Deployment, Discovery, and Optimization

Category	Workshop
Content Type	Workshop
Status	Not Started
Workshop Day	Day 3

Workshop Overview

Purpose: Teach participants how to take a working application from local development to a publicly accessible production website.

Participants will deploy their application using Vercel, connect a custom domain through Cloudflare, understand DNS configuration, prepare their website for search engine discovery through Google Search Console and Bing Webmaster Tools, and evaluate their production website using Google PageSpeed Insights.

The workshop emphasizes that development does not end when an application works locally. A production website must be deployed correctly, accessible through its domain, discoverable by search engines, performant, accessible, and tested in its production environment.

Duration: 60 to 120 minutes

Instructor(s): TBD

Workshop Day: Day 3

Learning Objectives

By the end of this workshop, participants should be able to:

- Explain the difference between local development and production
- Prepare an application for production deployment
- Deploy a GitHub repository using Vercel
- Understand the relationship between GitHub and Vercel deployments

- Configure required production environment variables
- Verify that Firebase functionality works in production
- Explain the purpose of domains and DNS
- Connect a custom domain using Cloudflare and Vercel
- Understand common DNS records at a practical level
- Verify that a production domain resolves correctly
- Explain how search engines discover websites
- Prepare basic technical requirements for search engine indexing
- Use Google Search Console
- Use Bing Webmaster Tools
- Understand the purpose of robots.txt and sitemaps
- Request or verify indexing where appropriate
- Analyze a production website using Google PageSpeed Insights
- Interpret performance, accessibility, SEO, and best-practice feedback
- Prioritize meaningful improvements instead of blindly optimizing scores
- Use Codex and Claude Code to investigate production issues and optimization opportunities
- Verify changes after deployment

Prerequisites

Participants should have:

- A working web application
- A GitHub repository containing the application
- Basic Git and GitHub knowledge
- A working Firebase configuration
- Authentication working locally
- Persistent data working locally
- Familiarity with browser Developer Tools

- Experience using Codex or Claude Code
- Completed Day 1 and Day 2 or equivalent knowledge

Instructor Preparation

- [ ] Prepare a working application in GitHub
- [ ] Verify the application deploys successfully to Vercel
- [ ] Prepare a domain or subdomain for demonstration
- [ ] Verify access to Cloudflare DNS management
- [ ] Prepare an example DNS configuration
- [ ] Prepare production environment variables
- [ ] Verify Firebase works from the production deployment
- [ ] Prepare an example robots.txt file
- [ ] Prepare an example sitemap
- [ ] Verify access to Google Search Console
- [ ] Verify access to Bing Webmaster Tools
- [ ] Prepare a website that can be analyzed with PageSpeed Insights
- [ ] Prepare at least one example production deployment problem
- [ ] Prepare at least one example DNS problem
- [ ] Prepare at least one PageSpeed improvement example
- [ ] Prepare participant deployment instructions
- [ ] Prepare backup screenshots in case indexing or DNS changes take longer than expected

Required Accounts

- GitHub
- Vercel
- Cloudflare
- Google

- Bing Webmaster Tools
- Firebase
- Claude
- OpenAI / Codex

Required Software

- Visual Studio Code
- Git
- Node.js
- npm
- Modern web browser
- Claude Code
- Codex

Required Files / Repositories

- Working Day 2 application
- GitHub repository
- Deployment checklist
- DNS reference
- SEO/indexing checklist
- Example robots.txt
- Example sitemap
- PageSpeed checklist

Workshop Outline

Time	Section	Format	Notes
0 to 10 min	From Local to Production	Teach	Explain what changes when an application becomes public

Time	Section	Format	Notes
10 to 25 min	Vercel Deployment	Demo / Exercise	Deploy the GitHub repository
25 to 40 min	Cloudflare and DNS	Teach / Demo / Exercise	Connect the production domain
40 to 55 min	Production Verification	Demo / Exercise	Test Firebase, routes, environment variables, and functionality
55 to 70 min	Search Engine Discovery	Teach / Demo	Introduce crawling, indexing, sitemap, and robots.txt
70 to 85 min	Google and Bing	Demo / Exercise	Configure Search Console and Bing Webmaster Tools
85 to 100 min	PageSpeed Insights	Demo / Exercise	Analyze the production website
100 to 120 min	Optimization and Instructor Support	Exercise	Participants improve, redeploy, and retest

For a 60-minute workshop, prioritize deployment, domain configuration, production verification, and PageSpeed Insights. Search engine tooling can be demonstrated briefly and supported with a handout.

Concepts to Teach

Concept 1: Local Development vs. Production

What participants need to understand:

An application working on localhost does not mean it is ready for real users.

Production introduces additional considerations including hosting, domains, DNS, environment variables, external services, security, performance, accessibility, and search engine discovery.

Key points:

- Localhost is the developer's environment
- Production is the publicly accessible environment
- Configuration may differ between environments
- Environment variables may need to be configured separately

- External services may behave differently in production
- Production must be tested independently

Concept 2: Deployment with Vercel

What participants need to understand:

Vercel can connect directly to a GitHub repository and build and deploy the application.

This creates a useful development workflow:

Code → Commit → Push → GitHub → Vercel → Production

Key points:

- Connect the correct repository
- Understand build settings
- Configure environment variables
- Read deployment logs
- Understand successful and failed deployments
- Verify the deployed application
- Future GitHub changes can trigger new deployments
- Deployment success does not guarantee application correctness

Concept 3: Domains and DNS

What participants need to understand:

Hosting and domains solve different problems.

Vercel hosts the application.

The domain provides the human-readable address.

DNS tells internet clients where that domain should go.

Cloudflare is used to manage that DNS configuration.

Key points:

- Domain
- DNS
- DNS records

- A records
- CNAME records
- Root domain
- Subdomain
- DNS propagation
- HTTPS
- Vercel domain verification

Practical mental model:

User enters domain → DNS resolves domain → Request reaches Vercel → Vercel serves application

Concept 4: Production Verification

What participants need to understand:

After deployment, the application must be tested again in production.

Key points:

- Test navigation
- Test authentication
- Test sign-up and sign-in
- Test Firestore reads and writes
- Test refresh behavior
- Test important routes
- Test on more than one screen size
- Inspect browser console
- Check for failed network requests
- Verify environment variables
- Check for broken assets
- Verify HTTPS

Concept 5: Search Engine Discovery

What participants need to understand:

Publishing a website does not automatically guarantee that it will immediately appear in search results.

Search engines need to discover, crawl, understand, and index pages.

Key points:

- Crawling
- Indexing
- Page titles
- Meta descriptions
- Semantic HTML
- robots.txt
- Sitemap
- Internal navigation
- Publicly accessible pages
- Search engine webmaster tools

Basic model:

Website → Discovery → Crawl → Index → Search Result

Concept 6: Google Search Console and Bing Webmaster Tools

What participants need to understand:

Search engine webmaster tools allow site owners to communicate information about their websites to search engines and inspect indexing-related information.

Key points:

- Add or verify the website
- Verify domain ownership when required
- Submit a sitemap
- Inspect URLs
- Review indexing information

- Identify crawl or indexing issues
- Understand that submitting a URL does not guarantee ranking

Concept 7: PageSpeed Insights

What participants need to understand:

A website should not only function. It should provide a usable experience.

PageSpeed Insights can identify opportunities related to:

- Performance
- Accessibility
- Best practices
- SEO

Participants should use the report as diagnostic information rather than treating the score itself as the product.

Key points:

- Test the production URL
- Review mobile results
- Review desktop results when useful
- Identify high-impact problems
- Understand recommendations before changing code
- Avoid blindly applying every suggestion
- Make one meaningful improvement at a time
- Redeploy
- Retest

Concept 8: Production Debugging

What participants need to understand:

Production problems should use the same evidence-based debugging process introduced previously.

Expected → Observed → Evidence → Hypothesis → Fix → Deploy → Verify

Key points:

- Read Vercel build logs
- Inspect browser errors
- Inspect network requests
- Verify environment configuration
- Verify DNS
- Verify Firebase behavior
- Isolate the failing layer
- Give Codex or Claude Code specific evidence
- Test locally when appropriate
- Test again in production after deployment

Live Demonstration

Objective

Take the workshop application from its GitHub repository to a publicly accessible, custom-domain production website and evaluate the result.

Steps

1. Open the completed Day 2 application.
2. Verify that the latest working version is pushed to GitHub.
3. Connect the repository to Vercel.
4. Review the project's deployment configuration.
5. Configure required environment variables.
6. Deploy the application.
7. Open the Vercel production URL.
8. Test important application functionality.
9. Verify Firebase authentication and persistent data.
10. Review the production browser console.
11. Add the custom domain to the Vercel project.

12. Open Cloudflare DNS management.
13. Configure the required DNS records.
14. Verify the domain connection.
15. Open the application using the custom domain.
16. Verify HTTPS and application functionality again.
17. Review the site's robots.txt and sitemap.
18. Demonstrate Google Search Console.
19. Demonstrate Bing Webmaster Tools.
20. Demonstrate sitemap submission or URL inspection.
21. Run the production URL through PageSpeed Insights.
22. Review the report.
23. Select one meaningful improvement.
24. Use Codex or Claude Code to help investigate the issue if appropriate.
25. Implement the improvement.
26. Test locally.
27. Commit and push the change.
28. Allow Vercel to redeploy.
29. Verify the production change.
30. Run PageSpeed Insights again and compare the result.

Expected Result

Participants should see the complete production workflow:

GitHub → Vercel → Cloudflare → Production Domain → Search Engines → PageSpeed Insights → Improvement → Redeployment

The application should remain functional throughout the process.

Hands-On Exercise

Objective

Participants will deploy their application, connect it to a production domain, verify its functionality, prepare it for search engine discovery, and analyze its quality.

Instructions

1. Verify the application works locally.
2. Commit any working changes.
3. Push the latest version to GitHub.
4. Connect the repository to Vercel.
5. Configure required environment variables.
6. Deploy the application.
7. Open the production URL.
8. Test the application's critical functionality.
9. Test Firebase authentication.
10. Test persistent data.
11. Inspect the browser console for production errors.
12. Configure the assigned domain or subdomain.
13. Configure the required Cloudflare DNS records.
14. Verify the domain connects successfully.
15. Verify HTTPS.
16. Test the application again using the custom domain.
17. Verify basic page metadata.
18. Verify or create robots.txt where appropriate.
19. Verify or create the sitemap where appropriate.
20. Configure Google Search Console.
21. Configure Bing Webmaster Tools.
22. Submit or verify the sitemap where appropriate.
23. Run the production URL through PageSpeed Insights.
24. Review the results.

25. Identify one meaningful improvement.
26. Implement and test the improvement.
27. Commit and push the change.
28. Verify the new Vercel deployment.
29. Retest the production website.
30. Document the final production URL.

Success Criteria

Participants have successfully completed the exercise when:

- [ ] Their application is deployed through Vercel
- [ ] The production deployment loads successfully
- [ ] Required environment variables are configured
- [ ] Firebase authentication works in production
- [ ] Persistent data works in production
- [ ] Their custom domain or assigned subdomain resolves correctly
- [ ] HTTPS works
- [ ] Critical application functionality has been tested in production
- [ ] Basic search engine discovery requirements have been reviewed
- [ ] Google Search Console has been configured or demonstrated
- [ ] Bing Webmaster Tools has been configured or demonstrated
- [ ] The production website has been analyzed with PageSpeed Insights
- [ ] At least one meaningful improvement has been identified
- [ ] The final production URL is ready to share

AI Prompts

Prompt 1: Production Readiness Review

> Review this project for production readiness before I deploy it.
>
> Do not make any changes yet.

> Inspect the application and identify:
>
> 1. Required environment variables
> 2. Build or deployment concerns
> 3. Firebase configuration concerns
> 4. Client-side errors that could appear in production
> 5. Routing concerns
> 6. Security concerns
> 7. Missing production configuration
>
> Prioritize issues that could prevent the application from functioning after deployment.

Purpose:

Encourage participants to use AI for pre-deployment review rather than deploying blindly.

Prompt 2: Diagnose a Failed Deployment

> My Vercel deployment failed.
>
> Here is the relevant deployment output:
>
> [PASTE ERROR]
>
> The application works locally using:
>
> [LOCAL COMMAND]
>
> Before changing anything, identify the most likely root cause from the deployment evidence. Explain your reasoning and recommend the smallest appropriate fix. Do not modify unrelated functionality.

Purpose:

Reinforce evidence-based debugging in a production environment.

Prompt 3: PageSpeed Analysis

> I ran my production website through Google PageSpeed Insights.
>
> These are the most important findings:
>
> [PASTE FINDINGS]

> Review the existing project and determine which findings are actionable in the codebase.
>
> Prioritize the improvements based on:
>
> 1. User impact
> 2. Performance impact
> 3. Accessibility impact
> 4. Implementation effort
> 5. Risk of breaking existing functionality
>
> Do not make changes yet. Give me a prioritized optimization plan first.

Purpose:

Teach participants to interpret automated analysis rather than blindly chasing a score.

Prompt 4: SEO and Indexing Review

> Review this website's codebase for basic technical SEO and search engine discoverability.
>
> Check for:
>
> - Page titles
> - Meta descriptions
> - Semantic HTML
> - Heading structure
> - robots.txt
> - Sitemap
> - Important public routes
> - Broken internal links
> - Other obvious indexing problems
>
> Explain each issue and its impact before making changes.

Purpose:

Use AI as a review assistant while ensuring participants understand why each recommendation matters.

Common Problems

Problem 1: Application Works Locally but Vercel Build Fails

Symptoms:

The local development server works, but Vercel reports a failed deployment.

Likely Cause: Possible causes include build errors, missing dependencies, environment variables, incorrect project configuration, case-sensitive file paths, or code that behaves differently during production builds.

How to Investigate: Read the Vercel build logs and identify the first meaningful error.

Instructor Hint:

Ask: "What specifically failed according to the deployment log?"

Solution: Address the identified build problem rather than making unrelated changes.

Problem 2: Website Deploys but Firebase Does Not Work

Symptoms: The website loads, but authentication or Firestore functionality fails.

Likely Cause: Production configuration, environment variables, Firebase settings, authorization configuration, or application logic.

How to Investigate: Compare local and production behavior. Inspect the browser console and network activity.

Instructor Hint:

Ask: "What changed between localhost and production?"

Solution: Isolate the production-specific configuration or behavior before modifying application logic.

Problem 3: Custom Domain Does Not Load

Symptoms: The Vercel URL works but the custom domain does not.

Likely Cause: Incorrect DNS records, incomplete verification, conflicting records, or DNS propagation.

How to Investigate:

Check the domain status in Vercel and compare the required DNS configuration with Cloudflare.

Instructor Hint:

Ask: "Does the application fail, or does the request never reach the application?"

Solution: Correct the DNS or domain configuration based on the evidence.

Problem 4: PageSpeed Score Is Lower Than Expected

Symptoms: The application functions correctly but PageSpeed identifies performance, accessibility, SEO, or best-practice issues.

Likely Cause: Possible causes include large assets, inefficient loading, accessibility problems, metadata issues, layout behavior, or application implementation choices.

How to Investigate: Read the individual findings instead of focusing only on the overall score.

Instructor Hint:

Ask: "Which finding has the greatest impact on the actual user experience?"

Solution: Select a meaningful issue, understand the recommendation, make a focused improvement, redeploy, and retest.

Problem 5: Website Is Not Immediately Appearing in Search Results

Symptoms: The website is deployed but cannot immediately be found through Google or Bing search.

Likely Cause: Deployment and indexing are separate processes. Search engines may not have discovered or indexed the website yet.

How to Investigate: Check accessibility, indexing configuration, webmaster tools, sitemap status, and URL inspection information where available.

Instructor Hint:

Ask: "Is the website unavailable, or has the search engine simply not indexed it yet?"

Solution: Verify that the website is crawlable and properly submitted where appropriate. Explain that indexing and ranking are not necessarily immediate.

Instructor Notes

- Keep deployment practical rather than turning the session into a detailed networking lecture
- Explain DNS only to the depth participants need to configure and troubleshoot their application
- Make participants verify production functionality rather than celebrating immediately when Vercel says the deployment succeeded
- Test Firebase again after deployment
- Encourage participants to read Vercel logs when deployments fail
- Use DNS problems to reinforce layered debugging
- Explain that Google indexing and Bing indexing may not happen immediately
- Do not promise that submitting a website guarantees indexing or ranking
- Do not make PageSpeed scores the objective of the workshop
- Focus on understanding and addressing meaningful findings
- Encourage participants to make one optimization at a time and retest
- Continue using the debugging methodology from Day 2
- Reserve enough time for instructors to assist participants with individual deployment problems

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Participant Questions

Record useful questions that come up during practice sessions or the actual workshop.

- TBD during workshop

Resources

Documentation

- Vercel documentation
- Cloudflare DNS documentation
- Firebase documentation
- Google Search Console documentation
- Bing Webmaster Tools documentation
- Google PageSpeed Insights documentation
- Google Search documentation for robots.txt and sitemaps

References

- Deployment checklist
- DNS cheat sheet
- Production verification checklist
- Search engine indexing checklist
- PageSpeed optimization checklist
- AI production debugging prompts

Examples

- Example Vercel deployment
- Example DNS configuration
- Example custom domain
- Example robots.txt
- Example sitemap
- Example Search Console property
- Example Bing Webmaster Tools property
- Example PageSpeed report

Workshop Materials

Slides/Html

Create a presentation covering:

- Local vs. production
- GitHub to Vercel deployment workflow
- Environment variables
- Production testing
- Domains and DNS
- Cloudflare
- Search engine discovery
- Google Search Console
- Bing Webmaster Tools
- robots.txt and sitemaps
- PageSpeed Insights
- Production debugging
- Optimization and redeployment

Handout / Cheat Sheet

Create a production checklist containing:

Before deployment:

Local Test → Commit → Push → Production Configuration

Deployment:

GitHub → Vercel → Build → Production URL

Domain:

Domain → Cloudflare DNS → Vercel → HTTPS

Verification:

Load → Navigate → Authenticate → Read/Write Data → Console → Network

Discovery:

Metadata → robots.txt → Sitemap → Google → Bing

Optimization:

PageSpeed → Prioritize → Improve → Commit → Deploy → Retest

Repository

Use the same practice application from Day 1 and Day 2.

The Day 3 version should be deployable but should not reveal the competition application or its solution.

Additional Files

- Deployment checklist
- DNS cheat sheet
- Production verification checklist
- Search engine indexing checklist
- PageSpeed checklist
- Production debugging prompt sheet

End-of-Workshop Check

Participants should be able to demonstrate:

- [ ] A working Vercel production deployment
- [ ] A connected custom domain or assigned subdomain
- [ ] Correct DNS configuration

- [ ] HTTPS access
- [ ] Working authentication in production
- [ ] Working persistent data in production
- [ ] Successful production functionality testing
- [ ] Understanding of robots.txt and sitemaps
- [ ] Understanding of Google Search Console
- [ ] Understanding of Bing Webmaster Tools
- [ ] A PageSpeed Insights report for the production website
- [ ] At least one identified improvement
- [ ] Ability to investigate a production failure using evidence
- [ ] A final production URL that can be shared with others

Improvements for Next Time

Complete this section after delivering the workshop.

What worked well:

What caused confusion:

What should be changed:

What took longer than expected:

Participant feedback: