



Hays, Cynthia J

From: Gagnon, Gregory J  
Sent: Friday, November 05, 1999 10:34 AM  
To: James, Thomas H; Kahn, Raynold M; Klaus, Peter M  
Cc: Kollar, William J  
Subject: FW: White Paper

Importance: High

This is the Contract Study final report from Nagra. Can you please review this document and give me your comments ASAP so we can give them feedback on it. I know you guys are busy, but we need to close this contract out and we cannot do it until we have agreed on the final report. I sent this out prior to my vacation, but I didn't get any responses. I am hoping you guys may have already reviewed this and just need to send me your comments.

Bill Kollar and I are working with them to resolve the confidentiality and copyright information issues they raise as well as proprietary marking issues on the individual pages of the report.

Thanks

Greg

-----Original Message-----

From: Alan Guggenheim [mailto:aguggenheim@cis-tech.com]  
Sent: Friday, November 05, 1999 10:06 AM  
To: 'Gregory J. Gagnon (E-mail)'  
Subject: White Paper

Greg,



White Paper V1.pdf



SrbCakOw100.pdf

Here is the white paper version 1. as promised. Please note that it is principally the current Nagra system design, with adaptations for DIRECTV, as we agreed verbally, and as such, is considered NagraVision confidential and copyrighted information. Do not hesitate to call me if you have questions.

Thanks  
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**Project Phoenix**

**White Paper**

**Version 1.0**

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## 1. Introduction

*This chapter gives the scope and revision history of the document, along with a list of references and an extensive glossary.*

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**1.1 About this document****1.1.1 Scope**

This document supplies the detailed presentation of the NagraVision Conditional Access System (CAS) in the context of the Simulcrypt configuration required by the project Phoenix.

This is a "live" document, updated as time goes by to reflect the latest information available.

**1.1.2 Intended audience**

This technical document assumes the reader is familiar with the basics of DTV in general, and of the Phoenix Program and Phoenix RFI in particular.

**1.1.3 Structure**

This document is divided in three major chapters:

- ?? Chapter 3 describes the solution proposed by NagraVision for the Phoenix project.
- ?? Chapter 4 describes in detail NagraVision's various software modules, including extensive details of any customization required for Phoenix.
- ?? Chapter 4.8 presents a performance analysis of the whole NagraVision system.

**1.1.4 Conventions**

- ?? Directory and machine names appear in Courier.
- ?? The use of `0x` at the end of a machine name implies any machine. For example, `eme0x` refers to any one eme machine.
- ?? The term "component" refers to a hardware device and/or machine, the term "module" to software.

**1.2 Revision History**

Version	Author(s)	Date	Description
0.1 DRAFT	Eric Chaubert	1-June-99	Creation
0.2	Eric Chaubert	June 99	Editing
0.3	E. Chaubert & V. Trevisan		TOC modification
0.4	Ph. Stransky	August 99	Descriptions applied to the Phoenix architecture
0.99	Ph. Stransky	September 99	Editing
1.0	Alan Guggenheim	September 99	Editing

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**1.3 References**

The references in bold identifies Phoenix documents and their versions used by NagraVision.

Ref.	Title	Version	Issued by
[ASCEND]	<a href="http://www.ascend.com/205.html">http://www.ascend.com/205.html</a>		Ascend
[ASI]	DVB-TM Ad Hoc Group Physical Interfaces, Interfaces for CATV/SMATV Head-ends and Similar Professional Equipment; DVB-P1-154; TM1449 Rev. 1	7/11/95	ETSI
[DVB]	DVB; Specification for Service Information (SI) in DVB systems; EN 300 468	1.3.1 (1998-02)	ETSI
[DVB_IMPL]	DVB; Guidelines on Implementation and usage of Service Information (SI); ETR 211	9/97	ETSI
[DVB_NAGRAVISION]	IMS List of NAGRAVISION specific DVB / SI descriptors	2.2	NagraVision
[DVB_SIMUL]	DVB Simulcrypt; Part 1: Head-end architecture and synchronization; TS 101 197-1	1/97	ETSI
[GPS]	<a href="http://www.bancomm.com/vTs2100.html">http://www.bancomm.com/vTs2100.html</a>		Datum
[IMS_IBS]	IMS - IBS Gateway design	1.55	NagraVision
[MIB]	CAS MIB definitions	1.8	NagraVision
[MIB_OVW]	SNMP MIB User Guide	2.0	NagraVision
[NSM]	PHOENIX NagraVision System Management Overview	1.0	NagraVision
[NTP]	RFC-1305, Network Time Protocol (Version 3): Specification, Implementation, and analysis <a href="http://smurland.cvl.buffalo.edu/nrc/rfc1305.txt">http://smurland.cvl.buffalo.edu/nrc/rfc1305.txt</a>	03/1992	Mills, D.L.
[SCLAPI]	NRS Schedule Importer File Format	1.1.1	NagraVision
[SMS]	NagraVision SMS Gateway Interface, Specimen	2.0.4	NagraVision
[STB_API]	NRS STB Auditor File Format	0.2 DRAFT	NagraVision
[TOPD_OVW]	NagraVision Topology Functional Overview	1.2	NagraVision
[PH_RFI]	Request For Information		Phoenix
[PH_RRFI]	Response To Phoenix RFI		NagraVision
[SIPD]	Phoenix, NagraVision SI Private Descriptors	1.0	NagraVision

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1.4 Annexes

Ref.	Title	Version	Issued by
[CAK_OVM]	Set-Top-Box & Multimedia Group Conditional Access Kernel Overview	1.0	NagraVision

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## 1.5 Glossary

Acronym	Meaning	Comments
ACS	Access Control System	Part of the SAS, composed of the EMM Manager and the SMS Gateway
APG	Advanced Program Guide	
API	Application Programming Interface	
ARP	Address Resolution Protocol	A protocol in the TCP/IP protocol suite, ARP is responsible for translating an IP address into a physical address
ASE	Available Server Environment	Mechanism used to provide redundancy on the main CAS machine
ASI	Asynchronous Serial Interface	Protocol for interconnected DVB equipment
BCS		
BLOB	Binary Large Objects	Name given in databases for fields able to store a picture or another big data object
BNF	Backus Naur Form	Common presentation and definition of grammars
BSS		
CAS	Conditional Access System	NagraVision's product, as a whole
cas	Conditional Access Server	The main CAS server
CAK	Conditional Access Kernel	Part of the CAS, running on the STB
CAM	Conditional Access Module	Another acronym for smartcard
CAMC		
CAUS		
Component		Refers to a NagraVision hardware device, in opposition to module, referring to software.
CORBA	Common Object Request Broker Architecture	A standard protocol for inter-application communications.
CW	Control Word	
CWP	Control Word Packet	Phoenix equivalent of ECM
DTV	Digital TV	
DVB	Digital Video Broadcasting	
ECM	Entitlement Control Messages	Part of the information used by the STB to decrypt a service
EIT	Event Information Table	See [DVB]
EBS	EMM Broadcaster	
EME	EMM Encryptor	

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# NAGRAVISION

## Phoenix White Paper

Acronym	Meaning	Comments
EMGR	EMM Manager	
EMM	Entitlement Management Message	Part of the information used by the STB to decrypt a service
ETSI	European Telecommunications Standards Institute	
FTP	File Transfer Protocol	RFC-959
GUI	Graphical User Interface	
ICC	Integrated Circuit Card	Another acronym for a smartcard
IEMM	Impulse EMM	EMM for impulsive purchase
IMS	Information Management System	Part of the CAS responsible for products and SI definition and generation
IPPV	Impulsive Pay Per View	
IRD	Integrated Receiver Decoder	Another term for STB
MDI	Multimedia Data Injector	General-purpose data injector with DVB/ASI output
MIB	Management Information Base	A collection of objects that can be accessed via SNMP
MMT	MultiMedia Toolkit	Divicon's injection platform
Module		Refers to one of NagraVision's software modules, in opposition to component, referring to hardware.
MPEG Mux	Moving Pictures Expert Group Multiplexer	Group defining DVB's underlying standard Part of the UPSP equipment
NIT	Network Information Table	See [DVB]
NSM	NagraVision System Management	Main controller for NagraVision equipment
NVOD	Near Video On Demand	
ORB	Object Request Broker	Application providing CORBA services to other applications
OS	Operating System	
PID	Packet Identifier	Mpeg denomination for SCID
POTS	Plain Old Telephone System	Another name for the regular telephone network
PPV	Pay Per View	
PTC	Physical Transport Channel	Another name for a transport stream
PTV	Pay TV	
RAID	Redundant Array of Inexpensive Disks	
RAS	Remote Access Server	

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Acronym	Meaning	Comments
SAS	Subscriber Authorization System	
SCID		
SCS	Simulcrypt synchronizer	
SDDS		
SDT	Service Definition Table	See [DVB]
SI	Service Information	Data used by the STB to display information about services available on the network
SMS	Subscriber Management System	
SNMP	Simple Network Management Protocol	TCP/IP based protocol used to control and monitor remote objects or equipment
STB	Set Top Box	
STU	Set Top Unit	Another name for STB
TDT	Time Definition Table	See [DVB]
TSS	Traffic & Scheduling System	
UA	Unique Address	Smartcard serial number that allows addressing a unique smartcard in the field
UI	User Interface	
USPS	Uplink System Processing Segment	Part of the head-end responsible for encoding and multiplexing
VNM	Virtual Network Management	Communication protocol used by the SMS Gateway

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## 2. Executive Summary

*This chapter gives an executive summary of the white paper. It is intended to get a quick overview of the content of the white paper.*

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### 3. The NagraVision solution

*This chapter gives an outlook of the system features.*

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### 3.1 Context and objective

The solution described is intended to address the requirements outlined in the Phoenix RFI but with the intent to start operation with the NagraVision system in parallel to the actual Phoenix system. All the Phoenix system architectural changes that will happen in the near future are also supported by the proposed system solution.

Since the NagraVision system is built following DVB standards, the DVB terms are used throughout this document.

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### 3.3 NagraVision components functional description

#### 3.3.1 The Information Management System (IMS)

The IMS handles all the information needed to manage the broadcasting topology, the product profiles and the event profiles. It is composed of an ORACLE database and various processes running on a DEC Alpha computer.

#### 3.3.2 IMS functions

The ORACLE database contains the following data:

- ?? Transponders, services and circuit definitions.
- ?? Event schedules and descriptions.
- ?? Event broadcasting profiles.
- ?? Product and entitlement definitions.

The main processes are:

- ?? The ECM generator: this generates the ECM profiles each time a new event starts. The ECM profile is sent to the ECE computers.
- ?? The impulse PPV server: this creates all the information needed by the system for impulse PPV.
- ?? The product server: this provides product and entitlement definitions to the SMS gateway.
- ?? Automation: this manages services and circuit profile changes (bandwidth, elementary streams, etc). This feature will not be activated for this project.
- ?? The scheduler: this provides timing and starting signals for the different tasks that have to be launched at regular times or when a new event starts.
- ?? DVB SI or ATSC SI stream generation. This feature will not be activated for this project.

Additional functions are provided to manage or monitor the IMS data:

- ?? The external data filter: this allows importation of event data from an ASCII-formatted file. This feature will not be activated.
- ?? The IMS editor: this is an application running on a separate PC allowing the creation and modification of all data handled in the IMS database.
- ?? The schedule navigator: this is an application running on a separate PC with a 17" or 21" screen displaying all channels and events broadcasted.
- ?? Topology Discovery: this is an application running on a separate PC with a 17" or 21" screen. It automatically retrieves the transponder, services and elementary streams configuration and import them in the IMS database. It will not be provided for this project.

#### 3.3.3 The Simulcrypt synchronizer (SCS)

The SCS is responsible for generating ECM and for sending them to the Multimedia Data Injector. Control words are received from the Control Word Distributor and ECM profiles from the IMS.

#### 3.3.4 The Multimedia Data Injector (MDI)

The MDI is a general-purpose data injector, with DVB/ASI input and output ports and Ethernet port. It is required to inject data seamlessly into the multiplexer.

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### 3.3.5 The IMS editor (IME)

The IMS Editor (IME) is a Microsoft Access application accessing the ORACLE database. The following functions are available:

- ?? Create/Update transports.
- ?? Create/Update services.
- ?? Create/Update events.
- ?? Create/Update products.
- ?? Create/Update entitlements

The complete description of the IME is available in a separate document. The IME application accesses the Oracle database through the TCP/IP network. It uses the Oracle ODBC interface. It may run on Windows 95 or Windows NT.

### 3.3.6 Schedule Navigator

The schedule navigator is a separate PC with a 17" or 21" screen showing all the events on all the services for the next 6 to 48 hours. It runs on Windows NT.

The user can select a particular event on the screen and display detailed information like:

- ?? Service name
- ?? Event name
- ?? Duration
- ?? Remaining broadcast time
- ?? Detailed description
- ?? PPV number

### 3.3.7 Product server

The product server has two main tasks:

- ?? Managing the products and entitlements
- ?? Providing the SMS gateway with products and rights definitions.

When the SMS gateway receives a command related to products and entitlements management (create/update/remove product), it sends the data to the product server.

The product server updates the Oracle database according to the data received.

When the SMS gateway receives a subscription related command, it obtains all the data needed from the product server to build the EMMs that have to be sent to the subscribers when they order or cancel a product.

### 3.3.8 Scheduler

The scheduler is the main clock of the system. It manages all operations requiring synchronization between different subsystems:

- EPG generation
- ECM generation

### 3.3.9 Impulse PPV server

The PPV server provides the data describing an EMM for PPV impulse purchase.

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