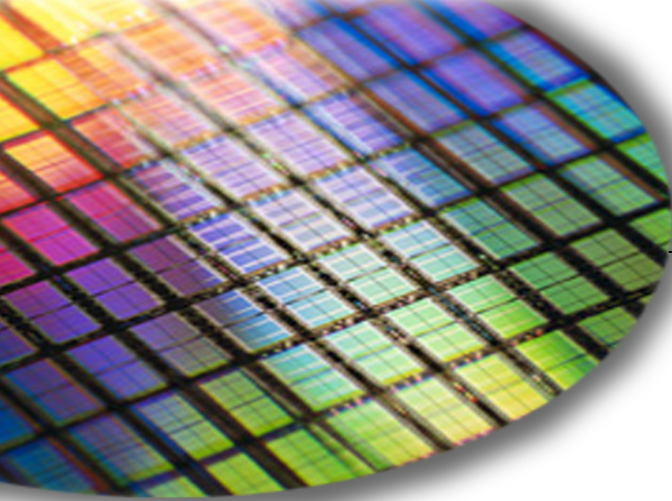




The World Leader in High-Performance Signal Processing Solutions



Overview of JPEG2000 and the ADV202



Brief Overview of JPEG2000

- ◆ JPEG2000, the new still and moving image compression standard from the JPEG Committee, was designed to address the shortcoming of JPEG including:
 - Better image quality:
 - ◆ Up to 50% better Pixel SNR performance than JPEG
 - ◆ Lossless compression possible
 - ◆ Compresses continuous tone and bi-level compression equally well
 - Scalability - dynamic bandwidth / quality control possible
 - Better error resilience compared to JPEG and MPEG
 - Content-based description and image security (encryption, copyright info, etc)
- ◆ No user fees for JPEG2000 (unlike MPEG4); see following website for details:
 - http://www.jpeg.org/faq.phtml?action=show_answer&question_id=q3f042a68b1081
- ◆ JPEG2000 uses wavelet-based transform to achieve better compression
- ◆ **Analog Devices has the most experience in wavelet-based compression (since 1996) with the ADV6xx series; no other company comes close.**

Example: JPEG2000 and JPEG Picture (50:1)

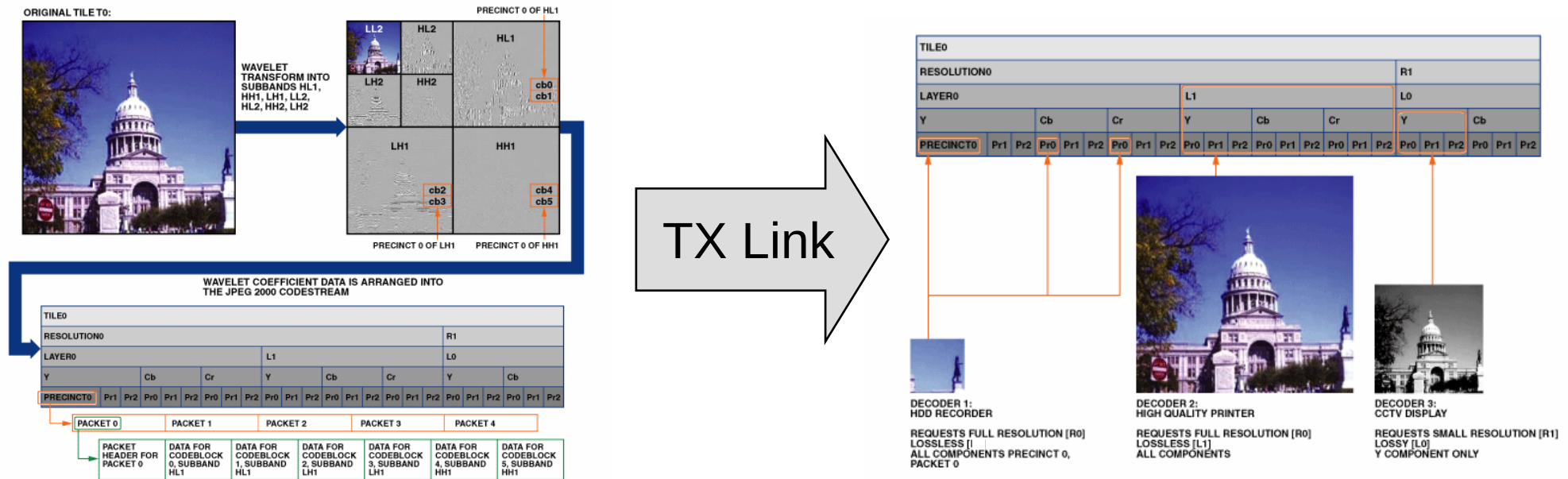


JPEG2000



JPEG

JPEG2000 codestream

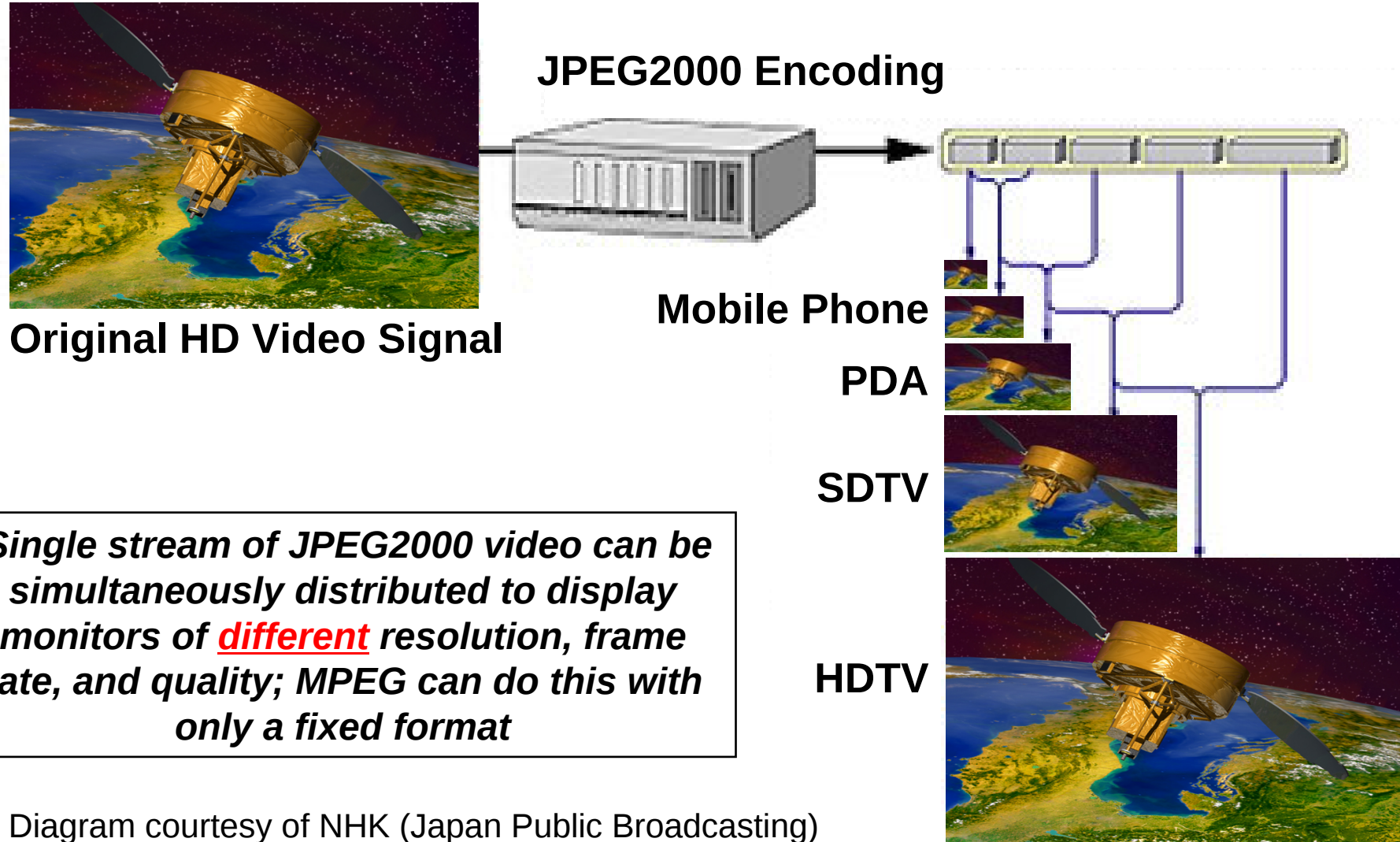


- ◆ The JPEG2000 header and codestream contains information about different resolutions, layers [compression ratios], components, precincts [areas of the image] of the input.
- ◆ On the decode side it is possible to extract only a very specific codestream, based on the header information. For example : Extract and decompress only a smaller resolution in monochrome.
- ◆ “Encode once, decode in a variety of different ways”

More on this at:

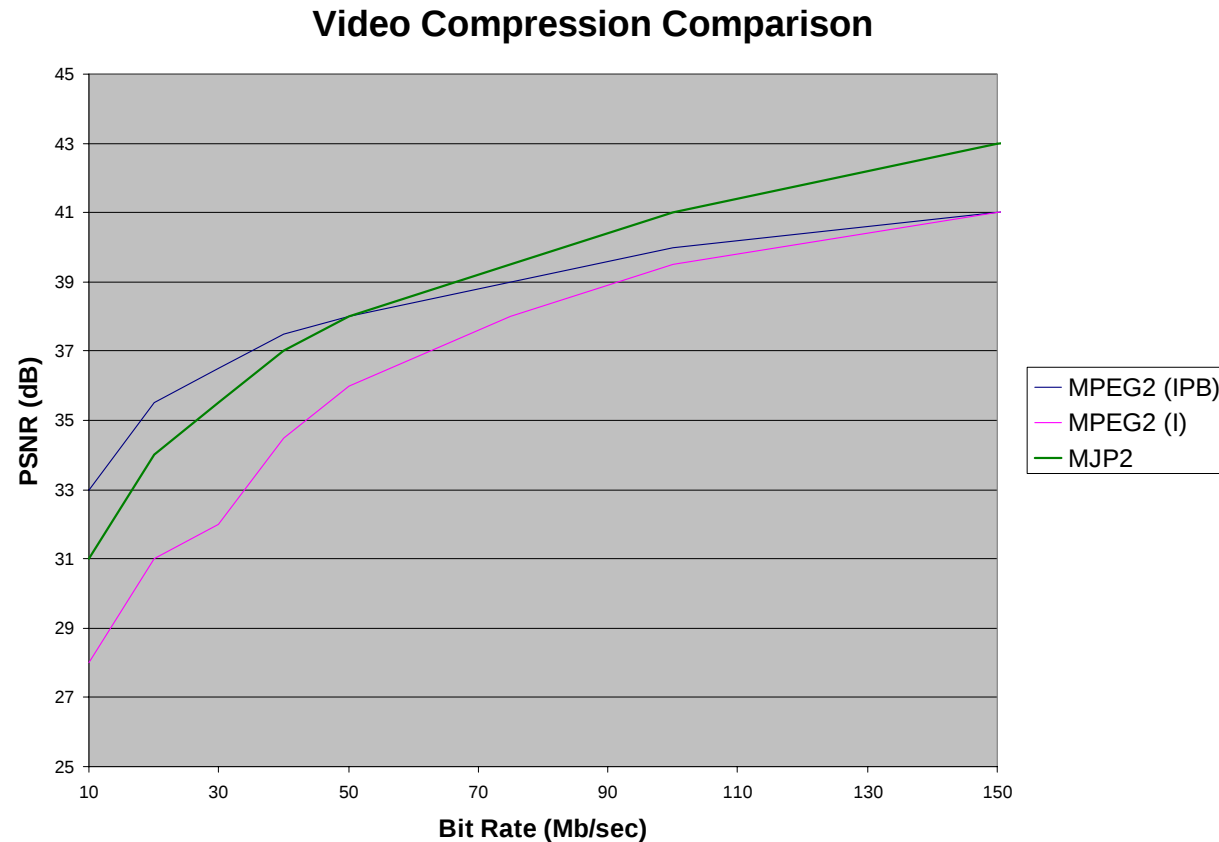
<http://www.analog.com/library/analogDialogue/archives/38-09/jpeg2000.html>

Scalability of Video with JPEG2000*



* - Diagram courtesy of NHK (Japan Public Broadcasting)

Comparison of HD Video Compression Technologies



- MPEG2 IPB compression efficiency very good < 50 Mbits/sec
- MPEG2 IPB performance approaches MPEG2 I at > 50 Mbits/sec
- JPEG2000 is superior at higher bitrates, especially > 70 Mbits/sec

JPEG 2000 Handles High Bit Error Rates*

(Compression ratio of 80:1, BER of 10^{-4})



Motion-JPEG2000



Motion-JPEG



MPEG-2



MPEG-4

*-"Motion JPEG2000 in Video Processing," Master's Thesis, Wei Yu, Washington University July 2002

Analog Devices Confidential Information

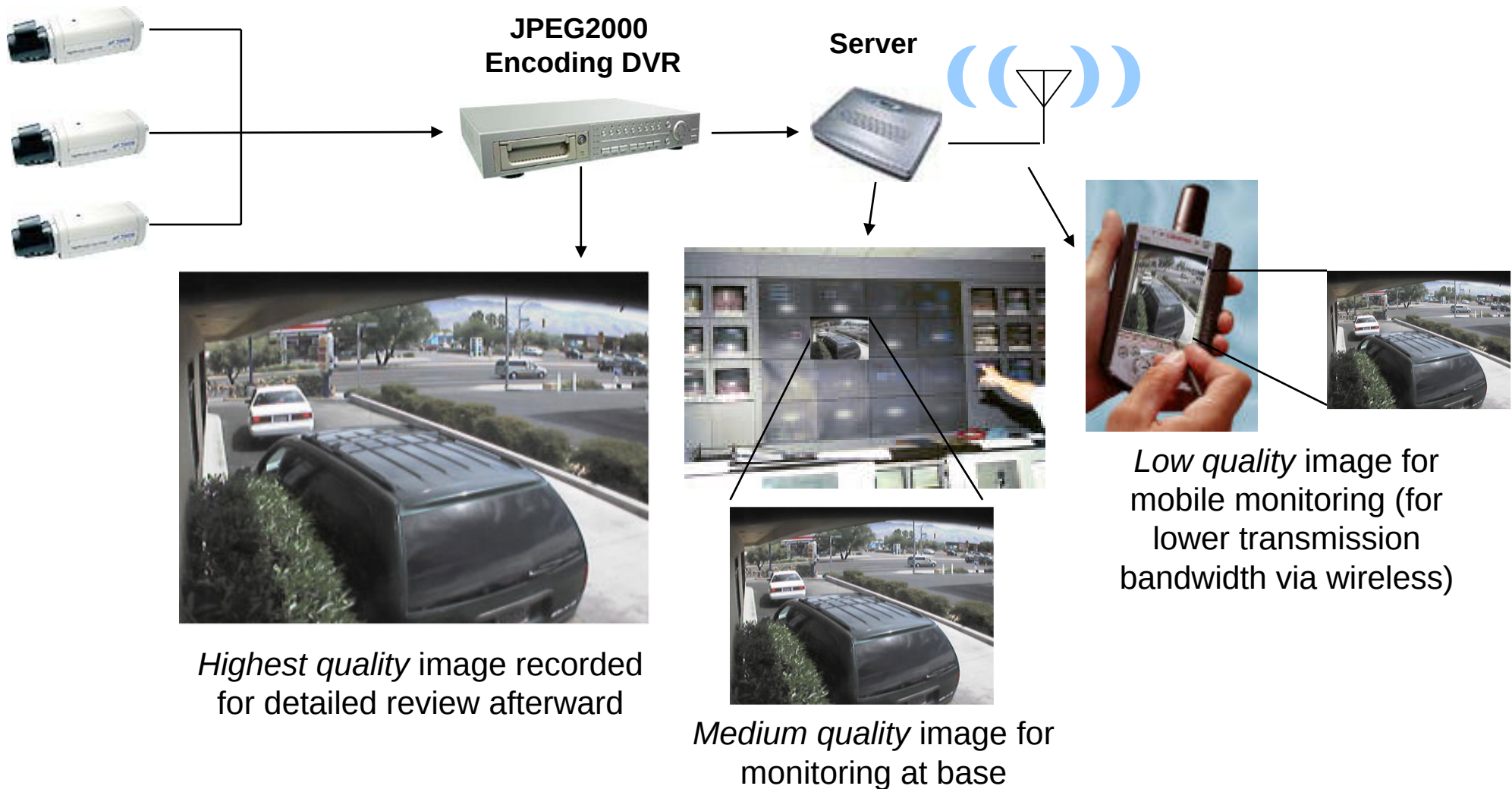


ADV202 Features

- ◆ Compliance to the JPEG2000 standard for still and motion pictures.
- ◆ SURF (Spatial Ultra-efficient Recursive Filtering) technology
 - No external memory needed – competitive solutions need frame buffer memory
 - Lower power – ~750mW of power dissipation
 - Low Latency - <1.5 frames for encode or decode; MPEG solutions have up to 10 frames worth of latency
- ◆ Internal rate control is accurate to +/-5%
 - MPEG or JPEG solutions are content dependent
- ◆ Tile/image sizes with widths up to 2048 pixels in 3-component 4:2:2 mode; 4096 pixels in single-component mode.
- ◆ **Two ADV202s can be used to encode or decode HD (720p, 1080i) signals in real-time**
- ◆ Various standard video and microcontroller (16/32-bit) Interfaces for ease of use
- ◆ Flexible pixel interface supporting 8, 10, 12, 14, 16-bit Y, Cr, Cb pixels
- ◆ Compact 12x12 or 13 x 13 BGA package

ADV202 in Surveillance

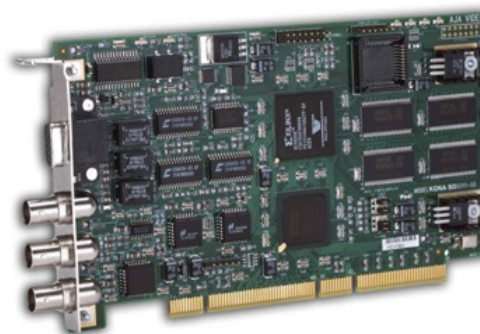
Simultaneously transmit different resolutions, frame rates, and quality levels with no transcoding



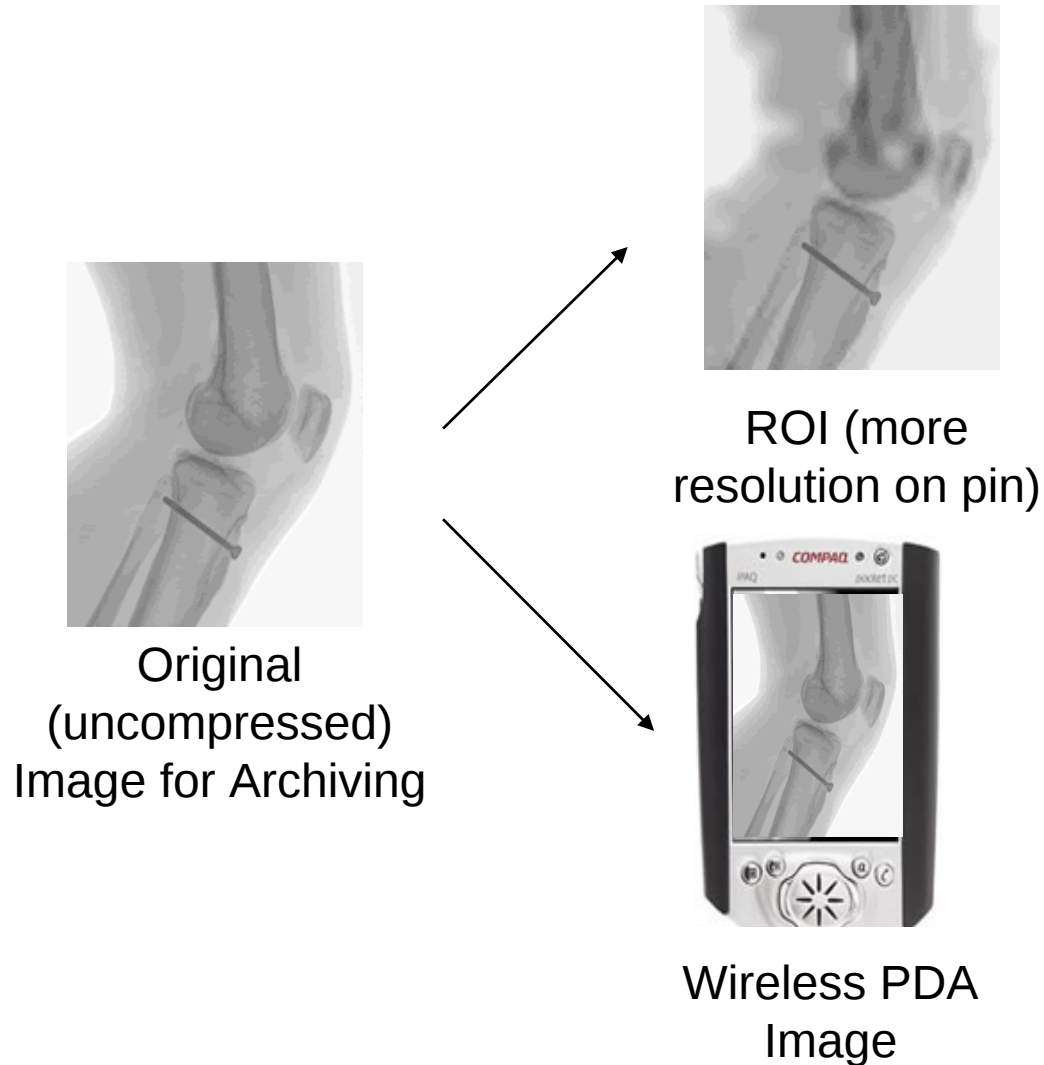
Applications for ADV202

◆ Pro Video / Broadcast

- Recommended by Digital Cinema Initiatives (DCI) as cinema distribution medium – applications in
 - ◆ Cinema projectors
 - ◆ Video servers
 - ◆ Storage disks
 - ◆ Post Production Equipment
 - ◆ Camcorders
- HDTV Capture/Playback
- High-end scanners
- ◆ Any imaging application that uses compression



JPEG2000 in Medical Imaging



- JPEG2000 – the only compression standard accepted by DICOM (Digital Imaging and Communication in Medicine)
- Both the JPEG2000 lossless compression and lossy compression algorithms have been accepted for use.



ADV202 Product Status

- ◆ Release Status
 - ADV202BBC-115: 12mm x 12mm BGA package
 - ADV202BBC-135: 13mm x 13mm BGA package
 - ADV202BBC-150: 13mm x 13mm BGA package
- ◆ Datasheet, application notes, firmware updates, as well as other documentation available on ftp://ftp.analog.com/pub/Digital_Imaging
- ◆ Application notes include:
 - Getting Started documentation
 - User Guides
 - Using multiple ADV202s to do high resolution images
- ◆ ADV202 Evaluation Board
 - SD evaluation board (\$1500) available
 - HD evaluation board (\$2500) available
 - Stand-alone board (no PC) using FPGA available



In Conclusion

- ◆ Analog Devices has the most experience in wavelet-based compression (since 1996) with the ADV6xx series
- ◆ JPEG2000 offers:
 - Scalability – dynamic bandwidth, quality, and resolution control
 - Stability (constant bit rate and strong error resiliency)
 - Highest image quality compared to any other compression algorithm
- ◆ The ADV202 offers in addition to the benefits of JPEG2000:
 - The smallest footprint (no external memory)
 - Very low power
 - Extremely Low Latency
- ◆ The ADV202 is the highest performance, most economically viable real-time HD compression / decompression device on the market