MongoDB Developer Training Program

Overview

Get ramped quickly on MongoDB with a comprehensive training program for developers. Our developer training program comprises a graduated, modular curriculum in two main parts:

- **Foundation Training**
  - An entry-level training course comprising a series of four instructor-led classroom days.

- **Advanced Training**
  - Five instructor-led, small group, practical workshops.

The entire program can be completed in 2 consecutive weeks, or the parts can be spread out over a longer time. Students can also choose to complete only part of the program according to their learning objectives.

Who Should Attend?

All application developers who use MongoDB will benefit from this training program. Developers may enter the program at one of the foundation training days or advanced training workshops according to their existing knowledge and skills.

Outcome

A developer completing the program will go from knowing little or nothing about MongoDB to having a complete set of skills to build sophisticated, high-performance MongoDB applications. At every stage of the program they will learn a new facet of MongoDB and how to apply their knowledge to real-world application development.

Course Logistics

- Public and private training options are available. See mongodb.com/training for the public course schedule.
- Public classes are only delivered remotely.
- Private classes can be delivered in person or remotely. For in-person classes, all students must attend the class in person.
- A minimum of two consecutive days of delivery must be scheduled.
- Each class accommodates up to 12 students.
- To fully participate in a class, students should be equipped with a computer that has:
  - full access to the strigo.io training delivery platform via a supported web browser
  - for remote classes - the ability to join a Zoom meeting via the desktop client or web browser, and a microphone and webcam to share their audio and video

February 2021
MongoDB Developer Training Program

Foundation Training: Overview

Our entry-level developer training course comprises a series of four classroom days. Each day introduces new concepts and skills and gets students closer to developing high quality, scalable, production applications using MongoDB. Training focuses on what’s most important for developer productivity and teaches concepts and skills in a developer-oriented way, including hands-on exercises throughout the course where appropriate.

Students are provided with a copy of the training slides and comprehensive lecture notes.

Foundation training can be delivered in sessions of between 2 and 4 consecutive days. Each training day builds on knowledge and skills acquired from the preceding prerequisite days. Students may choose to schedule all four days in a row, or space them out according to their schedule or project timeline.

Each day includes a short, end-of-day student assessment with real-time results provided to students.
# MongoDB Developer Training Program

<table>
<thead>
<tr>
<th>Audience</th>
<th>Developers and Technical Managers</th>
<th>Developers</th>
<th>Developers</th>
<th>Developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>1 day</td>
<td>1 day</td>
<td>1 day</td>
<td>1 day</td>
</tr>
<tr>
<td>Prereqs</td>
<td>None</td>
<td>DF100</td>
<td>DF100, DF200</td>
<td>DF100, DF200, DF300</td>
</tr>
<tr>
<td>Topics</td>
<td>• What is MongoDB?</td>
<td>• Indexing</td>
<td>• Advanced Features</td>
<td>• Replication</td>
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<tr>
<td></td>
<td>• How to access MongoDB</td>
<td>• Profiling</td>
<td>• Application Development</td>
<td>• Sharding</td>
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<td></td>
<td>• Storage and Retrieval</td>
<td>• Aggregation</td>
<td>• Schema Design</td>
<td>• Security</td>
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<td>Summary</td>
<td>This training day covers in detail what MongoDB is, its strengths and where you should use it, how to get up and running, and the breadth of powerful functionality for storing and retrieving data.</td>
<td>This training day covers the fundamentals of indexing in theory and in practice, how to profile database operations to identify bottlenecks, the aggregation query language and how to move beyond simple retrieval of raw data to in-database computation.</td>
<td>This training day covers a broad set of MongoDB functionality beyond simple storage and retrieval, best practices for application development, and design of application code and database schema — the most important part of a well-written MongoDB application.</td>
<td>This training day covers a set of topics which make the difference between an application being fit for production or not. What does a developer need to do to ensure their application is secure, to ensure it is highly available and protects data, and to ensure it will scale when required in future?</td>
</tr>
<tr>
<td>Outcome</td>
<td>On completion of this training day you will have an understanding of what MongoDB is and how it can be a good fit for your development project. This is an ideal training to take prior to the evaluation of MongoDB for use in your project, in order to validate your planned development effort.</td>
<td>On completion of this training day you will know how to avoid common MongoDB mistakes (failing to correctly index queries or leverage database capabilities for computation of data) and design your data access for optimal performance. This training is a must for any developer writing code which needs to perform quickly and efficiently.</td>
<td>On completion of this training day you will have all the skills needed to build a complete, performant, scalable application. You will understand what database functionality to use and when to use it. You will be aware of the paramount importance of good schema design and know several common design patterns you can use in your applications.</td>
<td>On completion of this training day you will be able to evaluate and make vital deployment decisions required when building business-critical, highly available and secure applications. Lack of developer awareness in these areas frequently leads to severe production deployment gaps cited by MongoDB consultants, resulting in last-minute rework before go-live. Using this knowledge gets you ahead of the game.</td>
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</table>

February 2021
MongoDB Developer Training Program

Foundation Training: Agenda

**DF100: MongoDB Developer Fundamentals**

Introduction
- Why a new database?
- What are documents?
- MongoDB
  - Agility
  - Usability
  - Utility
  - Scalability
- When to use MongoDB
- Common mistakes

Accessing MongoDB
- Starting a cluster *
- Installing a shell *
- Using the web shell
- Connecting to your cluster *

Developer Basics
- Container types
- Comparison with RDBMS
- Coding against MongoDB
- Developer sandbox *
- CRUD examples *

Storage and Retrieval
- Bulk versus single writes
- Filtering and projection
- Basic query operators *
- Querying arrays
- Expressive queries
- Using cursors
- Basic update operations *
- Array update operations *
- Expressive updates
- Advanced atomicity models
  - Upsert
  - findOneAndUpdate

End of day test

**DF200: Optimizing Storage and Retrieval**

Indexes and Optimization
- What are indexes?
- MongoDB misconceptions
- Single field indexes
- Reading explain plans *
- Indexes and performance
  - Limits
  - Best practices
  - Compression
- Multikey indexes
- Compound index design *
- Covered queries
- Geospatial indexing *
  - 2d indexes
  - Spherical indexes
- TTL indexes
- Text indexes
- Wildcard indexing
- How indexes are chosen
  - Query planner / Query optimizer
  - Hints and tips

Database Profiling
- Finding slow operations
  - Slow query log
  - Enabling the profiler
- Causes of slow operations

Using Aggregation
- Aggregation basics
- How to code aggregation
- Using the GUI pipeline builder
- Stages and expressions *
  - Grouping *
  - Joining / Classifying / Reshaping
- Database internal statistics
- Expression variables
- Optimizing aggregation *

End of day test

* includes hands-on exercise
# Foundation Training: Agenda (continued)

## DF300: Design Skills and Advanced Features

**Functionality Beyond Storage**
- Regular expressions
- Schema validation
- GridFS
- Change streams
- Sessions
- Retries
- Transactions
- Bulk write models
- Server-side JavaScript
- Atlas Search / Atlas Triggers
- Views

**Internals Developers Should Know**
- BSON data types
- Null handling
- Collation and ordering
- Type bracketing
- Sorting container types
- Internal locking models
- Long-term lock management

**Developer Best Practices**
- Coding for idempotency
- Understanding the drivers *
- Error handling
- Majority writes
- Authentication pools
- Codecs, DALs and ODMs
- Driver helpers

**Schema Design**
- BSON internals *
- Choosing container types *
- Design fundamentals
- Linking models
- Payload versus process
- Dynamic schema
- Design patterns *

End of day test

## DF400: Production-Ready Development

**Replication**
- Reasons to replicate data
- Components of a replica set
- Drivers and replica sets
- The concept of majority
- Elections simplified
- Failure modes *
- Write Concern *
- The Majority Commit Point
- Read Concern
- Read Preference

**Sharding**
- What is sharding?
- Horizontal versus vertical scaling
- When to shard
- Sharding infrastructure
- Shard keys *
- How sharding works
  - Reads / Writes / Chunks
- Sharding in slow motion
- Sharding pitfalls
  - A cautionary tale
- Managed sharding technique
  - Computed keys
  - Presplitting
  - Scaling out

**Security**
- Introduction to keys and PKI *
- Authentication models
- Authorization
  - Roles
  - LDAP
- Encryption
  - In flight
  - At rest
  - In use
- Auditing
- Additional security measures

End of day test

* includes hands-on exercise
MongoDB Developer Training Program

Advanced Training: Overview

Classroom training, even with exercises, is no substitute for deep practical experimentation and observation. MongoDB advanced training workshops enable a much more in-depth exploration of a topic through a series of technical challenges.

In these workshops students typically investigate and demonstrate the impact made by a change to design or the use of a feature. Students work together with each other and with the instructor – evolving code, answering questions and discussing the observed behaviors.

Students can choose any subset of workshops according to the areas in which they would like to deepen their skills. Workshops can be taken in any order, although the order shown below is recommended.

Advanced training workshops are technically demanding and as a prerequisite require students to have successfully completed all four days of foundation training. Workshops are limited to 12 students per class.

- Advanced Queries and Data Processing 1 day
- Languages, Drivers, Web Services 1 day
- Distributed Systems and Transactions 1 day
- MongoDB Application Optimization 1 day
- Code Evolution, Scale and Workflow 2 days
MongoDB Developer Training Program

Advanced Workshop:

MongoDB Advanced Queries and Data Processing (DA610)

Overview

The MongoDB Query Language has many capabilities that untrained engineers are either unaware of or unsure how to best use. This lack of knowledge can result in code that underperforms or has edge cases that impact correctness. The aggregation framework enables writing functional expressions that run inside the database, close to the data, to perform analysis, updates and computation. In this workshop, we move through a series of short but challenging exercises using advanced MongoDB Query Language and aggregation features. Mastery of these skills allows one to achieve far more with MongoDB than merely using it as a data store.

Intended Audience

This training workshop is intended for developers who have completed DF200 (Optimizing Storage and Retrieval) or who are already comfortable with using the most common MongoDB aggregation operators such as $project, $group and $unwind, and who want to be able to push significant computation and data manipulation closer to their data.

Workshop Objectives

In this training workshop, you will learn how to:

- build nested queries
- create complex queries using expressive syntax
- adopt best practices for when to project, enrich or redact your data to optimize your queries
- choose between various options for bucketing and summarizing your data
- optimize cross-collection data aggregation
- create non-blocking and highly parallel aggregation operations
- use list comprehension to implement complex functions
- optimize database computation using $let

Duration

1 day
MongoDB Developer Training Program

Advanced Workshop:
Languages, Drivers, Web Services (DA620)

Overview
In this training workshop we create a scalable, stateless web service to perform a real-world business task. Using three different styles of programming language (dynamic, static, and asynchronous), we compare the performance, readability and functionality of these three language styles as well as provide a reusable foundation to create new services. We measure performance and observe which factors influence it. We then look at what bottlenecks exist in our solution and design ways to overcome any limitations before finally learning a new design pattern as we create a consumer replenished resource service.

Intended Audience
This training workshop is intended for developers who have completed DF300 (Design Skills and Advanced Features) and who intend to build a multi-user, shared-data application and want to understand how to do so in a way that will scale well and make optimal use of database resources. This is a polyglot programming course but taught in a way that means knowledge of any modern programming language will equip you to complete it.

Workshop Objectives
In this training workshop, you will learn how to:

- implement isolation using advanced MongoDB update operators
- evaluate the implied infrastructure costs of different app language choices
- understand the impact of network latency between application servers and the database
- diagnose hidden resource contention and eliminate unnecessary performance loss
- implement mechanisms to reduce database resource contention for better throughput
- ensure traceable message delivery to clients

Duration
1 day
MongoDB Developer Training Program

Advanced Workshop:
Distributed Systems and Transactions (DA630)

Overview

Nearly all MongoDB production systems are highly available and distributed; even if distribution is only over a small distance, data is held in multiple independent places. Students will have learned in foundation training the decisions required to define “durable” and “safe” in a distributed system and how these responsibilities partly fall to the developer to implement correctly. In this workshop we experiment with settings that affect speed, latency, durability and business correctness to learn how and when to use concerns and transactions in MongoDB.

Intended Audience

This training workshop is intended for developers who have completed DF400 (Production-Ready Development) and want to fully understand where a distributed document database necessitates important additional design decisions. This workshop is for those who care about performance and correctness and how to achieve both.

Workshop Objectives

In this training workshop, you will learn how to:

- choose the appropriate write concern to ensure correctness of your application without unnecessarily sacrificing performance
- safely and effectively use retryable writes
- understand the implications of selecting the wrong read concern and choose the appropriate read concern to ensure correctness of your application without unnecessarily sacrificing performance
- decide when and when not to use transactions, taking into account contention and performance considerations

Duration

1 day
MongoDB Developer Training Program

Advanced Workshop:

MongoDB Application Optimization (DA640)

Overview

In this training, students are presented with a working but unusable solution to a problem, in this case the storage and retrieval of product review information. We work through an iterative process of application improvement to take a 20 second response time down to 20 milliseconds. We then learn how this can be further optimized by using lower-level APIs in the MongoDB driver. This workshop helps students avoid lengthy refactoring in their next project — by understanding how to do things correctly from the start.

Intended Audience

This training is intended for developers who have completed DF300 (Design Skills and Advanced Features) and need to build an application that will work for many users and at significant scale. Optimizing your application to reduce your infrastructure costs can easily make this the most valuable course you attend.

Workshop Objectives

In this training workshop, you will learn how to dramatically improve the performance of a MongoDB application by:

- leveraging indexes
- re-writing aggregation queries to ensure they use index covering
- implementing a caching pattern in the schema
- implementing a computed summary pattern in the schema
- using raw BSON data types to reduce the overhead of object creation

Duration

1 day
MongoDB Developer Training Program

Advanced Workshop:
Code Evolution, Scale and Workflow (DA650)

Overview
In this training workshop, students create an application that evolves its schema over time to support new business needs without needing to transform older data. This is a substantial benefit of dynamic schema in MongoDB, but one developers often fail to take full advantage of. We build a social media service akin to Twitter and Facebook with followers, posts and data feeds. We learn how to model high cardinality graphs and handle changes to tricky fields such as username, various write models for extreme scale, and how to build asynchronous worker tasks to ensure the completion of long-running operations even in the event of application or database failover.

Intended Audience
This training workshop is intended for developers who have completed DF400 (Production-Ready Development) and who are embarking on a project to build a long-lived, highly-scalable application from the ground up. It will get you off to the best possible start to ensure maximum performance and uptime over the lifetime of the application.

Workshop Objectives
In this training workshop, you will learn how to:

- create an adaptable data access layer (DAL) to decouple your objects from your schema
- use schema versioning to avoid having to rewrite older records
- use schema versioning to support running new and old application versions simultaneously
- identify bottlenecks which limit scaling and design schemas capable of managing millions of users
- apply caching design patterns to optimize retrieval time
- use collection-queues and background workers to complete long running tasks asynchronously

Duration
2 days