IPMS: IP Management
From IP Design To Delivery up to Royalty Reporting

Gabrièle Saucier
Design and Reuse
Outline

• History and Innovation

• IP Provider: Do you deliver IP to the market? Enhance your productivity
  – Case Study 1: IP provider Station Starter Kit

• IP Consumer: Do you integrate many IP from many vendors? Monitor your 3PIP
  – Case Study 2: Third Party IP Manager

• Conclusion
History: IP Publishing Challenge

• IP Publishing a D&R Challenge (starting in 97)
  – Commonly used: “IP/product” list as an Excel Sheet (Provider list often not available..)
  – Import/export over firewall (early request)
  – Unique (VSIA) format: intractable ??? Diversified formats needed
  – Multi application (intranet management): IP reuse hot in 2000

• Required: “Server hosted” Next Generation Catalog
  – Multi-format, Multi-catalog, Evolving Format
  – Importable/Exportable over a firewall catalogs to companion/partner/client site
History: Innovation in Cataloguing?

Evolving Catalog Format in a XML layer with an extensible set of Field Types (all management needs)

- Multi value attribute, Integer, parametric
- Field Dependent Section
- Access control and Dedicated Views (engineering, marketing)
- Hyperlink and URL...
- Hierarchy (embedded/related)
- Bridge to design DB

And More

- Customizable Search
- Automated Upload from Excel ...
- Import/Export (over firewall) of filtered catalogs to companion site

Build, Search, Export in an XML layer/Store in Mysql

- Used as web portal
- Used for Internal Management
- Shared Data with Corporate web site
Extension to intranet smart IP Management Dashboards

History:

- IP centric tables (bug list, delivery list, additional property (Maturity, claims...))
- Commonly Used: **Fixed Format** DB Table

Innovation: *Smart configurable synchronized* management “panels“

Extensible supported types

- Date and Alert
- Algorithmic Calculation (Python)
- Bridge to/ Synchronized with
  - Other panels
  - Companion DB
- Workflow primitive (control signal)
- ...
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IP Provider Intranet Station Station-Starter Kit

• Goal:
  – Enhance Productivity
  – Increase Quality and Customer Satisfaction

• How?
  Make it available for Sales, Product managers, Engineers
  – Which Product Line /Product is available?
  – Which product(s) release (.. various configurations, target nodes ..) has been delivered to whom
  – Which bug affects which client?

• In Sync with the corporate environment

Basic Implementation. Starter Kit
– Catalog and Three Key Interconnected Management Panels
IP Provider Intranet Management Station - Starter Kit

- Basic Configuration

- Delivery Storage
- Design DB
- CRM DB
- Bug DB

- IP1 Release 1.0
- IP2 Release 2.0

- Shelf Delivery Panel
- Customer Delivery Panel
- Bug Panel
- Product Line Catalogs

- Corporate /partner
  Web site
  Reuse Station...

- Product Line Managers
IP Provider Management Station - Starter Kit

Easy access of Key data (information Documentation sharing) in the product list

Powerful flexible documentation (Product Family specific)

- **Shelf Delivery** : Hierarchy Support:
  - A shelf delivery release can include other shelf delivery
  - “Add On” such as standard cell / add on macro...

- **Customer Delivery**
  - Easy Online client specific Package creation
  - Predefined Package of shelf delivery
    - Sponsored Package (Free online download)
## Synchronized Bug panel

Bug Declaration associated with Shelf delivery - affected client automatically inherited

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Shelf Delivery Release</th>
<th>Bug Status</th>
<th>Bug Criticality</th>
<th>Bug Details</th>
</tr>
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<tbody>
<tr>
<td>auxADC-12x8-GP.01.TSMC.180.bis</td>
<td>auxADC-12x8-GP.01.TSMC.180.bis R3.2</td>
<td>Confirmed</td>
<td>Critical</td>
<td>Bug Details</td>
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<tr>
<td>mCODa-MT1-LR.01.TSMC.55</td>
<td>mCODa-MT1-LR.01.TSMC.55 R1.0</td>
<td>Confirmed</td>
<td>Minor</td>
<td>Bug Details</td>
</tr>
<tr>
<td>mCODa-MT1-LR.01.TSMC.55</td>
<td>mCODa-MT1-LR.01.TSMC.55 R1.2</td>
<td>Delivered</td>
<td>Minor</td>
<td>Bug Details</td>
</tr>
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</table>

- Warning on Bug in Shelf Delivery when creating Client Delivery

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Shelf Delivery Release</th>
<th>Pending Bug</th>
<th>Bug Details</th>
</tr>
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<tbody>
<tr>
<td>auxADC-12x8-GP.01.TSMC.180.bis</td>
<td>auxADC-12x8-GP.01.TSMC.180.bis R3.2</td>
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<td>Bug Details</td>
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<tr>
<td>mCODa-MT1-LR.01.TSMC.55</td>
<td>mCODa-MT1-LR.01.TSMC.55 R1.0</td>
<td>Yes</td>
<td>Bug Details</td>
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<tr>
<td>mCODa-MT1-LR.01.TSMC.55</td>
<td>mCODa-MT1-LR.01.TSMC.55 R1.2</td>
<td>Yes</td>
<td>Bug Details</td>
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<tr>
<td>mCODa-MT1-LR.01.TSMC.55</td>
<td>mCODa-MT1-LR.01.TSMC.55 R2.2</td>
<td>No</td>
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<td>Metro-Jade-PM-mono.05.GSMC.130bis</td>
<td>Metro-Jade-PM-mono.05.GSMC.130bis R6.2</td>
<td>No</td>
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<td>Metro-Jade-PM-mono.05.GSMC.130bis</td>
<td>No</td>
<td>Bug Details</td>
</tr>
</tbody>
</table>
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Needs and Goals of a global management

• 3PIP monitoring across all organizational Units
  • Procurement department
  - License agreement
  - Legal restriction
  - Pricing Negotiation: Fee, royalty scheme
  • Engineers need to know
  - Which IP have been licensed (key technical details)
  - Under which type of agreement
  - Which usage restriction
  • 3PIP Engineering Manager
  - IP acceptance IP quality
  • Finance department
  - Payment calculation & schedule
  - Expense prediction
  - Finance Tear sheet
Synchronization Badly Needed: IP Life Cycle

IP reception* Qualification* Delivery to Design Manager* Integration in SoC* Product Tape out/Shipmen

Goal: Reliability and Quality enhancement, easy and secure access, expenses control, high quality finance management. Including prediction and tear sheet etc..
Synchronisation Badly Needed: IP Entry

Quality Check Integrate IP in SoC/Product

Manufacturing TO-BOM

IPMS 3PIP List

3PIP Delivery Server

Client Shipment
Third Party IP Entry

- Information for designers in a 3PIP IP List (*Catalog technology*)
  - Which IP have been licensed (key technical details)
  - Under which type of agreement
  - Which usage restriction

- Alert about new IP, about Bug ... (*Alert technology*)

- Controlled Secure access to the IP version (*optional*)
  - IP Version entry (*Packaging Station*)
  - Download workflow for secure and controlled download (*Workflow technology*)
  - File transfer if distributed locations (*controlled ftp/sftp technology*)
Synchronization Badly Needed: IP Tracing

1. 3PIP Delivery Server
2a. Quality Check Integrate IP in SoC/Product
2b. Manufacturing TO-BOM

IPMS

Client Shipment
Which IP in which Product? Who? Where used?

- IP version in Product version?
  - IP version in SoC version
  - IP in Package in Board
  - IP activated (Fuse technology) in Package in a Board

- Constructive Entry (Product/Project Manager)
  - Map IP in Soc (Package)
  - Map Soc (Package) in product

- Synchronize/Upload existing table
  - *Bridge to any existing table / DB record /BOM*

- Result Tracing Table
## Tracing Table

<table>
<thead>
<tr>
<th>Project</th>
<th>Sub Project Name</th>
<th>Project Alert Group</th>
<th>Package</th>
<th>IP Key Identifier</th>
<th>Block name</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD Project</td>
<td>MD Sub-Projects</td>
<td>USER1, USER2, USER3, USER4, USER5, USER6</td>
<td>MD Package</td>
<td>MD IP</td>
<td>MD Product Name</td>
<td>Artura Corporation</td>
</tr>
<tr>
<td>Project 1</td>
<td>alone project</td>
<td>USER0, USER1, USER2, USER3, USER4, USER5, USER6</td>
<td>Lattice Package</td>
<td>Lattice Controller MAC Core</td>
<td>Lattice Controller MAC Core</td>
<td>Lattice</td>
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</table>

### Number of Instances

<table>
<thead>
<tr>
<th>IP Block</th>
<th>SoC</th>
<th>Instances</th>
<th>Vendor</th>
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</thead>
<tbody>
<tr>
<td>IP Block A</td>
<td>SoCA2</td>
<td>1</td>
<td>AppleTwo2</td>
</tr>
<tr>
<td>IP Block A</td>
<td>SoCA2</td>
<td>1</td>
<td>AppleOne2</td>
</tr>
<tr>
<td>IP Block A</td>
<td>SoC1</td>
<td>1</td>
<td>AppleTwo1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IP Block</th>
<th>Version ID</th>
<th>Licensor</th>
<th>Master SoC</th>
<th>SoC Version</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB 2.0</td>
<td>V3.2</td>
<td>Synopsys</td>
<td>Edison</td>
<td>Edison V1</td>
<td>1705-ED-CA</td>
</tr>
<tr>
<td>USB 3.0</td>
<td>V1.3</td>
<td>Synopsys</td>
<td>Lamar</td>
<td>Lamar V1</td>
<td>1700-LAM-CD</td>
</tr>
<tr>
<td>USB 3.0</td>
<td>V1.3</td>
<td>Synopsys</td>
<td>Lamar</td>
<td>Lamar V1</td>
<td>1700-LAM-CA</td>
</tr>
</tbody>
</table>
In Sync Shipment Data

1. 3PIP Delivery Server
2. 3PIP List
   - 2a: Quality Check Integrate IP in SoC/Product
   - 2b: Royalty engine
3. Client Shipment
   - 3: Manufacturing TO-BOM
Shipment Report

• Shipment Type
  – Direct /Distributor/client

• Manual entry : Quarterly Product Shipment Entry

• Existing Table upload

• Shipment Data synchronized from Shipment Center
  – Shipment Raw Data Table
    ▪ Daily updated
    ▪ Java Cron or Scheduled Batch Processes
  – Filtered and interpreted in IPMS table
    ▪ Volume added
    ▪ Volume Break detection
In Sync Shipment Data

- If shipment data captured
- Platform will be able to handle NRE fee, licensing fee (with reminder alerts)
  - And royalty... An unique Royalty Engine
Royalty Functions Library

- Extensible Python library
  - Platform owner can enter his own
- Parameters

- **Pricing**
  - Rate Dependency
  - Annual Price Break
  - Extra Life Time Dollar Cap

- **Shipment Volume**
  - Period Coverage
  - Volume Break
  - Volume Cap
  - Extra Life Volume Cap

- **Parameters**
  - None - IP Category-SoC Type-ASP; - Volume - IP Bundle Discount
  - Yes-No
  - Annual - Life Time
  - Per Product- All Product- Subset of Products- Per SoC- All SoC
  - Yes-No
Royalty Parameter Value

Values entered in the IP description

<table>
<thead>
<tr>
<th>Forecasted Royalty Structure</th>
<th>Royalty Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IP Annual Volume Cap Forecast</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
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<table>
<thead>
<tr>
<th>Annual Volume Cap</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Number of Years</td>
<td>9</td>
</tr>
<tr>
<td>Add Extra Royalty Parameter</td>
<td>Select...</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 1</th>
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<tbody>
<tr>
<td>Year</td>
<td>2007</td>
</tr>
<tr>
<td>Volume Cap</td>
<td>10000</td>
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<tr>
<td>Royalty Rate Before Cap</td>
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</tr>
<tr>
<td>Royalty Rate After Cap</td>
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</table>
# Royalty Display

## Licensor A

<table>
<thead>
<tr>
<th>Product</th>
<th>SoC</th>
<th>IP Block</th>
<th>Licensor</th>
<th>Royalty Structure</th>
<th>Q1 Volume</th>
<th>Q2 Volume</th>
<th>Q3 Volume</th>
<th>Q4 Volume</th>
<th>Q1 Royalty</th>
<th>Q2 Royalty</th>
<th>Q3 Royalty</th>
<th>Q4 Royalty</th>
<th>Cumulative Royalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>AppleTwo</td>
<td>SoCA</td>
<td>IP Block B (2)</td>
<td>Licensor A</td>
<td>IP Annual Volume Cap</td>
<td>10,000</td>
<td>20,000</td>
<td>30,000</td>
<td>40,000</td>
<td>$1,000.00</td>
<td>$3,500.00</td>
<td>$3,000.00</td>
<td>$4,000.00</td>
<td>$11,500.00</td>
</tr>
<tr>
<td>AppleOne</td>
<td>SoCA</td>
<td>IP Block B (2)</td>
<td>Licensor A</td>
<td>IP Annual Volume Cap</td>
<td>10,000</td>
<td>20,000</td>
<td>30,000</td>
<td>40,000</td>
<td>$1,000.00</td>
<td>$3,500.00</td>
<td>$3,000.00</td>
<td>$4,000.00</td>
<td>$11,500.00</td>
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<tr>
<td>AppleOne 1</td>
<td>SoCA</td>
<td>IP Block B (2)</td>
<td>Licensor A</td>
<td>IP Annual Volume Cap</td>
<td>10,000</td>
<td>20,000</td>
<td>30,000</td>
<td>40,000</td>
<td>$1,000.00</td>
<td>$3,500.00</td>
<td>$3,000.00</td>
<td>$4,000.00</td>
<td>$11,500.00</td>
</tr>
</tbody>
</table>

## Arteris

<table>
<thead>
<tr>
<th>Material</th>
<th>SoC Version</th>
<th>IP Block</th>
<th>Licensor</th>
<th>Q1 Volume</th>
<th>Q2 Volume</th>
<th>Q3 Volume</th>
<th>Q4 Volume</th>
<th>Annual Volume Cap</th>
<th>Q1 Royalty</th>
<th>Q2 Royalty</th>
<th>Q3 Royalty</th>
<th>Q4 Royalty</th>
<th>Cumulative Royalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1871-STH-CA</td>
<td>Kepler V1</td>
<td>FlexNoC</td>
<td>Arteris</td>
<td>15,500</td>
<td>22,000</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>15,500</td>
<td>22,000</td>
<td>31,000</td>
<td>41,000</td>
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## Synopsys

<table>
<thead>
<tr>
<th>Material</th>
<th>SoC Version</th>
<th>IP Block</th>
<th>Licensor</th>
<th>Q1 Volume</th>
<th>Q2 Volume</th>
<th>Q3 Volume</th>
<th>Q4 Volume</th>
<th>Annual Volume Cap</th>
<th>Q1 Royalty</th>
<th>Q2 Royalty</th>
<th>Q3 Royalty</th>
<th>Q4 Royalty</th>
<th>Cumulative Royalty</th>
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</thead>
<tbody>
<tr>
<td>1701-LAM-CB</td>
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<td>21,000</td>
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</tbody>
</table>
Description

Cadence Design Systems is a leading global EDA company. Cadence customers use our software, hardware, and services to overcome a range of technical and economic hurdles. Our technologies help customers create mobile devices with longer battery life. Designers of ICs for game consoles and other consumer electronics speed their products to market using our hardware simulators to run software on a virtual chip long before the actual chip exists. We bridge the traditional gap between chip designers and fabrication facilities, so that manufacturing challenges can be addressed early in the design stage. And our custom IC design platform enables designers to harmonize the divergent worlds of analog and digital design to create some of the most advanced mixed-signal system on chip (SoC) designs. These are just a few of the many essential Cadence solutions that drive the success of leading IC and electronic systems companies.

<table>
<thead>
<tr>
<th>License Agreement</th>
<th>Licensed IP</th>
<th>LifeTime License Fees</th>
<th>LifeTime Royalties</th>
<th>LifeTime Payments</th>
<th>LifeTime Volumes</th>
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<td>Cadence IP 2 Cadence IP 3</td>
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<td>Cadence PHY Agreement</td>
<td>Cadence IP 4</td>
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<td>1,970,000</td>
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</tbody>
</table>
Conclusion

• Managing several IPs from many suppliers needs a global management platform
  – Dedicated to IP in Product
  – From IP files to Financial Views

• Synchronized with all related corporate Views
  – Outsource
  – No competitive tool on the market
  – Use 2 decades of experience .. Use IPMS platform