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WHITE PAPER

Oracle in Hi-Def: Unique iStore implementation enables the Intellectual Property Marketplace.

Contributors from Silicon Image - Kenny Gilbert (Director, Technology Services) and Krista Ladd (Business Applications Manager)
Contributors from Trianz - Vikram Bhandari, Jay Bhatt, Minerva Camacho, Manisha Desai, Sanjay Dey, Dave Eastlund, Edward Porta.
Contributors from HDMI - Leslie Chard

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Solution Whitepaper

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Trianz Service(s):
Enterprise Applications Services

Trianz Solution(s):
Systems Integration Services

Oracle in Hi-Def

Unique iStore implementation enables the Intellectual Property Marketplace

The Challenge and Solution

Silicon Image, HDMI co-founder, and HDMI LLC, administrator of annual fees and royalties for the industry standard, faced the daunting task of automating the processes for calculating, tracking, invoicing and receiving annual fee and royalty payments from HDMI adopters. After toying with the idea of a custom application, Silicon Image teamed up with Oracle to generate ideas on how its applications could be leveraged to address this business issue. After coming up with the initial idea for iStore and Service Contracts as a solution, Trianz – a preferred Oracle Integration Partner – was brought in to expound on and round out the solution. Added to the solution set were TeleService for compliance and Install Base for royalties.

UNIQUE AND GROUND-BREAKING...The approach chosen by HDMI LLC and Silicon Image differs significantly from traditional approaches to licensing and royalty management often referred to as Intellectual Property Management. Because HDMI LLC uses a normalized adoption and royalty approach to its adopters, it is able to more effectively streamline the process using off the shelf software with minimal customizations versus going the route of a specialized Royalty or IPM solution. In addition, the concept of "self-service" licensing and royalty management is unique in and of itself. Even the most sophisticated purpose-built solutions in this space do not offer the Licensee (or Adopter) the ability to manage their agreements and report on shipped items for royalty payments. This unique business model and enabling solution approach has applicability to other consortium or standards bodies seeking to enable rapid adoption of a standard or specifications and improve the tracking and timeliness of payments.

What is HDMI? [1]

Developed by Sony, Hitachi, Thomson (RCA), Philips, Matsushita (Panasonic), Toshiba and Silicon Image, the High-Definition Multimedia Interface (HDMI) has emerged as the connection standard for HDTV and the consumer electronics market. HDMI is the first and only digital interface to combine uncompressed high-definition video, multi-channel audio and intelligent format and command data in a single digital interface. For your end-users, use of a single cable for audio and video dramatically simplifies home theater system installation and eliminates the cable quagmire typically associated with home theater system components. Most importantly, HDMI offers significant advantages over analog A/V connections, including the ability to transmit uncompressed digital video and audio content. In addition to numerous device and display manufacturers, Hollywood studios and cable and satellite operators also support HDMI.

HDMI (High-Definition Multimedia Interface) is the first and only industry-supported, uncompressed, all-digital audio/video interface. By delivering crystal-clear, all-digital audio and video via a single cable, HDMI

dramatically simplifies cabling and helps provide consumers with the highest-quality home theater experience. HDMI provides an interface between any audio/video source, such as a set-top box, DVD player, or A/V receiver and an audio and/or video monitor, such as a digital television (DTV), over a single cable.

HDMI supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable. It transmits all ATSC HDTV standards and supports 8-channel, 192kHz, uncompressed digital audio and all currently-available compressed formats (such as Dolby Digital and DTS), HDMI 1.3 adds additional support for new lossless digital audio formats Dolby TrueHD and DTS-HD with bandwidth to spare to accommodate future enhancements and requirements.

- **HDMI is the de facto standard digital interface for HD and the consumer electronics market**: More than 400 companies have become adopters, and more than 60 million devices featuring HDMI are expected to ship in 2006 (conservative estimate by In-Stat).

- **Convergence – HDMI is the interface for convergence of PC and consumer electronics devices**: HDMI enables PCs to deliver premium media content including high definition movies and multi-channel audio formats. HDMI is the only interface enabling connections to both HDTVs and digital PC monitors implementing the DVI and HDMI standards.

- **Evolving standard – HDMI is continually evolving to meet the needs of the market**: Products implementing new versions of the HDMI specification will continue to be fully backward compatible with earlier HDMI products.

HDMI Licensing, LLC is the agent responsible for administering use of the HDMI Specification, promoting the HDMI standard and providing education on the benefits of HDMI to retailers and consumers.

HDMI Adoption Process

HDMI is an industry standard offered to better the end-user experience. End users benefit by seeing the HDMI logo and knowing the device on which it is displayed will interface properly with other HDMI compatible components and deliver the image and sound quality they expect with their purchase.

As with many other standards and like intellectual property, the benefit cannot be realized if offered only by the founders or a small group of companies. Therefore, the HDMI logo can be applied to any product which complies with the specification, undergoes compliance testing and whose maker becomes an adopter.

The HDMI Mark may be used only by authorized adopters who have entered into an Adopter Agreement with the HDMI Licensing Agent (as well as authorized distributors and resellers pursuant to the Adopter Agreement).[1]

An Adopter Agreement is offered for those parties that desire to make and sell HDMI-based products such as DVD players, Set-top boxes, TVs, semiconductors, cables and connectors, etc. A Test Equipment Maker Agreement is offered for those parties that desire to make and sell test equipment such as oscilloscopes, wave form generators and other measurement tools designed to assist manufacturers in using the Compliance Test Specification to test their HDMI products for compliance with the HDMI Specification.[1]

Annual Fee [1]

HDMI Adopters must pay an annual fee. The annual fee is due upon the execution of the Adopter Agreement, and must be paid on the anniversary of this date each year thereafter.

Royalty [2]

In addition to the annual fee, adopters are responsible for a royalty payment on each HDMI labeled unit sold. The exact rate per unit varies between four cents and fifteen cents per unit (USD). For example, the rate is reduced for adopters who meet certain HDMI promotional requirements and reduced further if HDCP content protection (as set forth in the HDMI Specification) is also implemented.

The HDMI royalty is only payable on Products that will be sold on a stand-alone basis (i.e. that are not incorporated into another Product that is subject to an HDMI royalty). For example, if a cable or IC is sold to an Adopter who then includes it in a television subject to a royalty, then the cable or IC maker would not pay a royalty, and the Adopter television manufacturer would pay the royalty on the final product. If the cable is sold directly to consumers, then it would be subject to a royalty.

HDMI Compliance Testing [2]

Prior to mass producing or distributing any Product or component that claims compliance with the HDMI Specification (or allowing someone else to do such activities), each Adopter must test a representative sample for HDMI compliance.

First, the Adopter must self-test as specified in the then-current HDMI Compliance Test Specification. The HDMI Compliance Test Specification provides a suite of testing procedures, and establishes certain minimum requirements specifying how each HDMI Adopter should test Products for conformance to the HDMI Specification. Such compliance testing is limited to evaluation of a product's compliance with the HDMI Specification and is not designed to test the overall performance of any Product.

Second, each Adopter must submit the first product of each product type (i.e. source, sink, repeater, or cable) to an HDMI Authorized Testing Center (ATC) for testing. Once an Adopter product of each type has passed testing, it is not required to submit to the ATC subsequent products of that type. For example, once an Adopter's television has passed ATC testing, it is not required to submit another television or other display for ATC testing. This essentially validates the Adopter's self-test procedures for each product type from that point forward. However, to help ensure HDMI interoperability, HDMI encourages Adopters to use the ATCs for new products. The HDMI Compliance Test Specification represents the minimum compliance testing required for Products.

The HDMI Founders have established Authorized Testing Centers (ATC) where manufacturers can submit their products for compliance testing.[4]

China	Europe	Japan	North America
– Shenzhen (Silicon Image)	– France (Philips Semiconductor)	– Osaka (Matsushita Electric)	– Sunnyvale, California (Silicon Image)
– Shanghai (Silicon Image)		– Tokyo (Sony Corporation)	

Table 1: HDMI Authorized Testing Centers

Successful completion of the Compliance Test Specification or ATC Testing does not guarantee that any product will conform to the High-Definition Multimedia Interfaces, function correctly or interoperate with any other product. Each Adopter is solely responsible for ensuring that its products function correctly, fully comply with the HDMI Specification and Adopter Agreement, and interoperate with other products.

HDCP Testing

As referenced in the annual fees section above, HDCP content protection is an element of the HDMI specification and its implementation can result in reduced fees.

HDMI Licensing LLC does not offer HDCP testing, although the HDMI Founders, at their discretion, will likely do so in

High-Bandwidth Digital Content Protection (HDCP) is a form of digital rights management (DRM) developed by Intel Corporation to control digital audio and video content as it travels across Digital Visual Interface (DVI) or High Definition Multimedia Interface (HDMI) connections. The HDCP specification is proprietary and an implementation of HDCP requires a license.

HDCP is licensed by Digital Content Protection, LLC, a subsidiary of Intel. In addition to paying fees, licensees agree to limit the capabilities of their products. For example, High-definition digital video content must be restricted to DVD quality on non-HDCP compliant video outputs when requested by the source. DVD-Audio content is restricted to DAT quality on non-HDCP digital audio outputs (analog audio outputs have no quality limits). Licensees cannot allow their devices to make copies of content, and must design their products to "effectively frustrate attempts to defeat the content protection requirements."[5]

the future. HDCP testing services are currently available from Silicon Image (http://www.simplayhd.com). *NOTE: Neither HDMI Licensing, LLC nor the HDMI Founders as a group endorse these resources and are not responsible for such services in any way.*[2]

How Do You Manage All of This?

Short Answer

…A great deal of manual effort by the licensing company (HDMI LLC) with assistance from its parent (Silicon Image), the other HDMI Founders, and the HDMI adopters.

HDMI is one of the most successful consumer electronics standards in existence. And with the rapid current and anticipated growth of the standard, it was clear that a more robust, scalable solution was needed.

The Whole Story

The process was manual and data storage was spread across multiple desktops in across Microsoft Excel spreadsheets and Access databases. Fortunately, the process was managed by a few highly skilled and knowledgeable individuals who were able to keep it on track. But this was obviously not scalable.

Being a communication intensive process without automation, information exchange was handled mainly through phone calls and emails. Verification and authentication required searching through various data sources and additional phone calls. As with other manual processes, audit of the process and data was difficult.

Looking forward, HDMI LLC wanted to strengthen its processes for royalty tracking and receipt. As adoption of HDMI increases dramatically in the future, the enabling infrastructure needed to scale and allow for identification of any revenue leakage in terms of failure to receive royalties from Customers.

Customer Support was also made difficult by the lack of centralized data.

The Mission – Automate, scale and focus on compliance

Key business outcomes anticipated:

- Process scalability. Enable effective fee and royalty management as the install base of HDMI products sky-rockets – HDMI products numbered just short of 20 million in 2005 and are expected to grow to over 120 million in 2006.
- Auto creation of Customer, Contacts, Order, Invoice (all manual previously)

- Annual Fee tracking and auto-creation of Annual Fee Invoice (instead of creating a new order)
- Dramatically improved reporting
- Service for compliance

The Solution

Unique HDMI Business Approach Drives Simplicity in Operations

The business approach chosen by HDMI LLC differs significantly from traditional approaches to licensing and royalty management often referred to as Intellectual Property Management. Because HDMI LLC uses a normalized adoption and royalty approach to its adopters, it is able to more effectively streamline the process using off the shelf software with minimal customizations versus going the route of a specialized Royalty or IPM solution. In addition, the concept of "self-service" adoption (similar to licensing; see note below*) and royalty management is unique in and of itself. Even the most sophisticated purpose-built solutions in this space do not offer the Licensee (or Adopter) the ability to manage their agreements and report on shipped items for royalty payments. This unique business model and enabling solution approach has applicability to other consortium or standards bodies seeking to enable rapid adoption of a standard or specifications and improve the tracking and timeliness of payments.

Special Note: The HDMI Adopter model is similar to licensing in the way it is enabled and managed, but there are significant differences and business implications of each approach which are not the subject of this paper.

Alternatives Considered and Fundamental Solution Approach Selected

Conceptually, from a process element and flow perspective the changes from the current to future state were few. However, in terms of process execution and control, the changes were to be dramatic – going from almost completely manual to highly-automated and controlled operations. To enable this transformation, some level of application customization was expected in any scenario.

Two alternatives were considered:

- Custom application
- Hybrid solution of an Enterprise application (Oracle) with customized workflows as well as look and feel

Serious consideration was given early-on to building a custom application. However, as with any custom solution, it would come with the headaches of maintenance, integration with existing footprint and future platform upgrade. However, Silicon Image made the strategic decision to focus on fully leveraging the existing infrastructure – an Oracle footprint – prioritizing ease of integration and maintenance, and scalability to adapt to upgrades of existing Oracle versions. In short, the operating principles became "few applications, streamlined infrastructure, and limited number of vendors."

While it was expected that an out-of-the-box (OOB) solution would not provide the functionality HDMI LLC and Silicon Image were looking for, Silicon Image turned to its ERP vendor – Oracle – to generate ideas on how to address this business challenge. A third partner, a valued integration partner – Trianz – rounded out the brain trust. This team, over a period of months, penned out a solution that all thought would fit the need.

Business Flows to be Enabled

The following HDMI processes were identified as part of the solution:

1) **HDMI User Registration**
2) **HDMI Adopter Membership**
3) **HDMI Royalties Quarterly Billing**

4) **HDMI Adopter Annual Billing**

5) **Non Compliance Issue Resolution**

6) **Revenue Recognition Reporting**

7) **Key Performance Indicators for HDMI**

At the outset of Solution Design, each HDMI process flow to be enabled was related to one standard Oracle flow. The standard flows represent common practices for enabling business processes on ERP and CRM application platforms. The objective was to identify the most relevant standard flows to use as starting points for HDMI process enablement. This approach limits customization (always good), results in better application performance and efficiency when deployed.
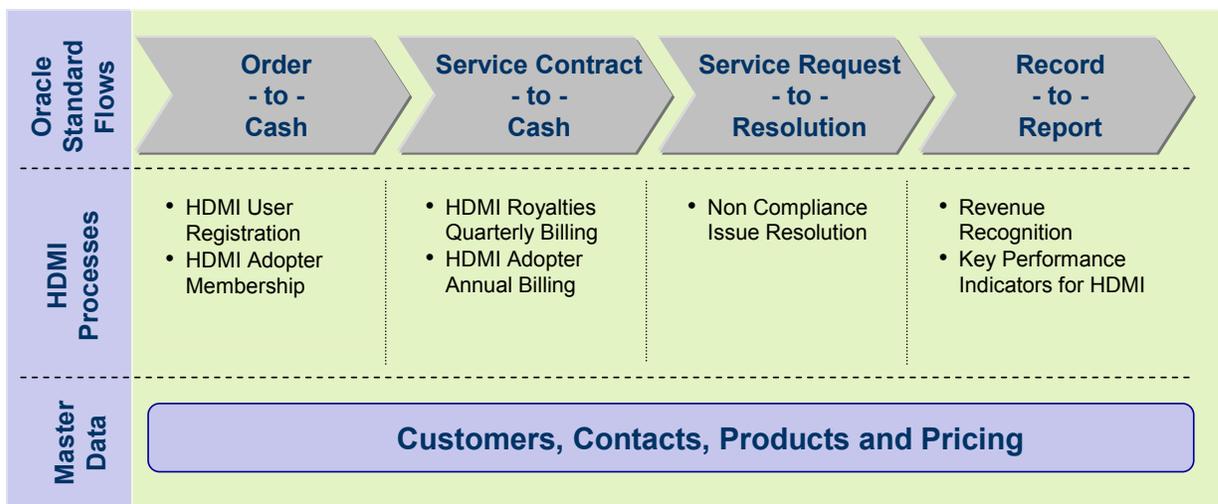
Figure 1: HDMI Process Flows Related to Oracle Standard Flows

Application Architecture

The design selected and built out is predominantly an Oracle solution with some customization on the front-end.

Eight (8) Oracle modules plus workflow and a custom web application comprise the solution:

1) **Oracle iStore**
   – User registration
   – Contact management
   – Request to be an Adopter
   – Order tracking

2) **Web Extranet (Non-Oracle)**
   – Submit Units Shipped
   – Approve Units Shipped

3) **Oracle Inventory**
   – Serviceable / Service-item setup

4) **Oracle Order Management**
   – Price list setup
   – Order booking

5) **Oracle Service Contracts**
   – Adopter annual billing
   – Royalty quarterly billing

6) **Oracle Install Base**
   – Customer products tracking with counter feature for royalty billing

7) **Oracle Accounts Receivable**
   – Customer Master
   – Invoice generation
   – Credit memos
   – Collections

8) **Oracle TeleService**
   – Customer Support process and issue resolution with audit trails
   – Compliance Issues
   – Issues escalations

9) **Oracle Daily Business Intelligence (DBI)**
   – Reporting capabilities from modules in order to get user-friendly and accurate reports
   – KPI to track active and pending adopters
   – Compliance issue reporting

Figure 2 shows the application architecture and system flow of the solution. Oracle modules are shown in green, while non-Oracle components appear hashed and in blue-grey.
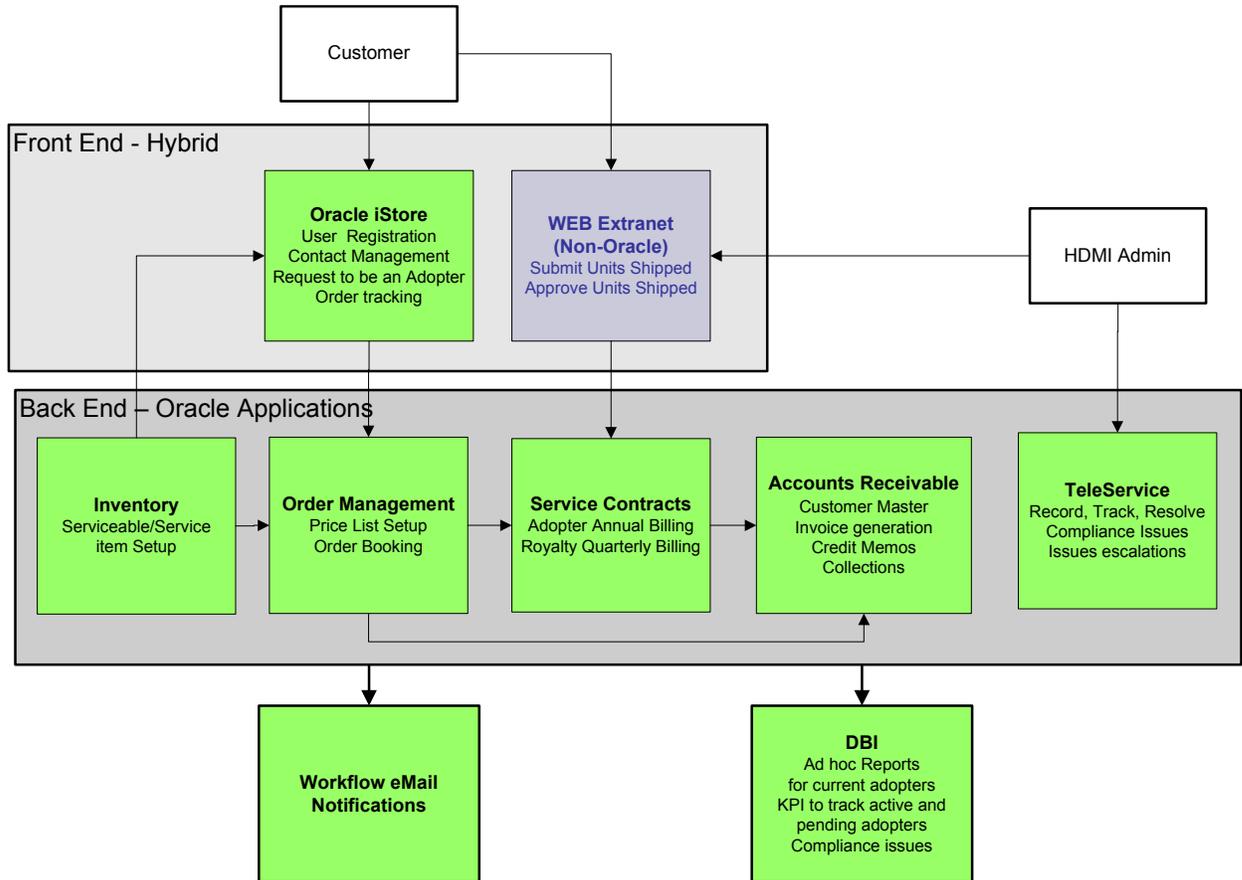

Figure 2: Solution Application Footprint

HDMI Future Process Flows Defined

1. **HDMI User Registration**

   This is a process where a company who wants access to the HDMI Specification and other information accesses the www.hdmi.org and registers.

2. **HDMI Adopter Membership (Becoming an adopter)**

   This is a process where a registered customer becomes and adopter. The process of becoming an HDMI adopter commences with a company accessing the www.hdmi.org website and proceeding to adopt the HDMI specification. The prospective adopter downloads the HDMI Adopter agreement. After signing the agreement, the customer either emails a scanned copy or faxes the signed agreement to HDMI LLC along with the appropriate annual fee.
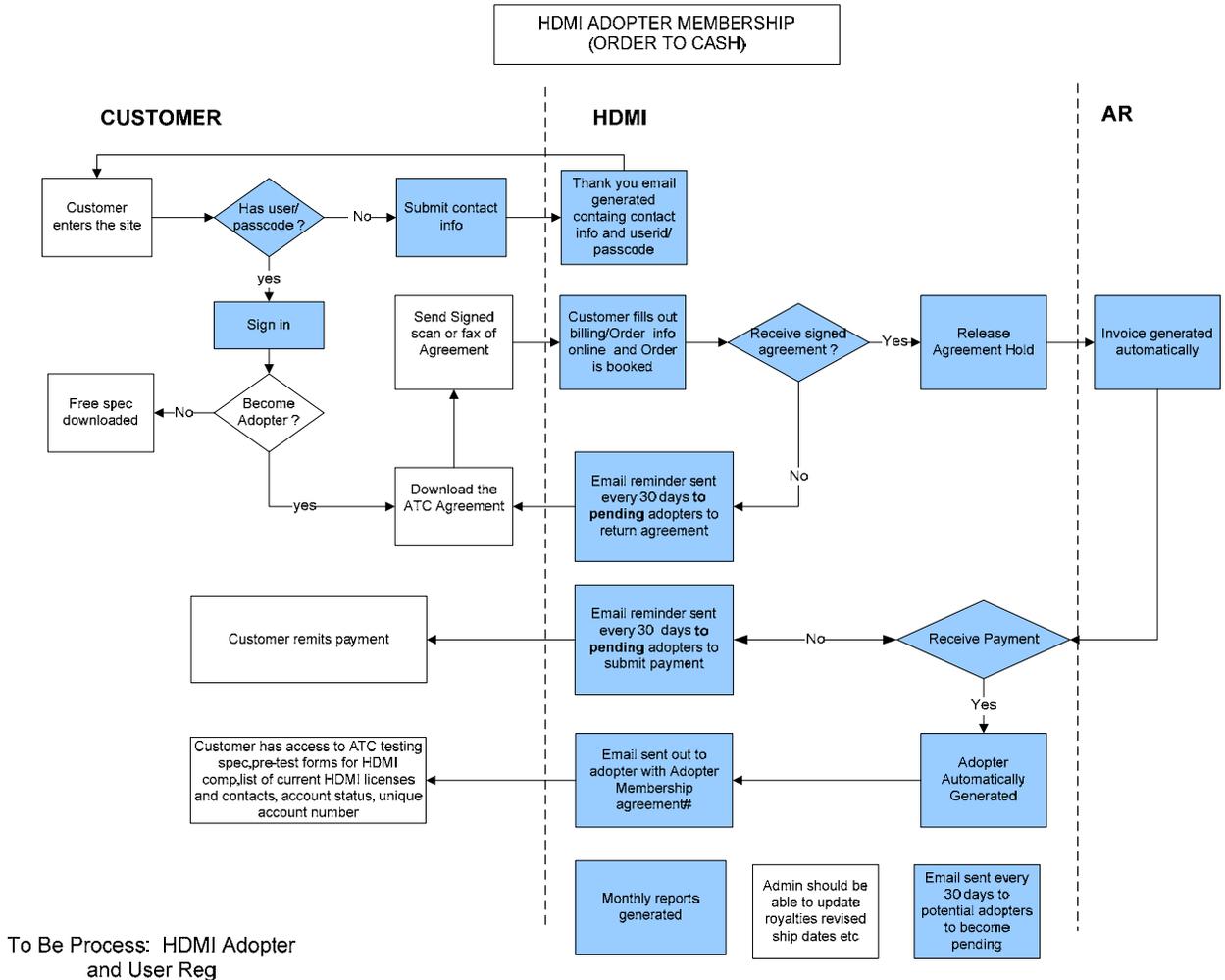
Figure 3: HDMI User Registration and Adoption Processes (Components marked in blue indicate processes that will be performed on Oracle Apps)

3. HDMI Royalties Quarterly Billing

Royalties are payable quarterly on HDMI Licensed Products. Royalty payments are calculated on units shipped per quarter as reported by customers.

Automation of 'Royalties Processing', Centralized storage of royalty data and Integration of royalty processing functions in a common suite of applications are key requirements for HDMI LLC. It is expected that fulfilling these requirements and re-engineering process flows will result in significant financial and operational benefits to HDMI LLC.

'Royalties' future business process flow starts with notification to a customer to select a royalty pricing option for each HDMI compliant product model. Royalties pertaining to a specific product model are manually created as 'usage' lines on a contract and pricing, billing schedules appropriately entered. Notifications are sent to customers requesting data on 'units shipped' in a quarter. Customer logs into

HDMI web portal and enters shipment information for each HDMI compliant product model. Oracle counters receive the data. Data entered by the customer is verified/validated by HDMI Administrator.

Royalties (Contracts) billing is scheduled to run on a quarterly basis. Automated billing functionality calculates and invoices customers based on pricing options selected by the customer and previously validated unit shipment data. Invoices are mailed and payments received per the standard receivables collections process.

Note: A key requirement is to produce a single consolidated invoice for royalty payments per quarter per customer.
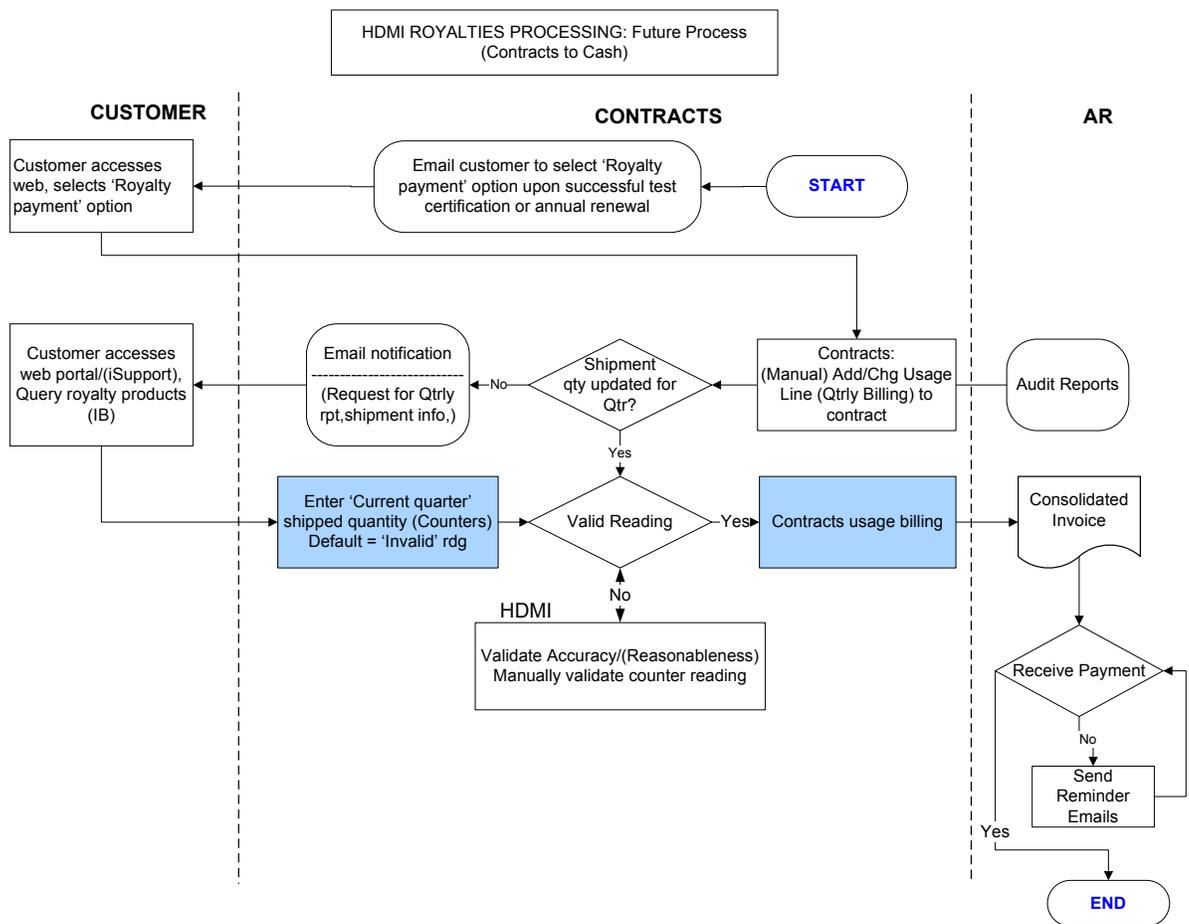
Future Process: HDMI Royalties (Contracts to Cash)

Figure 4: HDMI Royalties Quarterly Billing

4. HDMI Adopter Annual Billing

Annual Billing refers to the 'Annual Administrative Fee' payable to HDMI by the Adopter as referenced in the HDMI current Specification Adopter Agreement.

Business process summary

'Annual adopter membership fee processing' future business process flow starts with automated email notifications requesting current adopters to remit annual administrative fees as set forth in attachment B of the adopter agreement. For the purposes of the HDMI LLC design, annual billing was handled using the renewals functionality within Oracle Service Contracts.

Once the anniversary date of the agreement is reached, an adopter may choose to:

a) Remit payment (Oracle action: Automatic renewal and no further action)

b) Switch fee plans (Oracle action: Automatic renewal and manual contract update)

c) Take no action (Oracle action: Automatic renewal and payment reminder)

d) Cancel membership (Oracle action: Automatic renewal and manual contract termination)

For cases 'b' and 'c', automatic payment reminders are sent periodically until customer remits payment.

If payment is not received, HDMI LLC can take a variety of enforcement actions including suspension.

Cancellation of an Adopter agreement and the corresponding termination of the adopter agreement within Oracle trigger the following events:

– Automatic update of Web portal access level to 'Free status' with following exception: Access is granted to specifications older than 60 days and maximum of 3 years future access.

– Automatic update of contract entitlements as required.

– Automatic creation of credit memo and application to outstanding invoice.

– Manual update or creation of royalty payment 'usage' line for duration of three years.

Oracle Service Contracts functionality Summary

The solution design maximizes the benefits of automation using standard Oracle functionality. To enable the fifteen year Adopter Agreement with annual billing, the Oracle contracts functionality leveraged was:

– Automatic creation of an annual contract

– Automatic renewal of the contract for a period of fifteen years

This process effectively maintains duration of the adopter agreement for a total of fifteen years.

The business process is based on the following design principles within Oracle:

– Full automation of contract creation and renewal process.

– Automatically renewed contracts maintain the same agreement number. Only the modifier changes. Users can quickly and easily query up all contracts with the same agreement number and focus on the current 'active' contract. This is based on standard, accepted business practice pertaining to service contracts.

– If price lists change, renewal contracts automatically pick up new prices whereas recurring billing may not do so.
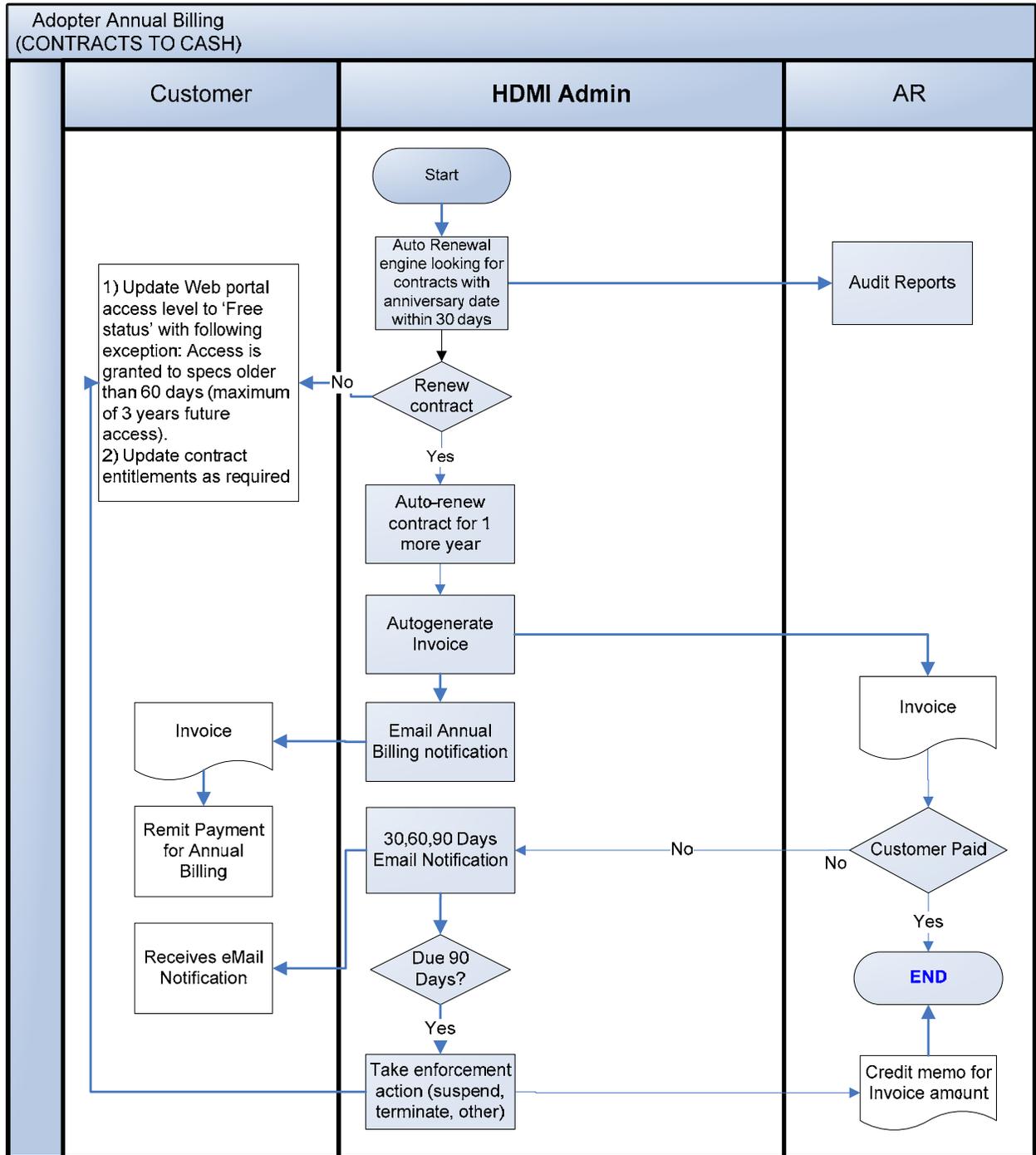
Figure 5: HDMI Adopter Annual Billing

5. Non Compliance Issue Resolution

The HDMI Administrator will receive a compliance complaint, or in other occasions will proactively search for customers who are non-compliant and yet advertising to be HDMI compliant.

When this situation arises, an investigation starts and multiple interactions with the non-compliant customer start until the problem is resolved. The HDMI Administrator will open a Service Request to track the issue resolution. The investigation will often require a series of tasks and reminders assigned to different personnel who need to be notified of the assigned task. The HDMI Administrator will create and assign tasks as needed. Each person assigned a task needs to update the status of the task upon completion. Multiple notes will also be created regarding findings and customer interactions.

When the HDMI Administrator decides that the case is resolved, then the status of the service request will manually be updated as resolved and the process is finalized for the particular compliance issue.
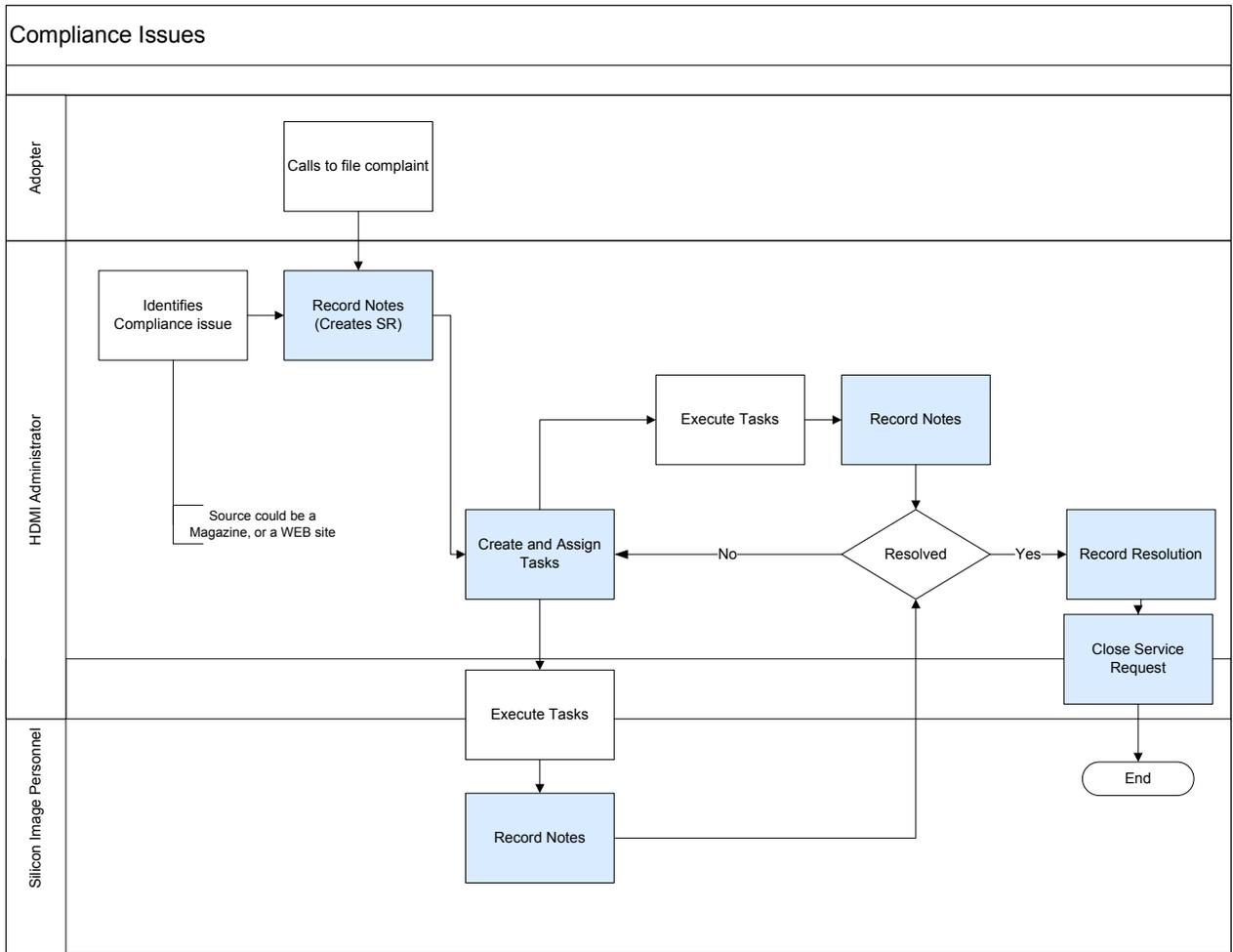
Compliance Issues

Adopter	Calls to file complaint
HDMI Administrator	Identifies Compliance issue → Record Notes (Creates SR) → Execute Tasks → Record Notes; Source could be a Magazine, or a WEB site; Create and Assign Tasks ← No — Resolved — Yes → Record Resolution → Close Service Request → End
Silicon Image Personnel	Execute Tasks → Record Notes

Figure 6: Non-compliance Issue Resolution

Successful Implementation

Capabilities Delivered and Progress against the Roadmap

As of October 2006, all flows and capabilities have been delivered and are ready for deployment. Rollout to Customers is pending deployment of the Extranet to handle Royalties. This includes the following capabilities:

- **HDMI User Registration** via standard functionality for iStore-User registration

- **HDMI Adopter Membership** via standard functionality for Service Contracts and Install Base

- **HDMI Royalties Quarterly Billing** via standard functionality for Service Contracts, Counters, Install Base

- **HDMI Adopter Annual Billing** via standard functionality for Service Contracts and Install Base

- **Non Compliance Issues Resolution** via standard functionality for TeleService

- **Revenue Recognition** via queries designed for the existing reporting tool, Oracle Discoverer

- **Key Performance Indicators for HDMI** via DBI for Service Contracts and trained Silicon Image IS staff. Silicon Image and HDMI LLC will deploy before the end of 2006.

- **Workflow Notifications** via multiple workflow extensions on Oracle iStore, Order Management, and Service contracts. This supports automatic notification and Adopter Contract creation upon physical agreement sign off and payment submittal.

Next Up

Trianz is currently providing support to Silicon Image and HDMI LLC to customize iStore and feed the contracts counters for Royalties calculation from the user WEB UI being developed.

Once the WEB interface is rolled out to customers in the US, Silicon Image and HDMI LLC are considering rollout of iStore in simplified Chinese.

Pushing the Envelope

The Oracle-based solution for HDMI fees and royalties management sheds new light on how to deliver great ideas and quality-of-life improvements to the public in a profitable manner. The envelope for managing the fees and royalties associated intellectual property and standards has just been expanded. The creative use of iStore as part of the HDMI solution leverages its inherent strengths in a new market. All solution participants are excited about the possibilities demonstrated by the solution.

- END Oracle in Hi-Def -

Sources and where to go for more information…

Sources	Solution Contributor Information
1. HDMI FAQ page (http://www.hdmi.org/about/faq.asp#q2_1) 2. HDMI Testing Policies page (http://www.hdmi.org/manufacturer/testing_policies.asp) 3. HDMI Becoming an Adopter page (http://www.hdmi.org/manufacturer/becoming_adopter.asp) 4. HDMI Authorized Testing Centers page (http://www.hdmi.org/manufacturer/authorized_test_centers.asp) 5. HDCP Defined, Wikipedia	HDMI (www.hdmi.org) Silicon Image (www.siliconimage.com) Trianz (www.trianz.com) Oracle (www.oracle.com)

About Silicon Image

Silicon Image is a leader in driving the architecture and semiconductor implementations for the secure storage, distribution and presentation of high-definition content in the consumer electronics and personal computing markets.

Known for creating and driving industry standards for digital content delivery such as DVI, HDMI and UDI, Silicon Image leverages partnerships with global leaders in CE and PC markets to meet the growing needs of consumers worldwide and is a leading provider of proven semiconductor IP solutions for high-definition multimedia and data storage applications.

For more information about Silicon Image please visit www.siliconimage.com.

About HDMI | High Definition Multimedia Interface

HDMI Licensing, LLC is the licensing agent responsible for administering the licensing of the HDMI Specification, promoting the HDMI standard and providing education on the benefits of HDMI to retailers and consumers.

While Silicon Image helps administer the day to day operations; the HDMI founders comprises of Hitachi, Matsushita Electric (Panasonic), Royal Philips Electronics, Silicon Image, Sony Corporation, Thomson and Toshiba Corporation, the High-Definition Multimedia Interface (HDMI) Founders have joined together to define a next-generation digital interface specification for consumer electronics products. HDMI is also supported by major motion picture producers, as well as satellite and cable companies.

For more information about HDMI please visit www.hdmi.org.

Reviewers and Contributors

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About Trianz

Trianz is a global consulting and professional services firm that helps leaders successfully execute on business and technology initiatives to achieve results as measured from a top management perspective. We provide a wide range of management consulting, technology and engineering and operations outsourcing services for a diversified global client base.

Trianz clients are results-focused executives and leaders in a range of organizations from Fortune 1000 corporations to emerging, rapid-growth companies. Trianz seeks to be the execution partner of choice for our clients and a leading participant in their global strategic initiatives. Our service offerings focus on the following areas:

- Operations Consulting
- Enterprise Applications Services
- Software Product Engineering
- Transformational Outsourcing