerInformation
    {
        ucs1            DMXSource[];            // DMX-source connection string. See DMX
                                                   Connection Strings in Definitions.
    };
};
```

10.2.2 MSEX / LSta - Layer Status message

The LayerStatus message is sent at a regular interval (suggestion: 4 times / second) to provide the receiver with live status information:

```
struct CITP_MSEX_LSta
{
    CITP_MSEX_Header    CITPMSEXHeader;         // CITP MSEX header. MSEX ContentType
                                                   is "LSta" and version is 1.0.
    uint8               LayerCount;             // Number of following layer information
                                                   blocks.
    struct LayerStatus
    {
        uint8           LayerNumber;            // 0-based layer number, corresponding to
                                                   the layers reported in the SInf message.
        uint8           PhysicalOutput;         // Current physical video output index,
                                                   0-based.
        uint8           MediaLibraryNumber;     // Current media library number.
        uint8           MediaNumber;            // Current media number.
        ucs2            MediaName[];            // Current media name.
        uint32          MediaPosition;          // Current media position (in frames).
        uint32          MediaLength;            // Current media length (in frames).
        uint8           MediaFPS;               // Current media resolution in frames per
                                                   second.
        uint32          LayerStatusFlags;       // Current layer status flags
                                                //      0x0001 MediaPlaying
```

```
    }[];
};
```

10.3 Message definitions: Element libraries and element information

In MSEX 1.0, there is a finite set of at most 256 libraries, each containing a finite set of at most 256 elements. This is designed to match the common media server layout of 2 dmx channels identifying the library and item respectively.

In MSEX 1.1 however, there is a finite set of at most 3 library levels with at most 256 elements each. Libraries are identified using a library identifier, a 4-byte integer divided into four 1-byte fields. When it's Level byte is set to 0, it is specifying the builtin root level, the parent of all first level libraries.

However - due to limitations imposed by the somewhat unwise choise of using an uint8 as data type for the number of elements in a library, a media server can only report a library to contain a maximum of 255 libraries or elements.

```
struct MSEXLibraryId
{
    uint8              Level;               // 0 - 3
    uint8              Level1;              // Sublevel 1 specifier, when Depth >= 1.
    uint8              Level2;              // Sublevel 2 specifier, when Depth >= 2.
    uint8              Level3;              // Sublevel 3 specifier, when Depth == 3.
};
```

An attempt to visualize by example the most traditional structure, two levels:

```
/Root Folder (abstract) ID{0,0,0,0}
   /Images ID{1,0,0,0}
      /Primo.gif ID{2,0,0,0}
      /Secundo.gif ID{2,0,1,0}
      /Tertio.gif ID{2,0,2,0}
   /Movies ID{1,1,0,0}
      /One.mpg ID{2,1,0,0}
      /Two.mpg ID{2,1,1,0}
      /Three.avi ID{2,1,2,0}
   /Empty folder ID{1,2,0,0}
   /Empty folder ID{1,3,0,0}
   /More Movies ID{1,4,0,0}
      /Test.mpg ID{2,4,0,0}
      /Test2.avi ID{2,4,1,0}
```

There are currently eight recognized elements types (a library can only contain elements of one type) and when information about elements is requested, different kinds of Element Information messages (Media, Effect or Generic) are returned:

1. Media (images & video)
2. Effects
3. Cues
4. Crossfades
5. Masks
6. Blend presets
7. Effect presets
8. Image presets

10.3.1 MSEX / GELI - Get Element Library Information message

The GetElementLibraryInfo message is sent to a media server in order to request information about an element library, or all available element libraries.

```
struct CITP_MSEX_1.0_GELI
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "GELI" and version is 1.0.
    uint8              LibraryType;             // Content type requested.
    uint8              LibraryCount;            // Number of libraries requested, set to
                                                   0 when requesting all available.
    uint8              LibraryNumbers[];        // Requested library numbers, none if
                                                   LibraryCount is 0.
};
```

```
struct CITP_MSEX_1.1_GELI
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "GELI" and version is 1.1.
    uint8              LibraryType;             // Content type requested.
```

```
    MSEXLibraryId       LibraryParentId;        // Parent library id.
    uint8               LibraryCount;           // Number of libraries requested, set to
                                                   0 when requesting all available.
    uint8               LibraryNumbers[];       // Requested library numbers, none if
                                                   LibraryCount is 0.
};
```

Example 1: two DMX channel media selection media server. A GELI message with LibraryParentId set to {0, 0, 0, 0} is sent to retrieve all libraries on the folder selection channel. This generates a response with an ELIn message with at most 255 items with LibraryId values of {1, 0-255, 0, 0}.

Example 2: three DMX channel media selection media server. First the procedure in Example 1 is executed to collect all Level 1 libraries (none of these will contain any elements, but up to 255 sub libraries). For each N of these (up to 255) libraries, an additional GELI message is sent with the LibraryParentId set to {1, N, 0, 0}. This will trigger a response with an ELin message with at mosts 255 items with LibraryId values of {2, N, 0-255, 0}.

10.3.2 MSEX / ELIn - Element Library Information message

The ElementLibraryInfo message is sent in response to the GetElementLibraryInfo message. It should contain individual element library information for the *entire contents* of the requested element library.

```
struct CITP_MSEX_1.0_ELIn
{
    CITP_MSEX_Header    CITPMSEXHeader;         // CITP MSEX header. MSEX ContentType
                                                   is "ELIn" and version is 1.0.
    uint8               LibraryType;            // Content type requested.
    uint8               LibraryCount;           // Number of following element library
                                                   information blocks.
    struct ElementLibraryInformation
    {
        uint8           Number;                 // 0-based library number.
        uint8           DMXRangeMin;            // DMX range start value.
        uint8           DMXRangeMax;            // DMX range end value.
        ucs2            Name[];                 // Library name.

        uint8           ElementCount;           // Number of elements in the library.
    }[];
};
```

```
struct CITP_MSEX_1.1_ELIn
{
    CITP_MSEX_Header    CITPMSEXHeader;         // CITP MSEX header. MSEX ContentType
                                                   is "ELIn" and version is 1.1.
    uint8               LibraryType;            // Content type requested.
    uint8               LibraryCount;           // Number of following element library
                                                   information blocks.
    struct ElementLibraryInformation
    {
        MSEXLibraryId   Id;                     // Library id.
        uint8           DMXRangeMin;            // DMX range start value.
        uint8           DMXRangeMax;            // DMX range end value.
        ucs2            Name[];                 // Library name.

        uint8           LibraryCount;           // Number of sub libraries
                           in the library.
        uint8           ElementCount;           // Number of elements in the library.
    }[];
};
```

10.3.3 MSEX / ELUp - Element Library Updated message

The ElementLibraryUpdated message is sent by a media server to notify a console or visualizer about updated media library contents.

```
struct CITP_MSEX_1.0_ELUp
{
    CITP_MSEX_Header    CITPMSEXHeader;         // CITP MSEX header. MSEX ContentType
                                                   is "ELUp" and version is 1.0.
    uint8               LibraryType;            // Content type of updated library.
    uint8               LibraryNumber;          // Library that has been updated.
    uint8               UpdateFlags;            // Additional information flags.
                                                //      0x01   Existing elements have been
                                                               updated
                                                //      0x02   Elements have been added or
                                                               removed
                                                // 0x04 Sub libraries have been updated
                                                // 0x08 Sub libraries have been added or removed
};
```

```
struct CITP_MSEX_1.1_ELUp
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "ELUp" and version is 1.1.
    uint8              LibraryType;             // Content type of updated library.
    MSEXLibraryId      LibraryId;               // Library that has been updated.
    uint8              UpdateFlags;             // Additional information flags.
                                                //      0x01   Existing elements have been
                                                               updated
                                                //      0x02   Elements have been added or
                                                               removed
                                                // 0x04 Sub libraries have been updated
                                                // 0x08 Sub libraries have been added or removed
};
```

10.3.4 MSEX / GEIn - Get Element Information message

The GetElementInformation message is sent by a console or visualizer to a media server in order to request information about individual elements.

```
struct CITP_MSEX_1.0_GEIn
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "GEIn" and version is 1.0.
    uint8              LibraryType;             // Content type requested.
    uint8              LibraryNumber;           // Library for which to retrieve element info.
    uint8              ElementCount;            // Number of elements for which information
                                                   is requested, set to 0 when requesting
                                                   all available.
     uint8              ElementNumbers[];        // Numbers of the elements for which
                                                   information is requested.
};
```

```
struct CITP_MSEX_1.1_GEIn
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "GEIn" and version is 1.1.
    uint8              LibraryType;             // Content type requested.
    MSEXLibraryId      LibraryId;               // Library for which to        retrieve elements
    uint8              ElementCount;            // Number of elements for which information
                                                   is requested, set to 0 when requesting
                                                   all available.
    uint8              ElementNumbers[];        // Numbers of the elements for which
                                                   information is requested.
};
```

10.3.5 MSEX / MEIn - Media Element Information message

The MediaElementInformation message is sent in response to the GetElementInformation message for element type 1. It should contain individual media element information for *all* elements requested.

```
struct CITP_MSEX_1.0_MEIn
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "MEIn" and version is 1.0.
    uint8              LibraryNumber;           // Library containing the media elements.
    uint8              ElementCount;            // Number of following (media) information
                                                   blocks.
    struct MediaInformation
    {
        uint8          Number;                  // 0-based number of the media.
        uint8          DMXRangeMin;             // DMX range start value.
        uint8          DMXRangeMax;             // DMX range end value.
        ucs2           MediaName[];             // Media name.
        uint64         MediaVersionTimestamp;   // Media version in seconds since
                                                   1st January 1970.
        uint16         MediaWidth;              // Media width.
        uint16         MediaHeight;             // Media height.
        uint32         MediaLength;             // Media length (in frames).
        uint8          MediaFPS;                // Media resolution (in frames per second).
    }[];
};
```

```
struct CITP_MSEX_1.1_MEIn
{
    CITP_MSEX_Header   CITPMSEXHeader;          // CITP MSEX header. MSEX ContentType
                                                   is "MEIn" and version is 1.1.
    MSEXLibraryId      LibraryId;               // Library containing the media elements.
    uint8              ElementCount;            // Number of following (media) information
                                                   blocks.
```

```
    struct MediaInformation
    {
        uint8           Number;                 // 0-based number of the media.
        uint8           DMXRangeMin;            // DMX range start value.
        uint8           DMXRangeMax;            // DMX range end value.
        ucs2            MediaName[];            // Media name.
        uint64          MediaVersionTimestamp;  // Media version in seconds since
                                                   1st January 1970.
        uint16          MediaWidth;             // Media width.
        uint16          MediaHeight;            // Media height.
        uint32          MediaLength;            // Media length (in frames).
        uint8           MediaFPS;               // Media resolution (in frames per second).
    }[];
};
```

10.3.6 MSEX / EEIn - Effect Element Information message

The EffectElementInformation message is sent in response to the GetElementInformation message for element type 2. It contains individual effect element information for *all* elements requested.

```
struct CITP_MSEX_1.0_EEIn
{
    CITP_MSEX_Header    CITPMSEXHeader;           // CITP MSEX header. MSEX ContentType
                                                     is "EEIn" and version is 1.0.
    uint8               LibraryNumber;            // Library containing the effect elements.
    uint8               ElementCount;             // Number of following (effect) information
                                                     blocks.
    struct EffectInformation
    {
        uint8           ElementNumber;            // 0-based number of the effect.
        uint8           DMXRangeMin;              // DMX range start value.
        uint8           DMXRangeMax;              // DMX range end value.
        ucs2            EffectName[];             // Effect name.
        uint8           EffectParameterCount;     // Number of following effect
                                                     parameter names.
        ucs2            EffectParameterNames[][]; // List of effect parameter names.
    }[];
};
```

```
struct CITP_MSEX_1.1_EEIn
{
    CITP_MSEX_Header    CITPMSEXHeader;           // CITP MSEX header. MSEX ContentType
                                                     is "EEIn" and version is 1.1.
    MSEXLibraryId       LibraryId;                // Library containing the effect elements.
    uint8               ElementCount;             // Number of following (effect) information
                                                     blocks.
    struct EffectInformation
    {
        uint8           ElementNumber;            // 0-based number of the effect.
        uint8           DMXRangeMin;              // DMX range start value.
        uint8           DMXRangeMax;              // DMX range end value.
        ucs2            EffectName[];             // Effect name.
        uint8           EffectParameterCount;     // Number of following effect
                                                     parameter names.
        ucs2            EffectParameterNames[][]; // List of effect parameter names.
    }[];
};
```

10.3.7 MSEX / GLEI - Generic Element Information message

The GenericElementInformation message is sent in response to the GetElementInformation message for element types 3 through 8. It contains individual element information for *all* elements requested.

```
struct CITP_MSEX_1.1_GLEI
{
    CITP_MSEX_Header    CITPMSEXHeader;           // CITP MSEX header. MSEX ContentType
                                                     is "GLEI" and version is 1.1.
    MSEXLibraryId       LibraryId;                // Library containing the elements.
    uint8               ElementCount;             // Number of following information
                                                     blocks.
    struct GenericInformation
    {
        uint8           ElementNumber;            // 0-based number of the element.
        uint8           DMXRangeMin;              // DMX range start value.
        uint8           DMXRangeMax;              // DMX range end value.
        ucs2            Name[];                   // Element name.
        uint64          VersionTimestamp;         // Element version in
                           seconds since 1st January 1970.
    }[];
};
```

10.4 Message definitions: Thumbnail information

10.4.1 MSEX / GELT - Get Element Library Thumbnail message

The GetElementLibraryThumbnail message is sent to a media server in order to retrieve a thumbnail of an element library, or of all available element libraries.

```
struct CITP_MSEX_1.0_GELT
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "GELT" and version is 1.0.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Preferred thumbnail image width.
    uint16             ThumbnailHeight;       // Preferred thumbnail image height.
    uint8              ThumbnailFlags         // Additional information flags.
                                              //      0x01   Preserve aspect ratio
                                                 of image (use width and height as maximum)
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    uint8              LibraryCount;          // Number of libraries requested, set to 0
                                                 when requesting all available.
    uint8              LibraryNumbers[];      // Numbers of the libraries
                requested, not present if LibraryCount is 0.
};
```

```
struct CITP_MSEX_1.1_GELT
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "GELT" and version is 1.1.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Preferred thumbnail image width.
    uint16             ThumbnailHeight;       // Preferred thumbnail image height.
    uint8              ThumbnailFlags         // Additional information flags.
                                              //      0x01   Preserve aspect ratio
                                                 of image (use width and height as maximum)
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    uint8              LibraryCount;          // Number of libraries requested, set to 0
                                                 when requesting all available.
    MSEXLibraryId      LibraryIds[];          // Ids of the libraries requested, not present if
                                                 LibraryCount is 0.
};
```

10.4.2 MSEX / ELTh - Element Library Thumbnail message

The ElementLibraryThumbnail message is sent in response to the GetElementLibraryThumbnail message.

```
struct CITP_MSEX_1.0_ELTh
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "ELTh" and version is 1.0.
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    uint8              LibraryNumber;         // Number of the library that
                the thumbnail belongs to.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Thumbnail width.
    uint16             ThumbnailHeight;       // Thumbnail height.
    uint16             ThumbnailBufferSize;   // Size of the thumbnail buffer.
    uint8              ThumbnailBuffer;       // Thumbnail image buffer.
};
```

```
struct CITP_MSEX_1.1_ELTh
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "ELTh" and version is 1.1.
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    MSEXLibraryId      LibraryId;             // Id of the library that the thumbnail
                                                 belongs to.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Thumbnail width.
    uint16             ThumbnailHeight;       // Thumbnail height.
    uint16             ThumbnailBufferSize;   // Size of the thumbnail buffer.
    uint8              ThumbnailBuffer;       // Thumbnail image buffer.
};
```

10.4.3 MSEX / GETh - Get Element Thumbnail message

The GetElementLibraryThumbnail message is sent to a media server in order to retrieve a thumbnail of a library, or all available element libraries.

```
struct CITP_MSEX_1.0_GETh
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "GETh" and version is 1.0.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Preferred thumbnail image width.
    uint16             ThumbnailHeight;       // Preferred thumbnail image height.
    uint8              ThumbnailFlags         // Additional information flags.
                                              // 0x01   Preserve aspect ratio of image
                                                        (use width and height as maximum)
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    uint8              LibraryNumber;         // Number of the media's library.
    uint8              ElementCount;          // Number of medias for which information
                                                 is requested.
    uint8              ElementNumbers[];      // The numbers of the requested elements.
};
```

```
struct CITP_MSEX_1.1_GETh
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "GETh" and version is 1.1.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Preferred thumbnail image width.
    uint16             ThumbnailHeight;       // Preferred thumbnail image height.
    uint8              ThumbnailFlags         // Additional information flags.
                                              // 0x01   Preserve aspect ratio of image
                                                        (use width and height as maximum)
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    MSEXLibraryId      LibraryId;             // Id of the media's library.
    uint8              ElementCount;          // Number of medias for which information
                                                 is requested.
    uint8              ElementNumbers[];      // The numbers of the requested elements.
};
```

10.4.4 MSEX / EThn - Element Thumbnail message

The ElementLibraryThumbnail message is sent in response to the GetElementLibraryThumbnail message.

```
struct CITP_MSEX_1.0_EThn
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "EThn" and version is 1.0.
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    uint8              LibraryNumber;         // Number of the element's library.
    uint8              ElementNumber;         // Number of the element.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Thumbnail width.
    uint16             ThumbnailHeight;       // Thumbnail height.
    uint16             ThumbnailBufferSize;   // Size of the thumbnail buffer.
    uint8              ThumbnailBuffer;       // Thumbnail image buffer.
};
```

```
struct CITP_MSEX_1.1_EThn
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "EThn" and version is 1.1.
    uint8              LibraryType;           // 1 for Media, 2 for Effects.
    MSEXLibraryId      LibraryId;             // Id of the element's library.
    uint8              ElementNumber;         // Number of the element.
    uint32             ThumbnailFormat;       // Format of the thumbnail.
                                                 Can be "RGB8" or "JPEG".
    uint16             ThumbnailWidth;        // Thumbnail width.
    uint16             ThumbnailHeight;       // Thumbnail height.
    uint16             ThumbnailBufferSize;   // Size of the thumbnail buffer.
    uint8              ThumbnailBuffer;       // Thumbnail image buffer.
};
```

10.5 Message definitions: Streams

10.5.1 MSEX / GVSr - GetVideoSources

The GetVideoSources message is sent to a media server in order to receive all available video source feeds.

```
struct CITP_MSEX_GVSr
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "GVSr".
};
```

10.5.2 MSEX / VSrc - Video Sources

The VideoSources message is sent in response to a GetVideoSources message. The PhysicalOutput and LayerNumber fields can be used for automatic connection to outputs and individual layers (for instance the video of output 1 would have PhysicalOutput = 0 and LayerNumber = 0xFF).

```
struct CITP_MSEX_VSrc
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "VSrc".
    uint16             SourceCount;           // Number of following source information
                                                 blocks.
    struct SourceInformation
    {
        uint16         SourceIdentifier;      // Source identifier.
        ucs2           SourceName[];          // Display name of the source (ie "Output 1",
                                                 "Layer 2", "Camera 1" etc).
        uint8          PhysicalOutput;        // If applicable, 0-based index designating
                                                 the physical video output index.
                                                 Otherwise 0xFF.
        uint8          LayerNumber;           // If applicable, 0-based layer number,
                                                 corresponding to the layers reported in
                                                 the SInf message. Otherwise 0xFF.
        uint16         Flags;                 // Information flags.
                                              //      0x0001 Without effects
        uint16         Width;                 // Full width.
        uint16         Height;                // Full height.
    };
};
```

10.5.3 MSEX / RqSt - Request Stream message

The RequestStream message is sent by a console or visualizer to a media server in order to create a time limited subscription of a video source. The media server will not provide multiple resolutions and frame rates of a single source, but it may provide a feed for each requested format. It is up to the peer to regularly request a stream, based on its timeout parameter, if it wishes receive a continuous feed. High values of the timeout field is of course discouraged.

```
struct CITP_MSEX_RqSt
{
    CITP_MSEX_Header   CITPMSEXHeader;        // CITP MSEX header. MSEX ContentType
                                                 is "RqSt".
    uint16             SourceIdentifier;      // Identifier of the source requested.
    uint32             FrameFormat;           // Requested frame format.
                                                 Can be "RGB8" or "JPEG".
    uint16             FrameWidth;            // Preferred minimum frame width.
    uint16             FrameHeight;           // Preferred minimum frame height.
    uint8              FPS;                   // Preferred minimum frames per second.
    uint8              Timeout;               // Timeout in seconds (for instance 5
                                                 seconds, 0 to ask for only one frame).
};
```

10.5.4 MSEX / StFr - Stream Frame message

The StreamFrame message is multicasted regularly from a media server. The resolutions, formats and FPS are determine by the current set of subscribing peers.

```
struct CITP_MSEX_StFr
{
    CITP_MSEX_Header   CITPMSEXHeader;        // The CITP MSEX header. MSEX ContentType
                                                 is "StFr".
    uint16             SourceIdentifier;      // Identifier of the frame's source.
    uint32             FrameFormat;           // Requested frame format.
                                                 Can be "RGB8" or "JPEG".
    uint16             FrameWidth;            // Preferred minimum frame width.
    uint16             FrameHeight;           // Preferred minimum frame height.
    uint16             FrameBufferSize;       // Size of the frame image buffer.
    uint8              FrameBuffer[];         // Frame image buffer.
};
```

Prior to version 1.1 of MSEX, RGB8 data was transmitted as BGR rather then RGB. As of version 1.1, stream

frames are to be transmitted over the multicast channel only (sames as used by PINF) and never over a TCP connection.