

Methodology, Tools and Techniques to Support a Collaborative Implementation of a Loan Origination System

Minnesota Housing Finance Agency

Agenda

- **Project Overview**
- **ISIS-Methodology**
- **Collaboration Tools
and Techniques**
- **Lessons Learned**



- **Project Overview**
 - **Context**
 - **Project's Goals**
 - **Partnership**
 - **Stakeholders**
 - **Challenges**
 - **Application Presentation**



Context

- **Minnesota Housing Finance Agency (MHFA)**
 - **B2B Space in the Secondary Market for Mortgage Lending**
- **Project: Single Family Mortgage Online System (SFMOS)**

Transform the way the MN Homes Division does business with their Mortgage Lending Partners, Administrators of their loan products, the designated MHFA Trustee and MHFA's Servicing Partner(s)

Goals: Business

- **Reduce turn around time to respond to business changes**
 - Implementation of new/updated business policies
 - Roll out of new/updated product service
- **Ensure adherence to regulation and compliance mandates**
 - Increase transparency, auditability & traceability
 - Empower business users
- **Reduce costs and risks by improving efficiency**
 - Reduce loan processing costs
 - Reduce loan processing cycle

Project Overview



Goals: Business

- **Ensure a Collaborative Environment for Mortgage Lending Partners and Administrators that provides the following benefits:**
 - **No More faxing**
 - **No more typewriters - forms available online**
 - **Business program manuals redesigned for ease of use**
 - **Program forms and documents reduced**
 - **Shortened approval timeframes**

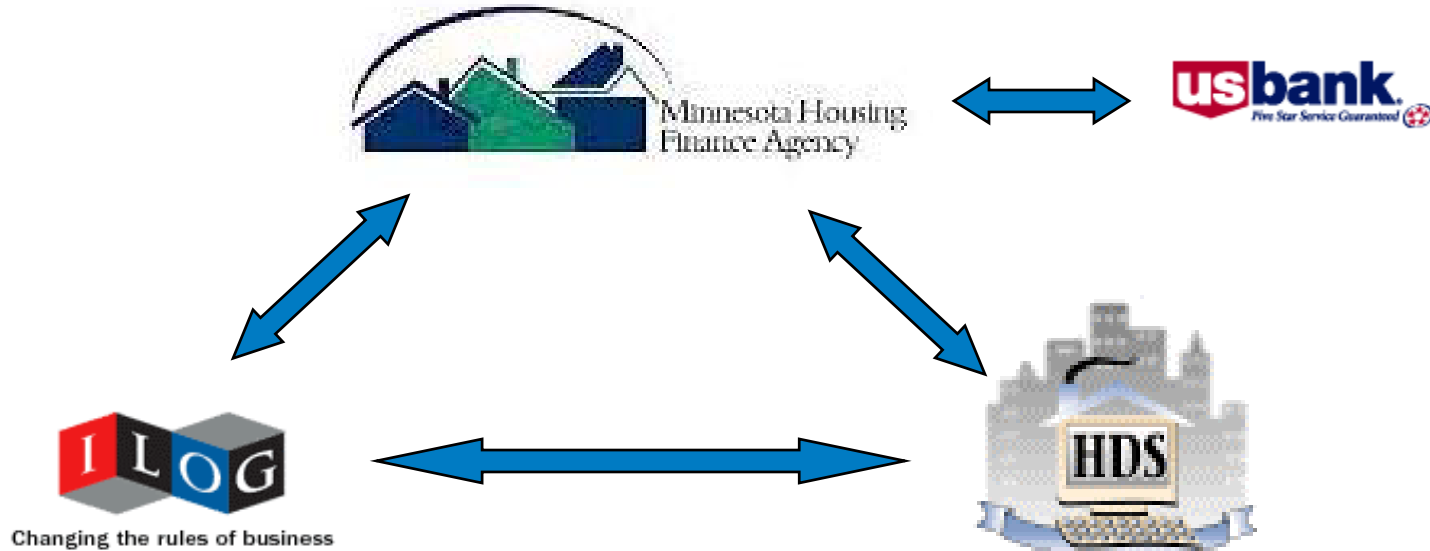
Goals: Technology

- **A web based system for Mortgage Lending Partners to access to their pipeline, funds availability and management of their organizational information**
- **Business Rules System (powered by the ILOG Rule Engine):**
 - **Rule versioning and historical compliance reporting**
 - **Integration with HDS to dynamically build a custom web interface based on specific program data requirements**
 - **Program selection module to determine the best product for the partner**
 - **Compliance module to ensure program requirements are met**

Project Overview



System Integrations



- Loan Eligibility
- Content Requirements

- Fund Availability
- Partner Status
- Program Rates

System Integrations

- **Housing and Development Software (HDS) Modules**
 - Allocation, Accounting, P&A Tracking, Reporting, SF Loan Maintenance, Web Partner Security, ILOG Web Loan, Purchase, Master Servicing, Security, SF Program, and System Tables
- **ILOG Modules**
 - Business Rules Engine integrated with the HDS web based application to produce a dynamic web interface and program selection & loan compliance
 - Rule Management Application on the web
- **US Bank**
 - New transaction based process and files to support the Master Servicing Module

Project Overview



MHFA Project Stakeholders

MN Homes Division

Job Mission

- Simplify use of interdivisional loan information
- Redefine business processes & policies
- Restructure most jobs within the division
- Web Based System for partner use

Project Contribution

- Easier Access to loan information, partner information, and fund information
- Loan data from beginning to end in one place vs. three or more
- Reduced system constraints for the business to allow for more creative program development

Project Overview



MHFA Project Stakeholders

Information Systems Division

Job Mission

- Reduce integration issues and application support
- Redefine support IS support structure to accommodate the move from a 'Build' shop to a 'Buy' shop
- Approve and support technical architecture

Project Contribution

- Business looking to manage their own rules via the ILOG web rule delivery
- First Web Application for Agency
- Reduced duplication of data and integration issues

Project Overview



MHFA Project Stakeholders

Accounting and Finance Division

Job Mission

- **Redefine business processes & policies**
- **Agency Fund Management**

Project Contribution

- **Vision to program dollars and usage**
- **Transformed Master Servicing System and business processes**
- **Ability to track reporting fund source and current fund source**

Project Overview



MHFA Project Stakeholders

Research Division

Job Mission

- Continue to provide agency reporting to legislative bodies

Project Contribution

- Common Loan structure for all programs included in SFMOS
- Built in views and reporting to simplify Agency reporting needs

Challenges

- **New Technology**
 - No in-house experience with rule systems
 - Selling the importance of integrating a dynamic business rule management system to the IT Steering Committee
- **Resource Constraints**
 - Small IT group
 - Multiple large IT initiatives happening at same time
 - Limited Business Experts
 - Project Staff turnover
- **Software Partners not local**
- **Selling HDS on the idea that a mature rule based engine was the best solution for the web portion of the project**
- **Replacement of 20 year old patched together legacy system**
- **Organizational Change Management Issues**

Application Sample - Loan Detail



Housing And Development Software - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Recycle Mail Print Fax AutoFill Options

Address <http://crisg/webapp/sfmcweb/webui/Default.htm> Go Links

Google Search Web 0 blocked AutoFill Options

HDS HOUSING AND DEVELOPMENT SOFTWARE

Single Family

- Available Programs
- Available Funds
- Lender Pipeline
- Program Pipeline
- Submit a Loan
- Certify a Loan
- Loan Compliance
- Loan Maintenance
- Program Forms
- Program Reports

ILOG

- Submit a Loan

User Maintenance

- Manage Entity-Contacts-Users
- View User-Functions
- View User-Details
- View User Login Report

Action | Update | Delete | Backup | Print | Refresh | Help

ILOG Submit - Detail - Loan:

Loan Info | Property Info | Borrower | Co-Borrowers | Incomes | Co-Signers

Loan Number:	<input type="text"/>	Stage:	<input type="text" value="Commitment"/>
Lender Loan Number:	<input type="text"/>	Status:	<input type="text" value="Proposed"/>
Lender Case Number:	<input type="text"/>	Reservation Date:	<input type="text" value="04/02/2005"/>
Interest Rate:	<input type="text"/>	Loan Amount:	<input type="text" value="\$0.00"/>
Term in Months:	<input type="text" value="0"/>	Purchase Price:	<input type="text" value="\$0.00"/>
Amortization Type:	<input type="text"/>	Rehab Amount:	<input type="text" value="\$0.00"/>
Monthly P+I:	<input type="text" value="\$0.00"/>	Total Acquisition:	<input type="text" value="\$0.00"/>
Loan Type:	<input type="text"/>	Assist Percent:	<input type="text" value="0.0000"/>
Product Type:	<input type="text"/>	Assist Amount:	<input type="text" value="\$0.00"/>

Copyright © 2005 Housing and Development Software. All rights reserved.

Done Local intranet

Sample Eligibility Rule



ILOG JRules - Web Rule Builder - Microsoft Internet Explorer provided by Comcast

File Edit View Favorites Tools Help

Address: https://brod.ilog.com/mhfa/Controller/OpenRepository?repositoryID=0&projectName=Eligibility+SFMO5

Welcome jboyer Business Rules on Demand

File Edit View Project Locking Query

Project Eligibility SFMO5

- Eligibility
 - Common Disqualifications
 - Down Payment Assistance Family D
 - First Mortgage Family Disqualificator
 - Foreclosure Family Disqualifications
 - Multiple Family Disqualifications
 - Building Type Category Progr...**
 - Income Limit Check
 - Loan Amount Max
 - Loan Amount Min
 - Loan Term
 - Total Acquisition Cost - MMP CAS.
 - Property Improvements Family Disqu
 - Compliance
 - Initialize

Category	Building Type	Program not in	Disqualify
0	SINGLE_FAMILY	CASA; MMP; MCPP; HAF; ECHO; FUF; CFUF; FPAP; REHAB	Invalid Building Type / Category / Program Combination
1	DUPLEX	CASA; MMP; MCPP; HAF; ECHO; FUF; CFUF; FPAP; REHAB	Invalid Building Type / Category / Program Combination
2	TRIPLEX	FUF; CFUF; FPAP; REHAB	Invalid Building Type / Category / Program Combination
3	FOURPLEX	FUF; CFUF; FPAP; REHAB	Invalid Building Type / Category / Program Combination
4	EXISTING	CONDO	Invalid Building Type / Category / Program Combination
5	TOWNHOME	CASA; MMP; MCPP; ECHO; FUF; CFUF; FPAP; REHAB	Invalid Building Type / Category / Program Combination
6	MANUFACTURED_REAL	CASA; MMP; MCPP; ECHO; FUF; CFUF; FPAP; REHAB	Invalid Building Type / Category / Program Combination
7	MANUFACTURED_PERSONAL	FPAP; REHAB	Invalid Building Type / Category / Program Combination
8	SINGLE_FAMILY	CASA; MMP; MCPP; HAF	Invalid Building Type / Category / Program Combination

Editor

Add | Insert | All Domain Values | Otherwise | Clear | Merge above | Merge below | SUBMIT

Operator: Building Type is

- FOURPLEX
- SINGLE_FAMILY
- DUPLEX
- CONDO
- TWINHOME
- TOWNHOME

Messages

Internet

Rule Test Harness



Microsoft Excel - mhfa_unittest.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

B125 FUF

	A	B	C	D	E	F	G	H
100	PropertyData	numOfUnits	propertyId	buildingType	categoryType	targetCensusTract	yearBuilt	propertyValue
101	ID	Number of Units	Property ID	Building Type	Category Type	Target Census Tract	Year Built	Property Value
102	DUPLEX_NEW	2		DUPLEX	NEW		2006	
103	DUPLEX_EXISTING	2		DUPLEX	EXISTING		2000	
104	SINGLE_FAMILY_EXISTING	1		SINGLE_FAMILY	EXISTING		2000	
105	TOWNHOME_EXISTING	1		TOWNHOME	EXISTING		2000	
106	TOWNHOME_NEW	1		TOWNHOME	NEW		2006	
107	TOWNHOME_NEW_PVM	1		TOWNHOME	NEW		2006	100
108	CONDO_EXISTING	1		CONDO	EXISTING		2000	
109								
110								
111								
112	ApplicationData	applicationState	isFirstMortgage	closingDate	moveInDate	loanNoteDate	commitDate	approvalDate
113	ID	Application State	Application Is First Mortgage	Loan Closing Date	Move In Date	Loan Note Date	Commit Date	Approval Date
114	TEST_FM		TRUE					
115	TEST_NOT_FM		FALSE					
116	VA		TRUE					
117								
118								
119	ExternalLoanData	isFirstMortgage	loanTerm	isFixedRate	maturityDate	firstPaymentDate	numPayments	
120	ID	Is First Mortgage	Loan Term	Is Fixed Rate	Maturity Date	firstPaymentDate	Number of Payments	
121	TEST	TRUE	120					
122								
123	BorrowerLoanHistoryItem	program	loanAmount	closingDate	commitDate	censusTract	loanStage	loanStatus
124	ID	Borrower History Program	Borrower History Loan Amount	Borrower History Closing Date	Commit Date	Census Tract	Loan Stage	Loan Status
125	FUF	FUF	2000		8/28/2005			
126	DISASTER	MMP	4000		8/28/2005			
127	REHAB	MCPP	5000		8/28/2005			
128		ECHO						
129		ELIF						
130	BorrowerData			history	isCoBorrower	percentageOwnership	totalDebt	totalIncome
131	ID	SSN	Age	BorrowerLoanHistoryItem	Is Co-Borrower?	Percentage Ownership	Total Debt	Total Income
132	BORRO1	111223333	35		FALSE			
133	BORRO2	123445555	30	[FUF],[DISASTER]	FALSE			
134	BORRO3	232313231	28	[REHAB]	TRUE			
135								
136								
137	Problem	explanation	decription	id				
138	ID	Explanation	Description	ID				
139	PB_THI	Total Household income exceeds the maximum income limit for that area.						
140	PB_FTH	All borrowers must be first time homebuyers						

Compliance / Program Selection / Object Collection / Config / Program List

Agenda

- **Project Overview**
- **ISIS-Methodology**
- **Collaboration Tools
and Techniques**
- **Lessons Learned**

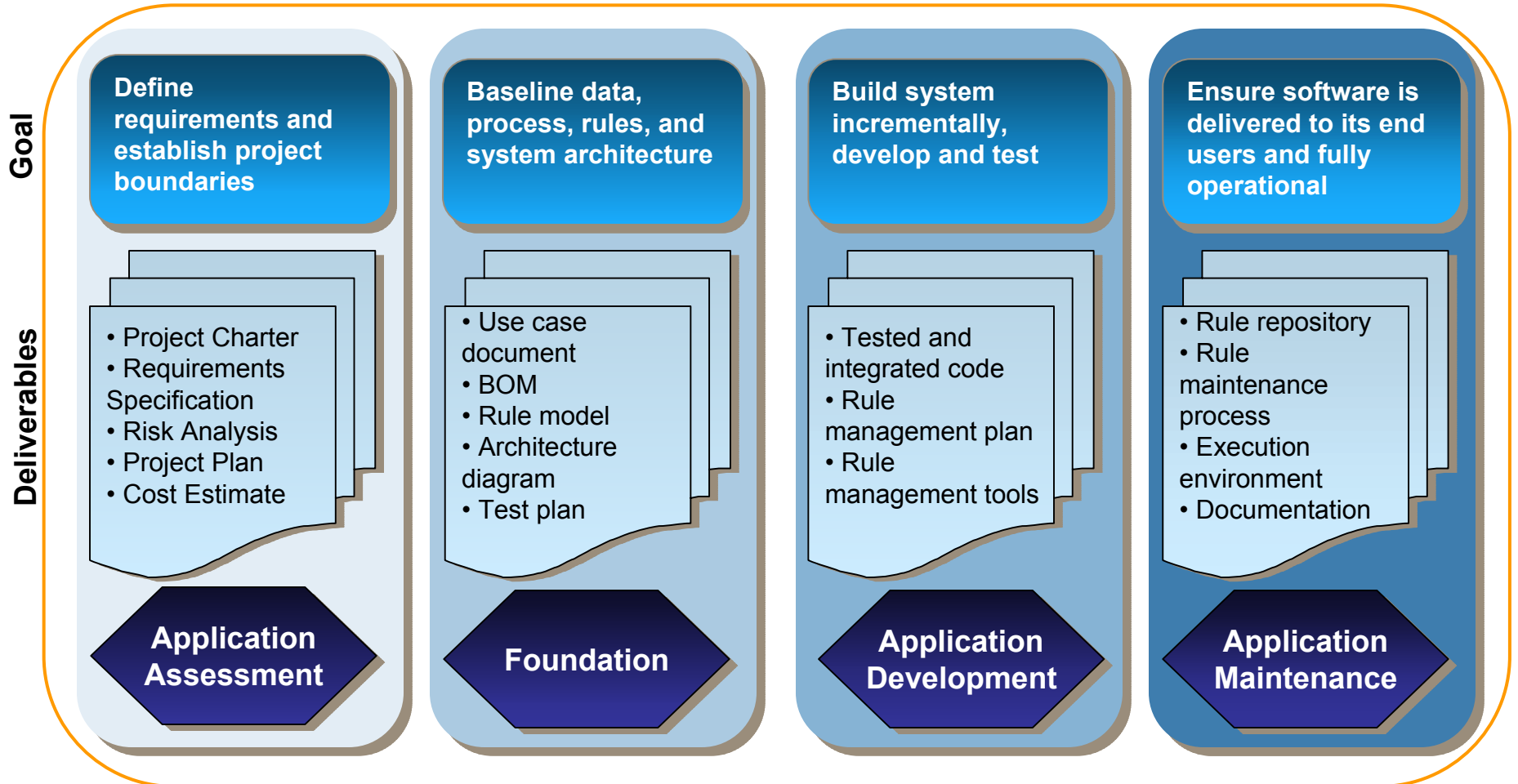


- **Utilize ILOG Solution Implementation Standard (ISIS)**
 - **Iterative approach based on RUP with pre-defined artifact templates specific to business rules management systems (BRMS)**

“ILOG’s breadth of BRMS implementation experience let us focus on our business and overall project objectives”

Methodology

Inception → Elaboration → Construction → Transition

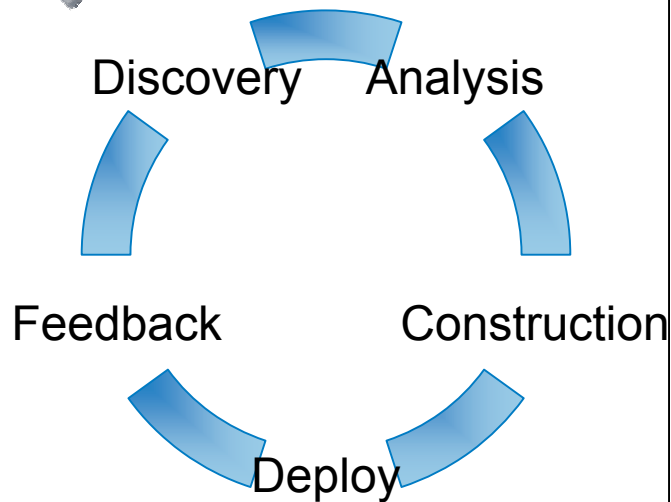


ISIS-Rule Agile Approach

“Business Rules modeling must be evolutionary with close collaboration between domain experts and engineers”

- **Business Rule Modeling is an evolutionary process (Agile Modeling)**
 - **Frequent requirement and model changes**
 - **Collaboration: Policy Manager, Rule Architect, Rule Developer**
 - **Minimum modeling artifacts: Rule description, Business Object Model**

Iterative Rule Set Development



Steps

- **Select One Rule Set and its Discovery roadmap**
- **Short Rule Discovery Session**
- **Instrument the JRules BOM**
- **Develop / Access Object Model**
- **Test Driven Development**
 - Develop Data to trigger rule conditions
- **Develop Some Rules**
- **Deployment to a simple rule service**
- **Involve Policy Manager for feedback**

- Project Overview
- ISIS-Methodology
- Collaboration Tools and Techniques
 - Rules Discovery
 - Rule Analysis
 - Rule Design
 - Rule Authoring
- Lessons Learned



ISIS-Rules Classifications Table

Rule class name	Type of Rules	Description of rules class	Source for rule class	Current State of automation for the rule class
Data Control	Action	Describe what elements the web client should hide or require for a particular screen at a specific stage in the process	Loan Application data	Manual
Eligibility	Inference	Initially determine which program(s) the borrower(s) is potentially eligible. Validate that the user is eligible for a specific program and provide detailed feedback if the user is not eligible.	Program definition, customer profile	Manual

Link business process decision points to rule sets

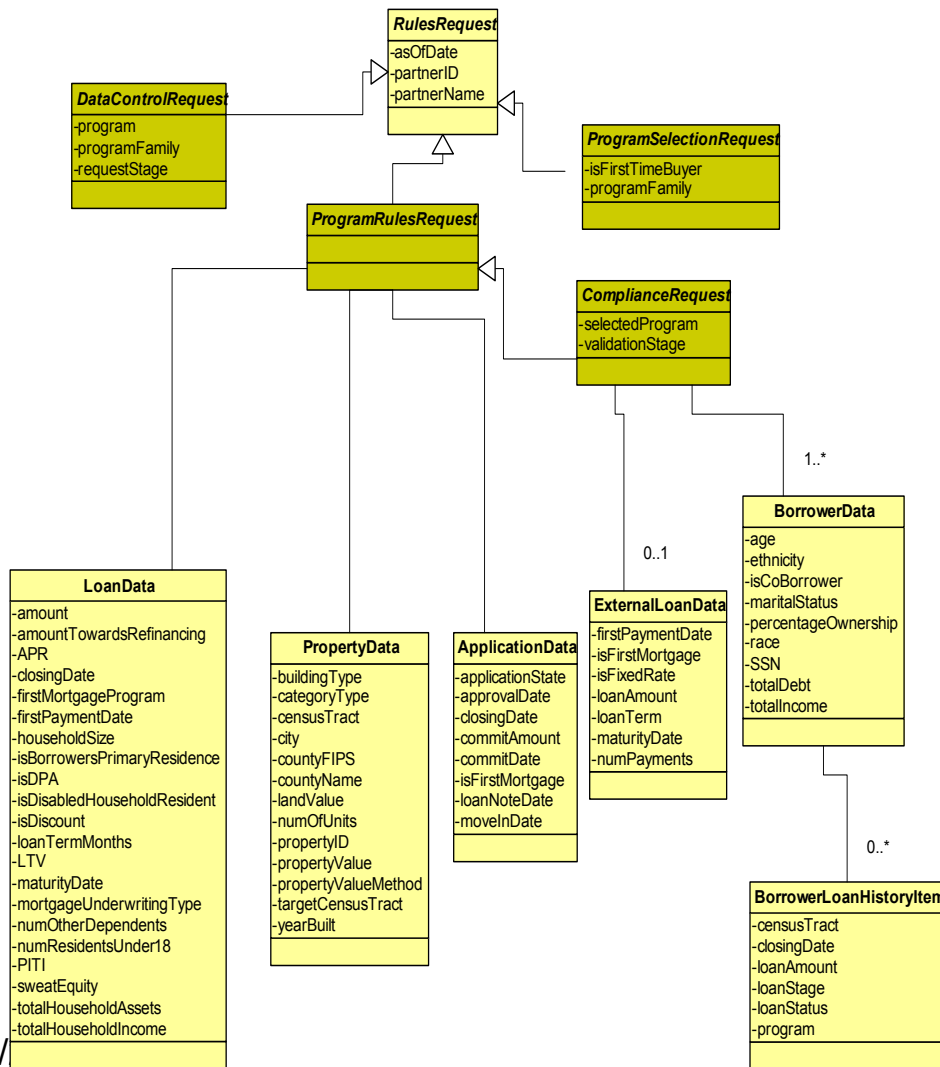
Rule Discovery



Rule Template

Rule Name	<i>1 Unit Valid Bldg Type</i>		
Rule ID	<i>RCE001</i>	Creation Date	<i>04/11/05</i>
Rule Class	<i>Multiple Program Family Disqualification</i>	Package	<i>IdentifyClaimExceptions</i>
Priority	<i>none</i>	Owner	<i>John Smith</i>
Business Rules description	<i>If the building type is in (Single Family, Condominium, Town home, Manufactured Home Real Property, Manufactured Home Personal Property) and Number of Units is not equal to 1 Then Disqualify eligibility with Message = A building type of Single Family, Condominium, Town home, or Manufactured Home Real Property is considered 1 unit. Please correct the Number of Units field.</i>		
Business Motivation	<i>Implement established building type/number of units in compliance with industry standards.</i>		
Objects involved	<i>Loan application</i>	Where to express the rule	<i>Jrules</i>
Who can change rule ?	<i>Owner only</i>	When the change should occur?	<i>If we define new product and building type</i>
How rule will be changed?	<i>Using Web edition</i>	Message for the action part	

Logical Data Model



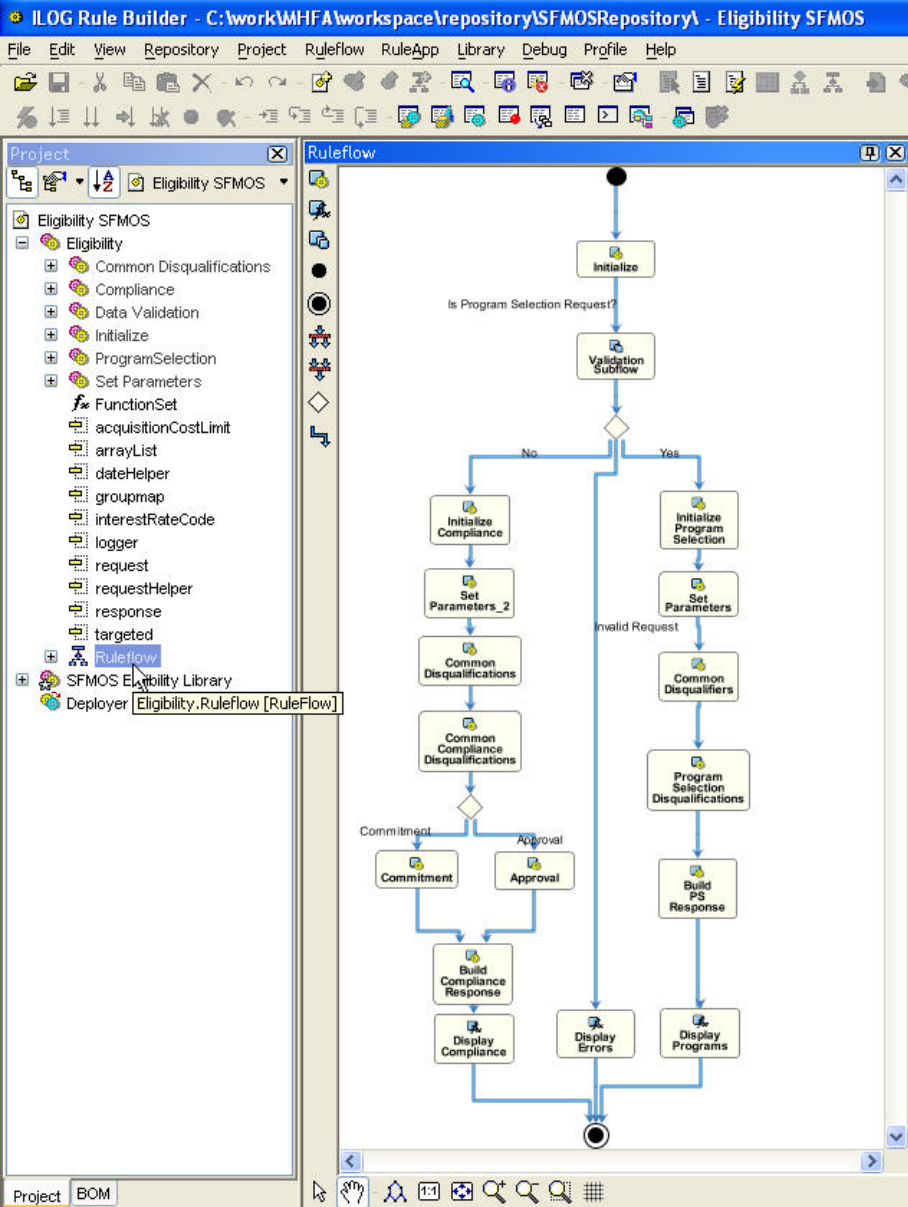
Define Vocabulary

Use the language of the business ("problem domain")

Use simple UML modeling to communicate with business users

Define interface (WSDL) between HDS application and ILOG rule service

Rule Analysis



Rule Flow

- It controls and orders the flow of rule execution
- Prototype the rule flow with Business Analyst
- Iterative process
 - Partition the rule package to facilitate rule flow edition
- Put emphasis on the state of objects between rule tasks
- Define the link guards

- **Service Oriented Architecture (SOA)**
 - **Rapidly align systems with business goals**
 - **Flexibility - connect various applications (i.e. ILOG rule engine to HDS application) over a local network or the internet to build composite applications such as SFMOS**
 - **Interoperability - easy integration by specifying a common interface**
 - **Facilitates testing independent of the HDS web interface**

- **Service Oriented Architecture (SOA)**
 - **Usability** – easy to communicate using a document that translates to both a technical and business audience
 - **Maintainability** – structured process for making modifications in a stable manner so the business object model and WSDL stay in sync
 - **Portability** – conforms to well defined standards which eases installation and deployment

- **Web based rule editor**
 - Allow multiple users without having to install builders on desktops
 - Repository accessible remotely with role-based authentication
 - Use of ILOG framework
- **Rule validation artifacts**
 - To verify rules defined by MHFA were developed in the ILOG rule builder accurately

Rule Authoring



- **Business Analyst centric test harness**
 - **Easy to use excel and web interface**
 - **Re-usable object components**

TEST ID	RUN	ProgramSelectionRequest	LoanData	PropertyData	ProgramSelectionResponse
1	TRUE	FTH	LOAN3	TOWNHOME_EXISTING	ALL_FTH
13	TRUE	FTH	LOAN4	TOWNHOME_EXISTING	NO_THI
28	TRUE	FTH	LOAN5	TOWNHOME_EXISTING	NO_ACL
33	FALSE	FTH	LOAN6	TOWNHOME_NEW	MMP,CASA,MCPP

- **Web seminars to demo project status**
- **Weekly status report to control project execution**
- **Create test samples with business user to test integration**
- **Iterative approach towards integration when changes occur**
- **Occasional on-site project coordination meetings**

Agenda

- **Project Overview**
- **ISIS-Methodology**
- **Collaboration Tools
and Techniques**
- **Lessons Learned**



- **Concurrent development requires special attention**
 - **Complexity incurred by working with multiple partners can be managed with the proper collaboration tools and techniques**
- **It's not just about technology**
 - **Early training for business users is extremely valuable, especially when introducing a new way of thinking**

- **SOA helps manage change and works!**
 - Using an architecture which supports flexibility for change and interoperability is invaluable, especially when dealing with multiple partners
- **Iterative approach facilitates legacy integration**
 - Tools & techniques are only useful with a proven methodology to implement them in a calculated and repeatable fashion

Questions



A