MAHARISHI INTERNATIIONAL UNIVERSITY

CS 544 Enterprise Architecture:
The Field of All Possibilities is the Source of All Solutions

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Professor:

Michael Zijlstra, M.S.

June Block 2023

(May 29th – Jun 22th 2023)

Maharishi International University is an Equal Opportunity Institution.

GOAL OF THE COURSE

This course focuses on teaching the principles and practices used when developing larger scale enterprise applications. We will examine the different architectural layers that are frequently used and different technologies associated with these layers, including Object Relational Mapping (ORM), Dependency Injection (DI), Aspect Oriented Programming (AOP), and integration with other applications through Web Services (RESTfull and SOAP), Messaging and remote method invocation.

COURSE OBJECTIVES, ACTIVITIES, AND ASSESSMENTS

This is what you'll learn to do*	**This is how you'll learn it**	**This is what will show you've learned it**
1. Explain the principles behind frameworks, and why they are the foundation of enterprise applications	By attending the lectures and working with both the Spring and Hibernate frameworks in the labs	Short answer questions on daily quizzes and exams (especially exam 2)
2. Apply Dependency Injection to create flexibility between different elements of an application	By studying how frameworks create and then link objects together, and then practicing in the labs	Dependency injection exercises on quizzes and exams (especially exam 2).
3. Apply Aspect Oriented Programming techniques to declaratively add additional features (e.g. Transactions)	By creating aspects and declaratively weaving them in between the program execution in the labs	Aspect Oriented Programming exercises on quizzes and exams (especially exam 2)
4. Create mapping meta data to reconcile the differences between Object Oriented languages and Relational Databases	By practicing how to create mappings for object domains to relational database schemas	Mapping exercises on quizzes and exams (especially exam 1)
5. Know best practices for Object Relational Mapping for speed and efficiency	By integrating ORM into actual applications	Short answer question on quizzes and as demonstrated in your project
6.Create communication channels between different Enterprise Applications	By using Web Services and messaging in the labs	Code questions on quizzes and exams (especially exam 3)
7. Explain the connection between the Science of Consciousness and Enterprise Applications	By writing appealing points (with a drawing) that have a science of consciousness connection	Short answer questions on the exams

*The numbers in parentheses refer to the MUM Essential Learning Outcomes that are best supported by this course objective; they appear in **boldface** in the list below. Holistic development of consciousness and health

1. Holistic development of consciousness and health
2. Consciousness-Based understanding (Knowledge)
3. **Creative and critical thinking**
4. Communication
5. **Scientific and quantitative reasoning**
6. Collaboration and leadership
7. Sustainable local and global citizenship

EVALUATION PLAN

Grading components

Quizzes	2%
Homework / Communication	2%
Project / Presentation	6%
Midterm Exam	45%
Final Exam	45%

Meaning of grades

A	**93-100**	Excellent — meets the course objectives at an exceptionally high level
A-	**90-92**	
B+	**87-89**	Good — meets the course objectives at the expected level
B	**83-86**	
B-	**80-82**	
C+	**77-79**	Fair — meets the course objectives at a basic level
C	**73-76**	
C-	**70-72**	
NC	**Below 70**	No credit — does not meet the course objectives

Week	Session	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
WEEK 1		**Theme I: Spring – The Nature of life is to grow**					
	a.m.	Overview	DI	AOP	Hibernate	Persistence API	Associations
	p.m.	Spring Context	Spring Startup	Spring Apps	Entities	Persistence API	Collections
	Eve	Homework	Homework	Homework	Homework	Homework	Homework
WEEK 2		**Theme II: Hibernate – Rest and Activity are the Steps of Progress**					
	a.m.	Complex	Queries	Web Apps	Transactions	Review	**Exam**
	p.m.	Queries	Optimization	Concurrency	Transactions		
	Eve	Homework	Homework	Homework	Homework		
WEEK 3		**Theme III: Applications – Life is Found in Layers**					
	a.m.	Spring MVC	Security	Spring Boot	Project	Project	Project
	p.m.	Spring Data	Validation	REST			
	Eve	Homework	Homework	Homework			
WEEK 4		**Theme IV: Integration Project – The Whole is Greater than the Sum of the Parts**					
	a.m.	Project	Presentations	Review	Exam		
	p.m.						
	Eve						

COURSE TIMELINE

Week 1 Spring	Week 2 Hibernate
Monday: Overview and Context • Course Overview • Spring Context Exercises: COV1, COV2	**Monday: Advanced Mapping** • Complex Mapping • Inheritance Mapping • First part Queries Exercises: IMP1 and CXM1
Tuesday: DI & Startup • Dependency Injection • Spring Startup Exercises: SDI.1, SDI.2, if time SDI.3	**Tuesday: Queries** • Queries • Hibernate Optimization Exercises: HQL1, HOP1
Wednesday: AOP • Aspect Oriented Programming • Spring Applications Exercises: AOP.1 SSL1, AOP2, if time SSL.2	**Wednesday: Applications** • Web Apps • Concurrency Exercises: HAP2, if time HAP1
Thursday: Hibernate • Hibernate Intro • Entity Mapping Exercises: HPA1, HPA2	**Thursday: Transactions** • Transactions Exercises: SPH2, SPH1??
Friday: EntityManager • Persistence API Exercises:	**Friday: Review** • Review before the Assessment
Saturday: Mapping Associations • Association Mapping • Collection Mapping Exercises: AMP1, CMP1, if time AMP2	**Saturday: Hibernate Assessment**

Week 3 Applications	Week 4 Integration Project
Monday: Spring MVC & Spring Data • Spring MVC • Spring Data Exercises: MVC.1	**Monday: Project** • Work on Project
Tuesday: Security & Validation • Security • Validation Exercises: SEC.1 and VAL.1	**Tuesday: Presentations** • Present your Project
Wednesday: Boot & Rest • Spring Boot • Spring Rest Exercises: RST.1	**Wednesday: Review** • Review before the Assessment
Thursday: Project • Project Proposals	**Thursday: Final Assessment**
Friday: Project • Work on Project	
Saturday: Project • Work on Project	

CONTACT INFORMATION

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Phone: Cell: (213) 290-6424

FLIPPED CLASSROOM

The lectures for this course have all be per-recorded, and can be viewed at: https://manalabs.org/videos/cs544/ . Your username is your @miu.edu email address and your password your 6 digit student ID.

Having the lectures per-recoded allows our meetings to focus on removing obstacles that students may have in understanding the materials or solving the labs. It also gives students a lot more flexibility as you can view (and review) the videos at any time of the day.

I've custom built the website that hosts these videos, and open sourced the code at: https://github.com/ProfZijlstra/video_site please let me know if you have any bug reports, feature requests, or push requests you would like to make

GRADE COMPONENT DETAILS

Professionalism: Punctuality, Participation and Dress

Consider MIU to be your employer, and your professor to be your supervisor. Just like a regular job, the inability to show respect can get you thrown out; regardless of work performance.

Although punctuality, participation and dress do not add a percentage to the final grade, it is the area that most clearly embodies the value of respect. Failure to attend class, to be punctual, or to dress respectfully can result in grade deductions, and even dismissal from class (outright failure).

Students are expected to attend all classes (morning and afternoon sessions) and wear business casual clothing. If you have an urgent appointment during class time, you can request to be absent for that time. More than 3 un-approved absences (counted per day part, mornings and afternoons) are grounds for immediate failure. Wearing inappropriate clothing will get you sent home to change, with the lost time count as absent. Although people are generally on time for my classes, consistent tardiness will result in a grade deduction.

Arguing with your professor about grades in a disrespectful manner is also grounds for grade reduction (up to 3% off your final grade percentage).

My system keeps track of your tardiness and or absences to the class meetings. At the end of the course if a student is super close to the next grade (less than 0.5% away) I will give those with a good professionalism score the benefit of the doubt / add a small amount of points so that they reach the next grade.

Homework / Communication

Homework is for your own benefit; not doing it does not make me unhappy. It just makes you less prepared for the assessments (exams).

You will do both the homework and the project in a team of 2 to 3 people (similar to MPP). I will setup teams on the first day. It's best for each team member to do each exercise. I don't mind if you first split up to do the different ones, and then come together to learn from each other.

The key is that I want every student to be prepared for the exam, by not doing an exercise you become less prepared.

Think of me as a job supervisor who requires daily reports. Although I may not always have the time to look at it (I do look at several items each day), you should always remember that lying to a supervisor about your work is something you usually get fired [immediately failed] over!

5 of the 10 points for each homework submission are based on the report. If you just submit code but no report you only get **half of the points** for that day's homework.

Example Report:

Your team should submit a single report including solutions (as a single zip file) on the course sakai website at http://sakai.cs.mum.edu/ where you should see the assignment listed for that day. The submission field will allow you to enter the text for your report which should look like:

> We were able to finish COV1 which took us about 30 minutes, and COV2 which took about 45 minutes. We had some more trouble getting the environment setup, but solved it in the end.

Quizzes

There will be a quiz each morning that will finish at 10:30am about the materials covered during the previous day. These quizzes allow me:

1) To give you a review of the previous day's materials
2) To re-emphasize tricky issues with the material
3) To give me a feel for how well you understood the material
4) To give you extra incentive to be on time

A quiz will typically have 3 to 5 questions, when grading the quizzes I will give one point per correct answer. At the end of the course, the student with the most points will be considered 100%, giving the others a percentage based on that top score.

Exams

There will be a midterm assessment at the end of the second week and a final assessment at the very end of the course.

You will be allowed to bring one page (front and back) of notes to each exam. I will come by during the exam, and if I find that you have more than the allowed amount of pages will deduct up to 3 points from the exam for inappropriate behavior.

As shown in the Evaluation Plan each exam is worth 45% of the course grade. Each exam will be scored out of 100. People sometimes have a bad day during one of their exams. If one of your two exams is significantly lower than the other (at least 10 points lower) I will consider changing the weights of the exams to 60% and 30% so that the bad exam gets less weight.

Important: on the day before the exam I will ask you to write a review of all the materials covered on the exam, and add a science of consciousness point. The grade for this review is part of the exam! Do not forget to write or submit it!

PROJECT & PRESENTATION

Goal:

The goal of the project is to give hands on practical experience with building an application using the technologies we have been discussing the 3 weeks before that.

The topic is relatively open so as to allow students to pursue an area that they are interested in, as long as it relates to the material of the course. There is a suggested topic: creating a blog, but you should feel free to do something else as well.

Important: each student (regardless of team size) should have their own project (micro-service), which then integrates with the common project for the team. This means that a team of 2 will create an application existing out of 3 projects that integrate with each other.

This also means that during presentation each person on the team presents on his own (micro-service) project, after which the whole team presents on the +1 project that integrates everything.

Attendance:

While working on the project everyone is still expected to attend the daily meetings so that I continue to be aware of how things are going with you and your project.

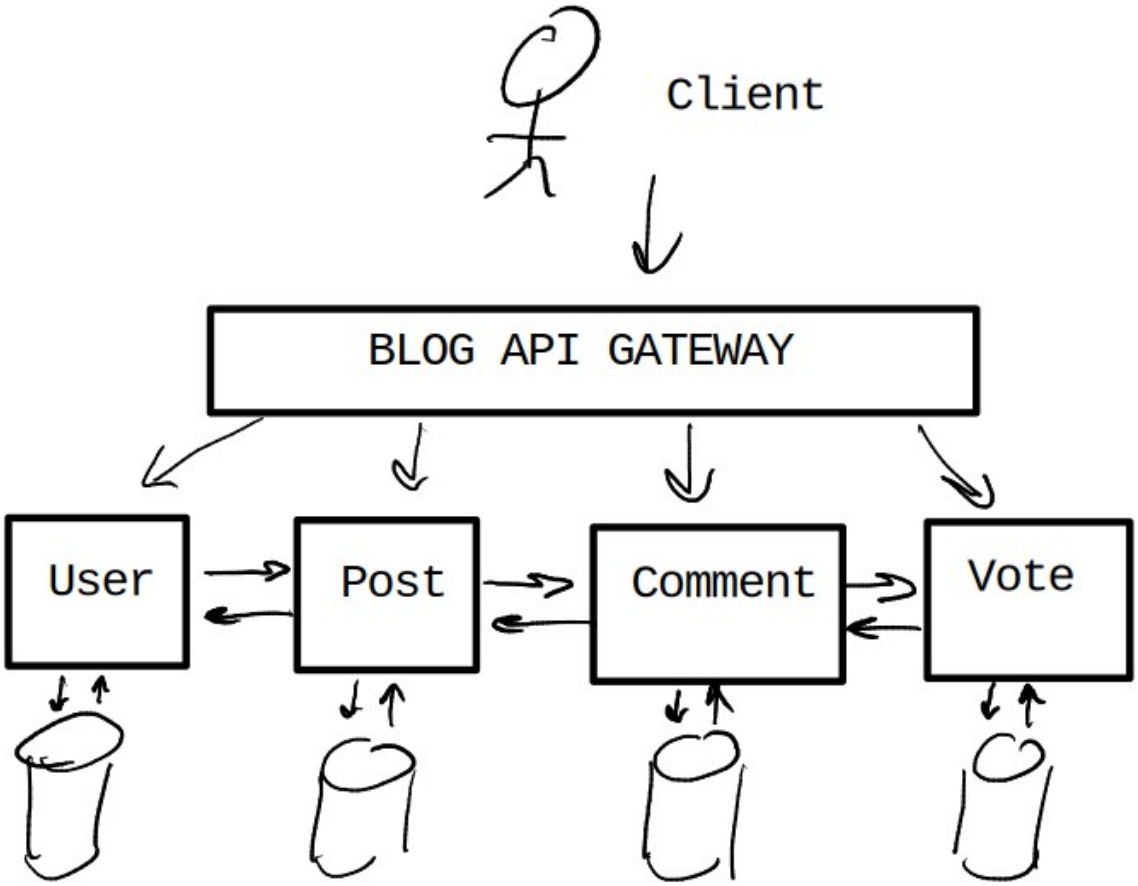
Blog Software:

For those who are having trouble thinking of the kind of application they would like to make I suggest making a Blogging application. A blog is defined as: A Web site on which an individual or group of users record opinions, information, etc. on a regular basis.

For this course there is no need to make a website – it can just be a RESTfull API for a blogging application.

There are many additional features that can be added to this, directly useful would be the possibility of updating or deleting blog posts (making the CRUD operations). On top of which, instead of one person posting, you could have multiple accounts that can post, or you could have reader accounts who could post comments.

A high level overview of the blog application (for a group of 4) would be:



Project Grading

Going above and beyond the areas of Spring and Hibernate discussed in the class will be rewarded, for example adding JTA, using Spring Testing or internationalization (I18N). Spending a lot of time on non-related topics such as nice HTML and CSS will not be rewarded. Your project will primarily be graded on functionality in the following areas:

	Excellent (A)	Good (B)	Not good (C)
Project Management 15%	All project features are finished on time, and each team member had a clear role / created distinct features, and kept me up to date	Things are mostly done, and each team member can basically show what they worked on	One or more team members are absent during a class session. Different team members create the same functionality
Hibernate 25%	Additional areas of Hibernate not discussed, or only discussed lightly are added	Hibernate is used for class mapping and Queries similar to the materials in class	JDBC code or direct use of SQL
Spring 25%	Additional areas of Spring not discussed, or only discussed lightly are added	Sprig is used for dependency injection, transactions, security	Spring is not used in areas where it could have been (eg. Bean managed transactions)
Integration 25%	Additional integration technologies are present	N+1 projects that integrate by using the techniques discussed in class	Less than N+1 separate projects, or projects that try to integrate through the DB
Presentation Delivery 10%	Not only was it structured and clear, it was engaging / fun.	The presentation was structured and clear, I had no trouble understanding what you were saying or why you were saying it	Lack of structure, or lack of clarity

Presentation Delivery:

Although I will schedule 15 minute time slots, I expect each presentation to be about 7 minutes allowing time for questions, setup and breakdown. Since presentation delivery isn't something that we have practiced, I will give a basic outline of what I would like to see in your presentation.

1. Start by explaining what you set out to do (and say what you will say)
2. Demonstrate your project running, showing what you accomplished
3. Show the Hibernate related parts of your project, what did you did with mapping / queries
4. Show the Spring related parts of your code, where did you use DI or AOP (including TX or method security)
5. Show the Integration parts of your code, controllers, views, possibly endpoints.
6. Summarize (and say what you've said)

LET'S CONNECT ON LINKEDIN

I'm happy to connect with you on LinkedIn. At the end of the course I'm also happy to endorse anyone that receives a B or higher with the Spring and Hibernate skills. In addition to which I'm happy to write a recommendation for anyone who receives and A or A+ (a course total >= 93).

If you enjoyed my course consider writing a recommendation for me on LinkedIn or at https://ratemyprofessors.com/ (I taught a couple of tough courses which destroyed my rating)

END-OF-COURSE FEEDBACK

Please give us your feedback about the course. Near the end of the course, you should be receiving an email from the Evaluations Office that gives you a one-step login link.

- Your Username: your student ID in 000-00-0000 format.
- Your Password: your birth date in MM/DD/YY format.

COURSE POLICIES

Contact me — In the rare event you must miss class or are sick, please contact me as soon as possible using the contact information above (email or phone) or send a message or note to class with a friend. If you keep me informed, I will know how you are doing and how to plan for each class.

Academic Honor Code — Personal integrity, honesty, and honor are essential qualities of a capable student and a developing leader. The University has established an Academic Honor Code that sets forth the standards of academic honesty and personal integrity expected of all students for all writing assignments and exams. Abiding by the Academic Honor Code will help you avoid academic dishonesty and plagiarism. Academic dishonesty includes a range of unethical behaviors undertaken to deceive anyone who may be evaluating your work for meeting course and/or degree requirements, such as cheating on an exam. Plagiarism means submitting or presenting someone else's work as if it were your own—without citations, quotation marks, or acknowledgment. Examples include copying text and/or graphics from online sources without attribution, copying a friend's paper, or purchasing an essay for submission.

Academic dishonesty and plagiarism are serious academic offenses. Here at MIU, you will get an NC on any homework that you have plagiarized. Additional penalties for plagiarism could include an NC in the course, academic probation, or suspension from the University for up to two full semesters, depending on the seriousness and intentionality of the violation (see pp. 363–367 in the 2015 MIU Catalog). For help in avoiding plagiarism, refer to http://plagiarism.org. Additional information is in the Student Handbook at http://www.miu.edu/handbook. If you are feeling pressured by assignment deadlines, don't risk everything by resorting to plagiarism. Come and talk with your professor instead.

Student Support Services — Beyond the normal support you will receive from me and your classmates, extensive on-campus support services are available for both academic and personal support that you may need at any time. To access these services, please stop by the Student Life Department in Room 105 of the Dreier Building between 10 a.m. and 4 p.m., Monday through Friday, or call the department administrator at 641-472-1225 for referral to the appropriate person.

Promoting Respectful Classroom Interaction — Maharishi International University is unique for the level of harmony and mutual support that exists on campus and in its classrooms. In this spirit, we honor cultural diversity as well as diverse backgrounds and viewpoints. While we welcome dialog from, and challenge to, all points of view, we ask that you maintain an open and supportive attitude toward your fellow classmates and University staff, and we do not tolerate harassment in any form.

Lesson: Spring Containers and Dependency Injection
Let Brahman be the Charioteer

WHOLENESS OF THE LESSON

Spring's aim is to make our life easier, by taking object creation out of the hands of the programmer it can automatically add many additional features to the objects that we ask it to create. *Science of Consciousness*: Spring wants to help us do less and accomplish more

MAIN POINTS

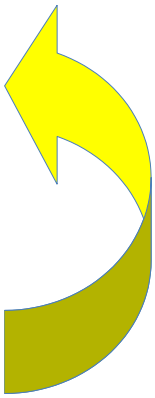
1. Spring started as a framework for the service layer, but now has many other useful modules for other layers as well. The core of Spring's functionality consists of DI, AOP, and Templates *Science of Consciousness*: This is a 3 in 1 structure, similar to Rishi, Devata, Channdas.

2. The Spring Container creates objects based on its configuration, default these are created only once at the start of the application, thereby never having to slow down to create an object at execution time. *Science of Consciousness*: Spring itself also aims to be efficient, to do the least and accomplish the most.

3. Dependency Injection lets us specify how objects should be connected, and then Spring (when it creates the objects), connects them for us. *Science of Consciousness:* The whole is greater than the sum of the parts – how the parts are connected is as important as the parts themselves

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

INVERSION OF CONTROL



1. Spring is an Inversion of Control Framework.
2. By having a Spring create our objects, it can wire together slightly different versions and provide extra functionality based on our needs.

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3. Transcendental Consciousness is provides a practical foundation of rest to our mind.
4. Impulses within the transcendental field: are what bring thoughts into our mind, by understanding their deepest levels we can make optimal use of them.
5. Wholeness moving within itself: In Unity Consciousness, we experience how both the silence at the basis of thought, and the most expressed thoughts and actions are nothing but the Self.

Lesson: Service Layer and Aspect Oriented Programming
Purification Leads to Progress

WHOLENESS OF THE LESSON

Additional Functionality, besides business logic, needs to be provided. Both the Service Layer and Aspect Oriented Programming are ways to clearly separate out different concerns. *Science of Consciousness*: Purification Leads to Progress.

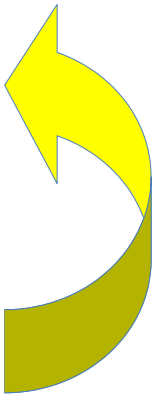
MAIN POINTS

1. The service layer provides a separation of concerns needed in larger applications. *Science of Consciousness*: Life is found in layers, just like our applications

2. Aspect Oriented Programming lets us program additional logic in one place, and then declaratively apply that logic to many places. *Science of Consciousness*: We create harmony (single implementation), in diversity (applied to many places).

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

ISOLATING FUNCTIONALITY



1. Separation of Concerns is a good general principle.
2. With AOP we can write functionality once, and then declare where it should be added

3. Transcendental Consciousness is provides a practical foundation of rest to our mind.
4. Impulses within the transcendental field: are what bring thoughts into our mind, by understanding their deepest levels we can make optimal use of them.
5. Wholeness moving within itself: In Unity Consciousness, we experience how both the silence at the basis of thought, and the most expressed thoughts and actions are nothing but the Self.

Lesson: Hibernate

Rest and Activity are the Steps of Progress

WHOLENESS OF THE LESSON

In order to work with an Relational Database more effortlessly from an Object Oriented language we can use an Object Relational Mapping (ORM) framework such as Hibernate. These ORM frameworks let us pretend that data in a database are just like objects (already) loaded in memory. In other words, once setup, they allow us to: do less and accomplish more. *Science of Consciousness:* similar to how TM by resting the mind (once the mind is setup) allows us to work more efficiently by being less distracted by stresses and strains.

MAIN POINTS

1. Although different Java Persistence possibilities exist, Object Relational Mapping is the most OO friendly, providing the greatest unity within diversity. *Science of Consciousness*: Practicing TM allows us to more clearly see the unity within diversity and thereby live an easier life, in greater harmony with our surroundings.

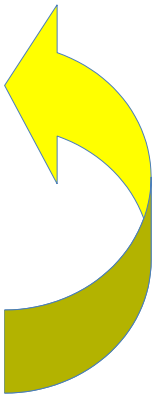
2. When mapping an Entity we map properties with data types, an identity, and possibly access type for a class. These are the tools you'll need to map any class; Highest First. *Science of Consciousness:* By first settling our mind, we can achieve greater success in action, similar to drawing a bow before shooting an arrow.

3. Objects have a persistence lifecycle within Hibernate (different states that they can be in). The Hibernate Session API (and JPA EntityManager API) provide means to move objects from one state to another. *Science of Consciousness:* The TM Technique is a tool to move our mind into the transcendental state, the most fundamental and restful state of consciousness.

UNITY CHART

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

THE BASICS OF USING HIBERNATE



1. Hibernate is an Object Relational Mapping Framework.
2. Hibernate allows you to unite the differences between OO and Relational domains.

3. Transcendental Consciousness is where all differences are united in infinite harmony.
4. Impulses within the transcendental field: create differences from within the unity.
5. Wholeness moving within itself: In Unity Consciousness, one realizes that both the diversity of life, and its underlying unity are nothing but the Self.

Lesson: Mapping Associations
The Whole is Greater than the Sum of the Parts

WHOLENESS OF THE LESSON

Mapping the foreign keys in a relational database to references in an Object Oriented language (or visa versa) is a large and complex area. In this lecture we will cover everything you'll need to know to map any type of association, no matter how it is represented in Java or in the DB. *Science of Consciousness*: The entirety of the complexity of the relative collapses to a single manageable unity in transcendental consciousness, providing the seed of all knowledge.

MAIN POINTS

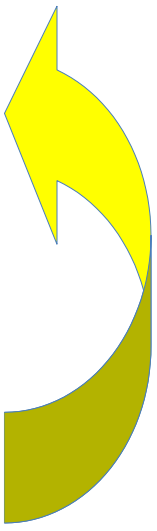
1. The seven different types of OO associations can often be mapped in more than one way. Generally though there is one normal way to map, and one or more exceptional ways to map an association depending on your DB or OO Domain needs. *Science of Consciousness*: Transcendental Meditation settles the mind, allowing one to select the right tool for the specific situation at hand, allowing you to do less and accomplish more.

2. Hibernate can map collections of references as Bags, Sets, Lists and Maps, which can be divided into non-indexed and indexed collections. While most collections can be mapped as a bag, it is important to know about and understand the other types of collections so that they can be used appropriately when needed. *Science of Consciousness*: Take the right angle and let go, but the key to finding that angle is having a settled mind (a benefit of TM).

UNITY CHART

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

MAPPING FROM ASSOCIATIONS TO FOREIGN KEYS



1. You can tell Hibernate how you want your association to be mapped.
2. Hibernate uses the association meta data to allow the programmer to just work with objects and follow references, so he doesn't have to worry about the details in the DB.

3. Transcendental Consciousness is the field of infinite bliss, where all worries about differences disappear.
4. Impulses within the transcendental field: create the differences; a lack of understanding of their underlying unity is where worries come from.
5. Wholeness moving within itself: In Unity Consciousness, one experiences how the impulses arise from the Self creating everything, which at the same time remains nothing but the Self.

Lesson: Advanced Associations
Creating Unity where there is Diversity

WHOLENESS OF THE LESSON

Certain things are very different in an OO domain than in a Relational Database, either due to core differences (such as inheritance), or due to manmade (legacy) design. Either way, we still have to bridge the gap. *Science of Consciousness*: Order is present everywhere, even when things look very different; there is still unity at the basis of all that diversity.

MAIN POINTS

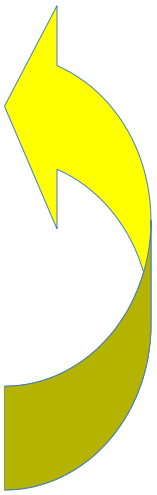
1. Inheritance can be mapped in 3 ways: single table, joined tables, and table per concrete. Single table is the default approach, although joined tables is better to use when there are many properties in the subclasses. Table per concrete class is mainly for legacy systems. *Science of Consciousness*: Life is found in layers, more abstract layers have greater flexibility and power.

2. Secondary tables, embedded classes, composite keys, and element collections are things often not encountered in new systems. The reality of life though is that we rarely work in an environment without legacy code or systems. Therefore these tools can be a real life safer. *Science of Consciousness*: The nature of life is to grow, we might start with a nice new system, but over time things may grow into all kinds of bends until we call it 'legacy'.

UNITY CHART

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

MAPPING INHERITANCE AND MULTIPLE TABLES OR CLASSES AS ONE



1. Hibernate offers excellent support for inheritance mapping.
2. Using the right inheritance strategy for the task at hand can have significant space / performance tradeoffs.

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3. Transcendental Consciousness is the most abstract field at the basis of all creation, with the greatest flexibility and power.
4. Impulses within the transcendental field: are like the first level of subclasses from the unified field, somewhat concrete, but still very abstract.
5. Wholeness moving within itself: In Unity Consciousness, we see that all layers of the relative, from completely abstract to completely relative are nothing but the Self.

Lesson: Queries & Concurrency
From Unity to Diversity and Back to Unity

WHOLENESS OF THE LESSON

Once you have an object from the database Hibernate can transparently load references, but how do you get the right starting object, how do you tell Hibernate what you want? Queries! But in an enterprise system there are likely many people executing queries at the same time, how do we make sure they don't contaminate each other's data? That's where concurrency comes in. *Science of Consciousness*: do less and accomplish more, let queries retrieve your data, and have hibernate version control prevent your conflicts.

MAIN POINTS

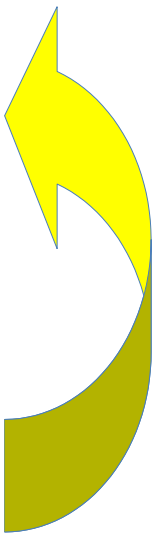
1. HQL is very similar to SQL, but is more 'object oriented'. *Science of Consciousness*: This clearly demonstrates the principle of unity in diversity

2. Optimistic concurrency uses version checking to avoid data loss while keeping the database in a lower isolation level (keeping things faster). Pessimistic locking can additionally be used to temporarily increase isolation or update the version number. *Science of Consciousness*: Purification leads to progress (add versions or extra locks), similar to how our mind purifies itself when we add Transcendental Conscisousness.

UNITY CHART

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

QUERIES EXECUTING CONCURRENTLY



1. If you know SQL it's relatively easy to write HQL.
2. HQL has many Object Oriented features that you wouldn't find in SQL, properly understanding them and using them still requires some dedicated studying.

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3. Transcendental Consciousness is effortless to obtain as it is the common basis of everything in the relative.
4. Impulses within the transcendental field: are what create the differences that we see around us, and would allow us to study endlessly if we didn't understand the underlying principles.
5. Wholeness moving within itself: In Unity Consciousness, we've understood all principles and came to the realization that they were actually nothing but the Self.

Lesson: Hibernate Optimization
Purification Leads to Progress

WHOLENESS OF THE LESSON

There are times when your application slows down, things don't work as well as you expected them to. Optimization is the process of fixing these types of problems. *Science of Consciousness*: The source of all thought is also the source of all solutions. Aligning our mind with its source helps us think more clearly about solutions.

MAIN POINTS

1. The most common Hibernate performance problems are the N+1 problem and the Cartesian product problem. Both of these are caused by a misunderstanding about what happens at deeper levels. *Science of Consciousness*: Life is found in Layers. In Cosmic Consciousness our mind is permanently established in the transcendent and is no longer troubled by problems (like a millionaire at the market).

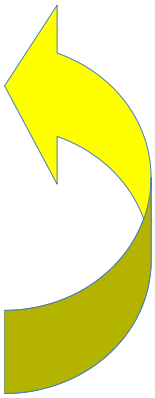
2. Specifying the FetchType as Lazy or Eager can change when Hibernate retrieves the data (Eager has issues, be careful). With Join Fetch, Batch Fetching, and SubSelect we can change how Hibernate retrieves data (possibly fixing N+1 problems). *Science of Consciousness*: in order to do less and accomplish more we have to understand what is going on underneath. Simply being lazy can often end up causing us to do more.

3. 2nd Level Caching can eliminate repeated requests to the database for the same data. Be careful though that you don't create stale cache. Plus to find out how well your cache is really working by looking at production statistics. *Science of Consciousness*: Rest and Activity are the steps of progress, don't retrieve data again if you can just keep it from last time.

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

FIXING PERFORMANCE PROBLEMS

1. You should only start optimizing when your application actually has problems.
2. You should only fix problems that you can clearly see, not 'fix' possible things that may occur (such 'fixes' just make the code harder to read and maintain).



3. Transcendental Consciousness provides the infinite blissful basis for clear thinking.
4. Impulses within the transcendental field: arise constantly, only through purifying our thinking can we properly understand these impulses and not see some as problems.
5. Wholeness moving within itself: In Unity Consciousness, we experience how the blissful basis of thinking is the Self, and these impulses really arise from our Self.

Lesson: Hibernate Applications
Life is Found in Layers

WHOLENESS OF THE LESSON

The way we have been writing Hibernate code during the last several days is unrealistic. Let's look at how to properly integrate Hibernate into an application. Science of Consciousness: Purification Leads to progress, do things the right way. In Cosmic Consciousness our mind has been purified of stresses to such an extent that we are permanently established in bliss.

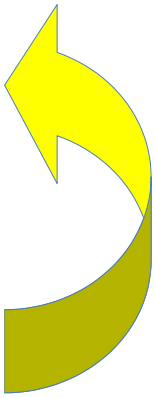
MAIN POINTS

1. It is important to know the basics of Servlets, JSP, JSTL and EL in order to make modern (web) applications with Java. Although there are many different parts, they all have the same basis (web development). *Science of Consciousness*: Harmony exists in diversity; in cosmic consciousness we still experience all the different parts, but at the same time permanently experience the bliss at the basis.

2. There are a variety of best practices related to using Hibernate in an actual application. Most importantly is using the sessions correctly (session per request instead of session operation). *Science of Consciousness*: Do less and accomplish more, work smart. In Cosmic Consciousness, our mind is not obstructed by stresses and can effortlessly see and choose the best practices for the situation.

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

CREATING APPLICATIONS THAT USE HIBERNATE



1. Using a session per operation is an anti-pattern.
2. By having a session per request, we can have proper transactions and make use of the session's cache, giving us practical performance.

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3. Transcendental Consciousness is provides a practical foundation of rest to our mind.
4. Impulses within the transcendental field: are what bring thoughts into our mind, by understanding their deepest levels we can make optimal use of them.
5. Wholeness moving within itself: In Unity Consciousness, we experience how both the silence at the basis of thought, and the most expressed thoughts and actions are nothing but the Self.

Lesson: Transactions
Doing Less and Accomplishing More

WHOLENESS OF THE LESSON

For the stability of the Data in an Enterprise Application Transactions are extremely important. Never the less, the code for them is repetitive messy. Spring provides a way to declaratively add transactions, where all the code for them is hidden in a single place. Science of Consciousness: Do less and Accomplish more.

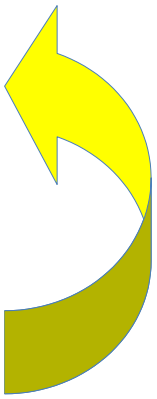
MAIN POINTS

1. Spring Transactions annotations allow you to declaratively specify how transactions should happen, using AOP to accomplish its goals. *Science of Consciousness*: Do Less and Accomplish More, the transactions are automatically applied in an additional AOP layer.

2. Spring and Hibernate combine relatively effortlessly, and we can start enjoying Spring features such as DI and AOP, which can give us Container Managed Transactions. *Science of Consciousness*: The Nature of life is to grow, to greater and greater levels of comfort and ability

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

DECLARATIVELY SPECIFYING TRANSACTIONS



1. Transactions are an important to any system where multiple users write data.
2. By using annotations instead of code we can more easily make sure transactions are applied correctly.

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5. Wholeness moving within itself: In Unity Consciousness, we experience how both the silence at the basis of thought, and the most expressed thoughts and actions are nothing but the Self.

Lesson: Scheduling

Rest and Activity are the Steps of Progress

WHOLENESS OF THE LESSON

Many enterprise applications need to periodically run certain processes. For example: Daily / weekly / monthly reports or backups. Many processes have to wait for their appropriate time. *Science of Consciousness*: Rest and activity are the steps or progress.

MAIN POINTS

1. A schedule has many jobs, each of which has its own trigger. Triggers are commonly based on CRON expressions; which are industry standard patterns for expressing time intervals. *Science of Consciousness*: Seek the highest first, once you've learned how to read and write CRON expressions you can use them in many scheduling environments.

2. The Java SE JDK includes a couple of scheduling options; in addition to which Quartz offers a more powerful open source solution. Unfortunately our beans must always extend a super class or implement an interface (not a POJO), to ensure your class has the required method name. We will see how we can solve this problem by introducing Spring. *Science of Consciousness*: Like the principle of the second element, the problem is not able to be solved on the level of the problem.

3. Spring provides @Scheduled annotation support that lets us schedule POJO methods and adds CRON support. If desired it can also integrate with Quartz. *Science of Consciousness*: Once again, spring lets us do less and accomplish more.

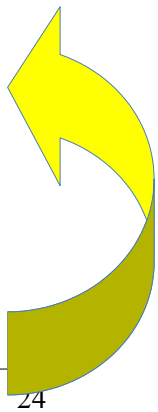
4. Asynchronous method calls allows our application to invoke longer running processes at any time, without having to sit and wait. It does this by providing a thread pool, where a separate thread provides for the needs of the called method. *Science of Consciousness*: Harmony exists in diversity, our application achieves more by having multiple threads.

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

EXECUTING A METHOD AT A SPECIFIED TIME

1. It's useful to be able to tell the computer to execute something later
2. CRON expressions are an industry standard for scheduling.

3. Transcendental Consciousness is at the foundation of all thought.
4. Impulses within the transcendental field: create time, and therefore a schedule
5. Wholeness moving within itself: In Unity Consciousness, the past, now, and future are experienced to all be part of Consciousness, the Self.



Lesson: Spring Data and Spring MVC
Doing Less and Accomplishing More

WHOLENESS OF THE LESSON

Two of the most important Spring modules outside Spring's core area are Spring Data for the Data Access Layer, and Spring MVC for the web / integration layer. Both of these aim to significantly simplify code in their respective areas / layers. *Science of Consciousness*: As we clearly see in enterprise architecture, life is found in layers.

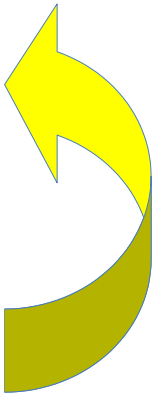
MAIN POINTS

1. Spring Data can generate our DAO's, and if we want finder methods we can just specify what we want. *Science of Consciousness*: Do less and accomplish more.

2. There is a lot to SpringMVC, but at its core it is a request centric web framework with URI templates. *Science of Consciousness*: Every action has a reaction – with Spring MVC we specify what the reaction (method) should be to each request.

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

HELPFUL SPRING MODULES FOR USE IN OTHER LAYERS



1. Spring provides additional modules useful in all areas of an application.
2. By leveraging the same principles as we saw before (IOC, DI and AOP) we can improve code in many other areas of the application as well.

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3. Transcendental Consciousness is provides a practical foundation of rest to our mind.
4. Impulses within the transcendental field: are what bring thoughts into our mind, by understanding their deepest levels we can make optimal use of them.
5. Wholeness moving within itself: In Unity Consciousness, we experience how both the silence at the basis of thought, and the most expressed thoughts and actions are nothing but the Self.

Lesson: Spring Security & Hibernate Validation
Purification Leads to Progress

WHOLENESS OF THE LESSON

It is important to secure your application, so that unauthorized people cannot do things they are not supposed to. A big part of this is validating your data, to check that you get what you expected, so that it doesn't cause trouble / break your application later on. *Science of Consciousness*: Purification (of data and user requests) leads to progress / a better application.

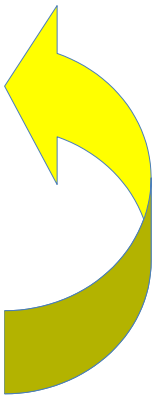
MAIN POINTS

1. Spring Security provides ways to authenticate and authorize users, allowing you to specify who can do what. *Science of Consciousness*: Every action has a reaction, not allowing access is appropriate if someone isn't authorized..

2. Validation allows us to ensure that our program operates on clean, correct, and useful data – we can do this easily using constraint annotations and integration with Spring MVC. *Science of Consciousness*: Harmony Exists in Diversity – we can receive any and all data, as long as we check that it's the correct right data and send back a warning for wrong data

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

KEEPING OUT BUGS AND HACKS



1. It's important that our application doesn't break.
2. By making sure people are only allowed to give good data, and take are not allowed to take dangerous actions they're not supposed to we can keep the application stable.

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Lesson: Web Services
Harmony Exists in Diversity

WHOLENESS OF THE LESSON

Web services allow applications to talk to each other over the internet, letting computers send and receive information instead of having humans read websites and fill out web forms. Science of Consciousness: There are a variety of different ways to achieve this, but the essence is all the same, we see harmony in diversity.

MAIN POINTS

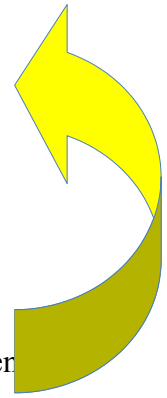
1. RESTful webservices are based on HTTP requests, and therefore easy to implement with Spring MVC. *Science of Consciousness*: Unity in Diversity, Spring MVC can be used for both web pages and REST web services

2. SOAP Web services always use XML data, but can theoretically use any transport protocol. More Enterprise like additions such as Security and Transactions are also standardized. *Science of Consciousness*: The whole is greater than the sum of the parts, web services bring together many parts to make a bigger whole

3. Spring HTTP Invoker allows you to quickly connect different Spring applications over the web, using serialized Java objects that are sent back and forth. *Science of Consciousness*: Do less and Accomplish more, if both sides are Spring it's quick and easy to have them communicate over the web with HTTPInvoker

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

CONNECTING TO EXTERNAL SYSTEMS



1. Sometimes our application needs some data from the web.
2. There are many different ways to connect over the internet, but each web service generally publishes an API describing how to connect and what data to send / expect.

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Lesson: RMI & JMS
Life is Found in Layers

WHOLENESS OF THE LESSON

RMI and JMS are older application integration protocols, more aimed at integrating between internal applications. RMI is a very Java specific synchronized protocol, while JMS mostly works asynchronously, and can work with many programming languages. *Science of Consciousness*: Because Life is Found in Layers, it's often important to create connections between different layers / applications.

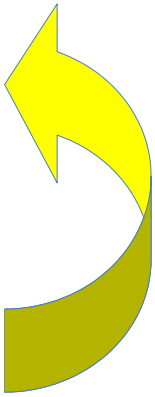
MAIN POINTS

1. Spring RMI lets the programmer more easily make calls to methods on a remote JVM. Spring hides the RMI implementation details, allowing us to work with POJO objects. *Science of Consciousness*: By going more abstract, we have more possibilities – the field of all possibilities (transcending all boundaries), is the source of all solutions.

2. JMS is an asynchronous message protocol, Spring provides a template to simplify the programming API. *Science of Consciousness*: Purification leads to Progress, simplifying the API makes it easier to create and maintain JMS applications

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE:

CONNECTING TO INTERNAL SYSTEMS



1. Inside a corporation there are often multiple applications that need to be connected.
2. Although there are many protocols, there are only a couple of different core concepts that describe how systems connect.

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