



VERIMATRIX PROPOSAL

Public Consultation on the Technical Specification for the Integrated Receiver Decoder for use with the Second Generation Digital Terrestrial Television Broadcasting System

Media Development Authority (MDA) of Singapore

And

THE INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF SINGAPORE

Verimatrix, Inc.

6825 Flanders Drive

San Diego, CA 92121, USA

Telephone: +1-858-677-7800

Fax: +1-858-677-7804

www.verimatrix.com

Copyright © 2012 Verimatrix, Inc. All rights reserved.

Portions © 2004-2012 convenient GmbH & Co. KG. All rights reserved.



Specifications and product availability are subject to change without notice.

Table of Contents

1	Introduction	3
2	Summary of major points.....	4
3	Challenges and Recommendations	5
3.1	One STB per household	5
3.2	Prevention of signal spill across borders.....	5
3.3	BOM reduction.....	5
3.4	One size fits all	6
3.5	Countering piracy	6
3.6	Software-Based Content Security means Multi-Screen Capabilities	7
3.7	Security Tiers of STB.....	7
3.8	Content Security without lock down	8
3.9	DVB-T/Hybrid Network (why would we recommend this on the low end zapper boxes it would increase the cost?.....	8
3.10	Support for Various Business Models	9
3.10.1	Scenario 1: Network Operator owns the subscribers.....	9
3.10.2	Scenario 2: Retail Operators owns the customers.....	10
4	Proposal.....	12
4.1	Phase 1 a: Unencrypted FTA transmission.....	12
4.2	Phase 1b : Encrypted FTA transmission.....	12
4.3	Phase 2 : Encrypted FTA and Premium transmission	12
5	Verimatrix – A Different Approach to Content Security	13
5.1	Verimatrix Video Content Authority System (VCAS™).....	13
5.2	VCAS for DVB – Unified Content Security for DVB Broadcast and Hybrid Networks	14
5.3	Opportunities	14
6	VCAS – The Proven Solution	15
6.1	Accepted By Major Studios and Broadcasters	15
6.2	Benefit from Verimatrix Partner Ecosystem	15
6.3	Meets the U.S. FCC Mandate for Separable Security	15
6.4	Conclusion.....	15
7	Verimatrix – Securing Content, Enhancing Entertainment	16

1 Introduction

The Media Development Authority of Singapore (“MDA”) is a statutory board established pursuant to the Media Development Authority of Singapore Act (Chapter 172) to regulate and promote the development of the media industry. The Infocomm Development Authority of Singapore (“IDA”) is a statutory board established pursuant to the Info-communications Development Authority of Singapore Act (Chapter 137A) to promote the efficiency and international competitiveness of the information and communications industry in Singapore.

On 31 January 2012, MDA formed a Technical Panel Committee (“TPC”) as part of an industry engagement process to deliberate on the DVB-T2 Basic Receiver Technical Specifications to be adopted for Singapore. The TPC comprises broadcasters and key TV and device manufacturers. The TPC has submitted its recommendations to MDA on the draft technical specifications for DVB-T2 basic receiver in Singapore to enable good reception of digital terrestrial TV services.

The MDA seeks to have a wide range of basic receivers that are affordable for mass deployment to facilitate the nationwide switchover to digital broadcasting. The Technical Specifications for the DVB-T2 receiver seeks to have minimal deviation from international guidelines and specifications to avoid incurring unnecessary costs to customize receivers for the Singapore market, while achieving minimum technical requirements and features to enable good indoor reception of Free-To-Air (FTA) digital terrestrial TV services in Singapore.

In June 2012, the draft Technical Specification for Integrated Receiver Decoder (IRD) for use with the second generation Digital Terrestrial Television broadcasting system (DVB-T2) was jointly developed by the MDA TPC and the IDA Telecommunications Standards Advisory Committee (“TSAC”) Industry Working Group 3 (“TSAC WG3”), as part of efforts in profiling the interactive TV service requirements for Singapore. The DVB-T2 basic receiver technical specifications recommended by the MDA TPC have been incorporated into the draft Technical Specification for IRD for use with the DVB-T2 to be issued by IDA.



2 Summary of major points

The Choice of Integrated Receiver Decoder (IRD) for use with DVB-T2 is a crucial choice to do for getting a well control domain of customers.

But one of the other choices to consider for getting the best manage network into broadcast, even if it is FTA system that we are talking about, is the security of your content.

That why Verimatrix wanted to submit a response in order to highlight the possibility of encryption on the FTA.

After this quick summary we will talk about the point below:

- **Challenges and Recommendations:**
this section will talk about STB possibilities, secure signal across border, BOM reduction, and Multiscreen capability.
- **Proposal**
in this section we will talk about different steps to bring a complete mature FTA solution.
- **A Different Approach to Content Security**
in this section, you will have a introduction to Verimatrix, our products, and our way to see security of content and revenue.
- **VCAS – The Proven Solution**
in this section we will bring to you some proff of the reliability of Verimatrix solution, as Major Studio compliance, our partner ecosystem.
- **Securing Content, Enhancing Entertainment**
in this section you will have the global conclusion of what we suggest and comments regarding your FTA project.

3 Challenges and Recommendations

3.1 *One STB per household*

One household is entitled to one STB as the boxes will be heavily subsidized between the government and the DTT network operator.

This can be controlled by using a feature called Mobile Phone Ordering System (MPOS) which requires registration via sms or through the web in order to activate the STB.

In the situations where the household does not have a mobile phone, checks can be made against their Identity Cards with restriction limited to one designate member of the household.

3.2 *Prevention of signal spill across borders*

If the signal is FTA, any DVB-T STB within the DTT footprint but across the border, can tune in and receive free transmission. This adds considerable costs in securing the content rights for FTA transmissions especially for live events such as EPL and BPL where the content providers will demand higher fees to offset free reception from the neighboring countries.

Verimatrix recommends that that every FTA signal be scrambled and encrypted to prevent any unauthorized reception. As the receiver can be only be authorized by mobile number or IC identification against each household, this will prevent any signal spillover.

With the FTA encrypted, the scrambler key or Control Word, can be sent to the receiver in an encrypted form as an Entitlement Control Message (ECM). The encrypted "FTA" signal can be decrypted by the receiver with the encrypted authorization in the form of an Entitlement Management Message or EMM.

3.3 *BOM reduction*

By encrypting the FTA signals, the DTT operator can lower their content rights fees and secure premium content for pay-tv delivery services thereby increasing revenue streams or ARPU without the need of a smart card, smart card reader or a DVB-CI module to accept variant Conditional Access smartcards.

One of the key challenges is a decision to ensure that the FTA setop box is able to decrypt encrypted channels in the future. Whilst the DVB-CI module offers such a possibility to accept multiple Conditional Access smartcards, it is costly both from a CAPEX and OPEX stand point

Verimatrix proposes a way to circumvent the problem by having the secure identifiers, PKI-based public and private associated keys and unique keys integrated into the secure silicon of an SOC(System-On-Chip). The advantages from this approach are multi-fold and can be summarized as below:

- This does away with the need for smartcard or deploy smartcards
- A DVB-CI module on every FTA Digital Receiver is not necessary resulting in drastic reduction for the followings :
 - Bills of Materials with less components needed
 - Real estate in the receiver



- Power consumption with smaller power supply
- Heat generation resulting in lower occurrences of over-heating
- Cooling fins and fans with less components that need cooling
- Mechanical failures
- Disruption in services when premium services are launched
- RMA occurrences
- Inventory and logistics management
- Field service teams
- Strain on customer care
- Complaints from customers

Removing the DVB-CI module has an overall trickle down savings in lowering the CAPEX and OPEX for the DTTB network operator. The costs of implementing a secure system-on-chip is a fraction of the cost of a DVB-CI module.

Shorter ROI can be expected with improved margins and potential for flexible revenue models that yield higher ARPU.

3.4 *One size fits all*

The same cardless DTTB Digital Terrestrial receiver will be able to cater for FTA and Pay-tv services. There is no differential on the specifications on the receiver as the same box provides a homogenous platform for initial and future service. There is no necessity to deploy basic zapper receivers and premium receivers, or upgrade households with zapper boxes to premium boxes in order to enjoy premium tv signals.

The benefits with this approach can be summarized as below:

- Homogenous digital terrestrial receiver population across the network
- Same receiver for both FTA and Pay-TV services
- Software updates, revision and upgrades will easier with no interoperability and compatibility with individual vendors through the eco chain
- Better customer service
- Zero disruption of service when customers wants to subscribe or pay for premium services that are encrypted

3.5 *Countering piracy*

It is common that a network with premium services will be subject to piracy attacks.

Using a software-based client together with a secure system-on-chip(Soc) offers best of breed content and revenue protection. Content access provisioning can be done securely over the air from the DTTB headend with no truck roll-out of smartcards and card logistics. Any compromise on the network can be countered immediately through the air without the need for replacement/swap-out of cards.

3.6 **Software-Based Content Security means Multi-Screen Capabilities**

Today consumers demand to watch “anything, anywhere, anytime”. Hardware-based security solutions or smart cards, were developed in a period when video was watched exclusively on television sets, using set-top boxes. Today, however, video is increasingly watched on PCs and mobile devices.

Software-based security solutions offers flexibility to support set-tops, PCs and mobile devices, while hardware-based solutions are only suitable for set-tops, they are impractical for PCs and a range of mobile devices.

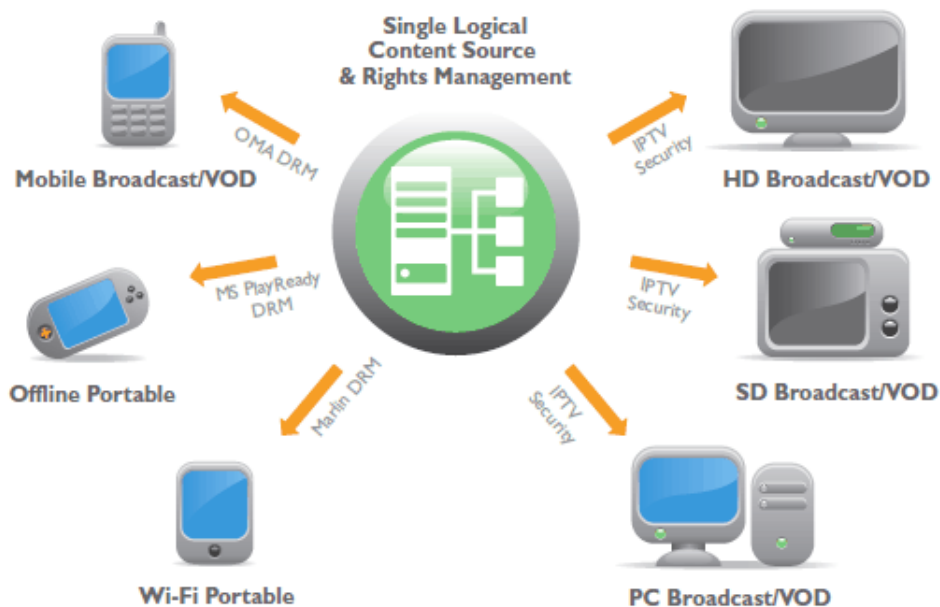


Figure 2: The Challenge of Securing the Multi-Device Environment

3.7 **Security Tiers of STB**

In the area of cardless STB, Verimatrix leads this field.

The major security tiers implemented by Verimatrix are summarized as below:

- 1) **Basic Security** – Our ViewRight STB solution is deployed on a low-cost generic chipset with no additional security features that can be enabled during manufacturing or at run time. .
- 2) **Enhanced Security** – The ViewRight STB solution is deployed using security features on the chipset without personalization and that can be enabled during manufacturing or at run time.



- 3) **Hardened Security** – The ViewRight STB solution takes advantage of security features on the chipset that are enabled and configured via a personalization of the device by the **chipset vendor**. Additional security measures are enabled at manufacturing which requires additional logistic management.

We can provide a list of chipset vendors that we support upon request and hardened security would be recommended for the DTTB STB.

Note: Verimatrix works with more than 70 STB manufacturers.

3.8 Content Security without lock down

In the situation where a Hardened Security is necessary and the DTTB network operator needs secure identifiers, PKI-based public and private associated keys and unique keys integrated into the secure silicon of an SOC, but is concerned about binding themselves into a single conditional access vendor, Verimatrix offers the ability to place all the keys into a third-party escrow account with terms and conditions applied.

This enables the operator to enroll as the beneficiary to retrieve and reuse the identifiers and keys that are permanently burned into the chipsets or securely placed in flash of the deployed STBs, should they choose to terminate the relationship with Verimatrix, without disrupting their services which would otherwise entails an outright replacement of STBs with a new CA vendor's chip-based solution.

3.9 DVB-T/Hybrid Network (why would we recommend this on the low end zapper boxes it would increase the cost?)

It is recommended that the receiver has a return path such as the RJ45 Ethernet IEEE802. to open up more possibilities of increasing the ARPU through personalized and interactive services such as VOD, impulse pay per view, premium subscription and targeted advertising.

It combines the strength of DVB and IPTV delivery technologies within a hybrid network that take advantage of the strengths of each: an RF-based broadcast network for one-to-many simultaneous content delivery, combined with a scalable iP network for the interactive one-to-one services.

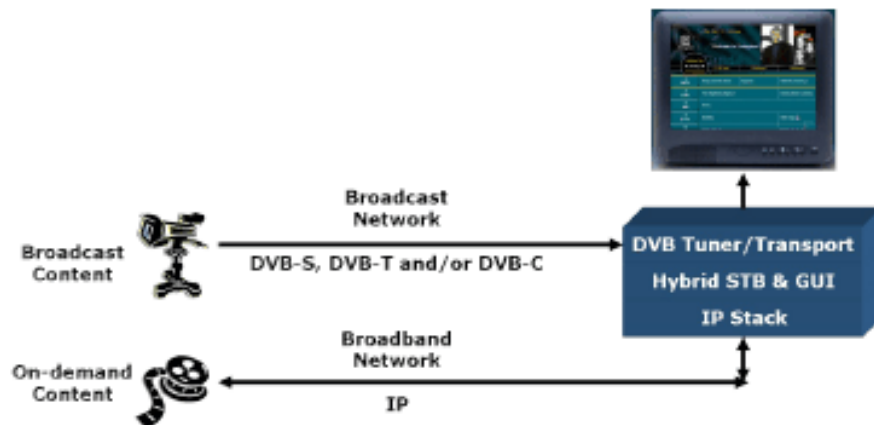


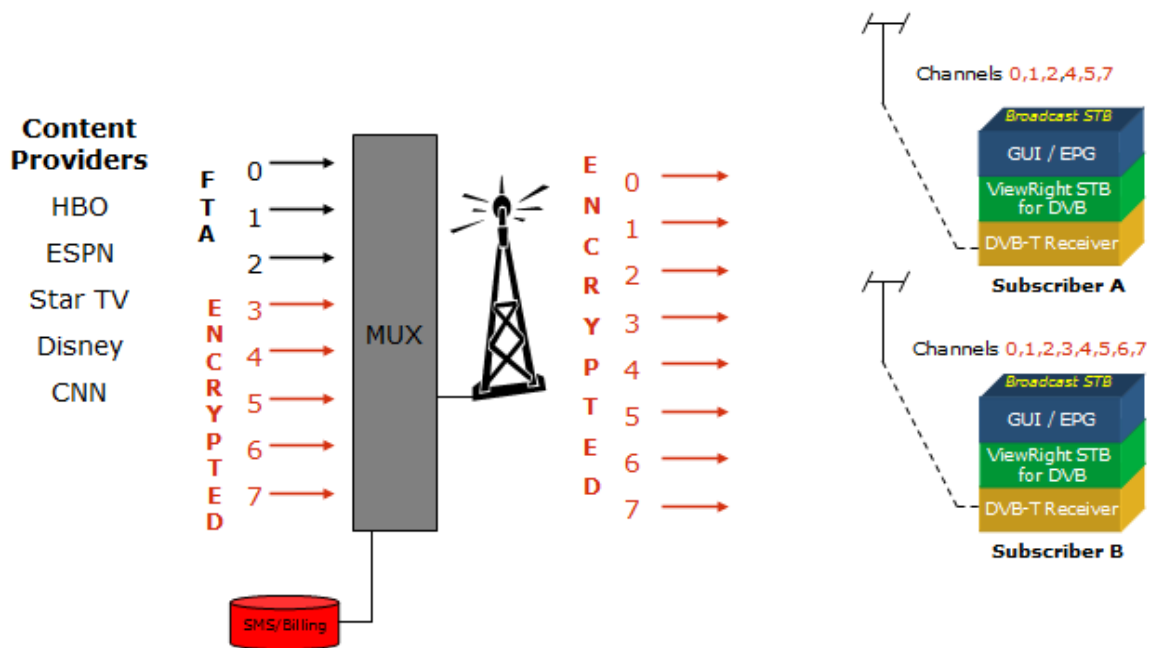
Figure 1: Hybrid Broadcast-Broadband Network

The diagram above illustrates a hybrid STB with content merged from two networks offering a variety of business scenarios in creating various opportunities.

3.10 Support for Various Business Models

The modular architecture of Verimatrix Video Content Authority Solution (VCAS™) for DVB enables a flexible Content Delivery Network (CDN) architecture and supports various business models, which are outlined below.

3.10.1 Scenario 1: Network Operator owns the subscribers



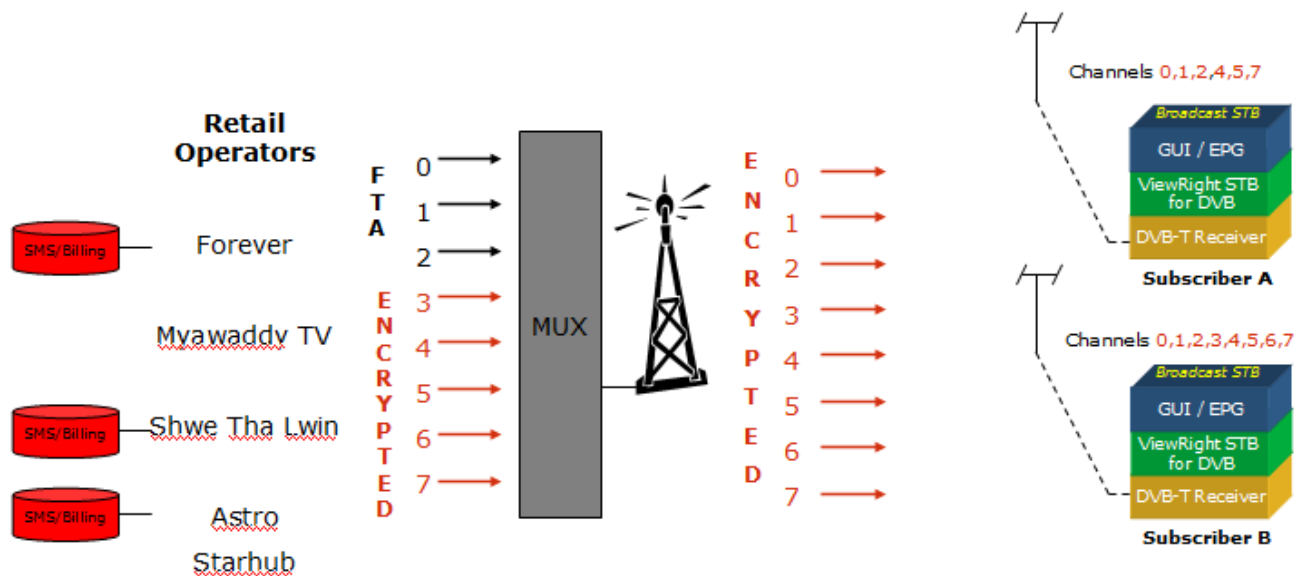


The content aggregator and DTT network operator distributes encrypted FTA and pay-TV content from various content providers. Subscriber entitlement management is done from a single location by the network operator.

The benefits summed up below:

- Enabling of attractive new business models and revenue streams for both the platform operator and content providers
- Dramatic reduction of capital and equipment cost for content providers
- Reduction of day-to-day operational costs for content providers
- Content providers can reap additional revenues without the initial capital and on-going operational investment to manage a pay-tv platform
- Centralized customer care for better service
- Unified EPG and better consumer experience

3.10.2 Scenario 2: Retail Operators owns the customers



The network operator manages the DVB-T network to handle both encrypted FTA and pay-TV content from various retail broadcasters. Subscriber entitlement management is managed and distributed by individual retail broadcasters.

The benefits summed up below:

- Retail broadcasters control the subscribers and owns the customer
- Increased competition amongst the retail broadcasters



- Lower initial capital investment on network operator
- Lower operational costs on the network operator
- Consumers enjoy variety of competing service offerings and prices

4 Proposal

Verimatrix proposes the following phased approach from FTA to encrypted pay-TV services which are explained below:

Phases	1a	1b	2
Conditional Access	Dormant	Active	Active
Free-to-air signal	Unencrypted	Encrypted	Encrypted
Pay-tv signal	NA	NA	Encrypted

4.1 **Phase 1 a: Unencrypted FTA transmission**

The CA system can be installed in the SOC at a marginal unit cost. The FTA signals can be transmitted unencrypted to the CA-ready DTT STB.

4.2 **Phase 1b : Encrypted FTA transmission**

The FTA signals can be encrypted by having the CA system activated seamlessly without any nationwide deployment of smart cards and no need for consumer educational program.

4.3 **Phase 2 : Encrypted FTA and Premium transmission**

Premium and pay-TV services can be added and encrypted with no disruption of services as there is no need for smart card distribution, insertion or STB exchange. This will be a seamless process.

5 Verimatrix – A Different Approach to Content Security

Verimatrix sets the standard for software-based content security and revenue enhancement technologies in pay-TV networks, with a growing global customer base of service providers.

The company's 3-Dimensional Content Security approach enables secure delivery of content to multiple devices across multiple networks using multiple layers of content protection techniques. The Verimatrix strategy addresses three key technology challenges for pay-TV operators:

- Content delivery – Broadcast, streaming, file based and on-demand
- Device diversity – TVs, PCs and Mobile devices
- Threat detection and elimination – Services, content and revenue



Maintaining close relationships with major studios, broadcasters, industry organizations and a broad partner ecosystem enables the company to address any challenge facing pay-TV operators.

5.1 Verimatrix Video Content Authority System (VCAS™)

The Verimatrix Video Content Authority System (VCAS) offers an advanced suite of technologies that address content security challenges for the networks of today, and those of the future:

- Best of breed encryption and subscriber key management for DVB broadcast cable, satellite and terrestrial, mobile TV, IPTV, over-the-top and video-on-demand systems.
- A hardened, downloadable Verimatrix ViewRight™ software security core for set-top boxes and other client devices – hardware-based security element optional.
- Independently audited content security architecture – zero exposures.
- Primary and backup security system – provides fast countermeasure capability.
- Advanced clone detection techniques to help operators eliminate theft of service threats.

VCAS and ViewRight technologies offer an independently-audited security solution for pay-TV operators of all types, and the company is consistently ranked as a global leader in the content protection marketplace.

Supporting IPTV, traditional DVB broadcast and mobile networks, VCAS fully exploits the power and elegance of modern two-way IP infrastructure to provide a superior level of content security and revenue protection on STBs, PCs and a growing range of other client devices. Even in DVB broadcast networks, cost and renewability requirements demand that the system architecture match evolving standards. Cryptographic and secure electronic transaction technologies proven in e-commerce applications, together with the increasingly sophisticated features of client device chipsets, enable VCAS to offer a more renewable and flexible implementation of content protection than that of traditional CA systems.



VCAS incorporates pioneering features that provide the best security perimeter of any content protection system, enabling complete transparency for legitimate content consumption while significantly raising the level of protection against content piracy.



5.2 VCAS for DVB – Unified Content Security for DVB Broadcast and Hybrid Networks

Challenges	Solution	Features and Benefits
<p>Rising consumer demand for access to pay-TV on an “anywhere, anytime” basis is challenging service providers to adopt unified content security strategies that will support the seamless 3-screen experience customers are looking for.</p> <p>Operators of one-way satellite, cable and terrestrial broadcast services face particular issues:</p> <ul style="list-style-type: none">• Securing services without the benefit of a set-top box (STB) return path.• Supporting basic tier, one-way segments with lower average revenue per user (ARPU).• Raising ARPU by migrating subscribers to premium and interactive services.• Combating revenue loss from content piracy in many forms.• Competition from triple-play operators including IPTV.• Containing cost of call centers and customer care staffing.• Content security requirements such as fingerprinting, regional blackouts and watermarking, imposed by rights owners.	<p>VCAS for DVB enables pay-TV operators to combine standards-based and proven Digital Video Broadcast (DVB) technology for broadcast distribution with the interactivity of IP-based networks using a single security system.</p> <p>A modular solution, it supports multiple network topologies from a single head-end:</p> <ul style="list-style-type: none">• One-way satellite, cable and terrestrial broadcast networks with no return path.• Hybrid networks with IP return channel supporting higher value subscribers with video-on-demand (VOD) and interactivity.• Combinations of broadcast and hybrid networks. <p>The solution supports operators seeking a lower total cost of ownership while achieving a favorable positioning in a world that is steadily moving towards two-way connectivity.</p> <p>The result is the most optimal pay-TV solution that is ready to tackle any challenges.</p>	<p>VCAS for DVB offers unified security for broadcast and hybrid services:</p> <ul style="list-style-type: none">• Advanced pay-TV business models providing each operator with virtually unlimited flexibility to define products and services, including impulse pay-per-view (IPPV).• Software-based broadcast content security with rich pay-TV functionality lowers the total cost of ownership.• Choice of software- and hardware-based client security in same network and STB allows the operator to match subscriber revenue potential with suitable STBs.• Mobile phone and web-based self-provisioning, including pre-paid vouchers, lowers cost of back-end systems.• Middleware-independent SI Server for STB program guide.• On-screen messages and chat rooms, parental control, client-STB pairing, fingerprinting.• Very efficient form factor:<ul style="list-style-type: none">○ 500K STBs in 2RU (3.5”)○ 1M STBs in 3RU (5.25”).

5.3 Opportunities

The Verimatrix approach to broadcast and hybrid network content security is ideal for:

- Greenfield deployments.
- Pay-TV operators transitioning from analog to digital video broadcasting.
- Operators wishing to complement or replace existing DVB CA systems.
- Operators planning advanced DVB-IP hybrid and/or IPTV services.

Thanks to the system architecture and efficient form factor, VCAS is inherently cost effective for the smallest deployment while scaling easily to pay-TV operations with millions of subscribers.



6 VCAS – The Proven Solution

6.1 ***Accepted By Major Studios and Broadcasters***

VCAS security has been accepted by all major studios for protection of premium content as well as by all the major broadcasters including Disney, Discovery, HBO, Showtime and ESPN. Based on very favorable results in independent audits, and an excellent service record in more than 200 deployments, VCAS is the approved security choice in pay-TV operator deployments on a worldwide basis. As the global leader in software-based security, VCAS offers a vast partner ecosystem with flexibility in choice of client devices, broad middleware interoperability and proven scalability.

6.2 ***Benefit from Verimatrix Partner Ecosystem***

Thanks to the vast Verimatrix partner ecosystem, operators can choose from a variety of pre-integrated components. Interfaces to Subscriber Management Systems are flexible for access to subscriber entitlement data. Other key components are the third-party DVB encoders, multiplexers and modulators as well as a wide range of pre-integrated STBs.

6.3 ***Meets the U.S. FCC Mandate for Separable Security***

The special current circumstances of the U.S. pay-TV environment include the FCC mandate for deployment of separable security implementations. The Verimatrix software-only security solution meets or exceeds the requirements of this FCC mandate, offering operational flexibility, reduced STB cost, and rapid response and renewability options.

6.4 ***Conclusion***

Operators of one-way pay-TV networks face the challenge to raise subscriber ARPU, best accomplished by encouraging impulse pay-per-view and premium subscriptions. The introduction of hybrid RF and IP pay-TV systems offers the potential for a tremendous expansion of entertainment services coupled with new revenue generating capabilities such as VOD. Key to making such services cost effective is the optimization of the content security architecture to enable a single system to handle linear content, whether over one-way or two-way networks, and IP-based VOD.

VCAS for DVB is the answer for operators seeking a lower total cost of ownership while positioning themselves favorably in a competitive environment that is moving inexorably towards two-way connectivity and interactivity. One-way broadcast systems can be complemented by two-way, IP-based communications, enabling interactive services and VOD, all from a unified head-end implementing a single content authority. The end result is the most optimal pay-TV solution that is ready to tackle any challenges, now and into the future.



7 Verimatrix – Securing Content, Enhancing Entertainment

- Software-based content security lowers deployment CAPEX and OPEX.
- Layered security regimes with rapid response and renewability options.
- Common key management model across broadcast, streaming and file-based applications.
- Unified head-end supports multiple delivery networks for “3-screen” applications.
- Optional user-specific VideoMark™ watermarking technology for forensic tracking.
- Award-winning content security and independently audited with zero exposures.
- Flexible deployment options and wide choice of components enabled by an extensive partner ecosystem.
- Most widely deployed system among tier 1 telecommunications operators globally.

Headquartered in San Diego, California, Verimatrix offers both local sales and customer care in major centers around the world including The Americas, Europe, Russia and Asia, plus 24/7/365 online and phone support.

To learn more about Verimatrix products and the VCAS approach to 3D content security and revenue protection, please see <http://www.verimatrix.com/company/offices.php> for offices worldwide, or use the contact information below. A Verimatrix representative will be pleased to assist.

Verimatrix, Inc
6825 Flanders Drive
San Diego, CA 92121, USA
Main: +1-858-677-7800
Fax: +1-858-677-7804

www.verimatrix.com

Copyright © 2007-2012 Verimatrix, Inc. All rights reserved.

Portions © 2004-2012 convenient GmbH & Co. KG. All rights reserved.

Reproduction or redistribution of Verimatrix web site or collateral content is prohibited without prior written consent.