Solution Requirement Document

Version 3.2

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G Conran	0.2	Jan 29th, 2010	Added solution components.
G Conran	0.3	Feb 1st, 2010	Added solution components. Added Glossary.
G Conran	0.4	Feb 8th, 2010	Added P-Commerce requirements. Added Reporting requirements.
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G Conran	2.5	8 August 2010	Updated TV media companies to include UKTV
G Conran	2.6	6 Sept 2010	Added patent trolls patent
G Conran	2.7	10 Sept 2010	Added TV vendors

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Glossary

Acronym	Definition
3GPP	3rd Generation Partnership Project
.NET	Windows OS application framework
ACS	Auto-Configuration Server
AIM	AOL Instant Messenger
ALA	(Ethernet)Active Line Access
ARD	First public service German TV channel
ASA	Advertising Standards Authority
ASP.NET	Web application framework from Microsoft
ATM	Asynchronous Transfer Mode
ATVOD	Association for Television Video On Demand
A / B Testing	Split or bucket testing
AMPS	Advanced Mobile Phone System
API	Application Programmable Interface
B2B	Business to Business
B2C	Business to Consumer
BB	Broadband
BC	Broadcast
BIDS	Business Intelligence Development Studio
BSD	Berkeley Unix
BML	Broadcast Markup Language
BT	British Telecom
C +	Canal Plus – French pay TV channel
CA	Conditional Access
CBR	Constant Bit Rate
CC	Competition Commission
CDMA	Code Division Multiple access
CDPD	Cellular Digital Packet Data
CEA	Consumer Electronics Association
CGI	Common Gateway Interface
CIS	Common Interface Slot
CMS	Content Management System
COFDM	Coded Orthogonal Frequency-Division Multiplexing

Acronym	Definition
CPA	Cost Per Action
CPM	Cost per (one thousand) impression
CPE	Customer Premises Equipment
CPR	Consumer Protection from Unfair Trading Regulations
CRM	Customer Relation Management
CSD	Circuit Switched Data
CSS	Cascaded Style Sheets
CSV	Comma Separated Values
CW	Carphone Warehouse
CWMP	CPE WAN Management Protocol
D-AMPS	Digital AMPS
DCDM	Digital Cinema Distribution Master
DCI	Digital Cinema Initiatives
DCM	Digital Cinema Media
DCP	Digital Cinema Package
DMP	Digital Media Project
DNS	Domain Name Server
DOCSIS	Data Over Cable Service Interface Specification
DOOH	Digital Out Of Home
DoS	Denial of Service
DPI	Deep Packet Inspection
DSL	Digital Subscriber Loop
DTG	Digital TV Group (UK)
DTT	Digital Terrestrial Television
DVB-S	Digital Video Broadcasting - Satellite
DVB-T	Digital Video Broadcasting - Terrestrial
DVB-T2	Digital Video Broadcast – 2nd Generation Terrestrial
EBU / UER	European Broadcasting Union / Union Europeene de Radio-Television
EDGE	Enhanced Data rates for GSM Evolution
EFM	Ethernet in the First Mile
EPG	Electronic Program Guide
EPO	European Patent Office

Acronym	Definition
ERP	Enterprise Resource Planning
ETL	Extraction, Transformation, Loading
ETSI	European Telecommunications Standards Institute
FTP	File Transport Protocol
FITL	Fiber In The Loop
FTTH	Fiber To The Home
FTTx	Fiber To The Curb/Home
GAN	Generic Access Network
GATC	Google Analytics Tracking Code
GIF	Graphics Interchange Format
GIPS	Global IP Solutions
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HBBTV	Hybrid Broadband Broadcast TV
HD	High Definition
HME	Home Media Engine
HSCSD	High Speed CSD (Circuit Switched Data)
HSDPA	High-Speed Downlink Packet Access
HSPA	High Speed Packet Access
HSUPA	High-Speed Uplink Packet Access
HTML	Hyper Text Mark-up Language
HTTP	Hyper Text Transfer Language
HTTPS	HTTP Secure (encrypted)
IAB	Internet Advertising Bureau
ICQ	Instant Messaging Computer Program
iDEN	Integrated Digital Enhanced Network
IEEE	Institute of Electrical & Electronic Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IMS	IP Multimedia Subsystem
IP	Internet Protocol

Acronym	Definition
IMT	International Mobile Telecommunications
IPO	Intellectual Property Office
IRT	Institut fur Rundfunktechnik GmbH (Research Centre for ARD / ZDF / DLR, ORF, SRG)
ISP	Internet Service Provider
IVR	Interactive Voice Response
ITU	International Telecommunications Union
JPO	Japan Patent Office
LINQ	Language Integrated Query
LLU	Local Loop Unbundling
LTE	Long Term Evolution
MEF	Metro Ethernet Forum
MIME	Multi Purpose Internet Mail Extensions
MMOG	Mass Multi Player Gaming
MNO	Mobile Network Operator
MPLS	Multi Protocol Label Switching
MSN	The Microsoft Network
MSAN	Multi Service Access Network
MVC	Model View Controller
MVNO	Mobile Virtual Network Operator
MXF	Material eXchange Format
NATO	National Association of Theatre Owners
NGA	Next Generation Access
NMT	Nordic Mobile Telephone
OFCOM	Office of Communications
OFT	Office of Fair Trading
OIPF	Open IPTV Forum
ORF	Austrian national public service broadcaster
OS	Operating System
OMA	Open Mobile Alliance
PBB	Packet Burst Broadband
PCI DSS	Payment Card Industry Data Security Standard
PCN	Personal Commerce Network

Acronym	Definition
PDC	Personal Digital Cellular
PHS	Personal Handy System
PON	Passive Optical Network
PPC	Pay Per Click
OTT	Over The Top Services
PDF	Portable Document Format
PPC	Pay Per Click
QAM	Quadrature Amplitude Modulation (4/16/64/236)
QPSK	Quadrature Phase Shift Keying (modulation)
RDL	Report Definition Language
REST	Representational State Transfer
ROP	Run of paper / press
RSS	Really Simple Syndication
SD	Standard Definition
SCC	Single Column Centimeter
SDK	Software Development Kit
SDN	S4C Digital Network
SEM	Search Engine Marketing
SEO	Search Engine Optimization
SIP	Session Initiation Protocol
SMPTE	Society of Motion Picture and Television Engineers
SOAP	Simple Object Access Protocol
SQL	Structured Query Language
SRG SSR	Swiss Broadcasting Corporation
SRO	Self Regulatory Organization
SSL	Secure Sockets layer
SSIS	SQL Server Integration Services
SSMS	SQL Server Management Studio
SSRS	SQL Server Reporting Services
SUMO	Service, User, MSAN, Operator
TACS	Total Access Communication System
TF1	Main national French TV channel
TLC	The Listening Company

Acronym	Definition
TLS	Transport layer Security
TIFF	Tagged Image File Format
TMS	Theatre Management System
TMT	Technology, Media & Telecommunications
TNS	Transaction Network Services
TR	Technical Report
UMA	Unlicensed Mobile Access
UMTS	Universal Mobile Telecommunications System
UN	United Nations
URL	Uniform Resource Locator
URI	Uniform Resource Identifier
WCM	Web Content Management
WCMS	Web Content Management System
WiMAX	Worldwide Interoperability for Microwave Access
WSDL	Web Services Description Language
WYSIWYG	What You See Is What You Get
VM	Virtual Machine
VS	Visual Studio
VOD	Video On Demand
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
VS BIDS	Business Intelligent Development Studio
W3C	World Wide Web Consortium
WBA	Wholesale Broadband Access
WiDEN	Wideband iDEN
WIPO	World Intellectual Property Office
XML	Extensible Mark-up Language
XMPP	Extensible Messaging & Presence Protocol
XSL	Extensible Stylesheet Language
XSLT	XSL Transformation
ZDF	Second public service German TV channel

1. Introduction

1.1 Purpose of the document

The purpose of this document is to capture and summarize all possible requirements that could be considered for inclusion in the Online Sales Solution.

1.2 Description of project

The requirements described in relation to the PCN and are internally and externally (from competitors and prospects) driven.

1.3 Solution Requirements

This section outlines the required components of the end to end solution.

1.4 Tomahawk Requirements

This section outlines Tomahawk's requirements.

2. Overview of the Personal Commerce Network (PCN)

1.1 Introduction

This document uses Figure 1 as a framework called the Personal Commerce network (PCN). The framework consists of functional blocks in order to identify and place requirements.

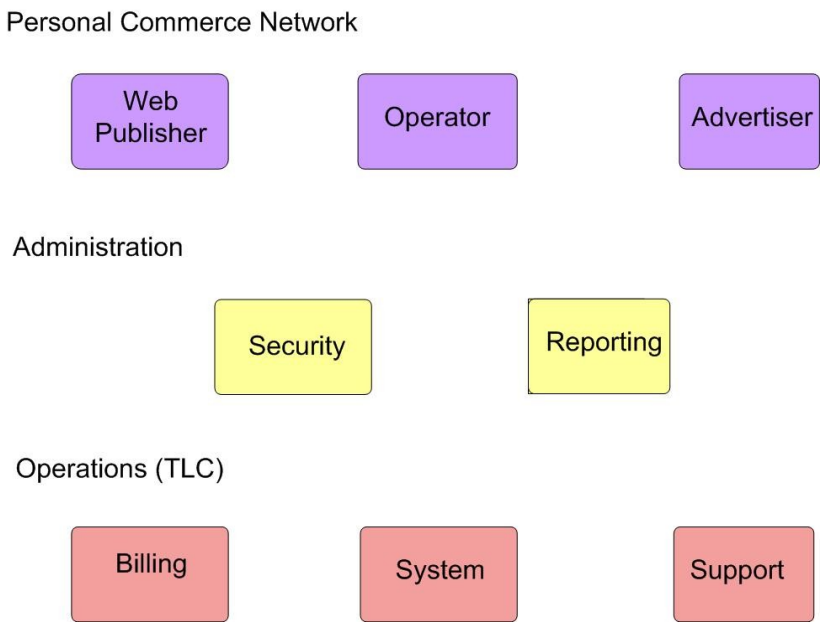


Figure 1: Overview of PCN

Each requirement within the list of requirements on the next page is tagged with the name of a functional block.

3. Solution Requirements

The best prospects for our sales solution are those with a complicated value proposition, high volume of web traffic generated via different sources, a relatively high price and who already publish telephone numbers online. Verticals with such characteristics are TMT, retail (high end) and financial products.

The following section contains the details of the proposed requirements that affect our sales solution based on the PCN.

3.1 Online Selling Solution

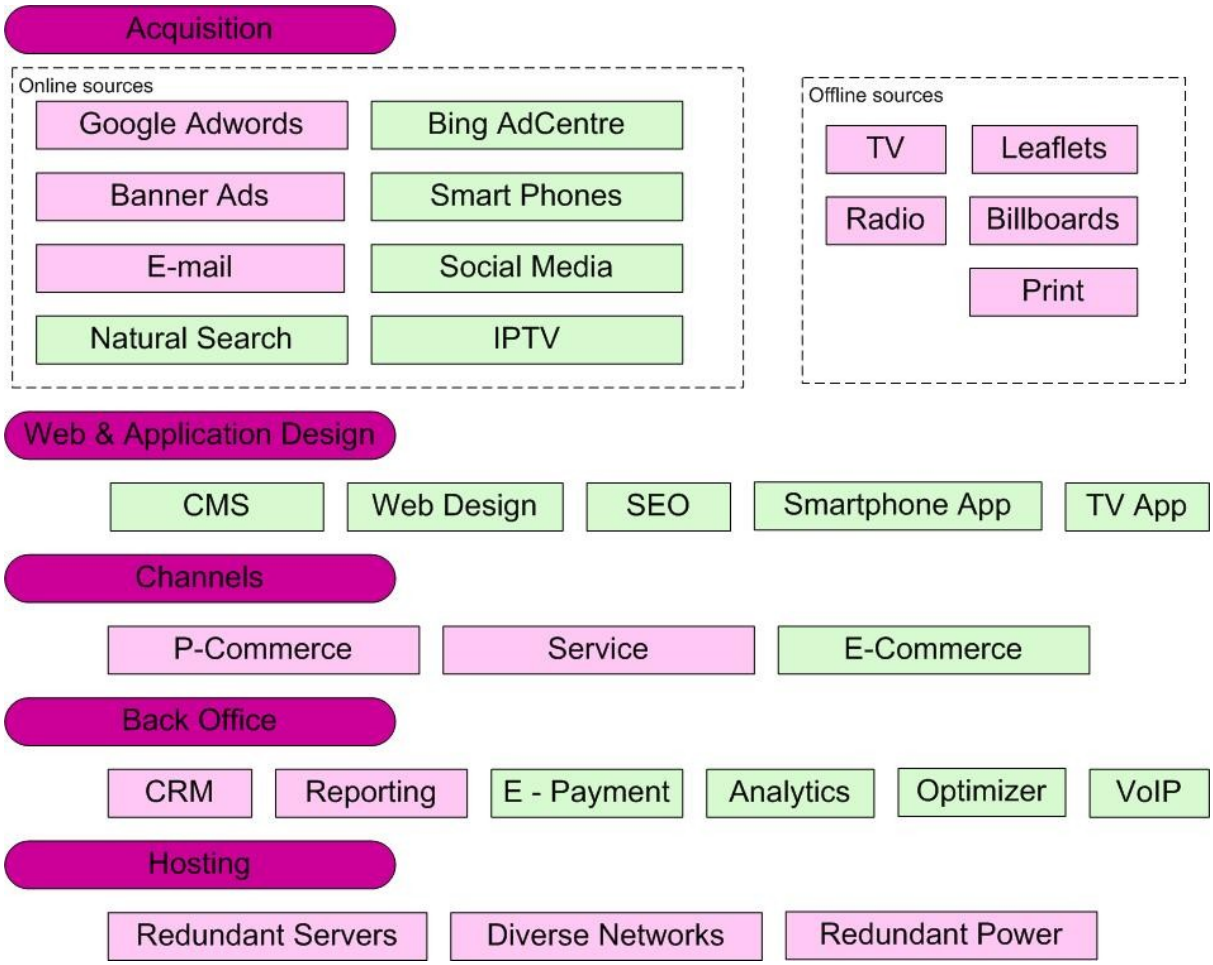


Figure 2: Generic Selling Solution
(Lilac: Exists; Green: Required)

3.2 Introduction

The largest cost of a campaign lies in acquisition. For this reason, it is important to convert as many subscribers as possible in a single marketing campaign.

The E-commerce channel is a cost effective channel but the conversion rate is very low. This is why to maximise the ROI of your marketing (acquisition) spend it is important to offer the consumer to choose from a P-Commerce and an E-Commerce channel.

The solution outlined in Figure 2 is our Generic selling solution. Solution can easily be

tailored towards Print, Broadcast, Online subscriptions, high end retail, advertising and health.

Once we have proven the business benefits of P-Commerce with The Times there will be four stages to growing revenue.

1. P-Commerce for Media (Subscriptions)
    a. Print/Online
    b. Mobile
    c. Broadcast
2. P-Commerce for Media (Advertising)
3. P-Commerce for Retail (high end)
4. P-Commerce for Health

3.2.1 P-Commerce for Media Subscriptions

3.2.1.1 Print

The first is to encourage other print media businesses to start selling subscriptions as similar to The Times. Prospects will include The Telegraph, The Mail, The Guardian, The Independent, Trinity Mirror and The Racing Post.

3.2.1.2 Online / Mobile

All serious content providers are developing strategies to begin charging for online content distributed over multiple devices. If The Times and Sky are using P-Commerce we will be invited to be part of any solutions selling online content.

3.2.1.3 Broadcast

Once we have proven P-Commerce with The Times we will be in a better position to return to Sky and add P-Commerce to their in-house solution.

3.2.2 P-Commerce for Retail

If a web user arrives at lastminute.com via Google a generic phone number will appear on the landing page. If you go directly to the site then the number does not appear. This means that lastminute.com has identified users arriving via Google as better prospects than those going directly to the site. We can greatly increase the effectiveness by displaying a call to action in addition to a unique telephone number that will increase the call rate and allow a detailed analysis of the performance of the source and the attribute.

Retention can be increased by adding a Tomahawk campaign to an E-mail campaign. Once a user has become a customer of a retail site then it is easier to sell them more things. By notifying your existing customer base of upcoming offers a specific telephone number and call to action can be served on the landing page once they have clicked on the Tomahawk link embedded in the E-mail.

It is difficult for retailers to keep a visual inventory of their stock on the web site. Using Tomahawk, retailers can serve a specific banner with a call to action and a telephone number for users to call. An example of this is www.brandalley.com.

3.2.3 P-Commerce for Advertising

This opportunity has arisen from the need for publishers to offer an online way for content aggregators i.e. today's publishers, to sell advertising for their different distribution platforms and end user devices.

With convergence comes a different playing field for advertising. Advertisers will want a one stop shop for buying advertising space on all the different platforms. This is ideal for P-Commerce as this will be a difficult proposition for people to understand. We are very well positioned with Trinity Mirror to create a solution that exactly meets the market's requirements.

3.2.4 P-Commerce for Health

There has been continuing developments over the last 10 years in the use of information technology across healthcare and whilst the NHS delivery model is unique, innovation and integration have created some significant developments that have changed the way the world delivers healthcare.

The UK healthcare market continues to evolve. Virtual health services are becoming an increasingly important part of local and national care delivery as the NHS looks at innovative ways to become more efficient. Such services not only provide cost efficiencies but also bring other benefits that and can help address the following common challenges in healthcare provision.

As the UK market reaches a level of maturity where patients now trust and expect electronic health channels for support and advice, a new an era of great potential unfolds for P-Commerce in the world of health care.

In the US, the healthcare market is changing rapidly, and with consumers paying a greater share of total costs, a new consumer retail market is emerging. This shift carries significant implications for healthcare payers, and their consumer, employer, broker and provider constituents.

Consumer retail refers to more than a particular set of products; it is a business model that emphasizes the consumer's increased financial role-including greater cost sharing as well as the use of tax-advantaged accounts - and the consumer's role in medical utilization and decision making.

The winners in a consumer-retail healthcare world will succeed based upon their ability to foster positive relationships, efficiency and superior outcomes across all healthcare constituents.

Retail healthcare platform s are designed to meet information and process needs of consumers, providers, employers and brokers, turning the traditional role of health plan from process administrator, increasingly to true value chain coordinator.

3.3 How Tomahawk Works Today (V3.0)

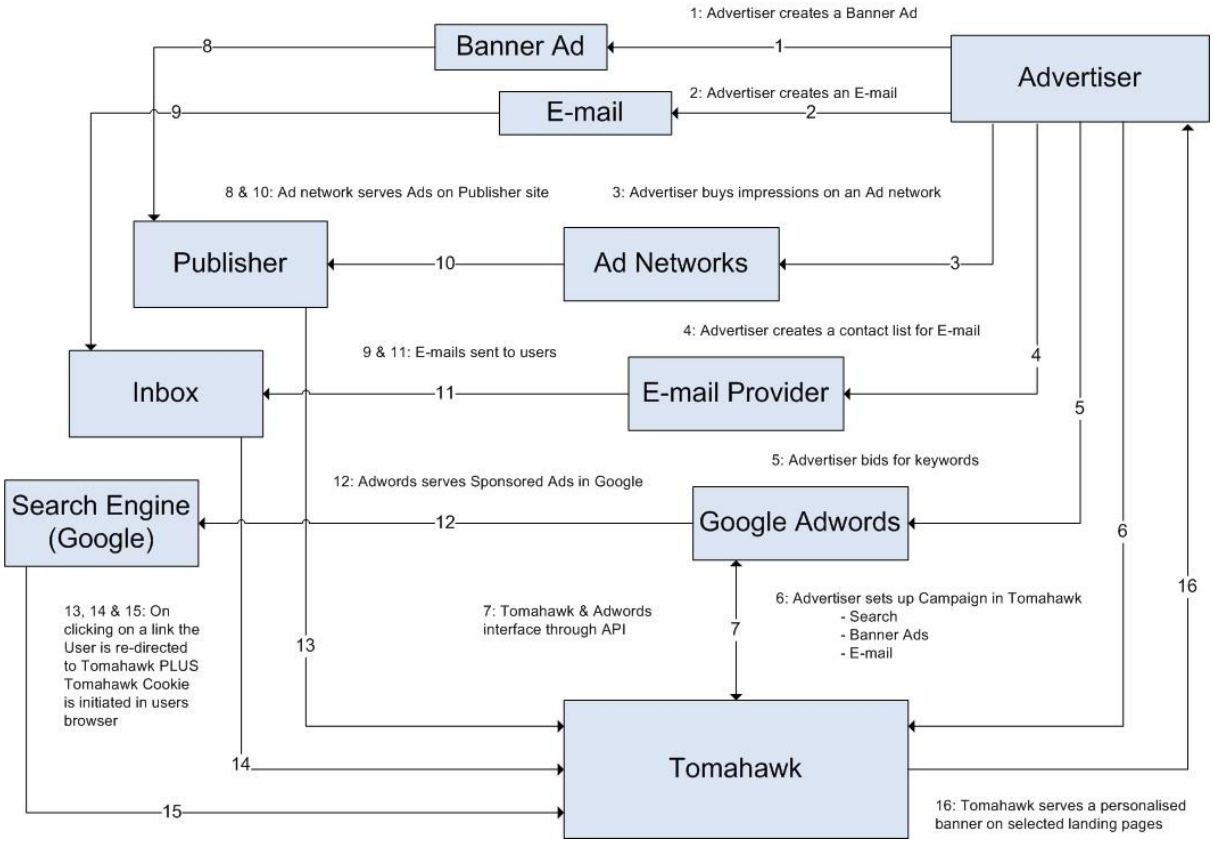


Figure 3: Tomahawk Flow Diagram

Figure 3 shows how Tomahawk V3.0 works with Google Adwords, E-mails & Banner Ads. When a user clicks on a sponsored link/E-mail/Banner Ad, keyword and cookie information is sent to Tomahawk. From this information, Tomahawk decides which banner to serve on the landing page.

The key functionality of Tomahawk is the re-direction server. This allows users to be served with a personalized banner. This was developed to work with Google Adwords. We have re-used the same technology to re-direct traffic generated by E-mails and banner ads.

From the diagram, see steps 13, 14 & 15, when a user clicks on a sponsored link, E-mail or banner ad, the user is re-directed to Tomahawk. Tomahawk then performs two main functions:

- Cookie is initiated/updated in users browser
- A personal banner is served on the landing page
  the banner is called from the landing page via JavaScript

The rest of the chapter outlines the main components of a solution.

3.4 Acquisition

3.4.1 Extending the Source

3.4.1.1 Introduction

A goal of our solution is to track user activity across different communications networks. A receiving device, such as PC or mobile phone, receives a request for a telephone number on a second network, i.e. a fixed or mobile telecommunications network.

3.4.1.2 How Tomahawk should work in the future

Presently, P-Commerce only tracks activity originating from Google Adwords, E-mails and banner ads.

What is required is for Tomahawk to track activity originating in other sources. In addition to the sources supported in V3.0 new sources should be Bing, natural search and Social Media.

Tomahawk should track activity from more online sources:

- Natural Search
- Social Networking – Facebook
- Smartphone applications & advertising
- Microsoft AdCentre for searching on Bing
- IPTV Applications & advertising

Web Services	Description	Google	Bing	Facebook
Campaign	Create, list, and modify campaigns	Yes	Yes	Yes
Ad Group	Create, list & associate ad groups with a campaign, & perform actions	Yes	Yes	Yes
Criterion / Targeting	Get information about targeting criteria	Yes	Yes	Yes
Ad	Create and modify ads	Yes	Yes	Yes
Site Suggestion	Estimate the performance of keywords, ad groups, and campaigns	Yes	?	?
Traffic Estimator	Estimate the performance of keywords, ad groups, and campaigns	Yes	?	Yes
Keyword Tool	Generate keywords based on a seed keyword or on the words found on a web page or web site that you provide	Yes	Yes	?
Reporting	Generate reports on the performance of you campaigns	Yes	Yes	Yes (Basic)
Info	Get basic information about how much you have used the API	Yes	Yes	Yes

Account	Lets you modify accounts	Yes	Yes	Yes

Figure 4: Search Engine & Social Media API comparison
(Web service used in Tomahawk)

Please refer to Appendix XIX: Social Media Comparison for a comparison of the main social media providers.

3.4.2 Auto-bidding

At any particular time Tomahawk will know how many calls are being generated. If the number of calls falls then agents will be unproductive. The goal is to be able to control demand. This can be done in a number of ways:

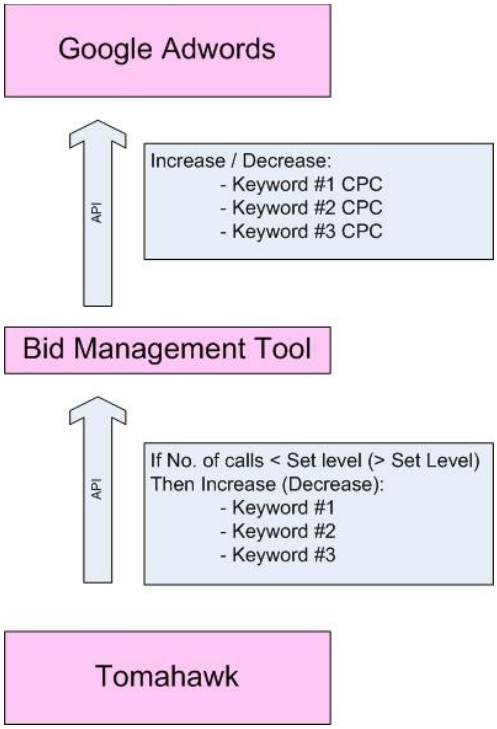
- Control the number of banners served over a particular time period
  This can be done today by using the banner throttle control.

- Control the number of clicks via Google
  This can be done by increasing the CPC on keywords. Automating this is the requirement and is called Auto bidding.

P-Commerce relies on telephone agents to handle calls. This is a cost which does not depend on demand and in quiet periods, agents may be sitting with nothing to do with zero calls and zero transactions.

The requirement is to manage demand in order to keep a steady flow of calls and transactions. In quiet periods, this can be done by automatically increasing the CPC on certain keywords in order to increase demand. The inverse is also true; if there is high demand then the CPC can be automatically lowered to make sure potential buyers are not held in the queue.

Tomahawk already has the banner throttle controller which regulates the serving of telephone banners. This is totally dependent on the availability of agents but does not regulate the number of clicks generated.



3.4.3 Back up original Adword URLs for roll-back

Tomahawk could potentially be a block to sales if it were to fail because Tomahawk replaces the Adword URL's with re-direction URLs. If Tomahawk fails web users who click on a sponsored ad will not reach the landing page. This will lead to advertisers been charged a CPC even though the web users do not reach the landing page.

This requirement is to offer an URL fail over mechanism.

3.5 Web & Application Development

Web development consists of CMS, web design and Search Engine Optimisation (SEO). The design of landing pages are tightly coupled with the Analytics and web optimisation as the feedback from segmentation and multivariate testing will have a large impact on the design of the web pages.

Apple believes that while on the move users will access the majority of their information via their apps. They are planning a mobile AD network, called iAD, to serve mobile advertisements within their applications.

The IPTV industry is also working on applications that will reside on the STB or an edge server.

3.5.1 Smartphone 3rd Party Application Development

The iPhone SDK was officially announced on March 6, 2008. It allows developers to develop native applications for the iPhone and iPod Touch, as well as test them in an "iPhone simulator". Developers are free to set any price for their applications to be distributed through the App Store, of which they will receive a 70 percent share.

Before the SDK was released, third-parties were permitted to design "Web Apps" that would run through Safari. Unsigned native applications are also available. The ability to install native applications onto the iPhone outside of the App Store will not be supported by Apple. Such native applications could be broken by any software update, but Apple has stated it will not design software updates specifically to break native applications other than those that perform SIM unlocking.

A form, the Open Mobile Alliance (OMA), which is the centre of all mobile application standardisation work, enabling the creation of mobile services designed to meet the needs of the end-user.

A full description of the competing smart phone eco-systems can be found in Appendix X: Smartphone Eco-Systems.

3.5.2 IPTV 3rd party Application Development

The “Project Canvas” open API means that in theory there could be an "apps store" in some ways like iPhone. So e.g. while initially there will be no common payment mechanism over time someone could create a Canvas "wallet" enabling common payment across a variety of platforms.

These apps stores are already supplied by companies such as Access of Japan, Accedo of Sweden and ANT of the UK.

A full description of the competing IPTV eco-systems in the UK can be found in Appendix XI: UK TV Provider Comparison.

3.5.3 Web Content Management System (CMS)

3.5.3.1 Introduction

Web content management system (WCM, WCMS or Web CMS) is content management system (CMS) software, implemented as a Web application, for creating and managing HTML content. It is used to manage and control a large, dynamic collection of Web material (HTML documents and their associated images). A WCMS facilitates content creation, content control, editing, and essential Web maintenance functions.

The software provides authoring tools to allow users with little knowledge of programming languages or mark-up languages to create and manage content with relative ease.

Most systems use a database to store content, metadata, or artefacts that might be needed by the system. Content is frequently, but not universally, stored as XML, to facilitate reuse and enable flexible presentation options.

A presentation layer displays the content to Web-site visitors based on a set of templates. Administration is typically done through browser-based interfaces.

A full description of a CMS can be found in Appendix IV: Web CMS Capabilities.

3.5.3.2 Potential Web CMS partners

- Alterian
- Wordpress

3.5.4 Web Design

The design of the pages will be greatly influenced by the results of market segmentation and multivariate testing. The design of the site will be out-sourced to a suitable agency.

3.5.5 SEO

3.5.5.1 Introduction to Search Engine Optimisation (SEO)

Search engine optimization (SEO) is the process of improving the volume or quality of traffic to a web site from search engines via "natural" or un-paid ("organic" or "algorithmic") search results as opposed to Pay-Per-Click (PPC) which deals with paid inclusion.

Typically, the earlier (or higher) a site appears in the search results list, the more visitors it will receive from the search engine. SEO may target different kinds of search, including image search, local search, video search and industry-specific vertical search engines. This gives a web site web presence.

As an Internet marketing strategy, SEO considers how search engines work and what people search for. Optimizing a website primarily involves editing its content and HTML and associated coding to both increase its relevance to specific keywords and to remove barriers to the indexing activities of search engines.

The term "search engine friendly" may be used to describe web site designs, menus, content management systems, images, videos, shopping carts, and other elements that have been

optimized for the purpose of search engine exposure.

3.5.5.2 How to include SEO in a P-Commerce Campaign

3.5.5.2.1 Acquisition

When adding keywords to a Tomahawk campaign, the same keywords are added to the SEO component.

3.5.5.2.2 Tracking

How do we?

- Redirect
- Manipulate cookie

OR

- Should we use tracking URLs
- Or other method

3.5.5.2.3 Agency

The SEO will be out sourced to a suitable agency.

3.5.6 Ads on a Smart Phone App

Apple launched a war with Google over mobile advertising revenues as it announced its own iAd network for the iPhone. The move challenges its Silicon Valley rival's core business model and its plans to expand into mobile devices. Steve Jobs, Apple chief executive, said that Google's search-based advertisements were not the future for mobile devices because users tended to spend their time inside "apps" rather than browsing the web. "On a mobile device, search is not where it's at, not like on the desktop," he said. "They're using apps to get to data on the internet, not generalised search."

Apple will launch its iAd network on the iPhone, iPod touch and iPad later this year. In February, the iPhone and iPod touch accounted for 40 per cent of the mobile ads served up by one of the biggest ad networks, AdMob – a sign of the dominance of Apple's software platform in the mobile ad market. Under the new ad network – part of a 4.0 upgrade to the operating system on Apple's mobile devices – Apple would host adverts within apps and pass on 60 per cent of the revenues to their developers.

Google announced the acquisition of the AdMob network in November for $750m. Apple bought the Quattro Wireless mobile ad network in January for a reported $300m instead.

A full description of how to build an iPhone application can be found in Error: Reference source not found.

A full description of how to build an Android application can be found in Error: Reference source not found.

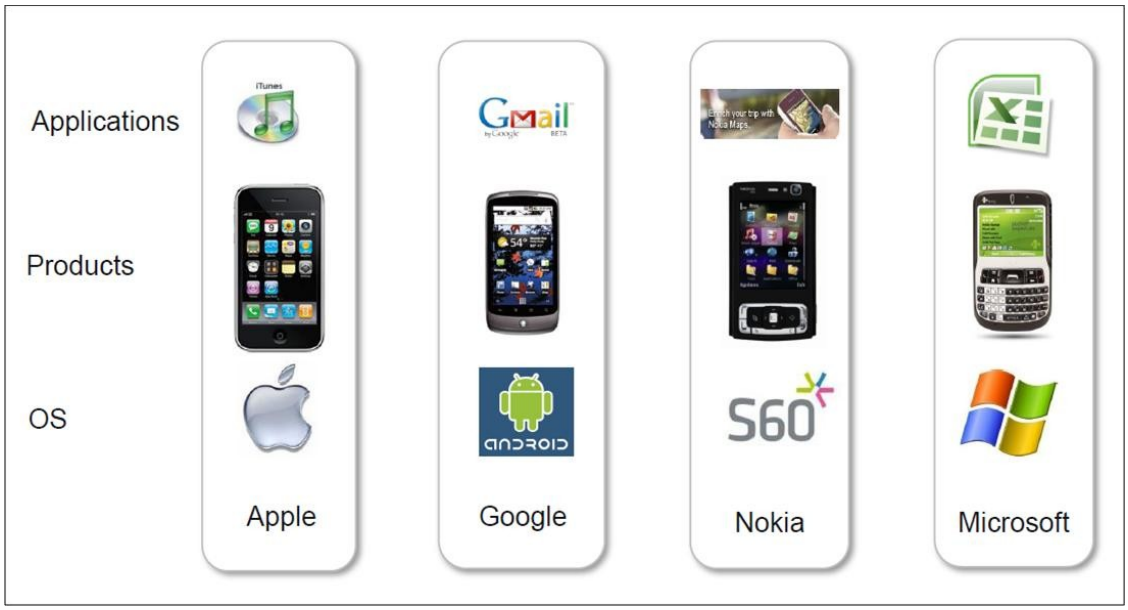


Figure 5: Vendors are targeting the entire value chain

3.5.6.1 Potential Mobile Ad Network Partners

- Millennial Media
- Yahoo
- AdMob – acquired by Google
- JumpTap
- Quattro – acquired by Apple
- Alcatel Lucent (Optism)
- Adfonic
- Advertising.com
- Acision Mobile Advertising Platform
- AdMarvel - acquired by Opera

3.5.7 Ads on an IPTV Ad network / Application Partners

Mobile terminals and broadcast infrastructure are still evolving, and they are starting to merge. When they do fully integrate, the television environment will be omnipresent and people will be able to watch TV wherever and whenever they want to. Television and Internet functions will then integrate, and TV will evolve as a complex platform that enables anyone to easily access a whole spectrum of information and services.

A number of vendors provide a SDK for the development of STB/TV based applications.

- Project Canvas
- Nagravision
- NDS
- Access (NetFront)
  Used in Amazon Kindle & member of HbbTV
- ANT (Galio)
  Founding member of HbbTV
- Opera
- Obigo

3.5.7.1 Potential IPTV Ad Network / Application Partners

- Google TV (invested in Invidi)
- Nagravision / OpenTV (Advertising Network)
- NDS / Blackarrow (In Stream advertising)
- Alcatel Lucent (Optism)
- Acision Mobile Advertising Plaform
- AdMarvel (Opera)

3.6 Channels

3.6.1 P-Commerce

New Features for V3.2:

Publisher

- Natural Search (Google)
- Social Media (Facebook)

Advertiser

- Improvements to mapping with Adwords campaigns
- Improvements to Home Page

Reporting

- Integrate SQL Server Reporting Services

3.6.2 E-Commerce Application (Shopping Cart)

There is a six step selling process making it complicated for an ordinary user and will become more complicated as more titles and platforms are added to the mix.

1. Select a category
2. Select a publication & date
3. Crete the ad
4. Enhance the ad
5. Buy it
6. Place it

Our P-Commerce channel will manage the number published on sites similar to this.

3.6.3 Service Channel

Provided by TLC.

Should we add a Social CRM element to this?

3.7 Back Office

3.7.1 CRM

3.7.1.1 Introduction

Customer relationship management is a strategy for managing and nurturing a company's interactions with customers and sales prospects. It involves using technology to organize, automate, and synchronize business processes—principally sales related activities, but also those for marketing, customer service, and technical support. The overall goals are to find, attract, and win new customers, nurture and retain those the company already has, entice former customers back into the fold, and reduce the costs of marketing and customer service.

A full description of a CRM can be found in Appendix V: Web CRM Capabilities.

3.7.1.2 Potential CRM Partners

- EpiCentre
- Salesforce
- IBM
- Oracle

3.7.2 Payment Process

3.7.2.1 Introduction

Payment processors connect merchants and retailers to the world's leading banks, acquirers and processors, enabling secure, efficient and cost-effective delivery of payments. They provide a wide array of pre-packaged, end-to-end managed solutions designed specifically for the payments industry, enabling customers to focus on their core businesses.

A full description of an E-Payment system can be found in Appendix VI: Web E-Payments.

3.7.2.2 Service Providers

- TNSI

3.7.3 Web Analytics & Optimization

3.7.3.1 Introduction

Web analytics is the measurement, collection, analysis and reporting of internet data for purposes of understanding and optimizing web usage.

On-site web analytics measure a visitor's journey once on your website. This includes its drivers and conversions; for example, which landing pages encourage people to make a purchase. On-site web analytics measures the performance of your website in a commercial context. This data is typically compared against key performance indicators for performance,

and used to improve a web site or marketing campaign's audience response.

Many different vendors provide on-site web analytics software and services. There are two main technological approaches to collecting the data. The first method, log file analysis, reads the log files in which the web server records all its transactions. The second method, page tagging, uses JavaScript on each page to notify a third-party server when a page is rendered by a web browser. Both collect data that can be processed to produce web traffic reports.

In addition other data sources may also be added to augment the data. For example; e-mail response rates, direct mail campaign data, P-Commerce, sales and lead information, user performance data such as click heat mapping, or other custom metrics as needed.

A full description of how web analytics work can be found in Appendix II: Web Analytics.

3.7.4 Market Segmentation

Customer segmentation is a method for grouping customers based upon similarities they share with respect to any dimensions deemed relevant to a business - whether it is customer needs, channel preferences, interest in certain product features, customer profitability, etc.

The key is for the marketer to first decide on what basis you to segment customers and prospects. And, the only way to answer this question is to first determine what your objective is for the segmentation, and thus what you want the segmentation to "do for you".

The process of segmentation is distinct from targeting (choosing which segments to address) and positioning (designing an appropriate marketing mix for each segment). The overall intent is to identify groups of similar customers and potential customers; to prioritize the groups to address; to understand their behaviour; and to respond with appropriate marketing strategies that satisfy the different preferences of each chosen segment.

3.7.5 Multivariate testing

In a nutshell, multivariate testing can be seen as allowing website visitors to vote with their clicks for which content they prefer and will stand the most chance of them proceeding to a defined goal. The testing is transparent to the visitor with all commercial solutions capable of ensuring that each visitor is shown the same content on every visit.

To be more specific, multivariate testing is a process by which more than one component of a website may be tested in a live environment. It can be thought of in simple terms as numerous A/B tests per market segment performed on one page at the same time. A/B tests are usually performed to determine the better of two content variations, multivariate testing can theoretically test the effectiveness of limitless combinations.

Multivariate testing is usually employed in order to ascertain which content or creative variation produces the best improvement in the defined goals of a website, whether that is user registrations or successful completion of a checkout process, i.e. the conversion rate. Dramatic increases can be seen through testing different copy text, form layouts and even landing page images and background colours. By looking at the results from different tests, it is possible to identify those elements that consistently tend to produce the greatest increase in conversions per market segment.

A full description of web optimisation works can be found in Appendix III: Web

Optimisation.

3.7.5.1 Potential Web Analytic & Optimization Partners:

- Coremetrics
- Google Analytics & Website Optimiser (Testing)
- Omniture (Analytics, testing & partners) (Acquired by Adobe)
- Conversion works (Multivariate Testing) plus Google Analytics
- Amadesa (A/B & Multivariate testing, segmentation, behavioural, recommendations)
- Maxymiser (as above)

3.7.6 Fulfilment / Inventory

3.7.6.1 The Opportunity

The proposition of reaching a targeted audience with a single advertising message through multiple digital channels is very powerful and easily understood by advertisers.

The technology is in place to offer such a proposition but there are a number of problems that must be overcome before it becomes a reality. For example there are digital adverting providers for:

- Digital Cinema ✉ DCM (Digital Cinema Media)
- IPTV ✉ Google TV (Invidi), Opera (AdMarvel),
- Web ✉ Google / Doubleclick, Atlas, Adtech, Criteo
- Mobile ✉ Admob (Google), Quattro (Apple), Opera (AdMarvel)
- E-Reader ✉ Apple, Amazon, Sony, Barnes & Noble
- Games ✉ Microsoft (Xbox), Sony (PSP), Nintendo (Wii, DS)
- DOOH ✉ Clear Channel, CBS
- Print ✉ NI, Trinity Mirror, DMGT, GMT, Lebedev, Telegraph

Being able to offer an advertiser a single place to buy multi-channel advertising has its very clear benefits.

Being able to offer publishers and broadcasters the ability to sell their advertising as a single package and as a subscription guarantees a steady revenue flow from their advertising inventory.

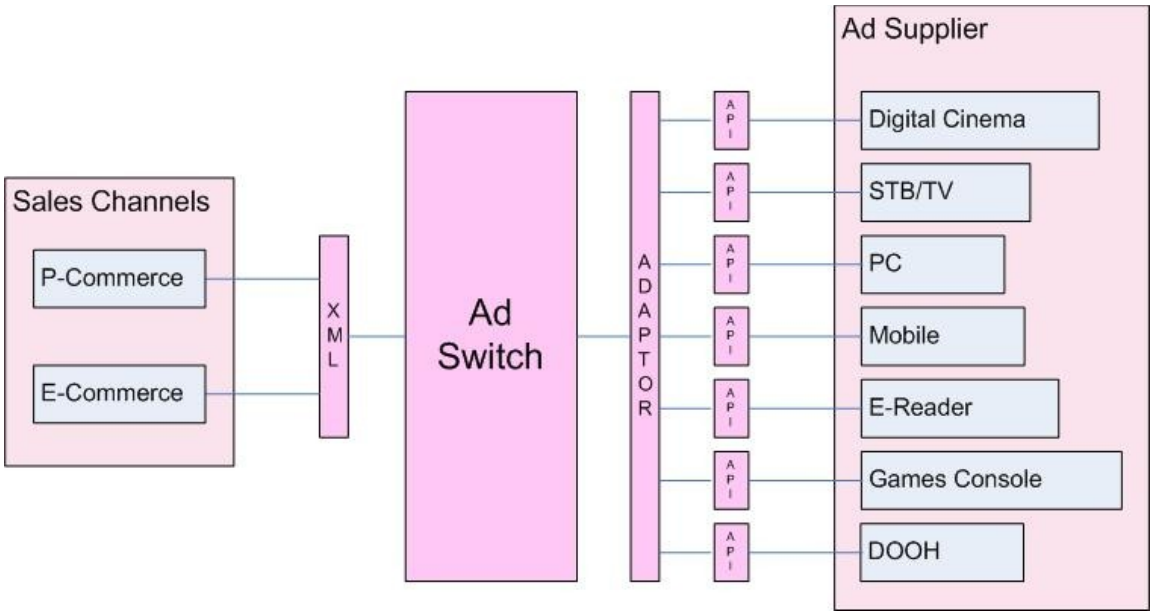


Figure 6: Ad Aggregator (Switch)

3.7.6.2 The Problem

At present, there is no single platform that monitors and allocates advertising inventory on multiple channels in real time. This is important as if we want to sell advertising space to advertisers then we must know what is available at any particular time. In addition, when advertising inventory has been sold then it must be with drawn from the available stock.

This problem is very similar to a ticket aggregator as shown in Figure 7 below. Multiple online ticketing outlets want access to all types of tickets. The advantage to the ticket supplier is that it increases the sales channels and hence increases the chance of selling their seats.

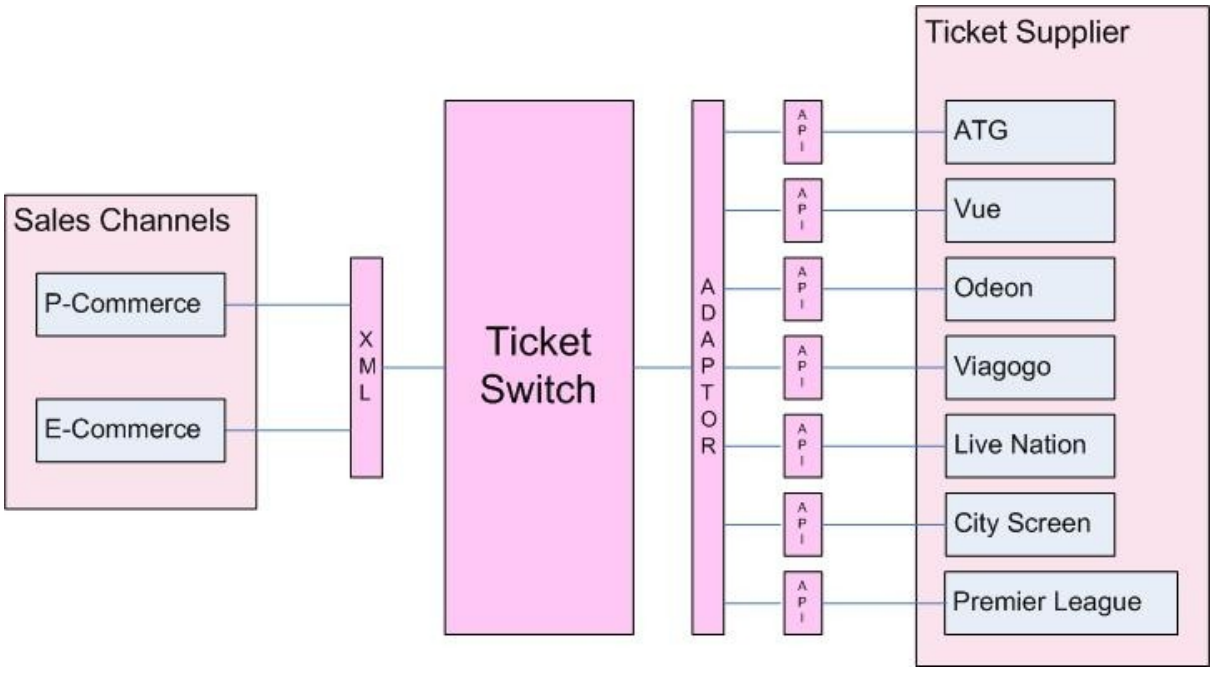


Figure 7: Ticket Aggregator (Switch)

It is especially effective in shifting unsold seats closer to the performance date. The obvious advantage to the ticket distributor as they can earn a commission or booking fee for each extra ticket sold.

3.7.6.3 The Solution

TLC's real-time, digital advertising inventory module monitors available inventory on all platforms and removes inventory from the system once sold. Potentially, is very similar to how online ticketing is sold today as outline shown in Figure 7 above. Tickets from various sources, i.e. theatres, cinemas, sports and other events are aggregated on a single platform and then sold through multiple online outlets via E & P-Commerce channels.

In fact, our solution based on P-Commerce could be used to sell tickets and memberships for entertainment groups.

3.7.7 Mobile VoIP

There are several methodologies by which a mobile handset can be integrated into a VoIP network. One implementation turns the mobile device into a standard SIP client, which then uses a data network to send and receive SIP messaging, and to send and receive RTP for the voice path. This methodology of turning a mobile handset into a standard SIP client requires that the mobile handset support, at minimum, high speed IP communications. In this application, standard VoIP protocols (typically SIP) are used over any broadband IP-capable wireless network connection such as HSDPA, WiFi or WiMAX.

Another implementation of mobile integration uses a softswitch like gateway to bridge SIP and RTP into the mobile network's SS7 infrastructure. In this implementation, the mobile handset continues to operate as it always has (as a GSM or CDMA based device), but now it can be controlled by a SIP application server which can now provide advanced SIP based services to it. Several vendors offer this kind of capability today.

A comparison of VoIP vendors and operators can be found in Appendix XVIII: Mobile VoIP Vendor Comparison.

3.7.7.1 Potential VoIP Partners

- Fring
- Gizmo5 (acquired by Google)
- Jajah (acquired by Telefonica / O2)
- Sipdroid (Android only)
- Truphone
- Vopium
- Skype

3.7.8 Reporting

3.7.8.1 Introduction

Most business decisions are based on server based reporting. They can be used to prepare and deliver a variety of interactive and printed reports. They are usually administered via a web interface. Usually, the reporting service features a web services interface to support the development of custom reporting applications.

A full description of how Microsoft reporting works can be found inAppendix I: Microsoft SQL Server for Reporting.

3.7.8.2 Potential Reporting Partners

- Microsoft SQL Server Reporting Services
- Crystal Reports

Source	Partner	Desired Parameters
Search	Adwords	Impressions Clicks Acquisition Costs
Search	Google (natural)	
E-mail	Pure360	
Banner Ad	DoubleClick	
Mobile banner Ad	iAD	
	AdMob	
IPTV	Invidi	
	OpenTV	
Social Media	Facebook	
Offline Source	Tomahawk	Calls
Analytics/Optimizer	Coremetrics	Visitors Visits
	Google	

E-Commerce	Shopping Cart	E-Commerce Conversions
P-Commerce	Tomahawk	Visitors Visits Calls
CRM	Epi	P-Commerce Conversions P-Commerce Conversion Costs
Payment	TNSI	Revenue E-Commerce Conversion Costs

Figure 8: Combined Reporting

In Figure 8 above, you can see the desired parameters, tools and sources to feed the Reporting Manager to generate all types of reports.

4. Detailed Solution Requirements

4.1 Web Development

4.1.1 CMS

Requirement Name	Content Management System (CMS)
Version	Solution
TFS	
Requested by	Internal
Release Priority	1
History	
Description	Partner with a CMS provider like Alterian. Required features: • Automated templates • Easily editable content • Scalable feature sets • Web standard upgrades • Workflow management • Delegation • Document management • Content virtualization • Content syndication For a more detailed description see Appendix IV: Web CMS Capabilities
Benefits	No need to create web sites/landing pages from scratch.
Implementation	Purchase, install & configure
Issues	
Dependencies	On feature list & road-map of vendor
Dev. Estimate	Non-technical skills required for set-up
Impact on product related material	Update presentations and training material.
Test estimate	TBD
Current Status	Non-approved

4.1.2 Web Design

Requirement Name	Web Design
Version	Solution
TFS	
Requested by	Internal
Release Priority	
History	Critical part of ant solution involving E-Commerce
Description	Partner with an agency such as Clock or AKQA. Required to create web sites / landing pages that adhere to corporate branding guidelines and the results from web analytics and optimization.
Benefits	Landing page will be optimized for conversions
Implementation	Heavy on design and lighter on development
Issues	
Dependencies	May have to build a relationship with different agencies depending on clients
Dev. Estimate	Depends on brief
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

4.1.3 SEO

Requirement Name	Search Engine Optimization (SEO)
Version	Solution
TFS	
Requested by	Internal
Release Priority	Medium
History	Critical part of ant solution involving E-Commerce
Description	Partner with an agency like SiteLynx or Unique digital
Benefits	Higher click through rate
Implementation	Ongoing and may change according to campaign.
Issues	May have to build a relationship with different agencies depending on clients
Dependencies	Depends on campaign brief
Dev. Estimate	Measured in weeks
Impact on product related material	Update
Test estimate	Measured in days
Current Status	Non-Approved

4.1.4 Smartphone Applications

Requirement Name	Smartphone Applications
Version	Solution
TFS	
Requested by	Internal
Release Priority	Medium
History	Critical part of any future solution involving acquisition
Description	Partner with Apple, Android, Microsoft, Symbian, RIM & HP(Palm) application developers.
Benefits	Higher click through rate
Implementation	Ongoing and may change according to campaign.
Issues	May have to build a relationship with different agencies depending on clients
Dependencies	Depends on campaign brief
Dev. Estimate	Measured in months
Impact on product related material	Update
Test estimate	Measured in weeks
Current Status	Non-Approved

4.2 Channels

4.2.1 P-Commerce

Requirement Name	See detailed P-Commerce requirements
Version	Solution
TFS	
Requested by	Internal
Release Priority	
History	
Description	See Tomahawk V2.2, V3.0 & V3.2
Benefits	When added to E- Commerce channel, P-Commerce will increase the ROI on marketing spend, i.e. acquisition costs.
Implementation	In-house by Tomahawk team.
Issues	
Dependencies	Hitting agreed time-scales
Dev. Estimate	4 months
Impact on product related material	Update material
Test estimate	1 month
Current Status	Approved

4.2.2 E-Commerce

Requirement Name	E-Commerce
Version	Solution
TFS	
Requested by	Internal
Release Priority	Medium
History	
Description	Need to build a shopping cart application or partner with existing E-Commerce platform. The steps are: 1. Select a category 2. Select a publication & date 3. Crete the ad 4. Enhance the ad 5. Buy it 6. Place it
Benefits	Offers customer’s an E-Commerce channel
Implementation	5 * Development member team or partner with existing E-commerce platform
Issues	Need to bring in expertise to build this module
Dependencies	
Dev. Estimate	1 year (at least)
Impact on product related material	Update presentation material
Test estimate	3 months
Current Status	Non-Approved

4.3 Back Office

4.3.1 CRM

Requirement Name	CRM
Version	Solution
TFS	
Requested by	Internal
Release Priority	High
History	TLC has developed its own CRM system – Epi. TLC also use Salesforce.com.
Description	EpiCentre Salesforce.com Features should include: • Call Centre • Customer Portal • Social • Knowledge • Analytics • Email • Chat • Community • Search • Partners • Mobile For a more detailed description see Appendix V: Web CRM Capabilities
Benefits	Integral part of end to end solution
Implementation	Tomahawk already integrated with Epi.
Issues	None
Dependencies	Getting Epi development resources can be difficult for upgrades etc.
Dev. Estimate	Measured in weeks
Impact on product related material	Update presentations and training material.
Test estimate	TBD
Current Status	Non - Approved

4.3.2 E-Payment

Requirement Name	E-Payment
Version	Solution
TFS	
Requested by	Internal
Release Priority	Medium
History	Presently, TLC do not have an E-Payment capability
Description	E-Payments are secure real time payments that transfer funds (using the Internet) between a cardholder and the merchant's financial institutions. E-Payments require secure communication between all components of the E-Payment process. For more detail see Appendix VI: Web E-Payments.
Benefits	Part of our end-to-end solution
Implementation	Partner with TNSI
Issues	Agree a per transaction price with TNSI
Dependencies	None
Dev. Estimate	Measured in months
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

4.3.3 Analytics

Requirement Name	Analytics
Version	Solution
TFS	
Requested by	Internal
Release Priority	Medium
History	All TLC’s big customers have their own Analytics tool kits.
Description	The key features of web analytics are: • Real time marketing • Reporting • Marketing Attribution Engine • Industry Benchmarking • Profiling For a more detailed description see Appendix II: Web Analytics
Benefits	Part of end-to-end solution.
Implementation	Partner with Coremetrics, Omniture or Google
Issues	Deciding the best package
Dependencies	None
Dev. Estimate	Measured in weeks
Impact on product related material	Update material
Test estimate	?
Current Status	Non - Approved

4.3.4 Optimisation

Requirement Name	Optimization
Version	Solution
TFS	
Requested by	Internal
Release Priority	Medium
History	All TLC’s big customers have their own Optimization tool kits.
Description	The key features of web analytics are: • Multivariate testing • Segment Testing & Targeting • Recommend & Re-targeting For a more detailed description see Appendix III: Web Optimisation
Benefits	Integral part of end-to-end solution
Implementation	Partner with Maxymiser, Vester or Google
Issues	Must integrate with other solution modules
Dependencies	None
Dev. Estimate	Measured in weeks
Impact on product related material	Update material
Test estimate	?
Current Status	Non - Approved

4.3.5 Fulfilment / Inventory

Requirement Name	Fulfillment / Inventory
Version	Solution
TFS	
Requested by	Trinity Mirror
Release Priority	High if we provide an ad selling solution
History	The proposition of reaching a targeted audience with a single advertising message through multiple digital channels is very powerful and easily understood by advertisers. The technology is in place to offer such a proposition but there are a number of problems that must be overcome before it becomes a reality. For example there are digital adverting providers for: • Digital Cinema • Digital TV • Web / Mobile • E-Reader • Games • DOOH • Print Being able to offer an advertiser a single place to buy multi-channel advertising has its very clear benefits. Being able to offer publishers and broadcasters the ability to sell their advertising as a single package and as a subscription guarantees a steady revenue flow from their advertising inventory.
Description	At present, there is no single platform that monitors and allocates advertising inventory on multiple channels in real time. This is important as if we want to sell advertising space to advertisers then we must know what is available at any particular time. In addition, when advertising inventory has been sold then it must be with drawn from the available stock. TLC's real-time, digital advertising inventory module monitors available inventory on all platforms and removes inventory from the system once sold.
Benefits	Can allow the real-time selling of advertising inventory on multiple platforms.
Implementation	Lots of known unknowns & unknown unknowns
Issues	Do we have the development skills?
Dependencies	Will require a lot of input from partners
Dev. Estimate	Measured in months to years
Impact on product related material	Update

Test estimate	?
Current Status	Non - Approved

5. Detailed P-Commerce Requirements

5.1 Overview of the Personal Commerce Network (PCN)

5.1.1 Introduction

This document uses Figure 9 as a framework called the Personal Commerce network (PCN) which will be the foundation of the Advertising selling solution. The framework consists of functional blocks in order to identify and place requirements.

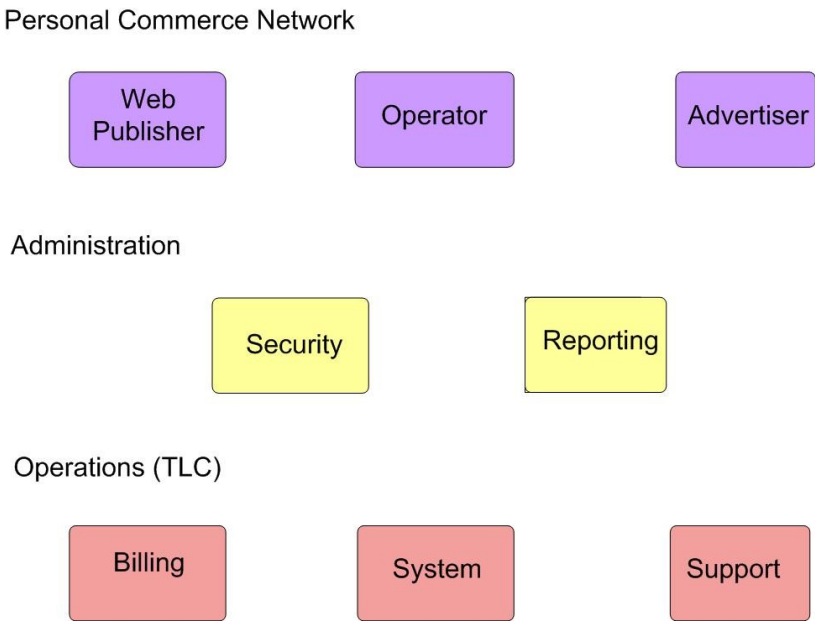


Figure 9: Overview of PCN

Each requirement within the list of requirements on the next page is tagged with the name of a functional block.

5.2 Publisher

5.2.1 Add Sources: Google Natural Search & Facebook

Requirement Name	Add Sources: Natural Search, Social Media & iPhone App
Version	V3.2
TFS	
Requested by	Feedback from Market Analysis
Release Priority	High
History	In V3.0 Tomahawk can track: • Google Adwords • E-mail • Banner Ads
Description	In V3.2 the requirement is to track: • Google Adwords • Google (natural search) • E-mail • Banner Ads • Facebook • iPhone App There is no API for Google natural search but we can use the Universal Interface combined with embedding Tomahawk tracking Code into an advertiser's page. Refer to Figure 10 below. The Facebook Ad APIs cover: • Campaign Create, list & modify campaigns • Ad Group Create, list & modify ad groups • Targeting Retrieve info about targeting criteria • Reporting Monitor performance of campaign • Info Account Modify account details Tomahawk will interact with the Facebook API the same way that Tomahawk interacts with the Adwords API.
Benefits	Can expand Tomahawk's ability to alter online campaigns like it does with Google Adwords.
Implementation	Is there a solution to the natural search problem?
Issues	Depends on above
Dependencies	Depends on API
Dev. Estimate	Measured in months
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

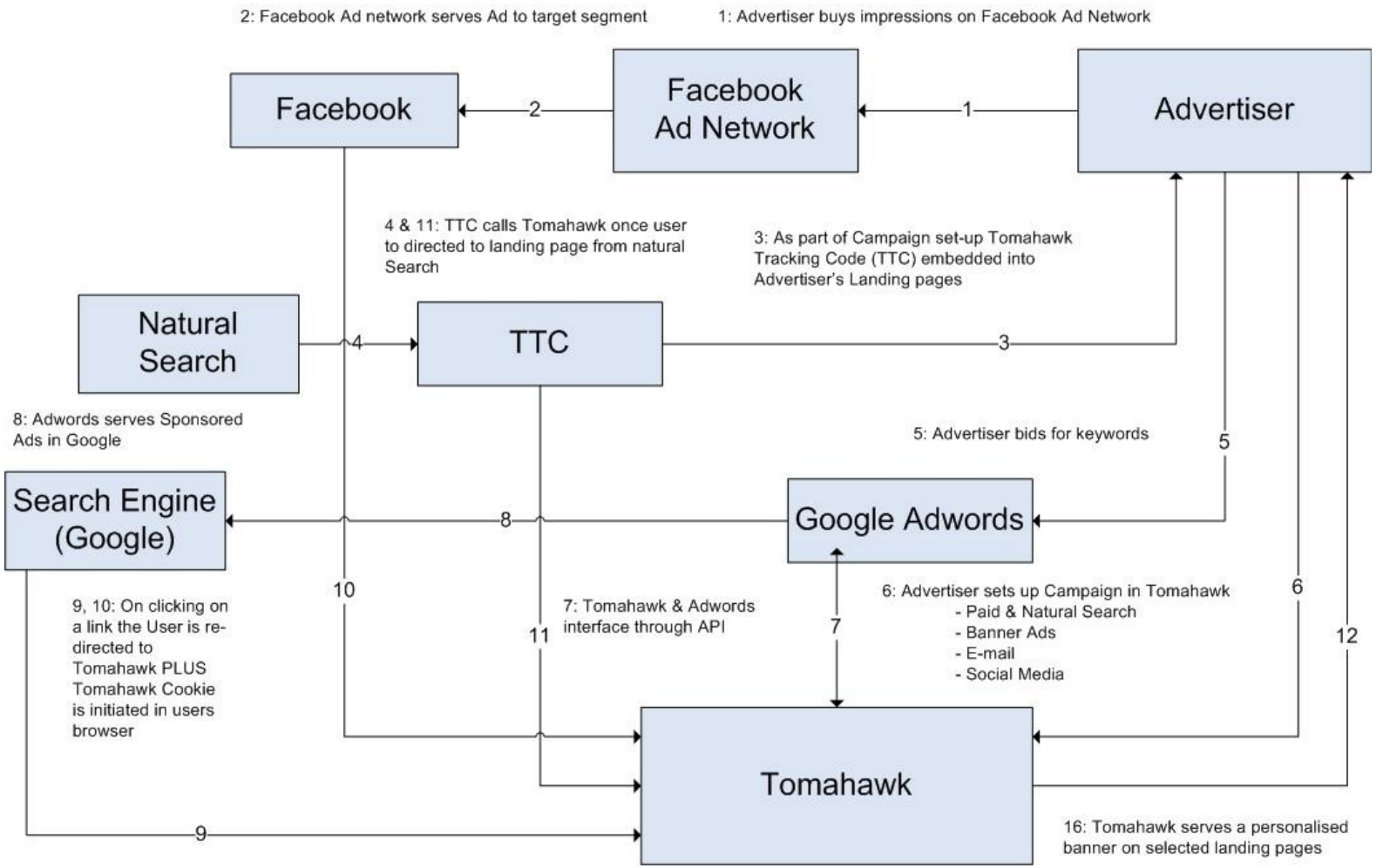


Figure 10: Tomahawk PLUS Natural Search & Facebook

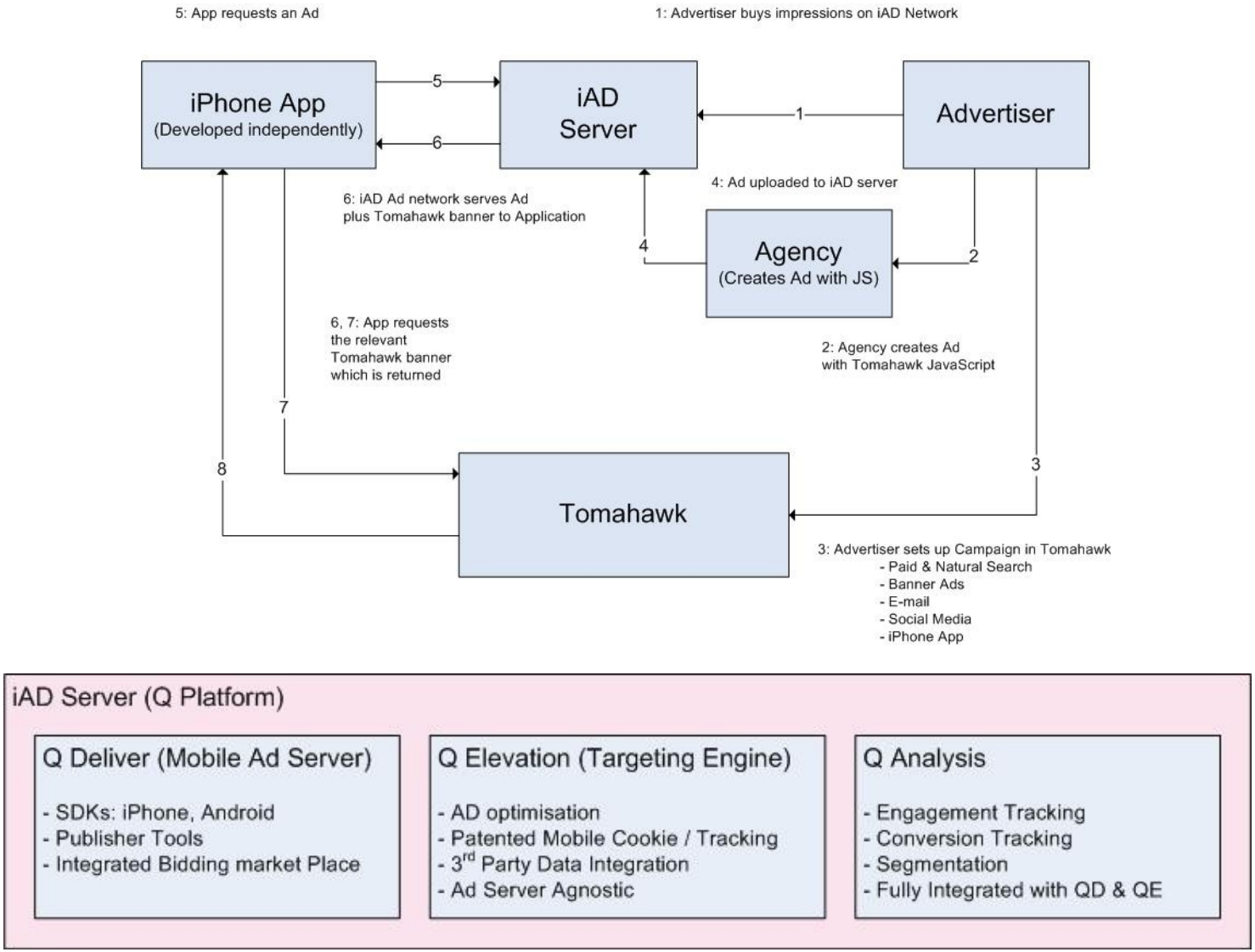


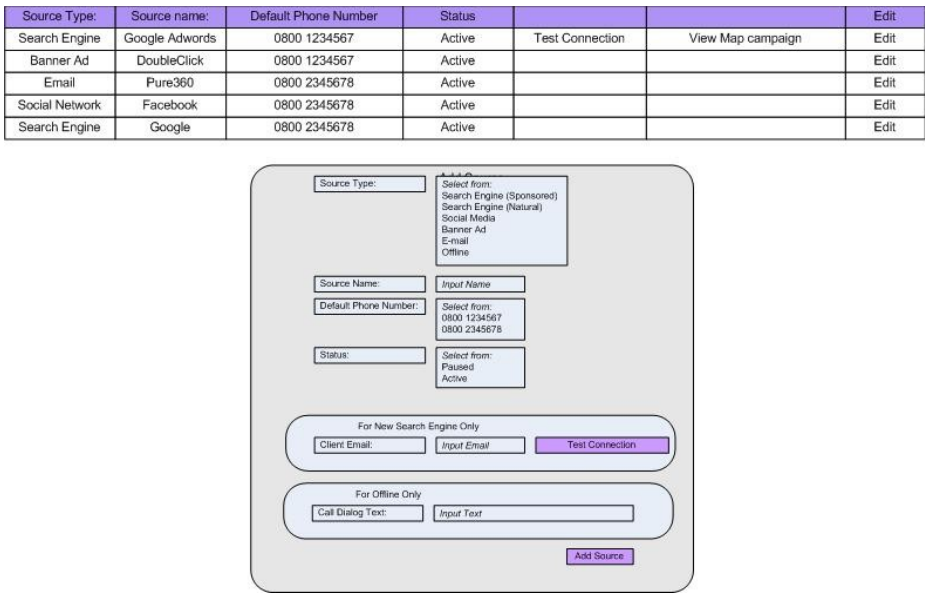
Figure 11: Tomahawk PLUS iAD Server

5.2.2 Auto Bidding

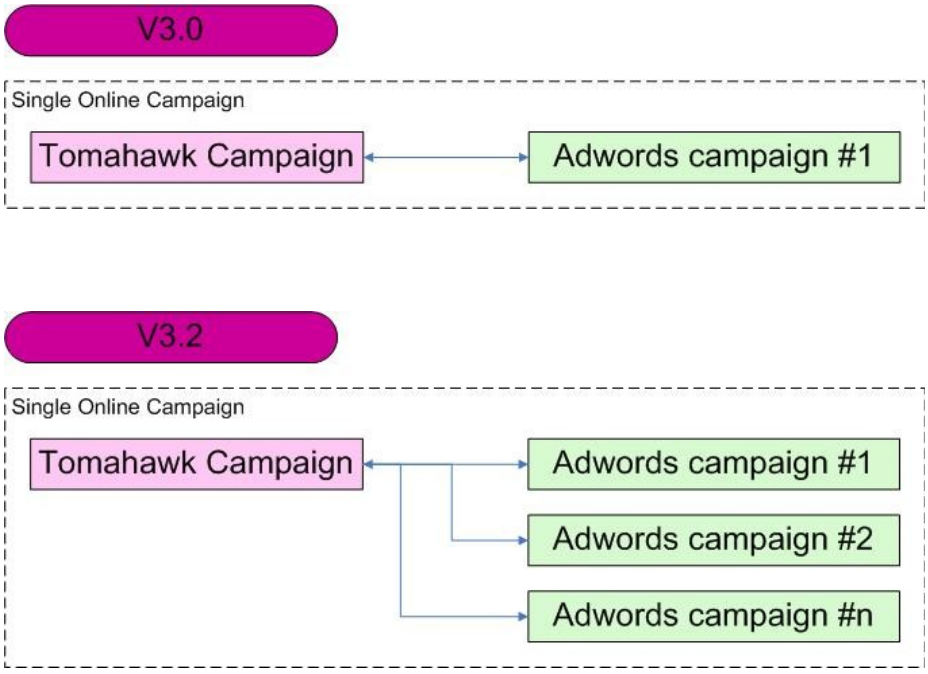
Requirement Name	Auto Bidding
Version	V3.x
TFS	
Requested by	Simon Frank
Release Priority	High
History	To manage demand we can throttle the number of banners served. The limit with this scheme is the number of clicks generated by an Adwords campaign.
Description	By picking up how many calls are being generated we can mange the demand by increasing the number of clicks. This is done by increasing the CPC on particular keywords.
Benefits	Can generate a steady flow of calls, transactions and potentially revenue.
Implementation	We will need to partner with a bid management vendor which will act as the intermediary between Tomahawk and the Sources.
Issues	Need to partner with Auto Bid vendor
Dependencies	Depends on Bid management APIs
Dev. Estimate	Measured in weeks
Impact on product related material	Change manual and sales material.
Test estimate	Measured in days
Current Status	Non - Approved

5.3 Advertiser

5.3.1 Work Flow: Add Sources

Requirement Name	Add Sources
Version	V3.2
TFS	
Requested by	Feedback from Market Analysis/Business Model
Release Priority	1
History	In V3.0 Tomahawk can track: • Google Adwords • E-mail • Banner Ads
Description	In V3.2 the requirement is to track: • Google Adwords • Google (natural search) • E-mail • Banner Ads • Facebook 
Benefits	Can expand Tomahawk's ability to alter online campaigns like it does with Google.
Implementation	Straight forward
Issues	Depends on a solution to natural search
Dependencies	Getting access to Facebook API Can we link Tomahawk to natural search?
Dev. Estimate	Measured in weeks
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

5.3.2 Map Tomahawk campaign to multiple Adwords campaigns

Requirement Name	Map Tomahawk campaign to multiple Adwords campaigns
Version	V3.2
TFS	
Requested by	Insight from SiteLynx project
Release Priority	Medium
History	At present there is a 1 to 1 mapping between a Tomahawk campaign and a Google Adwords campaign
Description	The requirement is for a Tomahawk campaign to map to a number of Adwords campaigns. 
Benefits	Can fit in more easily with how some agencies break up a single campaign into a number of different Google Adwords campaigns.
Implementation	May be complicated.
Issues	May be difficult to capture direct and relevant requirements without direct communication with a n agency.
Dependencies	
Dev. Estimate	Measured in weeks
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

5.3.3 Working with a disabled Adwords campaign

Requirement Name	Working with a disabled Adwords campaign
Version	V3.2
TFS	
Requested by	Insight from SiteLynx project
Release Priority	Medium
History	In order to map a Tomahawk campaign to an Adwords campaign the Adwords campaign must be active. This can lead to a cash burn as when the campaign is active, web users are clicking on sponsored links and using up the campaign budget
Description	It must be able to download keywords from an deactivated Adwords campaign to a Tomahawk campaign
Benefits	No need to contact agency to activate/de-activate Adwords campaign while setting up the campaign
Implementation	Development
Issues	None
Dependencies	None
Dev. Estimate	Measured in days
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

5.3.4 Adding multiple keyword extensions and banner ads to a campaign

Requirement Name	Adding multiple keyword extensions and banners to a campaign
Version	V3.2
TFS	
Requested by	Insight from SiteLynx project
Release Priority	Medium
History	The Times campaign has over 250 keyword extensions and banners. These had to be manually entered into the campaign manager which about took 2 * man days.
Description	Automate the way extension numbers are applied to keywords. Automate the way banners are assigned to a telephone number / extension combination.
Benefits	Easier to set up large campaigns
Implementation	Basic development
Issues	None
Dependencies	None
Dev. Estimate	Measured in days
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

5.3.5 Record original Adword URLs for roll back

Requirement Name	Record original Adword URLs for roll back
Version	V3.x
TFS	
Requested by	Simon Frank
Release Priority	Medium
History	If the Tomahawk server falls over advertisers will waste large amounts of money as clicks that will not go anywhere. (Because of the redirected URL).
Description	When downloading the keyword information we need to: 1. Save a copy of the associated URLs 2. Re-directed URLs replace original URLs in Adwords 3. If Tomahawk goes down then the original URLs replace the re-directed URLs. This means that advertisers will not be paying for redundant clicks.
Benefits	Easier to set up large campaigns
Implementation	Will involve monitoring Tomahawk servers. This may be done using the features of a bid management tool.
Issues	
Dependencies	None
Dev. Estimate	Measured in weeks
Impact on product related material	Change manual and sales material.
Test estimate	Measured in days
Current Status	Non - Approved

5.4 Reporting

5.4.1 Integrate Reporting Services for porting to Analytics tools

Requirement Name	Integrate Reporting Services for porting to Analytics tools
Version	V3.2
TFS	
Requested by	Internal
Release Priority	High
History	Reporting has always been a bit ropey within Tomahawk.
Description	<u>Requirements:</u> • Users to see a list of the types of reports • Run and view these reports within Campaign Manager • Export and print reports within Campaign Manager • View a list of reports which users can schedule o Delivery date and date range o Date interval, campaign, sources & attributes • Users can only see reports for their campaigns • Only Admin can change Master reports • Low maintenance <u>Types of Reports:</u> • Keyword Performance Report • Keyword (Parameters required • Keyword Group Performance Report • Campaign Report • Account Report <u>Report Manager:</u> • Master Reports contains all the types of reports • Each Tomahawk client of Tomahawk will have own designated report folder with Client ID • The client report folder stores all created reports <u>Report Designer:</u> The master reports created within VS BIDS and stored in a report project.
Benefits	
Implementation	
Issues	
Dependencies	
Dev. Estimate	
Impact on product related material	Change manual and sales material.
Test estimate	?
Current Status	Non - Approved

1.2 Under the Bonnet

1.2.1 Database & Data Layer Re-design

Requirement Name	Database & Data Layer Re-Design
Version	V3.2
TFS	
Requested by	Internal
Release Priority	Medium
History	Reporting tables need normalization
Description	
Benefits	
Implementation	
Issues	
Dependencies	
Dev. Estimate	
Impact on product related material	
Test estimate	?
Current Status	Non - Approved

6. IT

6.1 Hosting Requirements (Manual fail-over ✉ Auto fail-over)

Virtual Servers	**TH-WS-1**	**TH-DB-1**	**TH-WS-2**	**TH-DB-2**
Applications	Campaign Manager Reporting Banner Server		Campaign Manager Reporting Banner Server	
Web Server	IIS		IIS	
Database	SQL Standard 2005	SQL Standard 2005 (Log- ship for auto failover)	SQL Standard 2005	SQL Standard 2005 (Log- ship for auto failover)
OS	Windows Server 2003	Windows Server 2003	Windows Server 2003	Windows Server 2003
Physical Servers	**TH-PS-1**		**TH-PS-2**	
Virtual Layer	VMWare ESX3.5i		VMWare ESX3.5i	
Server	HP DL360 G6 (Rack mounted Server)		HP DL360 G6 (Rack mounted Server)	
CPU	Dual Quad Core CPU		Dual Quad Core CPU	
Memory	22GB RAM		22GB RAM	
Hard Drives	4 x 146GB 10K SAS HD's		4 x 146GB 10K SAS HD's	
Communications	Quad NIC		Quad NIC	
Power	Dual PSU		Dual PSU	
Remote Management	Advanced iLo management		Advanced iLo management	
Communications				
Load balancing	N/A (Needed for Auto Failover)		N/A (Needed for Auto Failover)	
Firewall	Cisco ASA 5520 Firewall		Cisco ASA 5520 Firewall	
Switch	Cisco 2960 Catalyst 24 Port Switch		Cisco 2960 Catalyst 24 Port Switch	
Cables	Cat.6 Cables x 8		Cat.6 Cables x 8	
Support				
HP	4H 8x5 3 year care pack (server)			
Cisco	SmartNet Support ASA			
Cisco	SmartNet Support catalyst 1 year			
Hosting				
Provider	FastHosts; rack D, row 2; 6U			
Bandwidth	100 mbps; Diverse A + B to Tier 1, 100GB per month			
Domain name	Tomahawknetworks.co.uk; IPs = 87.252.58.1 ✉ 87.252.58.13; SN = 255.255.255.240; GW = 87.252.58.14			
Certificates	SSL cert from rapidsonline.com; P3P cert			
Back up	TLC			

Figure 12: Tomahawk IT Requirements

6.2 Browser Requirements

6.2.1 Number Banner Server

The following browsers should be fully supported:

- Microsoft Internet Explorer 7.0 upwards (Windows XP, 2000, Vista)
- Firefox 2.0+ (Windows XP / 2000 / Vista, Max OSX 10.3 +)
- Safari 2.0+ (Max OSX 10.3+)
- Opera series 8+ (Windows XP, 2000, Vista)
- Google Chrome V2.0+ (Windows XP, Vista)
- Mozilla Suite (latest version)
- AOL (latest version)

6.2.2 Campaign Management System

The following browsers should be fully supported:

- Microsoft Internet Explorer 6.0 upwards
- Firefox 2.0+

6.3 Accessibility

6.3.1 Number Banner Server

Alternative descriptive content should be provided for the image/s served within the number banner and links should be clearly titled.

6.3.2 Campaign Management System

Effort should be made to ensure that the campaign management system meets the priority I WAI guidelines for accessibility. Details on these guidelines can be found here: http://www.w3.org/TR/WCAG10/full-checklist.html

6.3.3 SSL Certificate

We own a wildcard SSL certificate for *.tomahawknetworks.co.uk purchased from:

http://www.rapidsslonline.com/rapidsslwildcard-certificates.php

6.4 Privacy Policy

Below is the Tomahawk Privacy Policy:

Introduction
We are committed to protecting individual's personal information when we deliver our services on client's websites. The purpose of our services is to improve your user experience.

Content served
Tomahawk technology does not collect any personal information when delivering our services.

Our services employ cookies to identify where individuals have come from in order to display content that is most relevant to them within the site they are visiting. We only collect non-personal information for the purpose of determining what content is most suitable to be delivered to a user.
A cookie is a small amount of data, which often includes a unique identifier that is sent to your computer's browser when you visit a website. Cookies allow us to identify the particular content that you are looking for and display relevant content that is designed to assist you in this process. We only display content that is relevant to the site and do not display any content that promote products or services on other websites.

For more information on cookies and how to control their use please visit About Cookies.

Opt-out
If you wish to opt-out from our cookies so that no unique content is displayed to you on that computer then use one of the following procedures below:

If you're using Internet *Explorer 7.0*:
1. Choose Tools, then
2. Internet Options
3. Click the Privacy tab
4. Click on Custom Level
5. Click on the 'Advanced' button
6. Check the 'override automatic cookie handing' box and select Accept, Block or Prompt for action as appropriate.

If you're using *Firefox 2.0 or 3.0*:
1. Choose Tools, then
2. Options
3. Click the Privacy icon

If you're using *Firefox 1.0 or 1.5*:
1. Choose Tools, then
2. Options
3. Click the Privacy icon
4. Click the Cookies tab

If you're using *Opera 8.0 or 9.0*:
1. Choose Tools, then
2. Preferences
3. Advanced
4. Cookies

If you're using *Opera 7.0*:
1. Choose File, then
2. Preferences
3. Privacy

If you're using *Chrome 2.0*:
1. Choose Tools, then
2. Select Options
3. Click the Under the Hood tab and find the 'Privacy' section

If you're using *Netscape 6.0*:
1. Choose Edit, then
2. Preferences
3. Click on Advanced
4. Click on Cookies

If you're using Internet *Explorer 5.0 or 5.5*:
1. Choose Tools, then
2. Internet Options
3. Click the Security tab
4. Click on Custom Level
5. Scroll down to the sixth option to see how cookies are handled by IE5 and change to Accept, Disable, or Prompt for action as appropriate.

If you're using *Internet Explorer 4.0*:
1. Choose View, then
2. Internet Options
3. Click the Advanced tab
4. Scroll down to the yellow exclamation icon under Security and choose one of the three options to regulate your use of cookies.

If you're using *Internet Explorer 3.0*:
1. Choose View, then
2. Options
3. Click on Advanced
4. Click on the button that says Warn before Accepting Cookies.

If you're using *Netscape Communicator 4.0*:
1. Choose Edit, then
2. Preferences
3. Click on Advanced
4. Set your options in the box that says Cookies.

Changes to our Privacy Policy
We reserve the right to change, modify, add or remove portions of this policy at any time and without notice.

Contacting us about this Privacy Policy
To address any questions, comments, or concerns related to our privacy policy, please contact us here.
Last updated: Feb 9th, 2010

Contact form http://tomahawk.listening.co.uk/contact.aspx to be sent to Tomahawk admin email address:

Title:
First name:
Last name:
Email:
Enter you questions or comments here:

7. Release Schedule

See Attached Project Plan (The matrix)

Notes:
All bugs will be tracked by using Microsoft Tool

..\Matrix\V32 Tomahawk Matrix.xlsx

8. Appendix I: Microsoft SQL Server for Reporting

8.1.1 SSRS

SSRS competes with Crystal Reports and other business intelligence tools, and is included in Express, Workgroup, Standard, and Enterprise editions of Microsoft SQL Server. The latest version was released as part of SQL Server 2008.

In SSRS, reports are defined in Report Definition Language (RDL), an XML mark-up language. Reports can be designed using:

- Microsoft Visual Studio with BIDS or
- Report Builder, a simplified tool that does not offer all the functionality of Visual Studio

Reports defined by RDL can be generated in a variety of formats including Excel, PDF, CSV, XML, TIFF (and other image formats), and HTML Web Archive. SQL Server 2008 SSRS can also prepare reports in Microsoft Word (DOC) format.

8.1.2 Report Manager

Users can interact with the Report Server web service directly, or instead use Report Manager, a web-based application that interfaces with the Report Server web service. With Report Manager, users can view, subscribe to, and manage reports as well as manage and maintain data sources and security settings. Reports can be delivered via e-mail or placed on a file system. Security is role-based and can be assigned on an individual item, such as a report or data source, a folder of items, or site wide. Security roles and rights are inherited and can be overloaded.

In addition to using the standalone Report Server that comes with SQL Server, RDL reports can also be viewed using the ASP.NET ReportViewer web control or the ReportViewer Windows Forms control. This allows reports to be embedded directly into web pages or .NET Windows applications.

SQL 2005 reporting services also support ad hoc reports: the designer develops a report schema and deploys it on the reporting server, where the user can choose relevant fields/data and generate reports. Users can then download the reports locally.

9. Appendix II: Web Analytics

9.1.1 Web server log file analysis

Two units of measure were introduced in the mid 1990s to gauge more accurately the amount of human activity on web servers. These were page views and visits (or sessions). A page view was defined as a request made to the web server for a page, as opposed to a graphic, while a visit was defined as a sequence of requests from a uniquely identified client.

9.1.2 Cookies & Caching

The emergence of search engine spiders and robots in the late 1990s, along with web proxies and dynamically assigned IP addresses for large companies and ISPs, made it more difficult to identify unique human visitors to a website. Log analyzers responded by tracking visits by cookies, and by ignoring requests from known spiders.

The extensive use of web caches also presented a problem for log file analysis. If a person revisits a page, the second request will often be retrieved from the browser's cache, and so no request will be received by the web server. This means that the person's path through the site is lost. Caching can be defeated by configuring the web server, but this can result in degraded performance for the visitor to the website.

9.1.3 Page Tagging (or Web Bugs)

Concerns about the accuracy of log file analysis in the presence of caching, and the desire to be able to perform web analytics as an outsourced service, led to the second data collection method, page tagging or 'Web bugs'.

In the mid 1990s, Web counters were commonly seen — these were images included in a web page that showed the number of times the image had been requested, which was an estimate of the number of visits to that page. In the late 1990s this concept evolved to include a small invisible image instead of a visible one, and, by using JavaScript, to pass along with the image request certain information about the page and the visitor. This information can then be processed remotely by a web analytics company, and extensive statistics generated.

The web analytics service also manages the process of assigning a cookie to the user, which can uniquely identify them during their visit and in subsequent visits.

Collecting web site data using a third-party data collection server (or even an in-house data collection server) requires an additional DNS look-up by the user's computer to determine the IP address of the collection server.

9.1.4 Ajax

With the increasing popularity of Ajax-based solutions, an alternative to the use of an invisible image is to implement a call back to the server from the rendered page. In this case, when the page is rendered on the web browser, a piece of Ajax code would call back to the server and pass information about the client that can then be aggregated by a web analytics company.

9.1.5 Analytics

Feature	Description
Real time marketing	The ability to anticipate customer behavior, automate the management of marketing campaigns, and syndicate personalized content to continually enhance your web site performance and optimize your marketing mix.
Reporting	Pre-built best practice reports tailored to your industry Leverage advanced segmentation to target the right audiences and maximize message relevancy Enhance web site performance by tracking key performance indicators (KPIs) Develop custom KPIs to track performance based on the unique requirements of a business
Marketing Attribution Engine	Get a comprehensive view of the impact your marketing programs make across all clicks and all sessions. Understand conversion cycles and visitor touch points to optimize your marketing mix View several attribution windows at once to identify the right programs for visitor acquisition, conversion, and retention Select from many attributable KPIs to zero
Industry Benchmarking	Measure site performance against peers and competitors to discover where to optimize for highest returns Leverage anonymous and aggregated competitive data from hundreds of clients to achieve accurate and reliable comparisons Create insightful dashboards and focus on the KPIs that are important to you Benchmark against your retail, sub-vertical, and your site's historical performance
Profiling	Build rich visitor profile in data warehouse Record every touch point of every visitor with your brand Develop sophisticated visitor segments and export to marketing applications for highly targeted messaging Optimize marketing spend by performing sophisticated marketing attribution analysis

Figure 13: Key features of an Analytics tool

9.1.6 A Functional view of Analytics

Google Analytics works by the inclusion of a block of JavaScript code on pages in your website. When visitors to your website view a page, this JavaScript code references a JavaScript file which then executes the tracking operation for Analytics. The tracking operation retrieves data about the page request through various means and sends this information to the Analytics server via a list of parameters attached to a single-pixel image request in the form of a GIF.

9.1.6.1 How Does Google Analytics Collect Data?

The data that Google Analytics tools uses to provide all the information in your reports comes from these sources:

- The HTTP request of the visitor
  The HTTP request for any web page contains details about the browser and the computer making the request, such as the hostname, the browser type, referrer, and language.

- Browser/system information
  The DOM of most browsers provides access to more detailed browser and system information, such as Java and Flash support and screen resolution. Analytics uses this information in constructing reports like the *Map Overlay*, *Browser*, and *Referring Sites* reports.

- First-party cookies
  Analytics also sets and reads first-party cookies on your visitors' browsers in order to obtain visitor session and any ad campaign information from the page request.

When all this information is collected, it is sent to the Analytics servers in the form of a long list of parameters attached to a single-pixel GIF image request.

The data contained in the GIF request is the data sent to the Google Analytics servers, which then gets processed and ends up in your reports. Here is an example of only a portion of a GIF request:

9.1.6.2 How the Tracking Code Works

Google Analytics Tracking Code (GATC) retrieves web page data as follows:

1. A browser requests a web page that contains the tracking code

2. The GATC creates and initializes a tracking object associated with web property ID in the code

3. Any customized tracking methods are executed

4. The tracking code is initialized and manages the following information:

   - Domain settings for the page

   - Cookie information (including retrieving campaign tracking if it exists)

   - Browser characteristics and page/referral information from the HTTP request

5. The tracking code requests a single-pixel image file from the Analytics server, __utm.gif, and appends to the image request a long list of parameters

containing the tracking information collected from cookies and the HTTP request.

6. This GIF request string is collected from the logs, and the parameters are used to populate the databases which provide the reports for the Analytics report user.

10. Appendix III: Web Optimisation

The process of optimizing conversion rates throughout a website' development road map using A/B and Multivariate testing on all content changes. By measuring live visitor responses to large numbers of content variations, conversions are increased by ensuring visitors experience the best performing content.

Feature	Description
Multivariate testing	Multivariate Testing solutions professionalize website marketing decision-making, binding user experience development to measurable conversion uplift. Segmentation discovers visitor and customer persona's then enables specific content to be delivered to specific visitor groups that we discover. Website Testing replaces subjectivity and guesswork with an iterative method, capable of qualifying which changes should be made based on feedback from all your online traffic. This level of intelligence provides a strategic decision making process that transforms the way you evolve your website.
Segment Testing and Targeting	Having deployed a Website testing framework in your marketing operation Segmentation Testing solutions ask the question– "I have found the best content for the full cross-section of visitors so can I increase conversion by targeting segments and persona's with specific content?" In the course of running a website testing program software mines visitor and customer persona data and identifies clusters where additional conversion revenue is predicted. The next step is to analyze the stability of these segments and enable them to be implemented in our powerful rule engine. Real-time reports track the uplift in conversion rate for each rule and weightings controls allow you to micro test variants in-segments.
Recommend & Re-target	Vanilla websites serve the same"most popular" content or subjective selections to all visitors. This effectively assumes that all website visitors want the same -an assumption that restricts customer engagement and limits your brand to price-lead competition and margin pressure.

Figure 14: Key features of a Web Optimization tool

11. Appendix IV: Web CMS Capabilities

A WCMS is a software system used to manage and control a dynamic collection of Web material (HTML documents, images and other forms of media). A CMS facilitates document control, auditing, editing, and timeline management. A WCMS typically has:

Feature	Description
Automated templates	Create standard output templates (usually HTML and XML) that can be automatically applied to new and existing content, allowing the appearance of all content to be changed from one central place.
Easily editable content	Once content is separated from the visual presentation of a site, it usually becomes much easier and quicker to edit and manipulate. Most WCMS software includes WYSIWYG editing tools allowing non-technical individuals to create and edit content.
Scalable feature sets	Most WCMS software includes plug-ins or modules that can be easily installed to extend an existing site's functionality.
Web standards upgrades	Active WCMS software usually receives regular updates that include new feature sets and keep the system up to current web standards.
Workflow management	Workflow is the process of creating cycles of sequential and parallel tasks that must be accomplished in the CMS. For example, a content creator can submit a story, but it is not published until the copy editor cleans it up and the editor-in-chief approves it.
Delegation	Some CMS software allows for various user groups to have limited privileges over specific content on the website, spreading out the responsibility of content management
Document management	CMS software may provide a means of managing the life cycle of a document from initial creation time, through revisions, publication, archive, and document destruction.
Content virtualization	CMS software may provide a means of allowing each user to work within a virtual copy of the entire Web site, document set, and/or code base. This enables changes to multiple interdependent resources to be viewed and/or executed in-context prior to submission.
Content syndication	CMS software often assists in content distribution by generating RSS and Atom data feeds to other systems. They may also e-mail users when updates are available as part of the workflow process.

Figure 15: Key features of a Web CMS

12. Appendix V: Web CRM Capabilities

Customer relationship management is a broadly recognized, widely-implemented strategy for managing and nurturing a company's interactions with customers and sales prospects. It involves using technology to organize, automate, and synchronize business processes—principally sales related activities, but also those for marketing, customer service, and technical support. The overall goals are to find, attract, and win new customers, nurture and retain those the company already has, entice former customers back into the fold, and reduce the costs of marketing and customer service.

Feature	Description
Call Centre	Create and track cases coming in from every channel, automatically route and escalate what's important, and integrate with your telephony or back office applications • Agent Console (Single Customer View) • Cross-channel service • CTI (integrate with Alcatel) • Workflow & escalation • Case collaboration
Customer Portal	Customers can get service on their own, 24 hours a day. • Intuitive case management • Portal customization • Knowledge base • Help & training • Customer analytics
Social	Connect your service application with popular Web communities like Twitter and Facebook • Twitter • Facebook • Knowledge base • Customer feedback
Knowledge	• Relevance dimensions • Cross-channel knowledge • Approvals & security • Rick knowledge articles • Knowledge metrics
Analytics / Reporting	Service analytics give you complete insight into your customers and total control over your business. Dashboards provide the high-level visibility you need at a glance, while real-time reports help you drill in for the details • Out of the box analytics • Reporting wizard • Customizable dashboards • Knowledge metrics
E-mail	• E-mail case capture • Custom Email templates • Email integration

Feature	Description
Chat	• Chat integration • Click to chat • Proactive chat
Community / forums	• Answers from the crowd • Ideas • Analytics • Community management
Search	• Google Search
Partners	• Third party case management • Partner service collaboration • Partner knowledge base
Mobile	• Anywhere case management • Mobile service analytics • Field service management • Support for popular devices

Figure 16: Key features of a Web CRM

13. Appendix VI: Web E-Payments

13.1.1 Introduction

E-Payments are secure real time payments that transfer funds (using the Internet) between a cardholder and the merchant's financial institutions. E-Payments require secure communication between all components of the E-Payment process.

E-Payments are represented in the following diagram:

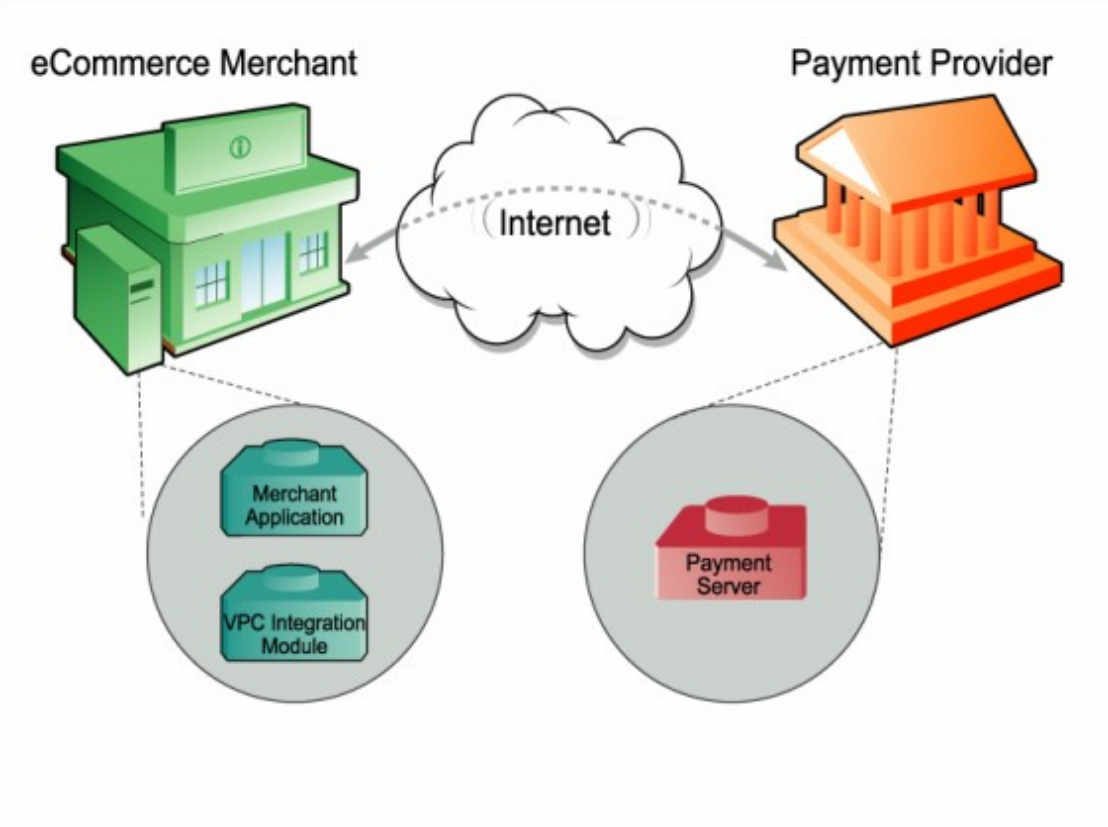


Figure 17: E-Payments

13.1.1.1 The Components of an E-Payment Solution

An end-to-end E-Payment solution is made up of the following components:

- **The Merchant application** is a business application/website on the merchant's system that uses Virtual Payment Client to process payments.
- **The Integration module** is some programming logic implemented by the merchant or their developer that provides a bridge between the merchant application and Virtual Payment Client.
- **Virtual Payment Client** provides secure communication between the merchant application and the Payment Server. Virtual Payment Client can be integrated with a number of systems including merchant applications, Interactive Voice Response (IVR) systems, and integrated ERPs
- **Payment Server** processes merchant Transaction Requests.
- **The Payment Provider** (Transaction Network Services) enables the merchant to accept payments online.

13.1.1.2 How E-Payments Transfer Funds

E-Payments transfer funds using the following steps:

- The cardholder purchases goods/services from the merchant (for example, in person, using the Internet, or over the phone).
- The merchant application sends a Virtual Payment Client Transaction Request (via the Payment Server) to the merchant's Payment Provider.
- The merchant's Payment Provider directs the request to the cardholder and merchant’s banks.
- The cardholder's bank debits the cardholder's account and transfers the funds to the merchant's account at the merchant's bank.

13.1.2 About E-Payment Information Flows

This section describes how information is transferred between the merchant application and the Payment Server.

13.1.2.1 The Merchant Application

To process a payment, the merchant application must send the required information to the Payment Server. The merchant application must create a message in a specified format to send this information using the Virtual Payment Client, which provides a remote interface (API) to the Payment Server using two messages:

- **Transaction Request** is sent to the Virtual Payment Client in the Payment Server to provide transaction information.
- **Transaction Response** is returned from the Payment Server using the Virtual Payment Client to indicate the outcome of the transaction (that is, successful or otherwise).
- A **Transaction** is the combination of a Transaction Request and a Transaction Response. For each customer order, merchants may issue several transactions.

13.1.2.2 The Virtual Payment Client

- Receives the Transaction Request from the merchant application; and
- Sends the information to the Payment Server
- The Virtual Payment Client receives the result from the Payment Server, creates a response in the appropriate format and forwards it to the Merchant Application.

13.1.2.3 Payment Models

- Virtual Payment Client supports the most commonly used payment models in the e-Payments process. These are include the Authorisation/Completion and Purchase models.
- Payment Integration models are described in Preparing for Integration (see "Preparing for Integration" on page 21).

13.1.2.4 Purchase Model

- Purchase is the most common type of payment model used by merchants to accept payments. A single transaction is used to authorise the payment and initiate the debiting of funds from a cardholder's credit card account through the Merchant bank’s settlement processes.
- This is typically used when the goods will be delivered immediately following a successful transaction.

13.1.3 Authorisation/Completion Model

The authorisation/completion payment type is a two step process. The merchant uses an Authorisation transaction to reserve the funds followed by a completion transaction to trigger settlement of the funds to occur by debiting the finds from the cardholder's account and crediting the merchant's account.

13.1.3.1 Authorisation in the Auth/Completion Model

The Authorisation (Auth) transaction verifies that the card details are correct and also reserve the funds.

The authorisation is used to ensure that the cardholder has sufficient funds available against their line of credit. The full amount of the order is sent to the card Issuing Bank to verify the details against the cardholder's card account. The authorisation does not debit funds from the cardholders account, but reserves the total amount, ready for the completion transaction to initiate settlement (debit the card and transfer the funds to your account).

The cardholder's credit limit is reduced by the authorised amount. If they make another transaction, this current authorisation transaction is taken into account and comes off the cardholder's available funds as though the transaction had already taken place. This authorisation reserves the funds for a predetermined period of time, (such as 5-8 days), as determined by the card scheme and the cardholder's card issuing rules.

The API does not have a method to void an Authorisation transaction so authorisations remain valid until they expire. Authorisation transactions do not appear in the cardholder's account records, until the transaction is settled following a completion transaction.

The Authorisation transaction uses the same API as the standard payment transaction used in the Purchase model where a Completion transaction is not required. The only difference is how the merchant profile is configured with the Payment Provider.

13.1.3.2 Completion in the Auth/Completion Model

The completion transaction refers back to the initial authorisation transaction, initiates settlement to transfers the funds from a cardholder's card into the merchant's account.

The merchant can only perform a completion transaction for the entire amount of the original Authorisation transaction and the amount cannot exceed the original authorised amount.

The completion transactions will be successful, provided:

- The total amount of the completion does not exceed the original Authorisation amount, and
- The card issuing institution has not expired the original Authorisation transaction.

13.1.4 PayPal

13.1.4.1 What is it?

PayPal is a secure online payment method, which allows you to pay or get paid quickly and easily without sharing any of your financial information. We remember and safeguard your bank, credit or debit card details, so you don’t have to.

14. Appendix VII: Payment Card Industry Data Security Standard (PCI DSS)

The Payment Card Industry Data Security Standard (PCI DSS) is a worldwide information security standard defined by the Payment Card Industry Security Standards Council. The standard was created to help organizations that process card payments prevent credit card fraud through increased controls around data and its exposure to compromise.

Organizations handling large volumes of transactions must have their compliance assessed by an independent assessor known as a Qualified Security Assessor (QSA), while companies handling smaller volumes have the option of self-certification via a Self-Assessment Questionnaire (SAQ).

The current version of the standard specifies 12 requirements for compliance, organized into six logically related groups, which are called "control objectives."

Control Objectives	PCI DSS Requirements
Build and Maintain a Secure Network	Install and maintain a firewall configuration to protect cardholder data
	Do not use vendor-supplied defaults for system passwords and other security parameters.
Protect Cardholder Data	Protect stored cardholder data
	Encrypt transmission of cardholder data across open, public networks
Maintain a Vulnerability Management Program	Use and regularly update anti-virus software on all systems commonly affected by malware.
	Develop and maintain secure systems and applications
Implement Strong Access Control Measures	Restrict access to cardholder data by business need-to-know
	Assign a unique ID to each person with computer access
	Restrict physical access to cardholder data
Regularly Monitor & Test Networks	Track and monitor all access to network resources and cardholder data
	Regularly test security systems and processes
Maintain an Information Security Policy	Maintain a policy that addresses information security

Figure 18: PCI Control Objects

PCI DSS originally began as five different programs:

- Visa Card Information Security Program,
- MasterCard Site Data Protection,
- American Express Data Security Operating Policy,

- Discover Information and Compliance, and the
- JCB Data Security Program.

Each company's intentions were roughly similar: to create an additional level of protection for card issuers by ensuring that merchants meet minimum levels of security when they store, process and transmit cardholder data. The Payment Card Industry Security Standards Council (PCI SSC) was formed, and on 15 December 2004, these companies aligned their individual policies and released the Payment Card Industry Data Security Standard (PCI DSS).

15. Appendix VIII: Potential Solution Partners

Category	Partner
CRM	Salesforce.com
	IBM
	Oracle
	SAP
Social Media	Facebook
	LinkedIN
	KickApps
	Ning
	Bebo
	Friends Reunited
	MySpace
	Twitter
Social TV	NDS
	ADB
	Project Canvas
Social Service	Get Satisfaction
	Radian 6
	Jive
Search Engines	Google
	Bing
E-mail	Pure360
Ads Networks	DoubleClick (Google)
	Atlas (Microsoft)
	AdServe
	AdJug
CMS	Alterian
	Wordpress
Design / SEO Agency	AKQA
	Clock
	Unique Digital
Payment	TNSI
	CallCredit
Web Analytics & Optimization	Coremetrics
	Google Analytics & Optimiser
	Conversion Works
	Amadesa
	Maxymiser
	Verster
Advertisers	ITV Digital
	Sky Digital
	Virgin
	ESPN
	Clear Channel
	The Times
	The Mirror
	DCM
	Racing Post

Category	Partner
Mobile Ad Network	Millennial Media
	AdMob – bought by Google
	JumpTap
	Quattro – bought by Apple
	Yahoo
	Alcatel Lucent (Optism)
	Adfonic
	Advertising.com
	Acision Mobile Advertising Platform
	AdMarvel (Opera)
IPTV Ad Network	Google TV (Invidi)
	Admarvel (Opera)
DOOH	CBS Outdoor
	Clear Channel
	JCDecaux
	Primesight
	Posterscope (Agency)
	Kinetic (Agency)

Figure 19: Potential Solution Partners

16. Appendix XI: iPad Feature List

Feature	Description
Display	
9.7 inch LED backlit glossy widescreen multi-touch display with IPS technology	IPS: In-Plane Switching. Improves wide viewing angle.
1024-by-768 pixel resolution at 132 PPI	PPI: Pixels per inch
Finger print resistant oleophobic coating	Oleophoic: (from the Greek (oleo) "oil") refers to the physical property of a molecule that is repelled from oil.
Support for display of multiple languages and characters simultaneously	
Wireless & Cellular	
Wi-Fi model	
Wi-Fi (802.11 a/b/g/n)	IEEE 802.11 is a set of standards carrying out wireless local area network (WLAN) computer communication in the 2.4, 3.6 and 5 GHz frequency bands. They are created and maintained by the IEEE LAN/MAN Standards Committee (IEEE 802). a/b/g/n refer to different physical layer modulation techniques used.
Bluetooth 2.1 + EDR technology	EDR: Enhanced Data Rate. Bluetooth base rate uses GFSK and supports 2Mbits/s. EDR uses a combination of GFSK & PSK and supports 3Mbits/s.
Wi-Fi & 3G Model	
UMTS/HSDPA (850, 1900, 2100, MHz)	UMTS: Universal Mobile Telecommunications System. HSDPA: High Speed Downlink Packet Access. Allows UMTS networks higher data transfer speeds and capacity. Down link speeds of 1.8, 3.6, 7.2 & 14Mbits/s.
GSM/EDGE	EDGE: Enhanced Data Rates for GSM Evolution. Allows GSM networks to have higher data transfer speeds and capacity. Peak down load rates of ~ 1Mbits/s.
Data Only	3G data plan sold separately.
Wi-Fi (802.11 a/b/g/n)	

Feature	Description
Bluetooth 2.1 + EDR technology	Bluetooth is a proprietary open wireless protocol for exchanging data over short distances (using short length radio waves) from fixed and mobile devices, creating personal area networks (PANs). It was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.
Capacity	
16, 32, & 64 GByte Flash Drive	
Processor	
1 GHz Apple A4 system-on-a-Chip	
Sensors	
Accelerometer	
Ambient Light Sensor	
Audio Playback	
HE-AAC (V1)	High Efficiency Advanced Audio Coding used in radio standards (DAB+).
AAC (16 to 320 Kbps)	Advanced Audio Coding. Default standard for iPhone (& other Apple mobile products) + Sony Play Station plus others. Designed to be the successor to MP3. Part of MPEG-2 & MPEG-4 standards.
Protected AAC (from iTunes store)	AAC plus DRM (Digital Rights Management)
MP3 (16 to 320 Kbps)	MPEG-1 Audio Layer 3. Part of ISO/IEC standard published in 1991.
MP3 VBR	Variable Bit rate
Audible (formats 2,3, and 4)	
Apple lossless	
AIFF	Audio Interchange File Format (AIFF). Old Apple standard.
WAV	Waveform Audio File Format. Microsoft & IBM standard for storing audio bit streams on PCs.
TV & Video	
1024 by 768 pixels with dock connector to VGA adaptor	
576p and 480p with Apple component AV cable	

Feature	Description
576i and 480i with Apple Composite AV cable	
H.264 video up to 720p, 30 frames per second	Standard for video compression. Identical technical content as MPEG-4 AVC.
MPEG-4 video up to 2.5 Mbits/s, 640 by 480 pixels	MPEG-4 is a patented collection of methods defining compression of audio and visual (AV) digital data. It was introduced in late 1998 and designated a standard for a group of audio and video coding formats and related technology agreed upon by the ISO/IEC Moving Picture Experts Group (MPEG) (ISO/IEC JTC1/SC29/WG11) under the formal standard ISO/IEC 14496 - Coding of audio-visual objects. Uses of MPEG-4 include compression of AV data for web (streaming media) and CD distribution, voice (telephone, videophone) and broadcast television applications.
Motion JPEG (M-JPEG) up to 35Mbits/s, 1280 by 720 pixels	Motion JPEG (M-JPEG) is an informal name for a class of video formats where each video frame or interlaced field of a digital video sequence is separately compressed as a JPEG image. Originally developed for multimedia PC applications, where more advanced formats have displaced it, M-JPEG is now used in portable devices with video-capture capability, such as digital cameras.
Mail attachments	
.jpg; .tiff; .gif(images); .doc; .docx; .htm; .html; .pdf; .ppt; .pptx; .txt; .rft; .vcf; xls; xlsx	
Operating system	
OS X	OS X is the default operating system of the iPhone, the iPod Touch, and the upcoming iPad. It is derived from Mac OS X, with which it shares the Darwin foundation, and is therefore a Unix-like operating system by nature. iPhone OS has four abstraction layers: the Core OS layer, the Core Services layer, the Media layer, and the Cocoa Touch layer. The operating system uses less than 500 megabytes of the device's memory.
Browser	
Safari	
Application / Content Partners	

Feature	Description
Books	
Macmillan	
Simon & Schuster	
Hachette	
Harper Collins	
Penguin	
Content	
New York Times	Subscription based
Wall Street Journal	Subscription based
Time Magazine	Subscription based
Generic Apps	
iTunes	
E-mail	Free
Photos	Free
Video	Free
YouTube	
iPod	
iTunes	
App Store	150,000 apps from the App Store.
Maps	
Notes	
Calendar	
Contacts	
Home Screen	
Spotlight Search	
iWork	Keynote, Pages, Numbers

Figure 20: iPad Feature List

17. Appendix X: Smartphone Eco-Systems

Feature	iPhone	Android	Symbian / Nokia	Microsoft	Blackberry / RIM
General					
Market Share (2009) *Gartner*	14.4% (24.9 m)	3.9% (6.8 m)	46.9% (80.9 m)	8.7% (15 m)	19.9% (34.3 m)
Market Share (2012) *Gartner*	13.7% (71.5 m)	14.5% (76 m)	39% (203 m)	12.8% (66.8 m)	12.5% (65.25 m)
Standards	Proprietary	OHA (Open Handset Alliance) www.openhandsetalliance.com	Symbian Foundation www.symbian.org	Proprietary	Proprietary
	Big in US		Big in Europe & Asia		Big in US
3rd party Licensing	OS not licensed to 3rd parties	Apache License 2.0 (Free Software with no Copyleft)	Eclipse Public License (EPL) (Free Software with limited Copyleft)	OS not licensed to 3rd parties.	OS not licensed to 3rd parties.
Flash Support	No. Uses HTML5	Yes	Yes	Yes	Yes
Browser	Safari	WebKit bsed, Chrome (to be announced)	Opera Firefox (Mobile)	Modified version of IE7	Proprietary
E-Reader	iPad	Probably. Sony E-Reader?	Sony Reader Sony / Ericsson	Probably	?
Applications					
App Market (What you like?)	iTunes	Android Market	Ovi Store	Windows Phone Marketplace	App world
Search Engines (Looking for?)	Google	Google	Google	Bing	Google Bing
Location (Where are you?)	Google Maps Tom Tom Navigon FourSquare	Google Maps FourSquare	Google Maps Garmin Mobile App Ovi maps	Google Maps Garmin	Google Maps Garmin Foursquare
Social Media	Facebook	Facebook	Facebook	Facebook	Facebook

Feature	iPhone	Android	Symbian / Nokia	Microsoft	Blackberry / RIM
(Who you know?)	Bebo MySpace LinkedIN	Bebo Myspace Twitter LinkedIN	Bebo MySpace Twitter LinkedIN	Twitter	MySpace Twitter LinkedIN
VoIP (Communicate)	Fring (WiFi only) Truphone Vopium Skype	Fring Gizmo5 SIPdroid Truphone Vopium Skype GIPS	Fring Gizmo5 Truphone Vopium	Fring Gizmo5 Windows Mobile 6 Vopium Skype	Truphone Vopium
DRM	Fairplay	Android DRM (Based on OMA DRM)	Based on OMA DRM	Playready	?
Application Development					
IDE	XCode	Eclipse	Carbide (variant of Eclipse)	Visual Studio	Eclipse or Blackberry JDE.
Language	Objective-C	Java	Java, C++, Python & Adobe Flash.	C # / .NET	Java
Application Developer License	iPhone SDK	Android SDK	S60 SDK Qt SDK	Windows Mobile SDK	Blackberry SDK
Mobile Advertising					
Mobile Advertising Networks	Wireless Quattro bought by Apple. Ads for mobile web iPhone applications (SDK for iPhone) to be released with V4.0 of iPhone OS. 7% market share.	AdMob bought by Google. Ads for mobile web and smart phone applications (SDK for iPhone, Android, Flash & WebOS). Google + AdMob now has 24% market share. Advertising.com (AOL) YOC group Adfonic	Millennial Media for mobile web and native apps. SDK for iPhone, Android, WinMo, WebOS, Brew, Java, PSP. Supports text, image and rich media (JavaScript & XHTML). DeckTrade is their Bidding	Microsoft has 8% market share. Only supports mobile web ads. Part of search & display ad strategy.	Yahoo 11% market share. Only supports mobile web ads. Part of search & display ad strategy.

Feature	iPhone	Android	Symbian / Nokia	Microsoft	Blackberry / RIM
		Acision 24MAS	manager plus SDKs and publishing tools. Mydas is their targeting engine. 18% market share.		
PCN	?	?	?	?	?
Application Management					
User Interface	Cocoa *Patent Protected*	Multi-Touch	S60 (Nokia), UIQ, MOAP (NTT DoCoMo), Qt coming in 2010.	Metro	?
UI management	Accelerometer, Cameras, Photo library, Battery state, GPS	Accelerometer, Cameras, Photo library, Battery state, GPS	Accelerometer, Cameras, Photo library, Battery state, GPS	Accelerometer, Cameras, Photo library, Battery state, GPS	Accelerometer, Cameras, Photo library, Battery state, GPS
Push Notification	Y	Y	Y	Y	Y
Address Book	Y	Y	Y	Y	Y
In App E-mail	Y	Y	Y	Y	Y
Maps	Y	Y	Y	Y	Y
Peer-to-Peer Support	Y		Y	Y	Y
Voice	Y	Y	Y	Y	Y
Media					
Graphics	Quartz; Core Animation; OpenAL	2D, 3D based on OpenGL ES	2D, 3D based on OpenGL ES. Flash	2D, 3D based on OpenGL ES	2D, 3D based on OpenGL ES
Audio	AAC; Apple Lossless; A-law; IMA; Linear PCM; u-law; GSM 6.10; AES3-2003	AAC, MP3, MIDI, OGG Vorbis	AAC, MP3, MIDI, OGG Vorbis	AAC, MP3, MIDI, OGG Vorbis	AAC, MP3, MIDI, OGG Vorbis
Video	H.264; MPEG-4 wrapped up in .mov;	H.264; MPEG-4 wrapped up in .mov; .mp4; .m4v or .spg.	H.264; MPEG-4 wrapped up in	H.264; MPEG-4 wrapped up in	H.264; MPEG-4 wrapped up in

Feature	iPhone	Android	Symbian / Nokia	Microsoft	Blackberry / RIM
	.mp4; .m4v or .spg	WebM	.mov; .mp4; .m4v or .spg	.mov; .mp4; .m4v or .spg	.mov; .mp4; .m4v or .spg
Core Services					
Address Book	Y	Y	Y	Y	Y
Location	Y	Y	Y	Y	Y
Threads	Y	Y	Y	Y	Y
In App Store	Y	Y	Y	Y	Y
SQLite	Y	Y	Y	Y	Y
XML parser	Y	Y	Y	Y	Y
Comm Services	Y	Y	Y	Y	Y
Multitasking	V4.0		Y	Y	Y
Core OS					
Communications	Wi-Fi (802.11 a/b/g/n; BlueTooth 2.1 + EDR; UMTS/HSDPA; GSM/EDGE	Wi-FI (802.11 a/b/g/n; WiMax; BlueTooth 2.1 + EDR; UMTS; GSM/EDGE; IDEN; CDMA; EV-DO	Wi-FI (802.11 a/b/g/n; WiMax; BlueTooth 2.1 + EDR; UMTS; GSM/EDGE; IDEN; CDMA; EV-DO	Wi-FI (802.11 a/b/g/n; WiMax; BlueTooth 2.1 + EDR; UMTS; GSM/EDGE; IDEN; CDMA; EV-DO	Wi-FI (802.11 a/b/g/n; WiMax; BlueTooth 2.1 + EDR; UMTS; GSM/EDGE; IDEN; CDMA; EV-DO
Security	Certificates, public & private keys and trust policies	Certificates, public & private keys and trust policies	Certificates, public & private keys and trust policies	Certificates, public & private keys and trust policies	Certificates, public & private keys and trust policies
System	Threading; networking; file-system access; memory allocation & math computation.	Threading; networking; file-system access; memory allocation & math computation.	Threading; networking; file-system access; memory allocation & math computation.	Threading; networking; file-system access; memory allocation & math computation.	Threading; networking; file-system access; memory allocation & math computation.
Hardware					
Devices	iPhone, IPad, iPod	Sony Ericsson (X10) Google (Nexus One) HTC (Desire)	Nokia E7, C7, C6 Fujitsu Huawei	Motorola LG HTC	Blackberry (Storm)

Feature	iPhone	Android	Symbian / Nokia	Microsoft	Blackberry / RIM
		Samsung Motorola	Samsung Sharp Sony Ericsson		
Operators					
O2	Y	Y	Y	Y	Y
Vodafone	Y	Y	Y	Y	Y
T-Mobile / Orange	Y	Y	Y	Y	Y
3	Planned	Y	Y	Y	?

Figure 21: Smartphone Eco-system

18. Appendix XI: UK TV Provider Comparison

Feature	Virgin Media	Google TV Advertising	Sky (News Corp)	BT / Microsoft	Freeview
Services					
Broadcast Platform	Cable (Own network)	N/A	Satellite (DVB-S) SES Astra 28.2 East Eutelsat's Eurobird 1 28.5	DTT (Freeview) BT Vision	FreeSat (SES Astra 28.2 East) DTT (Freeview) (Multiplex 1,2,A,B,C,D) DTT: Top Up TV
Broadcast Subscribers	4.7 M		9.8 M	0.5 M	10 M
Broadband Platform	Cable (Optical Fibre)	N/A	DSL (LLU) BB: EasyNet	DSL (BT)	DSL (BT) DSL (Talk Talk, LLU)
ISP	Virgin Media		Sky Broadband (EasyNet)	BT Retail	Talk Talk (CW, AOL, Tiscali) BT Retail
Broadband Subscribers	4 M		2.4 M	5 M	Talk Talk ✉ 4.2 M BT ✉ 5 M O2 Orange Vodafone
Hybrid (BC & BB)	Yes	Yes (Smart TV)	Yes	Yes	Yes (Canvas)
Landline Phone	Yes		Yes	Yes	Yes (BT & TT)
Mobile Offering	Virgin Mobile (MVNO)	Android	No	No	Partnership with O2
Middleware					
CDN	FilmFlex		Use P-2-P	In-House	Cisco MediaNet
Online VOD	iPlayer		Sky Player	BT Vision, iPlayer	Fetch TV, BT, iPlayer
VOD	FilmFlex		No	Yes	No
CA/EPG	Nagravision		NDS (EPG / PVR) OpenTV (Middleware)	Microsoft MediaRoom	Nagravision, iPlayer

Feature	Virgin Media	Google TV Advertising	Sky (News Corp)	BT / Microsoft	Freeview
DRM	?		?	Playready	?
Any Time TV	Yes		Sky AnyTime	Yes	Top Up AnyTime
Formats					
HD	Yes		Yes	Yes	Yes
3D	Planned		To Pubs First channel in Q2 2010	Planned	Planned
Digital / 3D Cinema	No	No	No	No	Yes (Arqiva), AAM
Partners & Standards					
Partners	Virgin Media		DirecTV (US)		Canvas (BBC, BT, Talk Talk, Five, ITV, 4, Arqiva) Freeview(Sky), OTT (Sony Internet TV), EchoStar (US), DISH network (US).
Standards	DVB-C DOCSIS		DVB-S	DVB-T, EBU, OIPF, HBBTV, Canvas Digital TV Group	DVB-T, EBU, OIPF, HBBTV, Canvas Digital TV Group
UK Regulator	OFCOM (BC & Tel), ASA (Advertising), IAB (Online Ads) OFT ✉ CC (VOD)	OFCOM (BC & Tel), ASA (Advertising), IAB (Online Ads) OFT ✉ CC (VOD)	OFCOM (BC & Tel), ASA (Advertising), IAB (Online Ads) OFT ✉ CC (VOD)	OFCOM (BC & Tel), ASA (Advertising), IAB (Online Ads) OFT ✉ CC (VOD)	OFCOM (BC & Tel), ASA (Advertising), IAB (Online Ads) OFT ✉ CC (VOD)
Applications					
OTT	Closed	Yes	Closed	Lovefilm Hulu Blinkbox Betfair	Lovefilm Hulu Blinkbox Betfair
Browser	?	Chrome	?	IE	Access, Ant, Obigo, Opera
App Market *(What you like?)*	TiVo	Android Market	Sky Apps	Windows Market Place	Accedo App Store ANT/Galio/FetchTV

Feature	Virgin Media	Google TV Advertising	Sky (News Corp)	BT / Microsoft	Freeview
					Access/NetFront/Sony Blu-Ray Disc Player
Recommendation Engine	?	Jinni Rovi	?	?	?
Movies	Lots		Sky Movies	Lots	Lots
Sport	Sky Sports		Sky Sports ESPN	Sky Sports 1 & 2 FA Premier League, Football League Carling Cup	BBC MoTD, Six Nations ITV, FA cup, Champions league, Formula 1 Five, Europa Cup, Via Top Up TV, Sky Sports 1 & 2 ESPN, Eurosport
Games				OnLive	
Services			SkyBet		Betfair
Search Engines (Looking for?)	Google / Bing	Google	Google / Bing	Bing	Google / Bing
Social Media (Who you know?)	Facebook	Facebook (Google Buzz?)	MySpace	Facebook	Facebook, Bebo, Friends Reunited Twitter,
Other Apps					NHS Direct, Amazon, Scotsman
VoIP (Communicate)	?	Gizmo5 / GIPS	Skype	Skype	Skype
Application Development					

Feature	Virgin Media	Google TV Advertising	Sky (News Corp)	BT / Microsoft	Freeview
IDE	Eclipse?	Eclipse	Eclipse	Visual Studio	Canvas
Language	Java	Java	C	C # / .NET	Canvas
Application Developer License	TiVo HME SDK (Home Media Engine) Bananas UI Toolkit	Android SDK	OpenTV SDK	Media Room SDK	NetGem / Accedo SDK Galio SDK NetFront SDK
Advertising					
Advertising Networks	Ids (owned by Virgin Media)	Google TV Ads (based on Adwords) Invidi (VoD & Linear)	Sky Media (Linear) NDS / Blackarrow (VOD) OpenTV (Apps)	Microsoft Advertising (VoD & linear)	ITV Media (Linear) DCM (Digital Cinema) VOD (?) Accedo (Apps) ANT (Apps) Access (Apps)
PCN	Contact Centre	Contact Centre	Contact Centre	Contact Centre	No
Hardware					
STB	TiVo / Cisco V (ex SA)	Intel (Atom) Logitech	Amstrad (owned by Sky) Technicolor Samsung Pace	Windows CE / Pace	<u>UK:</u> <u>Freeview:</u> Humax HD-FOX T2 Vestel F8300 NetGem (Hybrid) Smartbox 8000 (HbbTV) 3View <u>Top-Up TV</u> Technicolour <u>US:</u> Netflix on Roku Netflix on AppleTV
3D TV	Various	Sony	Various	Various	Sony Bravia Samsung LG Panasonic

Feature	Virgin Media	Google TV Advertising	Sky (News Corp)	BT / Microsoft	Freeview
Blu-Ray Player	Various	Sony	Various	various	Sony/Access Various
Remote Control	Various	Logitech			
Game Consoles	Xbox, PSP, Wii	Xbox, PSP, Wii	Xbox, PSP, Wii. Sky player/Xbox	Xbox, PSP, Wii	Xbox, PSP, Wii iPlayer/PSP

Figure 22: IPTV Service Comparison

19.

20. Appendix XII: TV and related vendors

Feature	Yahoo! Connected TV / Microsoft	Apple TV	Google TV (Smart TV)	Sony Internet TV	Samsung Internet@TV	Panasonic Vieracast
Lovefilm (Amazon)			***Web Applications***	Y	Y	N
YouTube				Y	Y	Y
BBC (iPlayer)				Y	Y	N
Twitter	Y				Y	Y
Skype					Y	Y
Google						
Amazon VoD						Y
NetFlix		Y		Y		Y
Bloomberg						Y
Betfair					Y	
Games					Y	
Sports				Y (FIFA, Eurosport, golflink.com)		
Yahoo!	Y				Y	
Music		Y (iTunes)				
App Market	Accedo	iTunes				
EBay	Y		Android Market			
3D	No	No		Yes	Yes	Yes
Browser	?	Safari	*Technology*	Chrome ?	Chrome ?	
OS		OSX	No	Android	Android	
STB	No	Y	Chrome	N	N	N
Blue_Ray Player	No		Android	Y	Y	Y
Remote	No	iPhone/iPod	Logitech	Y	Y	Y

Feature	Yahoo! Connected TV / Microsoft	Apple TV	Google TV (Smart TV)	Sony Internet TV	Samsung Internet@TV	Panasonic Vieracast
Control						
Games Console	No			PSP		
Tablet	No		Logitech		Yes (Sony Ericson)	
Cameras	No			Yes	Yes	Yes
			Samsung			

Figure 23: IPTV Vendor Comparison

21. Appendix XIII: Telecommunication Service Provider Comparison

Company	Ownership	Mobile	Broadband	Phone	Digital TV	Comment
3	Hutchison Whampoa	Yes (3G only)	Yes	No	No	BB: Openreach
O2	Telefonica	Yes	Yes (Be Unlimited)	No	No	BB: LLU
Vodafone	Public	Yes	Yes	No	No	BB: Openreach
Orange/T-Mobile (TOM)	FT, DT	Yes	Yes (ex Wanadoo)	No	No	BB: Openreach
Virgin Media	Virgin Media Inc.	Yes	Yes	Yes	Yes	Cable (Fibre)
Talk Talk	Public. (ex CW)	No	Yes (ex AOL & Tiscali)	Yes	No	BB: LLU
BT	Public	No	Yes	Yes	BT Vision	BB: xDSL
PlusNet	BT	No	Yes	No	No	BB: LLU
Sky BB	News Corp	No	Yes (EasyNet)	Yes	Yes	BB: Easynet: LLU BB: Openreach

Figure 24: Telecommunications Service Provider Comparison

22. Appendix XIV: Telecommunications and Media Regulatory Bodies

	OFCOM	ASA	IAB	Information Commissioner's Office	Office of Fair Trading	Competition Commission
Description	Independent telecommunications regulator and competition authority for the communication industries in the United Kingdom.	Self-regulatory organization (SRO) of the advertising industry in the UK.	The trade association for digital advertising. SRO	The Office's mission is to "uphold information rights in the public interest, promoting openness by public bodies and data privacy for individuals".	UK's Economic Regulator.	UK's Competition Regulator.
Governing laws	Office of Communications Act 2002 Communications Act 2003	The ASA is a non-statutory organization and so cannot interpret or enforce legislation. However, its code of advertising practice broadly reflects legislation in many instances.	The IAB is a non-statutory organization and so cannot interpret or enforce legislation. However, its code of advertising practice broadly reflects legislation in many instances.	Data Protection Act 1998 Privacy & Electronic Communications (EC Directive) 2003 Freedom of Info Act 2000	Fair Trading Act 1973 Enterprise Act 2002 Consumer Protection from Unfair Trading Regulations (CPR)	Competition Act of 1998 Enterprise Act 2002
Related to Government	Non-ministerial government department	Funded by a levy on the advertising industry.	Links with OFT & ICO.	a non-departmental public body which reports directly to Parliament and is sponsored by the Ministry of Justice	Non-ministerial government department	Under the Department for Business, Innovation & Skills.
Responsibilities	Consultations.	Regulate the content	Ensure marketers		Analyzing markets,	Enforcing remedies

	OFCOM	ASA	IAB	Information Commissioner's Office	Office of Fair Trading	Competition Commission
	Programme complaints. Licensing of the electromagnetic spectrum for TV, radio, mobile and private networks. ATVOD now regulates Video On Demand.	of advertisements, sales promotions and direct marketing in the UK by investigating complaints made about ads, sales promotions or direct marketing, and deciding whether such advertising complies with its advertising standards codes.	can identify the best role for online and the emerging mobile market, helping them engage their customers and build their brands. Acts as an authoritative and objective source for all internet advertising issues whilst promoting industry-wide best practice.		enforcing consumer and competition law, merger control, licensing and supervisory work, and advice through Consumer Direct.	following inquiries which have identified competition problems, i.e. blocking mergers, asset sell-offs and making changes to the way particular markets operate.
History	Broadcasting Standards Commission Independent TV Commission Office of Telecommunications Radio Authority Radio communications Agency	Committee of Advertising Practice				Monopolies and Mergers commission.

Figure 25: Telecommunications and Media Regulatory Bodies

23. Appendix XV: Standard Bodies

Standards Body	Description	Key Standards
Broadcast		
National (UK)		
Project Canvas	Project Canvas is the working title for an attempt to create an open, internet-connected television platform built on common standards, by the United Kingdom's terrestrial broadcasters BBC, Channel 4, ITV plc, Five and communications companies Arqiva, BT and TalkTalk. There are three main elements to the project: setting the technical standard, building the technical platform, and creating the user experience.	The partners intend to form a venture to promote the platform to consumers and the content, service and developer community. A consumer brand (not Canvas) will be created, and licensed to device manufacturers, and internet service providers who meet the specifications. Canvas-compliant devices (e.g. set-top boxes), built to a common technical standard, would provide seamless access to a range of third-party services through a common, simple, user experience.
Digital TV Group (DTG)	The Digital TV Group is an industry association for digital television in the UK. BBC R&D engineers have worked closely with the Digital TV Group to set these standards. Now the group is concentrating on high definition television, radio spectrum issues, and domestic systems	This group defined the profile of the DVB standards which is now used for all Freeview services, and they have a laboratory which is able to test compliance of consumer equipment with those standards.
European		
European Telecommunications Standards Institute (ETSI)	ETSI is the dominant European body with responsibility for broadcasting and telecommunication standards.	Most of the broadcast standards the BBC use are standardised in ETSI, including DAB, the DVB suite of standards, and TV-Anytime
European Broadcasting Union (EBU)	The EBU is no longer the prime body for creating broadcast standards. It has now changed its role to act as a consensus building body, ensuring that public service broadcasters in Europe are able to develop a common viewpoint. It also hosts other standards groups, for example the DVB.	Much of the EBU's formal documentation is published and subsequently referenced in the standards. The EBU organises its work into a series of technical groups, and we contribute to a number of these.
TV – Anytime European Users Group	The Group has started working on creating a more 'Semantic Web'-friendly representation of the TV-Anytime	RFC 4078 (The TV-Anytime Content Reference Identifier (CRID)

Standards Body	Description	Key Standards
	data model using RDF (Resource Description Framework).	
The European Committee for Electro technical Standardization (CENELEC)	Prepares voluntary standards for electrical and electronic goods and services.	The most immediate relevance is their influence on the specifications of receiver performance.
Hybrid Broadcast Broadband TV (HbbTV)	Hybrid Broadcast Broadband TV (HbbTV) is both an industry standard and promotional initiative for "harmonising the broadcast and broadband delivery of entertainment to the end consumer through connected TVs and set-top boxes".	The HbbTV consortium of digital broadcasting and Internet industry companies is establishing a standard for the delivery of broadcast TV and broadband TV to a television in the home, through a single user interface, creating an open platform as an alternative to proprietary technologies.
International		
Digital Video Broadcasting (DVB)	The Digital Video Broadcasting Project (DVB) is a consortium of over 270 companies and other organisations developing global standards for the delivery of digital television and data services. Their work has now extended beyond broadcasting to cover the convergence of internet and mobile systems in the home. DVB specifications are offered to ETSI, CENELEC, the EBU, or the ITU to create the standards themselves. BBC R&D is instrumental in a number of DVB standards.	**DVB-CPT** This group maintains the DVB 'Blue Book', the technical specification for the DVB copy protection and copy management (DVB-CPCM). An updated and more complete CPCM specification was released early this year. **DVB-GBS** We chair the SEG sub-group, which has defined the carriage of TV-Anytime data in the SI within the DVB transport stream. **DVB-T2**
The Digital Media Project	The Digital Media Project (DMP) is a non-profit Association. Its mission is to promote the successful development, deployment and use of digital media that respect the rights of creators and rights holders to exploit their works, the wish of end users to fully enjoy the benefits of digital media and the interests of value-chain players to provide products and services.	The DMP has recently released a series of specifications on interoperable digital rights management.
Society of Motion Picture and Television Engineers (SMPTE)	It provides a standard mechanism for managing content delivery between production centres; this will become an important requirement for tapeless production. There is a joint SMPTE-EBU taskforce on next-generation timing and synchronisation signals for use in production, suitable for	The **SMPTE MXF** standard, becoming widely used for capture and storage of content in tapeless production systems, has been revised to correct ambiguities in the specification and to add new support for carrying application-specific data that is required in some circumstances.

Standards Body	Description	Key Standards
	use in IT-based production systems and at high frame rates for HDTV and beyond.	**SMPTE 410M**, an addition to MXF which enables data streams such as subtitles and other non video or audio data to be carried.
Institute of Electrical & Electronics Engineers	The IEEE is a key organisation for network related standards development.	Main areas of interest are the wired and wireless networking standards, comprising the IEEE802 group of standards including Ethernet IEEE802.3 WiFi IEEE802.11 WiMAX IEEE802.16
Broadband / Telecommunications		
Broadband Forum	The Broadband Forum is a non-profit global industry consortium dedicated to developing broadband network specifications. Its members include leading industry players covering telecommunications, equipment, computing, networking and service provider companies. Its service provider make-up is primarily fixed line operators. Since it was established in 1994 as ADSL Forum, this forum has had a couple of name changes reflecting its evolving scope of work, first to the DSL Forum, and then to the Broadband Forum. The first name change was almost trivial, and was viewed as self evident at the time. However, the change to the "Broadband Forum" was carefully evaluated and launched in summer of 2008, two years after it officially expanded scope of work. In May 2009, IP/MPLS Forum merged with the Broadband Forum. All technical work of IP/MPLS Forum continued in a newly created "IP/MPLS and Core" Working Group of the Broadband Forum. The historical specifications from the IP/MPLS Forum's predecessors, ATM Forum, Frame Relay Forum, MFA Forum, and MPLS Forum, are archived	**Architecture** TR-101: Migration to Ethernet Based DSL Aggregation **Broadband Suite 3.0** Network R3.0 TR-156: Using GPON Access in the Context of TR-101 User R3.0 TR-135: Data Model for a TR-069 Enabled Set Top Box TR-140: TR-069 Data Model for Storage Service Enabled Devices TR-142: Framework for TR-069 Enabled PON Devices TR-143: Enabling Network throughput Performance Test and Statistical Monitoring TR-098 Amendment 2: Internet Gateway Device Data Model for TR-069 TR-106 Amendment 2: Data Model Template for TR-069 Enabled Devices Management R3.0 TR-117: Broadband Trouble Reporting TR-141: Protocol Independent Management Model for Access Nodes Supporting TR-101 TR-176: ADSL2Plus Configuration Guidelines for IPTV TR-147: Layer 2 Control Mechanism

Standards Body	Description	Key Standards
	on the Broadband Forum's website, under IP/MPLS Forum specifications	TR-159: Management Framework for xDSL Bonding TR-169: EMS-NMS Interface Reqs for Access Nodes Supporting TR-101 TR-069 is a Broadband Forum technical specification entitled CPE WAN Management Protocol (CWMP). It defines an application layer protocol for remote management of end-user devices.
Internet Engineering Task Force (IETF)	The IETF has done a remarkable job in producing stable and widely implemented Internet standards. The decisions are typically made online (by consensus—there is no voting in the IETF), and anyone with access to the Internet can participate in any working group and get hold of any IETF documents for free.	The IETF is divided into eight broad expertise areas: Applications Area, Internet Area, Operations and Management Area, Routing Area, Transport Area, Security Area, User Services Area, and General Interest Area. Areas are in turn divided into working groups, which focus on specific subjects of standardization.
International Telecommunication Union (ITU)	A specialized agency of the United Nations, has been standardizing everything related to traditional telephone networks since the time they first appeared—ITU began in the 1860s, standardizing telegraphy. Historically, almost all telephone networks were operated by government agencies, which explains the place of ITU in the United Nations.	Three Sectors of ITU: ITU-T (Telecommunication Standardization), ITU-R (Radiocommunication), and ITU-D (Telecommunication Development).
ETSI	ETSI has played an important role both in developing telecommunications standards for the European Union and contributing to ITU-T.	The ETSI Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) project has become an international effort dedicated to the architecture and protocol requirements in support of IP telephony.
IEEE	As above	As above

Standards Body	Description	Key Standards
Metro Ethernet Forum (MEF)	The Metro Ethernet Forum (MEF), founded in 2001, is a nonprofit international industry consortium, dedicated to worldwide adoption of Carrier Ethernet networks and services. The forum is composed of leading service providers, major incumbent local exchange carriers, network equipment vendors, and other networking companies that share an interest in Metro Ethernet. It had 160 members as of February 2010.	The forum makes recommendations to existing standards bodies and creates specifications that are not being developed by (or fall within the scope of) other standards bodies.
NICC	NICC is a technical forum for the UK communications sector that develops interoperability standards for public communications networks and services in the UK.	
Mobile Telecommunications		
ETSI	As above	
Global System for Mobile Communications (GSM)	The most popular standard for mobile telephony systems in the world. The GSM Association, its promoting industry trade organization of mobile phone carriers and manufacturers, estimates that 80% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity enables international roaming arrangements between mobile phone operators, providing subscribers the use of their phones in many parts of the world. The ubiquity of implementation of the GSM standard has been an advantage to both consumers, who may benefit from the ability to roam and switch carriers without replacing phones, and also to network operators, who can choose equipment from many GSM equipment vendors.	GSM differs from its predecessor technologies in that both signaling and speech channels are digital, and thus GSM is considered a second generation (2G) mobile phone system. This also facilitates the wide-spread implementation of data communication applications into the system. GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, which has since been supported on other mobile phone standards as well. The standard includes a worldwide emergency telephone number feature (112). Newer versions of the standard were backward-compatible with the original GSM system. For example, Release '97 of the standard added packet data capabilities by means of General Packet Radio Service (GPRS). Release '99 introduced higher speed data transmission using Enhanced Data Rates for GSM

Standards Body	Description	Key Standards
		Evolution (EDGE).
ITU	See above	See above
3GPP *(3rd Generation Partnership Project)*	A collaboration between groups of telecommunications associations, to make a globally applicable third-generation (3G) mobile phone system specification within the scope of the International Mobile Telecommunications-2000 project of the International Telecommunication Union (ITU). 3GPP specifications are based on evolved Global System for Mobile Communications (GSM) specifications. 3GPP standardization encompasses Radio, Core Network and Service architecture.	The groups are: ETSI ARIB/TTC)(Japan) China Communications Standards Association Alliance for Telecommunications Industry Solutions (North America) and Telecommunications Technology Association (South Korea). The project was established in December 1998. 3GPP should not be confused with 3rd Generation Partnership Project 2 (3GPP2), which specifies standards for another 3G technology based on IS-95 (CDMA), commonly known as CDMA2000.
3GPP2 *(3rd Generation Partnership Project 2)*	The 3rd Generation Partnership Project 2 (3GPP2) is a collaboration between telecommunications associations to make a globally applicable third generation (3G) mobile phone system specification within the scope of the ITU's IMT-2000 project.	In practice, 3GPP2 is the standardization group for CDMA2000, the set of 3G standards based on earlier 2G CDMA technology.
WiMAX Forum	The WiMAX Forum is a non profit organization formed to promote the adoption of WiMAX compatible products and services. A major role for the organization is to certify the interoperability of WiMAX products. Another role of the WiMAX Forum is to promote the spread of knowledge about WiMAX.	Interoperability
Open Mobile Alliance (OMA)	The mission is to provide interoperable service enablers working across countries, operators and mobile terminals. Adherence to the standards is entirely voluntary; the OMA	The OMA only standardises applicative protocols; OMA specifications are meant to work with any cellular network technologies being used to provide networking and data

Standards Body	Description	Key Standards
	does not have a mandative role. The OMA is not a formal government-sponsored standards organization like the ITU, but a forum for industry stakeholders to agree on common specifications for products and services. The goal is that by agreeing on common standards, stakeholders will be able to "share slices from a larger pie". "FRAND" intellectual property licensing. OMA members that own intellectual property rights (e.g. patents) on technologies that are essential to the realization of a specification agree in advance to provide licenses to their technology on "fair, reasonable and non-discriminatory" terms to other members.	transport. These networking technology are specified by outside parties. In particular, OMA specifications for a given function are the same with either GSM, UMTS or CDMA2000 networks. Linked to 3GPP, 3GPP2, IETF & W3C
The Web		
World Wide Web Consortium (W3C)	The World Wide Web Consortium (W3C) is the main international standards organization for the World Wide Web (abbreviated WWW or W3). Works closely with IETF	CSS, CGI, DOM, GRDDL, HTML, OWL, P3P, RDF, SVG, SISR, SOAP, SPARQL, SMIL, SRGS, SSMK, VoiceXML, WCAG, WSDL, XForms, XHTML, XML, Xpath, XQuery, XSLT.
Consumer Electronics		
Digital Living Network Alliance (DLNA)	A standard used by manufacturers of consumer electronics to allow entertainment devices within the home to share their content with each other across a home network. Supports UPnP AV standard – see below	The DLNA specification categories: • Digital media servers (DMS) • Digital media players (DMP) • Digital media controllers (DMC) • Digital media renderers (DMR) Any PC with a network interface (e.g. Ethernet or WiFi) can become a DLNA device by installing DLNA software.
Universal Plug and Play Forum (UPnP)	Universal Plug and Play (UPnP) is a set of networking protocols promulgated by the UPnP Forum. The goals of	The UPnP AV specification categories: • UPnP Media Server (master)

Standards Body	Description	Key Standards
	UPnP are to allow devices to connect seamlessly and to simplify the implementation of networks in the home (data sharing, communications, and entertainment) and in corporate environments for simplified installation of computer components.	• UPnP Media Server Control Point (slave) • UPnP Media Renderer • UPnP Rendering Control • UPnP Remote User Interface client/server

Figure 26: Standard Bodies

24. Appendix XVI: Mobile Telephony Standards

Generation	Standards Body	Standards
1G (Analogue)	AMPS family	AMPS, TACS
	Other	NMT (Scandinavia), Hicap (Japan), Mobitex (Paging), DataTAC (Paging)
2G	GSM/3GPP family	GSM, CSD
	3GPP2 family	CdmaONE (IS-95)
	AMPS family	D-AMPS (IS-54 & IS-136)
	Other	CDPD, iDEN (Motorola), PDC (Japan), PHS (Japan, China)
2G Transitional (2.5G, 2.75G)	GSM/3GPP family	HSCSD, GPRS, EDGE/Enhanced GPRS
	3GPP2 family	CDMA2000 1xRTT (IS-2000)
	Other	WiDEN (Motorola)
3G(IMT-2000)	3GPP family	UMTS (UTRAN), WCDMA-FDD, WCDMA-TDD, UTRA-TDD, LCR (TD-DCDMA)
	3GPP2 family	CDMA2000, 1xEV-DO (IS-856)
3G Transitional (3.5G, 3.75G, 3.9G)	3GPP family	HSDPA, HSUPA, HSPA+, LTE
	3GPP2 family	EV-DO Rev. A, EV-DO Rev.B,
	Other	Mobile WiMAX (IEEE802.16e-2005), Flash-OFDM, IEEE 802.20
4G (IMT Advanced)	3GPP f 802.16mamily	LTE Advanced
	WiMAX family	IEEE802.16 m

Figure 27: Standard Bodies

25. Appendix XVII: World Patent Offices

	UK IPO (The Patent Office)	European Patent Office (EPO)	US Patent & Trademark Office (USPTO)	Japan Patent Office (JPO)	World IP Office (WIPO)
Description	Official government body responsible for intellectual property rights in the UK	The EPO acts as executive body for the EPOrg.	Official government body responsible for patent and trademark rights in the US.	In charge of industrial property right affairs in Japan.	To encourage creative activity, to promote the protection of IP throughout the world.
Governing laws	The Registered Designs Act 1949 The Patents Act 1977 The Copyright, Designs and Patents Act 1988 The Trade Marks Act 1994	Patent Cooperation Treaty (PCT).	Article 1, Section 8 of the United States Constitution, wherein the powers of Congress are defined.	Patent Monopoly Act of 1885	UN Convention establishing the World Intellectual Property Organization of 1970.
Related to Government	Under the Department for Business, Innovation & Skills.	Reports to European Patent Organization (EPOrg).	Agency in the US Department of Commerce.	Under the Ministry of Economy, Trade & Industry.	UN Agency
Responsibilities	Responsible for examining and issuing or rejecting patents, and maintaining registers of intellectual property including patents, designs and trademarks in the UK.	The EPO provides a single patent grant procedure, but not yet a single patent from the point of view of enforcement. Hence the patents granted are not EC patents but a bundle of national patents.	issues patents to inventors and businesses for their inventions, and trademark registration for product and intellectual property identification	To promote growth of the Japanese economy and industry by administering the laws relating to patents, utility models, designs, and trademarks.	Administers the PCT.
History		Trilateral Patent Office	Trilateral Patent Office	Trilateral Patent Office	
Web Site / Search	www.ipo.gov.uk	www.epo.org esp@cenet	www.uspto.gov	www.jpo.go.jp	www.wipo.int

Figure 28: World Patent Offices

26. Appendix XVIII: Mobile VoIP Vendor Comparison

Program	Operating Systems	License	Protocols/based upon	Encrypt	Other capabilities	Latest release
Fring	Symbian 8.x & 9.x Windows Mobile 5 & 6 Android iPhone (WiFi only)	Proprietary	SIP to publicly routable servers only, Skype, Google talk, MSN Messenger, Twitter, ICQ, AIM, yahoo	?		4.1.12 [S60]
Gizmo5 (Google)	Windows Mobile (non-native, only through SJPhone), Symbian, Android	Freeware	SIP, AIM, iChat, XMPP, MSN, Yahoo	Yes	Online Phone over EDGE, UMTS, 3G, call land and cell phone, Voicemail, AOL, iChat, XMPP, yahoo! Messenger, Windows Live.	1.15
GIPS (Google)		Proprietary				
Jajah Telefonica	Symbian OS Windows Mobile	Web based		?		
Sipdroid	Android	GPL	SIP	?	Uses WiFi, 3G oe EDGE	
Truphone	Symbian, iPhone, Android, RIM, iPad	Freeware / Proprietary	SIP	?	WiFi VoIP out & in, SMS over IP, call-through & call-back	Symbian 4.0 iPhone 1.11.1
Windows Mobile 6	Windows Mobile 6 Professional / Standard	Proprietary	SIP to publicly and non-publicly routable servers	?	WiFi Mobile VoIP	6.1
Vopium	Symbian, Java ME, Android, Blackberry, iPhone, Windows Mobile 2003 SE & higher, iPhone	Freeware / Proprietary	SIP, GSM, MSN, Skype, yahoo, AOL, ICQ, Google Talk, Facebook & Twitter	?	WiFi VoIP, GSM call-through, SMS over IP, least cost routing.	2.0
Skype	Linux, Mac OS X, Windows 2000/XP/Vista/7/Mobile, BREW, iPhone, PSP, Android	Freeware / Closed Proprietary	Proprietary P2P protocol	Yes	Conferencing, video, file transfer, voicemail, Skype to phone, phone to Skype, additional P2P extensions (games, whiteboard, etc.)	Windows (4.2.0.158) Mac OS X (2.8.0.851) Linux (2.1.0.81)

Figure 29: VoIP Vendor Comparison

27. Appendix XIX: Social Media Comparison

27.1.1 The Players

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
General	World's default social network.	World's default professional online network.	White label social networking	White label social networking	Bought by AOL in 2008 for $850 million	ITV paid £175 M. Sold to DC Thomson for about £25M. CC review.	Bought by News Corp in 2005 for $580 million	Mobile social networking / micro-blogging
Ownership	Private	Private (M. Andreessen is an investor)	Private	Private (Founded by Marc Andreessen)	Public	Public	Subsidiary of News Corp Public	Private
Markets (Based)	Worldwide (US)	Worldwide (US)	US & UK	US, UK	UK, Ireland, NZ.,US, Europe	UK, Oz, NZ, SA	Mostly US	Worldwide
Investment	$716 M	~ $80M	?	~ $130M	?	Public	?	~ $60M
No. of Users	350,000,000	50,000,000	?	40,000,000 (1.8M Ning networks)	80,000,000	20,000,000	125,000,000 (mostly in US)	?
Focus	Consumer - everything	Professional	B2B2C	B2B2C	Consumer - Entertainment	Consumer - Travel	Consumer - Music	B2C
Slogan	Giving people the power to share & make the world more open & connected	Relationships matter	Social & Media Apps On Demand	Create your own social network for anything	Sign-up Upload Invite	Get in touch – Share your life with your friends	A place for Friends	None
Business Model	Advertising Referral marketing	Subs (Premium) Advertisin	PPA (Activity) Advertisin	PPA (Activity) Advertising	Advertising	Advertising Re-seller (travel)	Advertising Adsense	Advertising

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
		g	g					
Revenue	$300 M	$17 M	?	?	?	?	$500M	$2M
Call Centre	None	None	None	None	None	None	None	None

27.1.2 Routes to Market

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
Direct	Y	Y	Y	Y	Y	Y	Y	Y
In-Direct	N	N	N	N	N	N	N	N

27.1.3 Features

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
Platform Developer Related								
Social Graph API	Y	N	Y	Y	?	?	Y	N
3rd party App API	Y		N	N	Y	?	Y	Y
3rd party Device API	Y	Y	?	?	?	?	?	N
Simple URLs	Y	Y	Y	?		No	Y	Y
Back Office								
Set up UI	N	N	Y	Y	N	N	N	Y
Set up Member Profiles	N	N	Y	Y	N	N	N	N
Enable users to view & edit own profiles	N	N	Y	Y	N	N	N	Y
Public & Private settings	N	N	Y	Y	N	N	N	N
Moderate users & actions before publishing	N	N	Y	Y	N	N	N	N

Player/ Feature	**Facebook**	**LinkedIn**	**KickApps**	**Ning**	**Bebo**	**Friends Reunited**	**MySpace**	**Twitter**
SEO with tagline, description & keywords	N	N	Y	Y	N	N	N	N
Social Graph Engine	Y	N	Y	Y	N	N	N	N
Manage Advertising	Y	Y	Y	Y	Y	N	N	No advertising on site
Branded video players on web	?		Y	Y	?	N	N	N
User Dashboard			Y	Y	N	N	N	N
Omnipresent Features								
Nav Bar	Y	Y	Y		Y	Y	Y	Y
Search	Y	Y	Y	Y	Y	Y	Y	N
Instant Messaging	Y	N	Y	Y	Y (AOL IM)	Y	Y	N
Advertising	Y	Y	Y	Y	Y (Banner Ads)	Y	Y Google (Adsense)	N
Pages								
Home	Y	Y	Y	Y	Y	Y	Y	Y
Profile	Y	Y	Y	Y	Y	Y	Y	Y
Friends /	Y	Y	Y	Y	Y	Y	Y	Y

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
Connections								
Inbox	Y	Y	Y	Y	Y	Y	Y	N
Events		Y				N	Y	N
Groups		Y	Y	Y	Y	Y	Y	N
Jobs		Y				N		N
Places						Y		N
Games					Y		Y	N
Books					Y			N
Local							Y	N
Schools						Y	Y	N
Forums							Y	N
Blogs							Y	N
Home Page								
Status Update	Y	Y	Y	Y	Y	Y	Y	Y
Friends Update	Y	Y	Y	Y	Y	Y	Y	Y
RSS IN	N	Y	Y	Y	Y	?	Y	N
RSS Out	N	?	?	?	?	?	?	N
Photos	Y	N	Y	Y	Y	Y	Separate page	N
Photo Tagging	Y	N	N	N	Y	?	Y	N

Player/ Feature	**Facebook**	**LinkedIn**	**KickApps**	**Ning**	**Bebo**	**Friends Reunited**	**MySpace**	**Twitter**
Links	Y	N	Y	Y	Y	?	Separate page	N
Video	Y	N	Y	Y	Y	Y	Separate page	N
Notes	Y	N	?	?	?	?		N
Groups	Y	Y	Y	Y	Y	Y	Separate page	N
Events	Y	N	?	?	?	?	Separate page	N
Widgets	N	N	Y	Y	Y	?	Y	N
Ratings	N	N	?	?	?	N	?	N
Comments	Y (wall)	N	?	?	Y	N	Y	N
Company pages	N	Y	N	N	N	N	N	N
Forums	Y (for devs only)	Y	Y	Y	N	N	Separate page	N
Blogs	N	N	Y	Y	Y	Y	Separate page	N
Recommendations	N	N	N	N	Y	N		N
Profile								
Page Decoration	N	N	Y	Y	Y (Skins)	N	Y (Skins)	N
Account Type	N	Y	Y	Y	N	N	N	N
Profile Settings	Y	Y	Y	Y	Y	Y	Y	N
Personal Information	Y	Y	Y	Y	Y	Y	Y	Y

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
Email notifications	Y	Y	Y	Y	Y	Y	Y	Y
SMS notifications	Y	N	?	?	Y	N	N	Y
Privacy Settings	Y	Y	?	?	Y	Y	Y	N
Homepage settings	Y (Application settings)	Y	Y	Y	N	N	Y	N
Feedback	Y (Suggestions)	Y	Y	Y	Y	Y	Y	N
Connections								
Friends / Connections	Y	Y	Y	Y	Y	Y	Y	Y
Find Friends	Y	Y	Y	Y	Y	Y	Y	Y
Friends Online	Y	?	?	?	Y	?	Y	N
Browse	Y	?	?	?	Y	?	Y	N
Invite Friends	Y	Y	Y	Y	Y	Y	Y	Y
Phonebook	Y		N	N	N	N	N	N
Remove Friends	Y	Y	Y	Y	Y	Y	Y	Y
Recently Added	Y		N	Y	N	N	N	N

Player/ Feature	**Facebook**	**LinkedIn**	**KickApps**	**Ning**	**Bebo**	**Friends Reunited**	**MySpace**	**Twitter**
Recently Updated	Y	Y	N	N	N	N	N	N
CRM		Y (Profile Organiser)	N	N	N	N	N	N
Friends' Friends	N	Y	?	?	Y	N	Y	N
Top Friends	N	N	?	?	Y	N	N	N
Requests made	Y	Y	?	?	Y	N	N	N
Inbox								
Email	Y (Messages)	Y	Y	Y	Y	Y	Y (username@myspace.com)	N
Sent	Y	Y	Y	Y	Y	Y	Y	N
Archived		Y	?	?	Y	N	Y	N
Delete	Y	Y	?	?	Y	Y	Y	N
Compose	Y	Y	Y	Y	Y	Y	Y	N
Mark Read	Y	Y	?	?	?	N	Y	N
Mark Unread	Y	Y	?	?	?	N	Y	N
1st party Apps	N	N	N	N	N	Y Genes Reunited Dating	N	N
3rd Party Apps	***Y***	***Y***	***Y***	***Y*** ***OpenSocial***	***Y*** ***OpenSocial***	***Y*** ***Bingo*** ***(Foxy)*** ***Holidays***	***Y*** ***Open Social***	***Y***

Player/ Feature	Facebook	LinkedIn	KickApps	Ning	Bebo	Friends Reunited	MySpace	Twitter
						(TC)		
3rd Party Devices								
Mobile	Y	Y	Y	Y	N	?	Y	N
Games Console		N	N	N	N	N		N
Content Distribution								
Platform					Open Media Platform		N	N

Figure 30: Social Media Comparison

28. Appendix XX: UK Print Media Companies

Group	Ownership	Divisions	Titles	Key Players	Comments
News International	News Corp	TV Broadcast Satellite TV Cable Books Newspapers Magazines Music & Radio Internet	Times Sunday Times The Sun News of the world TLS HarperCollins InsideOut BskyB (39.1%) MySpace Photobucket Hulu (45%) Propertyfinder.com Broadsystem Ltd	Rupert Murdoch James Murdoch Rebecca Wade	News Corp also own BSkyB. Tomahawk could be an online/offline sales channel for News Corp. OFT forced News Corp to sell their stake in ITV (17.5%).
Daily Mail & General Trust (DMGT)	DMGT PLC	Associated Newspapers Associated Northcliffe Digital Nortcliffe Media Nortcliffe International	Daily Mail The Mail on Sunday Mail Today Metro London Lite Jobsite	Viscount Rothermere (Chairman) Martin Morgan (CEO)	Sold Evening Standard to Alexander Lebedev

Group	Ownership	Divisions	Titles	Key Players	Comments
		DMG broadcasting DMG radio Australia DMG World Media DMG Information Euromoney	Motors.co.uk Findaproperty Primelocation Allegran Teletext ITN (20%)		
Guardian Media Group (GMG)	Scott Trust	Guardian News & Media GMG Regional Media Trader Media Group (with Apax) GMG Property Services (with Apax) Emap B2B (with Apax)	The Guardian The Observer Smooth Real Rock Radio Auto Trader Thinkproperty.com Emap (B2B)	Carolyn McCall	Manchester Evening News sold to Trinity Mirror
Independent News & Media (INM)	Independent News & Media plc	Ireland UK South Africa Oz & NZ	Ireland Evening Herald Irish Independent Sunday Independent	Tony O'Reilly Gavin O'Reilly Denis O'Brien	Sold to Lebedev

Group	Ownership	Divisions	Titles	Key Players	Comments
		India Publishing Online Outdoor Advertising Radio	Sunday World Irish Daily Star UK Belfast Telegraph Ireland's Saturday Night Sunday Life South Africa Largest publisher with 14 newspaper Oz & NZ APN News & Media (32.2%) India Dainik Jagran (13%)		
Independent Print Limited. *(Lebedev Holdings)*	Alexander Lebedev	Russia UK	The Evening Standard The Independent Independent on Sunday Novaya Gazeta (Rus)	Alexander Lebedev	Bought ES from DMGT. Bought Independent & Independent on Sunday from INM

Group	Ownership	Divisions	Titles	Key Players	Comments
Daily Telegraph	David & Frederick Barclay	Newspapers	Daily Telegraph Sunday Telegraph		Used to be owned by Conrad Black
Trinity Mirror	Trinity Mirror PLC	National Regional Manufacturing	Daily Mirror Sunday Mirror The People Daily Record Racing UK Lots of regional newspapers Job web sites Property web sites Car web sites	Ian Gibson Sly Bailey Tony Pusey	Largest UK newspaper & magazine publisher. Racing Post sold to Private Equity.
Pearson	Pearson PLC	Penguin Group Pearson Education FT group	FT The Economist (50%) Pearson Longman Addison-Wesley Prentice Hall Benjamin Cummings Pearson Scott Forsman	Majorie Scardino	FT sold as a subscription

Group	Ownership	Divisions	Titles	Key Players	Comments
Northern & Shell	Richard Desmond		Print Daily Express Sunday Express Daily Star Daily Star Sunday Irish Star (jointly owned by INM) OK! New! Star TV (Portland TV) Television X Red Hot TV	Richard Desmond	Acquired Channel 5 from RTL/Bertelsmann
Haymarket	Haymarket Media Group	Business Media Consumer Media Network Exhibitions Online			Largest privately-owned publishing company in the United Kingdom

Figure 31: UK Print Media Companies

29. Appendix XXI: UK Television Media Companies

Group	Ownership	Divisions	Titles	Key Players	Comments
BBC	UK Government	Radio TV Online BBC Worldwide (Content & Production)	BBC 1 BBC 2 BBC radio 1,2 ,3, 4 Five Live BBC online iPlayer TV production	Sir Michael Lyons Mark Thompson	License fee
BBC Worldwide	BBC (100%)	Production International programming sales & distribution TV channels	Red Production Company Left Bank Pictures Cliffhanger Productions (25%) UKTV (50%) BBC America BBC Entertainment (India)		Commercial ventures with partners.

Group	Ownership	Divisions	Titles	Key Players	Comments
		Book Publishing Magazine Publishing DVD	Random House Radio Times 2 Entertain		
Sky	News Corp (39.1%)	Multi-room Sky+ Sky+ HD Phone Broadband Mobile TV Sky Songs Sky Bet	Sky 1 Sky 2 Sky 3 Sky Arts Sky Movies Sky News Sky Real Lives Sky Sports Sky Player	Murdoch & Family	Subscription Advertising
BT	BT Plc	Broadband Internet services Internet products Mobile services TV services	BT Vision	Sir Michael Rake Ian Livingstone	Subscription
Virgin Media	Virgin Media Inc	Broadband Cable TV TV content		James Mooney Neil Berkett	Subscription Advertising

Group	Ownership	Divisions	Titles	Key Players	Comments
		Virgin Mobile Virgin Media			
ITV	ITV plc UTV Media STV Group plc Channel Television Ltd	Public service broadcaster	ITV News Regional Sport Children's ITV player		Advertising
Channel 4	Channel 4 Television Corporation	Public service broadcaster	C4 E4 More4 Film4 4Music 4oD / Catch-up	Luke Johnson David Puttnam Andy Duncan	State owned. Advertising
Five	Channel 5 Broadcasting	Public service broadcaster	Five Fiver Five USA Demand Five		Owned by Richard Desmond. Advertising
UKTV	50% Virgin Media	TV network. Satellite, Cable &	Alibi		All 10 channels on Virgin and Sky.

Group	Ownership	Divisions	Titles	Key Players	Comments
	50% BBC Worldwide	Terrestrial.	Blighty Dave Eden G.O.L.D Good Food Home Really Watch Yesterday		Freeview carries Dave, G.O.L.D, Home and Yesterday. Channel 4 acts as sole advertising sales agent for all channels.
Endemol	Mediaset	Production	Big Brother Changing Rooms Ready Steady Cook Ground Force Space cadets Fear factor	Joop van den Ende John de Mol	Adam Valkin is Head of Digital Services
Freeview	BBC, ITV, 4, Sky	TV network. Terrestrial Broadcasting	All Open Air Stations in UK		Brand covering all the public service broadcasters in the UK.
Top Up TV	Balderton	Pay TV over DTT.	ESPN Sky Sports	Len Blavatnik	Subscription Advertising

Figure 32: UK Broadcast Media Companies

30. Appendix XXII: UK Broadcasting Infrastructure Companies

Group	Ownership	Divisions	Titles	Comments
Arqiva	Macquarie bank	Telecommunications Transmissions	Terrestrial Broadcast (Multiplex C & D) Broadcast TV (ITV, C4, S4C, Five) Digital Platforms (Freeview) Broadcast Radio Satellite & Media Broadcast Distribute Digital Media Nets Outside broadcasts Wireless Access Public Safety Mobile Media Cellular solutions WiFi & IP VOD See Saw	
BBC	UK Government	Program development	Terrestrial Broadcast	Multiplex 1 operates in 16QAM mode at

Group	Ownership	Divisions	Titles	Comments
		Transmission	(Multiplex 1 & B) All BBC channels **Multiplex B is for HD**	18 megabits/second in pre-switchover areas, 64QAM mode at 24 megabits/second in post-switchover regions. Multiplex B operates in 16QAM mode at 18 megabits/second. Multiplex B is being cleared and is to be used for the forthcoming High Definition broadcasts, at which point it will switch to DVB-T2 format broadcasts with an effective multiplex capacity of 36 megabits/second. The dates for this changeover vary by region.
SDN	ITV	Transmission	Multiplex A	Broadcasts nationwide in 64QAM mode at 24 megabits/second.
Digital 3 & 4	ITV & Channel 4	Transmission	Multiplex 2	Broadcasts nationwide in 64QAM mode at 24 megabits/second

Figure 33: UK Broadcasting Infrastructure Companies

31. Appendix XXIII: Application: Freeview's Channel Line Up

EPG	Channel	Programming	Notes	Mux*
1	BBC One	Entertainment		1
2	BBC Two	Entertainment		1
3	ITV1 (and GMTV)	Entertainment		2
4	Channel 4 (S4C in Wales)	Entertainment		2
5	Five	Entertainment		2
6	ITV2	Entertainment		2
7	BBC Three	Entertainment		1
8	Ch. 4 (Wales) / TeleG(Scotland)	Culture		2/A
9	BBC Four	Culture		B
10	ITV3	Entertainment		A
11	Sky Three	Entertainment		C
12	Yesterday	History	Formerly UKTV History. 6am to 1am only	D
13	Channel 4+1	Entertainment		2
14	More 4	Entertainment		2
15	Film Four	Movies		D
16	QVC	Shopping		A
17	G.O.L.D	Entertainment	Top Up Anytime only. 6pm to 11:30pm only	A
18	4Music	Music		D
19	Dave	Entertainment	7am to 3am only	C
20	Virgin 1	Entertainment	9am to midnight only	A
21	VIVA	Music channel	Also running Noggin (morning kids content)	D
22	Ideal World	Shopping		D

23	Bid TV / ScreenShop	Shopping		A
24	ITV4 (and GMTV2)	Entertainment		D
25	Dave ja vu (+ 1)	Entertainment		C
26	Home	Lifestyle	Formerly UKTV Style - Top Up Anytime only. 2pm to 4pm only	A
27	ITV2 + 1	Entertainment	Scotland / N. Ireland only	2
28	E4	Entertainment		2
29	E4+1	Entertainment		C
30	Fiver	Entertainment		A
31	Five USA	Entertainment		A
32	Big Deal	Quiz	4am to 6am	C
33	ITV2 + 1	Entertainment	England / Wales only	2
34	ESPN	Sport	Available on BT Vision and Top Up TV or on Freeview CAM (Not 24 hours)	A
36	Create & Craft	Shopping	8am to 1pm. More	D
37	Price-Drop TV	Shopping		C
38	Quest	Documentary	10am to 1am	A
39	SuperCasino	Gaming		A
40	Rocks & Co 1	Shopping		D
41	BT 1 / Sky Sports 1	Sports	Subscription Sports - BT Vision	B
42	BT 2 / Sky Sports 2	Sports	Subscription Sports - BT Vision	B
50	BBC HD	Entertainment - HD	Freeview HD areas only	HD
51	ITV1 HD / STV HD	Entertainment - HD	Freeview HD areas only	HD
52	Channel 4 HD	Entertainment - HD	Freeview HD areas only	HD
53	S4C HD	Entertainment - HD	Wales Freeview HD areas only	HD
70	CBBC	Kids		1
71	Cbeebies	Kids		B
72	CITV	Kids		A

80	BBC News	News		1
81	BBC Parliament	News		B
82	Sky News	News		C
83	Sky Sports News	Sport	To be removed in 2010	C
84	CNN	News	7pm to midnight only	A
85	Russia Today	News		D
87	Community Channel	Specialist		C
88	Teachers TV	Specialist	4pm to 6pm only. Closes in July 2010	A
89	Al Jazeera English	Entertainment News	6pm to 11pm	D
93	Television X	Adult	Pay-to-view	A
94	Smile TV 2	Adult chat	Overnight	D
95	Smile TV 3	Adult chat	Overnight	C
96	Babestation	Adult chat	11pm-5am, pay-per-view from midnight	D
97	Partyland	Adult Chat		A
98	TMTV (Tease Me TV)	Adult	Overnight	A
99	Babestation 2	Adult chat	Overnight	D

Figure 34: Freeview TV channels

EPG	Channel	Programming	Notes	Mux*
101	Teletext Holidays	Text Holidays		A
102	Rabbit	Text Dating		2
103	Teletext Casino	Text Gaming		A
104	1-2-1 Dating	Text Dating		2
105	BBC Red Button	Text Information		1
107	Gay Rabbit	Text Dating		2
108	Sky Text	Text Information		C

109	Mobilizer	Text Adult	A
300	4TV Interactive	Text	D
306	Channel Zero	Text	C

Figure 35: Freeview Data / Text channels

EPG	Channel	Programming	Notes	Mux*
700	BBC Radio 1	Music		B
701	BBC 1 Xtra	Music		B
702	BBC Radio 2	Music		B
703	BBC Radio 3	Music		B
704	BBC Radio 4	Speech		B
705	BBC 5 Live	Sport		B
706	BBC 5 Live Sports Extra	Sport		B
707	BBC 6 Music	Music		B
708	BBC Radio 7	Comedy/Kids		B
709	BBC Asian Network	Specialist		B
710	BBC World Service	Speech		B
711	The Hits	Music		D
712	Smash Hits!	Music		A
713	Kiss	Music		D
714	Heat	Music		D
715	Magic	Music		D
716	Q	Music		D
718	Smooth Radio	Music		D
719	BBC Scotland / BBC Wales / BBC Ulster	Speech	Scotland/Wales/NI only	1
720	BBC Radio Cymru / BBC Radio nan	Speech	Scotland/Wales/NI only	1

	Gàidheal / BBC Radio Foyle			
722	Kerrang!	Music		D
723	TalkSport	Sport		C
725	Premier Christian Radio	Religious		C
726	U105 Radio	Music	Northern Ireland only	2
727	Absolute Radio	Music		C
728	Heart	Music		2

Figure 36: Freeview Radio channels

32. Appendix XXIV: The Independent Rate Card

32.1.1 Independent Display rate card

The Independent MON - SAT	Mono	Colour	Mono	Colour
Display	scc	scc	page	page
Specified position	£44	£70	£10,472	£16,660
Run of paper	£42	£64	£8,570	£13,050
Special Positions				
Page 3	£85	£85		
First colour site after page 3	£80	£80		
Fixed day +10%				
Media Weekly / Motoring / Property / Education & career / Arts & Books				
The Independent (Monday – Friday)	scc	scc	page	page
Run of section	£42	£64	£8,570	£13,050
Save & spend / The Independent Traveler				
The Independent (Saturday)	scc	scc	page	page
Front page		£108		
Run of section	£42	£64	£8,570	£13,050
The Independent Magazine				
(Saturday)				
Double page spread	£20,000			
Page	£10,000			
Half page	£5,000			

32.1.2 Independent Online adverting rates

Type	Dimensions	Formats	Max File Size	CPM run of site	CPM channel specific
Banners	468 x 60	Gif or Flash	37k	£22	£25
Leaderboard	728 x 90	Gif or Flash	37k	£35	£40
Sky		Gif or Flash	37k	£24	£28
MPU		Gif or Flash	37k	£45	£52
Button (Wide)		Gif or Flash	37k	£17	£20

32.1.3 Independent Classified rate card

Education	Mono	Colour	Day
	scc	scc	
School Recruitment	£30	+15%	Thursday
Independent Schools	£30	+15%	Thursday
Courses	£50	£60	Thursday
Higher Education Recruitment	£25	£35	Thursday
MBA			
	scc	scc	
Classified	£62	£72	Tuesday / Thursday / Sunday
ROP	£102	£112	Thursday
Media Weekly & Recruitment			
	scc	**scc**	
Classified	£52	£62	Thursday (REC) / Monday (MW)

33. Appendix XXV: DTT in the UK

33.1.1 Introduction

Digital terrestrial television in the United Kingdom encompasses over 100 television, radio and interactive services broadcast via the UK's terrestrial television network and receivable with a standard television aerial. The majority of services, including those from the existing five analogue broadcasters, are broadcast free-to-air, and a further selection of encrypted Pay-TV services (such as ESPN) are also available.

Digital Terrestrial services are often referred to with the Freeview name, however this is only a brand name adopted by the broadcasters of free-to-air services. Freeview channels account for most, although not all, of the total available channels broadcast on digital terrestrial television, available at no extra cost and requiring no subscription other than payment of the annual TV license fee.

The digital broadcasting technology adopted in the UK is the DVB-T system (Digital Video Broadcasting - Terrestrial) carrying compressed digital audio, video and other data in a combined transport stream, using COFDM modulation. A total of six 'multiplexes' are broadcast in the UK, guaranteed to reach over 90% of the country when analogue signals are fully switched off. Three of the six multiplexes, carrying the free public service channels operated by the BBC, ITV, Channel 4 and Five, are guaranteed wider coverage still, reaching 98.5% of the country including areas dependent on low-power local relays.

33.1.2 Receiving & Recording

Digital Terrestrial Television is most commonly received by means of a compatible Set-top box or Integrated Digital Television (IDTV), connected to an appropriate receiving antenna. In most cases, reception is possible using existing aerials originally used for analogue television.

Transmissions may be recorded in many ways - such as via the connection of a set-top-box to an existing 'analogue' VCR or DVD recorder, or by the use of newer models of such recorders which have built-in digital tuners. Alternatively, an increasingly common option is by the use of set-top-boxes which incorporate a hard disc drive, and allow the recording of the digital signal directly to disc, for later replay. Recording on such boxes, known as Personal Video Recorders or PVRs, is often more convenient, as programmes may be easily selected for recording from an on-screen programme guide, with no need to specify explicit start and end times for recordings, and no need to program more than one piece of equipment.

Many television services which incorporate DTT channels in their service offering - e.g. Top Up TV and BT Vision, offer set top boxes with such a recording facility. Non-subscription DTT PVRs are also available and are often sold under the 'Freeview+' banner (formerly Freeview Playback.)

33.1.3 Features

Digital Terrestrial Television provides many more channels. For some viewers it offers much improved reception compared to analogue, including 16:9 anamorphic widescreen. A number of interactive services including a newer version of Teletext is also offered.

An eight-day Electronic Programme Guide (EPG) is available and allows viewers to see programme descriptions and broadcast times well in advance. PVRs will make use of this facility allowing recording timers to be set. This Eight-Day EPG was not an original feature of the Digital Terrestrial system, therefore some early receivers, such as receivers originally made to operate with the ONdigital service, will only display details of 'now and next' programme information.

A fourteen-day Top Up TV EPG is an alternative which is available to TUTV-branded PVRs.

33.1.4 Future of Digital Terrestrial Broadcasting

In March 2006, the development of a new second generation Digital Terrestrial broadcasting standard, DVB-T2, was agreed by the DVB Group. Together with MPEG4, it is the required standard for HD transmissions.

Ofcom recently published its final decision for **HDTV using DVB-T2 and MPEG-4**: BBC HD, ITV1 HD, Channel 4 HD/S4C Clirlun will each have one slot from launch. Five HD was due to launch during 2010 but was unable to reach 'key criteria' to keep its slot. Spare allocation on multiplex B will now be handed over to the BBC but Ofcom intends next year to give the Commercial Public Service Broadcasters another opportunity to apply to provide an additional HD service from 2012. A fifth HD channel may be able to launch during 2013.

33.1.4.1 DVB-T2

DVB-T2 is an abbreviation for Digital Video Broadcasting – Second Generation Terrestrial; it is the extension of the television standard DVB-T, issued by the consortium DVB, devised for the broadcast transmission of digital terrestrial television. This system transmits compressed digital audio, video, and other data in "physical layer pipes" (PLPs), using OFDM modulation with concatenated channel coding and interleaving. It is currently broadcasting in parts of the UK under the brand name **Freeview HD**.

33.1.4.2 MPEG-4

MPEG-4 is a patented collection of methods defining compression of audio and visual (AV) digital data. It was introduced in late 1998 and designated a standard for a group of audio and video coding formats and related technology agreed upon by the ISO/IEC Moving Picture Experts Group (MPEG) (ISO/IEC JTC1/SC29/WG11) under the formal standard ISO/IEC 14496 - Coding of audio-visual objects. Uses of MPEG-4 include compression of AV data for web (streaming media) and CD distribution, voice (telephone, videophone) and broadcast television applications.

MPEG-4 absorbs many of the features of MPEG-1 and MPEG-2 and other related standards, adding new features such as (extended) VRML support for 3D rendering, object-oriented composite files (including audio, video and VRML objects), support for externally-specified Digital Rights Management and various types of interactivity. AAC (Advanced Audio Coding) was standardized as an adjunct to MPEG-2 (as Part 7) before MPEG-4 was issued.

MPEG-4 is still a developing standard and is divided into a number of parts. Companies promoting MPEG-4 compatibility do not always clearly state which "part" level compatibility they are referring to. The key parts to be aware of are MPEG-4 part 2 (including Advanced Simple Profile, used by codecs such as DivX, Xvid, Nero Digital and 3ivx and by Quicktime 6) and MPEG-4 part 10 (MPEG-4 AVC/H.264 or Advanced Video Coding, used by the x264 encoder, by Nero Digital AVC, by Quicktime 7, and by high-definition video media like Blu-ray Disc).

Initially, MPEG-4 was aimed primarily at low bit-rate video communications; however, its scope as a multimedia coding standard was later expanded. MPEG-4 is efficient across a variety of bit-rates ranging from a few kilobits per second to tens of megabits per second. MPEG-4 provides the following functionalities:

- Improved coding efficiency
- Ability to encode mixed media data (video, audio, speech)
- Error resilience to enable robust transmission
- Ability to interact with the audio-visual scene generated at the receiver

33.1.5 The multiplexes

- Multiplex 1
  Operated by the BBC; broadcasts nationwide in 16QAM mode at 18 megabits/second in pre-switchover areas, 64QAM mode at 24 megabits/second in post-switchover regions.
- Multiplex 2
  Operated by Digital 3&4 (an ITV/Channel 4 consortium); broadcasts nationwide in 64QAM mode at 24 megabits/second.
- Multiplex A
  Operated by SDN (owned by ITV plc); broadcasts nationwide in 64QAM mode at 24 megabits/second.
- Multiplex B
  Operated by the BBC; currently broadcasts nationwide in 16QAM mode at 18 megabits/second. Multiplex B is being cleared and is to be used for the forthcoming High Definition broadcasts, at which point it will switch to DVB-T2 format broadcasts with an effective multiplex capacity of 36 megabits/second. The dates for this changeover vary by region.

- Multiplex C
  Operated by Arqiva; broadcasts nationwide in 16QAM mode at 18 megabits/second

- Multiplex D
  Operated by Arqiva; broadcasts nationwide in 16QAM mode at 18 megabits/second

The DVB-T standard provides a multiplex service that can make trade-offs between the number of services and the picture and audio quality.

- a number of services use the same bandwidth at different times. For example CBeebies and BBC Four currently use the same space in Multiplex B, with CBeebies broadcasting from 6am until 7pm and BBC Four from 7pm; similarly for CBBC and BBC Three.

- some multiplexes allocate more bandwidth to services, providing a smaller number of higher-quality services. For example BBC One on Multiplex 1 is carried as a 4.4 Megabit stream, while QVC on Multiplex A typically uses 2 Megabits per second.

- The modulation of the multiplexes can be varied to squeeze higher digital bitrates out of the same portion of the electromagnetic spectrum, but require a stronger signal for good reception. The modulation schemes used in the UK are, in order of bandwidth efficiency, each with a progressively higher bitrate, at the cost of progressively higher likelihood of signal degradation:

    - QPSK (only used for tests in the Oxford and London areas)
    - 16 QAM
    - 64 QAM

- Multiplexes can make use of statistical multiplexing at the MPEG video coder whereby the bitrate allocated to a channel within the multiplex can vary dynamically depending on how difficult it is to code the picture content at that precise time, and how much demand there is for bandwidth from other channels. The only DTT channel which in most regions does not use statistical multiplexing at present, i.e. which uses a constant bit rate, is BBC One.

33.1.6 New Compression Technology

Developments in statistical multiplexing, improved compression technology, and, in some cases, an acceptance of lower quality or lower resolution broadcasts, has allowed gradual increases in the number of services carried on digital terrestrial television multiplexes, see the example below. A new service can be sold in the region of £10M per annum.

More recent compression technology, as now available in codecs like MPEG4, H.264 or Microsoft's WMV could enable a substantial increase in either quality or capacity due to their increased efficiency.

33.1.7 Statistical Multiplexing on DTT

One of the major changes to our infrastructure was instigated to allow the BBC complete freedom of scheduling for its new service BBC FOUR. BBC FOUR replaced BBC KNOWLEDGE in early spring 2002 and the programme proposition includes live concerts broadcast at weekends. From its launch BBC KNOWLEDGE had been conveyed on another DTT multiplex managed by SDN but for contractual reasons there were significant periods of the weekend during which bit-rate was not available. Bringing BBC KNOWLEDGE into our own DTT multiplex was thus a prerequisite to launching BBC FOUR.

Unfortunately the BBC multiplex was already full, conveying BBC ONE, BBC TWO, BBC CHOICE, BBC NEWS24 at constant bit-rate (CBR) together with BBC data services and, as audio-only, BBC PARLIAMENT. Making space for a fifth linear AV channel implied the use of statistical multiplexing – not an obviously revolutionary step except that the BBC is both a national and regional broadcaster with more than 15 sites across the UK at which regional programmes are inserted. At our sites in Glasgow (Scotland), Belfast (Northern Ireland) and Cardiff (Wales) significant amounts of regional content are inserted into BBC ONE and BBC TWO often by time-shifting national network programmes. At our many smaller regional sites in England it had already been decided for economic reasons only to insert regional content on BBC ONE for digital television.

The bit-rate needed to encode pictures for digital TV to an acceptable quality varies substantially from frame-to-frame, between shots and from one programme to the next. Differences in picture detail, in movement within the scene or even in the techniques used in production mean that, for a given bit-rate, some scenes may look crisp while others suffer from some (or more) of the customary digital effects of ‘blocking’, loss of detail in faces and on grass or the so-called ‘mosquito’ noise you sometimes see around the edges of objects in the picture.

Statistical multiplexing is frequently used to reduce the average bit-rate accorded to a service so as to add one or more additional services to the multiplex. This means that we use a somewhat lower average bit-rate than for fixed bit-rate coding. Any instantaneous peak of bit-rate required to code one of the services to a given quality has to be met from corresponding troughs in the bit-rate requirements for the other services in the bundle.

A challenge for the BBC is that we broadcast mixed-genre services, which are competitively scheduled, and our programmes are often visually stimulating with active content that is frequently hard to code. (Several coder manufacturers have been disagreeably surprised by the challenge normal BBC output presents to their products.) There are therefore frequent occasions when several or all of the services in our DTT multiplex are showing ‘bit-rate hungry’ pictures. Under these conditions the coders will usually get an approximately equal share of the pool and for those times picture quality will be no better than if the services had been coded at the (reduced) average bit-rate.

After prolonged experiments both off-line (using known testing material representative of BBC service propositions) and on-air on DSAT where we already were using statistical multiplexing with the same bundle of services, we established that we could code and statistically multiplex 5 BBC services (ONE, TWO, CHOICE, KNOWLEDGE/FOUR & NEWS24) in one 24 Mbits/s DTT multiplex.

We therefore now distribute over ATM ‘sustaining feeds’ of lightly-coded ONE, TWO, CHOICE, FOUR and NEWS24 to Cardiff, Belfast and Glasgow where they are decoded, regional content added for ONE and TWO and the five resulting services coded and statistically multiplexed at those places ready for transmission by Arqiva in Wales, Northern Ireland and Scotland. In England we code and statistically multiplex TWO, CHOICE, FOUR & NEWS24 in London leaving space for a CBR-coded ONE. The ‘sustaining feed’ of lightly-coded ONE is decoded at each regional site, regional content inserted, coded at CBR and added to the 4:1 stat.mux bundle on site for onward delivery by CCI. This approach obviates the practical problem of running relatively complex statistical multiplexing equipment at sites that have for substantial periods of time little or no technical staff on-site.

34. Appendix XXVI: Project Canvas (UK)

34.1.1 Introduction

Project Canvas is the working title for an attempt to create an open, internet-connected television platform built on common standards, by the United Kingdom's **terrestrial** broadcasters BBC, Channel 4, ITV plc, Five and communications companies Arqiva, BT and TalkTalk.

The partners intend to form a venture to promote the platform to consumers and the content, service and developer community. Canvas-compliant devices (e.g. set-top boxes), built to a common technical standard, would provide seamless access to a range **of third-party services** through a common, simple, user experience.

There are three main elements to the project: setting the technical standard, building the technical platform, and creating the user experience.

34.1.2 Formation

Dec 2008 ✉ Project Canvas formed as a partnership between the BBC, BT & ITV.

July 2009 ✉ Five joined.

Dec 2009 ✉ Channel 4 & Talk Talk joined.

Dec 2009 ✉BBC Trust gave provisional approval to the BBC's involvement.

Mar 2010 ✉ Arqiva as an equal partner in the project.

Mar 2010 ✉ OFT to initiate a consultation process.

34.1.3 Freeview 2.0

In a report, Morgan Stanley referred to Project Canvas as "Freeview 2.0".

Benefits:

- App Store-style resource could be introduced to Canvas in the future.
- Will integrate with social networks such as Twitter.
- Content providers would no longer need to pay £10m for capacity on digital terrestrial television to reach their target audience.
- Will increase consumer demand for fixed broadband packages and promote more expensive tariffs for high definition streaming.

- Storing popular programmes on local Canvas drives would also ease the burden of heavy streaming traffic over broadband networks.

34.1.4 Development

The BBC is working with three partners (Thomson SA, Humax and Cisco Systems) on the development of the core technical specifications. The relationships have NDAs, non-binding collaboration agreements and agreements ensuring any IP the trio develop can be shared with the industry. The system will offer access to the broadcasters' own VOD, but has also promised to offer a SDK to encourage internet content on to the screen. Canvas has also promised to offer payment mechanisms to content owners that wish to charge for their content.

35. Appendix XXVII: HbbTV (Europe)

Hybrid Broadcast Broadband TV (HbbTV) is both an industry standard and promotional initiative for "harmonising the broadcast and broadband delivery of entertainment to the end consumer through connected TVs and set-top boxes".

The HbbTV consortium of digital broadcasting and Internet industry companies is establishing a standard for the delivery of broadcast TV and broadband TV to a television in the home, through a single user interface, creating an open platform as an alternative to proprietary technologies.

Products and services using the HbbTV standard can operate over different broadcasting technologies, such as **satellite, cable or terrestrial** networks. The first demonstrations of HbbTV was made during 2009 in France by France Télévisions and Pleyo for the Roland Garros tennis sport event on a DTT transmission and an IP connection and in Germany, used the Astra satellite at 19.2° east were performed at the IFA and IBC exhibitions.

HbbTV is intended to extend the reach of multimedia content directly to the television set in a seamless, viewer-friendly manner, and to enable the TV viewer to more conveniently access both broadcast digital content (especially HD) and Internet multimedia content (including Internet TV and IPTV) on a TV set using a single remote control/box and a single on-screen interface.

As well as helping consumers/viewers, the introduction of the HbbTV standard is of benefit to both equipment manufacturers and content providers who at the moment have to produce hardware or content specific to each country to meet the de facto standard in that country. The establishment of a unified European HbbTV standard means "content owners and application developers can write once and deploy to many countries".

The HbbTV specification was developed by industry members of the consortium and is based on elements of existing standards and web technologies including OIPF (Open IPTV Forum), CEA, DVB and W3C.

Founding members are ANT Software Limited, SES Astra, Canal+ Group, France Televisions, OpenTV, Philips, TF1, IRT & UER. Samsung & Sony have also joined the group.

36. Appendix XXVIII: Web Technologies

36.1.1 WSDL

The Web Services Description Language (WSDL, pronounced 'wiz-dəl') is an XML-based language that provides a model for describing Web services.

The WSDL defines services as collections of network endpoints, or ports. The WSDL specification provides an XML format for documents for this purpose. The abstract definitions of ports and messages are separated from their concrete use or instance, allowing the reuse of these definitions. A port is defined by associating a network address with a reusable binding, and a collection of ports defines a service. Messages are abstract descriptions of the data being exchanged, and port types are abstract collections of supported operations. The concrete protocol and data format specifications for a particular port type constitutes a reusable binding, where the operations and messages are then bound to a concrete network protocol and message format. In this way, WSDL describes the public interface to the web service.

WSDL is often used in combination with SOAP and an XML Schema to provide web services over the Internet. A client program connecting to a web service can read the WSDL to determine what operations are available on the server. Any special datatypes used are embedded in the WSDL file in the form of XML Schema. The client can then use SOAP to actually call one of the operations listed in the WSDL.

Objects in WSDL:

- **Service:** The service can be thought of as a container for a set of system functions that have been exposed to the web based protocols.
- **Port/Endpoint:** The port does nothing more than defining the address or connection point to a web service. It is typically represented by a simple http url string.
- **Binding:** Specifies the interface, defines the SOAP binding style (RPC/Document) and transport (SOAP Protocol). The binding section also defines the operations.
- **PortType/Interface:** The <portType> element, which has been renamed to <interface> in WSDL 2.0, defines a web service, the operations that can be performed, and the messages that are used to perform the operation.
- **Operation** Each operation can be compared to a method or function call in a traditional programming language. Here the soap actions are defined and the way the message is encoded for example, "literal."
- **Message:** Typically, a message corresponds to an operation. The message contains the information needed to perform the operation.

- **Types**: The purpose of the types in WSDL is to describe the data. XML Schema is used (inline or referenced) for this purpose.

36.1.2 SOAP

SOAP, originally defined as Simple Object Access Protocol, is a protocol specification for exchanging structured information in the implementation of Web Services in computer networks. It relies on eXtensible Markup Language (XML) as its message format, and usually relies on other Application Layer protocols (most notably Remote Procedure Call (RPC) and HTTP) for message negotiation and transmission. SOAP can form the foundation layer of a web services protocol stack, providing a basic messaging framework upon which web services can be built. This XML based protocol consists of three parts: an envelope - which defines what is in the message and how to process it - a set of encoding rules for expressing instances of application-defined datatypes, and a convention for representing procedure calls and responses.

As a layman's example of how SOAP procedures can be used, a SOAP message could be sent to a web-service-enabled web site (for example, a real-estate price database) with the parameters needed for a search. The site would then return an XML-formatted document with the resulting data (prices, location, features, etc). Because the data is returned in a standardized machine-parseable format, it could then be integrated directly into a third-party web site or application.

The SOAP architecture consists of several layers of specifications for message format, message exchange patterns (MEP), underlying transport protocol bindings

The SOAP architecture consists of several layers of specifications for message format, message exchange patterns (MEP), underlying transport protocol bindings, message processing models, and protocol extensibility. SOAP is the successor of XML-RPC.

36.1.3 Session ID

In computer science, a session identifier, session ID or session token is a piece of data that is used in network communications (often over HTTP) to identify a session, a series of related message exchanges. Session identifiers become necessary in cases where the communications infrastructure uses a stateless protocol such as HTTP. For example, a buyer who visits a seller's site wants to collect a number of articles in a virtual shopping cart and then finalize the shopping spree by going to the site's checkout page. This typically involves an ongoing communication where several webpages are requested by the client and sent back to them by the server. In such a situation, it is vital to keep track of the current state of the shopper's cart, and a session ID is one way to achieve that goal.

A session ID is typically granted to a visitor on his first visit to a site. It is different from a user ID in that sessions are typically short-lived (they expire after a preset time of inactivity which may be minutes or hours) and may become invalid after a certain goal has been met (for example, once the buyer has finalized his order, he cannot use the same session ID to add more items).

As session IDs are often used to identify a user that has logged into a website, they can be used by an attacker to hijack the session and obtain potential privileges. A session ID is often a long randomly-generated string to decrease the probability of obtaining a valid one by means of a brute-force search. Many servers perform additional verification of the client, in case the attacker has obtained the session ID. Locking a session ID to the client's IP address is a simple and effective measure as long as the attacker cannot connect to the server from the same address.

A session token is a unique identifier, usually in the form of a hash generated by a hash function that is generated and sent from a server to a client to identify the current interaction session. The client usually stores and sends the token as an HTTP cookie and/or sends it as a parameter in GET or POST queries. The reason to use session tokens is that the client only has to handle the identifier (a small piece of data which is otherwise meaningless and thus presents no security risk) - all session data is stored on the server (usually in a database, to which the client does not have direct access) linked to that identifier.

36.1.4 HTTP Cookie

A cookie, also known as a web cookie, browser cookie, and HTTP cookie, is a text string stored by a user's web browser. A cookie consists of one or more name-value pairs containing bits of information, which may be encrypted for information privacy and data security purposes.

The cookie is sent as an HTTP header by a web server to a web browser and then sent back unchanged by the browser each time it accesses that server. A cookie can be used for authentication, session tracking (state maintenance), storing site preferences, shopping cart contents, the identifier for a server-based session, or anything else that can be accomplished through storing textual data.

As text, cookies are not executable. Because they are not executed, they cannot replicate themselves and are not viruses. However, due to the browser mechanism to set and read cookies, they can be used as spyware. Anti-spyware products may warn users about some cookies because cookies can be used to track people or violate privacy concerns.

Most modern browsers allow users to decide whether to accept cookies, and the time frame to keep them, but rejecting cookies makes some websites unusable.

Uses:

Session management:
Cookies may be used to maintain data related to the user during navigation, possibly across multiple visits. Cookies were introduced to provide a way to implement a "shopping cart" (or "shopping basket"), a virtual device into which users can store items they want to purchase as they navigate throughout the site.

Shopping basket applications today usually store the list of basket contents in a database on the server side, rather than storing basket items in the cookie itself. A web server typically sends a cookie containing a unique session identifier. The web browser will send back that session identifier with each subsequent request and shopping basket items are stored associated with a unique session identifier.

Allowing users to log in to a website is a frequent use of cookies. Typically the web server will first send a cookie containing a unique session identifier. Users then submit their credentials and the web application authenticates the session and allows the user access to services.

Personalization:
Cookies may be used to remember the information about the user who has visited a website in order to show relevant content in the future. For example a web server may send a cookie containing the username last used to log in to a web site so that it may be filled in for future visits.

Many websites use cookies for personalization based on users' preferences. Users select their preferences by entering them in a web form and submitting the form to the server. The server encodes the preferences in a cookie and sends the cookie back to the browser. This way, every time the user accesses a page, the server is also sent the cookie where the preferences are stored, and can personalize the page according to the user preferences. For example, the Wikipedia website allows authenticated users to choose the webpage skin they like best; the Google search engine allows users (even non-registered ones) to decide how many search results per page they want to see.

Tracking:
Tracking cookies may be used to track internet users' web browsing habits. This can also be done in part by using the IP address of the computer requesting the page or the referer field of the HTTP header, but cookies allow for a greater precision. This can be done for example as follows:

1. If the user requests a page of the site, but the request contains no cookie, the server presumes that this is the first page visited by the user; the server creates a random string and sends it as a cookie back to the browser together with the requested page;

2. From this point on, the cookie will be automatically sent by the browser to the server every time a new page from the site is requested; the server sends the page as usual, but also stores the URL of the requested page, the date/time of the request, and the cookie in a log file.

By looking at the log file, it is then possible to find out which pages the user has visited and in what sequence. For example, if the log contains some requests done using the cookie `id=abc`, it can be determined that these requests all come from the same user. The URL and date/time stored with the cookie allows for finding out which pages the user has visited, and at what time.

Third-party cookies and Web bugs, explained below, also allow for tracking across multiple sites. Tracking within a site is typically used to produce usage statistics, while tracking across sites is typically used by advertising companies to produce anonymous user profiles (which are then used to determine what advertisements should be shown to the user).

A tracking cookie may potentially infringe upon the user's privacy but they can be easily removed. Current versions of popular web browsers include options to delete 'persistent' cookies when the application is closed.

Third-party cookies:
When viewing a Web page, images or other objects contained within this page may reside on servers besides just the URL shown in your browser. While rendering the page, the browser downloads all these objects. Most modern websites that you view contain information from lots of different sources. For example, if you type www.domain.com into your browser, widgets and advertisements within this page are often served from a different domain source. While this information is being retrieved, some of these sources may set cookies in your browser. First-party cookies are cookies that are set by the same domain that is in your browser's address bar. Third-party cookies are cookies being set by one of these widgets or other inserts coming from a different domain.

36.1.5 Uniform Resource Locator

In computing, a Uniform Resource Locator (URL) specifies where an identified resource is available and the mechanism for retrieving it. The best-known example of a URL is the "address" of a web page on the World Wide Web, e.g. http://www.example.com

Syntax
Every URL consists of some of the following:

- The scheme name (commonly called protocol), followed by a colon,
- Hostname (alternatively, IP address),
- Port Number,
- Path of the resource to be fetched or the program to be run,
- For programs such as Common Gateway Interface (CGI) scripts, a query string,
- and with HTML documents, an anchor (optional) for where the page should start to be displayed.

The combined syntax is:

```
scheme://username:password@domain:port/path?query_string#anchor
```

- The query string contains data to be passed to web applications such as CGI programs. The query string contains name/value pairs separated by ampersands, with names and values in each pair being separated by equal signs, for example first_name=John&last_name=Doe.

- The anchor part when used with HTTP specifies a location on the page. For example http://en.wikipedia.org/wiki/URL#Syntax addresses the beginning of the Syntax section of the page.

36.1.6 Common Gateway Interface

The Common Gateway Interface (CGI) is a standard (see RFC 3875: *CGI Version 1.1*) that defines how webserver software can delegate the generation of webpages to a text-based application. Such applications are known as CGI scripts; they can be written in any programming language, although scripting languages are often used. In simple words the CGI provides an interface between the webservers and the clients.

The task of a webserver is to respond to requests for webpages issued by clients (usually web browsers) by analyzing the content of the request (which is mostly in its URL), determining an appropriate document to send in response, and returning it to the client.

If the request identifies a file on disk, the server can just return the file's contents. Alternatively, the document's content can be composed on the fly. One way of doing this is to let a console application compute the document's contents, and tell the web server to use that console application. CGI specifies which information is communicated between the webserver and such a console application, and how.

37. Appendix XXIX: Online Retailers

Luxury Retail Brands

- Harrods.com
- John Lewis
- Richemont
- House of Fraser
- Cocosa.com (invitation only)
- MyDeco.com

List of the Top UK Online Retailers:

(Does not include eBay and price comparison sites such as Kelkoo & Froogle)

- Amazon UK
- Argos
- Play.com
- Apple
- Tesco.com
- Amazon.com
- Thomson Holidays
- Tesco Direct
- Dell EMEA
- Expedia.co.uk
- Easyjet
- Marks & Spencer
- Next
- Currys
- Lastminute.com
- HMV.com
- RyanAir
- British Airways
- John Lewis
- Comet UK
- PC World
- Ticketmaster UK
- Thomas Cook

- Ebuyer
- GAME
- O2 Shop
- ASOS
- Debenhams
- B&Q Online
- Littlewoods UK
- Symantec Store
- The Orange Shop
- ASDA
- Woolworths UK
- Boots
- Odeon Cinemas
- Lovefilm.com
- IKEA
- Screwfix Direct
- QVCUK.com
- TopShop.co.uk
- Carphone Warehouse
- Sainsbury’s
- Thomsonfly.com
- HP
- Flybe.com
- Maplin Electronics
- Dixons Online
- Apple iPod & Tunes
- River Island

38. Appendix XXX: Open Source Software Licensing

38.1.1 Introduction

An open source license is a copyright license for computer software that makes the source code available under terms that allow for modification and redistribution without having to pay the original author. Such licenses may have additional restrictions such as a requirement to preserve the name of the authors and the copyright statement within the code.

38.1.2 Copyright

Copyright is the set of exclusive rights granted to the author or creator of an original work, including the right to copy, distribute and adapt the work. These rights can be licensed, transferred and/or assigned. Copyright lasts for a certain time period after which the work is said to enter the public domain. Copyright is described under the umbrella term intellectual property along with patents and trademarks.

38.1.3 Copyleft

Copyleft is a play on the word copyright to describe the practice of using copyright law to offer the right to distribute copies and modified versions of a work and requiring that the same rights be preserved in modified versions of the work.

In general, copyright law is used by an author to prohibit others from reproducing, adapting, or distributing copies of the author's work. In contrast, an author may give every person who receives a copy of a work permission to reproduce, adapt or distribute it and require that any resulting copies or adaptations are also bound by the same licensing agreement. Copyleft type licenses are a novel use of existing copyright law to ensure a work remains freely available. The GNU General Public License was the first copyleft license to see extensive use, and continues to dominate the licensing of copylefted software.

38.1.4 GNU General Public License

The GPL is the first and foremost copyleft license, which means that it requires derived works to be available under the same license terms. Under this philosophy, the GPL grants the recipients of a computer program the rights of the free software definition and ***uses copyleft to ensure the freedoms are preserved***, even when the work is changed or added to. This is in distinction to permissive *free software licenses* like the Apache License.

38.1.5 Eclipse Public License

The Eclipse Public License is designed to be a business-friendly free software license and features ***weaker copyleft provisions*** than contemporary licenses such as the GNU General Public License (GPL). The receiver of EPL-licensed programs can use,

modify, copy and distribute the work and modified versions, in some cases being obligated to release their own changes.

38.1.6 Apache License

The Apache License is a free software license authored by the Apache Software Foundation (ASF). The Apache License requires preservation of the copyright notice and disclaimer, but it is ***not a copyleft license*** — it allows use of the source code for the development of proprietary software as well as free and open source software.

Like any *free software license*, the Apache License allows the user of the software the freedom to use the software for any purpose, to distribute it, to modify it, and to distribute modified versions of the software, under the terms of the license.

The Apache License, like the BSD license, does not require modified versions of the software to be distributed using the same license (in contrast to copyleft licenses). In every licensed file, any original copyright, patent, trademark, and attribution notices in redistributed code must be preserved (excluding notices that do not pertain to any part of the derivative works); and, in every licensed file changed, a notification must be added stating that changes have been made to that file.

38.1.7 Who owns what?

38.1.7.1 Open Source

The Symbian and Android platform software is provided to their prospective bodies by members (and non-members) through contribution licenses.

IPR

Members of the foundation retain their respective IPRs, but agree to the patent and licensing policies of the foundation when joining. In the case of software contribution, each contributor, whether a member or not, agrees to grant to the foundation and its members necessary IPR licenses to such software contribution in order to enable use and development of such contributed code.

Code

Each contributor, both members and non-members, of software retains copyright to its own code, in a classical open source set-up. Contributors grant licenses for such contributions in order to enable use and development of such contributed code. Similarly, the same principle applies to those companies which provide initial contributions to the foundation.

38.1.7.2 Commercial

In the case of Apple, Microsoft and RIM they own their own IPR & Source Code copyright.

38.1.7.2.1 FRAND (Fair, Reasonable & Non Discriminatory terms)

Standard setting organizations commonly have rules that govern the ownership of patent rights that cover the standards they adopt. One of the most common rules is that a patent covering the standard must be adopted on "reasonable and nondiscriminatory terms" (RAND) or "fair, reasonable and nondiscriminatory terms" (FRAND). The two terms are generally interchangeable; FRAND seems to be preferred in Europe and RAND in the U.S.

In licensing, Fair, Reasonable and Non Discriminatory terms (FRAND) refers to the obligation that is often required by Standards Setting Organizations (SSOs) for members which participate in the standard setting process. Standards Setting Organizations are the industry groups which set common standards for particular industry in order to ensure compatibility and interoperability of devices manufactured by different entities.

Standards Setting Organizations include this obligation in their bylaws as a means of enhancing the pro-competitive character of their industry. They are intended to prevent members from engaging in licensing abuse based on the monopolistic advantage generated as a result of having their intellectual property rights (IPR) included in the industry standards. Without such commitment, members could use monopoly power inherent in a standard to impose unfair, unreasonable and discriminatory licensing terms that would damage competition and inflate their own relative position. While there are no legal precedents to spell out specifically what the actual terms mean, it can be interpreted from the testimony of people like Professor Mark Lemley from Stanford University, in front of the United States Senate Committee on the Judiciary that the individual terms are defined as follows:

Fair relates mainly to the underlying licensing terms. Drawing from anti-trust/competition law; fair terms means terms which are not anticompetitive and that would not be considered unlawful if imposed by a dominant firm in their relative market. Examples of terms that would breach this commitment are; requiring licensees to buy licenses for products that they do not want in order to get a license for the products they do want (bundling), requiring licensees to license their own IP to the licensor for free (free grant backs) and including restrictive conditions on licensees' dealings with competitors (mandatory exclusivity).

Reasonable refers mainly to the licensing rates. A reasonable licensing rate is a rate charged on licenses which would not be result in an unreasonable aggregate rate if all licensees charged a similar rate. Clearly aggregate rates that would significantly increase the cost to the industry and make the industry uncompetitive are unreasonable. It is worth noting that a licensor which has several different licensing packages might be tempted to have both reasonable and unreasonable packages. However having a reasonable "bundled" rate does not excuse having unreasonable licensing rates for smaller unbundled packages. All licensing rates must be reasonable.

Non-Discriminatory relates to both the terms and the rates included in licensing agreements. As the name suggests this commitment requires that licensors treat each individual licensee in a similar manner. This does not mean that the rates and payment terms can't change dependent on the volume and creditworthiness of the licensee. However it does mean that the underlying licensing condition included in a licensing agreement must be the same regardless of the licensee. This obligation is included in

order to maintain a level playing field with respect to existing competitors, and to ensure the potential new entrants are free to enter the market on the same basis.

The most controversial issue in FRAND licensing is whether the "reasonable" license price should include the value contributed by the standard-setting organization's decision to adopt the standard. A technology is often more valuable after it has been widely adopted than when it is one alternative among many; there is a good argument that a license price that captures that additional value is not "reasonable" because it does not reflect the intrinsic value of the technology being licensed.

39. Appendix XXXI: Patent Troll

Patent troll is a pejorative term used for a person or company that enforces its patents against one or more alleged infringers in a manner considered unduly aggressive or opportunistic, often with no intention to manufacture or market the patented invention.

39.1.1 Causes

Patent trolls may buy patents cheaply from entities not actively seeking to enforce them. For example, a company may purchase hundreds of patents from a technology company forced by bankruptcy to auction its patents.

The cost of defending against a patent infringement suit, as of 2004, is typically $1 million or more before trial, and $2.5 million for a complete defense, even if successful. Because the costs and risks are high, defendants may settle even non-meritorious suits they consider frivolous for several hundred thousand dollars. The uncertainty and unpredictability of the outcome of jury trials also encourages settlement.

39.1.2 Effects

A core criticism of patent trolls is that "they are in a position to negotiate licensing fees that are grossly out of alignment with their contribution to the alleged infringer's product or service", not their non-practising status or the possible weakness of their patent claims. The risk of paying high prices for after-the-fact licensing of patents they were not aware of, and the costs for extra vigilance for competing patents that might have been issued, in turn increases the costs and risks of manufacturing.

On the other hand, the ability to buy, sell and license patents is generally productive. By creating a secondary market for patents, these activities make the ownership of patents more liquid, thereby creating incentives to innovate and patent. Also, aggregating patents in the hands of specialized licensing companies facilitates access to technology by more efficiently organizing ownership of patent rights.

39.1.3 Mechanics

Patent trolls operate much like any other company that is protecting and aggressively exploiting a patent portfolio. However, their focus is on obtaining additional money from existing uses, not from seeking out new applications for the technology. They monitor the market for possibly infringing technologies by watching popular products, news coverage and analysis. They also review published patent applications for signs that another company is developing infringing technology, possibly unaware of their own patents. They then develop a plan for how to proceed. They may start by suing a particularly vulnerable company that has much to lose, or little money to defend itself, hoping that an early victory or settlement will establish a precedent to encourage other peer companies to acquiesce to licenses. Alternately they may attack an entire industry at once, hoping to overwhelm it.

An individual case often begins with a ***perfunctory infringement complaint***, or even a mere threat of suit, which is often enough to encourage settlement for the nuisance or "threat value" of the suit by purchasing a license to the patent. In the United States, suits are often brought in United States District Court for the Eastern District of Texas, known for favoring plaintiffs and for expertise in patent suits.

The uncertainty and unpredictability of the outcome of jury trials also encourages settlement. If it wins, the plaintiff is entitled as damages an award of at least a "reasonable" royalty determined according to the norms of the field of the patented invention.

Patent trolls are at a disadvantage in at least two ways:

- First, patent owners who make and sell their invention are entitled to awards of lost profits. However, patent trolls, being non-manufacturers, typically do not qualify.

- Further, patent owners' rights to bar infringers from manufacture, use, or sale of technologies that infringe their patents has recently been curtailed in the court decision eBay Inc. v. MercExchange, L.L.C.. Rather than automatically granting an injunction, the US Supreme Court stated that Courts must apply a standard reasonableness test to determine if an injunction is warranted. Writing in Forbes magazine about the impact of this case on patent trolls, writer Jessica Holzer concludes: "The high court's decision deals a blow to patent trolls, which are notorious for using the threat of permanent injunction to extort hefty fees in licensing negotiations as well as huge settlements from companies they have accused of infringing. Often, those settlements can be far greater than the value of the infringing technology: Recall the $612.5 million that Canada's Research in Motion forked over to patent-holding company NTP to avoid the shutting down of its popular BlackBerry service."

39.2 Defenses

Patent troll "companies have no interest in using the patents... but instead hope to reap large sums of money from the lawsuits themselves." This gives them an advantage over manufacturers since they are relatively immune to the typical defensive tactic large entities use against small patent plaintiffs, because the cost of litigation tends to fall more heavily on an accused infringer than on a plaintiff with a contingency-fee lawyer, and because trolls have an almost-unrestricted ability to choose their preferred plaintiff-friendly forums, most prominently the Eastern District of Texas.

Such defense tactics can be perceived as both good and bad. Among the common techniques rendered ineffective are:

- ***Monitoring*** patent activities of competitors to avoid infringing patents (since patent trolls are not competitors, productive companies usually have no way to find out about the troll or its patents until after significant investments have been made to produce and market a product);

- Going on the offensive with ***counterclaims*** that accuse the patent plaintiff of infringing patents owned by the defendant (the mutual threat often leads the parties to arrive at a mutually beneficial cross-licensing arrangement);

- a "***scorched earth***" defense designed to drive up litigation costs (which is equally ineffective because patent trolls plan for and have the finances to fully litigate a case. In fact, some are able to draw on hedge funds and institutional investors to finance their patent cases).

- ***Patent "pooling"*** arrangements where many companies collaborate to bring their patented knowledge together to create new products are also inapplicable to patent trolls because they operate outside the system.

- Substantial companies that attempt over-reaching patent litigation are subject to losing their patent rights to a defensive claim of patent misuse. However, defendants find it difficult to charge patent trolls with misuse because the antitrust violations typically involved require significant market power on the part of the patent holder.

Nevertheless, manufacturers do use various tactics to limit their exposure to patent trolls. Most have broader uses as well for defending their technologies against competitors. These include:

- ***Design arounds*** can be a defense against patent trolls. The amount of license fee that a patent troll can demand is limited by the alternative of the cost of designing around the troll's patent(s).

- ***Patent watch***. Companies routinely monitor new patents and patent applications, most of which are published, to determine if any are relevant to their business activities.

- ***Clearance search***. A standard practice is to perform a clearance search for patents or pending patent applications that cover important features of a potential product, before its initial development or commercial introduction. For example, a search by Thomas Edison uncovered a prior patent by two Canadian inventors, Henry Woodward and Mathew Evans for carbon filament in a non-oxidizing environment, (U.S. Patent 181,613), the type of light bulb Edison wanted to develop. Edison bought the patent for US$5,000 ($112,345 in present-day terms) to eliminate the possibility of a later challenge by Woodward and Evans.

- ***Opposition proceeding***. In Europe, third parties may conduct a proceeding to oppose overly broad patents. There is a more limited process in the United States, known as a reexamination. As an example, Research In Motion, filed reexaminations against broad NTP, Inc. patents related to BlackBerry technology.

- ***Litigation***. Whereas some companies acquiesce to a troll's demands, others go on the offensive by challenging the patents themselves, for example by finding prior art that invalidates their patentability. They may also broadly challenge whether the technology in question is infringing, or attempt to show patent

misuse. If successful, such a defense not only wins the case at hand but destroys the patent troll's underlying ability to sue. Knowing this, the patent troll may back down or lessen its demands.

- ***Early settlement***. An early settlement is often far less expensive than litigation costs and later settlement values.

- ***Patent infringement insurance***. Insurance is available to help protect companies from inadvertently infringing a third party's patents.

- ***Defensive patent aggregation***, the practice of purchasing patents or patent rights from patent holders so they don't end up in the hands of an individual or enterprise that can assert them. Increasingly aggregations are focused on purchasing patents and patent rights off the open market, or out of NPE assertion and litigation, which directly impact the businesses of the aggregation's members. The aggregator then provides members a broad license to everything it owns in exchange for an annual fixed-fee.

Patent defense companies have been formed in order to counteract problems caused by patent trolls in the high technology industry.

- A group of 11 high-tech companies including Cisco Systems, Ericsson, Google, Hewlett-Packard, and Verizon formed in 2008 Allied Security Trust with the goal of identifying and obtaining key patents prior to falling into the hands of patent trolls.

- In 2008 RPX Corporation introduced the RPX Defensive Patent Aggregation service to help e-commerce, financial services, hardware manufacturing, networking, software, and wireless companies reduce the risk of NPE assertion and litigation by purchasing patents off the open market.

40. Appendix XXXII: Selling Technology

40.1.1 What to sell?

The Go-to-Market plan depends on where in the value chain that a company can add most value. A high level value chain can be seen in Figure 37 below. Four general sales models based on which level a company can add the most value will be explored. The options are as follows:

- Service (High on the Value Chain)
- Solutions
- Products
- Technology / IP (Low on the Value Chain)

Each option has different characteristics that greatly influence how a company will be structured. These characteristics can be explored under the 4 Ps – product, promotion, positioning & pricing.

Figure 37: Broadband-on-the-Move value chain

40.1.1.1 Selling technology / IP

Characteristics:

Product: Intellectual Property or Source Code

Positioning: Explain value of technology to product manufacturers

Pricing: Low

Promotion: “More bang for your buck”

Revenue streams will be:

- Technology licensing
- Maintenance (including minor upgrades)
- Services
    - Consulting
    - Training

Qualcomm and ArrayComm are examples of a technology selling company. Qualcomm have IP in CDMA and they license this technology and sell their technical knowhow as a service to their customers. This option would allow us to focus on our technology and their IP would be brought to market by other product and solution developers.

40.1.1.2 Selling Products

This option is a step up the value chain from licensing technology. To turn technology into a product will require additional experience in adjacent technology.
Characteristics:

Product: High quality, easy to use and packaged product

Positioning: To be part of a larger solution

Pricing: Maintaining pricing depends on building market awareness

Promotion: More complex, including branding & trade show presence

Revenue streams will be:

- Product sales
- Maintenance (including minor upgrades)
- Services

- Consulting
- Training
- Install
- Support

Thrane of Denmark is an example of a product developer and seller. They bring together technology components, design and manufacture a satellite based product.

40.1.1.3 Selling Solutions

This option is the higher in the value chain. The idea is that a solution solves a well-known problem or pain, i.e. the problem of lack of high speed communications for border patrols in large remote areas. Our company will be the main contact to the market and will be seen as the thought leader in the market. Characteristics:

Product:	Etherware product + 3rd party products = Solution
Positioning:	Each solution will be adapted to a vertical market
Pricing:	Initial pricing is high with scope to increase pricing over time
Promotion:	A solution for each market segment

Revenue streams will be:

- Solution sales
  - Tomahawk product sales
  - 3rd party product sales with 30% discount for acting as re-seller
  - Future major upgrades
- Maintenance (including minor upgrades)
- Services
  - Consulting
  - Training

- Install
- Support

Example solutions could be Mobile Broadband Solutions for

- Online Selling Solutions for Retail
- Online Selling Solutions for Health
- Online Selling Solutions for Media (Subscriptions)
- Online Selling Solutions for Media (Advertising)

IBM was one of the first companies to pioneer solution based selling. Most IT companies, like HP, have followed suit. In addition, the big Telco vendors also pursue this selling strategy. It enables large revenue streams through the selling of professional services.

To be successful in solutions selling we must have very strong relationships with the above verticals.

40.1.1.4 Service Provider Model

In this model, we will offer a service to the market. The Service model can lead to repeat revenue generation on a large scale.

Product:	Service = Solution + Content
Positioning:	PPV content for BB on the move
Pricing:	Upfront fee for receiving hardware + monthly fee for channels
Promotion:	High volume marketing to increase subscriber base

Revenue streams will be:

- Subscription fees
    - Maintenance (including minor upgrades)

    - Services
        - Consulting
        - Training
        - Install
        - Support
- Advertising fees

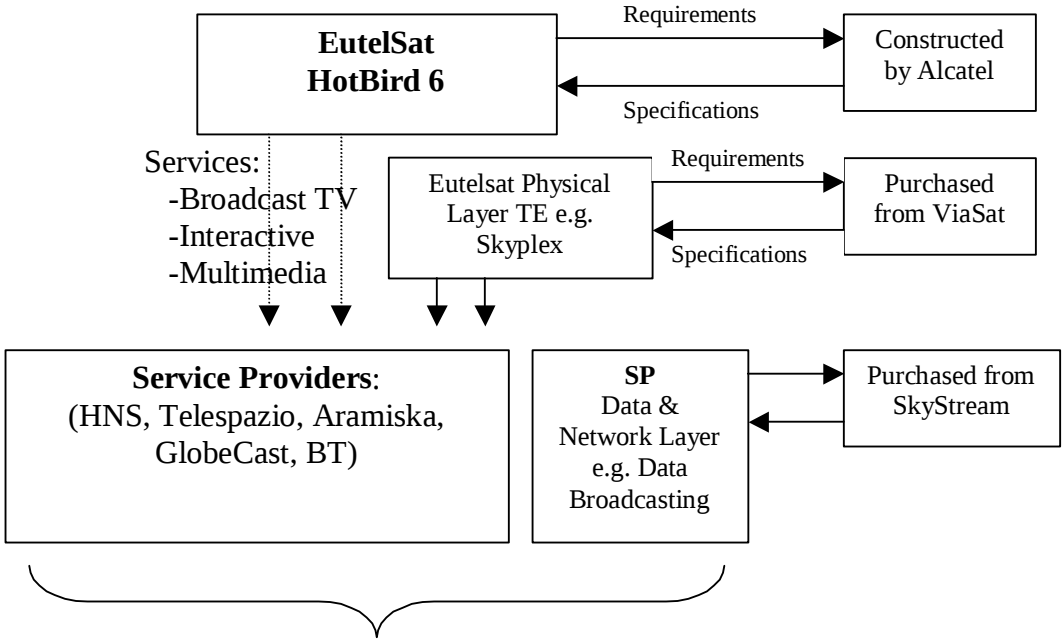
To run such a service has associated high fixed costs. Building a subscriber base is a major marketing exercise.

41. Appendix XXXIII: Satellite Eco-system

The satellite market ecosystem can be explained by focusing on a single satellite provider, as in Figure 38 below. The example satellite provider is Eutelsat, Europe's largest satellite provider. At the top of the value chain is Eutelsat controlling, through technical specifications and pricing, almost all aspects on the remaining value chain.

Eutelsat offer to Service Providers two things, a number of services and physical layer terminal equipment. The equipment must meet the exact specifications of HotBird 6 in order for interoperability.

The Service Provider adds value by packaging the satellite capacity and terminal equipment with terrestrial communication services to offer a particular market segment a solution.



Market Segment Offering consisting of:
Satellite capacity, Service & Terminal equipment.
E.g. BT Data Broadcasting Services to Large Corporates in the UK

Figure 38: Satellite Communications Ecosystem

What is of interest is where in the value chain the equipment manufactures interface with the service value chain. The highest level is the satellite manufacturer, in this case Alcatel. For interoperability reasons, the satellite provider tightly controls any equipment needed peer-to-peer communications with the satellite. The lowest level is related to the Service Provider. Here terminal equipment must interoperate with the Service Providers networks and support systems as well as the relevant transponder.

42. Appendix XXXIV: Atom (System-on-Chip for IPTV)

Intel’s Atom Chip Supports:

- Digital TVs, DVD players & set-top boxes
- Supports Internet & Broadcast applications on one chip
- Adobe Flash 10 Player
- Supported by BBC, CBS, Cisco & Transgaming
- Transgaming:
  Gametree.tv (port existing games onto Atom platform)
- Powerful enough for 3-D gaming
- Social Networking
- OpenGL ES 2.0
- Support for TV widgets & Interactive TV applications (for navigation)
    - Accedo Broadband
    - The Associated Press
    - BIGSTAR.tv
    - CBS
    - CinemaNow
    - Dailymotion
    - Immediatek
    - Mediafly
    - MyVideo
    - Netflix
    - PlayJam
    - radioTime
    - RallyPoint
    - ShowTime Networks
    - Tagesschau
    - Wherever TV

43. Appendix XXXV: Cisco MediaNet

43.1.1 Introduction

Malachy Moynihan, vice president for video product strategy, Cisco Service Provider Video Technology Group, discussed how delivering premium video to the TV will require intelligent networks and content storage.

"Cisco is helping service providers evolve their networks to a medianet, integrating the best elements of the existing broadcast infrastructure with carrier-grade IP networks to provide new services like unified video experience," said Moynihan. "The crucial components to enable a unified video experience include the need for an emerging monetization model across the video ecosystem as well as client devices with quality graphics and a high-performance processor to truly enhance the visual appeal for consumers."

43.1.2 Cisco MediaNet

Cisco® Content Delivery System (CDS) product family introduces a novel approach for video content delivery where functions such as content ingest, storage, distribution, ad-insertion, and streaming are performed in an intelligent way across a network-based, modular platform. Such "virtual video server" approach offers unprecedented level of scalability and reliability while providing Service Providers a unique service velocity edge to deliver the next generation of personalized entertainment and interactive media to their subscribers.

The Content Delivery System product family consists of Content Delivery Applications (CDAs), which are the software elements of the CDS (providing capabilities such as ingest, storage, caching, personalization, and streaming) and Content Delivery Engines (CDEs), which are a set of carrier-class, high-performance server appliances.

The Cisco Content Delivery Applications (CDAs) for TV Streaming are a set of standards-based applications that allow carriers to deploy a variety of next-generation, value-added video entertainment services such as Video on Demand, network-based Personal Video Recording (nPVR) and Broadcast Services.

44. Appendix XXXVI: UK Telephone Numbers

Area Code Prefix	Service Type
00	International dialing
01	Geographic area codes
02	New geographic area codes
03	Non-geographic number range, charged at geographic rates
04	Reserved
05	Corporate numbering
06	Not used
07	Mobile phones, pagers and personal numbering
08	Freephone and shared cost/special rates
09	Premium rate

Figure 39: List of UK telephone dialing codes

In the UK, phone numbers starting with 01 or 02 generally; for example a company whose number starts with 020 would usually be based in London, a company whose number starts with 0141 would be based in Glasgow. Phone numbers starting with 08 do not indicate the business's location and are known as non-geographic numbers.

0800/0808: These numbers, also known as "freephone" numbers, are generally used for sales enquiry lines and are shown to significantly enhance response rates – 7 out of 10 people are more likely to call a freephone number than any other number.

0845: Calls to these numbers are billed at local rate to the caller and are generally used for customer service lines. The local call cost underlines an organisation’s commitment to customer service.

0870: Calls to these numbers are charged at national rate and give the impression of a large, national organisation.

45. Appendix XXXVII: TR-069 & TR-101

45.1.1 TR-069

TR-069 (short for Technical Report 069) is a DSL Forum (which was later renamed as Broadband Forum) technical specification entitled CPE WAN Management Protocol (CWMP). It defines an application layer protocol for remote management of end-user devices.

As a bidirectional SOAP/HTTP based protocol it provides the communication between customer-premises equipment (CPE) and Auto Configuration Servers (ACS). It includes both a safe auto configuration and the control of other CPE management functions within an integrated framework. In the course of the boom of the broadband market, the number of different Internet access possibilities grew as well (e.g. modems, routers, gateways, set-top box, VoIP-phones). At the same time the configuration of this equipment became more complicated -- too complicated for the end-users. For this reason the TR-069 standard was developed. It provides the possibility of auto configuration of these access types. The technical specifications are managed and published by the Broadband Forum. Using TR-069 the terminals can get in contact with the Auto Configuration Servers (ACS) and establish the configuration automatically. Accordingly other service functions can be provided. TR-069 is the current standard for activation of terminals in the range of DSL broadband market. Other fora, such as the Home Gateway Initiative (HGI) and Digital Video Broadcasting (DVB), are endorsing CWMP as the protocol for remote management of home network devices (e.g. the HGI gateway) and terminals (e.g. the DVB IPTV set-top box)

There is a growing trend to add TR-069 management functionality to home networking devices such as powerline adapters used for distribution of IPTV content inside customer premises, as well as many other access devices like FTTH CPE/ONTs and other carrier access equipment

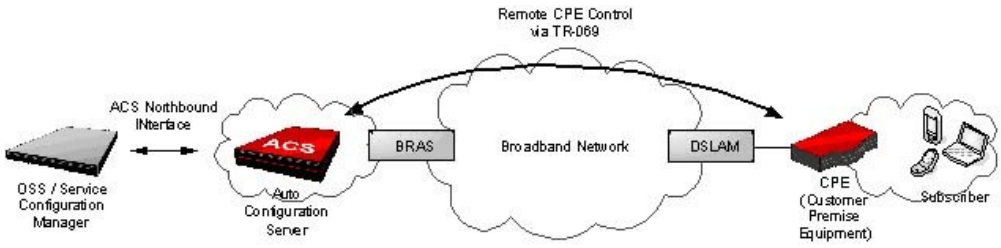


Figure 40: Overview of TR-069

Functions supported by TR-069

- Autoconfiguration and dynamic service activation

    - initial CPE configuration
    - remote CPE configuration
- firmware management
    - version management
    - update management
- status and performance control
    - logfile analysis and dynamic messages
    - diagnostics
    - connectivity and service control.

In the future TR-069 will control many additional options of the CPEs additionally to the pure standards for activation:

- enquiry of the equipment functions
- enquiry of information, diagnostics, status and capacity
- automatic process-controlled alarm
- irrespective gateway data model, in access with TR-064 it is upgradeable with secondary equipment and functions

45.1.2 TR-101: Ethernet over DSL

This document outlines how an ATM aggregation network can be migrated to an Ethernet based aggregation network. This document provides an architectural/topological model of such an Ethernet based aggregation network that supports the business requirements. In doing so it describes requirements for protocol translation and interworking, QoS, multicast, security, and OAM for a DSL aggregation network.

TR-058 describes the marketing requirements for a multi-service architecture. These requirements include the following capabilities:

- Improved transport
- Many-to-many access
- Differentiated services (QoS)
- Bandwidth services

- Content Distribution
- Simpler provisioning
- Support for business services(e.g. Layer 2 VPN, high availability, higher bit rate services)

46. Appendix XXXVIII: OFCOM NGA

Next Generation Access (NGA) will dramatically increase broadband speeds for European consumers and business over the coming years. However, it also threatens to disrupt established modes of competition and raises complex issues for telecommunications regulation.

In traditional telco access networks, the architecture of the copper network lent itself to infrastructure-based competition in the form of Local Loop Unbundling (LLU). In countries such as the UK and France, service providers invested in LLU creating price-competitive broadband markets, rich in innovation and service differentiation.

Looking forward, it is unlikely that the same degree of infrastructure-based competition will exist in an NGA world. The economics of laying fibre or deploying electronics in street cabinets do not favour multiple access networks. Furthermore, unbundling may not be technically possible in certain situations, for example where the incumbent chooses Passive Optical Networking (PON) for its fibre-to-the-home (FTTH) network.

In geographies where infrastructure-based alternatives are technically or economically unviable, service providers will be forced to rely on wholesale bitstream from the network operator to serve their end customers. Such wholesale offers have historically consisted of simple bitstream services or resale of the incumbent's retail offer, supporting little or no differentiation. NGA therefore risks eroding the competitive benefits won through LLU.

Strategically, telecommunications regulators see benefits from NGA but want to maintain a high degree of service innovation and consumer choice. The question is how to achieve this with wholesale access.

In the UK, Ofcom sees wholesale access as a necessary complement to infrastructure-based competition in NGA. Ofcom is therefore supporting the development of fit-for-purpose wholesale products. Ofcom is not attempting to specify the products directly, but has worked with industry to define a desirable set of characteristics for NGA wholesale access products: a concept it terms Active Line Access (ALA). The intention is that an ALA-compliant product would provide a service provider with a degree of control as close as possible to that of having its own network - a step change from traditional wholesale access.

There are five key characteristics of ALA as follows:

- Flexibility in selection of the aggregation interconnect point
- Ability to support QoS
- Flexibility in the types of user-network interface and CPE that can be supported
- Ability to guarantee network and service security and integrity

- Ability to support multicast services

In addition to the capabilities, Ofcom and the industry identified Ethernet as the most appropriate technology to realise ALA. Ethernet was chosen for its widespread adoption, support for a wide range of physical media, and its transparency to higher layer protocols.

Having agreed the characteristics of Ethernet ALA, Ofcom's next step was to understand whether there were barriers to realising the ALA concept in practice. To this end, Ofcom engaged industry consultants CSMG to develop case studies of real-world wholesale Ethernet-based access services, and to assess the extent to which they embodied the desired characteristics of ALA. The case studies were drawn from international markets and were selected to cover a range of network architectures and market segments.

COLT was included in the study to provide an example of wholesale Ethernet delivered over a copper network. Although best known for its fibre optic metro area networks, COLT has increased its network reach using Ethernet in the First Mile (EFM) over LLU. COLT's wholesale services are available across both infrastructures and include Internet Access, Ethernet Services, IP-VPN and VoIP.

Of the fibre-based examples, ***Optimum Lightpath*** has a metro ring architecture in cities on the East coast of the USA. Optimum Lightpath uses Ethernet in the access network to transport its business-focused voice, data and video services and also to serve the wholesale service provider market.

In Canada, ***Telus*** offers wholesale Ethernet access over both its metro fibre rings and point-to-point fibre access networks. Telus uses Ethernet access to provide E-Line and E-LAN services for business customers, emulating leased lines and LANs respectively.

Although not having a wholesale offer, ***Iliad*** was included as it uses Ethernet to deliver retail triple-play services on its FTTH network in France. In the wholesale market, Iliad plans to offer unbundled fibre access rather than an active Ethernet service.

BBned, in the Netherlands, provided an example of an alternative operator using point-to-point fibre to serve residential and business end-users. BBned's FTTH footprint includes Amsterdam where it operates the active layer of Amsterdam's CityNet network.

Also in the Netherlands, ***KPN*** offers a spectrum of wholesale access options including unbundled fibre and copper. Its wholesale Ethernet service is known as "Wholesale Broadband Access" (WBA) - first launched on ADSL in 2006 and extended to VDSL and FTTH in 2008.

Finally, as an example of wholesale Ethernet services on a Passive Optical Network, we included ***NTT***'s layer 2 "LAN Communications" service which is available across both its PON and point-to-point access fibre networks in Japan.

CSMG developed the case studies through a series of interviews with technical and product marketing executives from the network operators. Input was also taken from service provider customers, national regulators and vendors to provide a 360° view.

Looking at the first of the five characteristics, we found considerable ***flexibility in the range of interconnect and aggregation options***. A range of interconnect points were available, enabling aggregation of traffic at local, regional and national levels. One operator also offered international aggregation, i.e. a single interconnect could be used to reach end-users in multiple countries.

We also found strong support for ***QoS***, with network operators adopting one of two approaches. The first of these was to guarantee the bandwidth of individual access connections. The second approach was to classify the traffic (e.g. voice, video and data) and provide guarantees for the performance of traffic within each class. Guaranteed bandwidth was popular in the business market, where end-customers were using Ethernet services substitutes for leased lines. Class of Service was more popular in the consumer market as it enables network capacity to be shared and hence supports lower cost services.

In terms of ***flexibility at the user-network interface***, in all but one of the case studies the network operator installed an active device at the customer's site to present Ethernet ports towards the customer. We found it was common practice for service providers to add their own CPE resulting in two devices in the customer's home or office. At the time of the study, KPN was unique in providing a ‘wires-only' service; however, given historic trends we expect wires-only presentation to become more common in NGA over time.

The ability to ***guarantee security and integrity*** was largely determined by the architecture adopted by the network operators and the functionality of their network equipment. The primary techniques in play were to separate customer traffic logically and lock down vulnerable communications, e.g. using VLANs, controlling broadcast traffic, and preventing user-to-user communication at Layer 2. The shared-access medium in PON introduces additional potential risks in terms of eavesdropping and denial of service, which service providers will need to consider in designing their retail propositions.

Of the five ALA characteristics, the one with least support was ***multicast***. Only BBned and Optimum Lightpath had incorporated multicast into their wholesale offers, although the majority of network operators employed it to carry their retail services (e.g. television broadcast or video conferencing). Without access to multicast, it is unlikely that service providers would be able to offer competing retail services as the bandwidth cost of unicasting the traffic would be prohibitive.

Returning to the overall objective of the research, the case studies demonstrate that examples of most ALA characteristics can already be found real-world wholesale Ethernet access services. The presence of these characteristics in commercially available wholesale offers gives credence to the vision of ALA compliant services being realized in practice. The study therefore supports the view that Ethernet ALA would be a useful component of a future regulatory toolkit for NGA.

Going forward, having established the ALA concept Ofcom is now working with industry to promote the standardisation of Ethernet ALA. Ofcom see ALA as having

European, if not global relevance, and therefore plan to hand over the technical requirements to standards bodies as a next step. International standardization would enable widespread adoption by network operators and in turn deliver global scale economies in ALA-compliant infrastructure. Network operators stand to benefit from attracting service providers to their network, and for service providers ALA creates the opportunity for control and differentiation without the need to own infrastructure. Finally, for end customers, ALA promises to support a competitive and innovative market for broadband services.

47. Appendix XXXIX: ECI Hi-FOCuS MSAN

Thanks to its numerous deployments in some of the largest IPTV networks, ECI has the experience to know what operators need in their IPTV networks. This hard won knowledge is a vital yet intangible extra that other equipment vendors cannot offer. ECI's Hi-FOCuS Multi-Service Access Node (MSAN) family, with its common firmware, shared components and integrated management platform, has been designed with feedback from IPTV pioneers who have deployed the products, thus ensuring that the feature set meets all the requirements for a successful IPTV network. Though these requirements are detailed, most can be covered under the three headings of capacity, security and flexibility.

47.1.1 Flexibility

To start with the last – flexibility. Except for the extremely rare case where an operator has a pure greenfield buildout, any IPTV deployment is going to have to make use of existing infrastructure, and will almost certainly need to use a mix of subscriber connection methods. Some subscribers will be served using fiber, either GPON or Gigabit Ethernet, while others are likely to require leveraging of existing ADSL2+ or VDSL connectivity. Furthermore, in the case of xDSL, the street equipment that serves them will usually also have to support subscribers who are using POTS/ISDN or Internet-only xDSL services. During the IPTV rollout, the backhaul for xDSL may change from ATM to Ethernet, which might imply that the existing DSLAMs also have to be swapped out. However, the Hi-FOCuS MSAN can aggregate ATM DSLAMs using its built in ATM engine, thereby reducing the initial investment required. Subsequently, since the MSAN supports xDSL backward compatibility, xDSL subscribers can become IPTV subscribers with only a change of CPE – something the subscriber will need anyway in order to connect his TV.

On the fiber side, things are usually simpler, but not always. For example, a provider who has decided to offer Ethernet to businesses but serve homes with GPON may discover that in some locations homes and businesses must be served from the same network node. Another way that the Hi-FOCuS MSAN's flexibility provides benefits is its support of multiple access network topologies such as rings, stars and daisy-chains. No matter what topology is used, an MSAN network remains highly resilient, with fast network reconvergence after outages. Not only does this increase uptime and subscriber satisfaction, but it also means that the amount of new fiber required to support the IPTV rollout will be kept at a minimum. Furthermore, this topological flexibility means that new Points-of- Presence (POPs) may be added to handle additional demand without any need to worry about how to connect them to the existing access network.

Finally, of course, any provider, even a greenfield one, will discover that some locations require larger-sized distribution devices than others. Flexibility also means the requirement to cope with changes in bandwidth demand, and the ability to upgrade certain links to higher bandwidths without impacting the rest of the network.

The differing technology requirements could lead to a nightmare of different equipment, and severe issues with spare parts stocking. These issues can be reduced by the use of a common platform. ECI's Hi-FOCuS MSAN family uses common

linecards throughout its product range and supports any mix of copper and fiber in the same device, as well as analog voice and VoIP. Standardizing on such a platform also means that gradual migrations of (for example) xDSL to fiber can be managed without the need to totally replace street equipment or interrupt service to adjacent subscribers.

In addition to supporting a wide variety of subscriber connections, network topologies and distribution devices, the Hi-FOCuS MSAN has also been designed to handle differing availability of power (varying from none to CO-style reliable DC) that particular street cabinets may have. Smaller members of the MSAN family can be powered remotely, with power delivered over standard telephone lines using ECI's RLP (Remote Line Power) technology; hence subscribers at even the most remote locations can be given high-speed access.

Finally, so far as flexibility is concerned, it is critical that the network be able to support other uses that have yet to be imagined. Thus far, no new "killer application" has been identified for broadband networks, but the spread of mass multiplayer online gaming (MMOG) and online virtual communities gives an indication of some of the potential increase in service-driven network traffic that could be required. Currently, multiplayer games are usually run by having all players connected by point-to-point links to a single server. It is quite plausible that future efforts might use multicast groups with all players (and the server) multicasting updates. Peer-to-peer multicasting like this could imply radically different methods of handling multicast traffic and even potentially of network design. A well-engineered IPTV network must be able to support this kind of traffic without having to replace hardware.

47.1.2 Security

Security is a critical issue for any network, and this is particularly true for IPTV, with its requirements for content protection and service continuity. The Hi-FOCuS MSAN family supports VLANs and other methods of traffic separation. One critical requirement is to remove any requirement that the CPE and its link to the network are "trusted" with regard to the rest of the network. This means that control VLANs in particular must not be extended to the customer premises. The MSAN safeguards against this. Provisioning and management take place over VLANs which cannot be extended downstream to CPEs. If control of the CPE is required, that will use a separate VLAN. Likewise, separate VLANs may be used for Internet, voice and video traffic to and from the CPE, with monitoring available for each to ensure that only permitted IP packet types are sent on the prioritized Voice and Video VLANs.

ECI's SUMO (Service, User, MSAN, Operator) strategy splits security into a number of domains. Each domain is isolated and separately secured with its own security features. This protection means that, in the event of a security attack, no intruder is able to penetrate from one domain to another or to gain access to adjacent CPEs.

The separation of domains is also critical for the prevention of denial of service (DoS) attacks, and even distributed DoS attacks. The separation makes it nearly impossible for DoS attacks to penetrate the network effectively and, in combination with subscriber management features such as simultaneous channel limits and bandwidth caps, means that individual subscribers are unable to overwhelm the network infrastructure. These limits are managed in a distributed fashion at the edge of the network by the MSAN, thus out-of-contract traffic is never seen by any part of the

upstream network and does not impact any other part of it. This distributed management is key to defending against distributed DoS exploits because one way that a distributed DoS attack works is to overwhelm the resource that is used to determine access to services.

The same strategy also works in reverse. Not only is it important that unauthorized data not be injected into the network, but subscribers must also not be able to receive data that they are not entitled to. The MSAN helps by only transmitting data to the CPE that is explicitly authorized. In the video domain, for example, this is done by the pruning of multicast trees, which ensures that subscribers are unable to watch content to which they are not subscribed, as these channels are not sent to their CPE.

47.1.3 Capacity and Capacity Management

Bandwidth capacity is the obvious requirement for IPTV, particularly in HDTV forms. MPEG4-compressed 1080i HDTV transmissions require between 15 and 30Mbps1. This compares to the 2-4 Mbps required for a standard transmission (using standard MPEG2). If, as seems likely, the majority of transmissions move to HDTV, then a nominal 100+ channel system could theoretically require up to 3Gbps of total bandwidth just for TV, compared with just 400Mbps if the channels were standard definition. This potentially overwhelming bandwidth requirement, combined with the need to simultaneously support other services such as voice and regular Internet access, means that the network must include elements that can optimize traffic patterns.

The ECI Hi-FOCuS MSAN platform implements per-service, per-subscriber bandwidth enforcement at the access node, and individual MSANs communicate available bandwidth and bandwidth requests with the edge router to allow for optimum allocation. In addition, the Hi-FOCuS MSAN implements QoS prioritization to reduce the impact of temporary oversubscription, and aggressive IGMP pruning strategies to handle multicast trees. This pruning is critical to ensure that links are not overloaded with content that is not required by those downstream of them.

While IGMP pruning is good from a capacity management point of view, it could potentially impact perceived user responsiveness when channel zapping. ECI's IGMP snooping permits fast joins of multicast groups, which negates this issue, while the pruning ensures that the subscriber's link is not overwhelmed because multiple channels are being sent down it simultaneously.

Finally, it is worth pointing out that capacity management ties neatly into statistics gathering. The Hi-FOCuS MSAN is able to gather statistics that can be used for more than network management and capacity planning. It is possible to export usage data into billing systems, either as a primary source of billing information or as a verification to ensure that there is no revenue leakage. The same data can also be fed into systems such as content recommendation engines, providing information about such things as what TV channels were watched and when. This, combined with the program guide, can allow the content recommendation engine to determine what interests the subscriber may have, and thus customize offerings in the future.

48. Appendix XXXX: Application: Digital Cinema

Digital cinema refers to the use of digital technology to distribute and project motion pictures. A movie can be distributed via hard drives, optical disks (such as DVDs) or satellite and projected using a digital projector instead of a conventional film projector. Digital cinema is distinct from high-definition television and in particular, is not dependent on using television or HDTV standards, aspect ratios, or frame rates. Digital projectors capable of 2K resolution began deploying in 2005, and since 2006, the pace has accelerated. (2K refers to images with 2048 horizontal pixel resolution.)

48.1.1 Technology

To match or improve the theater experience of movie audiences, a digital cinema system must provide high-quality image and sound. Additionally, theater managers require server controls for managing and displaying content in multiple theaters, and studios want their content encrypted with secure delivery, playback, and reporting of play times to the distribution company.

Digital Cinema Initiatives (DCI), a joint venture of the six major studios, published a system specification for digital cinema. Briefly, the specification calls for

- Picture encoding using the ISO/IEC 15444-1 "JPEG2000" (.jp2) standard and use of the CIE XYZ color space at 12 bits per component encoded with a 2.6 gamma applied at projection,
- Audio using the "Broadcast Wave" (.wav) format at 24 bits and 48 kHz or 96 kHz sampling,
- Controlled by an XML-format Composition Playlist, into an MXF-compliant file at a maximum data rate of 250 Mbit/s.
- Details about encryption, key management, and logging are all discussed in the specification as are the minimum specifications for the projectors employed including the color gamut, the contrast ratio and the brightness of the image.

While much of the specification codifies work that had already been ongoing in the Society of Motion Picture and Television Engineers (SMPTE), the specification is important in establishing a content owner framework for the distribution and security of first-release motion picture content.

In addition to DCI's work, the National Association of Theatre Owners (NATO) released its Digital Cinema System Requirements. The document addresses the requirements of digital cinema systems from the operational needs of the exhibitor, focusing on areas not addressed by DCI, including access for the visually impaired and hearing impaired, workflow inside the cinema, and equipment interoperability. In particular, NATO's document details requirements for the Theatre Management System (TMS), the governing software for digital cinema systems within a theatre complex, and provides direction for the development of security key management

systems. As with DCI's document, NATO's document is also important to the SMPTE standards effort.

48.1.2 Digital capture

As of 2009, the most common acquisition medium for digitally projected features is 35 mm film scanned and processed at 2K (2048×1080) or 4K (4096×2160) resolution via digital intermediate. Most digital features to date have been shot at 1920x1080 HD resolution using cameras such as the Sony CineAlta, Panavision Genesis or Thomson Viper. New cameras such as the Arriflex D-20 can capture 2K resolution images, and the Red Digital Cinema Camera Company's Red One can record 4K. The marketshare of 2K projection in digital cinemas is over 98%. Currently in development are other cameras capable of recording 4K RAW, such as Dalsa Corporation's Origin, and cameras capable of recording 5K, such as the RED EPIC, and cameras capable of recording 3K (for budget filmmakers) such as the RED SCARLET.

48.1.3 Digital post-production

In the post-production process, camera-original film negatives (the film that physically ran through the camera) are scanned into a digital format on a scanner or high-resolution telecine. Data from digital motion picture cameras may be converted to a convenient image file format for work in a facility. All of the files are 'conformed' to match an edit list created by the film editor, and are then color corrected under the direction of the film's staff. The end result of post-production is a digital intermediate used to record the motion picture to film and/or for the digital cinema release.

48.1.4 Digital mastering

When all of the sound, picture, and data elements of a production have been completed, they may be assembled into a Digital Cinema Distribution Master (DCDM) which contains all of the digital material needed for projection. The images and sound are then compressed, encrypted, and packaged to form the Digital Cinema Package (DCP).

48.1.5 Stereo 3-D images

In late 2005, interest in digital 3-D stereoscopic projection has led to a new willingness on the part of theaters to co-operate in installing a limited number of 2K stereo installations to show Disney'sChicken Little in 3-D film. Six more digital 3-D movies were released in 2006 and 2007 (including Beowulf, Monster House and Meet the Robinsons). The technology combines two digital projectors fitted with polarizing filters with the use of polarized glasses and silver screens. A single projector can also be used in conjunction with a simple adapter in the front (a single-cell LCD screen that acts as a quarter-wave retarder, also known as a zscreen) that rotates the polarity of projector's light output several times per second to alternate quickly the left-and-right-eye views. Another system fromDolby Laboratories called Dolby 3D makes use of a special color filter and glasses and has the advantage that doesn't require a silver screen. Also, some theaters use a system that requires no modification on the screen or the projector but uses active liquid crystal shutter glasses that quickly block the views of each eye alternatively.

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