

# THE **ProHD 2013** REPORT

Enabling Fast-paced Mobile News Acquisition,  
Roaming LIVE & Reality/EFP Applications

## GY-HM650



## Winning the Connectivity Race

So advanced . . .

LIVE Mobile News is now routine.

So cost effective . . .

No News Organization can afford to be without

So light and compact . . .

Mobile Anywhere Coverage is now reality



Wi-Fi



4G-LTE



Ethernet



USB



## **PREFACE**

The handheld GY-HM650 ProHD camera is a state-of-art camera/recorder designed for the most demanding mobile news, ENG, EFP and reality HD acquisition, offering the customer the most attractive performance/price ratio. From the supplied lens through camera front end, 3x sensor block, Falconbrid processing and cost-effective dual recording on removable SD memory cards, this ProHD camera is the market leader by any measure. And when the “Extreme Backhaul Flexibility” is considered, a part of every HM650, the competition is left behind. This ProHD 2013 Report concentrates on the analysis of what exactly is “Extreme Backhaul Flexibility”. Please review JVC’s multipage color brochures for the GY-HM650 to learn about all the other market leading details. Retrieve the brochure at [http://pro.jvc.com/pro/attributes/CAMERA/brochure/GY-HM650\\_Catalog.pdf](http://pro.jvc.com/pro/attributes/CAMERA/brochure/GY-HM650_Catalog.pdf)

<b><u>Table of Content</u></b>	<b><u>Page</u></b>
<u>Winning the On-Air Race</u>	<u>3</u>
<u>The Secret is out . . . 4G-LTE or Wi-Fi</u>	<u>4</u>
<u>ProHD – First with Built-in “Must Have” Technologies</u>	<u>6</u>
<u>4G-LTE Backhaul . . . from everywhere?</u>	<u>8</u>
<u>Camera Resident FTP and Streaming Client</u>	<u>9</u>
<u>Extreme Backhaul Flexibility</u>	<u>10</u>
<u>No more Backhaul Bonding . . . No more Backpacks?</u>	<u>14</u>
<u>The Cost of 4G-LTE and Wi-Fi Backhaul</u>	<u>15</u>
<u>Compare data transfer costs: 4G-LTE vs. Wi-Fi</u>	<u>17</u>
<u>JVC delivers the most for the money</u>	<u>18</u>
<u>JVC Broadcast Direct</u>	<u>19</u>
<u>JVC Professional Products Company - Contacts</u>	<u>20</u>

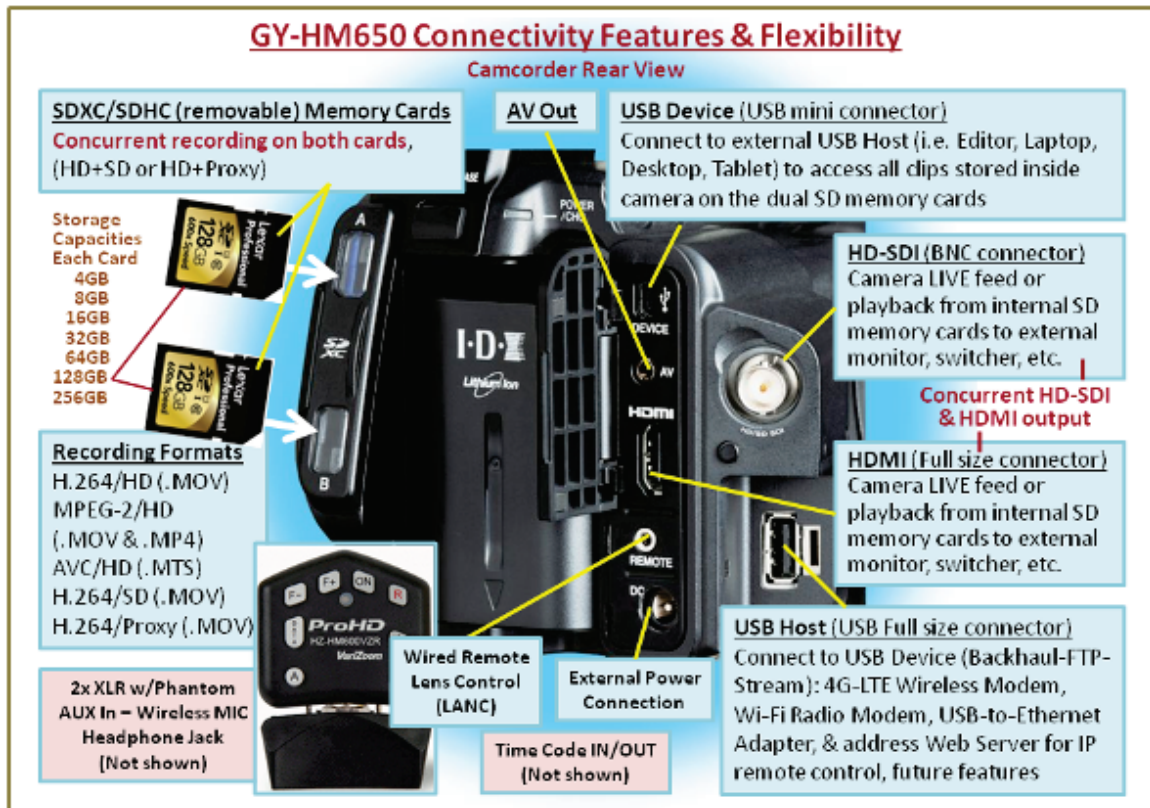
### **IMPORTANT:**

This ProHD-2013 Report has been authored by Tore B. Nordahl/nordahl.tv LLC on behalf of JVC Professional Products Company. Specifications stated herein are believed to be accurate at time of writing. Readers of this Report are encouraged to contact other sources including other manufacturers to obtain the latest specifications, as well as points of view and analysis other than those presented and concluded in this Report. **Trademarks:** All company, product and system names and trademarks found in this Report are the sole property of their respective owners.

## Winning the On-Air Race through flexible IP-centric Wireless & Wired Backhaul

Nothing shoots and delivers footage faster than JVC's GY-HM650, with the fully integrated FTP and LIVE streaming modes, over Wi-Fi and 4G-LTE backhaul, with an unbeatable performance/price ratio. This GY-HM650 handheld professional camcorder has a current list price of \$5,995 (NAB-2013).

The competitive advantage is particularly in the highly flexible connectivity solutions, comprising the built-in FTP and LIVE streaming client, Web Server and 4G-LTE applications, the dual USB ports (Host and Device), concurrent HD-SDI and HDMI outputs, the dual SDXC/SDHC memory cards with concurrent recording on both, and the wide selection of HD, SD and Proxy file formats. Look at the illustration below to see the extreme flexibility.



This Report concentrates on the connectivity features and flexibility, with the main purpose of showing that any camcorder purchase by a fast paced mobile news organization in 2013 and beyond, requiring fast (and LIVE) delivery of video clips from the field to go on-air, “must have” both 4G-LTE and Wi-Fi capabilities. Read on for fascinating and eye-opening analysis.

## The Secret is out . . . 4G-LTE and Wi-Fi?

Bear with the Author for the next two pages, as you need to know the background in order to understand what the Author believes to be essential knowledge when you select your next generation of HD camera/recorders for mobile news, ENG, EFP and reality HD acquisition.

There is heavy competition brewing between wireless broadband providers (AT&T, Sprint, T-Mobile and Verizon) offering 4G-LTE service and the cable TV/Internet providers (particularly Time Warner Cable (TWC), COX, Bright House, Comcast and Cablevision) offering Wi-Fi hotspot service, which competition will greatly benefit many local mobile news communities requiring live and near-live backhaul. The VJ (Video Journalist) may get the option of two backhaul paths: 4G-LTE and Wi-Fi. Competition decreases costs and improves service.

Why? The cable companies are worried about the 4G-LTE providers becoming dominant in distributing TV shows, TV news and VOD programs to the cable company subscribers in a mobile/away-from-home setting which, over years, may give the 4G-LTE providers an opening to provide highly competitive “wireless TV service” also to the home. The 4G-LTE providers can see heavy future mobile broadband activity by the cable companies by Wi-Fi Hotspots.

So, several years ago, the cable companies introduced the TV Everywhere service which enabled the subscribers to watch cable programming over Wi-Fi in the home on laptops, tablets and smartphones. The Author is a TWC (triple-play) subscriber in Los Angeles and a user of the TWC Wi-Fi in-the-home TV

Everywhere service. The restriction currently is that the subscriber must be within range of his home Wi-Fi service in order to use the service. To enable such service on a tablet, a user ID and a password must be provided. This TV Everywhere service may expand to be available outside the home using a “public” TWC Wi-Fi hotspot location (i) when the time is strategically right for TWC, and (ii) when such availability may be done securely to avoid “theft of service” by non-subscribers, and (iii) that sufficient bandwidth and hotspots are available. Note that such Wi-Fi TV service is primarily using the downlink path which may be taxed at a very high duty cycle during peak Wi-Fi viewing periods. BUT . . . remember that Mobile News backhaul, whether FTP or LIVE streaming, uses the uplink path.



### **So, how many “public” Wi-Fi hotspots will we have by 2015?**

The five major cable companies (specified above) have planned to have 50,000+ “public” Wi-Fi hotspots in operation nationally by 2014. Other cable companies see the opportunities, to compete for the wireless services market. By 2015, there may be as many as 200,000 “public” Wi-Fi hotspots.

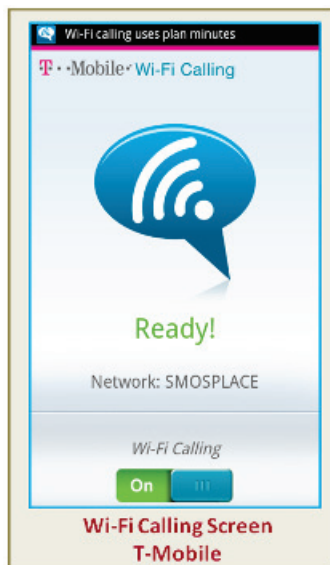


### Remember the old copper-line Bell telephone companies?

Among them are AT&T and Verizon. They lost out big when the cable companies started to offer IP home telephone service to their internet subscribers, reaching nearly 30 million homes by end 2012. That means that the old copper-line telephone companies lost nearly 30 million customers. AT&T and Verizon are now mobile phone and wireless broadband (4G-LTE) market leaders and they have become (“over-build”) competitors of the cable companies in the triple-play arena in some markets (U-verse & FIOS).

### The Author’s smartphone (telephone calling) works over Wi-Fi!

The Author subscribes to T-Mobile 4G wireless broadband using an HTC Sensation smartphone, and, in the absence of sufficient 4G coverage (as is the case in the Author’s home), the smartphone switches over to Wi-Fi (subject to availability and password access) for full telephone service, as well as internet access, provided through a T-Mobile app “Wi-Fi Calling”.



Such Wi-Fi calling app would certainly work over a “public” Wi-Fi hotspot, subject to password access and as long as such traffic was not specifically blocked by the Wi-Fi hotspot operator. The other wireless providers have similar “Wi-Fi calling” offerings.

**The wireless providers (AT&T, Sprint, T-Mobile & Verizon) are currently using 4G-LTE as the primary wireless path, while using Wi-Fi calling as secondary when 4G-LTE is not available (mostly inside the subscribers home).**

The cable companies are in the (IP) telephone business right now, with nearly 30 million homes as customers. And these customers are also internet customers (by definition) plus an additional 20 million customers are internet subscribers only, without IP telephone service. Why should the cable companies just serve their 50 million IP telephone and internet subscribers at home and allow the wireless providers to take the “away-from-home” telephone and broadband business without competition from the cable companies? After all, their fiber optic cable runs through-out their franchise area, and their (in-home) IP telephone service is already “Wi-Fi compatible”.

**The cable companies may indeed offer “away-from-home” telephone service using their franchise-area-wide Wi-Fi network as primary wireless path, while using (contracted for) 4G-LTE roaming as secondary when Wi-Fi is not available. The cable companies may do one better than the wireless companies, by extending your home IP telephone service outside the home and using the same home telephone number as the mobile number! (A smartphone designed for cable companies using primarily the local Wi-Fi network, once overlapping Wi-Fi hotspot coverage is operational. When? 2014 field testing? 2015 launch in limited areas? )**

## Conclusion:

The Author concludes that the cable companies' largest potential for network growth is perhaps to expand service offerings "outside-of-the-home" by installing thousands of Wi-Fi Hotspot radio/modems tapping into their trunk lines. Cable companies will accelerate the build-out of their Wi-Fi hotspot network over the next several years, while wireless providers will both build out and increase the bandwidth available over their 4G-LTE networks, creating a highly competitive wireless build-out race of capacity and service offerings which may greatly benefit local mobile news and ENG backhaul operations.

## Recommendation:

**Any new professional handheld or shoulder-mount camera/recorder, where the intended use is for regular or occasional FTP and LIVE streaming backhaul, must have built-in both 4G-LTE and Wi-Fi backhaul capabilities. (GY-HM650 includes both!)**

## ProHD . . . First with Built-in "Must Have" Technologies in Mobile News Cameras in 2013

Roaming LIVE wireless HD connectivity from camera to news studio has been a highly sought-after feature in the HD-ENG business for years, as the traditional TV station news van is expensive to acquire, operate and maintain, and required a wired connection from the HD-ENG camera to the news van unless a relatively expensive (camera-to-van) microwave link was available. Then, in 2009, JVC offered their Libre system, a camera-back-mounted microwave transmitter connecting with the van-mounted matching microwave receiver, providing good point-to-van wireless connection and even good roaming performance in HD-ENG and sports applications.

But the handwriting was already on the wall, with the emergence of 4G and WiMax broadband wireless and new advanced Wi-Fi modes of operation. WiMax fell by the wayside, but 4G-LTE and new Wi-Fi modes are now implemented and integrated into JVC's new Mobile News Cameras, the first model being the handheld GY-HM650. Simplicity rules: All that is required to make Wi-Fi and 4G-LTE operational is to plug in an appropriate "Wi-Fi Button or Stick" or a "4G-LTE Stick" in the USB Host connector on the back of the camera, and the camera is ready to FTP video clips back to the News Room in no time, or, better yet, LIVE video streaming back to Master Control!

**The 5 "Must Have" Built-in Camera Technologies for 2013 >>>**



## Why is “Built-in” so important?

Why not buy the “backhaul backpack” unit and just have the camcorder supply HD-SDI or HDMI (uncompressed) to the backpack, relying on the backpack’s encoder and processor to do the right thing, including inserting metadata and controlling the backhauling. The “lone ranger” VJ now has two control panels to work: the camcorder and the backpack. With JVC’s built-in 4G-LTE/Wi-Fi backhaul capabilities, the VJ simply plugs the 4G-LTE stick (or the Wi-Fi stick) into the USB host port on the camera, and all controls are available on the camera. And consider this: you don’t want to be at the mercy of the backpack supplier to update and improve compression, metadata handling and file wrappers. You prefer the “no-finger-pointing” one supplier responsibility you get with JVC’s “built-in-backpack” capabilities, where the responsibility lies with JVC (one source) to provide you with timely future updates and improvements for both camcorder and backhaul performance.

And, not to mention the added penalty of perhaps paying a hefty rental of as much as \$2,000 per month for that “backhaul backpack”, or perhaps a purchase price of \$15,000 which is nearly 3x the list price (\$5,995) of the GY-HM650 camcorder including the 4G-LTE and Wi-Fi capabilities. (Except the cost of the USB plug in Verizon 4G-LTE stick, which is about \$20 with a 2-year broadband wireless contract.)

## JVC delivers one more critical “built-in”: The Low Bitrate HD LIVE Encoding

You want to avoid the requirement of bonding two or more 4G-LTE backhaul paths for LIVE reporting, because bonding requires the backpack approach (or at least some sort of add-on box on top of the camera/recorder). And because bonding consumes more backhaul data bandwidth, it costs more to operate in terms of monthly data transfer charges from AT&T or Verizon. The two major 4G-LTE wireless carriers currently provides uplink data-rate in the range from less than 3Mbps to exceeding 8Mbps for a single link, thus JVC has established the “critical built-in low bitrate” especially designed for HD LIVE remote reporting to be as follows:

LIVE Bitrate	Format/Raster	Remarks
5 Mbps	1920x1080/60i	
3 Mbps	1280x720/30p	
2.5 Mbps	1920x1080/60i	
1.5 Mbps	1280x720/30p	
0.8 Mbps	720x480/60i	Use in challenging backhaul situations

**NOTE:** The above table is subject to change without prior notice.

## Wi-Fi is free . . . or is it?

When you connect to a public Wi-Fi hot spot, it may be free (Starbucks) or there may be a charge (hotel, although some are free). If you connect at home or at your business, Wi-Fi is “free” except for the monthly broadband internet subscription charge and, maybe, an additional usage charge for exceeding a down/up transfer limit (i.e. 200GB per month).



A streaming Netflix program consumes about 2.5GB per hour, thus one Netflix movie per day adds up to about 100GB per month. A LIVE streaming (compressed) HD news clip (720p60 – TV station local contribution quality – 3Mbps/AVC) backhauling to the TV station may consume around 23MB per minute or nearly 1.4GB per hour. The VJ doing one hour of FTP (1.4GB transfer of equivalent LIVE) from his/her home in the evening each workday of the month (22 workdays/mo) will consume 31GB per month. This is within the 200GB monthly baseline, so, perhaps, you can call it free. However, in a city-wide Wi-Fi Hotspot network, it is expected that the cable company will require a business broadband account to a (let’s say) TV station doing 31GB Wi-Fi Hotspot backhaul per month, not to mention that the TV station may own (let’s say) five (5) GY-HM650 camcorders for a total Wi-Fi backhaul budget of 31GB x 5 = 155GB per month. Look at 4G-LTE estimated backhaul costs on page 17.

**Obviously, 155GB of data usage will not be free, but it’s likely to be less expensive than 155GB of 4G-LTE.** (OR Wi-Fi presence may drive down 4G-LTE backhaul prices!)

## 4G-LTE Backhaul . . . from everywhere?

Well, let’s qualify that by saying from nearly everywhere there are significant clusters of people living and lots of cars driving. JVC has worked closely with Verizon over the past year testing out backhaul reliability and capabilities using the (standard) Verizon 4G-LTE USB “Stick” Modem UML290. Verizon covers more than 475 cities and towns by their 4G-LTE service which now includes 85+% of the U.S. population. AT&T makes similar statements of coverage, and their 4G-LTE Sierra 313U USB “stick” is also JVC approved. The maximum download speed may exceed 20 Mbps while upload speed may approach 10Mbps, in the “faster cells”. But the speed varies from area to area, although the adding of capacity (and data speed) by the wireless providers is going on continuously. Note that the crucial parameter for Mobile News LIVE backhaul is the upload speed, which will determine if the backhaul from a given news location can be live streaming or (pre-recorded) file transfer FTP. For example, a one-minute HD news clip of 130MB (17Mbps realtime) can be FTP’d back to the TV station in about 2 minutes over a 4G-LTE upload data rate of 9Mbps. 65MB is transferred per minute, completing the 130MB transfer in two minutes. Or four minutes over a 4.5Mbps uplink.





What is 4G-LTE? Within the wireless telecom industry, 4G stands for Fourth Generation while LTE stands for Long Term Evolution. LTE means that 4G evolved from 3G, with a number of smaller steps being implemented over time. All of the Big 4 wireless providers (AT&T, Sprint, T-Mobile and Verizon) are by now 4G proponents, but Sprint is catching up in coverage while T-Mobile first achieved 4G-type speed through their dual carrier HSPA+.

Bottom line? Coverage and speed will vary from city to city and between wireless providers, so upload speed tests should be undertaken to determine which wireless provider is likely to offer the best backhaul performance in your case. And perhaps you need to subscribe to both Verizon and AT&T, after you find out that Verizon works best on the west side while AT&T works best on the east side!

## Camera Resident FTP Client & LIVE Streaming Client

File Transfer Protocol (FTP) is an established form of uploading a file over an IP network (i.e. internet) from a remote location (in this case using the FTP Client resident in the GY-HM650) to a central (FTP) file server, let's say at the TV station, where the media file is stored for wide access and edited (if necessary) in the news room and scheduled for air. In the event of LIVE coverage on-air, the LIVE video is stream formatted (in this case using the Streaming Client residing inside the GY-HM650) and streamed back to master control, re-formatted on the fly and sent to air or to website for LIVE presentation. The camera resident clients for FTP and for LIVE streaming work in concert with the cameras' Wi-Fi and 4G-LTE interface firmware, providing wireless backhaul through the USB plug/play devices. More details later in this Report.



## MXF AS-10 – Maximum Workflow Interoperability

Material Exchange Format (MXF) is a SMPTE-standardized media storage format. MXF is a "container" or "wrapper" format which supports a number of different streams of coded essence (video/audio), encoded using one of a variety of permitted codecs, together with a metadata header which may describe the material contained within the MXF file in great detail.



To combat what was seen as inconsistencies/ambiguities in implementation of the various SMPTE MXF standards when it came to production work flow interoperability, Adobe, AVID, JVC, Turner/CNN, Harmonic and Sony agreed several years ago to work together to arrive at a production-specific/enhanced version referred to as MXF AS-10.

Wide media format compatibility and support for data-rich MXF Files are built-in capabilities of the GY-HM650. AS-10 compatible metadata may be downloaded from the news room via the internet with "last mile" being over Wi-Fi or via 4G-LTE, or at the remote location by the VJ using Wi-Fi Direct connection from laptop, tablet or smartphone.

## GPS – Global Positioning System

GPS is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver. The built-in GPS receiver in ProHD cameras provides automatic and accurate date/time stamping of all clips, in addition to provide location coordinate data, inserted into the MXF data header.

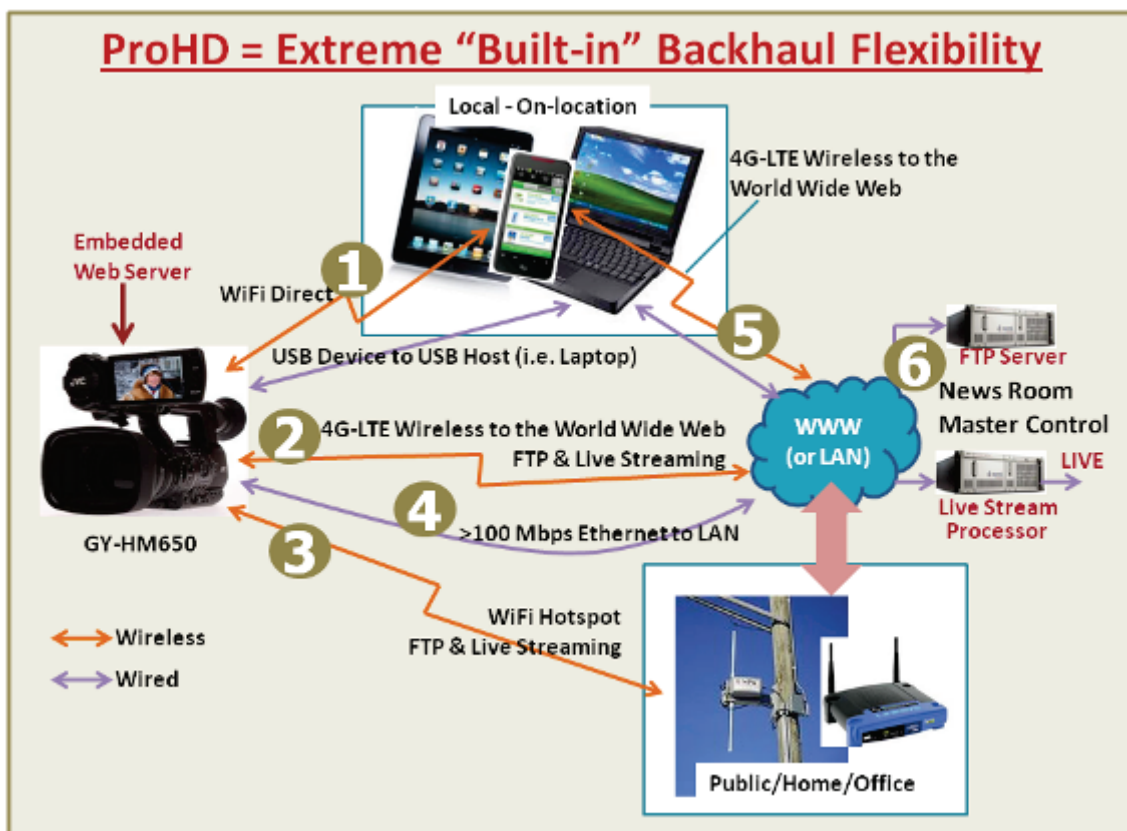


## Extreme Backhaul Flexibility

### Web Servers, IP Network & FTP/Streaming Clients

To enable internet/network communication and remote control, “unattended” devices attached to the network, such as printers, routers, even websites and, in our case, the ProHD camera (for remote control purposes), must have a resident web server with a unique IP network address.

The primary function of the camera’s web server is to respond with its (home) web page once accessed by another network attached device (tablet, smartphone, etc.) by typing the unique IP address of the ProHD camera into the tablet’s or smartphone’s browser.



In the “backhaul mode”, the GY-HM650 controls the streaming process by specifying the destination’s unique IP address, of either the FTP Server or of the LIVE Streaming receiver, using the camera’s built-in FTP Client or LIVE Streaming Client in concert with either the 4G-LTE modem or the Wi-Fi modem. The illustration above shows the extreme backhaul flexibility.

Note that the HM650 camera has two (2) USB ports:

- **USB Host** (full size rear USB connection), used when the camera is the host for USB devices, plugging in a Wi-Fi Radio Modem (stick/button) or a 4G-LTE Wireless Modem or a USB-to-Ethernet Adapter. Note that any FTP (or LIVE streaming) activity must be initiated by the camera as the network host (USB Host connection).
- **USB Device** (rear mini USB connection), used when the camera is a device connected to a USB Host, like a desktop PC/Mac, a laptop or a tablet, thereby enabling the host to access clips (full resolution or proxy) for editing or transfer purposes, just as another storage device (the internal removable dual SDXC memory cards).

Only one USB functionality may be operational at any one time: The camera may be a host or a device, not both at the same time.

## Wireless Remote Control of ProHD Camera

### 1

#### Wi-Fi Radio Module plugged into USB Host port

In a Remote On-location setting, the VJ may wish to remotely control the camera by establishing a wireless link (Wi-Fi) between the GY-HM650 and a smart device (smartphone, tablet or laptop) within local Wi-Fi range, each of which must have Wi-Fi and browser capabilities like Internet Explorer, Firefox, Safari (Apple) or Chrome (Android) etc. to control. The simple path is to use Wi-Fi Direct, to type the camera’s IP address into the smart device’s browser, and then access becomes available when the camera’s web server home page is accepted and displayed on the smart device. The following remote functionality will then become available to the VJ:

- Live View with Zoom and Trigger controls
- Clip thumbnails preview
- Metadata edit
- Network configuration

For purposes of wireless local control in a remote on-location setting, the smart device used are most likely to be a smartphone or a tablet, unless the VJ needs editing on a capable laptop.

## 2 Wireless FTP of Clips or LIVE Streaming Backhaul back to News Room using 4G-LTE 4G-LTE Modem plugged into USB Host port

Using 4G-LTE wireless broadband/internet service subscription (Verizon, AT&T) to connect to the internet, routing the clips to the FTP server at the TV Station, Cable News Facility or Website News Room, by entering FTP Server IP address. Similar procedure for LIVE streaming, by entering LIVE Stream receiver destination IP address.

## 3 Wireless FTP of Clips or LIVE Streaming Backhaul back to News Room using Wi-Fi Hotspot -- Wi-Fi Radio/Modem plugged into USB Host port

Primary “public” Wi-Fi Hotspots are operated by cable companies through Wi-Fi modems attached to telephone poles and buildings, inside and outside. Time Warner Cable reported 10,000 hotspots operational in the U.S. at the end of 2012, with a plan to double that number by the end of 2013. TWC has been concentrating on Los Angeles where there are “thousands of TWC hotspots” available free for their cable/internet subscribers. There now is a fair chance that there is a public Wi-Fi hotspot within range in Los Angeles near a breaking news event, if within TWC’s franchise area. If not in 2013, then in 2014, when there may be 20,000+ hotspots just in the greater Los Angeles area between several cable companies and others. For a commercial user like a local TV news organization, it may be necessary to contract with the local cable company to make sure that sufficient uplink data speed is available, especially when planning to do LIVE backhaul streaming.

As a matter of fact, the five major cable companies of TWC, COX, Bright House, Comcast and Cablevision have agreed to allow each other’s subscribers “Wi-Fi roam” for free on any of their Wi-Fi network, and their combined number of hotspots is expected to exceed 50,000 nationally by 2014. Some wireless providers (like AT&T) have been very active in developing Wi-Fi hotspots nationally for a number of years, working with companies to cover corporate customer locations including airport executive lounges. AT&T currently operates about 30,000 Wi-Fi hotspots nationally. In 2013, the two best metro areas for “away-from-home” Wi-Fi Hotspot service are the greater areas of Los Angeles and New York City.

Just as your home Wi-Fi router/modem is directly connected to the internet through your cable company’s broadband network, so is the Wi-Fi hotspot modem attached to a pole or to a building, with a potential uplink data bandwidth of up to 100Mbps, much more than what’s required to do live backhaul of compressed broadcast quality 1920x1080p60. **The competition between Wi-Fi hotspots and 4G-LTE is heating up in more areas than TV Everywhere!** And the uplink capacity may be less utilized (and less monetized) for both Wi-Fi hotspots and 4G-LTE. This is good for mobile news acquisition and the capability to do LIVE HD backhaul (uplink). The questions then become:

**Will 4G-LTE backhaul be primary and Wi-Fi hotspot secondary?**

**OR**

**Will Wi-Fi hotspots backhaul be primary and 4G-LTE secondary?**

**AND**

**Will 4G Bonded backhaul be necessary at all?**

Uncertain.  
Buy a camcorder  
with both 4G-LTE  
& Wi-Fi built-in

NO, Not in the future

#### **Wired FTP of Clips or LIVE Streaming Backhaul using Ethernet**

**4**

##### **Ethernet adapter plugged into USB Host port**

Network cable connects ProHD camera to Local Area Network (Home, Business, Public) to connect up with local desktop editing system, FTP Server, Live Stream Terminal/Processor, or make camera functions available on the internet for remote connectivity. Ethernet mode is used inside buildings shooting from fixed (tripod) position for LIVE streaming where wired Ethernet connection is available, or back at the News Room where wired Ethernet connections from several cameras to the LAN make cameras available to multiple editing bays.

**5**

#### **Wireless FTP of Clips or LIVE Streaming Backhaul using Wi-Fi Hotspot/4G-LTE Relay**

##### **Wi-Fi Radio Modem plugged into USB Host port**

Most smartphones can be configured as a Wi-Fi hotspot, accepting the Wi-Fi wireless signal from the camera and relaying the communication to the internet (www) over the smartphone's 4G-LTE wireless subscription. The VJ then has full access to the internet being able to enter the IP address of the FTP Server, or when LIVE streaming is needed, the IP address of the LIVE streaming terminal/processor, located in the News Room or near the Master Control.

Some tablets may have 4G-LTE modem built-in, which in most such cases include the Wi-Fi hotspot relay mode app. Laptops may require a special Wi-Fi hotspot app to be added and the plugging in of an active 4G-LTE modem stick in a USB port to be Wi-Fi hotspot relay ready.

#### **FTP Server & Live Stream Receiver/Processor Side**

**6**

##### **News Room & Master Control**

In a local TV News environment, with News Room and Master Control, the FTP Server receives and stores clips being FTP'd from the field, where editors may finalize the clips and then ready or schedule the clips for AIR. In a LIVE streaming mode, the LIVE video stream is received by the Live Stream Receiver/Processor, IP de-packetized and decoded (perhaps up/down/ cross-converted) to HD-SDI to go through Master Control to be integrated LIVE into the News Cast on-air with a minimum of delay. Concurrently, the LIVE program may be recorded in the in the News Room Server in the MXF wrapper format with the maximum metadata intact.



## No more Bonding? No more Backpacks?

### “Must have” Built-ins = Much less expensive

If you need to reliably backhaul a LIVE 35Mbps (wireless, compressed HD broadcast quality) stream today, you probably need expensive microwave equipment. And, when it comes to “4G-LTE backpack bonding”, with each 4G uplink circuit yielding let’s say an average of 5Mbps, you would need to bond a minimum total of eight (8) 4G-LTE uplink circuits (yes, plug in 8 each 4G-LTE USB modems into your backpack – if you have space for that many!). Similarly, at the receiving end, all 8 circuits need to be “IP de-packetized” and decoded which is likely to produce substantial latency. A Bonding Backpack (or add-on box) with such capabilities is not cheap, if available at all.

JVC’s strategy in the GY-HM650 Mobile News Camera is to offer TV stations and news organizations a HD camcorder containing all “Must Have Built-in” facilities including the ability to backhaul LIVE video without needing external add-on devices (NO box, NO backpack, NO wires), the only exception being the plugging in of the single 4G-LTE USB modem “stick” OR the Wi-Fi Radio/Modem, and with the requirement that the HD video shall be visually of high quality comparable to TV station local news quality at a uplink (backhaul) data-rate of 3 to 5Mbps.

**It’s important to mention that any easy-to-handle smallish form factor handheld camcorder will be seriously compromised by the attachment of any sort of box. This is yet another reason why it is critical that the wireless backhaul circuits are built into the camera body, as it is in the GY-HM650.**

As explained earlier in this Report, the GY-HM650 includes a highly efficient real-time H.264 encoder chip as a part of the camera’s resident LIVE streaming client, accepting uncompressed HD from the camera front end and outputting one of five (5) compressed LIVE data streams, as selected by the operator as 0.8Mbps (SD), 1.5Mbps (720p30), 2.5Mbps (1080i60), 3Mbps (720p60) OR 5Mbps (1080i60). Under normal 4G-LTE uplink data-rate speed condition, any one of the five LIVE data-rates should be producing reliable connections. Normal uplink data-rate over Wi-Fi hotspots may deliver higher speed, but as LIVE is at a given real-time data-rate (i.e. 5Mbps), it does not make a difference that the available backhaul speed is let’s say 10Mbps for the Wi-Fi connection and let’s say 8Mbps for the 4G-LTE connection. The transfer speed is 5Mbps as selected.



**“Must have” Built-in = Much less expensive**

## The Cost of 4G-LTE Backhaul Data Transfers

As JVC recommends the Verizon 4G-LTE USB Modem UML-290, the backhaul cost estimates in here are based upon [Verizon's website data plan pricing for consumers](#) (and general small business) as of March 28, 2013. Be aware that Verizon may offer special segment business plans which may be more or less attractive than the consumer plans analyzed below. Contact Verizon for business plan details, as well as AT&T which is also recommended.

Verizon is pushing their "share-up-to-25-devices" data plan. A local news organization may have purchased five (5) ProHD GY-HM650 handheld camcorders, requiring to buy a total of five (5) UML-290 4G modems. These five camcorders may then share in a data plan pool if such makes sense financially. The purchase of the UML-290 modems is only about \$20 each under a 2-year contract (about \$250 each without a contract).

Once established that FTP and LIVE backhaul works satisfactory for one, there is little risk in going with a 2-year contract for all five modems. On the other hand, \$1,250 purchase cost (month-to-month contract) for the five modems is not material in the overall mobile news operational costs, thus "month-to-month" may give some protection in the ability to switch 4G-LTE provider or transition more and more to Wi-Fi Hotspot backhaul as it develops. What is important is the monthly operational cost based on actual wireless backhaul traffic (data usage). Verizon offers the following (consumer and general business) data plans for sharing between several 4G data-only subscriptions OR attach the entire monthly bandwidth (data usage) for just one 4G subscription (one camera):

Monthly Contract (up to)	Monthly Cost	Monthly Cost GB	Remarks
10 GB	\$ 60	\$ 6.00	
20 GB	\$ 110	\$ 5.50	Lowest rate per GB
30 GB	\$ 185	\$ 6.17	
40 GB	\$ 260	\$ 6.50	
50 GB	\$ 335	\$ 6.70	
<b>Excess</b>			For each GB or part of . . .
1 GB	\$ 15	\$15	When monthly bandwidth contract is <b>exceeded</b>

Note that Verizon offers a number of smaller monthly contracts down to 4GB, insufficient for mobile news FTP and LIVE backhaul operations. Also note that the "exceeding-the-contract" charge is \$15 per GB or part thereof, which may become very expensive.

## Estimated Average Monthly Data Usage

The monthly consumed 4G backhaul bandwidth for one GY-HM650 camcorder is its total of all backhaul transfers sent over its wireless 4G-LTE link, without regard to whether such transfers are faster-than-realtime (FTP), realtime (LIVE Streaming) or slower-than-realtime (FTP). Over a month of usage, the total data usage being a combination of all three.

A certain video news clip recorded “live” to the SDXC (or SDHC) memory card will have a file size somewhat larger than the compressed bitrate per second multiplied by the duration of the clip in seconds due to added overhead like MXF wrapper etc.). Once the file size is fixed (determined), then the data bandwidth consumed in the backhaul transfer is the same whether it is transferred fast or slow over the 4G-LTE link.

The following table assumes a busy local mobile news organization (TV station?) having let’s say standardized on AVCHD at 17 Mbps for FTP, and H.264 HD at 3 Mbps for LIVE Streaming.

Recording Format	Compressed Bitrates (choice)	ONE MINUTE Realtime	ONE HOUR Realtime	Monthly Minutes Transfer	Monthly Data Usage
AVC, MPEG-2	35 Mbps	285 MB	17 GB	-	-
MPEG-2	25 Mbps	200 MB	12 GB	-	-
AVCHD	24 Mbps	185 MB	11 GB	-	-
MPEG-2	19 Mbps	170 MB	10 GB	-	-
<b>AVCHD FTP</b>	17 Mbps	140 MB	8 GB	330	46 GB
<b>H.264 LIVE</b>	3 Mbps 720p60	23 MB	1.4 GB	660	15 GB
		<b>TOTAL &gt;&gt;&gt;</b>		<b>16.5 hrs Monthly</b>	<b>61 GB Monthly</b>

Note that each chosen format/bitrate is estimated to consume an average of 15 minutes of FTP data usage per day, times 22 days of use in a month, consuming 330 “monthly minutes of transfer time” at equivalent LIVE realtime bitrate plus overhead. Any given file of a certain size (let’s say 285MB) consumes 285MB of transfer data usage whether transferred faster-than-realtime FTP, realtime LIVE, or slower-than-realtime FTP. The data speed of the “backhaul 4G-LTE pipe” only determines how soon the file will complete the transfer at the destination News Room! **The average LIVE backhaul per day is in this example set at 30 minutes average per day, over 22 days, for a total of 660 minutes of monthly transfer.**

One thing is obvious when looking at the above table: Verizon's "share-up-to-10-devices" is NOT really applicable to the multiple camcorders used in mobile news acquisition. It seems obvious that each camcorder should just subscribe to its own 50 GB monthly maximum baseline quota, as it seems assured that each camcorder will certainly exceed such maximum contract data plan bandwidth each month. Assuming the above backhaul duty cycle for each camcorder is reasonable, the news organization may do well in negotiating a fluid monthly contract for each of the five camcorders, without any minimum or base, at a per-GB-price equal to about \$6/GB. A monthly 61GB billing will then be about \$366 which may seem reasonable. **Remember, Verizon and AT&T may soon have to compete with their 4G-LTE data service against the cable companies' Wi-Fi Hotspots for the local news organizations' backhaul business.**

**It's obviously very important for each local news organization to perform FTP and LIVE backhaul tests initially, negotiate with Verizon (and/or AT&T) for attractive and flexible deals, research the availability and costs of cable company Wi-Fi hotspots access, and to plan the field use of multiple GY-HM650 camcorders as to FTP and LIVE backhaul use.**

## Compare data transfer costs: 4G-LTE vs. Wi-Fi

It is difficult (if not impossible) today to compare the monthly operational (data usage) costs between 4G-LTE and Wi-Fi Hotspot service. But it is reasonably certain that Wi-Fi will be significantly cheaper as the total pipe bandwidth of the cable companies' fiber trunks is measured in Gbps downlink to each hotspot location. Uplink speed over any "publically placed" Wi-Fi Hotspot radio/modem can reach hundreds of Mbps, and both downlink and uplink can be dynamically controlled to increase data speed over specific Wi-Fi Hotspots as required to serve special customers. A 4G-LTE broadband wireless cell will have less total bandwidth to share with a lot more subscribers. In the longer term, Wi-Fi Hotspot backhaul is expected to be significantly cheaper, in the opinion of the Author.








## Another Reason for Wi-Fi Competition & "Must-have" Both

If the VJ can locate reliable Wi-Fi Hotspots, there is an opportunity to "off-load" a significant portion of the FTP backhaul from 4G-LTE to the Wi-Fi, thereby reduce the current very expensive excess 4G usage charges. This is another reason to encourage the cable companies to build-out their local Wi-Fi Hotspot locations, **confirming that any new mobile news handheld camcorder purchased in 2013 and beyond must have "built-in" both 4G-LTE and Wi-Fi Hotspot FTP/LIVE client capabilities.**

## JVC delivers the most for the money . . . Whether handheld, shoulder-mount or studio

Over the eight years since JVC introduced the first ProHD camcorder GY-HD100 at the NAB in 2005, JVC's professional HD camera strategy has been to condense its models to a price range from about \$2,500 (handhelds) up to about \$10,000 (shoulder-mount) and to include features and performance well beyond what are available from the competition. The fact that competitors offer professional cameras in multiple price ranges, from less than \$2,000 to more than \$50,000, results in a requirement to "ration" features and performance, often telling a customer that feature X (although not costly to include) is not available in the \$10,000 camcorder but it is in the \$20,000 model range. The competitors have no option but to reserve some options for the \$20,000 model in the hope of selling some! No such range rationing with the JVC cameras, as JVC only has one model range: ProHD.

**ProHD Camera Model Line-up 2013**

Flexible Studio Configuration	Shoulder-mount	Handheld
 <b>TV Broadcast Studio</b> <b>GY-HM790</b> Request Price Quote	 <b>GY-HM790 \$9,995</b>	 <b>GY-HM650 \$5,995</b>
 <b>GY-HM750 \$7,700</b>	 <b>GY-HM600 \$4,695</b>	
 <b>GY-HM710 \$6,250</b>	 <b>GY-HM150 \$2,495</b>	
 <b>Portable or Fixed HD Studio</b> <b>Local Origination Studios</b> <b>GY-HM650, HM600 or HM150</b>		

**NOTE:** U.S. Suggested List Prices shown are subject to change without prior notice. As of NAB-2013.



## JVC Broadcast Direct

### A Sales & Support Organization dedicated to TV Broadcasters

JVC Broadcast Direct is a new program offered largely to Group Station Owners to achieve successful transitioning at their local TV station properties to full and highly competitive HD news operations through the adoption of cost effective ProHD acquisition systems, and, as importantly, to assure the ongoing uninterrupted daily operation of ProHD equipment at the highest possible level. JVC's core commitments under a Broadcast Direct group adoption agreement include:

- Direct buying from JVC under net-30 or capital lease
- Purchase at substantial discounts (Adoption pricing)
- Direct station-level support by JVC technical/operations staff
- Depot service and product loaner program (Immediate turn-around)
- Exclusive performance and features
- JVC Support Web Portal (Repair, purchase history, manuals, pricing)

**ProHD**  
On Air. On Time. On Budget.

JVC Broadcast Direct simplifies the ongoing purchasing and transition process, and includes initial setup of cameras and lenses, an exclusive depot service support program, and the very important training for technical and production staff by JVC product experts. All this to assure a highly successful ownership experience on a daily basis, including JVC placing ProHD camera/recorders at strategic locations as backup equipment when a TV station's equipment is sent to our depot for repair. Such gear is owned by JVC but available to the TV stations for the life of the adoption agreement. JVC's endeavor is to generate a win-win situation that will benefit all parties for now and the future. The success of ProHD will assure longevity and continued product developments to the benefit of the Group Station Owners through product continuum.

### Join the Win-Win JVC Broadcast Direct Relationship



#### **FALCONBRID: JVC'S Next-generation High-speed Picture Engine**

Falconbrid is JVC's high-speed processor developed for advanced video camera applications. 40nm processing is incorporated into a single chip, offering high performance and low energy-consumption with an economical design. The Falconbrid Picture Engine can handle any image data including RGB, YCC and RAW conversions in real time with virtually no latency. Additional Falconbrid processor(s) may be used to encode and format the video.



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**ProHD**  
On Air. On Time. On Budget.