



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?



Why?

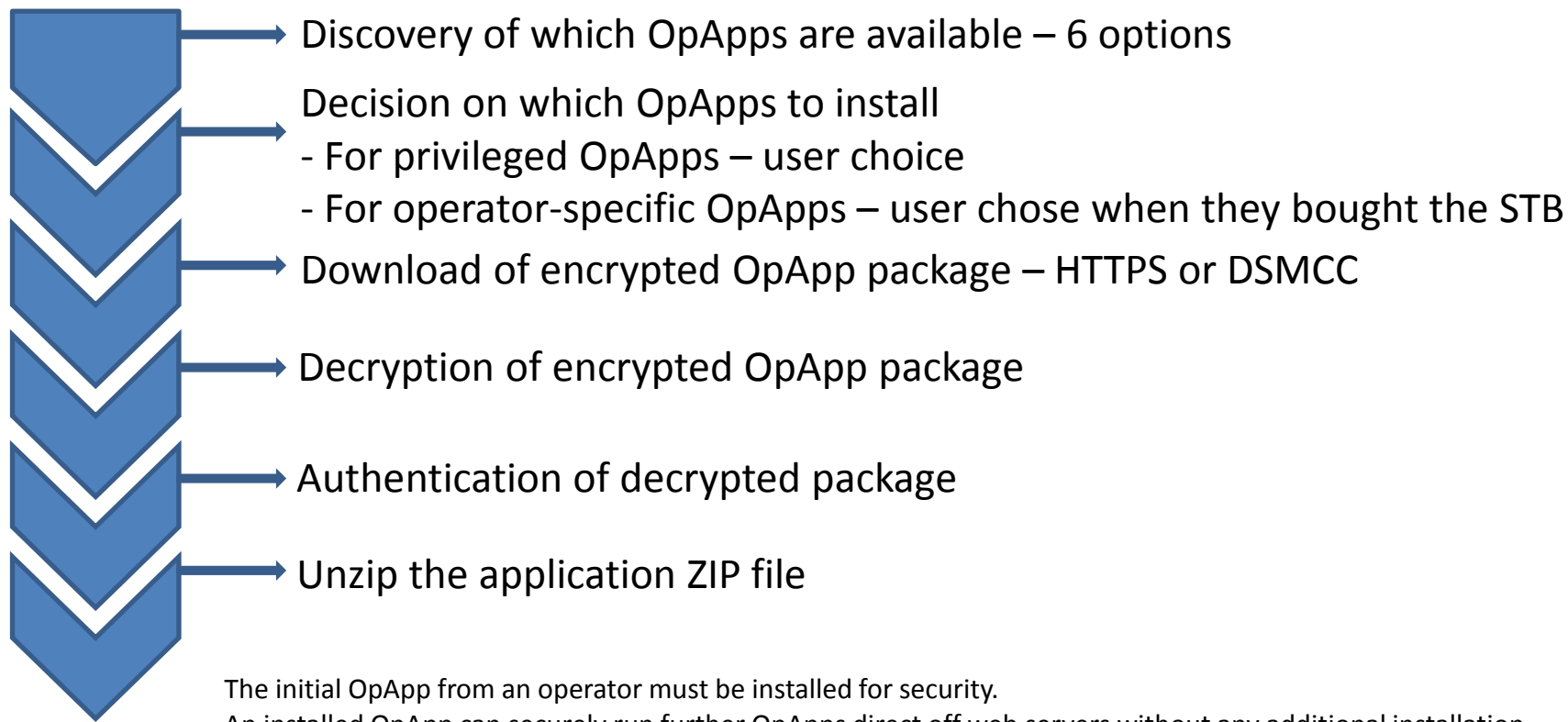
- Was starting to happen anyway; doing this in HbbTV:
 - Ensures compatibility with existing specs
 - Ensures that broadcast-related apps are not interfered with, & that they keep working the way HbbTV specifies
 - Will result in a solution of higher quality at less cost than when
- Expands the customer 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

- 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



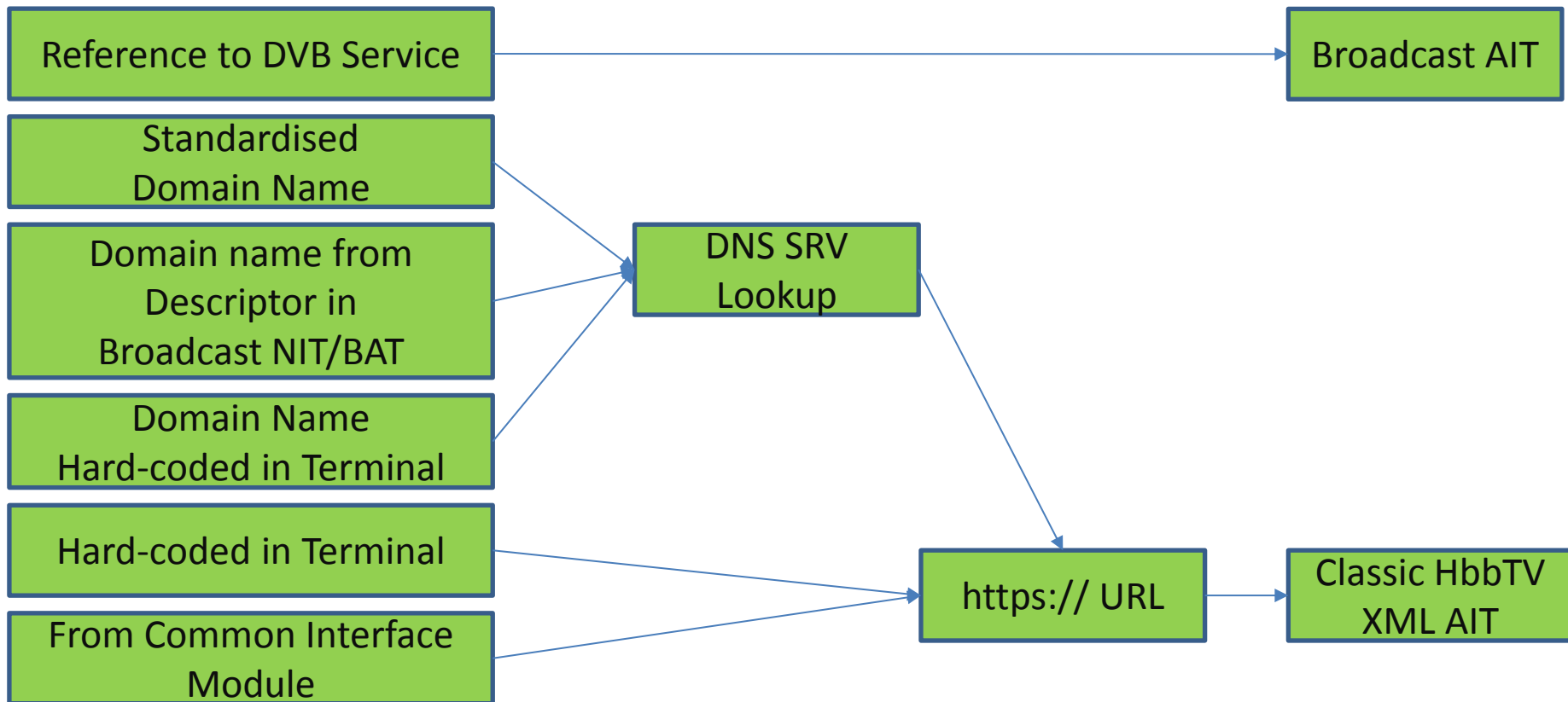
- Standard
 - Standard operator applications are HbbTV applications as defined in HbbTV 2 using regular broadcast signalling
 - Do not replace UI elements of the terminal but may provide alternatives to some of them.
 - Conceptually used in some HbbTV markets already
 - Not the primary focus of the spec,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



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

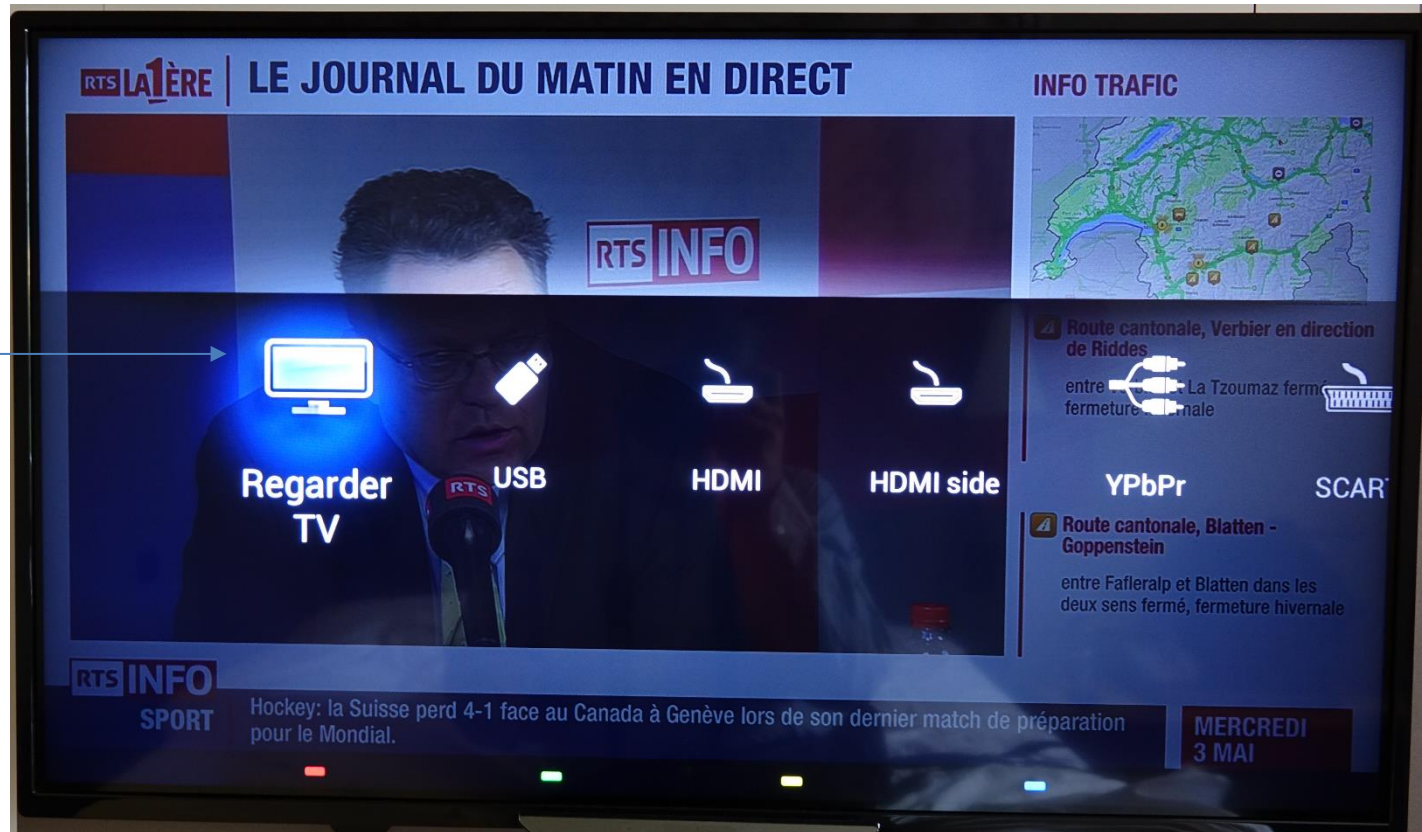
6 Options for Discovery of OpApps



- 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

- 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"



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)



- 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

- 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

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

- 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

- 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

- 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



- 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

- 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

- 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