Operator Applications Explained
What is an OpApp?

- OpApp is an “Operator Application” that provides a STB-like experience without the STB
- To the consumer, an OpApp running on the TV has all the benefits of the STB, without the hassle of cabling and multiple remotes
- Standardized by HbbTV, so OpApps:
  - Can be Interoperable across brands,
  - Are supported by HbbTV’s testing regime
  - can coexist with “regular” HbbTV Apps running on same device.
- Suitable for any distribution form, including IPTV, Satellite, Cable, and Terrestrial
What is an OpApp?

- An application from an operator that provides some/most of the user interface normally provided by the TV / STB
  - e.g. all normal TV watching UI comes from the OpApp
  - Exactly what is governed by a "bilateral agreement" between operator and manufacturer
- In order to do this
  - OpApps are independent of what TV channel is being watched
    - Different lifecycle from regular HbbTV apps
  - OpApps have access to the system beyond regular HbbTV apps
    - Channel list management
    - Extra remote control keys
  - OpApps can be available as a “source” on a TV.
    - Switch the TV off and on again, and you land straight back in the OpApp
- OpApps coexist with regular HbbTV apps from broadcasters & must not interfere with these

Note: The primary use of OpApps is to provide an STB user experience on a TV, but there is also a “profile” for white-label STBs
Why Did HbbTV Work on OpApps?

- Was starting to happen anyway; doing this in HbbTV:
  - Ensures compatibility with existing specs
  - Ensures that broadcast-related apps are not interfered with, & that they keep working the way HbbTV specifies
  - Will result in a solution of higher quality at less cost than when
- Expands the customer base for HbbTV platforms & technology
  - Demand for HbbTV technology will increase
  - A new constituency will support HbbTV technology
  - HbbTV participation and mindshare will increase
- Enriches the ecosystem of HbbTV technology offerings
  - more suppliers of HbbTV technology
  - more attractive to manufacture HbbTV components and terminals
- Operators blocking HbbTV may stop when integrated solution available; non-compatibility with their services currently one reason to block

HbbTV Confidential
Markets and Deployments

• OpApp spec was driven by operators
  – Satellite operators
  – IPTV operators
• Will also work for cable and terrestrial operators
  – Terrestrial operators can use the same features as satellite operators
  – Cable operators can pick from satellite and IPTV operator features as they prefer
• Everything that works for satellite operators should also work for terrestrial
  – There may be practical bandwidth issues in distributing a visually attractive OpApp via terrestrial broadcast to users without a broadband connection
Three Types of OpApp

• Standard
  – Standard operator applications are HbbTV applications as defined in HbbTV 2 using regular broadcast signalling
  – Do not replace UI elements of the terminal but may provide alternatives to some of them.
  – Conceptually used in some HbbTV markets already
  – Not the primary focus of the spec, included only for completeness

• Privileged
  – Intended for TV sets (and perhaps some retail STBs / PVRs)
  – When active, they replace some of the manufacturer user interface

• Operator-specific
  – Intended for set-top boxes
  – When active, they replace / provide virtually all of the user interface
    • e.g. everything comes from the operator except initial installation & basic setup
OpApp Installation

- Discovery of which OpApps are available – 6 options
- Decision on which OpApps to install
  - For privileged OpApps – user choice
  - For operator-specific OpApps – user chose when they bought the STB
- Download of encrypted OpApp package – HTTPS or DSMCC
- Decryption of encrypted OpApp package
- Authentication of decrypted package
- Unzip the application ZIP file

The initial OpApp from an operator must be installed for security.
An installed OpApp can securely run further OpApps direct off web servers without any additional installation.
6 Options for Discovery of OpApps

1. Reference to DVB Service
2. Standardised Domain Name
3. Domain name from Descriptor in Broadcast NIT/BAT
4. Domain Name Hard-coded in Terminal
5. Hard-coded in Terminal
6. From Common Interface Module

- DNS SRV Lookup
- https:// URL
- Broadcast AIT
- Classic HbbTV XML AIT
Decryption and Authentication

- OppApps are distributed as an "encrypted application package"
  - A ZIP file that has been signed & encrypted according to RFC5652
- Security is governed by the bilateral agreement
  - Each manufacturer provides "terminal packaging certificate" to operator
  - Operator provides "operator signing certificate" to each manufacturer
    - Needs to be included in the terminal along with other information about each supported operator
- Decryption
  - Use private key corresponding to "terminal packaging certificate"
  - Prevents rogue manufacturers installing OpApps
    - e.g. ones who don't care about security and just install any OpApp they discover
- Authentication
  - Use public key from the appropriate "operator signing certificate"
  - Prevents rogue OpApps getting installed
Starting OpApps

- Many options
  - Exactly which apply need to be agreed between manufacturer and operator (the "bilateral agreement")

- Explicit user choice
  - Terminal includes operator icon in its UI for choosing inputs or sources
    - e.g. alongside HDMI, home network, Smart TV (see next slide)
  - Operator and manufacturer agree that certain remote control keys start the OpApp even if user is in Smart TV or HDMI modes
    - e.g. GUIDE, PVR, …
    - May be problematic if multiple OpApps are installed

- Other
  - Perhaps after return from standby / power-on where the OpApp was the active input or source before standby or power-off
  - One OpApp can start another OpApp
    - E.g. an installed OpApp can start one that runs direct from a web server
Starting OpApps – "Source"
OpApps and Visibility

A running OpApp will be one of 5 states

- **Foreground / overlaid foreground** – designed for Guide, PVR, VoD, ....
  - OpApp is visible to user
  - Limitation on use of broadcast video to address broadcaster concerns
    - Video must be scaled to smaller than 1/3 by 1/3 of full screen
- **Transient / overlaid transient** – designed for channel change banner & similar
  - OpApp is visible to user
  - No limitation on use of broadcast video but ...
  - OpApps can only be in this state following user interaction and can only stay in it for a limited time if there's no more user interaction
- **Background**
  - OpApp is not visible to user

“Overlaid” states are where a terminal manufacturer UI overlays the OpApp (e.g. audio volume, input / source selection)
OpApps and User Input

- **OpApp in foreground / transient state can get**
  - Same keys as a regular HbbTV app
    - Colour keys, arrow keys, enter/OK, back, 0-9, play, stop, pause/play-pause, f-fwd, f-rew
    - "Operator application keys" - P+/P-, Info
  - OpApp in background state can get any of these if not taken by the app with focus
    - e.g. if broadcasters & operators agree regular HbbTV apps will not claim the green key then it can drop through to an OpApp in the background

- **OpApps can request other keys subject to the "bilateral agreement" with the manufacturer**
  - E.g. guide, channels, menu, volume up/down, mute, subtitle, audio-track, audio-description
  - These key presses go to the OpApp regardless of what state it's in
  - Only a few keys cannot go to the OpApp – teletext & exit
    - No APIs exist for the OpApp to implement the correct behaviour needed for these
Notifications

• OpApps in the background need a way to send time-critical messages to the user
  – Examples include:
    • Reminders set in an EPG for events which are imminent
    • Previously booked live pay-per-view events that are about to start
    • A subscription about to expire that would impact content currently being presented to the user
    • An imminent recording that will fail without user intervention
  – All of these represent messages that are a result of previous user actions

• OpApps can use the W3C Web Notifications API for this
  – Notifications are drawn by the terminal with terminal defined look and feel
  – OpApp can move to foreground if user selects a notification

• Notifications are only intended for messaging that is either time-critical or based on previous user action
  – This does not include:
    • Promoting products or services to the user
      ▪ either relating to currently presented broadcast content (e.g. advertising)
      ▪ or not (e.g. live pay-per-view events not previously booked by the user)
    • A subscription about to expire that does not impact content currently being presented to user
  – Broadcasters can block notifications over their services if system is abused
OpApp Replacement of Terminal UI

Exactly which parts of the terminal UI are suppressed & replaced by an OpApp needs to be agreed between operator & manufacturer

• Expected are EPG, program info, channel banner, channel selection and component selection
  – Interesting corner case about channels outside an operator’s offering where some countries have regulatory requirements
• More debatable are volume control, parental control, timeshift control, and UIs for CA/DRM messages
• PVR
  – Replacing terminal UI for managing storage space and resolving conflicts could get complex
    • if users also use the manufacturer UI to book recordings and/or
    • if users use multiple OpApps and/or
    • if some channels are outside the operator’s offering
• Device setup & channel installation
  – Could be replaced by an operator-specific OpApp but many operators may prefer to leave this with the device manufacturer
  – Out of scope for privileged OpApps
OpApps and Channel Lists

• For broadcast
  – Operators who have an existing channel scan / installation / LCN spec can just keep using it
    • No change needed - OpApps can just work with these channel lists
  – OpApps can create & use 'locally defined channels' as well as ones found via channel scan
    • e.g. using data obtained from file in object carousel or web server
  – Operator-specific OpApps may do RF-based channel scans
    • Subject to the bilateral agreement

• For broadband
  – OpApps can create 'locally defined channels' that refer to IP delivered channels
    • e.g. DASH or multicast IP to the extent supported by the terminal

• OpApps can replace the terminal channel list while running
  – New channel list can mix and match channels from channel scan and/or locally defined channels
  – In this case, terminal maintains & updates a shadow channel list in the background and returns to that when / if the OpApp exits
OpApp Impact on Regular HbbTV Apps

• Should be none under normal conditions
  – OpApps just replace some of the manufacturer UI that regular apps already have to live with

• But
  – Regular HbbTV apps can ask which OpApp is running
    • OpApps can define which (if any) regular HbbTV apps get an answer
    • Allows regular HbbTV apps to adapt their behaviour if a particular OpApp is running
      ▪ See previous example about regular HbbTV app not claiming a remote control key allowing the OpApp to get that key
    • Mostly applicable for markets where the operator is owned by a consortium of broadcasters
Bilateral Agreement

• Agreement between operator and manufacturer for things which:
  – Are not appropriate in a technical spec and/or
  – Which need a commercial negotiation and/or
  – Which are very specific to particular products

• Some examples
  – Details of how & where an OpApp is discovered
    • e.g. DNS domain name or which DVB multiplex to look in for NIT/BAT
  – How the operator and the OpApp are identified (a specific HbbTV organisation_id)
  – Arrangements for distribution of "terminal packaging certificate" to operator and "operator signing certificate" to manufacturer
  – Amount of memory to be available in terminal for installed files of OpApp
  – UI details for how user chooses to install OpApp and how user chooses to start OpApp (privileged OpApps only)
    • e.g. where these choices fit in the terminal UI, which menu screen & where on that menu screen
  – Exact conditions when an OpApp is started after power-on or resume from standby
  – Which keys are reserved for the OpApp?
    • e.g. guide, channels, menu, volume up/down, mute, subtitle, audio-track, audio-description
  – Which terminal UI elements are suppressed / replaced by the OpApp
  – References to (already existing?) operator channel scan / installation / LCN requirements
Privacy

• Respecting user privacy has been a requirement and a design consideration from the start
• Use of OpApps is a user choice
  – For operator-specific OpApps, user chooses to buy/rent an operator’s STB (or not)
  – For privileged OpApps
    • Either a menu of operators with the choice of OpApp being implicit or an explicit menu of OpApps
    • User choosing to insert a Common Interface module may result in an OpApp being installed
    • Terminals are required to allow users to uninstall an OpApp
  – OpApps need to include T&Cs and get user agreement when started for the first time
    • if a user does not accept, Privileged OpApps should uninstall themselves
• OpApps are securely delivered to the terminal & can use web secure communications to keep data exchanges with operators confidential.
• No requirements on OpApps result in sharing user data, preferences or behaviour information with the operator.
• No new identifiers or persistent storage capabilities are introduced for OpApps
  – Only those capabilities in HbbTV are provided, along with the privacy controls defined for them.
  – TVs and STBs usually include a “factory reset” feature which will erase any data stored locally by an OpApp
• Where TLS client certificates are used to identify a terminal, these identify models or product families and not to identify individual devices
  – e.g. same certificate for all of a manufacturer’s models in a calendar year using a particular hardware and software architecture
    • i.e. regardless of physical attributes such as panel size and bezel
Status

• Spec is completed
• Work on testing is started
  – Basic design of how to test implementations is done
  – Descriptions of unit test descriptions are written, reviewed and approved
• HbbTV is obtaining quotations for developing test cases according to these
  – Hope to order test cases early in 2018
  – Early implementers should work closely with HbbTV's selected supplier(s) to mature implementations and test cases in parallel
Summary

- HbbTV has just finished a spec for "operator applications"
- It defines how the HbbTV browser can run both broadcaster apps and operator apps at the same time
  - Like 2 tabs in a desktop browser
- It addresses 2 main deployment scenarios
  - "Privileged" operator application running in TVs and retail STBs that have their own TV watching UI
    - Enables operators to bring their UX to TV sets
    - User is in charge of installing these and can remove them
  - "Operator-specific" operator application that provides the TV watching UI for a STB
    - Simplify deployment and integration for white-label STBs
    - User choice to buy such a STB (or not)
- It carefully balances competing broadcaster, operator and manufacturer interests
- OpApps are more than just a technical specification – some points need to be addressed in a "bilateral agreement" between operator and manufacturers