Toshiba’s MPEG-4 Solutions

Low-Power, Single-Chip MPEG-4 CODEC

....Enabling Wireless Multimedia
Agenda

- Overview of MPEG-4 standard
- Overview of Toshiba’s MPEG-4 solutions
- Emerging MPEG-4 Applications
- MPEG-4 Roadmap
# What is MPEG-4?

**A Comparison of video standards**

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<th>Primary application</th>
<th>ENTERTAINMENT</th>
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<th>COMMUNICATIONS</th>
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<tr>
<td>MPEG-1</td>
<td>MPEG-2</td>
<td>MPEG-4</td>
<td>H.263</td>
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<td>CD-ROM</td>
<td>DVD, HDTV, Broadcast</td>
<td>Portable multimedia</td>
<td>Desktop video conference</td>
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<td>Video data rate's</td>
<td>1.5Mbps</td>
<td>4.6Mbps</td>
<td>20Kbps-6Mbps</td>
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<td>Typical video frame size</td>
<td>352x240</td>
<td>720x480</td>
<td>176x144(QCIF) 352x288(CIF)</td>
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<td>Typical audio quality</td>
<td>Stereo CD</td>
<td>Surround sound</td>
<td>Speech, stereo CD, surround sound</td>
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<td>Error resilience</td>
<td>Basic</td>
<td>Basic</td>
<td>Advanced</td>
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- **Typical video frame sizes:**
  - MPEG-1: 352x240
  - MPEG-2: 720x480
  - MPEG-4: **176x144 (QCIF)**, **352x288 (CIF)**
  - H.263: **176x144 (QCIF)**, **352x288 (CIF)**
  - H.261: **176x144 (QCIF)**, **352x288 (CIF)**

- **Audio qualities:**
  - MPEG-1: Stereo CD
  - MPEG-2: Surround sound
  - MPEG-4: Speech, stereo CD, surround sound
  - H.263: Speech
  - H.261: Speech

- **Error resiliences:**
  - MPEG-1: Basic
  - MPEG-2: Basic
  - MPEG-4: Advanced
  - H.263: Adequate
  - H.261: Basic
Toshiba’s MPEG-4 Activity

- Leader in MPEG technology standardization
  - ISO: Significant contributor to ISO MPEG-4 standard
  - ITU: H.223 Annex-D, Currently working for H.323Mobile
  - 3G-PP: Leading Activity on 3G-324M which includes MPEG-4
  - IETF: MPEG-4/IP Standardization Activities

- Complete suite of MPEG-4 solutions
  - Single-Chip, Low-Power MPEG-4 Decoder
  - Software MPEG-4 Decoder
  - Single-Chip, Low-Power MPEG-4 CODEC
  - Firmware IP for MPEG-4 CODEC (Video/Audio/Comm)
  - Middleware IP (Driver/Video telephony, etc)
  - Reference Boards for Prototype Design
Low-Power, Single-Chip Decoder

- First to market with production silicon
- Leveraged expertise in embedded DRAM technology to enable low-power dissipation
  - Reduced power dissipation to 50mW
- 4Mb of embedded DRAM
- Video decode of 15 fps at QCIF (176x144 pixel)
- 30MHz clock frequency
- Fully compliant with MPEG-4 standard
Low-Power, Single-Chip CODEC

- Again, integrated embedded DRAM for low-power dissipation
  - Reduced power dissipation to 80mW
- 12Mb of embedded DRAM
- Video decode of 15 fps at QCIF (176x144 pixel)
- Adaptive Multi Rate Speech CODEC
- 70MHz clock frequency
- Fully compliant with MPEG-4 standard
Power Consumption Comparison

- Over 1.5W by PC CPU
- 890 mW
- 240 mW
- 80 mW
MPEG-4 Single-Chip, Low-Power CODEC

- MPEG-4 Video
- Speech/Audio
- Mux/Demux

- Prefilter
- Embedded DRAM (12Mb)

- Firmware Module Options

- TOSHIBA
  Toshiba America Electronic Components, Inc.
What’s MPEG-4 Visual Telephony?

Cellular service

Internet

“You have to see it for yourself....”
Toshiba’s view on classes of phones

Feature Phone

- Software decoder
- I-mode like terminal

Visual Oriented Models

- Hardware decoder

Voice Oriented Models

- Bluetooth Oriented Models
T3 Application Example

- Application software
- Middleware
- Operating System

CELLULAR BASEBAND CONTROLLER

Host CPU

MPEG4 Driver's

LCD Controller

LCD

CMOS Camera

MPEG-4 T3 LSI
- Video Core
- Audio Core
- Mux./Demux.
- Arbiter
- 12Mb Embedded DRAM
Toshiba MPEG-4 Roadmap

- **0.3µm**
  - MPEG-4 Core (Test Chip)

- **0.25µm**
  - Good picture quality
  - MPEG-4 Video LSI (T1)

- **ISSCC 2000 version**
  - Video and Audio functions integrated
  - MPEG-4 Video & Audio (T2)

- **0.18µm**
  - MPEG-4 Software Decoder

- **Production versions**
  - MPEG-4 Video & Audio (T3D) Decode
  - MPEG-4 Video & Audio (T3) Decode & Encode

Timeline:
- '98
- '99
- '00
- '01
Toshiba MPEG-4 Summary

- Production versions of low-power, single-chip solutions now available in two formats, one decode only, the other encode and decode
- Leadership in embedded DRAM technologies enables low-power dissipation
- Middleware software available now to support chips
- Also offer a software Decoder, available now for PDA developers
- *Toshiba - the only complete mobile MPEG-4 solution provider - is poised to drive the wireless multimedia market*