Agenda

- **WHAT: ATSC Mobile DTV**
- **WHY: ATSC Mobile DTV**
- **HOW: ATSC Mobile DTV**
- **LET’S DO IT!**
Small screen offers big revenue opportunities

- ATSC Mobile Digital TV gives you the chance to boost your content, reaching your customers anywhere thus increasing revenues.

- In a recent report, InStat estimated the number of ATSC Mobile DTV tuner shipments would reach **30 million** through 2014 with substantial growth expected in the U.S. Mobile DTV market.

**Mobile TV is happening!**

**It’s not IF, but WHEN**
“Normal ATSC”

- HD Encoder
- 4 SD Encoder
- ATSC MUX
- ATSC Transmitter
- Existing STL 19.39 Mbps
- ATSC –MH enabled Exciter
“ATSC Mobile DTV”

- HD Encoder
- 4 SD Encoder
- MH Encoder
- MH Encoder
- ATSC MUX
- ATSC MH MUX
- Existing STL 19.39 Mbps
- ATSC Transmitter
- ATSC –MH enabled Exciter

Screen Service
RRD USA
“ATSC Mobile DTV” – What’s New?

- HD Encoder
- 4 SD Encoder
- ATSC MUX
- Existing STL 19.39 Mbps
- ATSC MH MUX
- ATSC –MH enabled Exciter
- ATSC Transmitter
“ATSC Mobile DTV” – More Than What’s Obvious

HD Encoder

4 SD Encoder

ATSC MUX

Existing STL 19.39 Mbps

ATSC MH MUX

ATSC MH enabled Exciter

MH Encoder

MH Encoder

SIGNALING ESG NRT/CAS...
A/153: ATSC Mobile DTV

ATSC Mobile DTV: technical Aspects

- Dual Stream: Multiplexing Normal and Mobile Stream
  - Mobile Stream is Encapsulated into MPEG NULL Packet for backward compatibility reason with the main stream receiver
- Uses a portion of the ~19.39Mbps ATSC 8-VSB payload
  - Adds Serial Concatenated Convolutional Coding (SCCC) for robustness
  - Adds extra training signals to the 8-VSB to aid reception in dynamic conditions
- Provides burst transmission of the M/H data enabling the receiver to cycle power for energy saving
- Includes control data for use by M/H receivers
  - Transmission Parameter Channel (TPC), for decoder settings
  - Fast Information Channel (FIC), for quick access to channels and for band scanning
The ATSC M/H standard has been designed to provide a reliable digital TV signal, that can be received by mobile devices:
- Cellular phones, laptops, portable media players or navigation devices.

The system allows the simultaneous transmission of standard ATSC terrestrial and mobile-handheld services over the same infrastructure.

The broadcaster can offer localized services, such as news, traffic information or weather, to offer viewers the content anytime and anywhere.

ATSC Mobile is a true cost-effective, new revenue stream opportunities for the Broadcasters, because it shares the same RF frequency and is fully backward compatible with ATSC Legacy stream.
What is ATSC Mobile DTV

What Does MDTV Mean for the End User –Today?

- Access to High Quality TV ANYTIME, ANYWHERE
- True LIVE TV Experience, adapt for mobile reception
- Real Content: LOCAL NEWS, Live news, sporting events, prime-time TV
- Ultimate time-filler; Viewing is Occasional: while commuting, waiting resting, etc.
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- LET'S DO IT!
WHY Broadcast Mobile TV

The Mobile TV need has always been there

Portable TV dream was around since 1952

Why it has never been a success?

Because it’s difficult and there are many challenges to face
WHY Broadcast Mobile TV

Why not 3G and later 4G

- In USA mobile broadband consumption is already equal to home-broadband consumption, and increasing rapidly
- With the increase of use of smartphones, iPhone, Blackberry people consume Video (YouTube) and Live Gaming over mobile devices
- IDC White Paper March 2010: “… the cost of providing video broadcasts over the cell networks —even 3G and 4G networks —is prohibitive because the unicast nature of these networks was not designed to serve broadcast-sized audiences simultaneously.”

Broadcast MDTV best answers the need for high quality, multiple channel TV to a large audience
## WHY Broadcast Mobile TV: Unicast Revenue

Unicast Network Limitations, not Consumer Preferences, limit content to short-form

<table>
<thead>
<tr>
<th>Service</th>
<th>Typical Revenue</th>
<th>Bandwidth Usage (Megabits)</th>
<th>Revenue Per Megabit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMS Message</td>
<td>$0.20</td>
<td>0.0098</td>
<td>$20.47</td>
</tr>
<tr>
<td>1-min voice Call (Peak)</td>
<td>$0.07</td>
<td>0.7200</td>
<td>$0.38</td>
</tr>
<tr>
<td>3-min Low-res Video Clip</td>
<td>$0.99</td>
<td>15.3677</td>
<td>$0.06</td>
</tr>
<tr>
<td>6-min Hi-res Video Clip</td>
<td>$1.99</td>
<td>92.2068</td>
<td>$0.02</td>
</tr>
<tr>
<td>30-min Hi-res Video Program</td>
<td>$1.99</td>
<td>461.0304</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

Source: Spectrum Management 2006

Low-res at 128 Kbsp

Hi-res at 384 Kbsp
Why Broadcast Mobile TV

Key Benefits of Mobile DTV

- Reinvent Existing Broadcast TV Capabilities
  - Uses same 6 MHz channel as ATSC signal

- Low Incremental Cost for upgrade Your TV Station
  - Average $100,000 per station

- Broadcast Local Content Will Drive Rapid Consumer Adoption

- Highest Quality User Experience

- New Business and Service Models
  - Audience Measurement
  - Interactivity

Bring Your Content where Your Viewer is!
**Strong Consumer Interest**: Constant high level of excitement about Mobile DTV and interest in continuing to receive the service. While free over-the-air service is a major positive with viewers, nearly half would said they would be at least “somewhat likely” to subscribe to premium services for a monthly fee.

**Live, Local News Ranks Highly**: Participants found themselves tuning into their battery-powered Mobile DTV devices when storms knocked out power to their home TVs. Local stations are considered essential to the Mobile DTV viewing experience, but participants also like having a variety of programming.

**Daytime is Primetime**: Mobile DTV viewing tends to peak during the weekday afternoon when consumers can watch their favorite programs while on a break from work or while waiting in line at the supermarket.

**Mobile DTV means MORE TV**: 94% of viewers reported watching more or the same amount of TV as before. The average daily viewer spent 50 minutes watching Mobile DTV and tuned in more than twice during the day.
Agenda

- **WHAT**: ATSC Mobile DTV
- **WHY**: ATSC Mobile DTV
- **HOW**: ATSC Mobile DTV
- **LET’S DO IT!**
1. **Coverage**: The service has to be on the air anywhere, including in subway / underground tunnels

2. **Content is the King**: Give to people Rich Content and the opportunity to see multiple channels
   - Local, Sports, Soap-Opera, News, talk-show

3. **Free-to-Air** Business Model has to be dominant
   - Wait the critical-mass before to introduce PPV model

4. **Devices** wide array available and up to the trend
   - I’m not “down-grading” my iPhone/Blackberry status just to watch Mobile DTV
## What’s going on around the world

<table>
<thead>
<tr>
<th></th>
<th>Korea</th>
<th>China</th>
<th>Japan</th>
<th>Brazil</th>
<th>MediaFlo</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td>T/S-DMB</td>
<td>CMMB</td>
<td>1Seg</td>
<td>1Seg</td>
<td>MediaFlo</td>
<td>DVB-H</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
</tr>
<tr>
<td><strong>Free</strong></td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>🆒</td>
<td>🆒</td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>🆒</td>
</tr>
<tr>
<td><strong>Devices</strong></td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>🆒</td>
<td>🆒</td>
</tr>
</tbody>
</table>

- **17.25 Mln users at the end of 2008, up 60% from a year earlier**
- **1 year, 10 Mln users in 331 cities**
- **80% of all mobile phones ship with mobile TV built-in**
- **Rapid take-off and adoption**
- **Service will shut down on March 27 2011**
- **High cost of investment, no devices available, no success stories**
## HOW capitalize your investment

### Where the money come from

<table>
<thead>
<tr>
<th>A/V Services</th>
<th>On Demand and Cross services</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Free to air Live channels</td>
<td>• Interactive channels</td>
</tr>
<tr>
<td>• Pay per view channels</td>
<td>• Multimedia portal through datacasting</td>
</tr>
<tr>
<td>- per subscription</td>
<td>• Personalized services</td>
</tr>
<tr>
<td>- per event</td>
<td>• Live ticker on idle-screen</td>
</tr>
<tr>
<td>- per time</td>
<td>• Watch &amp; click &amp; buy</td>
</tr>
<tr>
<td>• PVR</td>
<td>• Impulsive consumption</td>
</tr>
<tr>
<td>• User Generated content channels</td>
<td></td>
</tr>
</tbody>
</table>

$ from pay per view/service $ from return channel services $ from advertising
Agenda

WHAT: ATSC Mobile DTV

WHY: ATSC Mobile DTV

HOW: ATSC Mobile DTV

LET'S DO IT!
Let’s Do It

What’s the plan

- Bandwidth Requirements
- Studio Platform Requirements
- Transmitter Requirements
- Improving Coverage for Mobile DTV
ATSC A/53 has 19.39 Mbps payload capability
- The FCC requires all digital broadcasters to provide at a minimum 1 SD NTSC quality free-to-air program service
  - ATSC program guide (PSIP) requires about 0.5 Mbps
  - Typical SD service in MPEG2 requires 2-4 Mbps
  - Typical HD service in MPEG2 requires 10-14 Mbps
- ATSC Mobile DTV channels are scalable in number and level of robustness
  - Robustness is a function of coding level and it also drives payload efficiency
  - Half rate = 37%, Mixed rate = 26%, Quarter rate=17%

Bandwidth Requirement

- 2-4 Mbps
- 4-6 Mbps
- 10-12 Mbps
- 6-8 Mbps
- 5-7 Mbps

HD Service
- SD Channel
- PSIP

2-4 SD Mobile Services
- 5-7 Mobile Services

Channels

Let’s Do It
Let’s Do It

Bandwidth Requirement – 5 A/V Channels for Mobile DTV

- Audio and Video Bitrate
- Bandwidth required for A/V
- Robustness (i.e. Mixed Rate)
- Number Of Group
- Total Payload available
- Total Bandwidth needed
- Total Payload Needed
Let’s Do It

Studio Platform Requirements

- Encoder H.264 Low Resolution
- ESG Signaling and Announcement server
- Multiplexer Pre-processor MH
- GPS reference
- IP Hub Router/Switch
Let’s Do It

Transmitter Requirements

- Uses same 6 MHz channel as ATSC signal
- The mobile pre-preprocessor must be installed as the last item in the chain of equipment prior to the STL.
  - No additional multiplexing can be inserted after the mobile stream
- Transmitted spectrum identical to 8-VSB, so no additional FCC authorization
- Exciter has to be ATSC MH Capable
Optimizing Mobile DTV Coverage

- Different planning factors
  - Receive antenna height: 45” vs 30 ft
  - Receive antenna gain: -20db to -3db vs 0db

- Circular polarization antenna
  - Polarization Mismatch Loss caused by misalignment between the transmit and receive antenna

- Maximized power from main TX site
  - Low antenna gain and high transmitter output power gives more Saturation

- Digital Repeater on Channel / Gap Filler
Questions & Answers

Thank you

For further information please visit our Company website www.screenservice.net or contact via email at graziano.casale@rrdus.com or by phone at +1 (212) 695 8341
Back-Up
ATSC Mobile DTV Solution with existing Digital ATSC Headend present
SPEED Products

SPEED: Diagram Architecture

ATSC Mobile DTV Solution with Screen Service Digital ATSC Headend
SPEED Products

SPEED Encoder Mobile H.264

Function
- Compresses and encodes A/V for ATSC Mobile
- Format MPEG4 – H.264 baseline profile
- Resolution: 416x240
- Model N: ENC 325

Input
- SDI video with embedded audio and metadata

Output
- 1 ASI transport streams
- 1 A/V on Ethernet port

Features
- Web-interface for interactive management built on Java Applet
- SNMP server for remote control
- Close Captioning for ATSC Mobile DTV
- NTP carried in the RTP flow for ATSC Mobile DTV
- ASI or Multicast output
- Multi-standard Capability (ATSC-M/H, DVB-H, ISDB-T)
- IP-Sec Scrambler Option capability
SPEED Products

SPEED ESG Platform Coordinator

Function
- Service Platform Coordinator
- ESG Processor
- Flute Carousel
- ATSC-M/H Service Signaling Generator
- Model N. XBT 167

Input
- Tribune compliant metadata ingestion
- TV Anytime compliant metadata ingestion

Output
- ATSC-M/H compliant OMA BCAST ESG

Features
- ATSC-M/H compliant ESG generation
- Automatic program data ingestion
- Preview logo ingestion
- Easy webUI for configuration, provisioning and monitoring of service line up
- Bandwidth optimized flute carousel
- Linux based application server
**SPEED Products**

### SPEED Multiplexer Mobile

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preprocessor:</strong></td>
</tr>
<tr>
<td>- Real Time multiplex of Mobile A/V, Data and ESG</td>
</tr>
<tr>
<td>- Information editing function of FIC, TPC, Signaling generator (SMT, GAT, SLT, CIT and RRT)</td>
</tr>
<tr>
<td>- Internal generation of SSC IP packet for each ensemble for each parade</td>
</tr>
<tr>
<td>- Dedicated Gigabit port for ATSC-MH services</td>
</tr>
<tr>
<td>- Perform single and multiple ensemble</td>
</tr>
<tr>
<td>- Perform up to 16 parade</td>
</tr>
<tr>
<td>- Support all modes in the ATSC A/153 standard to calibrate the right quality-of-video/number-of-channel ratio</td>
</tr>
</tbody>
</table>

**Adapter**

- Network adaptation at exact 19.39 Mbps in 6 Mhz channel.
- Output interleaved Transport stream formed by multiplexed Transport stream and a MH transport stream with predefined PID

**Aggregator**

- Interleave transport stream A that carry the Legacy ATSC and transport stream B that carry the ATSC-MH
- 2 logical input TS channel selected from 11 input physical TS channel
- Model N.: XBT 667

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Maximum architecture flexibility between studio and transmitter site</td>
</tr>
<tr>
<td>- Dedicated FPGA servers with high performance result</td>
</tr>
<tr>
<td>- User-friendly web interface built on Java applet</td>
</tr>
<tr>
<td>- Internal generation of SSC IP packet for each ensemble for each parade</td>
</tr>
<tr>
<td>- Perform single/multiple ensemble</td>
</tr>
<tr>
<td>- Statistical Multiplexer capability (optional)</td>
</tr>
</tbody>
</table>

![SPEED Multiplexer Mobile Diagram](image-url)
**SPEED Products**

**SDT TV Transmitters**

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ 8VSB modulation</td>
</tr>
<tr>
<td>▪ ATSC MH Post-processing</td>
</tr>
<tr>
<td>▪ Multi-standard Capability (ATSC, DVB-T/H, ISDB)</td>
</tr>
<tr>
<td>▪ Model N. SDT ARK1 transmitter series</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ ASI transport Stream</td>
</tr>
<tr>
<td>▪ IP input</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ ATSC and ATSC M/H Transport Stream</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Perfect ATSC backward compatibility with no interference or packet-loss</td>
</tr>
<tr>
<td>▪ Compact and easy to install</td>
</tr>
<tr>
<td>▪ Adaptive digital Linear and Non-linear pre-correction</td>
</tr>
<tr>
<td>▪ Screen Service Exciter ATSC are sw upgradable to ATSC M/H, with no need to hw replacement</td>
</tr>
</tbody>
</table>

![Diagram showing SDT TV Transmitters](image)

**from 1W to 100KW**
ARK ECHO ATSC - ATSC/MH

Function
- Digital On-Channel Repeater
- Heterodyne Transposer
- Echo Cancellation
- Multi-standard Capability (ATSC, ATSC-MH, DVB-T/H, ISDB)
- Software Defined Transmitter series

Features
- Compact Size design 1RU up to 15W rms, 2RU up to 100W rms
- Advanced O&M feature support
- Maximum energy efficiency
- Fully adjustable:
  - AM / PM pre-correction
  - Modulus/Group Delay pre-correction
- Remote management capabilities included

Input
- RF
- GBE (MPEG / IP)
- 10 MHz / 1 pps (for SFN mode operation)

Output
- RF Out
- RF Monitor
Unique Mobile DTV Experience

Proven success in the convergence between Broadcast and Mobile

- RRD launched the first DVB-H service in the world in May 2006 for H3G Italy ("3") deploying a nationwide network (over 1200 sites).
  - In three years of operations of the biggest commercial mobile television network RRD has established one of the largest knowledge base available.

- RRD USA provided the platform for the richest Mobile TV Trial worldwide with the Hiwire Trial with 24 high-impressive quality channels on two 6Mhz frequencies

- OMVC hired RRD USA to run the Conformance Test on the A/153 leading the main vendor providers and lately on the Washington DC Consumer Showcase, RRD USA is the Technical Project Manager coordinating the TV stations involved to guarantee the best Quality of Service
In 2009 RRD was awarded the tender to set up and operate the Mobile TV trial in Yekaterinburg, a region in Russia (first mobile TV operation in Russia).

In 2007 RRD was awarded the tender to provide DTV and mobile TV coverage in the city of Riyadh, Saudi Arabia by the incumbent mobile operator Saudi Telecom Corporation. The trial is still operational.

In 2008 RRD was awarded the tender to provide end to end project management and consultancy for the creation and setup for the Philippines largest mobile carrier’s Mobile TV operation.

In 2007 RRD was awarded the tender to provide consultancy to the design and operation of the mobile TV service for Multichoice in South Africa.

In 2009 RRD was awarded the tender to set up and operate the Mobile TV trial in the city of Jakarta, Indonesia by the incumbent mobile operator Telkom Indonesia. The trial has been operational for more than one year.

In 2010 RRD was awarded the tender to set up and operate the Mobile TV trial in the city of Riyadh, Saudi Arabia by the incumbent mobile operator Saudi Telecom Corporation. The trial is still operational.

Since 2006 our mobile TV networks have provided coverage to more than 130 million people worldwide!