CONFIDENTIAL

NAGRAVISION

Eastern Multimedia Co, Ltd

PPV / IPPV SOLUTION ARCHITECTURE

1.2

Contents

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1. Introduction

This document describe the technical architecture for the Eastern Multimedia Co, Ltd (EMC) Phase II project.

Phase II is designed to provide EMC with a complete PPV/IPPV solution. This includes a CAS upgrade for the required PPV/IPPV features, head-end

Some details are subject to change to optimize the solution according to the other third party vendors, such as the compression equipment, the Set-Top-Box (STB) vendor, etc.

1.1 References

Ref. #	Version	Document name	Description
[1]	1.21	EMC Light STB - IPG 1.21.pdf	EMC-IPG specification for I-Vision and STB vendors.
[2]	3.5	Phase3_EMC_SMSgw_matrix_ver3.5.xls	SMS command matrix for EMC.
[3]	ETSI-197200	-	DVB Simulcrypt.
[4]	1.0.1	EMC ImsDex2X1Spe010001.pdf	Data Exporter (DEX) specifications.
[5] or [SMS]	2.7.5	EMC SasGwyStdSpe020705.pdf	SMS Gateway Specifications.
[6]	1.3.16-e	EmcIPPVStbCakIrdSpe010316e.pdf	CAK IRD cmd specifications for IPPV capable STB.
[7]	1.0.0	EmcADBStbCakIrdSpc010000.pdf	CAK IRD cmd specifications for ADB STB.
[8]	1.1.2	ImsDim4X1PL2Spe010102.pdf	Data Importer (DIM) level 2 specifications.
[9]	1.0.1	Imsdim4x1PL3Spe010001.pdf	Data Importer (DIM) level 3 specifications.
[10]	EN-300468	-	DVB SI specifications.
[11]	1.0.0	EMC ImsEpg4X3Spe010000.pdf	EPG-XML Schedule specification.
[12]	1.0.1	EMC-Phase3-IrdCmd-RefGuideforSMS.v.1.1.pdf	Generic IRD command reference guide for SMS.
[RFP]		EMC PPV (Translated from Chinese) 171204.doc	EMC PPV/IPPV RFP
[PROP]	1.0	EMC IPPV Solution Overview 1_0.pdf	Nagravision Response to RFP

1.2 Document History

Version	Author(s)	Date	Description
1.0	Gilles Russ	Dec 2003	Initial version for RFP response
1.1	Gilles Russ	Jan 2004	Added head-end and Lysis components
1.2	Gilles Russ	April 2004	Rework for final SOW discussion.

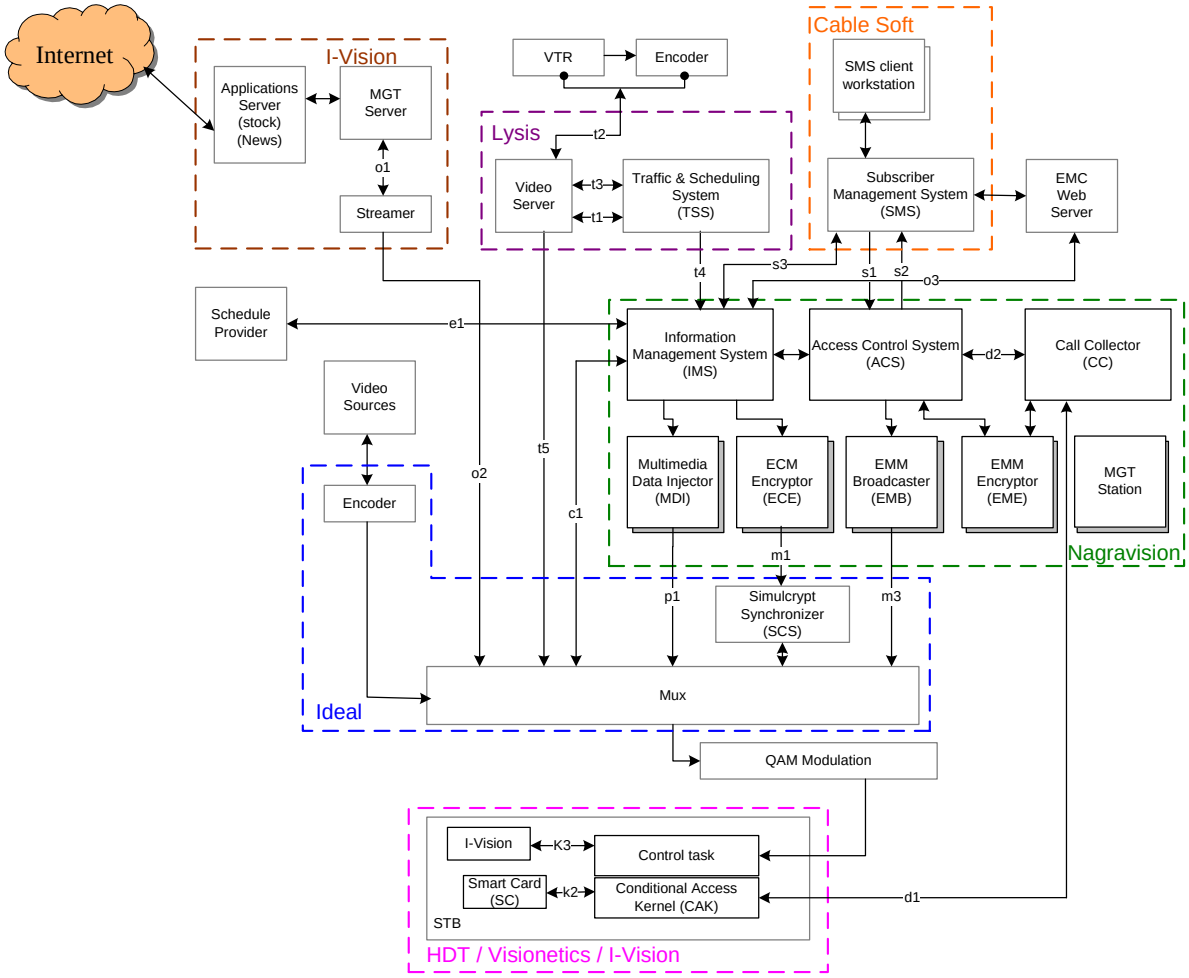
2. Solution Overview

This chapter presents a first overview of the entire system with and defines the interfaces between all its components.

Description / Axis			Remark	CAS-Packaging Levels	
				Phase I	Phase II
License		CA subscribers in thousands		**contract**	**contract**
License		Encrypted services		**contract**	**contract**
Hardware		Max CA subscribers in thousands		**1000**	**1000**
Hardware		Max nb of encrypted services		**100**	**150**
License		SI services		**100**	**contract**
License		PPV or IPPV services		**0**	**contract**
License		Automated services	Video servers control	**0**	**0**
Pay TV Products					
	Core	Subscription		✓	✓
	L1	OPPV	PPV module		✓
	L2	IPPV	IPPV module		✓
	L3	Event Packages	multi-event PPV module (non impulsive on PBL)		✓
Pre-Paid / Post Paid					
	Core	Post-paid		✓	✓
	L1	Pre-paid IPPV with return path	Pre-paid module		✓
	L2	Pre-paid IPPV without return path	Pre-paid module		✓
SI					
	Core	No SI		✓	✓
	L1	Mandatory DVB tables		✓	✓
	L2	DVB EIT Schedule		✓	✓
	L3	Full DVB tables (download, etc...)		✓	✓
	L4	Custom / Complex SI	only for multi-NIT		✓
Schedule					
	Core	No Schedule		✓	✓
	L1	Schedule Import		✓	✓
	L2	Staging server (Lysis)	as per Lysis proposal		✓
	L3	iDTV/LE	as per Lysis proposal		✓
Topology					
	Core	No edition (done at install)		✓	✓
	L1	Topology Edition		✓	✓
	L2	Topology synchronization	with Thomson ctrl.	✓	✓
Monitoring					
	Core	Basic, terminal based	mon...	✓	✓
	L1	CaSpy Basic	monitoring GUI		
	L2	CaSpy Full	config alarms + snmp		
Automation					
	Core	No automation		✓	✓
	L1	Single Video Server			
	L2	Redundant Single Video Server			
	L3	Multiple Video Servers			
SMS					
	Core	SMS gateway		✓	✓
	L1	Nagravision SMS			
Redundancy					
	Core	non redundant		✓	✓
	L1	redundant		✓	✓
DVR					
	Core	None			
	L1	Basic DVR			
	L2	Push-VOD			

2.1 System Design

The following diagram presents the overall system architecture to be deployed for EMC. Some part of the system are already deployed as part of the Phase I of the project.



2.2 System Interfaces

The system diagram presents the external interfaces to third party equipment. This diagram lists all major interfaces used in the context of the Nagra integrated system towards EMC network.

A letter and digit pair identifies each interface, briefly described below:

2.2.1 MUX configuration

C1 This interface allows the CAS to acquire the network topology from the MUX configuration. The CAS uses the network topology data to build DVB SI data. TOPD is able to read a configuration file provided by the MUX equipment. This import procedure allows synchronizing the CAS system with the MUX definitions.

2.2.2 Set-top-box

K1 This represents the set of interfaces between the Nagravision **Conditional Access Kernel** (CAK) and the *Set-Top-Box* (STB).
Specification document:
(provided directly to the STB manufacturer)

K2 This represents the interface between the Nagravision **Smart Card** (SC) and the *Set-Top-Box*. In practice the STB only provides physical and basic data exchange connectivity, and the CAK handles the communication protocol with the card.
Specification document:
(provided directly to the STB manufacturer)

K3 This represents the interface between the I-Vision embedded application and STB control task.
There is no direct interface between I-Vision embedded application and Nagravision Conditional Access Kernel (CAK); all communications are going through the STB control task.
Specification documents:
(I-Vision / STB vendor proprietary protocol)

2.2.3 Multiplexer

M3 This is the DVB Simulcrypt EMMG ↔ MUX interface.

M1 This is the DVB Simulcrypt ECMG ↔ SCS

P1 The CAS injects SI data to the MUX through this interface.
This interface is DVB ASI.
Specification document:
(provided directly from the STB manufacturer)

2.2.4 SMS

(S3) Products synchronization. Products built with PBL (subscriptions) and imported by Lysis TSS system (IPPV) are sent to the SMS.
Specification document:
- DEX specifications [4]

S1 Subscriber commands
SMS Gwy commands 0xx to 1xx
Specification document:
- SMS Gwy specifications [5]:
- CAK IRD specifications for IPPV capable STB (EMC specific) [6]
- CAK IRD specification for ADB STB [7]
- SMS IRD command reference guide [12]
- SMS cmd matrix [2]

(S2) Feedback commands
SMS Gwy commands 2xx
Specification document:
- SMS Gwy specifications [5]

2.2.5 Schedule data

E1 Schedule file provided by **Error! Unknown document property name.**; XML file
Specification document:
IMS; Data Importer –DIM- (XML File Interface)
Specifications: level2 [8] & level3 [9]

T1 Interface between the iDTV and the video server, to be described, installed and integrated.
The content has been entered as well as the approximate schedule on iDTV, iDTV exports the ingest list to the Video Server recording system.
Specifications: Flat file.
(Lysis proprietary protocol)

T2 Interface between video server and encoder, to be described, installed (automatic ingestion process).
Video Server recording system controls the VTR and encoders according to the ingest List. The MPG assets

are encoded and saved on the Video Server.
Specifications: API,
(Sony proprietary protocol for VTR (RS-432) + Thomson proprietary protocol for encoder).

T3 Interface between the video server and Lysis Traffic & Scheduling system, to be described, installed in order to have the as-run log exported to the Lysis iDTV server (db).
Specifications: API (Lysis proprietary protocol)

T4 Pay Per View products are exported to IMS, through ftp, XML file.
Specification document:
IMS; Data Importer –DIM- (XML File Interface) Specifications; level2 [8] & level3 [9]

T5 The Video Server streams the assets to the MUX according to the play list received.

2.2.6 Other Interfaces

O1 Interface between I-Vision management system and I-vision streamer to be described, installed.

O2 Interface between I-vision Streamer system and multiplexer, to be described, installed in accordance DVB ASI standard.

O3 Interface between Nagravision and EMC web server. Nagravision only provides the XML as already exported today to the “base runner” equipment.
Specification documents:
- DVB-SI specification [10]
- EPG Data Exporter Schedule file interface specifications [11]

D1 Interface STB and Call collector using PSTN line for return path, to be described, installed and integrated

D2 Interface between Call collector system and Nagra CAS system, to be described, installed and integrated in accordance with Nagra interface definition.
Specification document:
(Nagravision Internal)

2.3 Partners

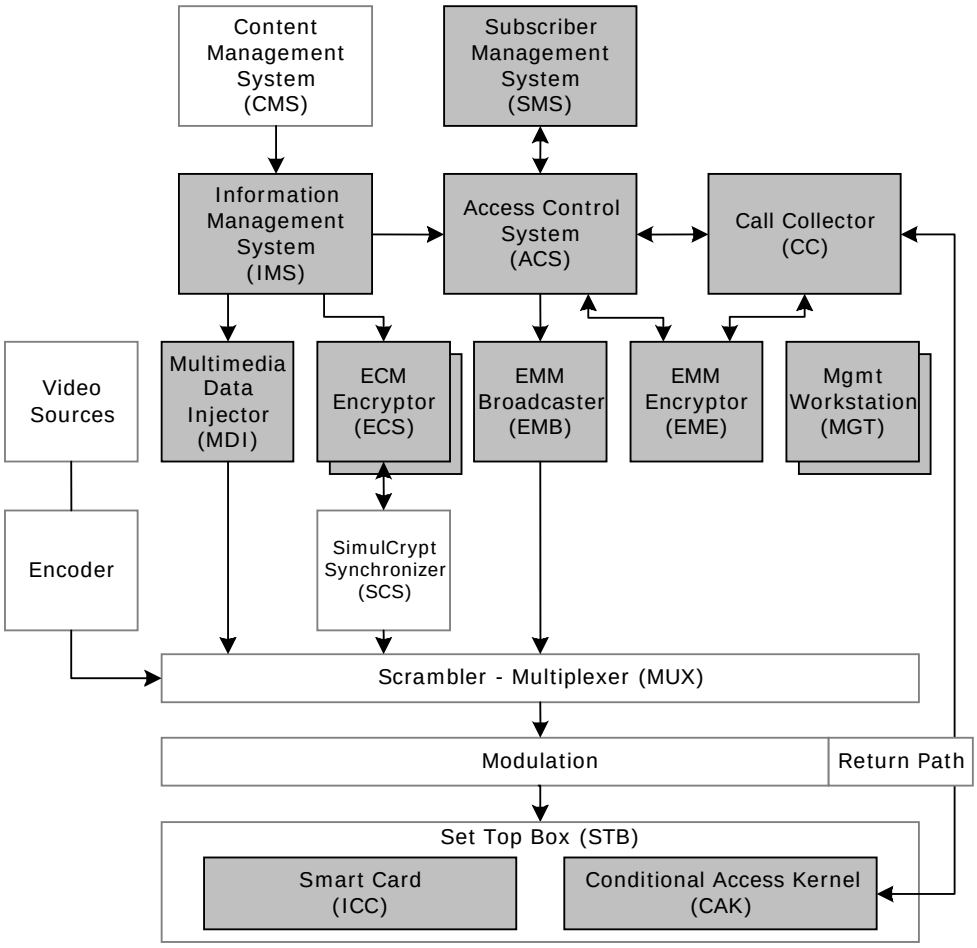
The table below represents the various vendors on the project.

Role / Component	Vendor / Model
System Integration	IDT
CAS	Nagravision
SMS	CableSoft
Muxes & Scrambler	Thomson DBX4300 Provided by IDEAL
Mux Controller	Thomson MCC 6.5.1 Provided by IDEAL
STB	Current : ADB ABQ-6H44-EMC New IPPV STB : HDT
Middleware	OpenTV for ADB STB. None for Phase II HDT STB. I-Vision browser integrated in HDT STB.
TCS	Lysis iDTV/LE
Video Server	HP Video servers provided by Nagravision/Lysis.

3. CAS PPV / IPPV Functionalities

The following diagram and associated paragraphs details the logical components of the complete CAS solution.

Nagravision components appear on a grey background.



The basic software architecture and functionalities of the Nagravision CAS are already deployed in Phase I and will not be described here.

This chapter focuses on the PPV and IPPV functionalities, payment modes and types of products supported for the EMC Phase II deployment.

3.1 Order ahead Pay per Views or OPPV

Here, the subscribers call the Customer Service Centre and order a specific product. The CAS makes sure the corresponding rights are sent to the smart card while the billing is being done by the Subscriber Management System (SMS).

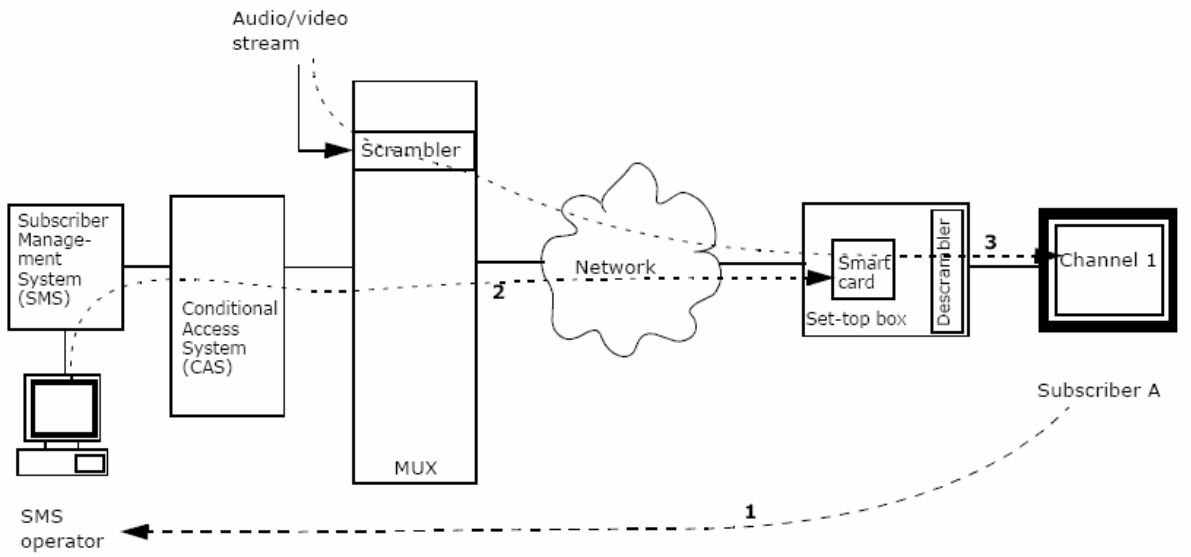


Figure 1: Model for Subscription and OPPV Modes

The pre-booked pay-per-view is a product where a subscriber purchases the right to view a particular event, not a whole service.
Subscriptions are usually purchased for long periods of time, typically one year. The pre-booked PPV products are ordered at a per-event basis, usually by calling the operator's call center. Creating the viewing right on the smart card works like this:

1. The subscriber asks the call-center for a PPV event; whether it is by mail, telephone or any other means of communication (PPV events are normally only ordered via telephone).
2. After receiving the order for a subscription or a PPV event from a customer, the operator creates the right for the subscription or PPV event directly into the subscriber's smart card by sending the appropriate commands via the SMS.
3. The subscriber can watch the PPV event

Typically, PPV events can be advertised through the TV Guide or by running ads on a dedicated promotion channel.

An easy and cost effective way to attract subscribers is to give them free access for a few minutes at the beginning of the event. The preview window locks subscribers in by giving them a chance to look at the event before purchasing. The length of this preview window is configurable for each event.

3.2 Prepaid IPPV without return path

With the postpaid IPPV feature, the subscribers have the possibility of buying events and are billed afterwards. In some cases, however, the operator might wish to ask the subscribers to pre-pay a certain amount before they have the possibility to impulsively buy and then watch an event. This is the prepaid functionality.

Not using the return path has the clear advantage where a customer does not need to have a telephone line in order to impulsively purchase events. In some countries or regions, the mere lack of telephone lines would simply render the deployment of a prepaid IPPV configuration impossible if decoders were to need a return path.

Another advantage lies in the realm of the marketing area. Some subscribers may be concerned about privacy issues raised by the reporting of watched events. If the decoder does not have a return path then the subscriber has the guarantee that the events he watches will not be reported.

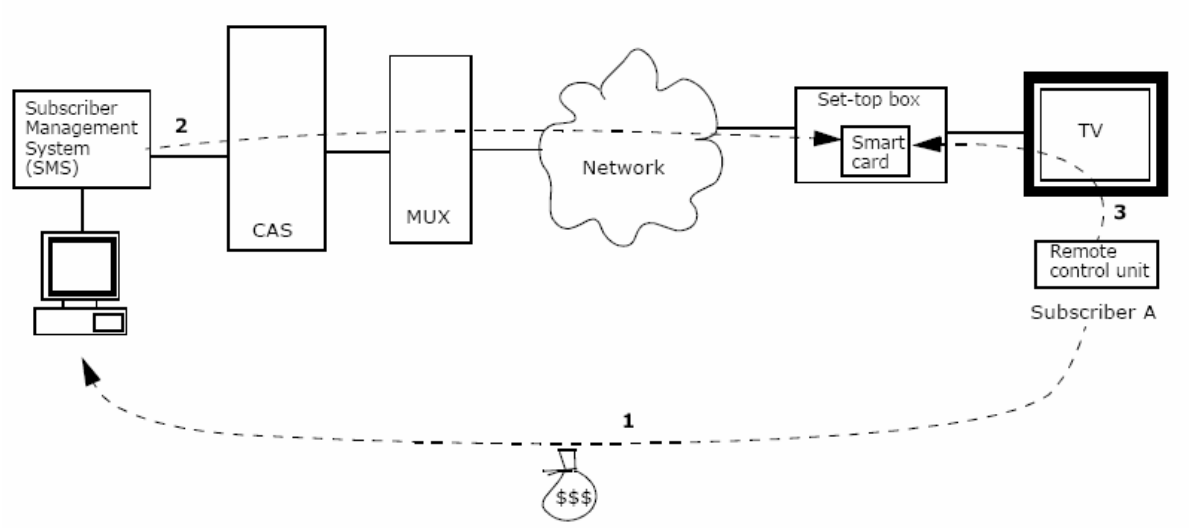


Figure 2: Model for prepaid IPPV without return path mode

This mode relies on the principle where a customer is only allowed to impulsively purchase events as long as there is credit in his smart card. In the typical business model the customer must first pay before being entitled to purchase an event. The usual mode of operation is as follows:

1. The subscriber asks the call-center to be charged a certain sum on his account or credit card for prepaid IPPV purposes.
2. The customer's smart card is credited with the amount that he ordered in (1).
3. The subscriber may now watch events up to the limit of the available credit.
4. Once the available credit it too low, the subscriber must ask the call-center for more credit.

3.2.1 The role of the credit record

In the prepaid IPPV mode the credit in the smart card is sensitive information. Typically, the credited amount in the smart card would correspond to the amount that the subscriber had paid in advance.

The smartcard manages 2 values: credit and debit.
Credit is the amount of credit sent to the smartcard by the SMS.
Debit is the total value of money spent buying events.

In the prepaid IPPV mode, the SMS is responsible to manage the credit value in the smartcard. That is the SMS must know at all times what is the last value that was sent to a given smartcard in order to add credit the next time.

The example below shows how the credit and debit values work:

#	Operation	Credit	Debit	Balance
1	Empty smartcard	0	0	0
2	Subscriber calls SMS and orders (meaning pays for) a $20 credit	0	0	0
3	SMS sends $20 to the smartcard	20	0	20
4	Subscriber buys one $3 movies	20	3	17
5	Subscriber buys another 5 movies at $3	20	18	2
6	Subscriber cannot buy any more movies for $3.	20	18	2
7	Subscribers calls SMS and orders an additional $20 credit	20	18	2
8	SMS sends **$40** to the smartcard	**40**	18	22

Please note a few important points:

- The debit value always goes up and cannot be changed by the SMS
- The credit value always goes up. It is managed by the SMS.
- The real “credit” available to the subscriber is in fact the balance. Balance = credit-debit.
- These concepts can sometimes be confusing because the STB software usually displays the balance values, but calls it credit

3.2.2 Limitations and recommendations

Content providers may require a proof about how many people has seen a particular event. In this case it is mandatory to gather the purchase lists from the decoders. Not using the return path may have the simple consequence that **some content providers are not willing to conduct business with the operator**. Using the return path provides the exact information about purchased and watched events.

Please also note that such deployment is **less secured** than the one using a return path. The events watched cannot be checked and confirmed, which can be a problem for the content owner, or in case of litigation, on the events watched by the subscribers.

One the one side, content owners may not trust the operator without a proper reporting mechanism controlled by the CAS.

On the subscriber side, there may be subscribers trying to call and complain that their credit disappeared or that they didn't watch this or that event. Without a proper reporting system through the CAS, it will be impossible to verify the truth of such claims.

Without a return path, the operator cannot know for sure what movies have been watched or how much credit the subscriber has spent. For that reason, when the subscriber is disconnected, the remaining credit on the smartcard **cannot be refunded** to the subscriber unless the operator puts in place a specific process of visually checking the remaining credit value on the subscriber's STB.

Similarly, in case of a defective smartcard, it will **not be possible to check the credit value** that was on the smartcard. Nagravision cannot be held responsible for the loss of the credit value on the smartcard.

Depending on the business rule applied by the operator in this case, the operator should consider to only allow **relatively small amount of credit** to be sent to the smartcard.

3.3 Prepaid IPPV with return path

This feature gives the operator an extensive flexibility to manage the subscribers' base for impulsive pay-per view (IPPV) events. For example one could imagine having trusted subscribers in the postpaid mode, which means that they would receive an invoice for the watched events, while having other subscribers on a prepaid mode, which would grant them access to IPPV events only if they have enough credit available on their smartcards.

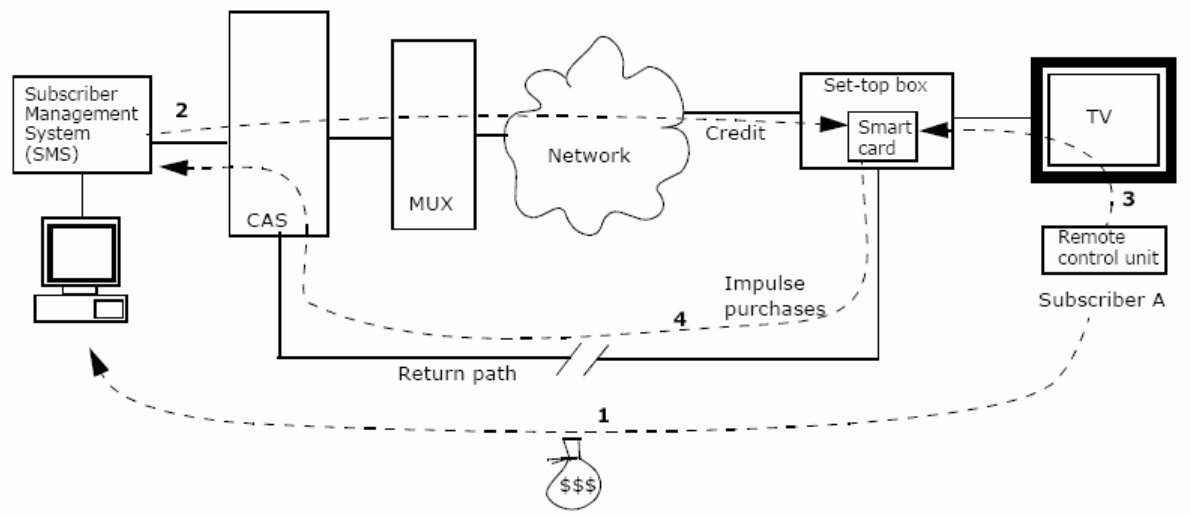


Figure 3: Model for prepaid IPPV with return path mode

This mode is very similar to prepaid IPPV without return path and relies on the principle where a customer is only allowed to impulsively purchase events as long as there is credit in his smart card. In the typical business model the customer must first pay before being entitled to purchase an event. The usual mode of operation is as follows:

1. The subscriber asks the call-center to be charged a certain sum on his account or credit card for prepaid IPPV purposes.
2. The subscriber's smart card is credited with the amount that he ordered in (1).
3. The subscriber may now watch events up to the limit of the available credit.
4. The decoder will perform regular call collections. These call collections are not intended for billing purposes but for providing the operator with information about the customers' event-watching habits. Also, the smart card is **not** recredited with a new amount as in the case of the postpaid IPPV mode. In order to obtain more credit the customer must go to step (1).

The credit management in prepaid with return path is exactly the same as in prepaid without return path.

3.4 Call back mechanism description

The call back is the function used by the set-top box to send information to the CAS over the return path. This information is collected in the Subscriber Authorization System by the Interactive Transaction Manager (ITM) and transmitted to the Subscriber Management System (SMS).

The ITM is the term used for the Nagravision Call Collector.

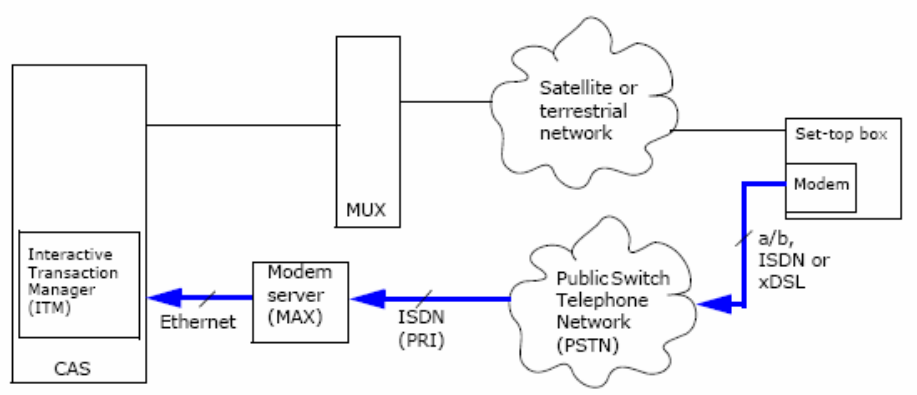


Figure 4: Callback Mechanism

The communication between the Interactive Transaction Manager (ITM) and the set-top box is fully encrypted.

Call Back Types

The different call back types are:

- **Regular**
  The set-top box reports periodically to the SMS, e.g. every month. The call back frequency can be configured in the Subscriber Management System (SMS) per subscriber (the date and time of the next call are maintained in the smart card). The regular call back is used for regular reporting of IPPV events, maintenance and statistical purposes.

- **Immediate**
  The SMS sends a call back request to the set-top box (an Entitlement Management Message (EMM) is sent by the Subscriber Authorization System (SAS)). The set-top box reports to the SMS typically 10 minutes later.

- **Special event**
  If the event the subscriber is watching is marked as a special event, the set-top box reports to the SMS as soon as the event is flagged as "watched". This is used for statistical purposes (viewing reports). The calling times of the set-top boxes can be determined on a random basis in order to balance the load.

- **Low credit (post paid only)**
  The set-top box reports to the SMS when the credit maintained in the smart card gets down under a predefined limit. The low credit call back never happens in prepaid mode since credit needs to be sent from the SMS.

In postpaid IPPV mode, it allows the smartcard to report the purchases to the call collector. The call collector will then automatically issue more credit to the smartcard so that the balance is back to the original credit limit. The subscriber can then keep buying more IPPV events.

- **Low memory**
  The set-top box reports to the SMS when the memory place available in the smartcard for new entitlements gets down under a predefined limit.

With each call back the impulse purchases are reported.

After a successful call collection the Interactive Transaction Manager (ITM) sends a clean-up command back to the smartcard. The purpose of the clean-up command is to purge expired IPPV records in order to make room for new ones.

3.5 Purchase List

A more detailed description of the purchase list kept in the smartcard will be inserted here.

The purchase list feature consists in reporting to the subscriber the different pay-perview products he/she has purchased. The following information is supported by the Nagravision smartcard:

- channel name
- event name
- event start time
- product price
- type (prebooked/impulse)
- watched/not watched

The channel name, event name and event start time information are created in the Information Management System (IMS) for IPPV products. However, for OPPV products, those values need to be included by the SMS in the “Add Event Product” SMS command.

The smartcard does not manage a monthly billing. Each product that is purchased is reported to the CAS and then to the SMS. Once a product is EXPIRED and REPORTED back to the CAS, it is purged from the smartcard (this is necessary to allow storage space on the smartcard for future bookings).

Therefore the smartcard cannot guarantee to keep a complete monthly bill. If this functionality is required, it must be implemented by the STB software storing the purchase history in flash memory.

3.6 Purge Mechanism of PPV and IPPV Records

This chapter provides an overview of how the old PPV/IPPV records on the smartcard can be purged in order to make room for new ones.

3.6.1 Record purging tools

The following list presents the tools and mechanisms available. Their use depends on what prepaid or postpaid modes need to be supported.

1. **Automatic, during callback**

   At the end of any successful callback, the call collector will issue a purge command to the smartcard. This will purge any PPV or IPPV that is marked as **reported** and **expired for more than x days (configurable)**.

2. **Automatic Global Cleanup (a global EMM)**

   This is a process, running on the CAS, periodically sending a global EMM to all smartcards. This EMM purges any PPV/IPPV marked as **reported** and **expired for more than x days (configurable)**.

   This cleanup process is active on any system supporting OPPV.

3. **SMS Cmd 97: Manual Set IPPV Records as Reported**

   The SMS uses this command to set some IPPV records on a given smartcard as reported. This command should be used to address ONLY decoders working in prepaid without return path mode.

   Typically this command is sent either periodically to each smartcard in that mode or at any time the subscriber requests more credit.

4. **SMS Cmd 96: Manual Purge PPV and IPPV Records**

   This command purges all PPV/IPPV on a specific smartcard when the record is **reported** and **expired for more than x days (configurable)**.

These tools and commands are either used alone or in combination depending on which modes co-exist on the system. The dependencies for a record to be purged are always which records are expired and which records are reported. The following 2 chapters explain these dependencies.

3.6.2 Product expiry and purge date

The following rules usually apply with regards to records expiry:

- The expiry of a record on the smartcard corresponds to the end_date value of the corresponding product in the CAS database.
- Also, the end_date of a typical single event product is not the end of the event. This is to allow last minute rescheduling of an event without having to change the product. Typically, the end_date of a single event product is 1 day after the end of the event.
- The product validity end_date is inclusive. The product is expired the day after that.
- Only the UTC date – and not the time – is stored in the smartcard.

Following these rules, we can show the following example:

- An event finishes at 14:00hours, Singapore time, on April 13.
- The event_end_time is 06:00, April 13 UTC
- The end_date of the product April 14 UTC
- The product will be expired (can be purged) on April 15 UTC.
- In Singapore (GMT+8), the product will be considered as expired, and therefore can be purged, at 8am on April 15.

3.6.3 The “reported” or “call collected” flag

Once it is clear which records are expired or not, the only remaining question for which record will be purged is the “reported” or “call collected” flag. The goal is to **make sure that the reported flag is set at the right time**.

Since OPPV can be supported on most systems, let us assume that a global clean-up EMM is running. This means that any record that is expired for more than x days and reported will be purged. Then we can explore each mode and describe what other mechanism should be used.

1. **OPPV**

   PPV (OOPV) are automatically marked as reported when they are sent to the smartcard. Therefore these will be purged by the global cleanup after they expire.

2. **Postpaid IPPV**

   The IPPV in postpaid mode are not flagged as reported when the IPPV is purchased. However, they will be flagged as reported after a successful callback and then purged.
   The important thing is for SMS to make sure to NOT send any Cmd97 (Manual Set IPPV as reported) to these cards or the revenue for these IPPV records will be lost.

3. **Prepaid IPPV without path**

   Case A: If prepaid without return path is the only mode used on the system, the CAS (crypt_iemm process) can be configured in order to mark all IPPV as reported during their creation (since there is no return path anyway). If this setting is active, the IPPV records will be automatically urged by the global cleanup after they expire.

   Case B: if some mode with return path (prepaid or postpaid) is also supported on the system, then IPPV records cannot be set as reported during their creation. In that case, the SMS needs manually send Cmd97 (Manual Set IPPV as reported) to each smartcard in prepaid mode without return path every time the subscriber requests more credit.

4. **Prepaid IPPV with return path**

   Similar to postpaid IPPV. The IPPV in prepaid with return path mode are not flagged as reported when the IPPV is purchased. However, they will be flagged as reported after a successful callback and then purged.
   The important thing is for SMS to make sure to NOT send any Cmd97 (Manual Set IPPV as reported) to these cards or the report for these IPPV records will be lost.

3.7 General notes on credit management

In prepaid mode, it is important to give some thought to the credit limit allowed for each subscriber group. Here are some general guidelines

In prepaid mode, the credit value sent to the smartcard represents real money and cannot be refunded. As explained earlier, there is a small risk that this money can be lost when a subscriber disconnects or in the case of a defective smartcard. For this reason, the operator should not allow very big amounts of credit to be purchased at one time.

In prepaid with no return path mode, if the amount of credit purchased gives access to an average of more than 30 IPPV products, then the process of sending a manual purge command every time the user requests more credit may not be sufficient. In that case, the SMS should plan to send a periodic manual purge command.

There is no time limit on the credit in the smartcard. Once the credit is sent to a smartcard, it cannot be set to expire at a certain date.

4. CAS Product Management

This chapter describes the various product types that are to be supported for the EMC Phase II project.

4.1 Subscription Products

Subscription products are already supported by the existing EMC Phase I system. There is no change in the support for subscription products in phase II. They can be defined as follows:

Subscription to one service (like CNN or MTV) and/or to a service package (like all sport channels bought as a single product) is delivered for a fixed period that can be extended automatically. Occasional subscription or single shot subscriptions are delivered to cover specific events (the Olympic games for example) that are spread over a certain time.

Subscription product **cannot be sold or cancelled impulsively**. However, this functionality can be achieved if EMC implements a SMS Web Portal. Such a solution is not described as part of this solution.

The CAS will allow product cancellation at any time using the *ProductCancellation* command. The SMS can implement the relevant rules.

Subscription products can be **managed exclusively on the Product Builder (PBL**) application located on the Nagravision Management Station (MGT).

Great care must be taken when creating or modifying subscription products as they potentially affect the entire subscriber population.

Please refer to the PBL user guide and Nagravision CAS training material for more information on PBL rules and recommendations.

4.2 Single Event Pay per Views

4.2.1 Definition

Single Event Pay per Views represents the basis for the definition of the IPPV functionality. It means for each event, a product can be created. This product grants access to one specific event and can contain the following attributes:

- event included
- sales period
- validity period
- EPG information (product name)

This means each event can be sold with its own price.

PPV products can be created as impulsive (IPPV) or non-impulsive (PPV). IPPV products can be sold impulsively, but also be sent by the SMS using the command *AddEventProduct*.

As explained in earlier chapters, each IPPV single event product will be included in the SI as part of the event description. The STB can then access this product, and through the CAK API, purchase the product on the smartcard. The smartcard will then store the purchases and report them back to the head-end using the phone line return path.

4.2.2 Usage of single event IPPV

All Single Event PPV can be created and managed either on the Lysis iDTV system or directly on the CAS PBL application. In the case of EMC, the best solution is as follows:

- Create and manage single event PPV on the Lysis iDTV
- Lysis iDTV exports schedule and single event product definitions to the CAS system
- Publication of the product is done on PBL, but can be automatic (see following chapter on product creation).
- IPPV product will be automatically included in the SI stream
- STB can access those products and the subscriber can perform local impulse purchases using the remote control.

The structure of DVB-SI, more specifically the EIT table, only contains an event loop. For this reason, single event products are the only type of products that can be purchased impulsively on the STB. To implement an impulse purchase of any other product would require to deploy some complex/custom SI and some extensive development work on the STB software side. This is not included as part of this delivery.

4.3 Multi-Event Packages

4.3.1 Definition

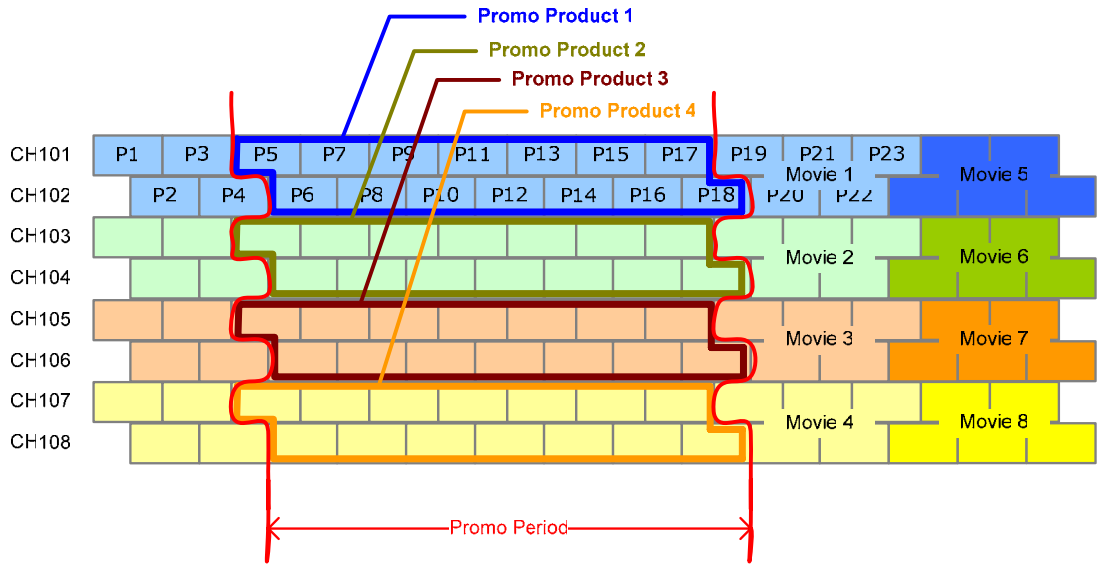
This extension allows your subscribers to buy a complete series or a complete package. Linking events together gives additional flexibility to the marketing and helps improve the attractiveness of the offering.

Event packages are basically a group of related events such as for instance a season ticket with all football games, a retrospective with all the James Bond movies, a pay-per-night package, a one day movies' package, etc.

These products grant access to a series of events and can contain the following attributes:

- events included in the product
- sales period
- validity period
- EPG information (product name)

The diagram below shows a possible example of such products:



In this example, each promotion product can contain a certain number of events.

For the EMC Phase II project, multi-event PPV have to be managed **exclusively on the Nagravision PBL application**.

For the EMC Phase II project, **multi-event products can only be non-impulsive**. Their definition will be exported to the SMS using the DEX xml file and the SMS can send them to subscribers using the *AddEventProduct* command.

4.3.2 Why only non-impulsive?

Strictly speaking, each multi-event product could be defined as impulsive in PBL and an IEMM could be generated for each of these products.

The issue is how to describe these products in the SI. DVB does not provide a mechanism to describe anything other than single event products (since the EIT only describes events and not really products).

Nagravision can propose some advanced solutions that involve a custom SI table called PDT (Product Description Table). However this may require extensive changes in the SI generation software (introducing some complex/custom SI and of course on the STB responsible to decode this SI. These functionalities are not included as part of this delivery.

As any implementation of PPV/IPPV is a rather complex project, Nagravision always recommends starting with a simple “single event PPV” system for the first deployment. More advanced features can always be added later. However those often present an added complexity that often isn’t justified by the commercial gain they bring.

4.3.3 Pay-Per-Day : Charged per channel / per day

Pay-per-day, independently of events, has been discussed. But this product is not supported by DNASP2 smartcard currently used at EMC.

However, Pay-per-Day can be implemented using the multi-event packages functionality. A multi-event package would represent a Pay-per-Day. This means creating a product containing all the events in that day. PBL has some tools (generators) that assist in creating these products.

Pay-per-Day or “multi-event PPV” can be managed at the CAS level using PBL and supported as a PPV (non impulsive) solution.

4.3.4 Pay-per-series; Charged per series

Some requirements for “Pay-per-series” have been expressed:

- The movie series can be play out in the same PPV channel or across several PPV channels, at the same or different period.

This could be implemented as a multi-event PPV. A multi-event PPV can be created on any group of events and across many channels.

- Once a subscriber views any event of the series, then he or she is thought to view entire product.

The multi-event PPV representing the series would be purchased as one product. Therefore, purchasing the product to view the first event would give access to the rest of the series.

Pay-per-Series or “multi-event PPV” can be managed at the CAS level using PBL and supported as a PPV (non impulsive) solution.

4.4 Impulse EMM (IEMM)

4.4.1 Introduction to IEMM

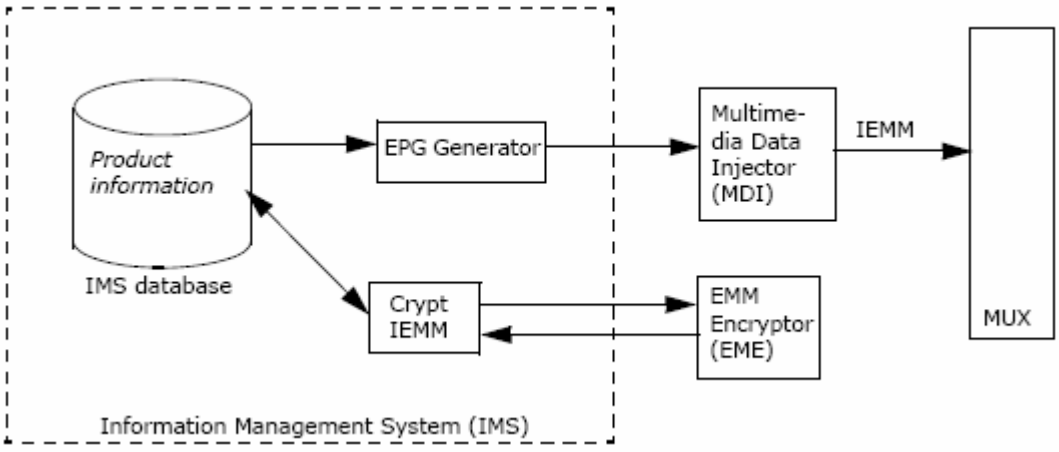
The Impulse Entitlement Management Messages (IEMM) are used to carry the access entitlements for impulsive purchases, i.e. purchases done using the remote control unit.

The Impulse Entitlement Management Messages (IEMM) are carried within the SI stream. They are included there within Nagravision private descriptors. An IEMM that gives access to an event is generally attached to the event within the Event Information Table (EIT).

In case the same event is sold in several package products, the operator can control, using the Product Builder (PBL), which product is purchased when a subscriber purchases the event impulsively.

4.4.2 IEMM Generation

The following figure shows the message generation in the Information Management System (IMS):



IEMM generation

Crypt IEMM

- checks regularly the IMS database for new impulse products and generates the corresponding IEMMs.
- sends the IEMMs to the EMM Encryptor (EME) for encryption
- stores the encrypted IEMMs in the IMS database.

EPG generator

- extracts the IEMM present in the IMS database, merges them into EIT sections and
- forwards the sections to the Multimedia Data Injector (MDI).

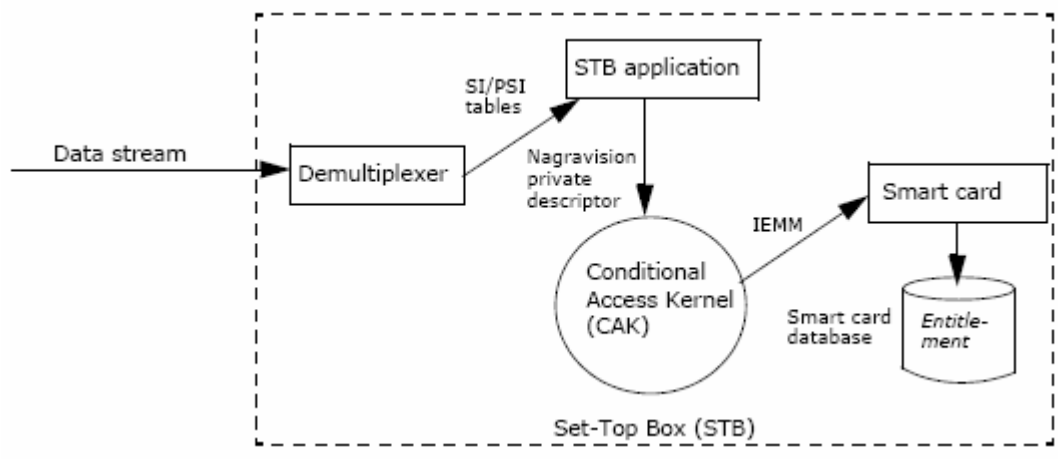
Multimedia Data Injector (MDI)

- injects the SI stream into the multiplexer (MUX).

4.4.3 IEMM Processing in Set-Top Box

When the subscriber performs an impulsive purchase with the remote control unit, the Set-Top Box (STB) application, that filters the Service Information (SI) stream, provides the Conditional Access Kernel (CAK) with the Nagravision private descriptor that contains the corresponding Impulsive Entitlement Management Message (IEMM). The CAK transmits the IEMM to the smart card that:

- extracts the entitlement
- stores it in its memory provided there is enough credit on the card.

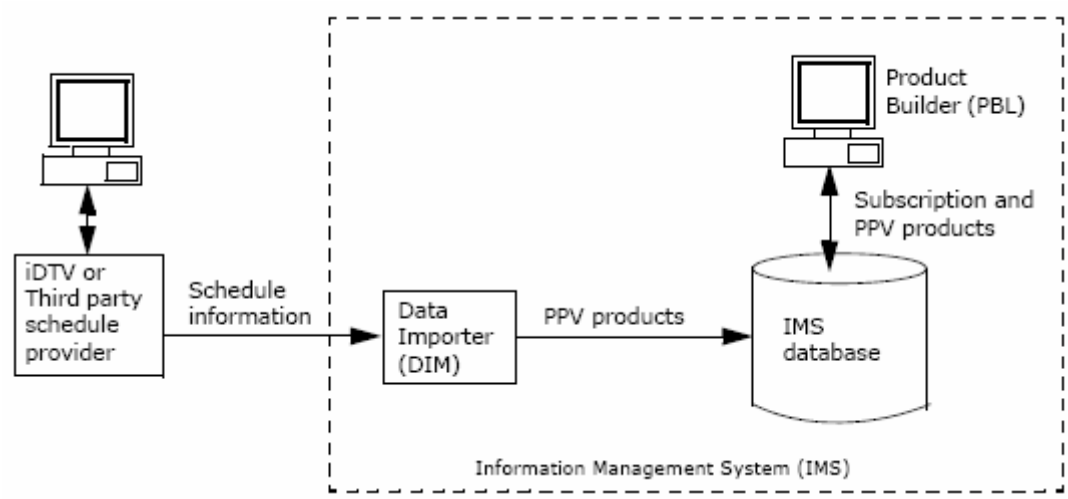


IEMM processing in set-top box

4.5 Product Management

4.5.1 Product Creation

The products are created either in the Information Management System (IMS) or iDTV. The created products have to be published in order to be validated and stored in the IMS database. A published product is a product that can be purchased by a subscriber.



Product creation methods

Product Creation in iDTV

The operator can predefine pay-per-view products using iDTV. The IMS Data Importer (DIM), that imports the schedule information (XML file) to the IMS database, creates then automatically the products.

The schedule information contains for each event the information necessary to create the different products. The supported products are the following pay-per-view products:

- single event IPPV products;
- pre-booked and impulsive,

Product Creation in the Product Builder (PBL)

PBL allows the operator to create all product types supported by PBL via a graphical user interface. PBL builds the product on the basis of the schedule information stored in the IMS database.

The PBL application is located

Please refer to the PBL user guide for more information.

4.5.2 Product Publication

The publication is the operation that:

- validates and stores the products in the Information Management System (IMS) database
- creates the corresponding access entitlements
- synchronizes the product data with the Subscriber Authorization System (SAS) and with the Subscriber Management System (SMS)

The products created automatically by the Data Importer (DIM) can be either published immediately during the import or manually using PBL.

The products created using iDTV are sent to the IMS once they are published by the operator in iDTV. The products created using the Product Builder (PBL) are published by the operator with PBL.

The automatic publication of products during DIM import is a global setting in the DIM component of the CAS system. This feature can be used only if all the events and product imported are NOT part of a multi-event product created in PBL.

If some single event products imported from iDTV need to be included in multi-event product, then the automatic publication needs to be turned off. In that case, products that are imported from iDTV need to then be manually published in PBL before then can be purchased.

This manual publishing can be done by batch in PBL. Per example the user can select all the PPV events on all PPV channels for a 24 hour period and publish all the products at the same time.

4.5.3 Product Validity

The validity period corresponds to the period during which the access to the purchased product is guaranteed to the subscriber. This period is described by its begin and end dates: bdate-edate.

Typically the product validity for a PPV event can be 48 hours. This means that the subscriber will be guaranteed to have access to this event with this product, even if the event has been rescheduled at the last minute (within the product validity period).

4.5.4 Sales Period (or Purchase Window)

The sales period corresponds to the period during which the product can be purchased: i.e. sold by the Subscriber Management System (SMS) or purchased impulsively, provided the SMS respectively the set-top box supports this feature.

SMS

The sales period values will be exported to the SMS by DEX. The SMS must then implement some checking of those dates so as to make sure that a SMS operator cannot send a product command outside of its sales period. By default the CAS will reject such a command if it is sent by the SMS.

STB

The behaviour of the EMC STB with regards to the sales period has not been defined. However, since EMC opted for a 1 day EPG, the sales period for IPPV events will not be used to limit the purchase of events on the STB (like early promotion expiring 3 days before the event).

4.5.5 Purchase of product during event

EMC stated the following requirement:

- The allowed subscription time after the program is played is one quarter of movie length.

In non-impulsive mode, this rule must be implemented by the SMS, based on the event information exported by DEX to the SMS.

In impulsive mode, this rule must be implemented by the STB software. The sales period parameters of the product cannot be used for this functionality because we must allow for possible rescheduling of the event within the sales period. The STB should therefore implement a check based on the event information in the EIT.

4.5.6 Preview Time

The purpose of the preview time is to allow the subscriber to watch the beginning of a controlled event, even if he/she has not purchased the event. This may encourage the subscriber to purchase the event.

The preview time is not a “floating preview”, but strictly at the beginning of each event.

A preview time (expressed in minutes) can be assigned to each event in the schedule information. The value can be different for each event.

The beginning of the event is then broadcast in free access for the duration of the preview time.

REMINDER: Free access means scrambled, but all subscribers with a paired smartcard have access.

4.5.7 Modification of products

All products information, including prices, can be updated on the Nagravision or the Lysis system. Products can also be updated after being published and changes will be reflected automatically in the SI.

However, from an operational point of view, careful consideration must take place when doing such modification of products that are already in their sales period (i.e. present in the SI stream for IPPV products).

As a general rule, do not modify products that are already for sale.

The reason for are:

- There is no way to notify the subscriber (on the STB) that the product definition has changed.
- This can lead to some confusion on the subscriber's side
- There will be some smartcards containing a product at price A while some others will contain the same product, but with a different price.

4.5.8 Cancellation of products

Subscription products can only be sent to the smartcard or removed from a smartcard using SMS commands. Subscription cannot be bought or cancelled impulsively.

OPPV products by definition are sent to the smartcard from the SMS using the *AddEventProduct* command. They can also be cancelled by the SMS using the *ProductCancellation* command.

IPPV products, once purchased, cannot be cancelled in the smartcard. However, the smartcard will record whether the event has been WATCHED. This information (the WATCHED flag) will then be reported to the SMS.The SMS can choose to bill or not to bill unwatched events.

If the event includes a preview time, the event will not be marked as WATCHED on the smartcard until the end of the preview time.

5. Other Phase-II System Functionalities

This chapter describes some of the functionalities that are added to or modified in the existing system in the scope of this EMC Phase II project.

5.1 SI

As in phase I of the project, the System Information (SI) generated by the Nagravision IMS system is compliant with the DVB-SI specifications.

This chapter describes some system parameters and configuration of the SI stream that are specific to the EMC system, while remaining DVB compliant.

5.1.1 EPG Depth

EMC has decided to provide a 1 day EPG on all transports.

Both EIT actual and other have to be present on all transports

Note that the EPG depth is a global setting across the system. The number of days presented will be the same for pre-paid (without return path) or post-paid service.

5.1.2 Bandwidth calculation

A SI bandwidth calculation summary will be inserted here in order to evaluate the amount of bandwidth needed on the system.

While the addition of new PPV services and IPPV descriptors normally increase the SI bandwidth required on the network, the decision to go from the current 7 days EPG to a 1 days EPG will compensate for this.

5.1.3 Nagra private descriptors

The table below describes in more detail what specific descriptors will be found for each item (channel or event).

Item	Descriptor	Description	Location	Tag hex	Tag dec
Channel (Unscrambled, Subscription or PPV)	NASP_CA_descriptor	General access conditions description	SDT	0x86	134
Event - Subscription	None		-	-	-
Event – PPV	NASP_CA_descriptor	General access conditions description	EIT	0x86	134
	NASP_PPV_descriptor	PPV access condictions description	EIT	0x87	135
Event – IPPV	NASP_CA_descriptor	General access conditions description	EIT	0x86	134
	NASP_PPV_descriptor	PPV access condictions description	EIT	0x87	135
	NASP_IEMM_descriptor	The product itself for smartcard purchase	EIT	0x8E	142

5.1.4 EMC private descriptor for theme_id

Each channel (DVB service) need to have a category assigned to it.

This will be done by assigning a category to each channel (DVB Service) in the Nagravision TopD application.

This category value will then be inserted in the form of a private descriptor in the SI Stream (SDT)

The STB will then use this category in order to display the channels sorted by categories.

A complete description of the category codes and specification for the private descriptor will be included here.

5.2 IRD Commands

5.2.1 Generic IRD commands

Generic IRD commands are described in [SMS] as follows:

The SMS uses this command to send an "IRD command" to a decoder. The decoder will execute an operation based on the "IRD command" instruction (ex: reset PIN code, set network ID, force tune, etc.). In other words, this command is not intended to modify the data of the smartcard, but it is intended to start an action executed by the decoder. The CAS provides with this command a secure transport mechanism between the head-end and the STB.

The data structure that is sent to the STB is described below. The SMS Gateway calculates the fields "sequence_number" and "checksum" for the convenience of SMS. It means that the SMS does not provide these two parameters.

```
command_body{
   sequence_number      32 uimsbf
   command_id           8  uimsbf
   operation            8  uimsbf
   for (i=0;i<N;i++){
      data              8  uimsbf
   }
   checksum             8  uimsbf
}
```

As explained above, the purpose of an "IRD command" is to provide the decoder with a message that will conduct the decoder to execute an action (ex: reset PIN code). The "command_id" and "operation" parameters provided to the decoder represent two indexes that will indicate which subroutine should be executed by the decoder.

Nagravision provides the STB manufacturers with a list of "command_id" and "operation" that map a list of given actions. This document is referenced as "Conditional Access Kernel – IRD Command Specification".

COMMAND 69: SEND GENERIC IRD COMMAND			
Field	**byte**	**format**	**Description**
command_id	4	r_num	command_id = 0069
IRD_command_id	3	r_um	command_id field of IRD command_body. Range: 000 to 255
IRD_operation	3	r_num	Operation field of IRD command_body. Range: 000 to 255
IRD_data_length	2	r_num	Length in bytes of useful part of IRD_data field Range: 00 to 48
IRD_data	96	r_text (see note below)	Hexadecimal data coded in ASCII format. The complete string must be transferred (96 chars representing 48 bytes). However, only the first left IRD_data_length bytes will be included in the data field of the IRD command_body.

IMPORTANT

As indicated in the table above, the format of the IRD_data field is r_text. However, this data is not a common string, i.e. it is not a text field such as "this is a sentence with characters and 1 2 3 4 numerical values". The data in this field is a sequence of hexadecimal number coded in text format. Consequently, only alpha characters A, B, C, D, E, F representing the number 10 to 15 in hexadecimal are accepted.

As an example the following IRD_data is accepted by the CAS:

"A0BCD12A29327B9F"

5.2.2 Specific IRD commands for EMC

Please refer to reference [6] and [7] for a full specification of the IRD commands supported for the EMC system.

Nagravision specification for EMC IRD commands

0xC6	Set Network ID
0x12	Set Parental Pin Code
0x12	Reset Parental Pin Code
0x12	Set PIN code for IPPV purchase
0x12	Reset PIN code for IPPV purchase
0xC1	Force Tune
0xC0	Mail
0xC7	Master/Slave Continuous Mode Initialization
0xC7	Master/Slave Continuous Cancellation
0xC7	Master/Slave Single Shot

5.3 Messaging

A description of the EMM mail function provided will be inserted here.

Messages can be sent either to one specific STB or to all.

The timing of the messages broadcast must be managed by the SMS.

All EMM-Mail message content will be encoded using UTF-8

5.4 CAK v6 Upgrade for STB

The new CAK v6 will be integrated in the new PPV STB. The CAK v6 is the new, more secure CAK Kernel included in the Nagravision system. This new CAK v6 is also compatible to the next generation Aladin CAS system.

In order to avoid confusion, it is necessary to point out that a CAK v6 upgrade is not an upgrade of the current DNASP2 CAS system to the Aladin CAS system.

The v5 to v6 CAK upgrade for EMC **only requires an over-the-air software download** to the STB. EMC will continue to use the same DNASP 2 smartcards and there is no need to change any head-end equipment.

EMC System Today ↓	DNASP2	CAK v5
V6 CAK upgrade	DNASP2 (same smartcards and head-end)	CAK v6.D2
New Aladin System (not planned)	Aladin Head-end DNASP3 smartcards	CAK v6.D3

At a later date, Nagravision will also provide a CAK v6 upgrade for the existing ADB STB.

5.4.1 CAK v6 STB Integration

In the immediate scope of this project, the CAK v6 will be integrated in the HDT STB.

At a later date, Nagravision will also provide the CAK v6 for the existing ADB STB. This new CAK v6 will be loaded to the existing deployed STB via OTA download when ADB completes the integration.

The integration process between STB manufacturer and Nagravision will make sure that:

- The CAK will provide the STB with the pids to use for EMMs
- The STB will provide received EMMs to the CAK
- The STB will provide received ECMs to the CAK
- The CAK and STB will share the PSI/SI filtering appropriately

5.4.2 NASC Security Concept

Nagravision brings more than just the CAK to the STB security. The security requirements for terminals are specified through the Nagra Advanced Security Concept (**NASC**). In particular, NASC specifies requirements that have to be implemented by the terminal manufacturer in the hardware and software design of terminals using Nagravision Conditional Access System.

From the hardware point of view, the main requirements impose having Flash memory parts that contain One Time Programmable (OTP) sectors or sectors that can be converted to Permanent Locked Sectors (PLS). Moreover, in order to remove the possibility to physically replace the Flash memory, it has to be covered with glue. Finally, it provides constraints on the chipset interface (no JTAG connector, secured serial ports, etc).

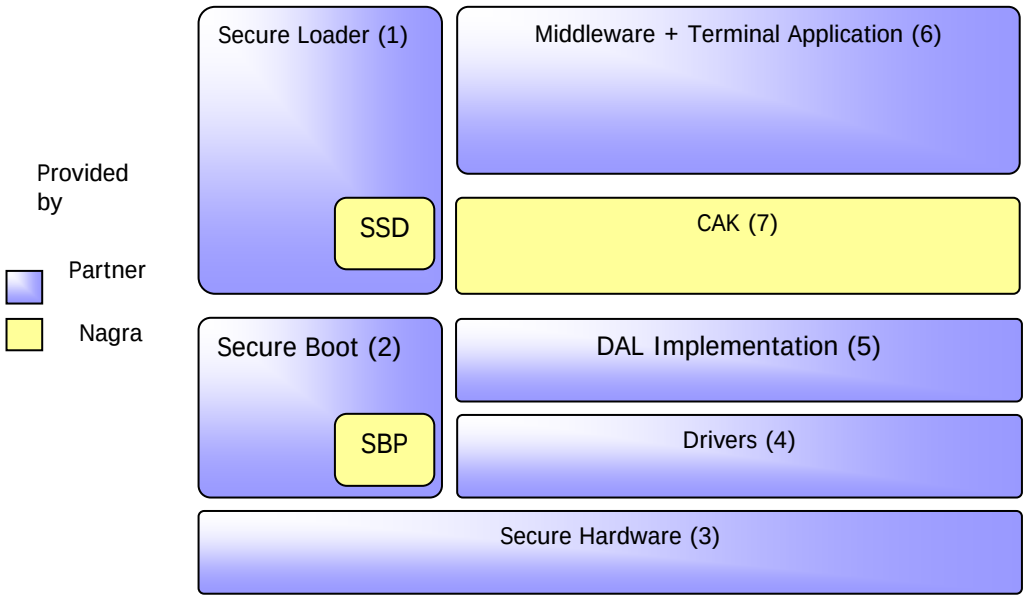
From the software point of view, the terminal has to adhere to Secure Software Authentication (SSA). This part of the NASC concept improves the security by ensuring that only validated and authenticated software is executed on the terminal. The SSA is made up of the following security components:

- Secure Booting Procedure (SBP): It secures the boot of the system by checking the full set of modules it will run.
- Secure Software Download (SSD): It secures the upgrade of applications.

5.4.3 Secure Terminal Architecture

The structure of the secure terminal can be broken down into the following parts:

- A loader (1) that updates code over the air or cable in a secure way by using the Nagravision secure software download (SSD) library
- Boot code (2) that verifies any executable code before its execution by using the Nagravision secure boot procedure (SBP) library
- Hardware (3) that is compliant with Nagravision hardware security requirements stated in [1] and that also provides CA related functionality
- CA related Drivers (4)
- Implementation of the Nagravision's driver abstraction layer (DAL) (5)
- One (or more) applications (6) that include the Nagravision Conditional Access Kernel (CAK) library (7)


Provided by
Partner
Nagra
Secure Loader (1)
SSD
Middleware + Terminal Application (6)
CAK (7)
Secure Boot (2)
SBP
DAL Implementation (5)
Drivers (4)
Secure Hardware (3)

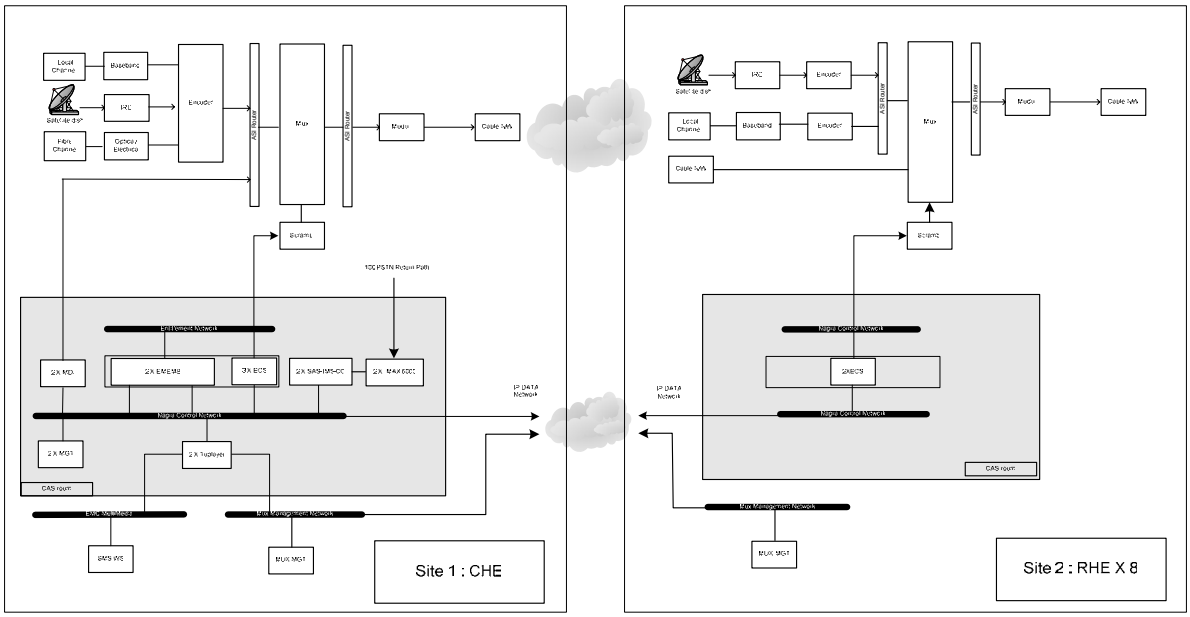
6. CAS Head-end System

The current EMC cable system includes the following characteristics.

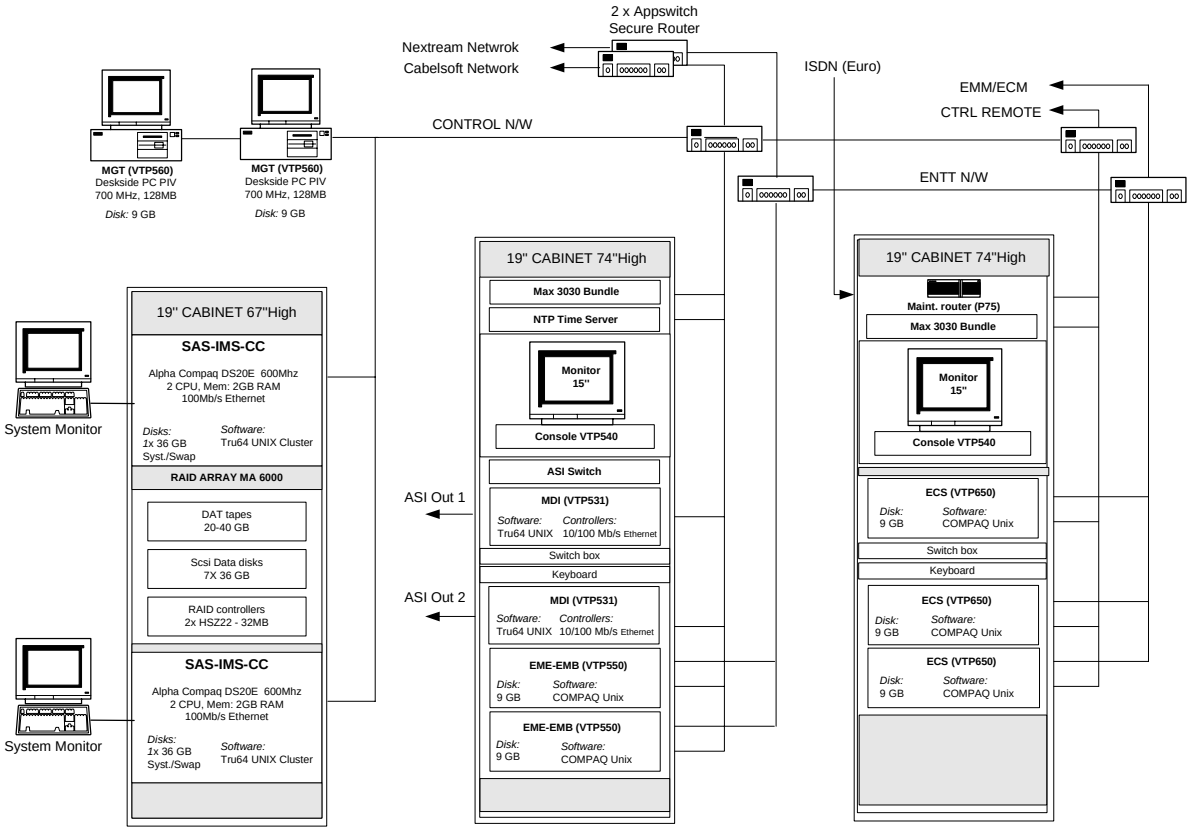
- 9-10 Transports
- 50 channels
- Return path (PSTN)
- Redundant

The system is also ready for remote head-end integration. Remote head-end only contain encryption equipment (ECS). No remote MDI (remote injection of SI) is provided.

6.1.1 Current EMC Block Diagram



6.1.2 Phase I CAS Hardware Overview



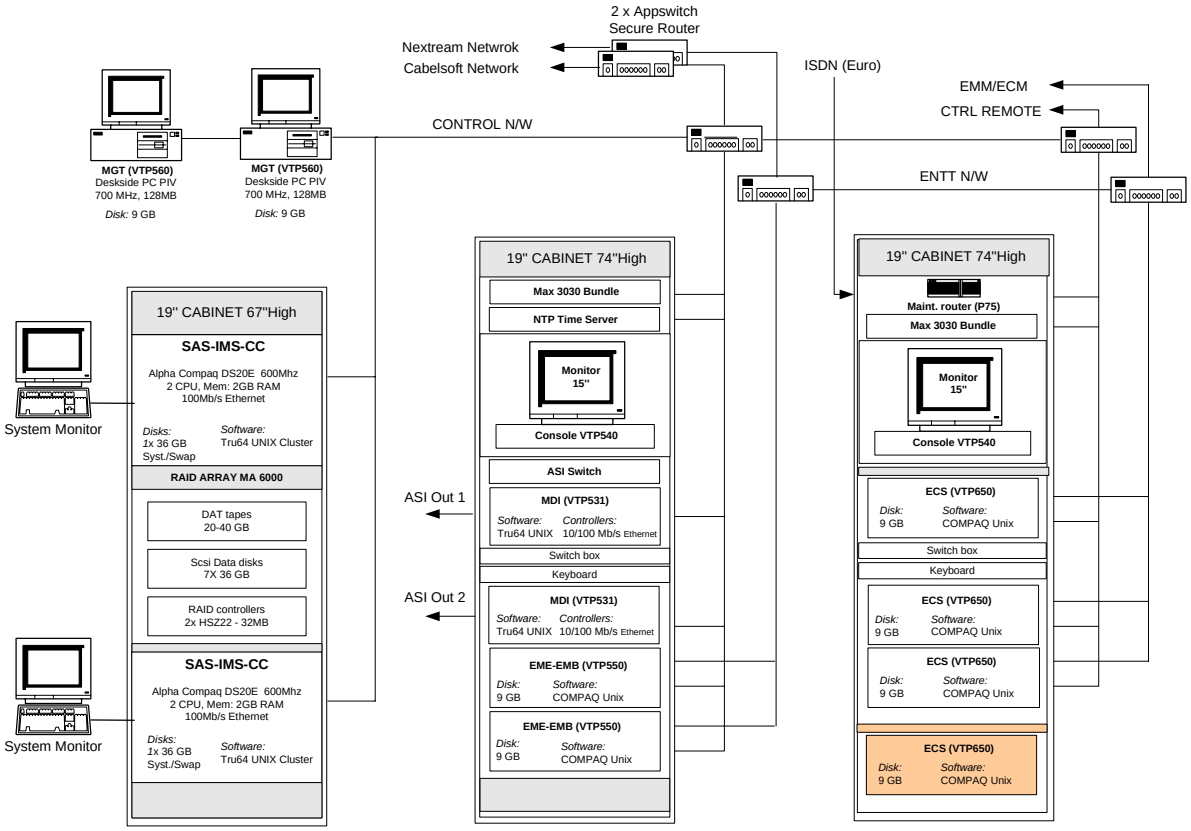
6.1.3 Central Head-end Equipment List

S/N	Model	Element	Qty
1.	VTP 1250R/CAS	Redundant Alpha Server DS20	1
2.	VTP 550 - EMEMB	EME-EMB	2
3.	VTP 650 - ECS	VTP 650 ECS	3
4.	APS-1	Secure Router (Appswitch 2500)	2
5.	VTP540-SWB 8	System Console with 8 pos switch	2
6.	TS-2	NTP Time Server	1
7.	P 75	1 ISDN Router for Maintenance	1
8.	HUB-10/100-16/RM	Rack mounted 16-port Hubs	6
9.	CAB-1	19" rack cabinet	2
10.	SC	Smart Card	50
11.	VTP531-MDI	Multimedia Data Injector	2
12.	ASI-R-SWT	ASI Switch for MDI redundancy	1
13.	VTP560-MGT	Management Workstation PBL-SCN-TOPD	2
14.	MTR-L15	Flat Screen Monitor	2
15.	Max 3030	Call Collector Modem	2

6.1.4 Phase II Channel upgrade

The Phase I EMC system has a maximum encryption capacity of 100 channels.

If the total number of current channels, plus the new PPV/IPPV channels exceeds 100, the encryption capacity has to be increased from 100 to 150 by adding one ECS (n+1 redundancy)



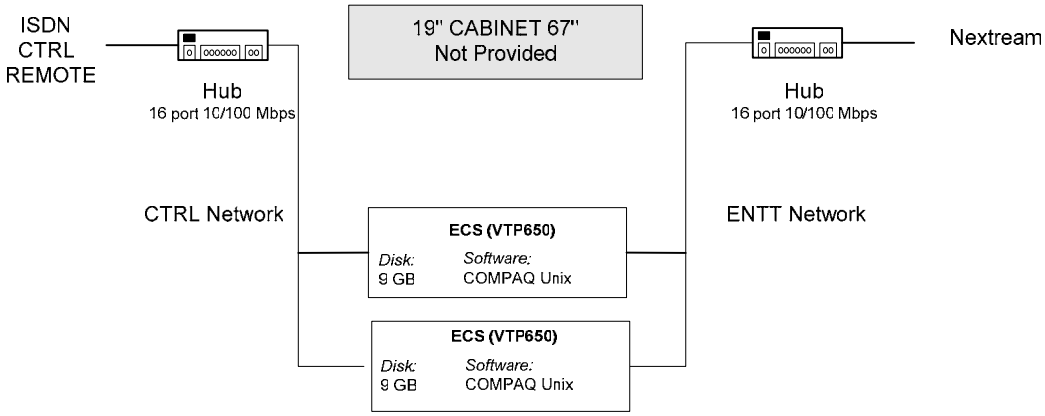
Since EMC already purchased some extra ECS, a second ECS will be configured in the head-end as a cold back-up, but not mounted in the production rack.

No other HW upgrades to the existing system are necessary to support the additional channels.

6.1.5 Remote Head-end Integration

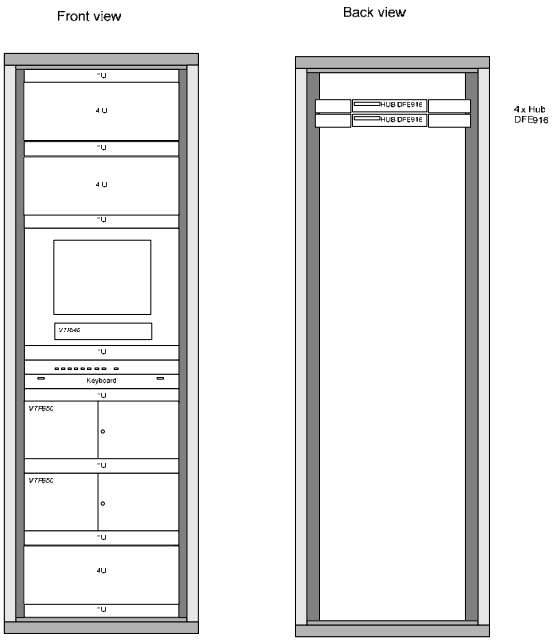
For phase II, no remote head-end integration is required. There will be no local encryption of PPV channels.

As a reminder of the Phase I design, each remote head-end can be commissioned by installed 2 ECS and 2 HUBs.



For added security, today Nagravision also recommends to install a redundant firewall in each head-end. Nagravision will be pleased to discuss various deployment options with EMC during clarification phase.

The cabinet was not included in the original design, but Nagra can propose it and price it if required. Below is the original proposed rack layout for remote head-end racks if provided by Nagravision.



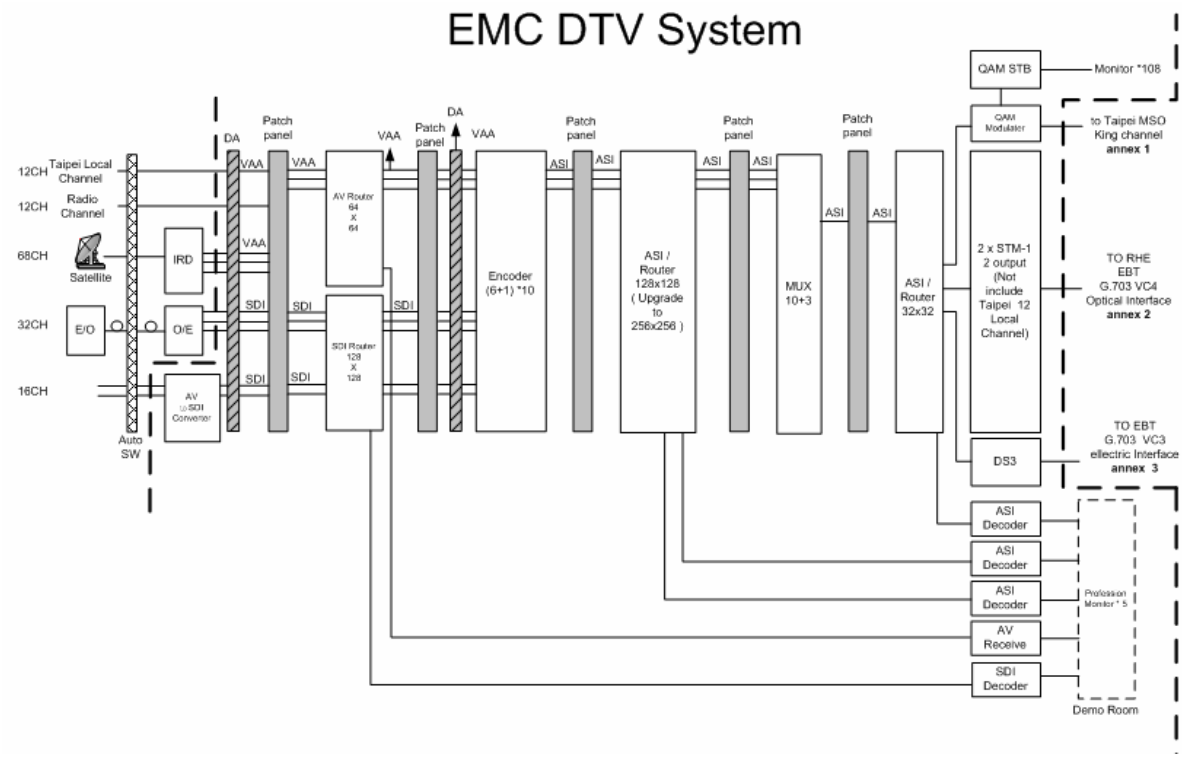
6.1.6 Remote Head-end Equipment List (8 sites)

S/N	Model	Element	Qty
16.	VTP 650 - ECS	ECS	2X8
17.	HUB-10/100-16/RM	Rack mounted 16-port Hubs	2X8

7. Head-end Compression System

7.1 Existing System Overview

EMC already have an existing system as indicated below.



Exisiting System in NeiHu

This project will manage to extend the existing platform by providing an extension to existing system.

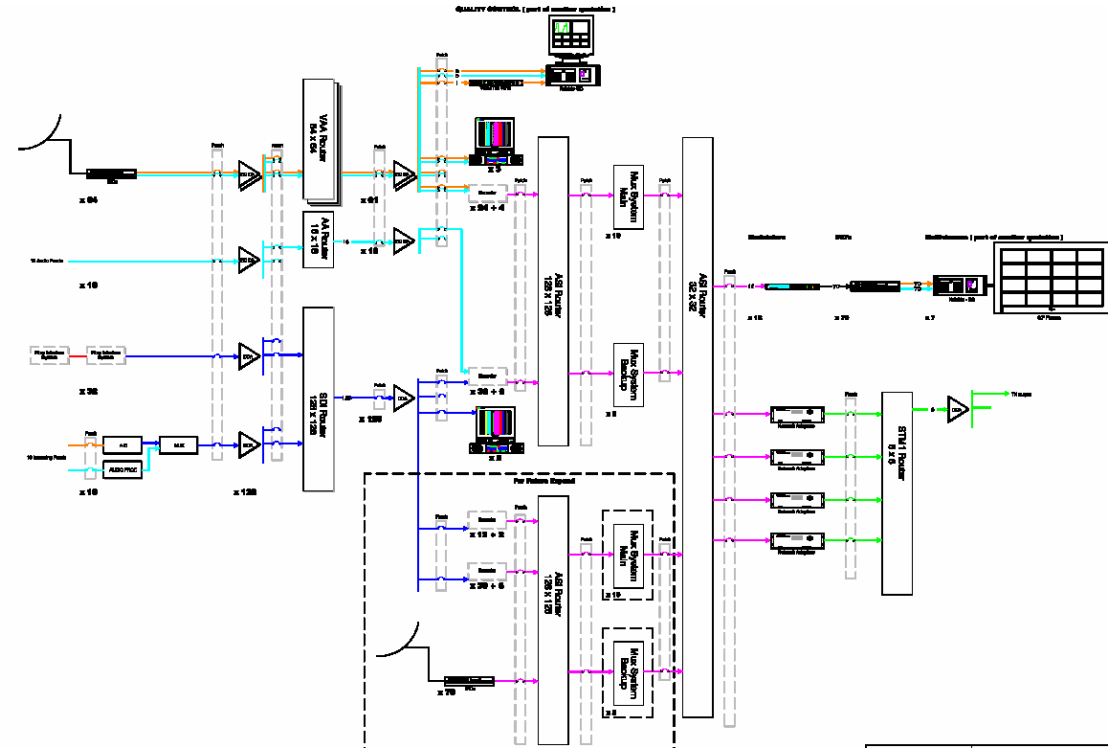
As THOMSON supplied the first platform, the new system will be perfectly integrated in the existing environment and will run under a centralized management system.

Several parts are to consider in this system

- Super Headend or NeiHu Headend extension
- Hsin Chu Headend extension
- 5x Regional Headends Extension

The proposal is based on several new products:

- ViBE Encoders (launched in 2003)
- New DBX 4300 Multiplexer with High Speed Capability (launched in 2003)
- DBD 4433 IRD (launched in 2003)
- XNA 4600
- TRITON routers
- XMS 3500 Management System (launched beginning of 2004)
- MCC DBS 2912 with extended RAM (launched in 2003)



Existing System and new system

THOMSON provide here the complete compression/multiplexing system including the network adapters and management system.

This sub-system is ready to be integrated in a turnkey system including following sub-systems:

- Conditional Access System
- Set Top Boxes with Middleware
- IPPV/PPV Subsystem

As NAGRAVISION is the Conditional Access System selected for the first phase of the project, THOMSON has proven the perfect interoperability and integration between these 2 systems.

THOMSON will handle the integration/configuration of the sub-system and equipment described in the following of this document.

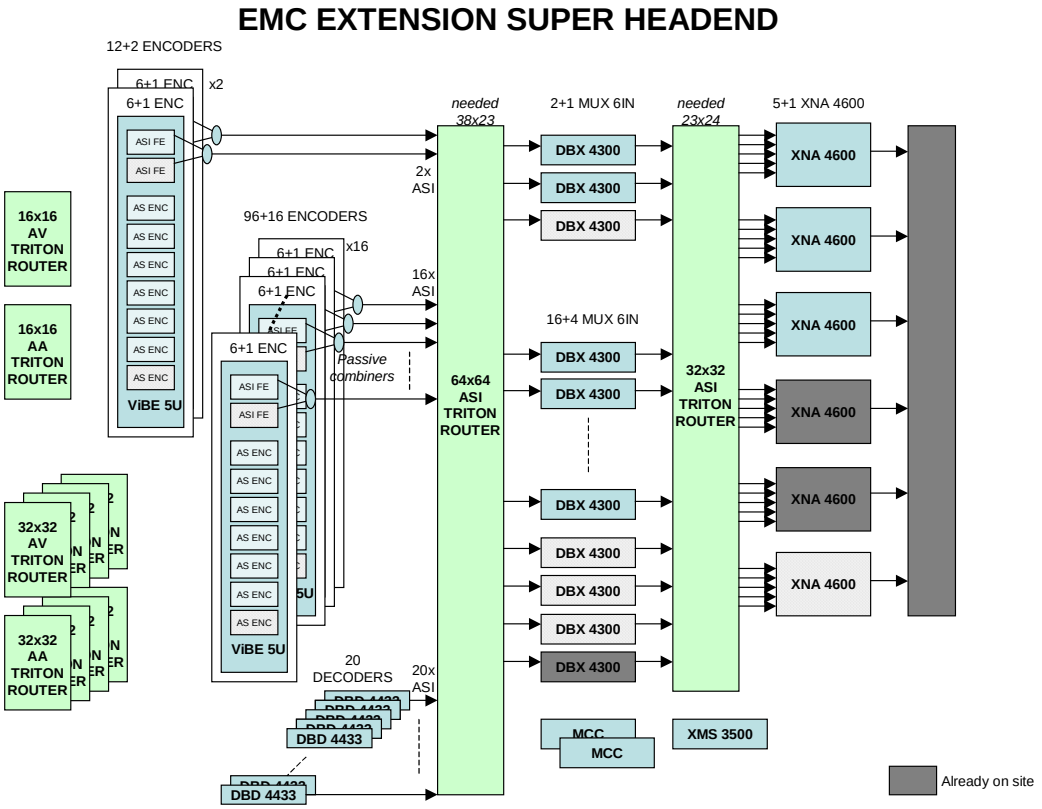
7.2 Nei Hu Super Head-End Overview

The existing platform will not be described in this document. It is made of:

- Encoders x70 (24+4)(36+6)
- Multiplexers x13 (10+3)
- Network Adapters x2 (1+1)

The new system will be handled by the same management system and will be smoothly integrated.

Extension proposed can be seen on the diagram below.



Extension proposed

The equipment needed on the extension platform as per EMC request is as follow:

- Encoders x126 (12+2)(96+16)
- Multiplexers x23 (2+1)(16+4)
- Network Adapters x4

Automatic redundancy is also needed but cost effective solution shall be proposed for router part.

7.3 Nei Hu System operation overview

We describe in the following the operational workflow of the system.

Video/Audio Sources Stage

We assume that we have 108 Video and Audio stereo sources. This is equivalent to 108 TV programs. Sources are considered to be analog as described in the tender document.

Analog Video/Audio Routers Stage – TRITON AA & AV

In order to reduce the cost of global routing system, we propose here 5 routers for analog video signals and 5 routers for digital video signals.

One couple of 16x16 routers (audio/video) allows to cover the needs of the subsystem including 12 TV programs.

Four couple of 32x32 routers (audio/video) allows to cover the needs of the subsystem including 96 TV programs. These 96 TV programs are therefore split in 4 groups of 24 programs.

Routers will be used for automatic redundancy of the encoding stage, allowing, in case of an encoder failure, to route the signal to the redundant encoder. They are all equipped with redundant power supplies.

Routers are connected to the analog video and audio sources and to the encoders. They are controlled by our centralized management system XMS 3500.

More details on the products can be reviewed in the following of this document (product description).

Encoding Stage – VIBE ENCODER

Encoders are taking opportunity of the ViBE internal multiplexing & redundancy capability.

Each 5U ViBE unit is configured with 6+1 encoders based on THOMSON 3rd generation chipset allowing good performance at low bit-rate. Each unit also have a 1+1 ASI front end that can multiplex the 6 programs together. At last, 1+1 redundant power supply is provided in each chassis.

ViBE encoder provides here analog audio & video interfaces. Each encoder also provides 2 ASI output, unused in this system but that can be used for monitoring purpose or to handle separately 1 program.

As the redundant ASI front end is inactive except if there is a switch (because of failure of the main board) a passive combiner is proposed at the output of the encoder.

This design has several advantages:

- Perfect safety since every item has automatic redundancy features
- Compact design reducing the required space & providing lower power consumption
- Easier cabling (MPTS of 6 programs handled after encoder)
- Still provide best-in-class THOMSON encoding capability

Encoder are connected to the analog video and audio routers and to the SDI routers. They are controlled by our centralized management system XMS 3500.

Encoders can be extended to 10 encoders per chassis allowing then a smooth and easy upgrade of the system if necessary.

More details on the products can be reviewed in the following of this document (product description).

Decoder Stage – DBD 4433

20 satellite decoders with QPSK input and ASI output are proposed here. A Conditional Access Module can be inserted to descramble any scrambled signal.

IRDs ASI output are connected directly to the ASI router 64x64.

More details on the products can be reviewed in the following of this document (product description).

Digital Video Routers Stage – TRITON ASI

Thanks to a first level of multiplexing at encoder level, we can here propose one centralized allowing more flexibility in the system and in the program grooming.

Router proposed here is a 64x64 router. Not all in/out are required but having a bigger router makes the system more flexible allowing to combine in 1 multiplexer several MPTS

This router will be used for automatic redundancy of the multiplexing stage, allowing, in case of a multiplexer failure, to route the signal to the redundant multiplexer. This machine is equipped with redundant power supply.

Router is connected to the encoders ASI Front End , to the IRDs and to the Multiplexers. It is controlled by our centralized management system XMS 3500.

More details on the products can be reviewed in the following of this document (product description).

ASI Multiplexing Stage – DBX 4300

Multiplexers receive here programs from the 64x64 routers, they do standard MPEG-2 DVB multiplexing allowing to set-up the content of each transponder that will be broadcasted on the Network. Multiplexer can have up to 26 ASI inputs.

Transponders are expected to contain 6 to 8 programs in about 27 Mbps (including SI and Applications datas).

Multiplexers are in automatic redundancy configuration thanks to our management system XMS 3500 together with channel controller MCC 2912.

These multiplexers are also connected to the NAGRA CAS system in order to achieve the scrambling of the signal. It will also handle PSI/SI insertion through ASI connection.

Service and PID filtering allow to easily modify or re-arange the first level of grooming done at the encoder level.

Output in this configuration is scrambled, there is an option allowing to provide “clear” outputs and “scrambled” output with the same content if necessary.

More details on the products can be reviewed in the following of this document (product description).

Digital Video Routers Stage – TRITON ASI

In a similar way as the 64x64 router, this 32x32 router will handle the signals coming out of the multiplexers and send them to the Network adapters XNA 4600.

The product is mandatory for automatic redundancy of the multiplexer and is controlled by our management system XMS 3500. It is also equipped with redundant power supply.

Network Adapter Stage – XNA 4600

Network adapters receive programs from 32x32 ASI router.

New Network Adapters are combined with existing Network adapters and a STM-1 router already on site.

Network adapters allow to change format from ASI to ATM and then do ATM multiplexing of the incoming ASI streams. Output is STM-1. Currently there is 5 ASI inputs.

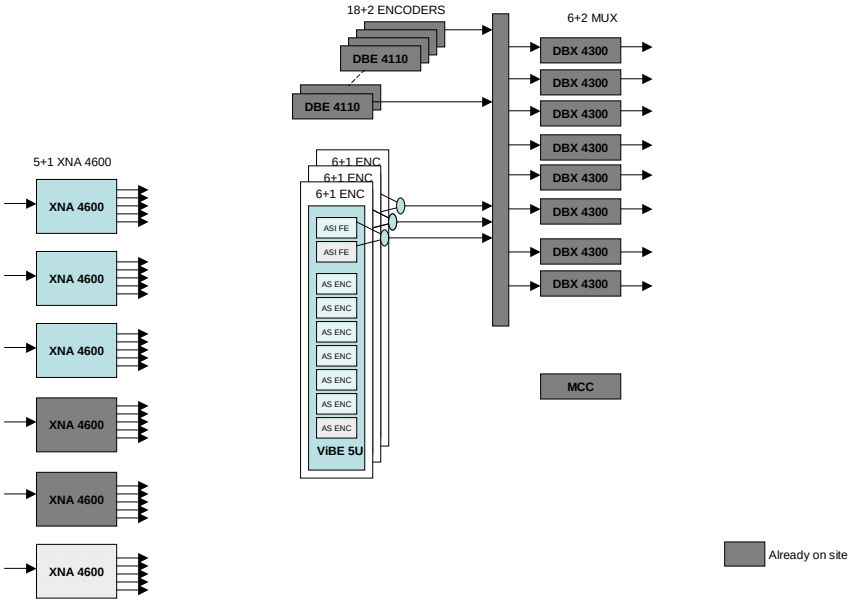
Automatic redundancy is provided using our management system and the ASI and STM-1 routers.

More details on the products can be reviewed in the following of this document (product description).

7.4 Hsin Chu Head-end System overview

Extension proposed can be seen on the diagram below.

EMC EXTENSION HSIN CHU HEADEND



Extension proposed

The equipment needed on the extension platform as per EMC request is as follow:

- Encoders x42 (36+6) (china encoder)
- Multiplexers x8 (6+2)
- Network Adapters x4

This system is using some existing equipment:

- 20x DBE 4110 Encoders
- 10x DBX 4300 Multiplexers
- 2x XNA 4600 Network Adapters

All these equipment can be controlled (existing one and new one) by our centralized management system XMS 3500.

7.5 Hsin Chu System operation overview

System operations in this subsystem are similar to the main headend.

As there is no router, no fully automatic redundancy is proposed, however our management system allow to automatically copy the configuration of faulty equipment in the backup one, therefore using patch panels the switching operation can be done in a few seconds.

Encoders are in the same configuration as the Super Headend and provide the same features.

Multiplexers already exist so we do not need to provide new multiplexers.

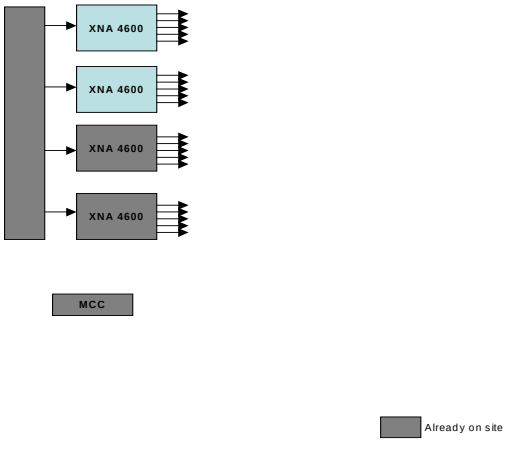
Network adapters need to be extended from 2 existing to 6 units so we provide 4 adapters. These products are in a reception configuration symmetrical to the super headend adapters (1 STM-1 interface and 5 ASI outputs).

All ASI streams (from Multiplexers and Network Adapters) are sent to some QAM modulators that we do not need to provide (provided by EMC).

7.6 Regional Headends Overview

Extension proposed can be seen on the diagram below.

EMC EXTENSION 5x RHE HEADEND



Extension proposed

The equipment needed on the extension platform as per EMC request is as follow:

- Network Adapters x2

This has to be proposed for 5 local headends.

Network Adapters here are added to some existing XNA 4600, and are in reception configuration as in Hsin Chu headend.

Everything can be controlled by our centralised management system in the Super Headend.

7.7 Interfaces between Thomson and CAS systems

The presentation here below focus on the Nextream / NAGRAVISION CAS interfaces.

IMS (Information Management System)

Main database for service and event, access condition and EPG

CA and EPG scheduler

ECE (ECM generator)

Runs with IMS on a Digital Alpha Server on UNIX

Generates ECM on specific board

Listens to TCP connection(s) from CAC

EMB (plays for EMM generator)

Rackable PC running on SCO UNIX or IMS module

Broadcast EMM in packet format (DVB Simulcrypt protocol for EMMG<>MUX I/F on UDP)

TopD (Topology Discovery)

IMS module

Synchronization with Head-end information (service lay-out…)

MDI

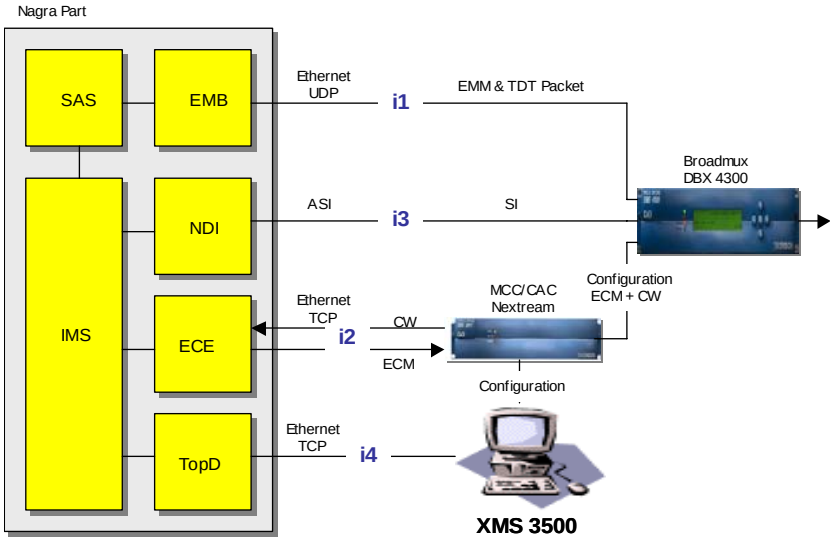
SI (and private data) injector, DVB ASI output

The major components of the system are:

- NEXTREAM equipment
  - Multiplexers,
  - Encoders,
  - DBS 2912/11/08 (MPEG-2 Channel Controller),
  - XMS3500 Control & Command Software

- NAGRA CAS
  - EMB (EMM Broadcaster)
  - ECE (ECM injector)
  - IMS (NAGRA management platform)
  - MDI (for SI tables injection)

The global architecture will be as shown in the following picture.



NAGRA Interfaces overview

Four main interfaces appear in this picture:

I1: EMM broadcasting

Interface between NAGRA EMB and Multiplexers

I2: ECM Injection

Interface between NAGRA ECE and MCC's

I3 : SI tables Injection

Interface between NAGRA MP100S data carrousel server and Multiplexers

I4: Access Groups configuration and Service Description recovery

Interface between NAGRA IMS and C&C PCs

C&C PC (XMS3500)

Interfaced to TopD with OpenDBS

Provide service and component layout

MCC/SCS (DBS2908, 2911, 2912)

Establishes TCP connection to ECMG(s)

Uses DVP Simulcrypt protocol for SCS<>ECMG I/F on TCP (version 1 & 2)

MUX (DBX4300)

Listens to UDP datagram (or TCP connections)

Uses DVP Simulcrypt protocol for EMMG<>MUX I/F on UDP or TCP (version 1 & 2)

Remuxes SI Data

Redundancy

Managed for ECMG

Managed for NDI with ASI routers

Examples:

EMC, Starhub, NTL/CWC, Telewest, Euskaltel, QuieroTV, Optus, Antena Hungaria

8. Content management system

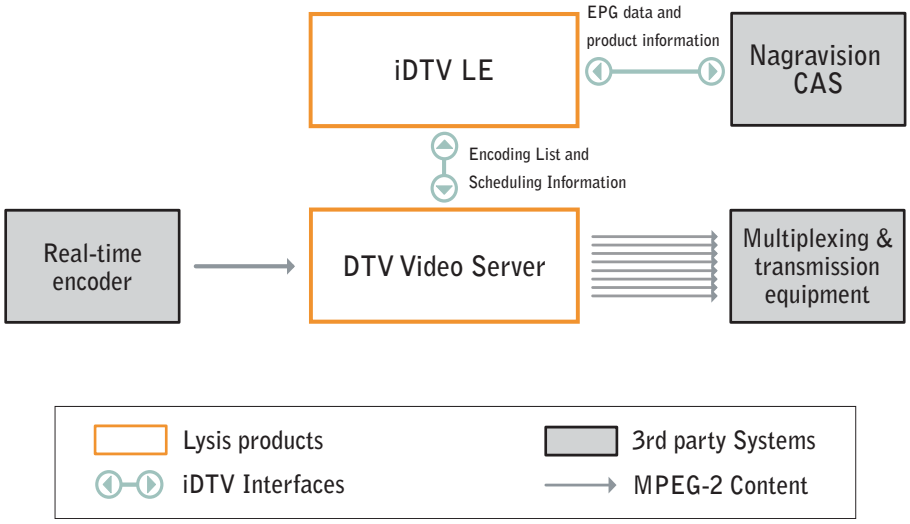
8.1 Solution overview

The proposed solution is composed of the following building blocks:

iDTV LE (Limited Edition) for content management and scheduling of PPV services, including interfaces to

- Nagravision CAS
- DTV Video Server solution

- **DTV Video Server Solution** for acquisition, storage and delivery of MPEG-2 content over digital television networks.



8.2 iDTV LE - PPV scheduling management

The iDTV LE PPV component is a fully integrated set of applications for the management of the business functions, processes and information flow required for the successful broadcast of locally originated channels. The solution addresses the management of digital television entertainment over digital broadcast and IP broadband networks, enabling subscription & PPV programming services.

It supports advanced EPG information management and other business functions such as programming, packaging and pricing.

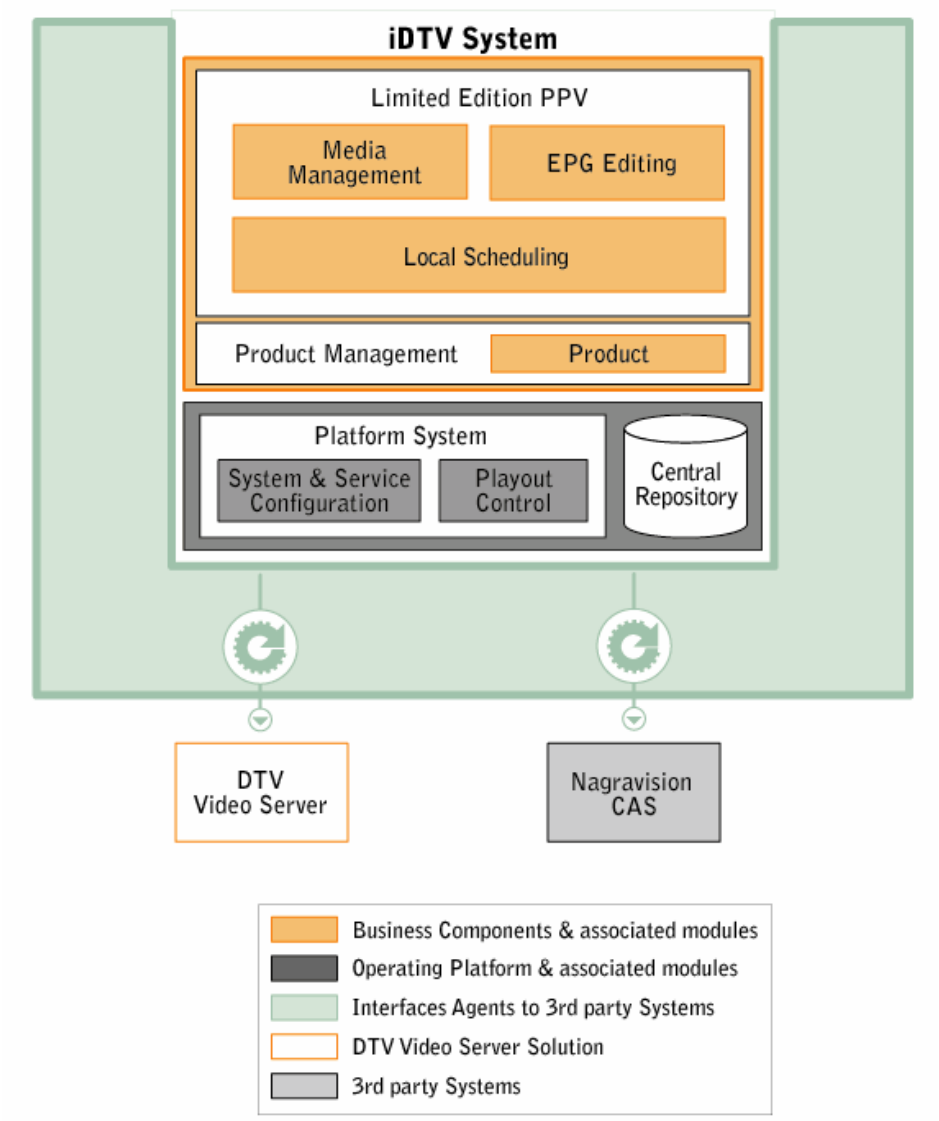
It is an open system based on industry standards, allowing information to be exchanged with heterogeneous external systems.

For the efficient programming and deployment of broadcast channels, the iDTV PPV component provides the following key features:

- Edit, analyse and validate programme schedules for PPV channels, with the creation of transmission playlists for video servers.
- Manage programme content with rich metadata and build locally originated channels with associated EPG schedule information.
- Design and manage PPV and subscription product packaging and pricing, with export of pricing and product data to Conditional Access System.
- Supervise playout with a dedicated broadcast supervising tool.

8.3 iDTV PPV LE software architecture

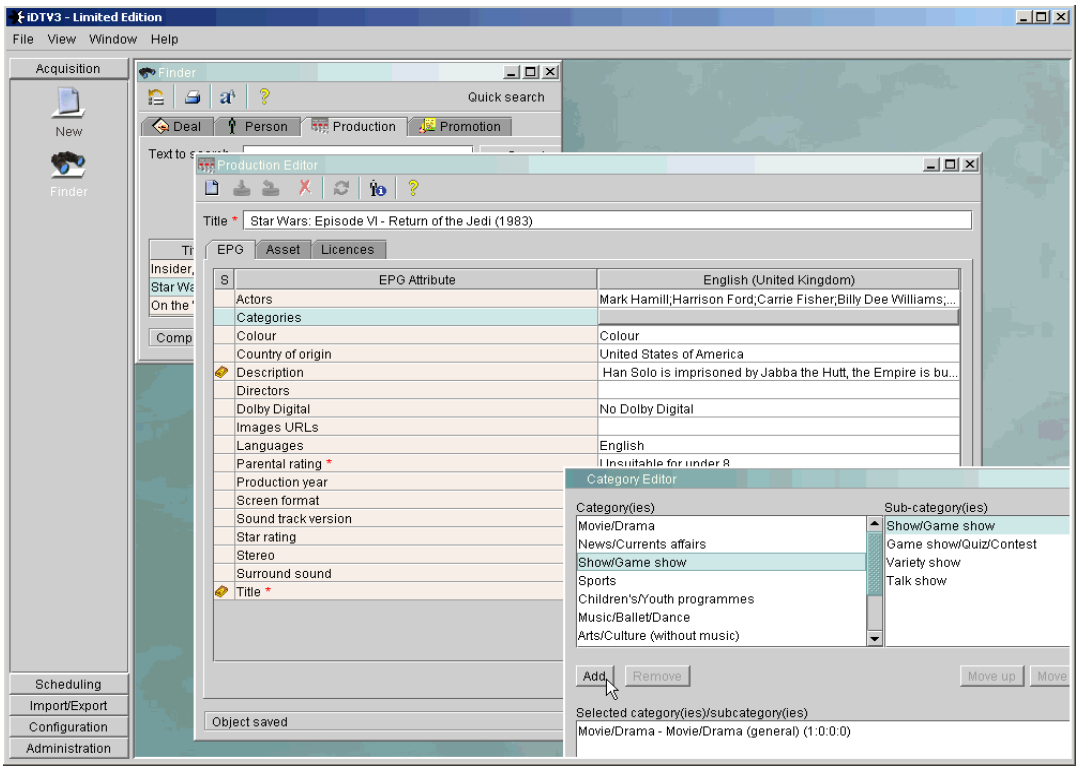
The figure below illustrates the logical components of the iDTV LE solution and the following sections describe the modules included.



8.4 Business applications

8.4.1 Media management

The Media Management module deals with the metadata associated with the content of programme elements. The module acts as a central repository for programme titles, which can be described and managed independently from their physical media.



The system stores comprehensive information about the following types of programme elements:

- Programmes (e.g. movies, events.)
- Promotions, fillers and other interstitial material

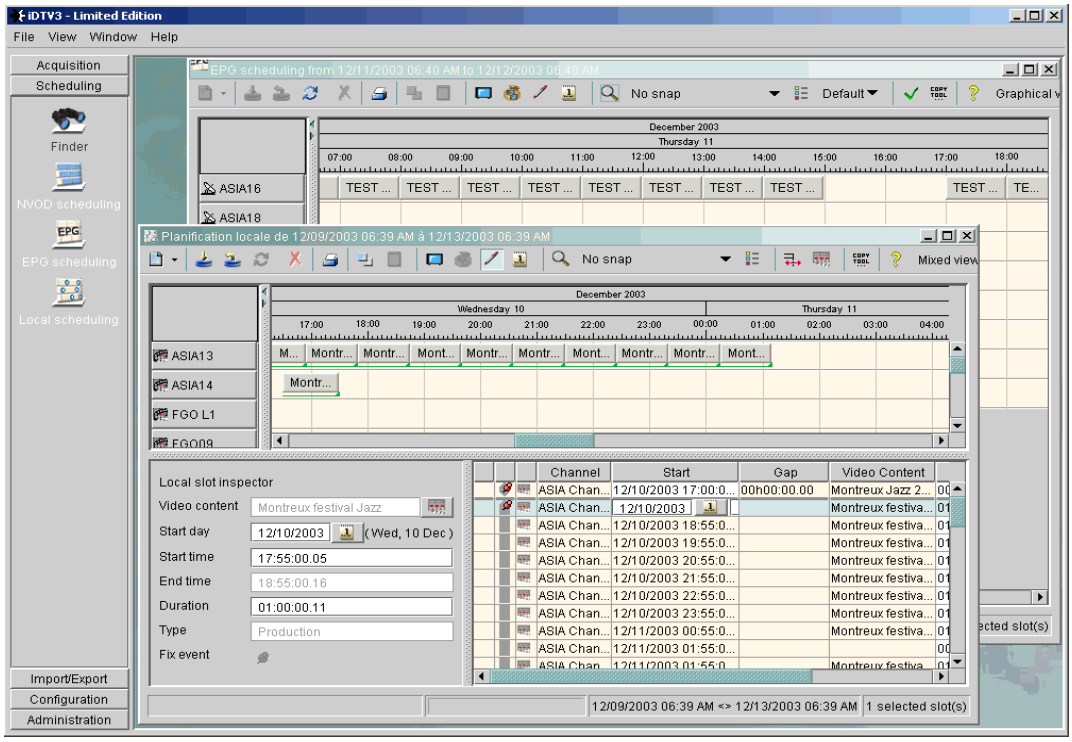
The Media Management module offers the following functions:

- Management of all the attributes necessary to generate a multi-lingual EPG
- Full integration with the Scheduling tool
- A repository search for programme elements using a large number of search criteria, such as title, duration, cast, licence information, rating and programme type.

8.4.2 Schedule Management

Scheduling is based on the notion of programmes and events. A programme, which contains one or more events, is a temporal envelope used to generate the EPG timing information. An event corresponds to the scheduled transmission of a particular piece of content (movie, promotion or advertisement). The main event within a programme determines the EPG and, eventually, the PPV information.

You can use dedicated tools for **Local** and **Turnaround** scheduling.



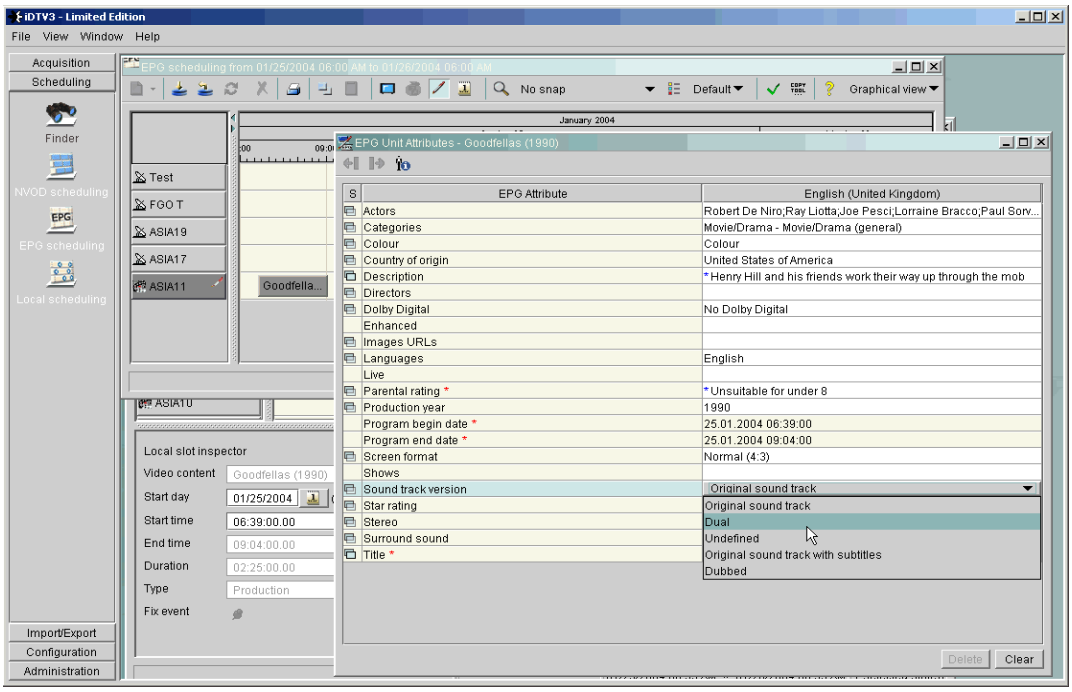
The views available in the tools are:

- **Graphical view**: A graphical display of the programme schedule for an unlimited set of services over a configurable period of time. A variety of graphical features are available in this view such as specific colour criteria for the scheduled elements according to their type, status, etc., a contextual menu, zoom and snap functions, and an inspector that presents detailed information on the selected element.
- **Textual channel view**: Lists in a table the schedules of an unlimited set of services over a configurable period of time. This view is specially designed to facilitate the acquisition of new schedules and has been optimised for keyboard manipulation.
- **Mixed view**: Shows a double view (graphical and textual) of the schedule.

Before transmission, the validation process will detect any gaps or media problems.

8.4.3 EPG Editing

The EPG Editing module enables the management of EPGs on a per channel basis. The default setting enables the manipulation of DVB-compliant EPGs (title, description, parental rating, genre/sub genre, etc.), but other kinds of EPG are easily configurable.



The EPG Editing offers the following functionality:

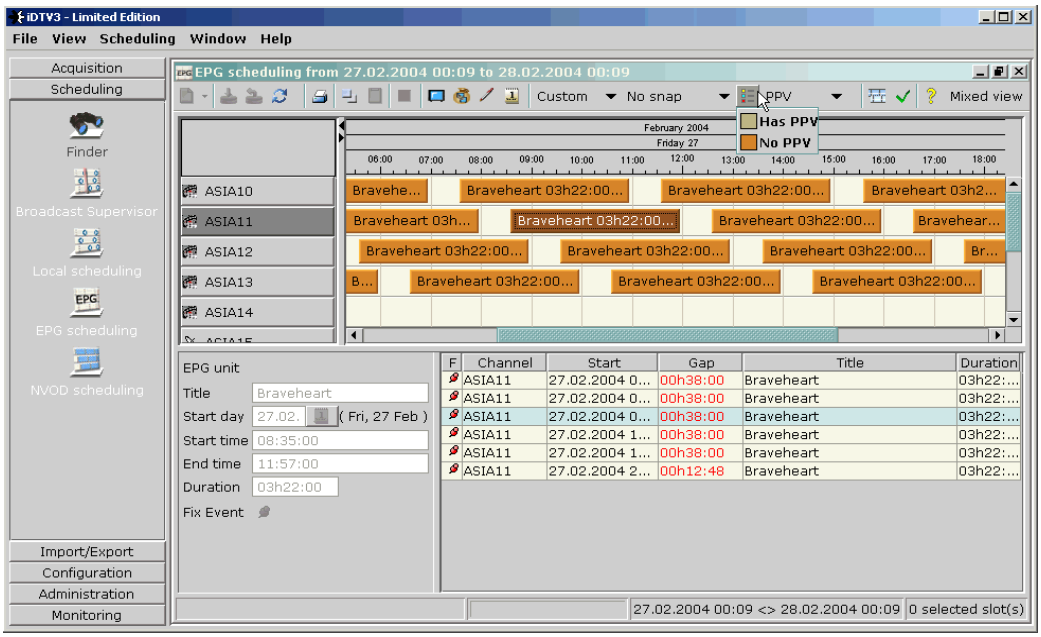
- Powerful manual acquisition
- Multilingual facilities
- Picture management
- DVB-compliant EPG
- Configurable EPG

8.4.4 Product management

Nagravision provides support for all aspects of product management for Conditional Access System (CAS). The Product Management tool is the central point for the coordination of the product workflow, from the creation of a purchasable item to its publication through the export agent(s).

Technically, access criteria define the conditions under which a customer can unscramble the content on broadcast services. The tool is used to define and store business information, such as CAS-specific access criteria, in the database. The export agent(s) then sends this information to the appropriate CAS or delivery system.

Purchase parameters for individual events can be added by hand, for example to manage the selling of football games.



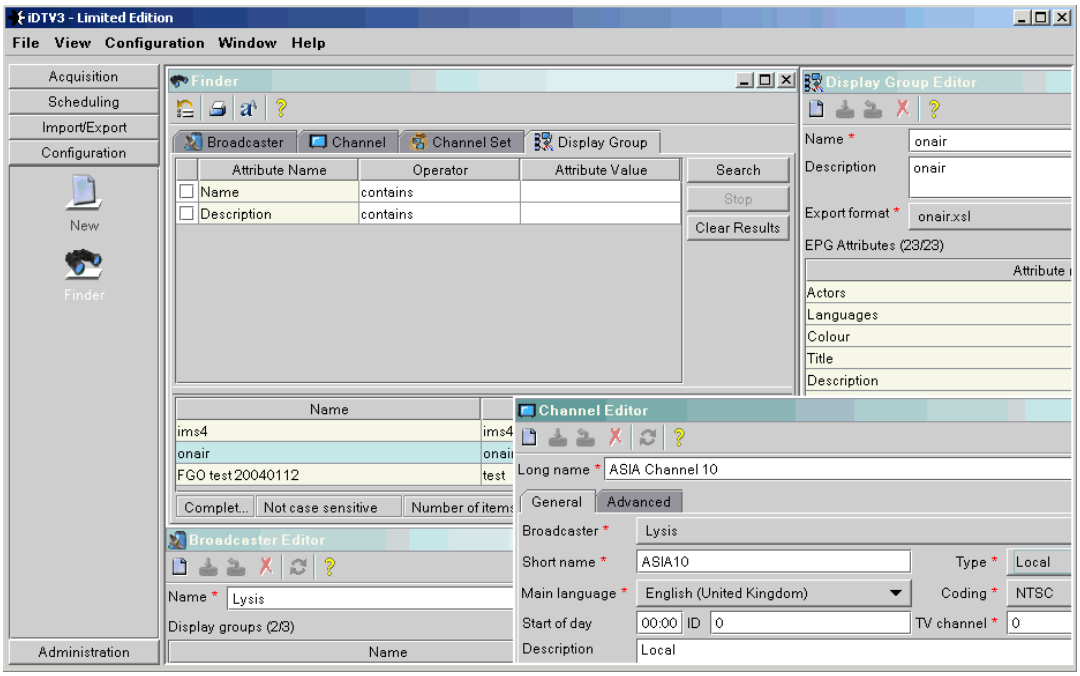
8.5 Operating Platform

8.5.1 System and Service Configuration

The System and Service Configuration module is used to set up and administer the system from a central point, manipulating the data that impacts the iDTV applications the most. The use of this application must be restricted to system administrators.

One important aspect of the module is to configure the channel line-up by defining the services (i.e. channels where the schedule is defined), When defined, channels can be grouped into sets that can be then manipulated for export purpose, for instance.

Another provided facility is the localization of the complete iDTV user interface. A translator tool allows the system administrator to translate every text appearing on the user interface into the preferred user's language.



The System and Service Configuration module offers the following functions:

- Creating Operators.
- Creating Services and defining their parameters.
- Creating Service Sets by grouping services into sets and defining their parameters.
- Translating the user interface into a given language.
- Managing the user and the associated security: user accounts with passwords and their rights to access specific parts of the different iDTV components.
- Auditing on past operations within the system.

8.5.2 Video Server Playout Control

The iDTV Video Server Playout Control system enables service operators to manage and monitor the playout of PPV channels from local video servers. Whether the schedule is locally created or provided by an external content aggregator, the system facilitates the ingestion, preparation and control of transmission playlists for use in conjunction with the video servers, as well as the post-transmission activities such as as-run log management. Furthermore, apart from efficient integration with the video servers' native APIs, the system typically:

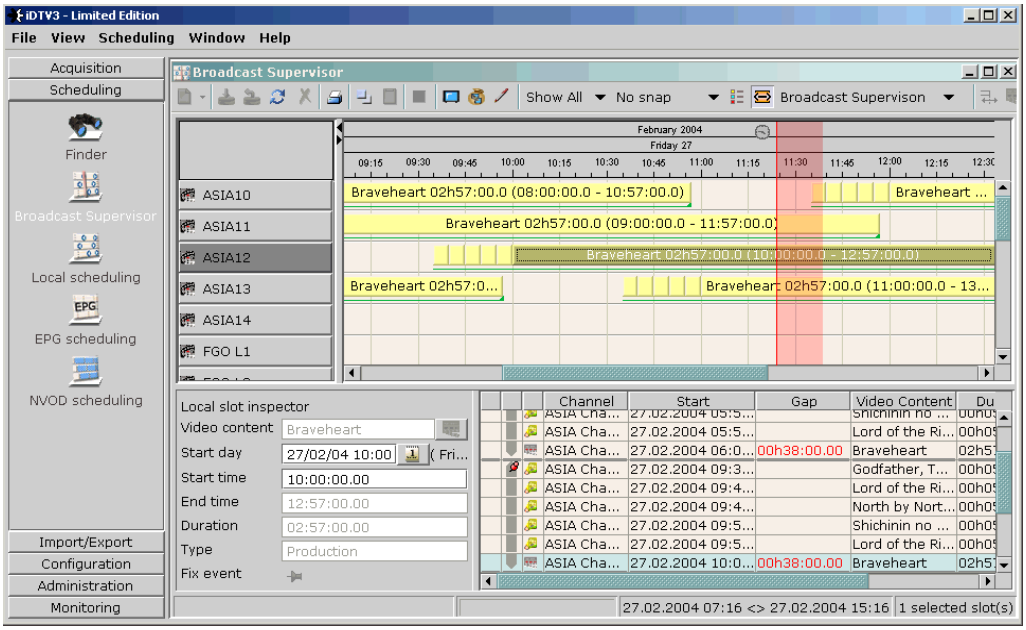
- Tracks digital assets and enables the operator to load the related duration essential for programme scheduling.
- Manages the digital asset acquisition process from content encoding to recording on the video server.
- Manages and monitors the transmission status of video server for multiple channels and detects, in advance, missing media or other problems through instant alarm notification.
- Manages the detailed accounting of each transmission event and generates the audit logs.

8.5.3 Supervising the broadcast

This module is based on the scheduling module, but comes with additional features that focus on broadcast supervision:

- Current time moving on the schedule.
- Colour-coded event playout status display.
- Asset presence verification (coupled with alarm management).

Event statuses are retrieved from the return link of the broadcast device (video server or tape machine) provided that the automation system implements this return link.



8.5.4 Reporting

Report generation is an important component in iDTV, allowing the operator to perform his day-to-day work; most of the reports are based on scheduling computations and can be previewed, printed or exported. The report list includes:

- Daily play list.
- Asset load, purge, 'to encode' and presence lists.

8.5.5 Alarm monitoring

The processing and monitoring of alarms in iDTV is based on several software processes running in the background and one front-end application that enables users to view and acknowledge the alarms.

The following interfacing agents generate alarms:

- Agents that detect the failure of an external system, such as a video server.
- Agents that detect a disconnection from a controlled device or the database.
- Agents that detect that critical data to be exported are missing.

Typical alarms include:

- Video server disconnected.
- Asset missing on playout device.
- Playout failed on a video server.
- Playlist refused by a video server.
- Price data missing for PPV product (to be exported to the SMS).
- File generation failed (for a text file based export agent, if any).

All alarms can be configured to be active or inactive, and all active alarms are logged into log files.

8.6 Agents and Interfaces

For the project deployment, we assume at this stage that the video server will be controlled by the iDTV system. Therefore, the micro schedule will be exported to the video server, while other information, such as EPG data and the products, will be exported to the Nagravision CAS.

8.6.1 Nagravision CAS Agent

The Nagravision CAS Agent enables the export of all the metadata associated with locally generated services to the Nagravision CAS.

This interface usually includes all the metadata related to content descriptive information (including EPG fields) and other information specific to service scheduling.

It is also responsible for sending access conditions based on product definition. Usually, these access criteria are transmitted to the CAS in a rolling buffer for the same number of days as they are for the EPG. Changes inside this window are transmitted as soon as possible. All access criteria are transmitted on an event basis.

This agent performs the following actions:

- Extracts data from the iDTV LE system central database.
- Transfers conditional access attributes for PPV programmes, such as purchase prices, taping constraints, preview period, encryption period and buy window.
- Validates the presence of mandatory fields and normalizes the necessary information.
- Notifies the operator of errors encountered during the transfer.

8.6.2 DTV Video Server Agent

The Video Server Agent provides a framework to control the streaming engine by communicating with its native API. The agent regularly exports the schedule information to enable playout, and requests an "As-Run" log at the end of the transmission.

It also tracks digital assets by monitoring their installation and purge on the server, in order to retrieve associated metadata, such as asset duration. If assets are missing an alarm is raised by the alarm management system.

8.7 Hardware configuration

The following section describes the requirements for each part of the system. However, on customer's request, we can supply additional hardware description in a separate proposal.

8.7.1 Workstations for business components

Workstations used for running business applications are Intel Pentium platform, with a Pentium V processor at 1GHz, standard disk space (a minimum of 10GB) and a minimum of 512 MB of RAM.

All workstations are identical, although the monitor types and sizes may differ. Some Graphical User Interfaces (GUI) require a 21" screen.

Scalability is achieved by increasing the number of workstations, as is redundancy.

8.7.2 Agent server

The agent server used for running agent processes is a low-end server-class machine with reasonable CPU and memory capabilities. We provide a minimum of 1GB RAM and a Pentium V of 2GHz or better. Physical hard disk space is not critical: 20Gb of storage is adequate.

We usually provide machines such as HP ProLiant ML370 G3 server or similar.

8.7.3 Database Server

The database server is a server-class machine with scalability and expansion possibilities to allow for system growth.

The database server requires powerful CPU and memory capabilities in order to maximise data throughput and processing. We usually provide HP AlphaServer (DS15 67/600 MHz, 1CPU, 1GB RAM, DAT tape drive). The database server is designed with sufficient physical expansion space to add extra hard disk storage as required. We provide an initial 72GB of storage (2 x 36GB SCSI disks).

When high availability is required, a redundant solution may be considered. This offer includes a single database server, but cluster solution can be proposed upon request.

9. DTV Video Server Solution

The DTV video server solution is based on the following products:

- **DTV Provisioning Software** for acquisition and storage of content.
- **DTV Distribution Software** for delivery of content over DVB or IP networks.

Real-time software packages run on high performance HP AlphaServer systems based on 64-bit Alpha microprocessor architecture.

The DTV Provisioning Software handles the acquisition, concatenation and storage of all digital content planned for broadcast. It allows preparing and managing digital assets efficiently and ensures that all encoded material is acquired, stored and ready to be delivered with no alteration to the original signal's quality.

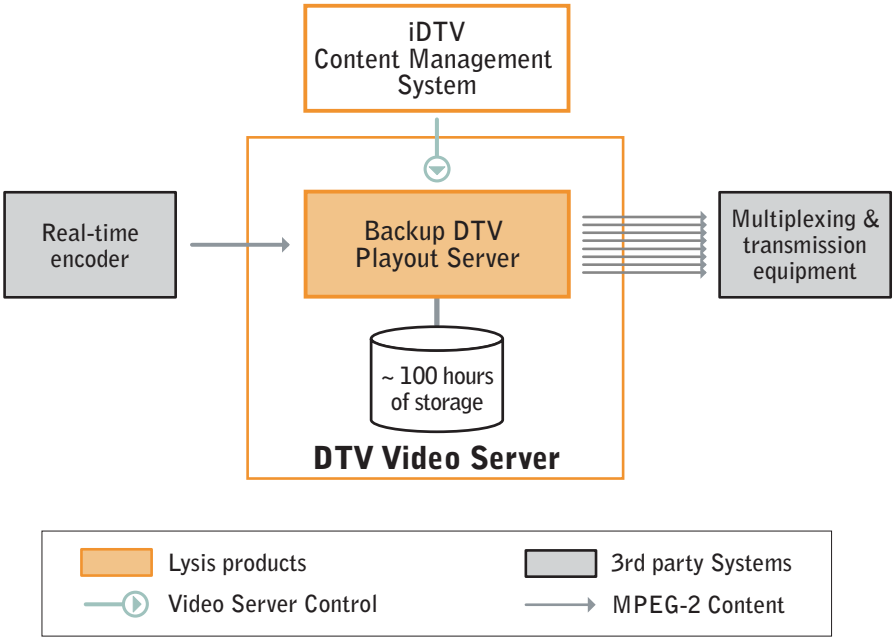
The DTV Distribution Software delivers movies, promos, clips, advertisements and other content as seamless digital TV streams, using DVB interfaces. The software is based on key industry standards such as MPEG-2 compression and typically includes features such as PPV streaming. The internal playlist scheduler is compatible with iDTV LE system and is capable of running autonomously for several hours or days depending on the configuration.

9.1 DTV Video Server architecture

The proposed solution, illustrated in the following figure, consists of:

1. 1 x **DTV video Server** for real-time ingest, to be used in conjunction with real-time encoders (not included in this proposal), and for playback of local channels.

The DTV Video Server Solution is controlled by the iDTV LE System.



9.1.1 Redundant DTV Video Server architecture

This configuration does not provide any backup capability for the playback in case of failure, which is not recommended for a production site. If required, the solution can easily be upgraded to a fully redundant, fail-safe hardware architecture.

9.2 Ingest and playback of MPEG-2 content

9.2.1 Hardware

The **DTV Video Server** consists of one AlphaServer DS25 system, equipped with:

- DS15, 1 Ghz
- 1GB RAM
- DS15 Internal Storage Cage (3X-BA15A-AA)
- 2 x 18-GB Ultra320 SCSI 15,000 rpm 1-inch Universal disk drive (3R-A3848-AA)
- 6 x 72.8-GB Ultra320 SCSI 15,000 rpm 1-inch Universal disk drive (3R-A3851-AA)
- 1 x DVD reader
- Rackmount Kit
- Smart Array 6402/128M
- 2 x MSA30 single bus with redundant power
- MediaPump DVB-ASI, 3 output, 533-31

9.2.2 Software

The **DTV Video server Server** includes the following software:

- Tru64 UNIX operating system software, license and documentation.
- DTV Provisioning and Distribution software, license and documentation.
- DTV Control and monitoring software, license and documentation.

9.2.3 Physical layout and specifications

The **DTV Video Server** is available as a pedestal or as a rack mount system. In either case the components are identical; the rack mount variant is simply rotated to one side. The rack mount system requires 5U space and can be mounted in a 67- or 79-inch M-series cabinet along with additional disks. The rack cabinet is not included in this proposal and must be ordered separately.

9.3 Assumptions

The PPV package solution described in this proposal is based on the following assumptions:

- The proposed systems, including content management and video server, will be deployed in an existing digital broadcasting infrastructure based on DVB and MPEG-2 standards, and running a Nagravision CAS configured to support PPV products.
- The proposed video servers are equipped with DVB-ASI input and output ports and are compatible with professional MPEG-2/DVB encoders and decoders. The offer does not include specific set-top box integration and test services.
- EMC will provide a real-time encoder to ingest the content on the video server. It must be compatible with both the set-top-box and the video server. A list of compatible encoders will be provided on request.
- This solution does not include any customisation of business features, though customisation can be managed through a specific analysis and then implemented by Lysis.
- This solution does not include any custom agents to integrate with specific vendor systems, except for pre-integrated systems such as the Nagravision CAS.

Glossary, terms and acronyms

ACS	*Access Control System*; Nagravision component translating SMS commands into EMMs
ASE	*Available Server Environment*; Compaq UNIX mechanism providing redundancy between a cluster of two identical machines. Used by the main CAS machines in redundant architectures
ASI	*Asynchronous Serial Interface*; protocol to interconnect DVB equipment
CA	*Conditional Access*; equipment and techniques preventing unauthorized use of data or video streams.
CAK	*Conditional Access Kernel*; Nagravision component running on the Consumer Device (or STB) and providing an interface to the security chip
CAS	*Conditional Access System*; Nagravision product, as a whole
CC	*Call Collector*; Nagravision component handling the calls from the STB to collect IPPV usage
CMS	*Content Management System*; software to manage all aspects linked to content (acquisition, scheduling, broadcasting, payments) for a Pay TV operator
DNASP	*Digital Nagravision Advanced Security Processor*; name of the Nagravision CA technology
DVB	*Digital Video Broadcasting*; Consortium of companies establishing common international standards for digital broadcasting. <http://www.dvb.org/>
DVB-CI	DVB Common Interface; optional digital removable security devices implementing the security and CA portions of STB in the DVB standard, functionally equivalent to the US OpenCable POD standard
ECB	Nagravision hardware device combining and ECE, EMB and EME.
ECM	*Entitlement Control Message*; CA message
ECMG	*ECM Generator*; In the context of DVB SimulCrypt, generic name given to the CA specific device or software generating ECMs.
ECO	*Engineering Change Order*; In general, procedure designed to document as precisely as possible a change in a system. Specifically, procedure by which Nagravision customers can request specific modifications to their CAS.
ECS	*ECM SimulCrypt Encryptor*; Nagravision component providing ECMs to the network; acts as a DVB SimulCrypt ECMG
EIS	*Event Information Scheduler*; In the DVB SimulCrypt system architecture, functional unit in charge of holding all the schedule information, all the configurations and CA specific information required for the complete system.
EIT	*Event Information Table*; part of the DVB SI specification
EMB	*EMM Broadcaster*; Nagravision component providing EMMs to the network; acts as a DVB SimulCrypt EMMG
EME	*EMM Encryptor*; Nagravision component encrypting EMMs before diffusion by the EMB
EMM	*Entitlement Management Message*; CA message
EMMG	*EMM Generator*; In the context of DVB SimulCrypt, generic name given to the CA specific device of software generating EMMs.
EPG	*Electronic Program Guide*; depending on the context, refers either to the STB application providing a display of the channel schedule on the subscriber TV screen, or either to the whole schedule process, from its definition, its transmission on the network to its display.
FTTH	*Fiber To The Home*; Network architecture
GUI	*Graphical User Interface*; a computer program human interface that takes advantage of the computer's graphic capabilities to make the program easier to use

IMS	*Information Management System*; Nagravision component handling the topology, schedule, and subscriber offerings (products)
IP	*Internet Protocol*
ISDN	*Integrated Services Digital Network*; set of international standards for transmitting voice, data, and video simultaneously
ISO	*International Standard Organization*
MDI	*Multimedia Data Injector*; Nagravision component streaming data or video over ATM or DVB equipment
MGT	*Management Workstations*; Nagravision supplied Windows NT computers designed to run a suite of GUIs to monitor and control the CAS
MMDS	*Multipoint Microwave Distribution System*; Wireless broadband network technology
MPEG	*Moving Picture Experts Group*; ISO working group. The term also refers to the family of digital video compression standards and file formats developed by the group
MPEG-2	MPEG second video compression scheme; coding scheme for the compression of video signals
MUX	*Multiplexer*;
Nagravision	*Nagravision S.A.*; member of the Kudelski Group of Companies, provides this document and the solutions, components or APIs it describes
NIT	*Network Information Table*; part of the DVB SI specification
NVOD	*Near Video On Demand*; principle by which the same movie or event is repeated on multiple channels at short intervals like 15 minutes
PSI	*Program Specific Information*; MPEG specifications enabling auto-tuning on the STB
SC	*Smart Card*;
SCS	*SimulCrypt Synchronizer*; In the DVB SimulCrypt architecture, logical component that acquires CW, ECMs and synchronizes their play-out for all the CA systems connected
SDT	*Service Definition Table*; part of the DVB SI specifications
SI	*System Information*; DVB or ATSC defined data format used by the STB to display information about services available on the network
SIG	*SI Generator*; In the DVB SimulCrypt architecture, component responsible for generating the SI, taking its primary data from the EIS and supplementary data from the Custom SI servers supplied by the CA providers.
SMS	*Subscriber Management System*; software program managing subscribers on the network; may be supplied by Nagravision
STB	*Set Top Box*; name of the Consumer Device in DTV networks
TCP	*Transmission Control Protocol*; main protocols in IP networks; enables two computers to establish a connection and exchange streams of data; guarantees delivery of data
TDT	*Time Definition Table*; part of the DVB SI specifications
TOT	*Time Offset Table*; part of the DVB SI specifications
VOD	*Video On Demand*; umbrella term for a wide set of technologies whose common goal is to enable individuals to select video streams from a central server for viewing on a television or computer screen
XML	*eXtensible Markup Language*; a pared-down version of SGML; allows designers to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations. Nagravision uses XML for most of its APIs.