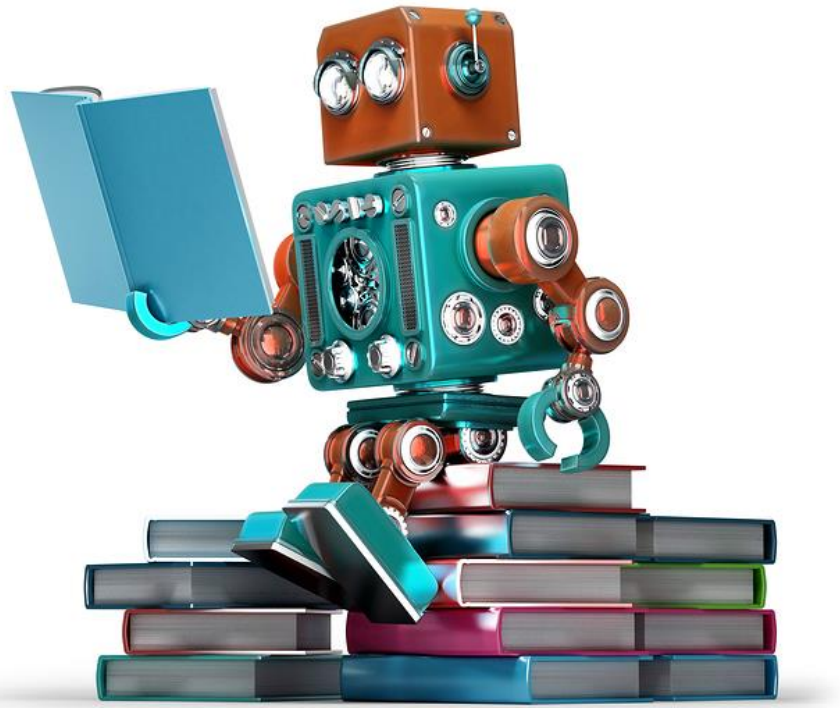
MACHINE REASONING
DAY 4



https://robohub.org/wp-content/uploads/2016/11/bigstock-Retro-Robot-Reading-A-Book-Is-110707406.jpg

DAY 4 AGENDA

4.1 Contemporary Reasoning Systems

4.2 Machine Reasoning Course **Review**

4.3 Machine Reasoning **Assessment (Graded individual exam)**

4.4 Creating Reasoning System **Workshop**

(Graded workshop & project deliverables)

DAY 4 TIMETABLE

No	Time	Topic	By Whom	Where
1	9 am	4.1 Contemporary Reasoning Systems	GU Zhan (Sam)	Class
2	10.10 am	Morning Break		
3	10.30 am	4.2 Machine Reasoning Course Review	GU Zhan (Sam)	Class
4	10:45 am	4.3 Machine Reasoning Course Assessment	All	Class
5	12.10 pm	Lunch Break		
6	1.30 pm	4.4 Creating Reasoning System Workshop Tutorial	GU Zhan (Sam) All	Class
7	3.10 pm	Afternoon Break		
8	3.30 pm	4.4 Workshop: Creating Reasoning System	All	Class
9	4.50 pm	Summary and Review	All	Class
10	5 pm	End		

4.1
CONTEMPORARY REASONING SYSTEMS

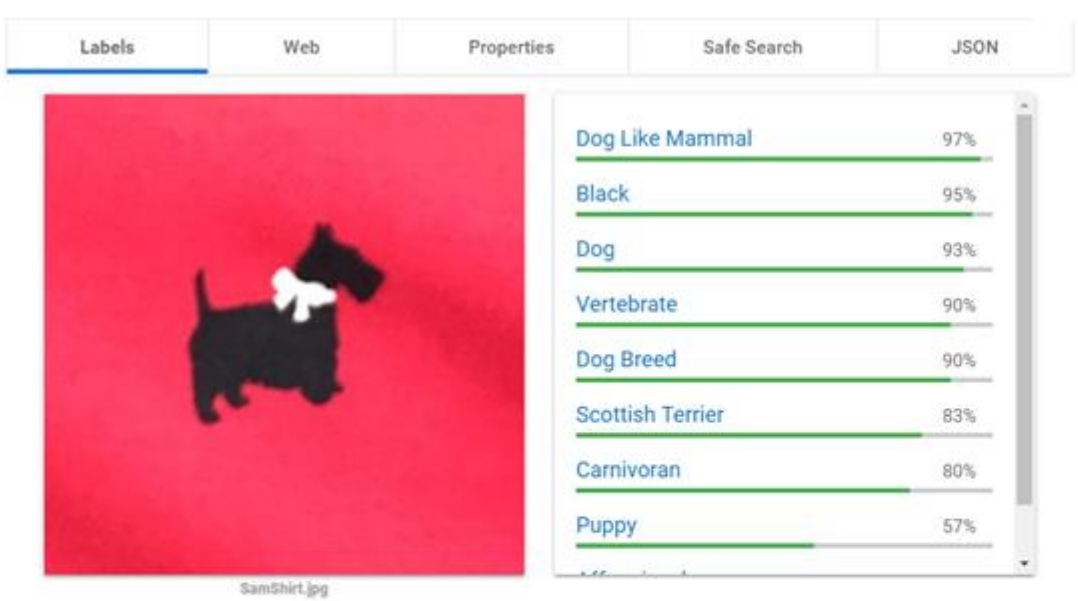
4.1 CONTEMPORARY REASONING SYSTEMS

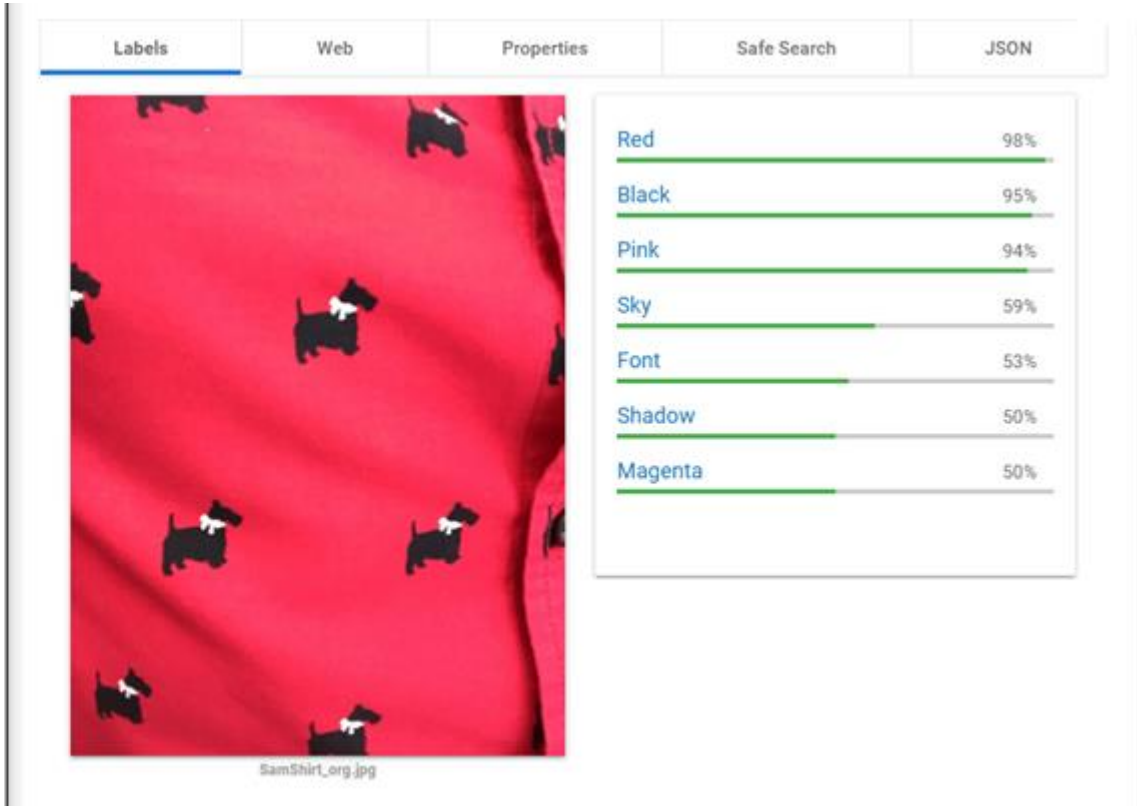
- **Question Answering System: IBM Watson**

IBM Watson

4.1 CONTEMPORARY REASONING SYSTEMS

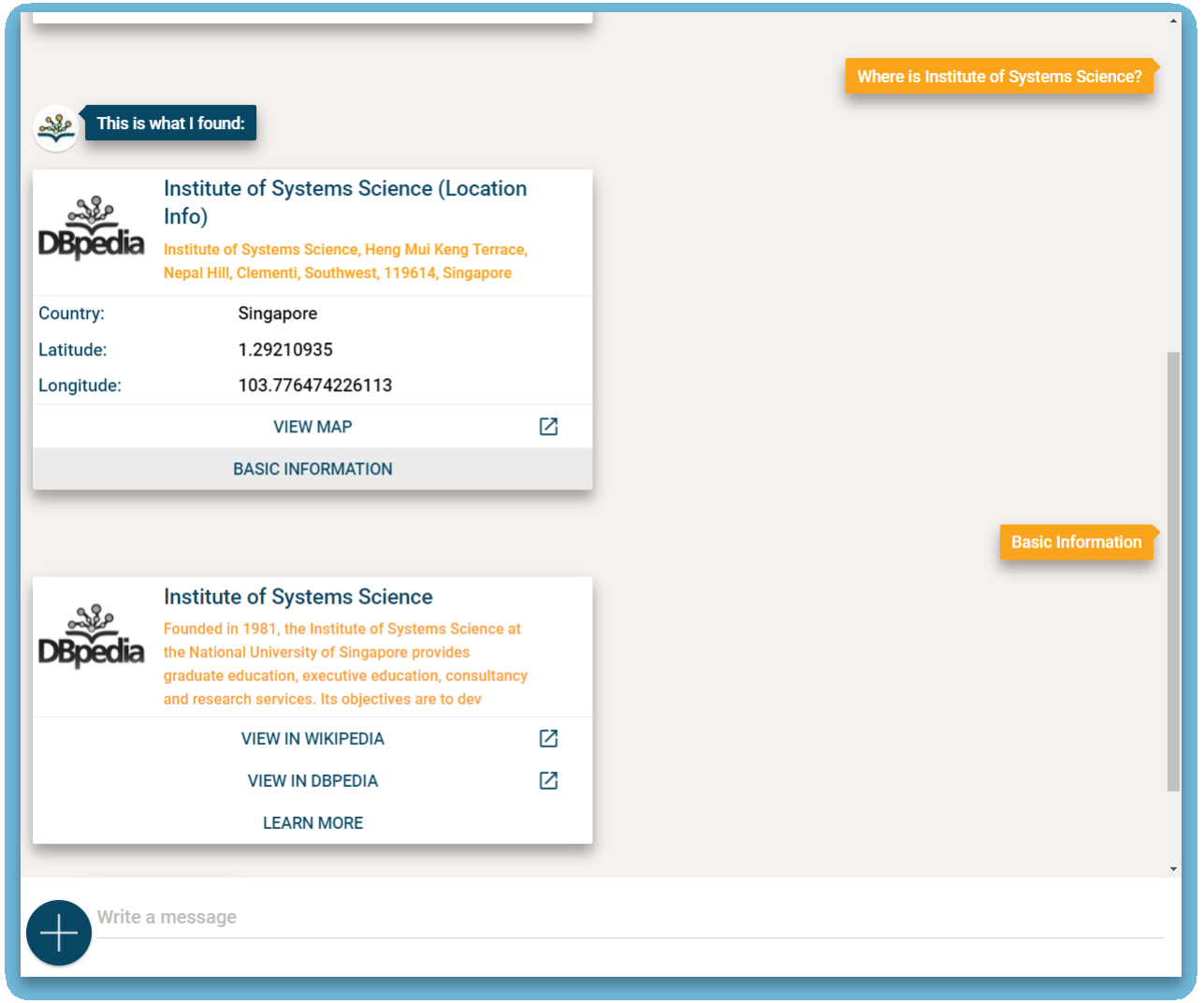
- **Image Object Recognition: Google Vision**





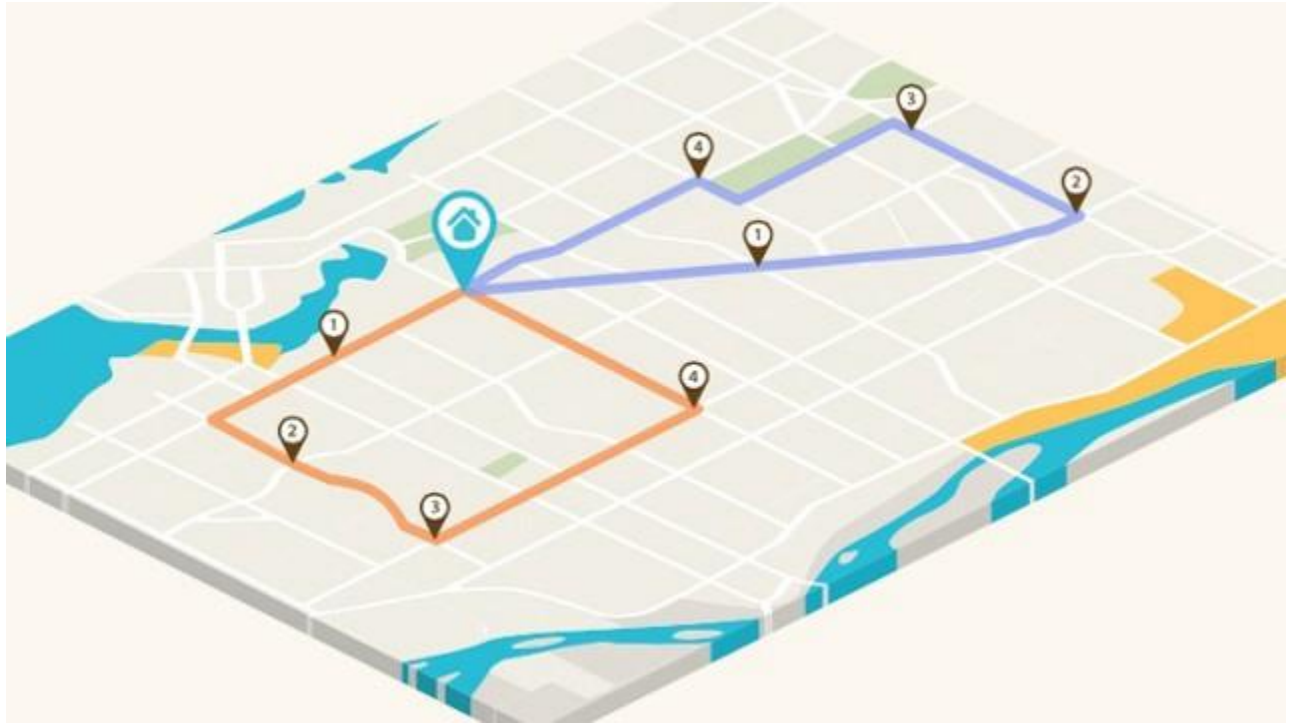
4.1 CONTEMPORARY REASONING SYSTEMS

- **Chat-Bot: DBpedia**



4.1 CONTEMPORARY REASONING SYSTEMS

- **Vehicle Scheduling: Delivery routing**

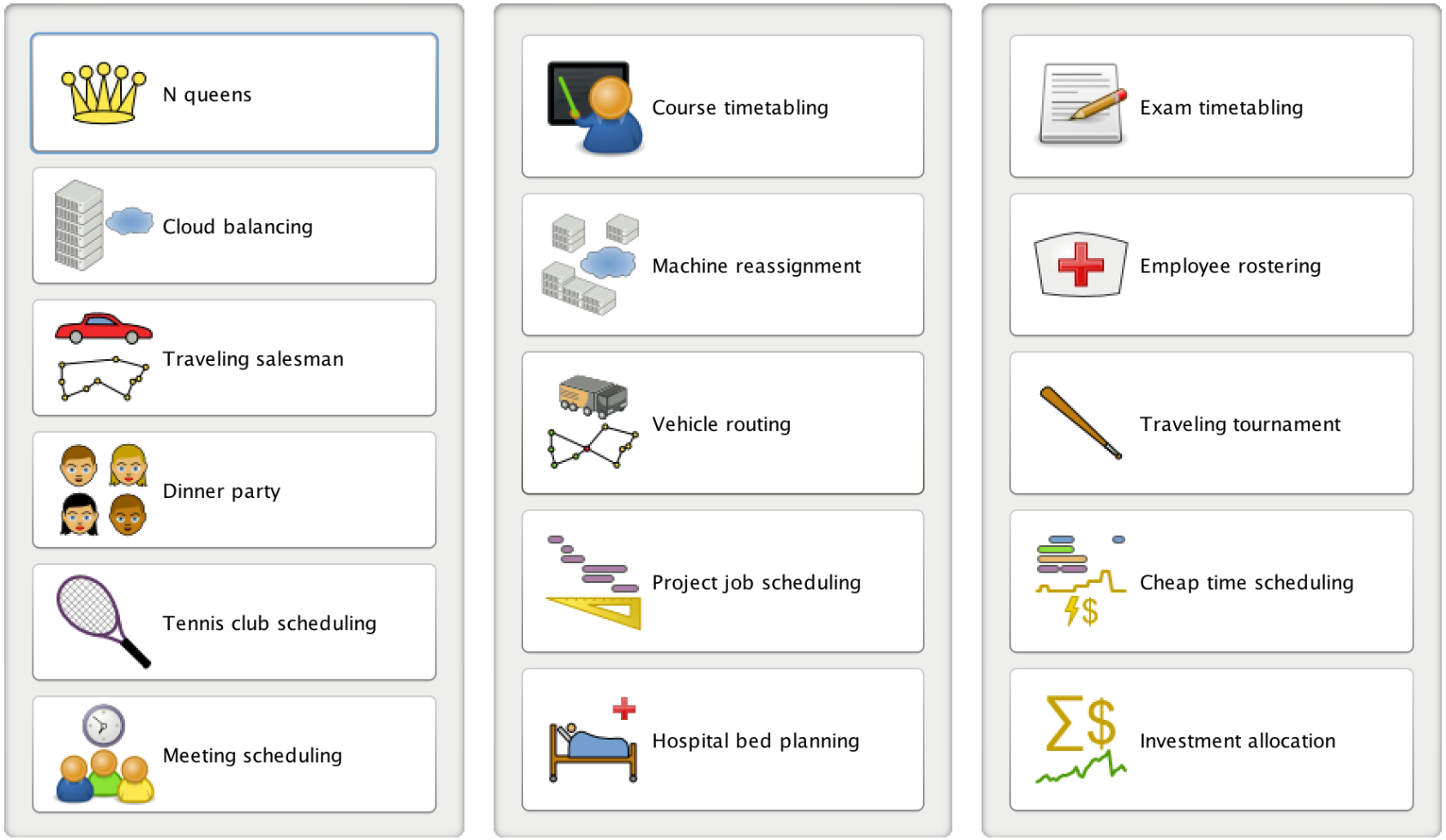


https://routific.com/

Routific Solutions

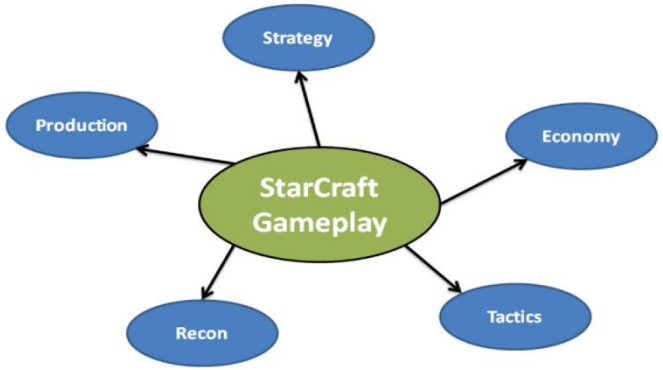
4.1 CONTEMPORARY REASONING SYSTEMS

- **Constrain Satisfaction: Business Task Optimizer**



4.1 CONTEMPORARY REASONING SYSTEMS

- Finite state machines
- Scripting
- Dynamic scripting
- Probabilistic inference
- Influence maps
- Neural networks
- Swarm intelligence
- Potential fields
- Genetic programming



Bot vs. Bot Results - (Row,Col) = Row Wins vs. Col

	Win %	IceBo	Ximp	LetaB	Aiur	Skyne	Xelna	UAlbe	MaasC	Moose	BTHAI	Terra	NUSBo	Nova	HITA	CruzB	Bonjw	Orita	Yarmo
IceBot	85.86	-	61/67	42/67	30/67	39/67	28/67	62/67	64/67	65/67	67/67	67/67	67/67	55/67	63/67	67/67	67/67	67/67	67/67
Ximp	84.64	6/67	-	30/67	51/67	62/67	49/67	64/67	50/67	67/67	67/67	66/67	62/67	56/67	67/67	67/67	67/67	66/67	67/67
LetaBot	82.09	25/67	37/67	-	65/67	67/67	51/67	46/67	15/67	65/67	60/67	62/67	63/67	58/67	59/67	67/67	63/67	67/67	65/67
Aiur	70.94	37/67	16/67	2/67	-	56/67	45/67	49/67	41/67	46/67	64/67	59/67	38/67	57/67	50/67	55/67	67/67	63/67	63/67
Skynet	68.74	28/67	5/67	0/67	11/67	-	44/67	31/67	63/67	66/67	67/67	67/67	15/67	51/67	67/67	67/67	67/67	67/67	67/67
Xelnaga	68.31	39/67	18/67	16/67	22/67	23/67	-	13/67	56/67	31/67	49/67	66/67	67/67	56/67	62/67	66/67	66/67	61/67	67/67
UAlbertaBot	67.25	5/67	3/67	21/67	18/67	36/67	54/67	-	63/67	36/67	30/67	40/67	67/67	62/67	65/67	65/67	67/67	67/67	67/67
MaasCraft	59	3/67	17/67	52/67	26/67	4/67	11/67	4/67	-	32/67	33/67	55/67	60/67	52/67	67/67	62/67	67/67	60/67	67/67
MooseBot	50.13	2/67	0/67	2/67	21/67	1/67	36/67	31/67	35/67	-	15/67	27/67	65/67	35/67	66/67	50/67	53/67	65/67	67/67
BTHAI	46.8	0/67	0/67	7/67	3/67	0/67	18/67	37/67	34/67	52/67	-	33/67	38/67	47/67	65/67	34/67	35/67	64/67	66/67
TerranUAB	42.93	0/67	1/67	5/67	8/67	0/67	1/67	27/67	12/67	40/67	34/67	-	33/67	46/67	45/67	60/67	55/67	61/67	61/67
NUSBot	37.23	0/67	5/67	4/67	29/67	52/67	0/67	0/67	7/67	2/67	29/67	34/67	-	35/67	31/67	16/67	60/67	60/67	60/67
Nova	32.4	12/67	11/67	9/67	10/67	16/67	11/67	5/67	15/67	32/67	20/67	21/67	32/67	-	17/67	41/67	44/67	38/67	35/67
HITA	32.13	4/67	0/67	8/67	17/67	0/67	5/67	2/67	0/67	1/67	2/67	22/67	36/67	50/67	-	39/67	49/67	65/67	66/67
CruzBot	29.15	0/67	0/67	0/67	12/67	0/67	1/67	2/67	5/67	17/67	33/67	7/67	51/67	26/67	28/67	-	61/67	32/67	57/67
Bonjwa	16.51	0/67	0/67	4/67	0/67	0/67	1/67	0/67	0/67	14/67	32/67	12/67	7/67	23/67	18/67	6/67	-	43/67	28/67
Oritaka	14.4	0/67	1/67	0/67	4/67	0/67	6/67	0/67	7/67	2/67	3/67	6/67	7/67	29/67	2/67	35/67	24/67	-	38/67
Yarmouk	11.5	0/67	0/67	2/67	4/67	0/67	0/67	0/67	0/67	0/67	1/67	6/67	7/67	32/67	1/67	10/67	39/67	29/67	-

4.1 CONTEMPORARY REASONING SYSTEMS

Bot	Games	Win	Loss	Win %	AvgTime	Game Time Limit	Crash	Frame Timeout
SAIDA	2590	2484	106	95.91	15:36	27	0	8
CherryPi	2592	2355	237	90.86	12:21	19	0	0
CSE	2591	2257	334	87.11	11:59	5	1	0
BlueBlueSky	2586	2107	479	81.48	12:13	18	1	0
Locutus	2586	2095	491	81.01	12:14	29	1	0
ISAMind	2586	2029	557	78.46	12:07	13	1	0
DaQin	2590	1875	715	72.39	12:45	11	1	2
McRave	2592	1704	888	65.74	12:36	7	83	120
Iron	2582	1647	935	63.79	13:23	32	50	42
ZZZKBot	2576	1317	1259	51.13	8:35	3	1	0
Steamhammer	2583	1317	1266	50.99	11:48	8	0	22
Microwave	2582	1303	1279	50.46	12:09	11	17	7
LastOrder	2598	1279	1319	49.23	16:01	30	10	0
Tyr	2592	1156	1436	44.6	13:14	11	3	0
MetaBot	2393	1063	1330	44.42	14:32	38	80	80
LetaBot	2553	965	1588	37.8	15:45	78	29	12
Arrakhammer	2586	963	1623	37.24	12:21	8	11	10
Ecgberht	2579	947	1632	36.72	13:55	45	4	0
UAlbertaBot	2587	898	1689	34.71	11:32	50	46	0
Ximp	2579	841	1738	32.61	17:09	39	197	249
CDBot	2583	826	1757	31.98	10:29	8	130	6
Aiur	2570	811	1759	31.56	13:34	64	37	0
KillAll	2591	768	1823	29.64	11:01	12	3	15
WillyT	2586	718	1868	27.76	12:53	7	121	0
AILien	2584	698	1886	27.01	13:11	2	485	121
CUNYBot	2399	236	2163	9.84	11:04	10	320	44
Hellbot	2572	35	2537	1.36	9:01	21	5	0
Total	34694	34694	34694	N/A	12:43	303	1637	738

Link
https://www.youtube.com/watch?v=fai1cRra_Go

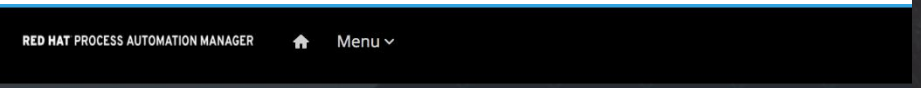
Link
https://www.cs.mun.ca/~dchurchill/starcraftaicomp/2018/

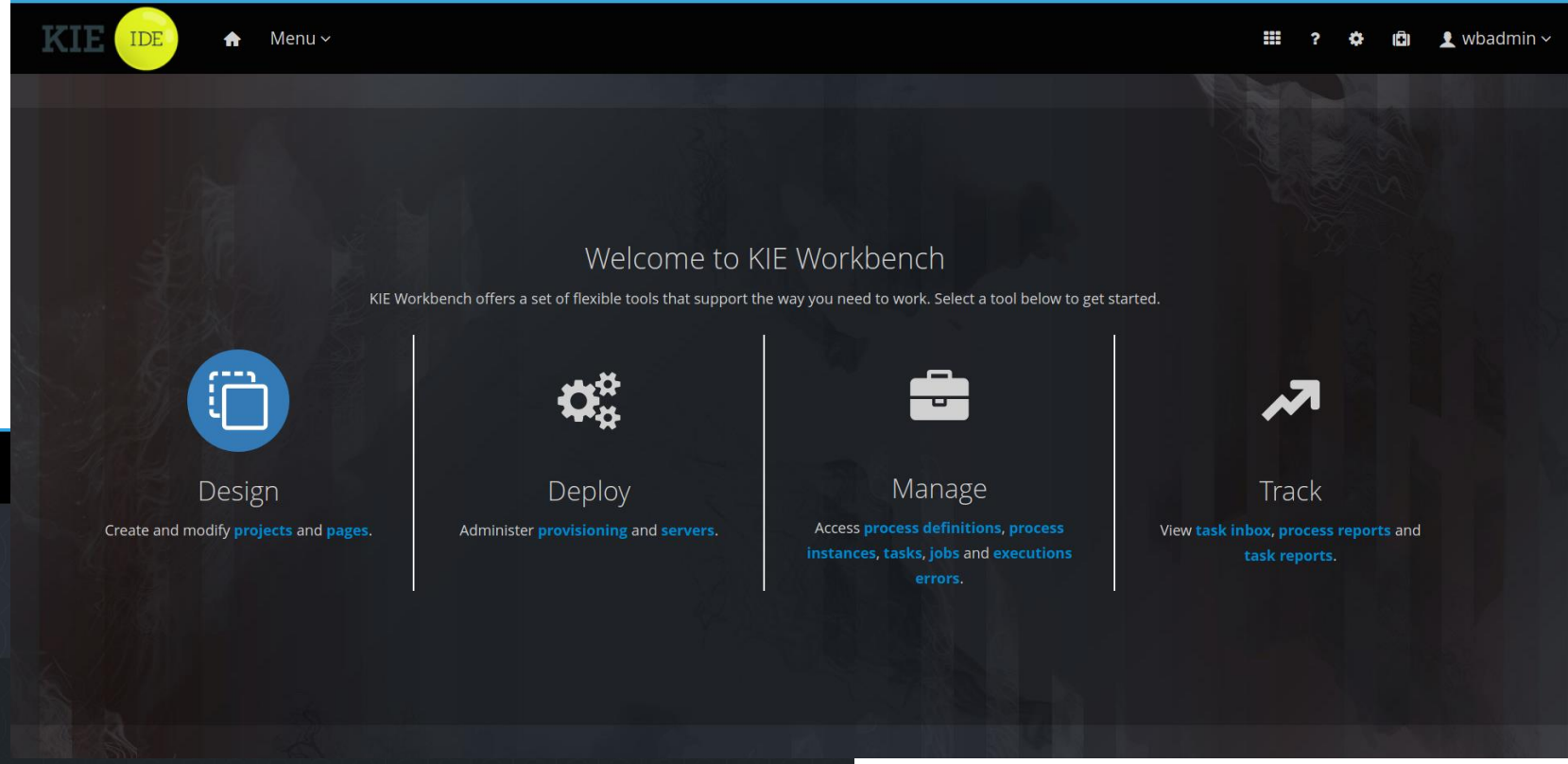
Link
https://github.com/TeamSAIDA/SAIDA

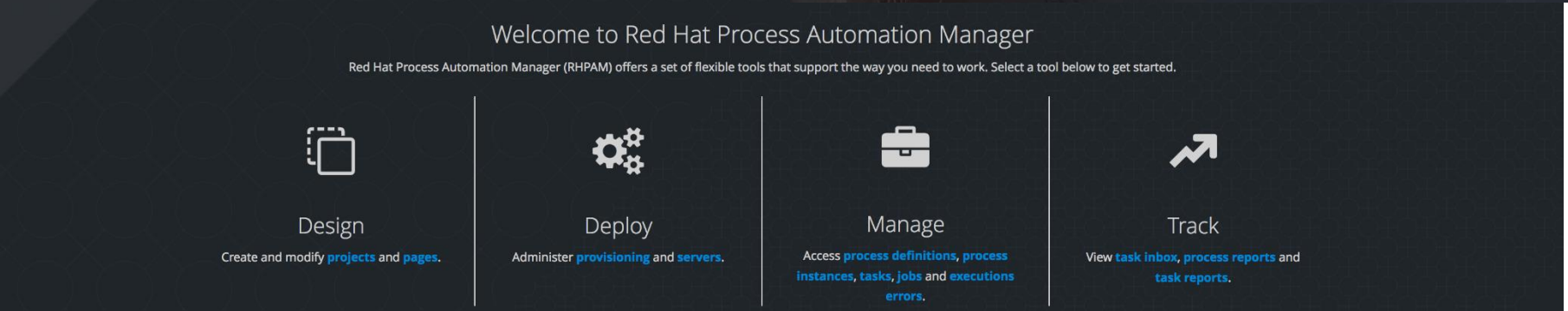
Bot	Win %	SAID	Cher	CSE	Blue	Locu	ISAM	DaQi	McRa	Iron	ZZZK	Stea	Micr	Last	Tyr	Meta	Leta	Arra	Ecgb	UAlb	Ximp	CDBo	Aiur	Kill	Will	AILi	CUNY	Hell
SAIDA	95.91	-	083/100	093/100	097/100	098/100	089/100	095/100	086/100	088/100	097/100	097/100	100/100	100/100	100/100	90/94	098/100	100/100	100/100	087/100	098/100	098/100	095/100	096/100	099/100	100/100	94/96	100/100
CherryPi	90.86	017/100	-	072/100	086/100	089/100	096/100	100/100	085/100	096/100	091/100	80/99	091/100	082/100	096/100	92/93	098/100	089/100	099/100	098/100	099/100	100/100	099/100	100/100	100/100	100/100	100/100	100/100
CSE	87.11	007/100	028/100	-	066/100	068/100	078/100	084/100	71/99	098/100	091/100	098/100	098/100	100/100	100/100	89/95	091/100	100/100	100/100	098/100	100/100	098/100	096/100	100/100	100/100	98/99	97/98	100/100
BlueBlueSky	81.48	003/100	014/100	034/100	-	061/100	066/100	092/100	072/100	098/100	088/100	097/100	094/100	100/100	100/100	60/94	095/100	092/100	100/100	089/100	095/100	098/100	072/100	097/100	100/100	100/100	92/92	100/100
Locutus	81.01	004/100	011/100	032/100	039/100	-	056/100	076/100	054/100	088/100	095/100	097/100	096/100	100/100	097/100	90/96	094/100	097/100	100/100	094/100	094/100	100/100	095/100	098/100	100/100	098/100	90/98	100/100
ISAMind	78.46	011/100	004/100	022/100	034/100	044/100	-	063/100	049/100	098/100	089/100	098/100	093/100	100/100	095/100	79/90	092/100	098/100	100/100	095/100	093/100	098/100	082/100	097/100	100/100	100/100	98/98	100/100
DaQin	72.39	005/100	000/100	016/100	008/100	024/100	037/100	-	042/100	092/100	087/100	099/100	96/99	096/100	098/100	58/95	095/100	096/100	100/100	088/100	073/100	097/100	081/100	098/100	100/100	097/100	89/96	100/100
McRave	65.74	014/100	015/100	28/99	028/100	046/100	051/100	058/100	-	055/100	072/100	063/100	079/100	096/100	088/100	49/97	074/100	098/100	096/100	71/99	041/100	100/100	077/100	058/100	074/100	083/100	89/97	100/100
Iron	63.79	002/100	004/100	002/100	002/100	012/100	002/100	008/100	045/100	-	041/100	073/100	086/100	091/100	094/100	66/86	066/100	094/100	100/100	091/100	099/100	088/100	097/100	085/100	100/100	093/100	87/96	100/100
ZZZKBot	51.13	003/100	009/100	009/100	012/100	005/100	011/100	013/100	028/100	059/100	-	059/100	057/100	055/100	035/100	68/85	040/100	083/100	025/100	086/100	100/100	072/100	089/100	058/100	092/100	073/100	77/91	099/100
Steamhammer	50.99	003/100	19/99	002/100	003/100	003/100	004/100	001/100	037/100	027/100	041/100	-	024/100	025/100	053/100	50/88	074/100	057/100	096/100	089/100	079/100	084/100	088/100	091/100	093/100	083/100	91/96	100/100
Microwave	50.46	000/100	009/100	001/100	006/100	004/100	007/100	04/99	021/100	014/100	043/100	076/100	-	057/100	052/100	66/92	080/100	068/100	073/100	081/100	065/100	078/100	081/100	091/100	086/100	50/99	98/98	100/100
LastOrder	49.23	000/100	018/100	000/100	000/100	000/100	000/100	004/100	004/100	009/100	045/100	075/100	043/100	-	057/100	87/99	075/100	083/100	004/100	095/100	085/100	089/100	095/100	089/100	035/100	092/100	95/99	100/100
Tyr	44.6	000/100	004/100	000/100	000/100	003/100	005/100	001/100	012/100	006/100	065/100	047/100	048/100	043/100	-	20/98	061/100	098/100	046/100	058/100	098/100	100/100	050/100	094/100	049/100	062/100	88/94	100/100
MetaBot	44.42	04/94	01/93	06/95	34/94	06/96	11/90	37/95	48/97	01/86	17/85	38/88	26/92	12/99	78/98	-	32/78	56/91	79/92	52/94	38/94	64/94	62/85	47/95	85/93	62/95	80/92	87/88
LetaBot	37.8	002/100	002/100	009/100	005/100	006/100	008/100	005/100	026/100	034/100	060/100	026/100	020/100	025/100	039/100	46/78	-	042/100	076/100	041/100	078/100	044/100	036/100	053/100	023/100	092/100	67/75	100/100
Arrakhammer	37.24	000/100	011/100	000/100	008/100	003/100	002/100	001/100	001/100	006/100	017/100	043/100	032/100	012/100	004/100	35/91	058/100	-	069/100	043/100	071/100	077/100	054/100	059/100	094/100	063/100	93/95	100/100
Ecgberht	36.72	000/100	001/100	000/100	000/100	000/100	000/100	000/100	004/100	000/100	075/100	004/100	027/100	096/100	054/100	13/92	024/100	031/100	-	058/100	079/100	038/100	057/100	066/100	058/100	084/100	83/87	096/100
UAlbertaBot	34.71	013/100	002/100	002/100	011/100	006/100	005/100	012/100	28/99	009/100	014/100	011/100	019/100	005/100	042/100	42/94	059/100	057/100	042/100	-	048/100	045/100	064/100	075/100	041/100	070/100	78/94	098/100
Ximp	32.61	002/100	001/100	000/100	005/100	006/100	007/100	027/100	059/100	001/100	000/100	021/100	035/100	015/100	002/100	56/94	022/100	029/100	021/100	052/100	-	003/100	068/100	084/100	096/100	064/100	71/85	094/100
CDBot	31.98	004/100	000/100	001/100	004/100	000/100	001/100	003/100	000/100	012/100	028/100	016/100	022/100	011/100	000/100	30/94	056/100	023/100	062/100	055/100	097/100	-	023/100	062/100	078/100	066/100	79/89	093/100
Aiur	31.56	005/100	001/100	004/100	028/100	005/100	018/100	019/100	023/100	003/100	011/100	012/100	019/100	005/100	050/100	23/85	064/100	046/100	043/100	036/100	032/100	077/100	-	027/100	061/100	038/100	65/85	098/100
KillAll	29.64	004/100	000/100	000/100	003/100	002/100	003/100	002/100	042/100	015/100	042/100	009/100	009/100	011/100	006/100	48/95	047/100	041/100	034/100	025/100	016/100	038/100	073/100	-	039/100	070/100	94/98	095/100
WillyT	27.76	001/100	000/100	000/100	000/100	000/100	000/100	000/100	026/100	000/100	008/100	007/100	014/100	065/100	051/100	08/93	077/100	006/100	042/100	059/100	004/100	022/100	039/100	061/100	-	043/100	85/93	100/100
AILien	27.01	000/100	000/100	00/99	000/100	002/100	000/100	003/100	017/100	007/100	027/100	017/100	49/99	008/100	038/100	33/95	008/100	037/100	016/100	030/100	036/100	034/100	062/100	030/100	057/100	-	87/91	100/100
CUNYBot	9.84	02/96	000/100	01/98	00/92	00/90	00/96	07/96	08/97	09/96	14/91	05/96	02/92	04/99	06/94	12/92	08/75	00/95	04/87	16/94	14/85	10/89	20/85	02/96	08/93	04/91	-	80/84
Hellbot	1.36	000/100	000/100	000/100	000/100	000/100	000/100	000/100	000/100	000/100	001/100	000/100	000/100	000/100	000/100	01/88	000/100	000/100	005/100	002/100	006/100	007/100	004/100	005/100	000/100	000/100	04/84	-

PROCESS AUTOMATION MANAGER (PAM / JBPM) & DECISION MANAGER (DM / DROOLS)

Key Customer Case Studies


RED HAT PROCESS AUTOMATION MANAGER
Menu


KIE
IDE
Menu
wbadmin
Welcome to KIE Workbench
KIE Workbench offers a set of flexible tools that support the way you need to work. Select a tool below to get started.
Design
Create and modify projects and pages.
Deploy
Administer provisioning and servers.
Manage
Access process definitions, process instances, tasks, jobs and executions errors.
Track
View task inbox, process reports and task reports.


Welcome to Red Hat Process Automation Manager
Red Hat Process Automation Manager (RHPAM) offers a set of flexible tools that support the way you need to work. Select a tool below to get started.
Design
Create and modify projects and pages.
Deploy
Administer provisioning and servers.
Manage
Access process definitions, process instances, tasks, jobs and executions errors.
Track
View task inbox, process reports and task reports.

Aviva Achieves Faster Response Times - Courtesy: Red Hat PAM

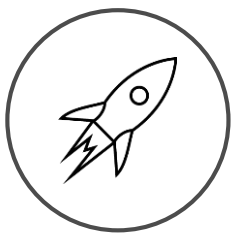
Aviva leveraged Fuse to manage additional service endpoints and establish a service gateway for routing and service integration with third-party vendor systems, such as Kofax and IBM FileNet.

CHALLENGE

The inflexible bond management and workflow systems of Aviva's new acquisition FPI, was hampering it's goal of bringing the new joint offering to the Asian market faster.

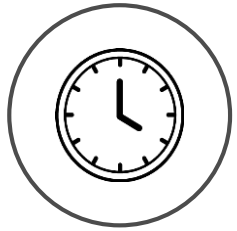
SOLUTION

- Aviva decided to migrate from FPI's existing AWD system to a new & faster imaging and workflow application based on **Red Hat Process Automation Manager (PAM)**.
- Standardized on a single process automation platform leveraging **PAM** to unify applications across users in Singapore, Hong Kong and Dubai, in 6 months.



New Services at a Faster Rate

Lower Overall Costs



Faster Response Times

Case Study

Real Time, Automated Billing with Red Hat Middleware

Migrated to a web application that uses Red Hat JBoss EAP for custom user interfaces to manage rule editing and versioning. The stability and scalability of EAP made it an obvious choice.

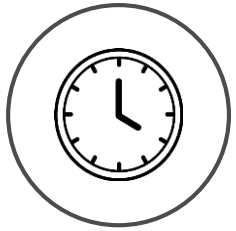
CHALLENGE

Dispersed data across various applications causing complexity for real time package tracking. Growing number of rules/scenarios for various types of customers.

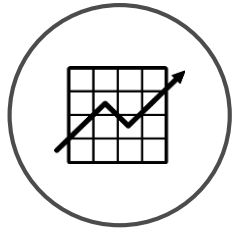
SOLUTION

- Using middleware Sia developed an automated, flexible pre billing system to collect data from various legacy systems and applied business rules to calculate client bills
- Fuse to collect and store transaction data.
- **Red Hat BPM Suite** to manage business rules and related governance workflows

Improved Costs by Moving Rules Management from Developers to Business Units



Reduced Development Times



Application Scalability

Case Study

Jalisco State Government, Powered by Red Hat Middleware, Increases Service Rate by 900%

"With the Red Hat Solution, we can gradually scale up and grow in line with demand for our services.This capability is quite extraordinary, because we can add other solutions that permit further improvement of our servicesand building innovative applications "

- MASTER MARIA ANGELINA ALARCON ROMERO
DIRECTOR,TECHNOLOGY INNOVATION,
GOVERNMENT OF THE STATE OF JALISCO

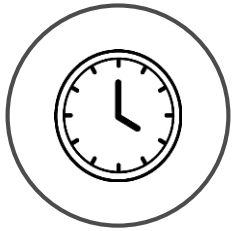
Case Study

CHALLENGE

With dispersed data sources and manual processes, Jalisco State was finding it challenging to cope with the increasing demands of its citizens

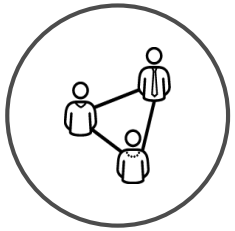
SOLUTION

With Red Hat Fuse connecting disparate systems and **BPM Suite** automating the complex processes, Jalisco State provided a wide range of services from mobility, public safety, and revenue collection to environmental issues. Citizens could pay road taxes or traffic fines, order birth certificates, or electronically sign receipts from one online location.



Traffic Infringement Notices Sent within 3 days rather than 120 days

Enhanced Security



Citizens Served Per Day Increased from 3,000 to 30,000

Asahi Implements an IOT Solution to Increase Production Efficiency Using Red Hat Decision Manager

ASAHI
旭鉄工株式会社

"With Red Hat Decision Manager, you can describe various rules in an Excel-based decision table. There is no need to correct the program for each minor change."

- RYUJI KUROKAWA
DEPUTY GENERAL MANAGER OF CORPORATE PLANNING
ASAHI TEKKO CO., LTD.

CHALLENGE

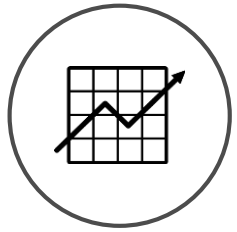
To keep pace with customer orders, Asahi needed to speed just-in-time workflows without expanding its physical footprint and replace manual data collection with automated machine monitoring.

SOLUTION

IoT solution using Decision Manager for automated data collection and real-time insight into machine operations reduced capital expenditure (CapEx) and labor costs by about ¥300 million and ¥100 million per year respectively.

¥400 Million in Cost Savings

Reduction in Manual Errors



Decreased Overworking by an Average of 10 Hours/Day

Case Study

FI Reduces User Related Errors and Programming Costs with Decision Manager

finanz informatik

*"When we first started using **Red Hat DM** … we had excellent experiences with it, both professionally and technically. So the decision was rather easy when we needed a standard rules management system for our comprehensive core banking solution, OSPlus. Our architecture board made an unanimous decision for [Red Hat]."*

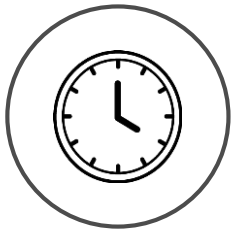
- ANDREAS JUNGIEREK
MANAGER
Sales Process Lending and Assets and Securities Management
FINANZ INFORMATIK

CHALLENGE

With increased programming costs due to the inflexibility of their existing rules based system, it was getting difficult to cope with the growth in customer demand.

SOLUTION

FI implemented a centralized, rules-based business process management system for OSPlus-Kredit, its solution portfolio loan business and processes, that simplified management, improved response times and reduced the risk of user-related errors.



Improved Response Times

Reduced Programming Costs

Drop in User Related Errors

Case Study

70 Million Seamless Ride Bookings Per Year Powered by Red Hat Decision Manager

LogistiCare®

"We anticipate moving from large software releases quarterly to functional releases monthly, with system refinements happening as often as weekly," Our IT organization is now a responsive partner with a business focus."

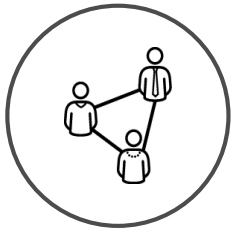
- MICHAEL QUINTERO
ENTERPRISE SOLUTIONS ARCHITECT
LOGISTICARE

CHALLENGE

Business has grown over 60% and the core app was not able to handle the growing scale and complexity of business. The app contained custom business logic that made meeting the evolving needs of clients & partners, increasingly difficult.

SOLUTION

- Saved $6Mn in operations by using **DM** to define complex rules for regulatory compliance, routing, payments, and ride scheduling.
- Adopted the OpenShift container platform to manage, deploy and scale apps and APIs, built using Red Hat Middleware.



Easier
Third Party
Integration

Operational
costs reduced
by $6 Mn

Increased
agent efficiency
by 15%

Case Study

4.2

COURSE REVIEW

4.2 COURSE REVIEW EXERCISE

- **The following set of rules was designed to help a new zoo-keeper look after his animals:**

  IF feathers(x) THEN bird(x)

  IF flies(x) AND lays_eggs(x) THEN bird(x)

  IF gives_milk(x) THEN mammal(x)

  IF eats_meat(x) THEN carnivore(x)

  IF mamamal(x) AND sharp_teeth(x) THEN carnivore(x)

  IF carnivore(x) THEN feed_meat(x)

  IF bird(x) AND not_flies(x) THEN penguin(x)

  IF penguin(x) THEN feed_fish(x)

  IF carnivore(x) THEN dangerous(x)

- **Initial facts:**

  sharp_teeth(Lucy), feathers(Penny), not_flies(Penny), gives_milk(Lucy), lays_eggs(Penny)

- **Q3: What can be derived from the knowledge base by forward chaining? Explain your answer.**
- **Q4: How can backward chaining be used to determine which animals are known to be dangerous? Work through the details.**

4.3

COURSE ASSESSMENT

(GRADED INDIVIDUAL EXAM)

Module

Overview

Consultation

Class & Groups

Tools

Announcement

Assessment

Chat Room

Files *(Workbin)*

Forum

Gradebook

Lesson Plan

Multimedia

Poll

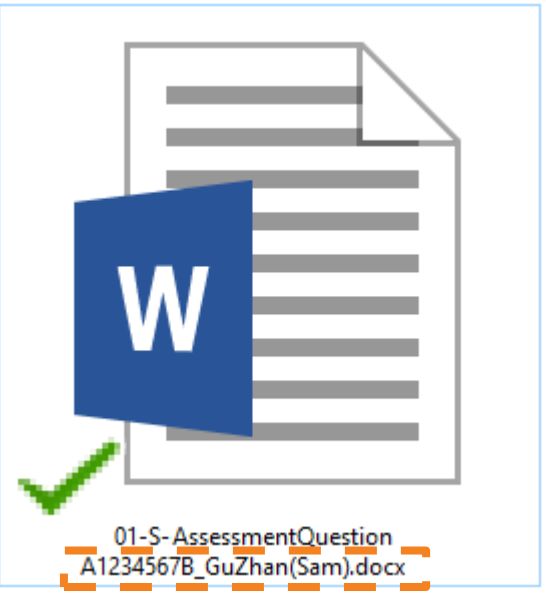
Project

Machine Reasoning

Search

Back

Name	Size	Owner	Date
01 - Courseware	7.09 MB	GU Zhan (Sam)	OPEN
02 - Workshop n Project	6.64 MB	GU Zhan (Sa	
02 - Workshop n Project Submission	0 Bytes	GU Zhan (Sa	
03 - Assessment	0 Bytes	GU Zhan (Sa	
03 - Assessment Submission	0 Bytes	GU Zhan (Sa	



4.4 WORKSHOP

CREATING REASONING SYSTEM

(GRADED WORKSHOP & PROJECT DELIVERABLES)

4.4 WORKSHOP CREATING REASONING SYSTEM

MTech Thru-Train

- **KIE Test & Deployment – Group Work**

  Integrate, test, and deploy bespoke reasoning system components using KIE tools:

  - Continue from Day 3 workshop: **KIE Development – Group Work**
  - Integrate, test, and deploy bespoke reasoning system components using KIE tools

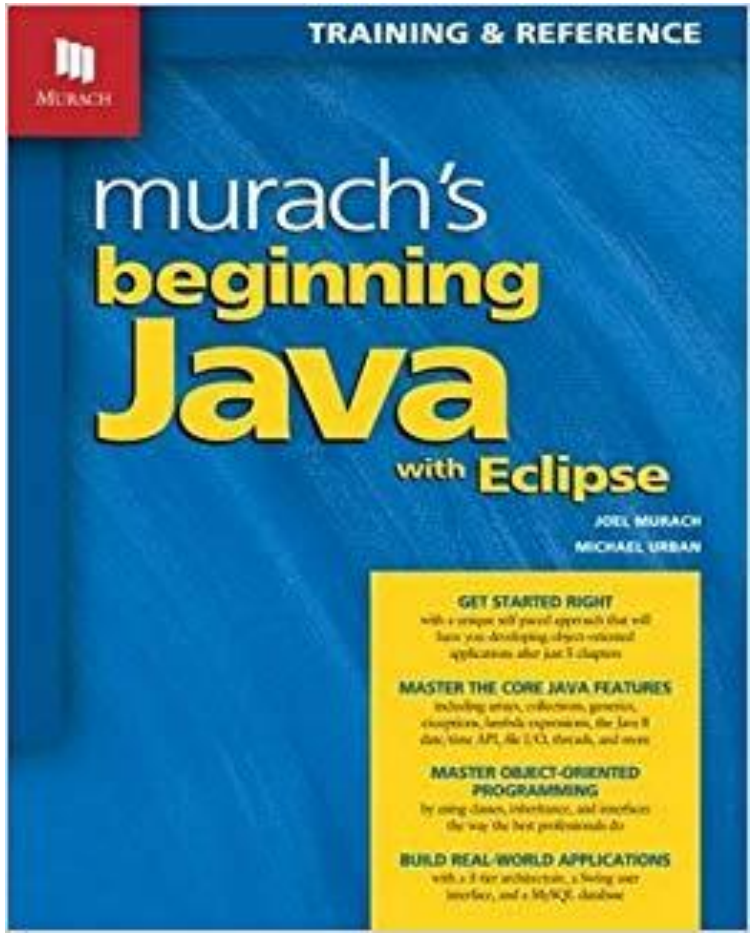
- **KIE Minimum Viable Product (MVP) – Group Work**

  Deliver bespoke reasoning system as MVP:

  - Prepare project report and user guide
  - Prepare system demo for video presentation
  - Submit project deliverables. Refer to Project Submission Template

☺ **Candidate Project: HDB BTO; Airport Gate Assignment System (AGAS); DoReMi**

DAY 4 REFERENCE



1. CLIPS (C Language Integrated Production System) : A Tool for Building Expert Systems from NASA

   http://www.clipsrules.net/

2. FuzzyCLIPS : A fuzzy logic extension of the CLIPS tool

   https://quentin.pradet.me/blog/fuzzyclips-downloads.html

3. PyKnow: Expert Systems for Python (inspired by CLIPS)

   https://pyknow.readthedocs.io/en/stable/index.html

4. Getting Started With Red Hat Business Optimizer (PAM / OptaPlanner)

   https://access.redhat.com/documentation/en-us/red_hat_decision_manager/7.2/html-single/getting_started_with_red_hat_business_optimizer/

5. OptaPlanner constrain solver for business planning

   https://www.optaplanner.org/