Broadcast TV is more than 50 years old and is a proven way to deliver entertainment, sports, news and information. Broadcast TV is delivered via Terrestrial Transmitters, Cable Head-ends or Satellite based systems (DTH). In today’s Internet and mobile era, this half century old way of entertainment video delivery is being challenged. Below is a summary of what a large segment of consumer’s want and they cannot get from MSOs/LCOs/DTH delivered Live TV services.

(1) TV programs are broadcast on schedule and most people either have to hurry or miss the programs. Most of the time programs broadcasted on TV are pre-recorded. Consumers would like the flexibility of viewing such programs at their convenience. This is called Catch-up TV.

(2) Everybody wants to watch their Bollywood and Regional Music Videos and Movies. A very large collection of such content is available online. Live TV service providers cannot deliver such diverse and personalized video viewing experience.

(3) With Internet and PC, consumers are used to accessing Hollywood Music videos and Movies and other international entertainment content. This requires a PC & a browse and search action. They want it on their TV without a PC and without cumbersome browse & search operation.

(4) Today’s young generation uses Youtube,
Social Media (for photos) and Web Browsing. More and more people want this capability of viewing this content on large screen TV and share with the family, without a PC.

(5) This is the decade of App Stores! There are many games, like Angry Birds that are fun to play for hours and hours and that too for free! Also, there are many useful Apps from learning to productivity to nursery rhymes suitable for viewing on TV.

(6) We are in mobile era. Our smartphone is for capturing personal photos and videos. It remains locked in there or gets synced to PC. How to enjoy these personal photos and videos from smartphones to large screen TV, with the family & friends, over wi-fi network? It can be done.

To provide all of the above on a TV, over an unmanaged IP Network is extremely complex. Furthermore, it is a huge challenge to design a user interface to be able to do so many different activities on TV screen with simplicity and a simple input device that a large population can use.

This is what iRevo Multimedia, a five year old Silicon Valley company; with strong presence in India; has developed. It is developed by a team having collective experience of over 100 man-years and engineering effort of over 50 man years; solely focused to solve the above problems.

The Company; after field testing in India for a period of 12 months; announced an end to end solution comprising of the iRevo Cloud-TV platform, iRevo SmartTV Box and iRevo PlayCast App for SmartPhones and Tablets at the 2014 Consumer Electronics Show in Las Vegas, USA.

During the past two decades, the world has changed with the Internet and Mobile broadband network proliferation. This infrastructure is further strengthened with devices like smartphones, Devices like Apple TV, Google TV and generic Android Boxes. This network and device infrastructure is delivering content from sources like Youtube; world’s largest video deliverer; and new class of services like Hulu for TV Shows (also referred as Catch up TV) and Netflix for movies on demand. It is claimed that Netflix is the fastest growing entertainment network in the history with over 30 Million subscribers across many countries in less than 5 years; without the
investment of a typical broadcast network infrastructure. Netflix success is built upon support from content owners, Netflix investing in Streaming Media Player manufacturer Roku to jumpstart its business and global content delivery network of Amazon. Today, Roku is a strong independent company providing IP network based content delivery platform and media players for Paid Video service delivery by US and UK broadcasters, increasing broadcasters and content owners reach to consumers that would not be possible otherwise, and helping them generate new revenues. Services like those listed above will be offered in India in not too distant a future and is most likely to disrupt the business model of incumbents.

Movies, TV Shows and other content services that are delivered over a public IP network are called Over the top Content (OTTC) and is one of the fastest growing category in entertainment service industry. Almost all major broadcasters in the US have extended their TV services to IP network to prevent exodus of consumers from living room TV viewing; which is a very profitable business for them. US TV Service providers have invested heavily in technology or acquired companies or outsourced

Movies, TV Shows and other content services that are delivered over a public IP network are called Over the top Content (OTTC) and is one of the fastest growing category in entertainment service industry. Almost all major broadcasters in the US have extended their TV services to IP network to prevent exodus of consumers from living room TV viewing; which is a very profitable business for them. US TV Service providers have invested heavily in technology or acquired companies or outsourced
such capabilities to service consumer demand with initiatives like TV Everywhere. Such initiative enable service providers’ subscribers to watch the broadcast content on their PC, smartphones and tablets; when they want to watch; barring certain sports content.

**CHALLENGES TO DEPLOYING OVER THE TOP CONTENT IN INDIAN IP NETWORK ECOSYSTEM:**

In developed countries, fixed line broadband and 3G/4G mobile broadband has reached over 50% of the population which makes it feasible to make money from this large user base by offering newer services. India has about 15 Million fixed line broadband connections and less than 30 Million users are on 3G mobile network. Author of this article guestimates that broadband reaches to less than 10% of Indian population; outside of workplace; on a sustained basis. This low penetration of broadband makes it complicated for many content owners and operators to invest in bringing new services to consumers that will generate profit for them. However, there are dozens of companies working to increase the broadband reach while improving the quality of the broadband network and service. This would increase the monetizable user base for delivering additional services. It would be prudent for Operators and Content Owners to learn the OTTC business, understand the platform requirements and learn marketing of the same by playing in local ecosystem where reliable broadband service exists.

**OVER THE TOP CONTENT DELIVERY IS EXPENSIVE; REQUIRES MORE BANDWIDTH AND HIGHER COST DEVICE:**

Live TV is a utility class service, it is regulated by TRAI and being a utility class service there is a high sensitivity to cost. Furthermore, the broadcast technology is a matured one and Set Top Box hardware being fixed function (of video decoding) technology is a matured one and Set Top Box being fixed function (of video decoding) technology is inherently more expensive than a classic Set Top Box. For example, a basic digital set

**HARATIYAA AIRIPI NETYORI INDIAN IP NETWORK ECOSSITE M ORBBOR BB TOP BB KORT S LAGNH INY I YO NDAHITIJI**

विवेकगत देशों में फिक्स्ड लाइन बोडविड और 3जी/4जी मोबाइल बोडविड की पहुंच 50 प्रतिशत से अधिक जनसंख्या तक है जो कि इसे नयी सेवाओं को आफर करके इस बड़े उपभोक्ता आर्थि में पैसा बनाने के लिए संभव बनाते हैं। भारत में लगभग 15 मिलियन फिक्स्ड लाइन बोडविड कंपनियाँ हैं और 3जी मोबाइल नेटवर्क पर 30 मिलियन से कम इस्तेमालकर्ता हैं। इस लेख के लेखक का अनुमान है कि बोडविड की पहुंच कार्यक्षेत्र के बाहर एक निरंतर आर्थिक पर 10 प्रतिशत से कम भारतीय जनसंख्या तक है। बोडविड की निम्न पहुंच कई कॉर्ट लेखकों और ऑपरेटरों के लिए उपभोक्ता आर्थि ने अनेक सेवाओं को लाने में निर्भर की जील बनाता है जो कि उन्हें लाने सिम्बित कर सकते हैं। बोडविड और सेवाओं की व्यापकता को बढ़ाने के लिए बड़ा लगाया दर्जा में परिवारिंग करते हैं जो बोडविड पहुंच की बढ़ते के लिए कम कर रही है। जो कि अर्थशास्त्रीय उपभोक्ता को लिखित प्रति के लिए इस प्राकृतिक उपभोक्ता आर्थि में बढ़ती होंगी। यह ऑपरेटरों और कॉर्ट मॉडलों के लिए निवेशपूर्ण होगा जिसे ओर्डिटनों व्यापारी की गोंडों, नेटवर्क निर्माता की महान और स्थायी इकाइयों में चलने के लिए इसकी मालिकी की गोंडुंजय किया जाएगा जब यह भर्तीमंडल सेवा सम्पूर्ण है।

**अधिक बैंडविड और उच्च लागत वाले उपकरण की जरूरत है:**

लाइव टीवी उपभोक्तागत सेवा है, यह द्वारा ग्रुपा होता है और उपभोक्तागत सेवा होने के लिए अतिउच्च मुद्रण निर्देशन है। इसके लिए आपूर्ति कन्फ्यूसन की प्रक्रिया है और मदद कम मूल्य पर प्रशिक्षण (बोडविड डिपार्टमेंट के) में गेट टॉप बॉक्स शर्तकर को आफर किया जा सकता है। ओर्डिटरी मैसेज अन्य टीवी सेवा उपभोक्ता के लिए नहीं है। उन्हें इरीवो मैसेज वॉल्क जैसा उपकरण की जरूरत है जो कि एक छोटे पर आर्थिक नेटवर्क में और सुरु गरे तेजी में जुड़ा हुआ होता है। इस तरह को उपकरण पेड़ में वाला काम करने के लिए बनाया गया है और यथार्थवाद से वाले बॉक्स टॉप बॉक्स के उपरांत अधिक महान होता है। उदाहरण के लिए एक बॉम्ब डिजिटल गेट टॉप बॉक्स
top box can be built with 256MByte DRAM and 16MByte Flash running with a 400MHz CPU. Now contrast that with the iRevo SmartTV Box: it uses 1 GByte of DRAM, 4GByte of Flash and Dual Core CPU running at 1.5GHz! Consumers who want OTTContent and related services are willing to pay for such services and devices. Furthermore, devices like iRevo SmartTV Box are designed to deliver additional future services via software updates, justifying little higher cost. Our limited research indicates that user base that would pay additional bandwidth cost and device rental may be as much as 20% of a typical Operators internet service subscriber base.

India missed the landline telephony revolution and is catching up with the mobile telephony revolution. The serious side effect of having missed landline telephony phase is the lack of quality copper infrastructure which is hindering the growth of internet connections. Similarly, Cable TV infrastructure in India is NOT ENGINEERED but it is a JUGAAD! Because of this Jugaad approach of building cable TV infrastructure, internet on Coaxial Cable (DOCSIS) is unreliable and not scalable for delivering managed internet service with quality. We have said for some time that India will bypass the
PC revolution of the developed countries and directly embrace mobile technology. Decline in PC sales is not helping the growth of fixed wireless connection. There is no extensive use of enterprise software applications that make use of internet cloud. So how does the bandwidth demand get created to fill the bandwidth pipe, without which, profitability may suffer. Video is the only data/service that can saturate the pipe. If video services are not delivered on fixed connection reliably, then the trend of mobile broadband solution providers dominating the connected user base will further solidify, leaving fixed wire ISP providers with smaller and smaller market to go after.

To overcome many of the above content, technology and business issues faced by TV Operators and Content Owners and to meet consumer demands while generating new revenue; iRevo offers an end to end solution comprising of Content Cloud (iRevo Cloud-TV), Content and Application Delivery Platform that can scale to tens of lakhs of users and a powerful hardware device (iRevo SmartTV Box) for a Managed Service Delivery of all types of entertainment content and social media content (like Facebook) to consumers TV set. It further completes the offering; with stickiness; by delivering the same services on smartphones, tablets and PCs with advanced features like pause on TV and resume on smartphone. Furthermore, iRevo brings to consumers its world leading, state of the art TelePlay feature that enables a user to browse the content on a smartphone or a tablet and play it on their television set. iRevo calls it a Content Driven Remote. For operators, the iRevo platform enables recurring revenue and a capability to offer additional services to further increase the Operators revenue.

CHALLENGES:

As you may have realized by now, delivering Over the top Content is complex! To run such a service requires an end to end technology understanding as well as appreciation for economic implications that alone could determine whether the service would be make a profit or loss.

Let us equate an OTTC Solution to a Cable Solution. Let us capture the key differences:

1. **Content Sources**: for OTT are Many and Un-controlled while for Cable network are Satellite, VoD, etc. and are Controlled. This

   - **Kabst Groot** is the only Car and To be driven by the end customer. The On Demand services are the only Car and To be driven by the end customer. The On Demand services are

   - **iRevo** offers an end to end solution comprising of Content Cloud (iRevo Cloud-TV), Content and Application Delivery Platform that can scale to tens of lakhs of users and a powerful hardware device (iRevo SmartTV Box) for a Managed Service Delivery of all types of entertainment content and social media content (like Facebook) to consumers TV set. It further completes the offering; with stickiness; by delivering the same services on smartphones, tablets and PCs with advanced features like pause on TV and resume on smartphone. Furthermore, iRevo brings to consumers its world leading, state of the art TelePlay feature that enables a user to browse the content on a smartphone or a tablet and play it on their television set. iRevo calls it a Content Driven Remote. For operators, the iRevo platform enables recurring revenue and a capability to offer additional services to further increase the Operators revenue.
alone requires unique skill to interface to so many different content sources and being able to decode / display many different types of content via OTTC Set Top Box. If not carefully selected, one may wind up with an OTTC STB that does not play certain content or cannot be upgraded for future services.

(2) **Head-end:** A Cloud Server Pool can be equated to a Virtual Head End (VHE). Since a VHE is built using a Server a Pool and delivers content via IP network, there is a direct cost associated with a number of servers used and bandwidth consumed. Unlike Cable Head-end where a single head-end can server a large number of users, OTTC Server Pool does require physically adding more servers as subscriber base grows.

(3) **Performance:** Everyone knows how complex it is to get performance from an IP network where data packets go through so many different networks. It starts with quality of

---

**End to End Solution:**
**Content Aggregation and Delivery with Multiscreen Support & TelePlay**

**Web or CMS**

- Content Ingestion
  - Web APIs, RSS, etc.
- CMS or IWS Storage

**LAN**

**In-Device**

- Service Management
  - Channels
  - Users
- Integrates With
  - EPG and Social TV
  - Home Automation
- All Content
  - Web Content and Apps
  - PC, NAS and In-Device

**Screen Shifting**

- UPnP/DLNA
- TelePlay

**Cloud Application Delivery**

- Monetization
  - Purchase or Subscribe
  - Ads & e-commerce

**Smartphone**

**Tablet**

**Set Top Box**

**PC**

**OTTC SERVICES**

103
Software on Server and Client and then goes deeper into Server performance, Load Balancing, Data Center Bandwidth, Caching, Edge Caching and then one most hope that the rest of the network is good enough for the OTTC packets to reach a target OTTC STB. This is where all the problems start!

Chances are that user is going to experience a sluggish response and video buffering unless the ISP / LCO is providing a reasonable last kilometer infrastructure and speed.

In the last kilometer, the following items matter the most: what is the true sustained bandwidth? What is the link speed between Home Router and OTTC STB? And of course, the hardware and software used in OTTC STB. Most Smart TV solutions and Android boxes are underperforming due to slow CPU and not enough memory.

SOLUTIONS AND SUGGESTIONS:
Just like a Cable Operator builds an end to end solution: Head-end + Cable Plant + Set Top Box, OTTC Service requires building an end to end solution: Server Farm with Scaling + WAN/LAN/Optimization + OTTC Set Top Box. Everything needs to be optimized for delivering acceptable user experience.

Building Blocks of OTTC Delivery System vs. Cable TV Delivery System

OTTC SERVICES
experience / response time. Consumers can be patient on PC when browsing internet but not in front of
television when their mind set is to relax and enjoy.

Many of you are aware several initiatives of
putting Head-end in the Sky (HITS). Here, the
complexity of Head-end infrastructure is outsourced
to a partner. Well this should be the case with OTT Service too! The biggest value add an LCO/ISP can
deliver in this ecosystem is to see that they are
provisioning 2Mbit of bandwidth per user and
deliver at least 1.2Mbit sustained bandwidth.

In US, the companies like Netflix and Sony outsource their OTTC Delivery Services. Companies
like Roku provide a turnkey solution for OTT Video
Content to domestic and international broadcasters.
iRevo has gone a step further, with focus on India
market; to provide a COMPLETE END TO END service
of content ingestion, cost effective scaling of Server
Farm, optimized delivery of User Interface, Content and
App to consumers OTT Set Top Box. It goes further by
providing the same content and fluid experience
on PC when browsing internet but not in front of
television when their mind set is to relax and enjoy.

Consumer should be the first winner, than everyone in
the chain wins. We offer business model that helps
LCOs / MSOs generate significant new revenues
when their mind set is to relax and enjoy.

iRevo believes in a win-win-win partnership.

ABOUT AUTHOR

Mr. Dhimant Bhayani is Founder & CEO of iRevo
Multimedia, Inc. and Chairman of iRevo Multimedia India Pvt.
Ltd. He can be contacted at dbhayani@irevomm.com. For
more information, visit http://in.irevomm.com

Prior to founding iRevo, Mr. Bhayani was the Co-Founder and
Managing Partner at IN3 Ventures, LLC. As a Venture
Capital fund manager and Angel Investor, Mr. Bhayani has
invested in over 40 start-up companies with exit value
exceeding $1 Billion. From 1995 to 1998, Mr. Bhayani served
as the Vice President, Marketing, Asia Pacific. During his
tenure at C-Cube, he was responsible for the development & delivery of
a Complete Solution for VCD and DVD players that resulted in the Company
shipping tens of millions of VCD/DVD chips in the China, Korea and Japan
markets. In 1991, Mr. Bhayani founded Media Computer Technologies
(MCT); a semiconductor company which lead the industry in the area of
Video Scaler Chips and Software. MCT was acquired by C-Cube in 1995.

Mr. Bhayani has gone a step further, with focus on India
market; to provide a COMPLETE END TO END service
of content ingestion, cost effective scaling of Server
Farm, optimized delivery of User Interface, Content and
App to consumers OTT Set Top Box. It goes further by
providing the same content and fluid experience
on PC when browsing internet but not in front of
television when their mind set is to relax and enjoy.

Consumer should be the first winner, than everyone in
the chain wins. We offer business model that helps
LCOs / MSOs generate significant new revenues
when their mind set is to relax and enjoy.

iRevo believes in a win-win-win partnership.