DevOps for Databases

Slides up at scottsauber.com

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Audience

- Developers + DBA's who want to automate their database builds and deployments
- Unsure where to get started
- Poll
  - Devs?
  - DBAs?
  - Managers?
  - Other?

Agenda

- What choices do I need to make?
- What are the tradeoffs?
- What tools are out there?
- What hurdles will I face?
- Demo
- Questions

Goals

- Ramp up on how to implement automation to your databases
- Know the options and tradeoffs of different approaches and tools

Who am I?

- Director of Engineering at Lean TECHniques
- Co-organizer of Iowa .NET User Group
- Automated dozens of databases
- Friend of Redgate
- Blog at scottsauber.com
- Developer – not a DBA

Typical manual workflows for database changes

- Devs write, review, and deploy the SQL
- Devs write the SQL and give to DBA to review and deploy
- Devs tell DBA’s what they want, DBA’s write, review and deploy the SQL

What a manual workflow may look like today

- Compare approach (i.e. RedGate SQL Compare, pgadmin4)
  - Developer/DBA works on a development DB
  - That DB is then compared to a Prod or Prod-like DB to compare changes
  - Tool generates script to deploy
  - Script is deployed to Prod
- Gather SQL Scripts approach
  - Developer/DBA works on a development DB
  - Developer/DBA accumulates scripts
  - Developer/DBA runs scripts against Prod

What's wrong with these approaches?

- No Source Control
  - No traceability
- Manual
  - Tedious
  - Easy for mistakes
  - Script order can get out of whack
- Development DB + Prod DB could be out of sync
  - Changes in behavior
  - Overwriting others (sprocs, views)
- Hard to pull in others changes (no forced CI)

“DevOps is the union of people, process, and products to enable continuous delivery of value to our end users.”

Donovan Brown

Microsoft

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“You can’t change culture and process with a credit card.”

Julie Gunderson

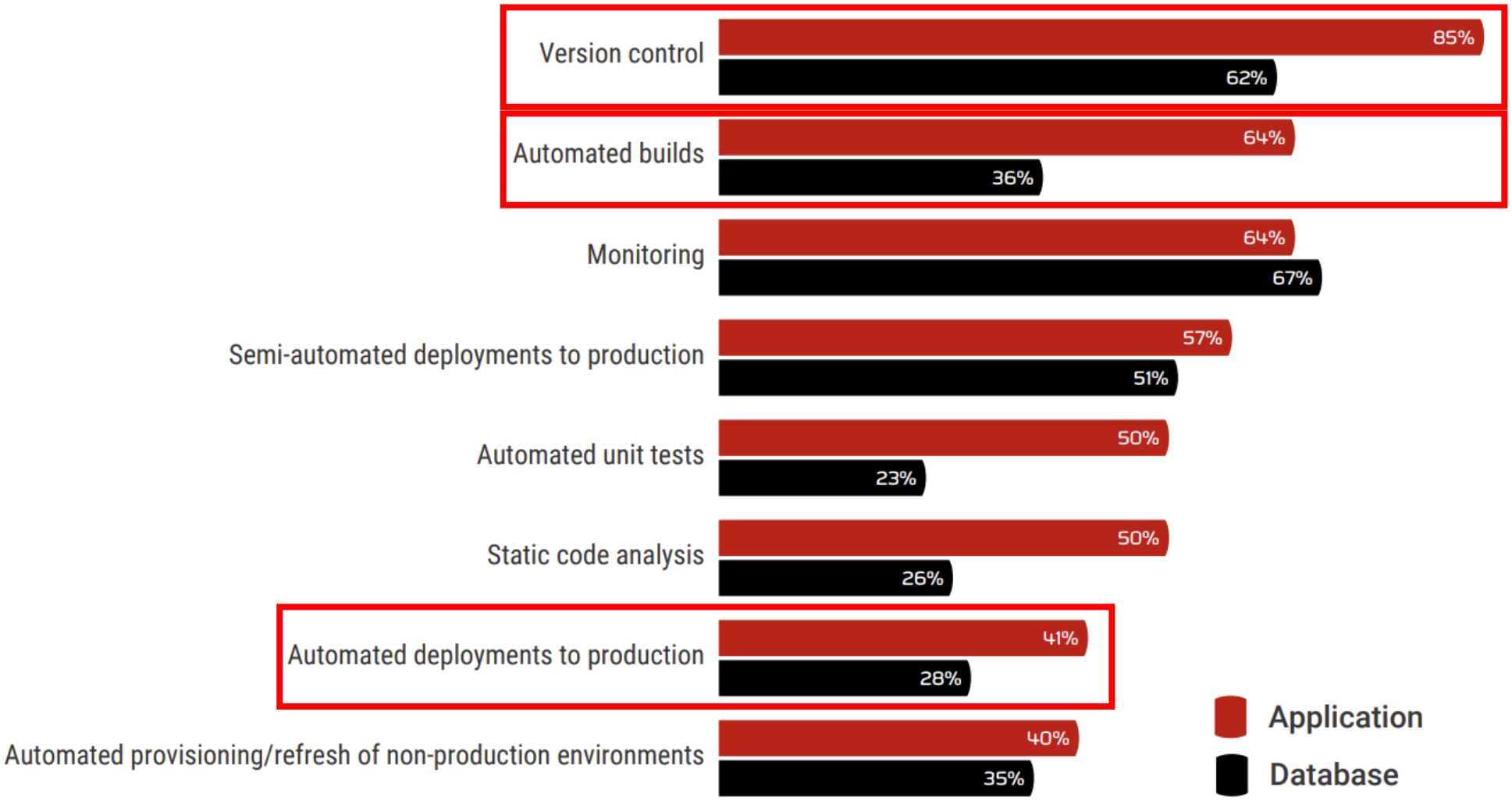
Pager Duty

Desired Outputs of Database DevOpsifying

In order of importance:

1. Database is source controlled
2. Database deployments are at most a single click of a button
3. Database builds for verification on each commit

Adoption of DevOps practices: application vs. databases



Why is this hard?

- 72%+ of companies do not have automated builds and deploys for their databases
- Source Control traditionally not built-in to Database tools (SSMS)
- Sins have been committed in your legacy databases over time
  - Linked servers, DB hopping
- Requires Devs + DBA's to talk to each other
- DBA's think they are getting cut out
- Spoiler: they're not. The crappy part of their job is, so they can do more value add work.

Why is this hard?

- The database is stateful, applications are not (or shouldn’t be.)
- Rollback of an app is “delete all these files and replace them with these ones….”
- Rollback of a database requires thought

Why is this hard?

- It’s a lot easier on greenfield databases
- Start it from the very beginning of a new database

Let’s get to DevOpsing

Source Control: What

- Schema Structure
  - Tables, Views, Stored Procedures, etc.
- Static Data
  - Data required for the application to run successfully
  - Lookup Tables, Roles table for users in a system, Configuration values, etc.

Source Control: How - Methodologies

- Model-based
- Migration-based

Source Control: Model-based

- Build an “ideal model” of your DB.
- Let a tool figure out how to migrate your Production DB to that ideal model.
- Examples of tools: Redgate SQL Source Control and Microsoft DACPAC
- I do not prefer this approach
  - Scenarios like Column Renames
  - Minimal insight into “how” it got there.
- This approach is losing mindshare

Source Control: Migration-based

- Every change is scripted
- Scripts are committed to source control
- Scripts run in order (date-based or #-based)
- Which scripts have run are kept track in a table
- Write them up front during dev
- Run the same scripts in every environment
- Examples of tools: Flyway, EF Migrations, DbUp, and RoundhousE
- Migration-based is my preferred approach

Source Control: How

- Database Code + Application Code should live together in the same Source Control Repository
  - Assuming not a shared database between many apps
- One Pull Request/Commit for the application code and SQL code
- Ideally Final Schema and Migrations live together

Automated Builds: How

- Responsibilities:
  - Take migrations and deploy them to an independent DB
  - Spin up new DB for you or have dedicated CI DB
- Use a Build tool
- GitHub Actions
- Azure DevOps
- Jenkins
- TeamCity

Automated Deployments: How

- Responsibilities:
  - Deploy to each Environment
  - Swap out secrets (i.e. connection strings)
- Use Deployment tool
- Octopus Deploy
- GitHub Actions
- Azure DevOps
- Jenkins
- TeamCity

Proposed Workflow

1. Developer adds their application code and SQL code
2. Developer commits to a branch and sends a Pull Request for code review
3. Another developer reviews the application code
4. DBA/senior person reviews SQL code
5. When both are approved, the code is merged into main
6. Code is built independently to verify the commit
7. Deployments are then a button push

Demo using
Flyway + GitHub Actions

Common Gotcha's Building The Database

- You will pay for the sins of your ancestors
- Linked Servers
- Cross-Database Hopping
- Old Stored Procedures or Views Referencing Old Tables/Columns
- Multi-tenant challenges

A Word On Rollbacks

- They are usually not worth the headache
- Why did the deployments succeed in Dev, UAT, etc. but not in Production?
  - Almost always a failure in people and/or process
- How do you rollback something destructive (DROP, DELETE, TRUNCATE, etc.)?
- Contextual
- Tradeoffs
  - Restore from backup but lose data in between deployment and restore.
- Instead: Roll forward

People Challenges

- Mindset shift
- The more you can force “no one has Prod” access the better
- Force everything to go through the pipeline.
- Danny the Deployer
  - Doesn’t fully buy in to Source Controlling the DB
  - Goes directly to Prod without Source Controlling
  - Inevitably causes pain later
  - “I’ll just do this, this one time.”
- Devs + DBA’s Need To Work Together
- Customer focus

Takeaways

- Choose a migrations-based approach
- Source Control your DB
- Auto Deploy the Source Controlled Migrations
- Tools you can use
- Gotcha’s – tools, existing DB sins, and people

You can do this…

…does your organization want to?

Resources

- https://github.com/scottsauber/database-devops
- Redgate Simple Talk Blogs
- Redgate Database DevOps Blogs
- State of DB DevOps 2021 Survey
- DB DevOps with Jeffrey Palermo and Paul Stovell

Questions?

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Thanks!

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