Using Cursor for Java Development

From IntelliJ to AI-Powered Development →

Contact Info

Ken Kousen
Kousen IT, Inc.

- ken.kousen@kousenit.com
- http://www.kousenit.com
- http://kousenit.org (blog)
- Social Media:
  - @kenkousen (Twitter)
  - @kousenit.com (Bluesky)
  - https://www.linkedin.com/in/kenkousen/ (LinkedIn)
- *Tales from the jar side* (free newsletter)
  - https://kenkousen.substack.com
  - https://youtube.com/@talesfromthejarside

Course Overview: 5 Sessions

1. **Using Cursor for Java Development** (Today - 3 hours)
   - Understanding code, navigation, generation, testing
2. **Using Cursor for Mobile Development** (3 hours)
   - Android/Kotlin with AI assistance
3. **Agentic Coding with Cursor** (3 hours)
   - Advanced AI workflows and automation
4. **Reviewing and Testing Code** (3 hours)
   - Quality assurance with AI
5. **Exploring Agents and MCP** (3 hours)
   - Model Context Protocol and advanced features

Today’s Session: What We’ll Cover

- **Setup & Foundations** - Cursor workspace, extensions, AI modes
- **Project Creation** - Build a Spring Boot REST API from scratch
- **Code Generation** - REST controllers, services, repositories with AI
- **Testing** - Generate unit and integration tests
- **Code Understanding** - Analyze Spring PetClinic with AI
- **Terminal & Debugging** - Build, run, and debug workflows

Two Projects Today

Project 1: Hello Spring Boot

Build together from scratch - a complete REST API

Project 2: Spring PetClinic

Understand complex existing code with AI

Session Objectives

By the end of today, you will be able to:

- ✅ Navigate Cursor effectively for Java development
- ✅ Choose the right AI mode (Chat vs Agent) for each task
- ✅ Generate Spring Boot code with AI assistance
- ✅ Refactor and improve code quality
- ✅ Write tests efficiently with AI
- ✅ Understand unfamiliar codebases quickly

Part 1: Setup & Foundations

Quick Setup Check

Is Cursor Installed?

- Download from cursor.sh
- Should be done from pre-session setup doc

Essential Extensions

Open Extensions panel (Cmd/Ctrl+Shift+X) and verify:

- ✅ **Language Support for Java** (Red Hat)
- ✅ **Debugger for Java** (Microsoft)
- ✅ **Spring Boot Extension Pack** (VMware/Tanzu)
- ✅ **Gradle for Java** (Microsoft)
- ✅ **REST Client** (Huachao Mao) - like IntelliJ's HTTP client

Install missing extensions now - takes ~1 minute

IntelliJ → Cursor: Key Concepts

What's Familiar

- **Multi-window support** ✅
- **Integrated terminal** ✅
- **Git integration** ✅
- **Keyboard shortcuts** (similar)
- **Project structure** (folders/files)

What's Different

- **Workspace** vs Project
- **AI-first** design
- **VS Code base** (different UI)
- **Command Palette** focus
- **Extension ecosystem**

Opening Your First Workspace

File → Open Folder (Cmd/Ctrl+O)

- Navigate to project root (where `build.gradle` or `pom.xml` lives)
- Click **Open**
- Cursor auto-detects Java/Gradle/Maven
- Extensions activate for Java support

💡 Pro Tip: Multiple Windows

Like IntelliJ, you can have multiple Cursor windows open:

- One window per project
- Or one for code, one for reference
- **File → New Window** (Cmd/Ctrl+Shift+N)

Understanding AI Modes

The most important concept in Cursor: **Chat vs Agent**

Chat Mode (Cmd/Ctrl+L)

Purpose: Questions, explanations, understanding

Use when you want to:

- Understand how code works
- Get suggestions
- Learn about patterns
- Review code
- Explore options

Read-only by default - won't modify code

Agent Mode (Cmd/Ctrl+I)

Purpose: Code generation, modifications

Use when you want to:

- Create new code
- Modify existing code
- Refactor methods
- Generate tests
- Add features

Proposes concrete changes - you review and accept

Chat vs Agent: Live Demo

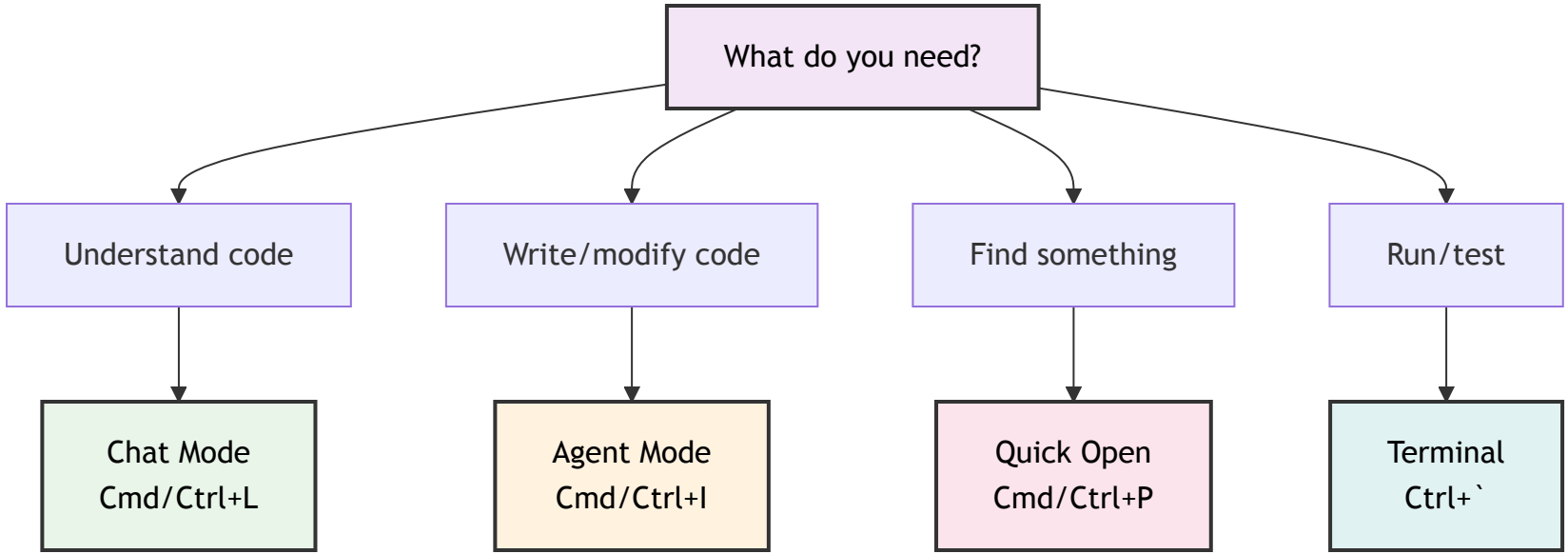
```java
// Prompt: "Add a POST endpoint with validation"
// Result (Agent Mode):
@RestController
@RequestMapping("/api/persons")
public class PersonController {
    private final PersonService personService;

    @GetMapping
    public List<Person> findAll() {
        return personService.findAll();
    }

    @PostMapping
    public ResponseEntity<Person> create(@Valid @RequestBody Person person) {
        Person saved = personService.save(person);
        return ResponseEntity.status(HttpStatus.CREATED).body(saved);
    }
}
```

Key Difference: Chat explains, Agent generates code

Decision Tree: Which Mode?



Part 2: Building Hello Spring Boot

Creating a REST API from Scratch

Our First Project: Hello Spring Boot

What We'll Build

A complete Spring Boot REST API with:

- ✅ REST Controllers (GET, POST, PUT, DELETE)
- ✅ Service Layer (business logic)
- ✅ JPA Entities & Repositories
- ✅ Bean Validation
- ✅ Unit & Integration Tests
- ✅ Modern Java patterns

Why Start From Scratch?

- Everyone succeeds together
- See AI assistance from ground zero
- Controlled scope and clear deliverable
- Build confidence before analyzing complex code

Step 1: Generate Project

Using Spring Initializr in Cursor

Command Palette (Cmd/Ctrl+Shift+P):
Type: `Spring Initializr: Create a Gradle Project`

Configure:

- **Spring Boot:** 3.5.6
- **Java:** 17 or 21
- **Group:** `com.example`
- **Artifact:** `hello-spring`

Dependencies: Spring Web, Spring Data JPA, H2 Database, Validation, DevTools

Select folder → Project opens in Cursor

Step 2: First REST Controller

```
// Run the application!
// Terminal (Ctrl+`):
// ./gradlew bootRun
//
// Test in browser:
// http://localhost:8080/api/greetings?name=Cursor
//
// Response:
// {"message": "Hello, Cursor!"}
```

🎉 **First success!** Everyone has a working endpoint

Step 3: Add Service Layer

```java
// Result 2 - Updated Controller:
@RestController
@RequestMapping("/api/greetings")
public class GreetingController {

    private final GreetingService greetingService;

    public GreetingController(GreetingService greetingService) {
        this.greetingService = greetingService;
    }

    @GetMapping
    public GreetingResponse greet(@RequestParam(defaultValue = "World") String name) {
        String message = greetingService.createGreeting(name);
        return new GreetingResponse(message);
    }

    @GetMapping("/formal")
    public GreetingResponse formalGreet(@RequestParam(defaultValue = "World") String name) {
        String message = greetingService.createFormalGreeting(name);
        return new GreetingResponse(message);
    }
}
```

Quick Student Exercise

Your Turn: Add a Custom Greeting

Using **Agent Mode** (Cmd/Ctrl+I):

1. Add a new method to `GreetingService`:
   - Name it `createCustomGreeting`
   - Accept two parameters: `name` and `greetingWord`
   - Return formatted greeting using both
2. Add corresponding endpoint in `GreetingController`:
   - Path: `/custom`
   - Accept `name` and `greeting` as request params

Test Your Custom Greeting

Example result:

```
GET /api/greetings/custom?name=Java&greeting=Bonjour
→ {"message": "Bonjour, Java! ..."}
```

Hint: Let AI do the work - describe what you want!

Part 3: Adding Persistence

JPA, Entities, and Repositories

Step 4: Create Person Entity

AI Prompt (Agent Mode):

```
Create a Person entity with id, firstName, lastName, and email.
Use JPA annotations and include validation for:
- firstName and lastName must not be blank
- email must be valid email format
```

Generated Person Entity

```java
@Entity
@Table(name = "persons")
public class Person {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    @NotBlank(message = "First name is required")
    private String firstName;

    @NotBlank(message = "Last name is required")
    private String lastName;

    @Email(message = "Email must be valid")
    @NotBlank(message = "Email is required")
    private String email;

    // Constructor, getters, setters, equals, hashCode...
}
```

Records vs Classes for JPA?

Ask Chat: "Should I convert this to a record? What are the trade-offs?"

Traditional classes (POJOs) are better for JPA entities:

- Records are immutable by default (final fields)
- JPA needs to modify fields directly
- Some JPA features require no-arg constructor

Records work great for:

- DTOs (Data Transfer Objects)
- Response/Request objects
- Value objects

Takeaway: Keep `Person` as a class, but we'll use records for API responses!

Step 5: Add Repository

```
// Follow-up with Chat: "How does Spring Data JPA generate these queries?"
// AI Response (Chat Mode):
// "Spring Data JPA uses method name parsing:
//
// findByLastName → SELECT * FROM persons WHERE last_name = ?
// findByEmail → SELECT * FROM persons WHERE email = ?
// findByFirstNameContainingIgnoreCase → WHERE LOWER(first_name) LIKE LOWER(?%)
//
// Keywords:
// - findBy, getBy, queryBy: SELECT queries
// - Containing: LIKE %value%
// - IgnoreCase: Case-insensitive comparison
//
// No SQL code needed - just follow naming convention!"
```

Key Learning: Spring Data JPA derived queries - convention over configuration

Step 6: CRUD Controller

AI Prompt (Agent Mode):

```
Create a REST controller for Person with all CRUD operations.
Use PersonRepository for data access. Include proper HTTP status codes.
```

PersonController: GET Operations

```java
@RestController
@RequestMapping("/api/persons")
public class PersonController {

    private final PersonRepository personRepository;

    public PersonController(PersonRepository personRepository) {
        this.personRepository = personRepository;
    }

    @GetMapping
    public List<Person> findAll() {
        return personRepository.findAll();
    }

    @GetMapping("/{id}")
    public ResponseEntity<Person> findById(@PathVariable Long id) {
        return personRepository.findById(id)
                .map(ResponseEntity::ok)
                .orElse(ResponseEntity.notFound().build());
    }
}
```

PersonController: POST & PUT

```java
@PostMapping
public ResponseEntity<Person> create(@Valid @RequestBody Person person) {
    Person saved = personRepository.save(person);
    return ResponseEntity.status(HttpStatus.CREATED).body(saved);
}

@PutMapping("/{id}")
public ResponseEntity<Person> update(
        @PathVariable Long id,
        @Valid @RequestBody Person person) {

    return personRepository.findById(id)
            .map(existing -> {
                existing.setFirstName(person.getFirstName());
                existing.setLastName(person.getLastName());
                existing.setEmail(person.getEmail());
                return ResponseEntity.ok(personRepository.save(existing));
            })
            .orElse(ResponseEntity.notFound().build());
}
```

PersonController: DELETE

```java
@DeleteMapping("/{id}")
public ResponseEntity<Void> delete(@PathVariable Long id) {
    if (personRepository.existsById(id)) {
        personRepository.deleteById(id);
        return ResponseEntity.noContent().build();
    }
    return ResponseEntity.notFound().build();
}
```

Complete CRUD operations with proper HTTP status codes!

Demo: Try the CRUD API

Run the Application

```
./gradlew bootRun
```

Manual verification

Options: curl, REST Client extension (.http files), or Postman

Create a person (POST):

```
curl -X POST http://localhost:8080/api/persons \
  -H "Content-Type: application/json" \
  -d '{"firstName":"John","lastName":"Doe","email":"john@example.com"}'
```

Get all persons (GET):

```
curl http://localhost:8080/api/persons
```

More CRUD Demos

Get one person (GET):

```
curl http://localhost:8080/api/persons/1
```

Update (PUT):

```
curl -X PUT http://localhost:8080/api/persons/1 \
  -H "Content-Type: application/json" \
  -d '{"firstName":"Jane","lastName":"Doe","email":"jane@example.com"}'
```

Delete (DELETE):

```
curl -X DELETE http://localhost:8080/api/persons/1
```

REST Client: The IntelliJ Way

Create a `.http` file (like IntelliJ's HTTP client)

Right-click `src/main/resources` → New File → `api-test.http`

```
### Create a person
POST http://localhost:8080/api/persons
Content-Type: application/json

{
  "firstName": "John",
  "lastName": "Doe",
  "email": "john@example.com"
}

### Get all persons
GET http://localhost:8080/api/persons

### Get one person
GET http://localhost:8080/api/persons/1
```

Click "Send Request" link above each request to execute

More .http Examples

```http
### Update person
PUT http://localhost:8080/api/persons/1
Content-Type: application/json

{
  "firstName": "Jane",
  "lastName": "Doe",
  "email": "jane@example.com"
}

### Delete person
DELETE http://localhost:8080/api/persons/1
```

Tip: Save this file in your project to share with your team!

🎉 Checkpoint: What We've Built

So far, we have:

- ✅ **Complete Spring Boot REST API**
- ✅ **Greeting endpoints** with service layer
- ✅ **Person entity** with JPA & validation
- ✅ **Repository** with custom queries
- ✅ **CRUD controller** with proper HTTP methods
- ✅ **Working application** running on port 8080

All with AI Assistance!

- Used **Agent** to generate code
- Used **Chat** to understand concepts
- Reviewed and learned from AI suggestions

Next: Code quality, refactoring, and testing

BREAK

10 Minutes

Part 4: Code Quality & Testing

Refactoring and Test Generation

Refactoring: Improving Code Quality

Chat Mode for Code Review

Prompt (Chat Mode):

```
Review this PersonController and suggest improvements for:
- Code organization
- Error handling
- Best practices
- Modern Java patterns
```

AI Suggestions:

- Create DTOs instead of exposing entities directly
- Add global exception handling with `@ControllerAdvice`
- Extract update logic to service layer
- Use Java records for request/response objects
- Add proper logging

Let's apply these improvements with Agent!

Creating DTOs with Records

Current Problem:

```java
@GetMapping
public List<Person> findAll() {
    return personRepository.findAll();  // Exposes entity structure
}
```

AI Prompt (Agent Mode):

```
Create PersonRequest and PersonResponse DTOs using Java records.
PersonRequest for POST/PUT, PersonResponse for GET responses
```

Generated DTO: PersonRequest

```java
package com.example.hellospring.dto;

import jakarta.validation.constraints.*;

public record PersonRequest(
    @NotBlank(message = "First name is required")
    String firstName,

    @NotBlank(message = "Last name is required")
    String lastName,

    @Email(message = "Email must be valid")
    @NotBlank(message = "Email is required")
    String email
) {}
```

Used for POST and PUT requests (no id field)

Generated DTO: PersonResponse

```java
public record PersonResponse(
    Long id,
    String firstName,
    String lastName,
    String email
) {
    public static PersonResponse from(Person person) {
        return new PersonResponse(
            person.getId(),
            person.getFirstName(),
            person.getLastName(),
            person.getEmail()
        );
    }
}
```

Used for GET responses (includes id field)

Updated Controller Using DTOs

```
1   @RestController
2   @RequestMapping("/api/persons")
3   public class PersonController {
4
5       private final PersonRepository personRepository;
6
7       @GetMapping
8       public List<PersonResponse> findAll() {
9           return personRepository.findAll().stream()
10                  .map(PersonResponse::from)
11                  .toList();
12      }
13
14      @PostMapping
15      public ResponseEntity<PersonResponse> create(@Valid @RequestBody PersonRequest request) {
16          Person person = new Person();
17          person.setFirstName(request.firstName());
18          person.setLastName(request.lastName());
19          person.setEmail(request.email());
20
21          Person saved = personRepository.save(person);
22          return ResponseEntity.status(HttpStatus.CREATED)
23                  .body(PersonResponse.from(saved));
```

Global Exception Handling

AI Prompt (Agent Mode):

```
Create a global exception handler using @ControllerAdvice to handle
validation errors and resource not found exceptions with proper HTTP status codes
```

Generated: GlobalExceptionHandler

```
1   @RestControllerAdvice
2   public class GlobalExceptionHandler extends ResponseEntityExceptionHandler {
3
4       @Override
5       protected ResponseEntity<Object> handleMethodArgumentNotValid(
6               MethodArgumentNotValidException ex, ...) {
7
8           Map<String, String> errors = new HashMap<>();
9           ex.getBindingResult().getFieldErrors().forEach(error ->
10              errors.put(error.getField(), error.getDefaultMessage())
11          );
12
13          ErrorResponse response = new ErrorResponse(
14              LocalDateTime.now(),
15              HttpStatus.BAD_REQUEST.value(),
16              "Validation Failed",
17              errors
18          );
19
20          return ResponseEntity.badRequest().body(response);
21      }
22
23      record ErrorResponse(LocalDateTime timestamp, int status,
```

Structured Error Responses

Before: Generic Spring error response

After: Clear, structured JSON response

```
1  {
2    "timestamp": "2024-01-15T10:30:00",
3    "status": 400,
4    "message": "Validation Failed",
5    "errors": {
6      "firstName": "First name is required",
7      "email": "Email must be valid"
8    }
9  }
```

Now validation errors return clear, structured responses!

Student Exercise: Code Review

Your Turn!

1. **Open Chat Mode** (Cmd/Ctrl+L)
2. **Select your Person entity class**
3. **Ask for review:**

```
Review this Person entity and suggest improvements
```

4. **Review AI suggestions**
5. **Apply ONE improvement** using Agent Mode
   - Example: Add a `toString()` method
   - Example: Add a convenience constructor
   - Example: Add an `@Column` annotation

Test Generation

Unit and Integration Tests with AI

Generating Unit Tests

AI Prompt (Agent Mode):

```
Generate comprehensive unit tests for GreetingService using JUnit 5
and AssertJ assertions. Test all public methods with edge cases.
```

Generated: GreetingServiceTest (Part 1)

```java
@DisplayName("GreetingService Tests")
class GreetingServiceTest {
    private final GreetingService service = new GreetingService();

    @Test
    void shouldCreateGreetingWithName() {
        String result = service.createGreeting("Alice");
        assertThat(result).contains("Alice").startsWith("Hello");
    }
}
```

Key Points: Constructor injection, AssertJ assertions

Generated: GreetingServiceTest (Part 2)

```java
@Test
void shouldCreateFormalGreeting() {
    String result = service.createFormalGreeting("Bob");
    assertThat(result).contains("Bob");
}

@Test
void shouldCreateCustomGreeting() {
    String result = service.createCustomGreeting("Charlie", "Bonjour");
    assertThat(result).contains("Bonjour").contains("Charlie");
}
```

Run tests: `./gradlew test`

Generating Integration Tests

```java
// Prompt: "Generate integration tests for PersonController using @SpringBootTest
// and MockMvc. Test all CRUD endpoints with valid and invalid data."
// Result (Agent Mode):

@SpringBootTest
@AutoConfigureMockMvc
@TestMethodOrder(MethodOrderer.OrderAnnotation.class)
class PersonControllerIntegrationTest {

    @Autowired private MockMvc mockMvc;
    @Autowired private ObjectMapper objectMapper;
    @Autowired private PersonRepository repository;

    @BeforeEach
    void setUp() {
        repository.deleteAll();
    }
}
```

Integration Test: Valid Data

```java
@Test
@Order(1)
@DisplayName("Should create person with valid data")
void shouldCreatePerson() throws Exception {
    PersonRequest request =
        new PersonRequest("John", "Doe", "john@example.com");

    mockMvc.perform(post("/api/persons")
            .contentType(MediaType.APPLICATION_JSON)
            .content(objectMapper.writeValueAsString(request)))
        .andExpect(status().isCreated())
        .andExpect(jsonPath("$.id").exists())
        .andExpect(jsonPath("$.firstName").value("John"));
}
```

MockMvc simulates HTTP requests without starting the server

Integration Test: Invalid Data

```java
@Test
@Order(2)
@DisplayName("Should reject person with invalid email")
void shouldRejectInvalidEmail() throws Exception {
    PersonRequest request =
        new PersonRequest("Jane", "Doe", "not-an-email");

    mockMvc.perform(post("/api/persons")
            .contentType(MediaType.APPLICATION_JSON)
            .content(objectMapper.writeValueAsString(request)))
        .andExpect(status().isBadRequest())
        .andExpect(jsonPath("$.errors.email").exists());
}
```

Validation works automatically with `@Valid` annotation

Running Tests

```
# Run all tests
./gradlew test

# Run specific test class
./gradlew test --tests PersonControllerIntegrationTest

# Run with detailed output
./gradlew test --info

# Continuous testing (rerun on changes)
./gradlew test --continuous
```

View Results:

- Terminal: pass/fail summary
- HTML report: `build/reports/tests/test/index.html`

AI-Assisted Test Debugging

When tests fail, paste the error into Chat Mode:

```
Chat: "Why is this test failing? [paste stack trace]"
```

AI can help with:

- Interpreting assertion failures
- Understanding stack traces
- Suggesting fixes for broken tests
- Explaining test framework behavior

Pro tip: Include test code + error message for best results

Student Exercise: Generate Tests

Your Turn!

1. **Select a service or controller method**
2. **Use Agent Mode** (Cmd/Ctrl+I):

```
Generate unit tests for this method using JUnit 5 and AssertJ.
Include happy path and edge cases.
```

3. **Review generated tests**
4. **Run tests:**

```
./gradlew test --tests YourTestClass
```

5. **If tests fail:** Ask Chat to debug

Goal: Everyone has at least one passing test

🎉 Checkpoint: Complete Application

What We've Built So Far:

- ✅ **Spring Boot REST API** with CRUD operations
- ✅ **Service layer** for business logic
- ✅ **JPA entities & repositories**
- ✅ **Bean validation** with proper error handling
- ✅ **DTOs using records** (modern Java)
- ✅ **Global exception handling**
- ✅ **Unit tests** for services
- ✅ **Integration tests** for controllers

All in ~90 Minutes!

Next: Understand complex existing code (Spring PetClinic)

BREAK

10 Minutes

Part 5: Understanding Complex Code

Exploring Spring PetClinic with AI

Spring PetClinic: Real-World Project

Why PetClinic?

- **Real-world complexity** - Not a toy example
- **Well-architected** - Spring best practices
- **Multiple layers** - Controllers, services, repositories
- **Rich domain** - Owners, Pets, Vets, Visits
- **Active project** - VMware/Spring maintained

Different Skills Needed

Project 1 (Hello Spring): Creation from scratch
Project 2 (PetClinic): Understanding existing code

Real-world scenario: Joining a new team, existing codebase

Setting Up PetClinic

Clone the Repository

Using Command Palette (Recommended):

1. `Cmd+Shift+P` / `Ctrl+Shift+P`
2. Type: "**Git: Clone**"
3. Paste URL: `https://github.com/spring-projects/spring-petclinic`
4. Choose folder (e.g., `~/projects`)
5. "**Open in New Window**" when prompted

Multi-window demo: You now have both projects open!

Alternative: Clone via Terminal

```
# Navigate to your projects folder
cd ~/projects

# Clone PetClinic
git clone https://github.com/spring-projects/spring-petclinic

# Open in new Cursor window
cd spring-petclinic
cursor .
```

Both approaches work! Command Palette is more discoverable.

First Impressions: Project Structure

```
spring-petclinic/
├── src/main/java/...petclinic/
│   ├── owner/              # Owner domain
│   │   ├── Owner.java
│   │   ├── OwnerController.java
│   │   └── OwnerRepository.java
│   ├── pet/                # Pet domain
│   │   ├── Pet.java
│   │   ├── PetController.java
│   │   └── PetRepository.java
│   ├── vet/                # Vet domain
│   │   ├── Vet.java
│   │   ├── VetController.java
│   │   └── VetRepository.java
│   └── visit/              # Visit domain
├── src/main/resources/
│   ├── templates/          # Thymeleaf templates
│   └── application.properties
└── pom.xml
```

Notice: Domain-driven design, each entity has its own package

AI-Powered Architecture Understanding

Start with Big Picture Questions

Chat Mode (Cmd/Ctrl+L):

```
Explain the overall architecture of this Spring PetClinic application
```

AI Response includes:

- Layer architecture (Controller → Service → Repository)
- Domain model relationships
- Technology stack (Spring Boot, JPA, Thymeleaf, H2)
- Design patterns used

Big Picture: Follow-ups

```
What design patterns are used in this application?
```

```
How is the database configured?
```

```
Explain the entity relationships using JPA annotations
```

Understanding Entity Relationships

```
Chat: "Explain the relationship between Owner, Pet, and Visit entities"
```

Goal: See how AI summarizes JPA relationships across entities

Entity Relationships: Owner

```java
@Entity
public class Owner extends Person {
    @OneToMany(cascade = CascadeType.ALL, mappedBy = "owner")
    private Set<Pet> pets = new HashSet<>();
}
```

Key Point: One Owner has many Pets (`@OneToMany`)

Entity Relationships: Pet

```java
@Entity
public class Pet extends NamedEntity {
    @ManyToOne @JoinColumn(name = "owner_id")
    private Owner owner;

    @OneToMany(cascade = CascadeType.ALL, mappedBy = "pet")
    private Set<Visit> visits = new LinkedHashSet<>();
}
```

Key Points: Many Pets belong to one Owner (`@ManyToOne`), one Pet has many Visits (`@OneToMany`)

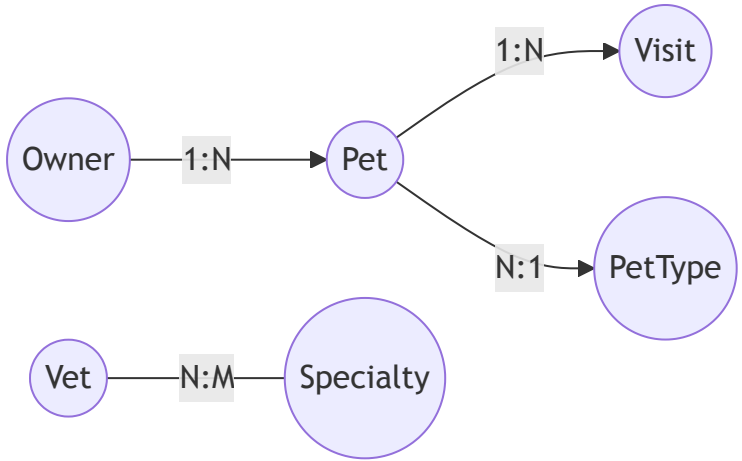
Entity Relationships: Visit

```
1   @Entity
2   public class Visit extends BaseEntity {
3       @ManyToOne @JoinColumn(name = "pet_id")
4       private Pet pet;
5   }
```

Key Point: Many Visits belong to one Pet (`@ManyToOne`)

AI extracts core relationships fast

Entity Relationships (Diagram)



Tracing Request Flow with AI

```
Chat: "Walk me through what happens when I GET /owners/1"
```

Goal: Understand the end-to-end path from controller → repository → view

Request Flow: /owners/

1. **HTTP Request** → `GET /owners/1`
2. **OwnerController.showOwner(...)** handles request

```
@GetMapping("/owners/{ownerId}")
public ModelAndView showOwner(@PathVariable int ownerId)
```

3. **OwnerRepository.findById(...)** loads data

```
Owner owner = owners.findById(ownerId);
```

4. **JPA/Hibernate** executes query and maps entities
5. **Thymeleaf** renders the page with the `Owner` model

AI advantage: Explains full request flow in seconds

Navigation Techniques in PetClinic

Finding Your Way Around

Quick Open (Cmd/Ctrl+P):

- Type `Owner` → `Owner.java`, `OwnerController.java`, etc.
- Type `Owner:30` → Opens Owner.java at line 30

Find Symbols (Cmd/Ctrl+Shift+O):

- `findByLastName` → Repository method
- `addPet` → Controller method

AI-Powered Search:

```
Chat: "Show me all REST endpoints in this application"
Chat: "Find all methods that query the database"
Chat: "Which controllers handle pet operations?"
```

Navigation: Go to Definition

Jump quickly to code:

- `Cmd+Click` on `Owner` → Entity class
- `F12` on method → Implementation

Tip: Use back/forward navigation (`Alt+Left/Right`) to hop around

Student Exploration Exercise

Guided Discovery with AI

Use Chat Mode to answer these questions:

1. **"How many entity classes are there? List them with their purpose"**
2. **"Which controller handles vet operations? Show me the endpoints"**
3. **"Explain how pet types are stored and retrieved from the database"**
4. **"What validation is applied to the Owner entity? List all constraints"**
5. **"How are visits associated with pets? Explain the relationship"**

Bonus Challenge:

```
"Find a potential bug or code smell in this codebase"
```

Share your findings: What did you discover?

Advanced Analysis with AI

Finding Patterns Across Codebase

Architectural Analysis:

```
Chat: "What Spring Boot features are used in this application?"
```

Code Quality Review:

```
Chat: "Review the OwnerController for best practices and potential improvements"
```

Security Analysis:

```
Chat: "Are there any security concerns in the data access layer?"
```

Performance Questions:

```
Chat: "Identify any N+1 query problems in the repository layer"
```

AI can analyze patterns that are hard to find manually!

Running PetClinic

Start the Application

Terminal (Ctrl+`):

```
./mvnw spring-boot:run
# or if Gradle:
./gradlew bootRun
```

Open browser:

```
http://localhost:8080
```

Explore the UI

- Find Owners
- View Owner details
- Add new Pet
- Schedule Visit
- View Veterinarians

Running PetClinic: Guided Exploration

Ask AI while exploring:

```
Chat: "How does the 'Add Pet' form submission work in the code?"
```

Try these prompts:

```
Chat: "Show me the controller + template involved in 'Find Owners'"
Chat: "Trace the flow for creating a new Visit"
```

Part 6: Terminal, Debugging & Workflows

Professional Development Setup

Terminal Integration

Opening Terminal(s)

Shortcut: `Ctrl+` (backtick)
Or: View → Terminal

Multiple Terminal Sessions

- Click + icon for new terminal
- Split terminal: Click split icon
- Switch with dropdown menu

Common Setup for Spring Boot:

```
Terminal 1: ./gradlew bootRun      # Running app
Terminal 2: ./gradlew test --continuous  # Test watcher
Terminal 3: git status              # Version control
```

Gradle Tasks: Build and Test

```
./gradlew build
./gradlew test
./gradlew test --tests PersonControllerTest
```

Gradle Tasks: Run and Utilities

```
./gradlew bootRun
./gradlew clean build
./gradlew dependencies
```

AI can help:

- "Run the Spring Boot application"
- "Execute all tests and show results"
- "Build the project and tell me if there are errors"

Debugging in Cursor

Setting Up Debug Session

Method 1: CodeLens (appears above main method)

```
public class HelloSpringApplication {
    // "Run | Debug" appears here ↓
    public static void main(String[] args) {
        SpringApplication.run(HelloSpringApplication.class, args);
    }
}
```

Click **Debug**

Method 2: Debug Panel

- Click Run & Debug icon (left sidebar)
- Click "create a launch.json file"
- Select "Java"
- Press F5 to start

Debugging Workflow

```
// 5. Inspect variables (Debug panel shows):
// - id = 1
// - personRepository = PersonRepository@1a2b3c
// - [Hover over variables for values]

// 6. Evaluate expressions (Debug Console):
// > id * 2
// 2
// > personRepository.count()
// 5
```

Variables panel, Watch expressions, Call stack - all available!

AI-Assisted Debugging

When Things Go Wrong

Test Failure:

```
Chat: "Why is this test failing?"
[Paste error message]
```

Runtime Exception:

```
Chat: "Explain this stack trace and suggest a fix"
[Paste stack trace]
```

Unexpected Behavior:

```
Chat: "This endpoint returns 404 but should return 200.
Here's the controller code: [paste code]"
```

AI analyzes errors and suggests solutions!

Multi-Window Professional Setup

Window 1: Your Project

```
hello-spring/
├── Active development
├── Terminal: ./gradlew bootRun
├── Debug session
└── Agent: Code generation
```

Used for:

- Writing code
- Running tests
- Debugging issues
- Active development

Window 2: Reference Project

```
spring-petclinic/
├── Code examples
├── Terminal: read-only
├── Chat: Understanding
└── Reference only
```

Used for:

- Learning patterns
- Finding examples
- Understanding architecture
- Quick reference

Multi-Window Benefits

Each window has:

- ✅ Independent AI context
- ✅ Separate terminal sessions
- ✅ Own Git state
- ✅ Different debugging session

Pro tip: Keep examples open in second window for quick reference while coding in the first!

Productivity Shortcuts Review

Task	Shortcut	What It Does
Quick Open	`Cmd/Ctrl+P`	Find any file, class, symbol
Command Palette	`Cmd/Ctrl+Shift+P`	Access all commands
Find in Files	`Cmd/Ctrl+Shift+F`	Search entire project
Chat Mode	`Cmd/Ctrl+L`	Ask AI questions
Agent Mode	`Cmd/Ctrl+I`	Generate/modify code
Terminal	`Ctrl+` `	Open/close terminal

Productivity Shortcuts Review (cont.)

Task	Shortcut	What It Does
Go to Definition	`F12`	Jump to code definition
Find Usages	`Shift+F12`	Where is this used?
Debug	`F5`	Start debugging
Step Over	`F10`	Debug: next line

Print this slide for reference!

Wrap-Up & Key Takeaways

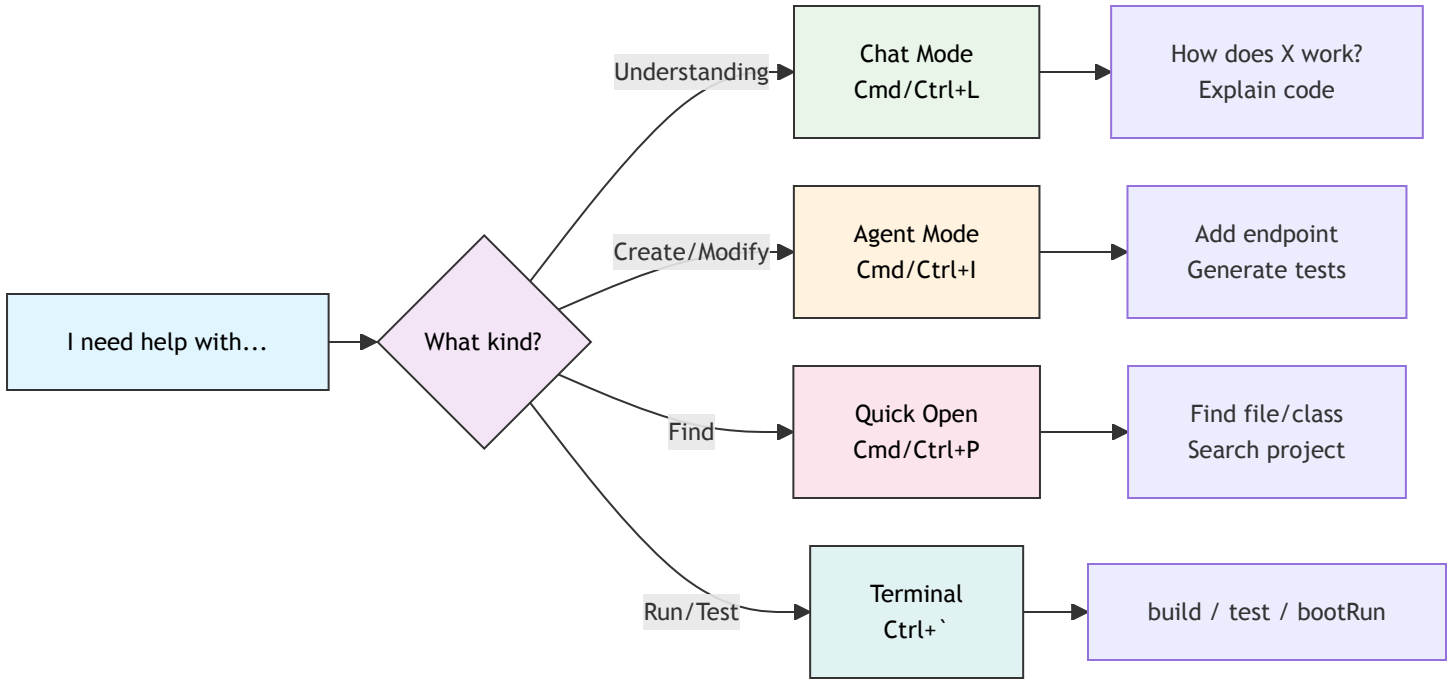
What We Accomplished Today: Hello Spring Boot

- Complete REST API with CRUD operations
- Service layer with dependency injection
- JPA entities and repositories
- Bean validation and error handling
- DTOs using modern Java records
- Unit and integration tests

What We Accomplished Today: Spring PetClinic

- Understood complex architecture quickly
- Traced request flows
- Identified entity relationships
- Found patterns and potential issues
- Navigated efficiently

Key Takeaways: The Decision Tree



Best Practices Learned (1/2)

1. **Start with Chat to understand, then use Agent to implement**
   - Understanding first → better results
2. **Review AI suggestions before accepting**
   - AI is a pair programmer, not autopilot
3. **Use specific, detailed prompts**
   - ✅ "Add Bean Validation: firstName/lastName not blank; email format"

Best Practices Learned (2/2)

4. **Leverage multi-window for reference**
   - Keep examples open in second window
   - Independent contexts prevent confusion
5. **Let AI handle boilerplate**
   - Tests, DTOs, CRUD scaffolding
   - Focus on business logic

Available Resources

Quick Reference

- ✅ `cursor-quickstart-for-intellij-users.md` — IntelliJ → Cursor guide
- ✅ `session1-outline.md` — Full outline
- ✅ `slides.md` — Slidev deck

Available Resources (cont.)

Labs & Practice

- ✅ `labs.md` — Code-along + homework
- ✅ Hello Spring Boot — Starter project
- ✅ Spring PetClinic — `git clone https://github.com/spring-projects/spring-petclinic`
- Practice: redo code-alongs, PetClinic challenges, advanced refactoring

Q&A

Questions?

Common Topics:

- Setup issues or extension problems
- AI not working as expected
- Java Language Server troubleshooting
- Best practices for specific scenarios
- Preview of next sessions

Remember: When in doubt, ask the AI!
`Cmd/Ctrl+L` → "How do I...?"

Thank You!

Great Work Today! 🎉

☕ + 🤖 = 🚀

Kenneth Kousen
Java Champion, Author, Speaker

kousenit.com | @kenkousen

See you next session for Mobile Development!

Appendix: Advanced Cursor Features

Plan Mode (high-level planning)

- Draft a step-by-step change plan before edits
- Best for multi-file refactors/migrations
- Ask Chat: "Create a plan to ..." then review/approve
- Execute approved steps; iterate as needed
- Keep plans small (PR-sized) for reviewability

Advanced Cursor Features (cont.)

Slash Commands (custom prompts)

- Type "/" in Chat to run reusable command templates
- Add/edit: Settings → Commands ("Cursor: Open Commands")
- Great for "Generate unit tests" or "Refactor selection"
- Use placeholders (selection, file) for context

Advanced Cursor Features (cont.)

.cursorrules (project guidance)

- Put `.cursorrules` at repo root to guide AI
- Capture coding standards and architectural rules
- Keep concise; link to longer docs
- Commit so the team benefits

Appendix: Troubleshooting (1/2)

Java Language Server not loading

```
Cmd/Ctrl+Shift+P → "Java: Clean Java Language Server Workspace"
```

Gradle tasks not recognized

```
./gradlew tasks --all
# Or: Cmd/Ctrl+Shift+P → "Gradle: Refresh Gradle Project"
```

AI seems confused or wrong

- Start new Chat (Cmd/Ctrl+L → New Chat)
- Be specific; add code/context

Appendix: Troubleshooting (2/2)

Imports not resolving

- Ensure "Language Support for Java" extension installed
- Check build.gradle/pom.xml dependencies
- Cmd/Ctrl+Shift+P → "Java: Clean Workspace"

Appendix: Additional Resources

Cursor & Spring

- docs.cursor.com — Official docs
- forum.cursor.sh — Community forum
- spring.io/guides — Spring guides
- Spring PetClinic — Reference app

Additional Resources (cont.)

Java & VS Code

- code.visualstudio.com/docs/java — Java in VS Code
- marketplace.visualstudio.com — Extensions

Ken's Resources

- kousenit.com — Courses and training
- kousenit.org — Blog
- Tales from the jar side — Newsletter
- Tales from the jar side YouTube channel