FOXTEL MANAGEMENT PTY LIMITED

FOXTEL Engineering

Report prepared for Special Access Undertaking

Application by FOXTEL

Prepared By

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and

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(13/10/2005)

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(13/10/2005)

Table of Contents

Author CVs

Peter Smart (Director of Engineering and Technology, FOXTEL)

From 1979 to 1987, Peter Smart worked for RTS 5, a free-to-air broadcaster in South Australia. He started with the broadcaster as a trainee technician and progressed to Chief Engineer.

In 1987, he moved to Imparja Television Pty Limited (Imparja) as Chief Technical Officer (CTO). At the time, Imparja was commencing operations as a new commercial television broadcaster in the Northern Territory. As CTO, he was responsible for creating satellite and terrestrial broadcasting systems for launch of Imparja in January 1988. Smart remained with Imparja until 1989, when he began working for Prime Television as its Network Engineer, remaining in that position until he began working for FOXTEL in 1995.

As Director of Engineering at FOXTEL, Peter Smart is responsible for the equipment and technical systems used by FOXTEL to produce and transmit services to its customers. He also oversees the day-to-day operation of the broadcast engineering and conditional access systems, as well as design, acquisition and change to those systems. He plans FOXTEL's future needs in respect of equipment and technical systems.

Initially, he was Chief Engineer for FOXTEL's "start-up" phase and was responsible for final design, acquisition and establishment of all the broadcast systems used by FOXTEL to commence analogue transmission to cable subscribers on 23rd October 1995. He performed a similar cycle of design, acquisition and implemtation to establish the FOXTEL satellite service on 1st March 1999.

Peter Smart was responsible for all technical aspects of the preparation and launch of the new digital subscription television product, "FOXTEL Digital", in March 2004. This included:

- Designing and acquiring equipment for digital broadcast such as digital-compatible set-top units (STUs) and additional technical equipment at the playout centre at Pyrmont.
- Overseeing integration of a broadcast facility at North Ryde for use by FOXTEL.
- Transitioning FOXTEL's satellite subscription service from the Optus B3 satellite to the new Optus C1 satellite.
- Designing and acquiring the following systems for the digital platform:
    - Conditional Access Systems (CAS).
    - Active customer smartcard database (ACSD) to allow up to 25 Access Seekers to interface with the platform.
    - Compression and transmission systems.
    - Upgraded telephone and subscriber management systems (SMS) in readiness for digital.

Ron Higgins

Ron Higgins has over 38 years of experience in Television, Radio and media Technology and Operations in Australia and Asia. The first 28 years were involved with electronic media in Northern NSW and Southern QLD. This involvement was in television and radio technology and operations. During this time Higgins achieved the industry qualifications of Radio Operators Certificate of Proficiency and Television Operators Certificate of Proficiency. He progressed through all levels of engineering and operations to management during his career in regional Broadcasting.

Higgins was recruited by News Corp. in 1993 after their purchase of STAR TV, the Hong Kong based Satellite Television Broadcaster. His initial role was to restructure all Broadcast Operations Facilities and Engineering. Higgins remained in Asia and accepted the challenge to convert the seven analogue channels of the STAR TV platform to multi-channel digital subscription services. This extensive upgrade commenced in 1994 and involved development and implementation of Broadcast and Business systems. To achieve the operational management required for a digital system of this magnitude many new technologies needed to be developed. These included Digital Broadcast SMS (Subscriber Management Systems), CA (Conditional Access) and new digital stream management systems. Ron Higgins led the design and development of new systems for the management of all aspects of multi-channel digital television broadcasting. This product is currently used in many countries and is marketed by NDS as StreamServer.

Under his leadership as Senior Vice President of Broadcast Operations, Engineering and Information Services, STAR implemented production facilities in China and India, and also television facilities in Singapore, Taiwan, India and China. Advice and expertise was provided to joint venture partners in the Asia Pacific region. STAR TV grew to cover more than 50 countries and a subscriber base of approximately 300 million. Higgins returned to Australia in February 2002 following completion of a total facilities rebuild at STAR TV and the handover to Local staff in Hong Kong and is now providing consulting services to Australian Broadcasters, including Foxtel.

Definitions

Compatible STU:	An STU capable of receiving and operating with the broadcast stream provided by the FOXTEL Platform Environment, irrespective of whether it utilises all the services provided in the stream.
FOXTEL STU:	refers to an STU installed and "owned" (see first paragraph of Section 2) by FOXTEL.
Full Function:	refers to an STU that supports all the subscriber available functions provided in the prevailing FOXTEL Platform Environment, such as decoding horizontal and vertical polarity signals and interactivity.
Platform Environment:	the combination of technical and operational specifications and technology that provides and carries the broadcast stream and provides the services available on the platform. For example, interactivity, call back, EPG, FBO and downloading.

1. System Overview

FOXTEL's subscription television system is designed to securely and reliably deliver programming to those customers, and only those customers, who are entitled to receive it. FOXTEL's recent conversion from analogue to digital transmission and reception equipment has increased its ability to offer features and enhancements to its broadcast programming as a result of increased system capacity and the roll-out of STUs with more features and increased processing capability.

Broadly, the system includes the following elements:

1. The digital play-out centre, where content is aggregated before being sent to the headends in each city (for cable) or the uplink station (for satellite).
2. Two operations are performed on the content stream as it is distributed:
    1. Encryption by the Conditional Access (CA) system which specifies how the content can be accessed
    2. Service Information (SI), which specifies how the content is arranged within the broadcast transport streams, is added.
3. Distribution paths – either cable or satellite – to take the signals to customers. These paths are acquired from Telstra (cable) or Optus (satellite).
4. STUs and Smartcards: the STUs receive the SI which enables them to locate, process and display the content (including interactive content) correctly and the Smartcards are programmed with certain security keys enabling them to decrypt the appropriate programs for each customer.

2. STU Components

The STU consists of a number of layers of hardware and software. Figure 1 provides an overview of how the STU works and Figure 2 provides a block diagram of its components.

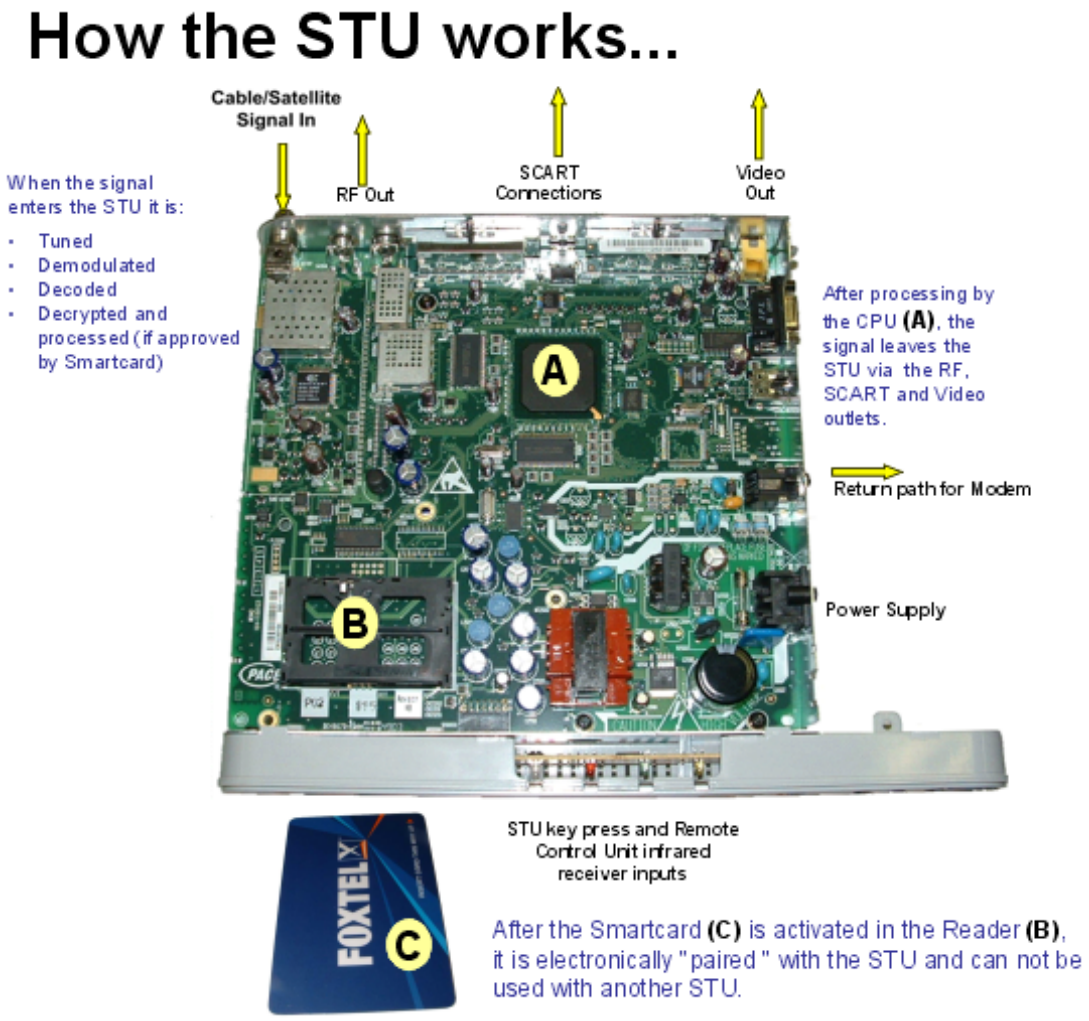

Figure 1 – Overview of STU operation

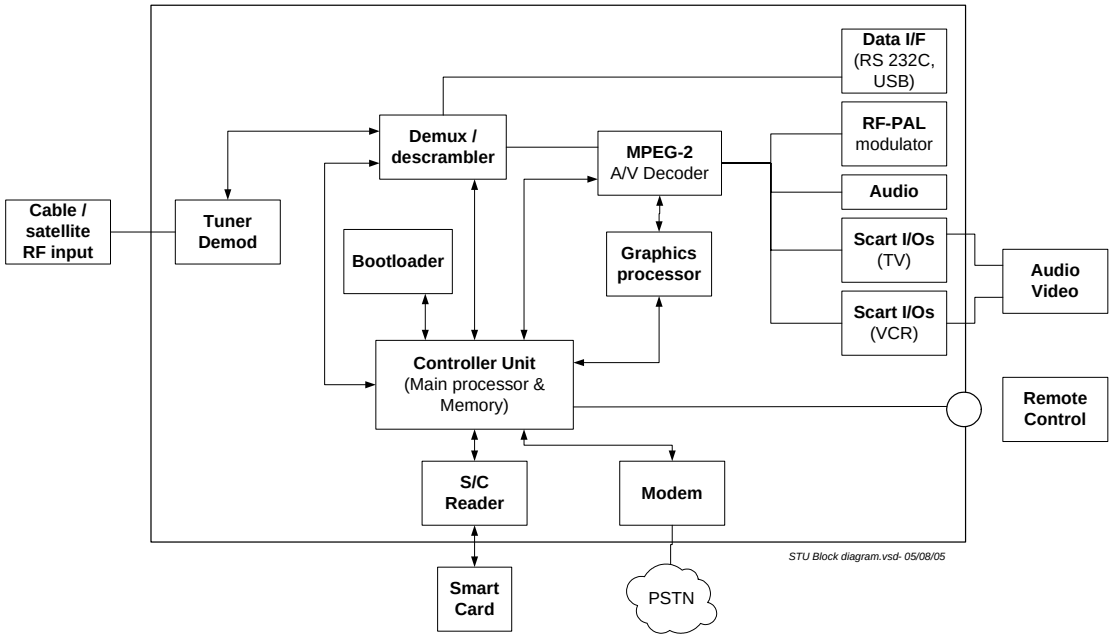

Figure 2 – Major components of the STU

In addition to the block diagram in Figure 2, the following is a list of major hardware components and interface ports in the STU (see Glossary for description of each item):

a. Tuner

b. Demodulator

c. Main Processor

d. Memory

e. Modem

f. Smartcard Interface/Reader

g. SCART

h. HDD Interface (iQ models only)

i. RF modulator

j. USB

k. RS232 Serial Interface

l. Front Panel Control/IR Interface

m. Digital Audio

n. Power Supply.

In addition to the hardware components, the STU contains software in the form of Firmware, Drivers, Middleware and resident Applications (such as the Electronic Programming Guide (EPG)). A number of the software and hardware components are required to be compatible with FOXTEL CA and SI and/or with other components in the STU. (By definition, only Compatible STUs use the same security keys as FOXTEL uses and therefore can utilise FOXTEL's CA and SI). The significant hardware and software components are (see Glossary for a description of each term):

1. The Smartcard is Paired with the STU and the Smartcard needs to be compatible with the CA provided in the stream.
2. The Loader, Applications and the EPG need to be compatible with the CA and the SI in the stream.
3. The Applications need to be compatible with the relevant content in the stream and the Middleware (to load the application itself and to load data from the stream).
4. The Middleware needs to be compatible with all of the Applications and the network specifications.
5. The Drivers need to be compatible with the hardware, Middleware and Verifier software.
6. The Central Process Unit and the Tuner link all the components of the STU by making it possible to receive and decode a stream.

In addition to these compatibility requirements, security keys determine whether an STU is compatible with FOXTEL's CA system. These keys sit across the Applications and some of the hardware components, and between the hardware and the CA. No STU will communicate with FOXTEL's CA and SI unless it has these keys, which are licensed (uniquely) to FOXTEL by the CA provider, NDS.

2.1. High-level view of CA and SI

In general terms, the CA and SI are handled as follows:

a. SI – the signal received by the Tuner contains SI (Service Information). This data is processed through the Tuner and Demodulator and delivered to the Main Processor where the SI is made available to the STU for a variety of purposes, such as telling the Tuner which stream to extract from the incoming signal.

b. CA – interaction with the Smartcard is managed through the Smartcard Reader. Data from the card is accessed from the Smartcard Reader by the STU's Main Processor.

c. FOXTEL regularly transmits data to the Smartcard itself, such as entitlement information that allows the subscriber to watch purchased content. In this case the data is processed through the Tuner, Demodulator, Main Processor and ultimately through the Smartcard Interface/Reader to the Smartcard where the data is stored for later use in authenticating the viewer's right to see the content.

The process of being able to send instructions to the Smartcard over-the-air (OTA) and to download software to the Bootloader is a fundamental difference between most pay TV STUs versus open market STUs. The OTA download ability makes it possible to keep Compatible STUs in lock-step with evolutions in the Platform Environment.

Open market STUs that currently do not receive OTA downloads require manual downloads (by the subscriber or a service person) otherwise these STUs will eventually lose the ability to work properly with the stream content. Alternatively, upgrades to the Platform Environment itself are severely restricted to keep those minority of STUs on-air, which causes the platform to stagnate.

d. At a Software level, all components including Drivers, Middleware, Applications and security, interact from time to time with the CA and SI.

3. STU Ownership

FOXTEL provides and controls ("owns") all of the STUs on its system (a financial institution has an interest in the STU title). The STUs are built to FOXTEL's specification, and do not work with other subscription television systems (even if the Smartcard is removed and swapped). In common with other subscription television systems worldwide, certain elements of the STU are hard-wired so that they function only with the conditional access system purchased from the CA vendor for that particular platform. FOXTEL purchased its CA system from NDS.

3.1. Ownership of STU components

Although FOXTEL "owns" the STU in the commercial sense, it is actually a combination of ownership and licensing rights:

a. Hardware: FOXTEL owns the whole STU including the Smartcard hardware.

b. Software: FOXTEL licenses the software. The software consists of components supplied by the hardware manufacturer, for example Pace or UEC, and integrated application-type software, for example, Middleware from OpenTV and the CA and Verifier software from NDS. Pace/UEC hold responsibility for integration of other third party Intellectual Property software components, whereas OpenTV and NDS only supply their own Intellectual Property. Listed below are the Intellectual Property components that may be integrated in the FOXTEL hardware product (see Glossary for description of each component):

   i. Provided and/or integrated by Pace/UEC:

      A. Drivers

      B. Macrovision

      C. MPEG2

      D. AC3 Dolby

      E. Modem

      F. RASP

      G. USB

   ii. Provided by Open TV and integrated by Pace/UEC:

      A. Core 1.1 middleware

      B. FNP

   iii. Provided by NDS and integrated by Pace/UEC:

      A. Verifier

      B. EPG

      C. iVG

      D. XTV

3.2. Licences

The licenses provided by the manufacturers, Pace, UEC, OpenTV and NDS, give FOXTEL the non-exclusive right to use the Software components in FOXTEL hardware products.

4. Active Customer Smartcard Database

FOXTEL has built an Active Customer Smartcard Database (ACSD) to provide an interface to the CA system for communicating with the subscriber's Smartcard (see Figure 4). This database stores all smartcards by ID number, together with their status as *active*/*inactive* by service. FOXTEL's own Subscriber Management System (SMS) communicates with the ACSD to provide authentication requests to be implemented by the CA system. The CA – ACSD confirm successful dispatch of the requests back to the SMS. For example, if a customer purchases a new tier channel, then the SMS alters that customer's entitlements in the ACSD, which in turn interfaces with the CA system to send the entitlements to the smartcard to enable the decryption of the additional channel.

The primary purpose of the ACSD is to allow appropriate connection of an SMS to the FOXTEL CA system without exposing confidential information to other SMSs or platform users.

An Access Seeker's subscriber management system (which would contain information such as a customer's name, address, and billing and payment details) can therefore interface to the ACSD by following the specifications in the existing Access Seeker protocol.

5. Conditional Access and Service Information

Conditional Access and Service Information are two elements that characterise the FOXTEL Platform Environment and make it distinct from any other platform environment, even though that environment has the same or similar broadcasting components (such as encoders and multiplexers).

5.1. Conditional Access

Conditional Access is a function that ensures that television channels can only be viewed by those who are authorised to receive them. All modern subscription television systems use Conditional Access to protect the Intellectual Property rights of Content Providers and subscription revenues. Typically, this is done through scrambling the channel content (using an encryption algorithm) before it is broadcast, and unscrambling of channel content using the STU and Smartcard at the customer's premises.

CA systems are licensed from large global providers who are heavily invested in the security elements of their service. For security and operational reasons, CA licences have to be network-specific (that is, unique to a single network). Typically, the licence covers at least:

1. The technology at the broadcast headend which encrypts signals according to specific security keys which define the encryption algorithm.
2. The technology in the Smartcard (inserted into the STU) which enables decrypting of signals using the corresponding security keys.
3. The verifier authentication technology in the STU.
4. The technology in the STU's loader which downloads software into the STU.

FOXTEL's CA was developed to serve a retail service consisting of approximately two million subscribers at a specified level of features/functionality. Broadly, the cost of a CA system varies with the number of subscribers it can serve, and the complexity of the features it supports. FOXTEL's CA system is one of the most complex in the world because of the functionality it offers, and because it serves both cable and satellite platforms simultaneously from the one signal source.

5.2. Service Information

Service information is a critical stream of information that is broadcast network-wide to all STUs on the relevant network. The SI maps the broadcast signal, and defines how the bandwidth is used. By reading the SI tables, each STU is informed of how data is arranged in the available bandwidth. Without it, the STU would be unable to locate or organise the data it receives. Without SI, the signal is a meaningless stream of bits which cannot be organised into anything of value.

The SI is layered and covers:

1. The Network Information Table, or bandplan, that defines which channels are broadcast on which parts of the available bandwidth.

2. Information about particular services (for example, the EPG or the weather channel) that are broadcast within the bandplan.

3. Information about particular components (for example, the interactive content on the weather channel) of those services.

The SI stream, (in conjunction with CA), is the means by which the STU can be updated by downloading new software.

Only one set of CA and SI can be broadcast on a network of STUs. Because it governs the organisation of all the information broadcast, it is not possible to have two sets of SI.

Guidelines for SI are contained within DVB standards. There are many possible interpretations of these standards, and they are implemented in different ways by different STU and headend manufacturers.

The DVB SI was developed from the collective input of the world-wide broadcast industry and hence its guidelines are very broad. The philosophy behind SI is to allow maximum freedom in implementation with the large range of activities of broadcasters. As guidelines, the SI specifications are not explicit recipes that can be applied with any guarantee of freedom from clashes and faults.

The intention is that any business wanting to enter digital broadcasting will select the SI configuration and the details from the specification that suits its business requirements. Consequently, every separate digital broadcasting business will have a different SI profile. The flexibility is reflected in the DVB specification overall by its division into Mandatory, Optional and Private tables.

In contrast, the DVB Common Scrambling algorithm imposes a much narrower specification and yet it has to co-operate with the SI because both are required for the customer to see the pictures.

For example, the addition of a new channel to an existing environment requires additional SI to be broadcast. The new SI can be interpreted incorrectly by the STU, leading to conflicts with information previously received. FOXTEL has experienced shared-SI situations where changes to SI have resulted in problems such as loss of audio on apparently unrelated channels, or excessive delays in channel changing. Usually, these problems can be resolved by subsequent software downloads to the STU, but the disruption can be costly as customers are inconvenienced and further changes to SI are stalled until such problems are diagnosed and rectified.

If the FOXTEL platform was hosting STUs that did not support over-the-air downloads, those STUs might not be able to interpret the changed SI with their existing software. In this situation, the customer would have to arrange for a manual software update (or replace the STU) before it could handle the changed SI correctly.

As a further example, FOXTEL's XSI, which provides the EPG and interactive functionality, is implemented in DVB Private tables. Open market STUs, especially those that are built to a price, may not have the ability to ignore unknown data in such tables, resulting in poor service reliability and poor resilience and in some cases, complete loss of service.

The SI difficulties increases in a non-linear fashion with the number of different types of STUs on the system and the complexity of the information carried. For example, every Access Seeker that requires unique channels, bouquets, etc, increases the quantity of information to be carried in the SI bandwidth of each stream. The quantity increases significantly with multiple Access Seekers. More SI permutations necessitate more extensive testing before deployment of new content/applications or new STUs, to ensure that negative impacts are ruled out. This involves both cost and delay in deployment.

FOXTEL's STUs and SI are optimised to work together. This optimisation occurs in at least two ways:

1. FOXTEL works closely with its STU manufacturer to ensure that the specifications are interpreted consistently across generations of STUs.
2. FOXTEL carefully co-ordinates its SI with the capabilities of the existing STU versions on the platform.

The Quality of Service provided by the Platform Environment is safeguarded by rigorous Change Management because uncontrolled changes to the SI can lead to catastrophic failures, (some of which could only be rectified by individually collecting every affected STU across the nation and returning it to a central service centre). The turn around time of the Change Management process increases every time a new version of STU is added to the platform (and it decreases as legacy STUs are removed from the platform).

5.3. Simulcrypting

Simulcrypting is the mechanism for carrying two or more CA streams on the same platform. The benefit of simulcrypting is that the content is prepared and transmitted once, together with each CA stream. The customer's STU will receive the broadcast and decode it in accordance with its type of CA.

From experience, one of the biggest stumbling blocks to simulcrypting is implementing it for multiple CA systems in strongly competitive commercial environments.

Simulcrypting would usually be used to merge two platforms that use different CA systems, or to transition a platform between CA systems. The options could be that simulcrypting continued or complete transition to a single CA platform is possible following the transition of all the legacy STU population. The "transition" option is not useful for Access Seekers, however can be used to transition platforms between CA vendors.

The first and foremost requirement for simulcrypting to succeed is for all parties concerned to work cooperatively and closely together. Without co-operation, merely providing the Content Provider with Access Seeker services raises technical and operational issues and risks that can significantly impact all users of the platform, and slow or cripple platform development.

The existing FOXTEL satellite platform is already operating in simulcrypt mode, however the cable platform is not. It is difficult to confirm, without extensive testing,

whether simulcrypting the cable platform and adding more CA systems to the satellite platform is possible, or the order of costs, as there are many factors:

a. Which CA system would be simulcrypted? For example, less secure or less robust CA systems cannot be simulcrypted in an existing environment without downgrading the security of all content. Similarly, CA systems that do not comply with the DVB simulcrypting protocols implemented in the master CA system, cannot be simulcrypted.

b. What compression system is to be used? Not all compression systems, even from the same vendor, are simulcrypt compatible and all components of the compression system have to operate co-operatively with the common CA stream.

c. The design for implementing more complex operational management (which is exponentially more difficult for each new CA system because of the significant co-ordination factors arising from the platform changes and additional test permutations).

d. Additional bandwidth will be required on all streams across the extended platform (assuming there is available capacity on the cable and satellite platforms). Therefore, in addition to the Access Seeker's content bandwidth, there must be carriage of additional EMMs (hits) on each transponder across the total platform.

e. Any modifications to support simulcrypting of Access Seeker services would have to be borne by the Access Seeker. (Each Access Seeker would face similar or higher costs for each different CA to be simulcrypted.)

   The most important and physically limiting factor is that the number of simulcrypt additions will rapidly become unmanageable and hence self-limiting.

To upgrade the FOXTEL satellite platform to simulcrypt more than the existing 2 CA systems will require replacing the CA hardware and software and re-integrating the whole platform (at an estimated $5-$10 million). The cost of simulcrypting the cable platform cannot be determined without preparing the relevant requirements and specification documents associated with at least the list of factors above. Based on previous experience, indicative costs could range up to $10 million.

6. STU Service Models

Figure 3 depicts four service scenarios (and summarised in Table 1) that are discussed in this report.

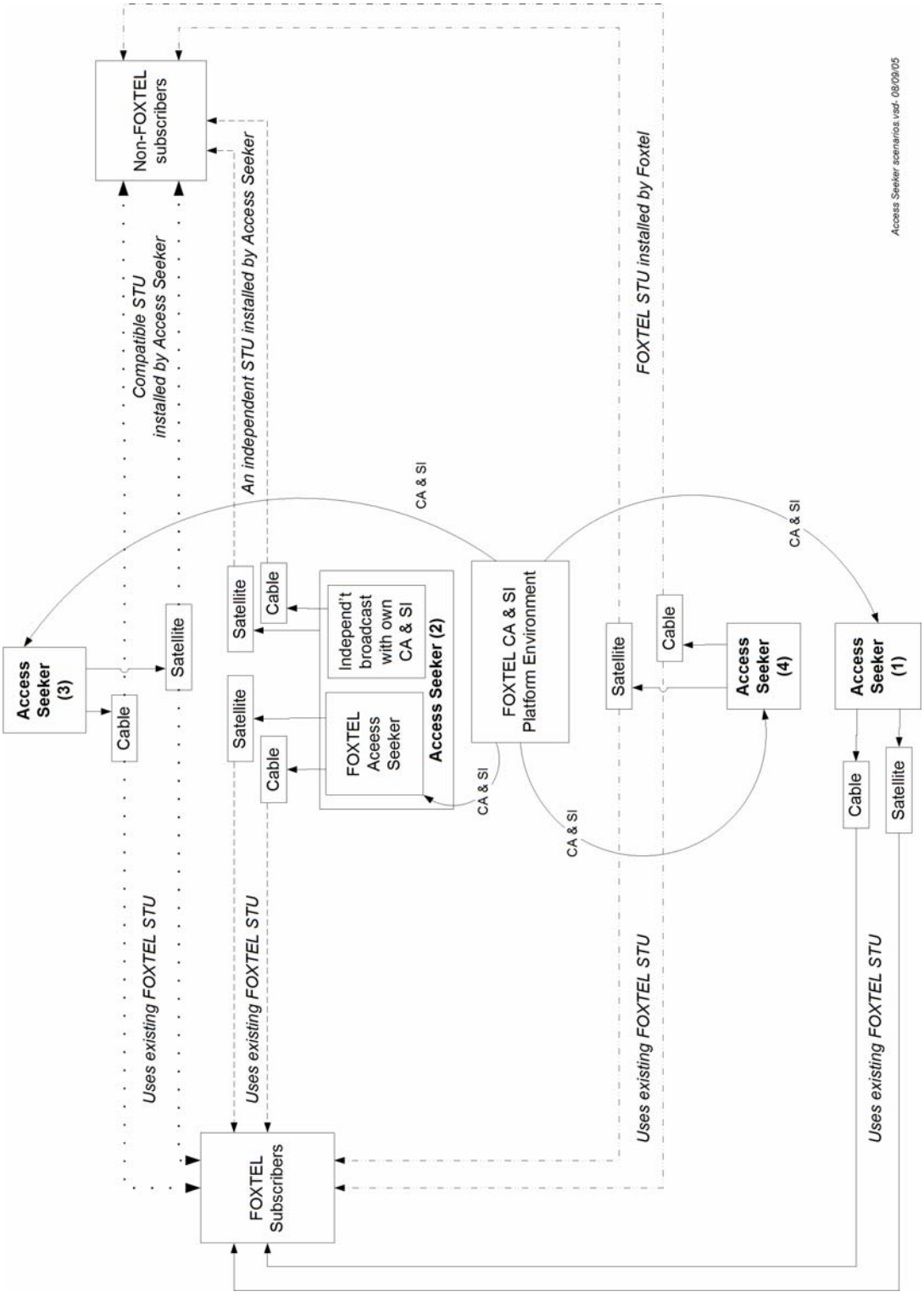

Figure 3 – STU service scenarios

Table 1 – Scenario Summary

Scenario	Reach FOXTEL subscribers using:	Reach non-FOXTEL subscribers using:	STU installed by:	
			FOXTEL subscribers	Non-FOXTEL subscribers
Access Seeker 1	• **FOXTEL Platform** • **FOXTEL STU**	–	FOXTEL	–
Access Seeker 2	• **FOXTEL Platform** • **FOXTEL STU**	• **Content Provider platform (own CA & SI)** • **Content Provider STU**	FOXTEL	Content Provider
Access Seeker 3	• **FOXTEL Platform** • **FOXTEL STU**	• **FOXTEL Platform** • **Compatible STU**	FOXTEL	Access Seeker
Access Seeker 4	• **FOXTEL Platform** • **FOXTEL STU**	• **FOXTEL Platform** • **FOXTEL STU**	FOXTEL	FOXTEL

There are several options for a Content Provider to provide its own platform and STUs in non-FOXTEL homes. (Content Provider programme services are not addressed as they are common to all scenarios and are the Content Provider's / Access Seeker's responsibility, according to the scenario under discussion.)

(Note that the Content Provider is called an *Access Seeker* only when it wants to reach FOXTEL Subscribers. If it is acting independently to reach non-FOXTEL subscribers, it is properly called a Content Provider.)

6.1.1. Scenario: Access Seeker (1)

In this scenario, the Access Seeker uses the service arrangements under the existing Digital Access Agreement. The Access Seeker makes its own arrangements for cable and satellite distribution and obtains CA, SI and STU services from FOXTEL. This allows the Access Seeker to gain access to the FOXTEL subscribers who are using an STU that has previously been installed by FOXTEL.

6.1.2. Scenario: Access Seeker (2)

In this scenario, the Content Provider operates in two modes:

1. It uses the existing Digital Access Agreement to gain access to the FOXTEL subscribers.
2. It acts independently, using its own CA and SI and its own STUs, to reach non-FOXTEL subscribers.

In summary, to be an Access Seeker and an independent Content Provider, the Content Provider will be establishing two cable distribution systems and two satellite distribution systems, as required:

1. As an **Access Seeker**, it has two steps:

i. Arranges its own carriage on the Telstra Multimedia cable platform ($750,000 per annum, plus any CPI increases calculated annually from 1 October 2002.) [1]

ii. Arranges satellite capacity (typically via a third party aggregator (such as Globecast) if less than a whole transponder is required) at an indicative cost of $700,000 per single channel per annum, (if on the Optus C1 satellite).

Both steps involve costs to the Access Seeker that are in addition to paying FOXTEL under the Digital Access Agreement.

This is what TVN does today on the FOXTEL platform using the C1 satellite.

2. Acting separately, as an **independent Content Provider** to non-FOXTEL homes, it provides its own:

i. Cable distribution on the Telstra cable, at an indicative cost of $750,000 per annum. This is in addition to the cable costs set out in Item 1.i, above.

ii. Satellite distribution, from a satellite service provider, at an indicative cost of $360,000 – $565,000 per annum (see GlobeCast and Optus letters on various Platform costs in Annexure 1 and Annexure 2, respectively). This is in addition to the satellite costs set out in Item1.ii, above.

iii. STUs.

iv. CA and SI, if not already included in the cable and/or satellite provider's offering.

This is what TVN **also** does today by operating as an independent Content Provider, to reach non-FOXTEL customers.

The detail of these options for the independent Content Provider, as set out in item 2, above, is presented in the remainder of this subsection.

a. Content Provider can purchase cable carriage and CA/SI services from Telstra.

i. Carriage cost currently $750,000.[2] Details of other costs can only be obtained in case-by-case discussion with Telstra.

b. A Content Provider of subscription services can purchase bundled satellite carriage and CA/SI services from existing third party providers. All satellite carriage requires SI as a minimum and the third party service provider's satellite transmission muxes would include basic CA functionality as standard.

i. An indicative figure of $30,000 per month ($360,000 per annum) for a single channel on an Optus B-series satellite has been provided by Globecast (see Annexure 1) which includes:

[1] Telstra Multimedia Access Agreement: Digital Services, Schedule 2, Telstra's Section 87B Undertaking.
[2] Telstra Multimedia Access Agreement: Digital Services, Schedule 2, Telstra's Section 87B Undertaking

A. MPEG Encoding of content.

B. Multiplexing into an existing service stream. This stream includes up to approximately 10 other video services and related audio and subtitles etc.

C. Providing all relevant DVB SI parameters.

D. Encryption of services.

E. Provision of Conditional Access services.

F. Provision of authorisation services.

G. Uplinking to Optus Satellite B3.

ii. Indicative figures of $47,000 per month ($565,000 per annum) for a single channel on the Aurora platform on an Optus C-series satellite has been provided by Optus (see Annexure 2) which include encryption of services (if required).

A. There is also a one-off set-up cost of $10,000.

B. This quote requires the Content Provider to deliver an ASI signal to the Optus satellite uplink facility.

c. The Content Provider can use STUs from the existing marketplace.

There are numerous STU providers in the world market. The cost of STUs are very dependant on the features and volumes. Full feature FOXTEL STUs are purchased in US$ (US$115, FOB excluding licence fees and royalties).

It is possible for Access Seekers to purchase an off-the-shelf Aurora/Globecast Irdeto compliant STU direct from a manufacturer for approximately US$100 (a built in modem would cost approximately US$4 extra), excluding licences and royalties.

The base manufacturer royalties are approximately US$5.00 per STU. A similar figure should apply to FOXTEL/NDS and Irdeto STUs. NDS and Irdeto STUs will attract an additional royalty payment for CA and other functionality. In the case of FOXTEL US$11.50 NDS royalty applies to the standard FOXTEL STU for CA, EPG and interactive. This figure will depend on functionality supported by the STU.

Because FOXTEL's full function STUs are built to deliver rich features, the licences and royalties payable are higher than those that would be payable for off-the-shelf STUs. This would magnify the cost difference between them.

Some providers of STUs are:

i. PACE

ii. Thomson

iii. SONY

iv. ADB

v. UEC

vi. Motorola

vii. SA

viii. Philips

ix. Sagem

x. Amstrad

xi. Panasonic

xii. Strong

xiii. Humax

xiv. Grundig

xv. Nokia

xvi. Topfield.

See also the following sites:

http://www.irdetoaccess.com/iab0001.asp

http://www.nds.com/partners/set_top_box_partners.html

http://www.nagravision.com/pages/stb.php?etat=3

d. The Content Provider can design and install their own standalone, appropriately sized DVB broadcast platform with its own level of Conditional Access for distribution to non-FOXTEL homes.

This is only practical if the Content Provider has several channels because, (in effect), a whole transponder is required (although, a special half-transponder arrangement is technically possible). Under this scenario, the Content Provider will also need to provide encoders (1 per channel), multiplexing and arrange purchase of the transponder and uplinking services.

i. Indicative costs are $800,000 for a 10 channel mux group, plus networking infrastructure for comms, CA connectivity, playout etc.

ii. Transponder and uplinking services are satellite dependent – indicative costs are $5 million PA.

iii. It is impossible to provide an exact price for a new CA system as this will be dependant on the sizing and features.

A. A very basic CA system capable of serving up to 50,000 could be as low as $500,000 including hardware for up to one Transport Stream. There would be small annual hardware and software vendor support charges.

B. A mid-level CA system capable of serving up to 750,000 subscribers would be available for around US$1.1 million (approximately A$1.45 million) plus annual support costs of around US$200,000. This would include some functionality improvements beyond that available in a very basic system, such as OPPV (Order-ahead-Pay-Per-View), but would not include feature richness to the level of FOXTEL's CA system

C. A CA system with multiple Transport Streams, security guarantees and a rich range of subscription products etc could be up to $12 million and there would be significant hardware and software support charges. (This would support the equivalent of a FOXTEL-like system – typically up to 200 channels and up to 2 million subscribers, using a single CA system.)

1 This type of CA system would include the capability to support the following features (but would cost extra to physically implement):

1 Interactive services

2 Pay Per View (PPV)

3 Impulse Pay Per View (IPPV)

4 NVOD

5 Annual staffing cost of approximately $1million

6 STUs sourced, as required.

D. At least one international company (NDS) provides cost effective CA hosting services (see: www.nds.com/conditional_access/videoguard_express.html).

Hosting provides a new entrant to the market with a low cost and low risk approach. The Content Provider does not need to install or establish any CA system hardware or day-to-day CA Operations facilities; it only pays a periodic management fee that is related to the number of subscribers and complexity of the Content Provider's services.

If the Content Provider is interested in providing only simple subscription services, including interactivity, it reduces the complexity of the CA system it needs. However, if the Content Provider wants to manage a revenue stream from the interactive service, a more sophisticated CA can be used to provide access to the modem, authentication and relevant customer details etc. (Alternatively, the Content Provider could implement other non-integrated technologies, such as direct marketing mechanisms.)

e. Simulcrypting: the Content Provider would still provide its own STUs in non-FOXTEL homes (which could be a non-Compatible STU), but the STUs would still have to use the FOXTEL common SI. The Content Provider will also have to interface with the FOXTEL CA system (but using its own CA). Taking this step changes this whole scenario to basically a variant of scenario Access Seeker (3), below, because the Content Provider now requires support from FOXTEL. The Content Provider also assumes responsibility for keeping their STU compatible with the platform.

The use of additional Simulcrypting is not considered a viable option for the FOXTEL platform. As stated earlier Simulcrypting would normally be used to facilitate the merging or transition of significant systems and not used to provide ad-hoc additional services on a per Access Seeker basis. The dynamic

nature and complexity of the FOXTEL platform increases the operational risk to an unacceptable level.

6.1.3. Scenario: Access Seeker (3)

In this scenario, the Access Seeker obtains CA, SI and STU services from FOXTEL to access FOXTEL subscribers on the one hand and to use the same CA and SI to access non-FOXTEL subscribers on the other. The Access Seeker will provide its own Compatible STUs for the non-FOXTEL subscribers.

For FOXTEL to provide CA and SI to a population of Access Seeker-supplied and Access Seeker-installed STUs that are outside of the FOXTEL subscriber base, the STU must always remain compatible with the FOXTEL digital stream (which means the STUs are upgraded as required to remain operable in the prevailing FOXTEL Platform Environment). Failing to remain as a Compatible STU means the STU will stop decoding FOXTEL signals.

a. By definition, a Compatible STU that does not remain compatible will not function on the FOXTEL platform.

   i. Even if the Access Seeker's STU is initially compatible with the CA specifications, the appropriate FOXTEL version of the DVB specifications and the appropriate FOXTEL network specific parameters, if the STU is not kept in sync with platform evolution, it will become unstable or eventually fail to decode FOXTEL and Access Seeker services. (FOXTEL does not have control over whether the Access Seeker chooses to remain compatible with the platform.)

   ii. The FOXTEL Platform Environment continues to be fine tuned for business initiatives and will continue to support the Compatible STUs that remain compatible.

b. There are a number of factors to be considered as the number of Compatible STU versions increases. In particular, different STUs will support different combinations of platform services which means:

   i. Full compatibility testing of all Compatible STU variants will become a very complex and hence expensive task. No commercial organisation(s) will be able to provide such a service on a commercially viable basis.

   ii. All Access Seekers would be notified of planned changes and the Access Seeker would be responsible for testing their Compatible STUs against the new platform parameters. However, this is not a practical solution because of the platform impact by the Access Seeker's own business priorities and potential difficulty in scheduling time and resources for proper testing, especially if they have more than one version of Compatible STU (which usually happens over time).

   iii. Platform upgrades will take longer due to the increased versions of STUs to be confirmed as Compatible.

   iv. Increased bandwidth will be required for STU management, support and operation, such as SI and over-the-air downloads, as the number of STU models increase over time.

v. The need for any upgrades to Access Seeker Compatible STU software will have to be negotiated with the Access Seeker. This may cause extended delays or block other essential upgrades.

vi. Integration of STU components provided by the Compatible STU manufacture, such as middleware, FNP CA etc, to remain compatible with the prevailing DVB specifications and FOXTEL-specific platform parameters will be the Access Seeker's responsibility.

FOXTEL biggest risk in trying to accommodate a large pool of Compatible STU versions is that sooner or later it will become responsible for or closely involved with competitive and potentially hostile service providers. Conflicts over the need to upgrade components such as Middleware, FNP, CA etc in Compatible STUs and the interpretation of the appropriate DVB specifications would affect all other compliant users of the platform, including the subscribers.

This could very easily stall platform development and impact all platform content providers' business objectives.

The consequences likely to follow if any of the technical requirements are not met are summed up by saying that the Access Seeker's Compatible STUs will become increasingly unstable and eventually fail to decode signals as the FOXTEL platform evolves. There are two existing commercial examples that illustrate the consequences of not having control of the STUs that are using the platform:

i. Some FTA operators have attempted to provide interactive services that can be utilised by the open market set top box population. However, for one operator, only one model of set top box can run the application, but only after the viewer manually downloads an update from the set top box manufacturer's site and connects the set top box to a PC to perform the upgrade.

   There is no universal method to update the total existing population of open market set top boxes to enable them to work with any operators efforts to provide enhanced digital television services. In many cases, the only option available to the customer is to buy a new set top box that support the enhanced services of the day.

ii. The Aurora satellite platform provides a broadcast stream that can be accessed by open market DVB compliant set top boxes. The Aurora platform has undergone very little technical evolution since it was launched because every evolution would cause more and more models of set top boxes to fail. The functionality of the Aurora platform is virtually constrained by the capabilities of the lowest standard set top box using the platform.

6.1.3.1. Impacts of providing CA and SI to non-FOXTEL subscribers

Providing CA and SI services to non-FOXTEL subscribers would require several significant modifications to the FOXTEL Platform Environment:

a. The Active Customer Smartcard Database (ACSD) will need to be redesigned and rewritten as the original specification was for a different operating model.

Some of the requirements of the existing ACSD are in conflict with the requirements that would exist with management of non-FOXTEL subscribers.

b. Smartcard purchase management and allocation of all platform enabled Smartcards is necessary. The CA and ACSD must have knowledge of every Smartcard that requires authorisation, therefore FOXTEL will have to manage this information and all the related security issues for the Access Seeker.

c. The number of staff required for operating the modified system can only be quantified after preparation of the full technical specification and impact assessment of the number of Access Seekers expected to be using the platform over time.

It is impossible to estimate detailed costs of the full range of FOXTEL system modifications without preparation of technical specifications and submission to third party vendors for quotations.

6.1.3.2. Customer transfer to and from a FOXTEL subscription

This sub-section provides examples of the day-to-day technical operations for handling a subscriber transfer to or from the FOXTEL service (see Note #1).

a. **Example:** Access Seeker-only customer becoming a FOXTEL subscriber (excluding STU ownership and tracking issues and assuming the CA and Smartcard components are identical between the Access Seeker and FOXTEL platform) (See Note #2):

   i. Assuming that the Access Seeker STU is a Compatible STU, it is technically possible for the Access Seeker customer to transfer to FOXTEL by provision of a FOXTEL Smartcard (to maintain the unique SMS relationship by vendor and smartcard populations).

      A. The subscriber becomes a FOXTEL subscriber and is recorded in the FOXTEL SMS (See Note #3).

      B. The FOXTEL Smartcard will be activated and “re-paired” to the STU.

      C. The new customer ID will be updated in the Access Seeker’s database to ensure that Access Seeker services continue.

   ii. If the STU is not a Compatible STU, a FOXTEL STU and Smartcard will be installed alongside (or at customer request, in place of) the Access Seeker’s STU.

      A. A standard FOXTEL installation is performed.

      B. The existing Access Seeker installation may be removed.

         1 The customer will need to advise all Access Seeker service providers of the new Smartcard number.

         C. If the STU is replaced, the customer will need to advise the owner of the STU if collection is required.

      D. The existing Access Seeker installation may remain (See Note #4).

1 The FOXTEL installation will require additional installation of a Multi-switch for Satellite installations. This assumes the Access Seeker and FOXTEL services are being provided from the same or co-located satellites.

2 FOXTEL cable installations will require addition of a splitter.

3 Customer operation of multi-STUs and the potential interaction between them will need to be addressed. An audio and video switcher may be required for connection to the TV.

b. **Example:** a FOXTEL subscriber becoming/returning to be an Access Seeker only customer.

i. The FOXTEL installation will be removed when the service is terminated.

ii. If the Access Seeker installation was removed at the time of the FOXTEL installation:

A. The Access Seeker will need to handle all of the post-FOXTEL relationship and reinstall the Access Seeker service.

B. The Access Seeker will need to update their records accordingly.

C. The customer will require reconnection to the Access Seeker service(s).

iii. If the Access Seeker installation was retained by the customer and FOXTEL was installed as an additional active facility:

A. The Access Seeker will need to handle all of the post-FOXTEL relationship.

B. The Access Seeker will need to update their records accordingly.

C. The customer may require reconnection to the Access Seeker service(s).

Notes:

#1 There may be multiple Access Seeker's active with the customer. For any of these scenarios to work smoothly for the subscribers in particular, someone needs to be responsible for co-ordinating the complete switch-over sequence. Without central co-ordination, the subscriber will almost certainly become involved in loss of services and/or billing disputes for charges on allegedly cancelled services. In the absence of a suitably knowledgeable process manager, it will fall to the customer to provide the multiple notifications and requests for service disconnections and reconnections and co-ordinate the sequence of events.

#2 Access Seeker to Access Seeker churn will need to be handled by the FOXTEL ACSD, however no other direct involvement is expected.

#3 For this to be possible, FOXTEL would need to be configured to operate as a sub-level SMS. This will significantly increase the

platform complexity and significantly increase the expansion and cost factors.

The existing FOXTEL SMS architecture (Figure 4) is designed to separate customer information from the operational information (which is in the ACSD). Any changes to the SMS architecture that require increasing integration of an Access Seeker SMS, especially with FOXTEL acting as a sub-SMS, requires FOXTEL to become more and more involved in knowing about and managing the Access Seeker's customer data.

On the other hand, if the Access Seeker maintains an independent SMS that only sends appropriate operational requests to the ACSD, the Access Seeker remains in total control of their customer data. This approach means customer changes to subscriptions are managed by the respective SMSs.

#4 Access Seeker services may exist on various satellites and/or carriage platforms.

6.1.4. Scenario: Access Seeker (4)

In this scenario, the Access Seeker obtains CA, SI and STU services from FOXTEL to access FOXTEL subscribers on the one hand and to use the same CA and SI to access non-FOXTEL subscribers on the other. FOXTEL will install FOXTEL STUs in the non-FOXTEL homes.

The current FOXTEL technical systems (such as CA and SI generators) will need little modification to provide total services to Access Seekers' customers in non-FOXTEL homes. The majority of the issues relate to business systems (such as the SMS) and business models which are not addressed in this report.

There will need to be some changes to installation and management software systems, however the exact cost and the nature of these changes can only be determined after an extensive review.

The SMS/ACSD will also need to undergo extensive review when the operational requirements are known. Figure 4 illustrates the single SMS model for a single subscriber population.

Figure 5 illustrates the scope change required to manage multiple populations of FOXTEL and non-FOXTEL subscribers in a full service model. The first step in defining the scope is to agree on a business model for managing STU hardware, smartcards and the customer data. (Once this model is agreed, it would mean that all future Access Seekers would have to follow the same model.) Having established the model, the SMS and ACSD requirements and specifications can be defined and accurately costed. This review will need to be conducted with a view to integrating the total Access Seeker changes from FOXTEL's original Digital Access Agreement-compliant specification.

6.1.4.1. Access Seeker costs

The changes to FOXTEL SMS/ACSD could range up to $20 million and the actual cost per Access Seeker could be in excess of $2 million.

The scope of the changes to the FOXTEL SMS/ACSD is very difficult to estimate because of the wide range of business options. The approach to each option depends on the business requirements of the individual Access Seekers.

Some of the most significant requirements relate to:

a. Final expected size of platform

b. Stages of growth to platform

c. Interval between growth steps

d. Number of Services (channels) to be managed

e. Type of services e.g. interactive/enhanced

f. Number of subscribers

g. Structure of product (tiering and packaging of subscription services)

Depending on planned roll-out of services and rate of Access Seeker and subscriber up-take (total numbers and distribution among the providers), there may be opportunities to stage upgrades to the ACSD/SMS systems. The previously stated estimates can be scaled to match the number of Access Seekers from time to time. This approach can reduce the initial cost, however if regular additions are needed then the final cost could be much greater due to duplicated effort. There are inherent risks associated with any upgrades and these will need to be evaluated with regard to the scope and duration of upgrade activity.

It will be difficult to apportion costs to Access Seekers and other users of the platform due to dynamic growth of each Access Seeker and different levels of functionality in Access Seeker services.

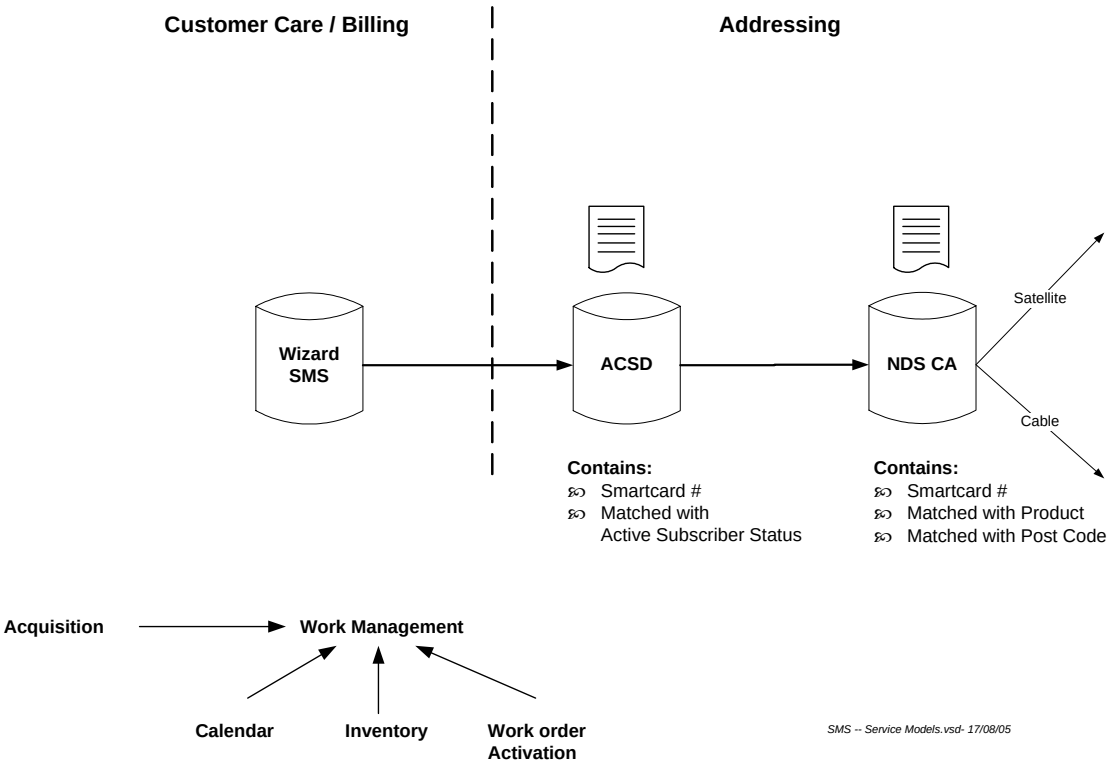

Figure 4 – FOXTEL service model with one SMS managing FOXTEL only subscribers

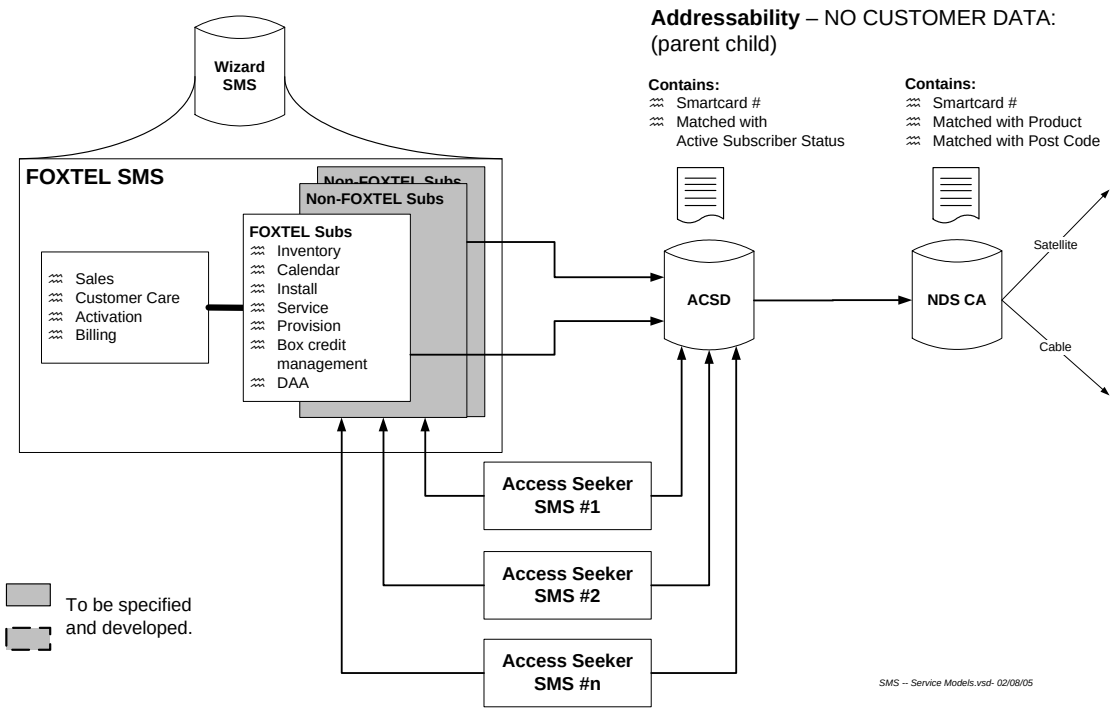

Figure 5 – Full Service Model for managing FOXTEL and non-FOXTEL subscribers

Glossary

AC3 Dolby	Audio Codec 3. This is the technical name for Dolby Digital which is a format for producing high quality sound.
ACSD	Active Customer Smartcard Database – is a database of active smartcard IDs that provides an interface between an individual Subscriber Management System and the Conditional Access system (see Section 3).
Application	is a software program or group of programs designed for the end users of a computer system, in this case, the customers using an STU. Figuratively speaking, the application software sits on top of the operating system (or system software) because it is unable to run without the operating system and system utilities.
AV	Audio Visual – typically used in expressions such as *AV leads* or *AV out* or *AV in* which refers to leads or plugs, for carrying an audio signal and carrying a video signal.
Bootloader	A software component that is stored in *Flash memory* that allows the STU to start and load its operating systems and applications.
CA	Conditional Access – subscriber authentication system (the process for ensuring viewers can view what they have subscribed to receive). It uses a system of uniquely assigned code words that allow the STU to decode the broadcast stream only if the Smartcard contains the appropriate code related entitlements.
CAPEX	Capital Expenditure
Change Management	the process by which a change, starting as a change request, is introduced into the Platform Environment in a controlled manner to minimise or avoid any incidents arising from the change itself.
Content Provider	a third party that provides content (programmes and applications of various types) for broadcast.
Core 1.1	Name of OpenTV's middleware and its version number.
CPU	Computer processing unit. This is the chip that controls activity within the STU.
Decryption	See *Encryption.*
Decoding	See *Encoding.*

Demodulator	is a receiver circuit which extracts or *demodulates* the signals from the received carrier signal.
Digital Audio	is a loose term that refers to an audio signal that has been encoded in a digital form for processing, storage or transmission. In the context of the FOXTEL STU, it also refers to a port on the back of the STU that provides a digital audio out signal, in a special form called *S/PDIF*. See also *S/PDIF*.
Digital Coaxial	See *S/PDIF.*
Dolby Digital	See *AC3 Dolby*.
DRAM	Dynamic random access memory – this type of memory does not retain its content when the power is switched off (*volatile* memory). It is used in the STU for graphics processing.
Drivers	Small software programs that allow software to talk to the hardware.
DB	Database.
DVB	Digital Video Broadcasting – a set of international standards that provide a specification for broadcasting digital television.
Encoding	in the digital broadcast context, is applied by an MPEG encoder to compress an original signal into a defined format for efficient distribution. The receiving device needs to know how to decode the signal in order to use it. See also *Scrambling* and *Encryption*.
Encryption	is the set of instructions (algorithm) used by the multiplexer to scramble a signal. These can be simple or complex instructions according to the required level of security to protect the content from unauthorised use. See also *Scrambling* and *Encoding*.
EPG	Electronic Programme Guide – this is a Middleware application that runs in the STU. It receives its data from its own broadcast data stream to provide up to the minute programme scheduling information.
FBO	FOXTEL Box Office – a collection of channels that provide Near Video On-Demand movies whereby a subscriber can watch a purchased movie at any of several times during a pre-set 24 hours period.
FEM	Final Emission Multiplexer – the final multiplexer in the broadcast chain that combines the stream of programme content with the System Information and

	Conditional Access data and sends the data stream to the satellite or cable platforms.
Firmware	is software embedded in a microchip at time of manufacture.
Flash memory	is a type of memory that holds its content when the power is switched off (called *non-volatile* memory). It gets its name from the fact that a group of memory cells are erased in a single action or "flash". (Hence, the name is not an acronym, but a proper word.) Flash and EEPROM memory use different processes to erase/write data in the memory.
FNP	FOXTEL Network Package – the interface between the FOXTEL platform information and the underlying operating system of the STU.
Front Panel Control	refers to the series of buttons on the front face of an STU that provide basic control of the STU. A more comprehensive set of controls is available via the remote control unit.
HDD	Hard Disk Drive – provided in personal video recorders – see *iQ*. The hard disk drive is also considered as a form of permanent (*non-volatile*) memory.
IPPV	Impulse Pay Per View – a mechanism to enable impulsive booking of a Pay Per View event (typically a special event such as a title fight).
iQ	refers to a FOXTEL branded Personal Video Recorder which is an STU that contains two tuners and an HDD that allows simultaneous recording and watching of content from different channels.
IR Interface	Infra-red Interface – refers to the infra-red receiver on the front of the STU that receives infra-red signals from the remote control unit.
iVG	Interactive VideoGuard – NDS proprietary Conditional Access security system that includes interactive television.
Loader	is that component of the bootloader firmware that manages over-the-air downloads. See also *Bootloader*.
Macrovision	A commercial proprietary content protection mechanism incorporated in material supplied by a content provider for STUs, DVDs, VCRs, television etc.

Memory	is a collective term that refers to all the different types of memory in the STU. See *Flash memory*, *EEPROM*, *DRAM*, *RAM*, *HDD*.
Main processor	See CPU.
Middleware	A software program(s) that provide an interface between an application and the underlying operating system of the STU.
Modem	Modulator/demodulator – a communications device that converts data for transmission and receives data over telecommunication lines.
MPEG2	Motion Picture Experts Group (definition 2) – a set of standards for video compression.
Mux	Multiplexer – a device for combining several different streams of data over a communications link.
NDS	Third party company providing services and products, including Conditional Access security systems, to the broadcast and telecommunications industry.
NVOD	Near Video On Demand – a method of providing access to selected movies of the viewer's choice to watch at a time prescribed by the broadcaster.
OpenTV	Third party company that provides services and products, including middleware, to the broadcast and telecommunications industry.
OPEX	Operational Expenditure.
Optical Audio Out	See *S/PDIF*.
OTA	Over-the-Air (delivery of STU-specific management information via the satellite and cable signal).
Pairing	A security technique for creating a working bond between one smartcard and one STU. Once paired, that smartcard and STU will only work with each other (unless specifically re-paired under CA control conditions).
PPV	Pay Per View – purchase of viewing access to a specific programme (typically a special event such as a title fight).
PDR	Personal digital recorder. See *iQ*.
PVR	Personal video recorder. See *iQ*.

RAM	Random Access Memory.
RASP	Random Access Stream (Scrambled) Processing – disk operating system for the FOXTEL Personal Digital Recorder.
Remote control unit	is the hand held device that controls the STU. Usually there is one remote control for each different device (STU, VCR, TV etc) because the set of commands that is transmitted by each remote control unit is usually unique. The FOXTEL iQ STUs have a remote control unit that can control any model of digital FOXTEL STU. The remote control unit for non-iQ model STUs can control any model of digital FOXTEL STU, except for the play and record functions on the iQ STU.
RF	Radio Frequency.
RF modulation	the process of modifying an RF carrier signal with an appropriate second signal so the result can be transmitted to an STU, television or VCR. (Using an RF connection between an STU and TV/VCR produces a lower quality signal than connections that use AV leads.) See also *AV* and *Demodulation*.
RS232 Interface	is a type of serial data communication port on the STU.
Security Servers	are the servers used in the CA system to generate the encryption code words used for scrambling the stream content.
SCART	A 21 pin rectangular connector that is common on European TVs, VCRs, and AV equipment. It provides a standard interface for audio in and out channels, video in and out channels, RGB signals, ground and some additional control signals. The FOXTEL STU SCART plugs are hard-wired and labelled for SCART-TV connection and SCART-VCR connection.
Scrambling	is applied by the multiplexer to provide a stream that consists of a randomised arrangement (see *Encryption*) of the digital data in the original content. The receiving device needs to know the encryption algorithm in order to unscramble the signal. See also *Encoding* and *Encryption*.
Smartcard Reader	is an STU component that holds the Smartcard and provides a connection for the embedded micro-chip in the Smartcard to communicate with components in the STU.
SI	Service information (data about the platform configuration). It consists of a series of mandatory and

	optional DVB defined tables, such as the Network Information Table (that tells the STU where program information is located – which stream it is in), and Time and Date etc.
Simulcrypt	the process of simultaneously providing Conditional Access data for two or more different Conditional Access systems on the same platform. (Practical limitations seldom see it done for more than two systems, and then usually to cope with extraordinary circumstances for brief periods of time.)
Smartcard	A credit-card sized card with an embedded micro-chip that manages the viewer's access to the encrypted signal delivered to the STU.
SMS	Subscriber Management System – a software program that manages subscription information, such as entitlements and purchases. It matches the subscription data to the subscriber's smartcard ID. It sends authorisation requests to the CA system for distribution to the subscriber's Smartcard.
S/PDIF	Sony Philips Digital Interconnect Format – also known as *Digital Coaxial*, AC3 and *Optical Audio Out* – is a high quality audio signal sent to a TV, video recorder, home cinema or stereo system. The quality comes from transferring digital sound data directly, without conversion to an analogue audio signal.
Stream	see *Transport Stream*.
STU	Set Top Unit (also known as Set Top Box, STB, and Integrated Receiver Decoder, IRD). It is a device that can receive and process transmissions that contain the appropriate DVB tables. The STU/STB/IRD used in the pay television environment differs from FTA STBs primarily by including CA components (such as a smartcard reader) to protect the intellectual property in the broadcast stream.
S-Video Out	refers to a good quality video signal output port that can be connected to a TV, video recorder or home cinema.
S/W	Software.
Transport Stream	is a collection of encoded and encrypted digital data output from one multiplexer group. In current technology it generally corresponds to 8-12 television channels plus the associated CA and SI.
Tuner	is a component of the STU that receives the broadcast RF stream *en masse* and, under instruction from the

	CPU, extracts the signal for the stream selected by the viewer pressing the channel buttons on the remote control unit or on the front of the STU (the viewer's channel is extracted from that stream using the SI).
USB	Universal Serial Bus – it is a standard for a type of data communications port on the STU.
Verifier	a firmware program that validates system commands within the STU.
XSI	Extended Service Information. It consists of a third party proprietary series of data tables that provide operating information to the STU, such as DVB private tables that provide service specific information, for example, data for the EPG application.
XTV	NDS product that provides the FOXTEL Personal Digital Recorder functionality.

Annexure 1 – Globecast

GlobeCast
AUSTRALIA

Monday 12 September 2005

TO WHOM IT MAY CONCERN

GlobeCast Australia Pty Ltd is an Australian company which has its registered office at 86 Dickson Avenue Artarmon NSW 2064 and specialises in the carriage of program content via fibre and/or satellite.

Within its various product lines, GlobeCast Australia provides clients with direct-to-home services as follows:

1) Carriage on Optus B3 satellite, currently transponders 5, 7 and 13

- Receive footprints are 'Australia only' or 'Australia and New Zealand', as available
- Transmissions are non-encrypted or encrypted in accordance with the requirements of the client
- Indicative carriage fee per regular channel is in the vicinity of A$35,000 per month
- Carriage fee covers the encoding + statistical multiplexing process, encryption (if required) and provision of the digital platform on the satellite transponder by GlobeCast
- Delivery of the client's signal to GlobeCast Sydney and any form of enhancement (such as standards conversion to PAL, insertion of other material or time delay) may attract additional charges
- The client is generally responsible for any form of marketing and promotion of the channel
- Although GlobeCast sells smartcards directly to the client, the distribution of the smartcards to the subscribers and the antenna/set top box installations are the responsibility of the client

2) Carriage on Panamsat PAS-8 satellite, currently transponders 22 and 24

- Receive footprint is 'Australia only'
- Transmissions are non-encrypted ('in the clear') or encrypted in accordance with the requirements of the client
- Indicative carriage fee per regular channel is in the vicinity of A$30,000 per month
- Carriage fee covers the encoding + statistical multiplexing process, encryption (if required) and provision of the digital platform on the satellite transponder by GlobeCast
- Delivery of the client's signal to GlobeCast Sydney or Panamsat Napa Valley California USA and any form of enhancement (such as standards conversion to PAL, insertion of other material or time delay) may attract additional charges
- The client is generally responsible for any form of marketing and promotion of the channel
- Although GlobeCast sells smartcards directly to the client, the distribution of the smartcards to the subscribers and the antenna/set top box installations are the responsibility of the client

3) Carriage on Optus C1 satellite, currently transponder 2

- By an arrangement between GlobeCast and Foxtel, GlobeCast performs the role of channel aggregator of access seeker channels and/or FTA re-transmissions that are carried on the Optus C1 transponder 2 platform
- Receive footprint is 'Australia only'
- The platform is encrypted in accordance with the requirements of Foxtel
- GlobeCast's indicative carriage fee per regular channel is in the vicinity of A$60,000 per month
- The carriage fee covers the encoding and statistical multiplexing process, encryption and provision of the client's channel on the digital platform on the satellite transponder by GlobeCast
- The cost of the delivery of the client's signal to GlobeCast Sydney or any form of enhancement (such as standards conversion to PAL, insertion of other material or time delay) may attract additional charges

Signed

PETER BOOTH
Business Development Manager
GlobeCast Australia

cc
Andrew Nealon
Mike Lattin

GlobeCast Australia P/L ABN 65 079 173 961
86 Dickson Avenue Artarmon NSW 2064
Ph (02) 8258 7900 Fax (02) 8258 7990

2

Annexure 2 – Optus

'yes' OPTUS

23rd September 2005

Ron Higgins
FOXTEL Management Pty Ltd
5 Thomas Holt Drive
North Ryde NSW 2113

Re Aurora Platform Pricing

Dear Ron

I am pleased to provide you with the following pricing information for capacity on the Optus Aurora platform. Based on your requirement for a service datarate of 4Mbps, pricing would be $565,000 per annum. A once-off set-up cost of $10,000 is also applicable. There is no additional charge for encryption. This price assumes a point-of-interconnect at the Belrose Satellite facility in the form of an ASI interface.

Please advise how you wish to proceed with this service.

Kind regards,

Geoff Fielding
Solutions Consultant – Satellite Services
Singtel Optus Pty Ltd

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