

Bashmatic™ - BASH primitives for humans and for
fun.

Table of Contents

1. Introduction	2
1.1. Compatibility	3
2. Project Motivation	4
3. Installing Bashmatic	5
3.1. Bootstrapping <i>Bashmatic</i> ® using curl	5
3.2. What Installer Does	6
3.3. Manual Installation	6
3.3.1. 1. Using Git	6
3.3.2. 2. Using Curl	7
3.4. Reloading Bashmatic	7
4. Using the Makefile	8
4.1. What can the Makefile do?	8
4.2. Docker Support	9
5. Bashmatic in Action - Practical Examples	10
5.1. Example (A): Install Gems via Homebrew	10
5.2. Example (B): Download and install binaries	10
5.3. Example (C): Developer Environment Bootstrap Script	11
5.4. Example (D): Installing GRC Colourify Tool	13
5.5. Example (E): Database Utilities & dbtop	13
6. Usage	16
6.1. Function Naming Convention Unpacked	16
6.2. Seeing All Functions	16
6.3. Seeing Specific Functions	17
6.4. Various Modules	17
6.5. Key Modules Explained	17
6.5.1. 1. Runtime	17
Runtime Framework in Depth	18
Examples of Runtime Framework	18
6.5.2. 2. Output Modules	19
Output Components	21
Output Helpers	21
6.5.3. 3. Package management: Brew and RubyGems	21
6.5.4. 4. Shortening URLs and Github Access	22
Github Access	22
6.5.5. 5. File Helpers	23
6.5.6. 6. Array Helpers	23
6.5.7. 7. Utilities	24
6.5.8. 8. Ruby and Ruby Gems	24
Gem Helpers	25
6.5.9. 9. Additional Helpers	26

7. How To....	27
7.1. Write new DSL in the <i>Bashmatic</i> ® Style	27
7.2. How can I test if the function was ran as part of a script, or "sourced-in"?	27
7.3. How do I run unit tests for Bashmatic?	28
7.4. How can I change the underscan or overscan for an old monitor?	28
7.5. Contributing	29
8. License	30

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Chapter 1. Introduction

Bashmatic® is a BASH framework, meaning its a collection of BASH functions (500+ of them) that, we hope, make BASH programming easier, more enjoyable, and more importantly, usable due to the focus on providing constant feedback to the user about what is happening, as a script that uses Bashmatic is running.

Bashmatic®s programming style is heavily influenced by Ruby's DSL languages. If you take a quick look at the [is.sh](#) script, it defines a bunch of DSL functions that can be chained with `&&` and `||` to create a compact and self-documenting code like this:



```
function bashmatic.auto-update() {
  local dir
  dir=${1:-${BASHMATIC_HOME}}
  is.a-directory "${dir}" && {
    file.exists-and-newer-than "${dir}/.last-update" 30 && return 0

    ( cd ${BASHMATIC_HOME} && \
      git.is-it-time-to-update && \
      git.sync-remote )
  }
}

# check if the function is defined and call it
is.a-function.invoke bashmatic.auto-update "$@"
```

To use it in your own scripts, you'll want to first study the Examples provided below, and take advantage of each module available under `lib`.

Final note, - once Bashmatic is installed and loaded by your shell init files, you can type `is.<tab><tab>` to see what functions are available to you that start with `is`. Each module under `lib` typically defines public functions starting with the name of the file. Such as, functions in `array.sh` typically start with `array.<something>.<action>`

Bashmatic® offers a huge range of ever-growing helper functions for running commands, auto-retrying, repeatable, runtime-measuring execution framework with the key function `run`. There are helpers for every occasion, from drawing boxes, lines, headers, to showing progress bars, getting user input, installing packages, and much more.



Some portion of helperse within *Bashmatic*® are written for OS-X, although many useful functions will also work under linux. Our entire test suite runs on Ubuntu. There is an effort underway to convert Homebrew-specific functions to OS-neutral helpers such as `package.install` that would work equally well on linux.

Start exploring *Bashmatic*® below with our examples section. When you are ready, the complete entire set of pubic functions (nearly 500 of those) can be found in the [functions index page](#).

And, finally, don't worry, *Bashmatic*® is totally open source and free to use and extend. We just like the way it looks with a little ® :)



You can also download the [PDF version of this document](#) which is better for print.

- We recently began providing function documentation using a fork of [shdoc](#) utility. You can find the auto-generated documentation in the [USAGE](#) file, or it's [PDF](#) version.
- There is also an auto-generated file listing the source of every function and module. You can find it [FUNCTIONS](#).
- Additionally please checkout the [CHANGELOG](#) and the [LICENSE](#).

1.1 Compatibility

- BASH version 4+
- BASH version 3 (partial compatibility, some functions are disabled)
- ZSH – as of recent update, Bashmatic is almost 100% compatible with ZSH.

Not Supported

- FISH (although you could use Bashmatic via [bin/bashmatic](#) script helper, or its executables)

Chapter 2. Project Motivation

This project was born out of a simple realization made by several very senior and highly experienced engineers, that:

- It is often easier to use BASH for writing things like universal **installers**, a.k.a. **setup scripts, uploaders**, wrappers for all sorts of functionality, such as **NPM**, **rbenv**, installing gems, rubies, using AWS, deploying code, etc.
- BASH function's return values lend themselves nicely to a compact DSL ([domain specific language](#)) where multiple functions can be chained by logical AND **&&** and OR **||** to provide a very compact execution logic. Most importantly, we think that this logic is **extremely easy to read and understand**.

Despite the above points, it is also generally accepted that:

- A lot of BASH scripts are very poorly written and hard to read and understand.
- It's often difficult to understand what the hell is going on while the script is running, because either its not outputting anything useful, OR it's outputting way too much.
- When BASH errors occur, shit generally hits the fan and someone decides that they should rewrite the 20-line BASH script in C++ or Go, because, well, it's a goddamn BASH script and it ain't working.



Bashmatic's goal is to make BASH programming both fun, consistent, and provide plenty of visible output to the user so that there is no mystery as to what is going on.

Chapter 3. Installing Bashmatic

Perhaps the easiest way to install *Bashmatic*® is using this boot-strapping script.

3.1. Bootstrapping Bashmatic® using `curl`

First, make sure that you have Curl installed, run `which curl` to see. Then copy/paste this command into your Terminal.



The shortcut link resolves to the HEAD version of the `bin/bashmatic-install` script in Bashmatic Repo.



```
bash -c "$(curl -fsSL https://bashmatic.rel.re); \  
bashmatic-install"
```

You can pass additional flags to the `bashmatic-install` function, including: * `-v` or `--verbose` for displaying additional output, or the opposite: * `-q` or `--quiet` for no output * If you prefer to install Bashmatic in a non-standard location (the default is `~/.bashmatic`), you can use the `-H PATH` flag

For instance, here is a verbose installation with a custom destination:

```
bash -c "$(curl -fsSL https://bashmatic.rel.re); \  
bashmatic-install -v -H ~/workspace/bashmatic"
```

Here is the complete list of options accepted by the installer:

```
$ bashmatic-install --help  
  
USAGE:  
  bin/bashmatic-install [ flags ]  
  
DESCRIPTION:  
  Install Bashmatic, and on OSX also installs build tools, brew and latest bash  
  into /usr/local/bin/bash.  
  
FLAGS:  
  -H, --bashmatic-home PATH      Install bashmatic into PATH (default: ~/.bashmatic)  
  -V, --bash-version VERSION     Install BASH VERSION (default: 5.1-rc2)  
  -P, --bash-prefix PATH         Install BASH into PATH (default: /usr/local)  
  -g, --skip-git                 Do not abort if the destination has local changes  
  -i, --skip-install             Only install/verify prerequisites, skip install.  
  -v, --verbose                  See additional output as bootstrap is running.  
  -q, --quiet                    See only error output.  
  -d, --debug                    Turn on 'set -x' to see all commands running.  
  -h, --help                     Show this help message.
```


3.2. What Installer Does

When you run `bash -c "$(curl -fsSL https://bashmatic.re1.re); bashmatic-install"`, the following typically happens:

- `curl` downloads the `bin/bashmatic-install` script and passes it to the built-in BASH for evaluation.
- Once evaluated, function `bashmatic-install` is invoked, which actually performs the installation.
 - This is the function that accepts the above listed arguments.
- The script may ask for your password to enable sudo access - this may be required on OS-X to install XCode Developer tools (which include `git`)
- If your version of BASH is 3 or older, the script will download and build from sources version 5+ of BASH, and install it into `/usr/local/bin/bash`. SUDO may be required for this step.
- On OS-X the script will install Homebrew on OS-X, if not already there.
 - Once Brew is installed, brew packages `coreutils` and `gnu-sed` are installed, as both are required and are relied upon by Bashmatic.
- The script will then attempt to `git clone` the bashmatic repo into the Bashmatic home folder, or - if it already exists - it will `git pull` latest changes.
- Finally, the script will check your bash dot files, and will add the hook to load Bashmatic from either `~/.bashrc` or `~/.bash_profile`.

Restart your shell, and make sure that when you type `bashmatic.version` in the command line (and press Enter) you see the version number printed like so:

```
$ bashmatic.version
1.9.1
```

If you get an error, perhaps *Bashmatic*® did not properly install.

Next, to discover the breadth of available functions, type the following command to see all imported shell functions:

```
# Numeric argument specifies the number of columns to use for output
$ bashmatic.functions 3
```

3.3. Manual Installation

To install Bashmatic manually, follow these steps (feel free to change `BASHMATIC_HOME` if you like):

3.3.1 1. Using Git

```
export BASHMATIC_HOME="${HOME}/.bashmatic"
test -d "${BASHMATIC_HOME}" || \
  git clone https://github.com/kigster/bashmatic.git "${BASHMATIC_HOME}"
cd "${BASHMATIC_HOME}" && ./bin/bashmatic-install -v
cd ->/dev/null
```

3.3.2 Using Curl

Sometimes you may not be able to use `git` (I have seen issues ranging from local certificate mismatch to old versions of git, and more), but maybe able to download with `curl`. In that case, you can lookup the [latest tag](#) (substitute "v1.6.0" below with that tag), and then issue this command:

```
export BASHMATIC_TAG="v1.7.1"
set -e
cd ${HOME}
curl --insecure -fSsl \
  https://codeload.github.com/kigster/bashmatic/tar.gz/${BASHMATIC_TAG} \
  -o bashmatic.tar.gz
rm -rf .bashmatic && tar xvzf bashmatic.tar.gz && mv bashmatic-${BASHMATIC_TAG} .bashmatic
source ~/.bashmatic/init.sh
cd ${HOME}/.bashmatic && ./bin/bashmatic-install -v
cd ~ >/dev/null
```

3.4. Reloading Bashmatic

You can always reload *Bashmatic*® with `bashmatic.reload` function.

Chapter 4. Using the Makefile

The top-level **Makefile** is mostly provided as a convenience around scripts that auto-generate documentation.

You can run **make help** and read the available targets:

```
kig/makefile © kg ~/.bashmatic
> make
help                Prints help message auto-generated from the comments.
install             install BashMatic Locally in ~/.bashmatic
setup              Run the comprehensive development setup on this machine
test               Run the fully auto-g mated test suite
update             Runs all of the updates, add locally modiofied files to git.
update_changelog   Auto-generate the doc/CHANGELOG (requires GITHUB_TOKEN env var set)
update_functions   Auto-generate doc/FUNCTIONS index at doc/FUNCTIONS.adoc/pdf
update_readme      Re-generate the PDF version of the README
update_usage       Auto-generate doc/USAGE documentation from lib shell files, to doc/USAGE.adoc/pdf
kig/makefile © kg ~/.bashmatic
> make update_readme
  ↪ Converting README.adoc into the PDF...
✓  gem asciidoctor (asciidoc) is already installed
✓  checking for 🍷 imagemagick@6...
✓  > gem install prawn-gmagick -- --with-opt-include=/usr/local/opt/imagemagick ( 3934 ms ) 0
✓  > rm -f README.pdf ( 12 ms ) 0
✓  > asciidoctor-pdf -v -a allow-uri-read README.adoc ( 4379 ms ) 0
✓  > open README.pdf ( 146 ms ) 0

  ↪ Reducing the PDF Size...
```

4.1. What can the Makefile do?

Makefile is provided as a convenience for running most common tasks and to simplify running some more complex tasks that require remembering many arguments, such as **make setup**, for example.

You might want to use the Makefile for several reasons:

- To run your local computer setup for software development:

```
make setup
```

This runs **bin/dev-setup** script with the following actions: **dev**, **cpp**, **fonts**, **gnu**, **go**, **java**, **js**, **load-balancing**, **postgres**, **ruby**

- To install Bashmatic with

```
make install
```

Or, if you plan on contributing to the framework:

- You can run the test suite with:

```
make test -B
```

- To update function index, re-generate the latest PDFs of README, USAGE or the CHANGELOG files:

`make update`



Running `make update` is required for submitting any pull request.

4.2 Docker Support

Bashmatic comes with a Dockerfile that can be used to run tests, validate functionality under linux, or to experiment.

Run `make docker-build` to create an docker image `bashmatic:latest`.

Run `make docker-run-bash` (or `···-zsh` or `···-fish`) to start a container with your favorite shell.

Chapter 5. Bashmatic in Action – Practical Examples

Why do we need another BASH framework?

BASH is known to be too verbose and unreliable. We beg to differ. This is why we wanted to start this README with a couple of examples.

5.1 Example (A): Install Gems via Homebrew

Just look at this tiny, five-line script:

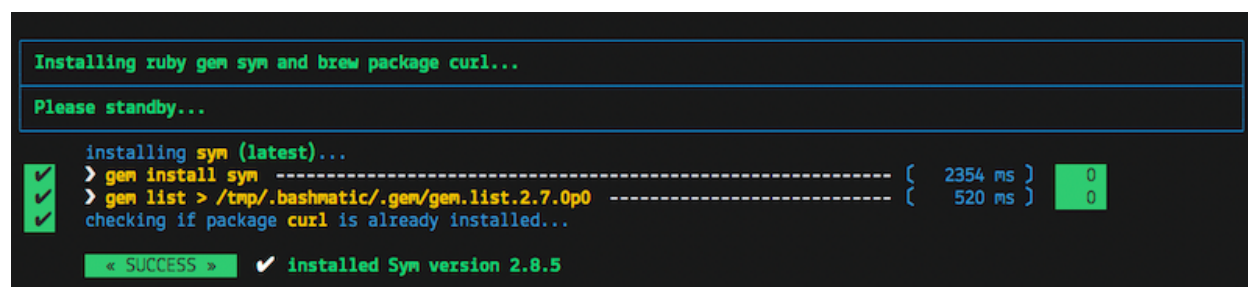
```
#!/usr/bin/env bash

source ${BASHMATIC_HOME}/init.sh

h2 "Installing ruby gem sym and brew package curl..." \
  "Please standby..."

gem.install "sym" && brew.install.package "curl" && \
  success "installed sym ruby gem, version $(gem.version sym)"
```

Results in this detailed and, let's be honest, *gorgeous* ASCII output:



```
Installing ruby gem sym and brew package curl...
Please standby...

installing sym (latest)...
> gem install sym ----- ( 2354 ms ) 0
> gem list > /tmp/.bashmatic/.gem/gem.list.2.7.0p0 ----- ( 520 ms ) 0
checking if package curl is already installed...

« SUCCESS » ✓ installed Sym version 2.8.5
```

Tell me you are not at all excited to start writing complex installation flows in BASH right away?

Not only you get pretty output, but you can see each executed command, its exit status, whether it's been successful (green/red), as well as each command's bloody duration in milliseconds. What's not to like!?

Still not convinced?

Take a look at a more comprehensive example next.

5.2 Example (B): Download and install binaries.

In this example, we'll download and install binaries `kubectl` and `minikube` binaries into `/usr/local/bin`

We provided an example script in `examples/k8s-installer.sh`. Please click and take a look at the source.

Here is the output of running this script:

```
kig/fix-k8s-example {1} S:5 U:1 @ kg ~/.bashmatic 19:27:24 ⚡ 100%
> examples/k8s-installer.sh

This script downloads and installs several executables, such as: kubectl minikube

Binaries are downloaded into the /tmp folder
Press any key to continue, or Ctrl-C to abort.

Setting up kubectl...

✓ > curl -L https://storage.googleapis.com/kubernetes-release/release/v1.2 ..... [ 2608 ms ] 0
✓ > chmod 755 /tmp/kubectl ..... [ 11 ms ] 0
✓ > [[ -f /usr/local/bin/kubectl ]] && mv /usr/local/bin/kubectl /usr/loca ..... [ 9 ms ] 0
✓ > mv /tmp/kubectl /usr/local/bin/kubectl ..... [ 10 ms ] 0

✓ verifying kubectl is valid...

Setting up minikube...

✓ > curl -L https://storage.googleapis.com/minikube/releases/latest/miniku ..... [ 2896 ms ] 0
✓ > chmod 755 /tmp/minikube ..... [ 11 ms ] 0
✓ > [[ -f /usr/local/bin/minikube ]] && mv /usr/local/bin/minikube /usr/lo ..... [ 8 ms ] 0
✓ > mv /tmp/minikube /usr/local/bin/minikube ..... [ 11 ms ] 0

✓ verifying minikube is valid...

« SUCCESS » ✓ Install successful, 2 binaries were installed in /usr/local/bin...
```

Why do we think this type of installer is pretty awesome, compared to a silent but deadly shell script that "Jim-in-the-corner" wrote and now nobody understands?

Because:

1. The script goes out of its way to over-communicate what it does to the user.
2. It allows and reminds about a clean getaway (Ctrl-C)
3. It shares the exact command it runs and its timings so that you can eyeball issues like network congestions or network addresses, etc.
4. It shows in green exit code '0' of each command. Should any of the commands fail, you'll see it in red.
5. It's source code is terse, explicit, and easy to read. There is no magic. Just BASH functions.



If you need to create a BASH installer, *Bashmatic*® offers some incredible time savers.

Let's get back to the Earth, and talk about how to install Bashmatic, and how to use it in more detail right after.

5.3. Example (C): Developer Environment Bootstrap Script

This final and most feature-rich example is not just an example – **it's a working functioning tool that can be used to install a bunch of developer dependencies on your Apple Laptop.**



the script relies on Homebrew behind the scenes, and therefore would not work on linux or Windows (unless Brew gets ported there).

It's located in `bin/dev-setup` and has many CLI flags:

```
Bashmatic Mac-OSX DevSetup Installer Version 0.3.0

USAGE:      dev-setup [ flags ]

DESCRIPTION:  Installs various packages via Homebrew.

FLAGS:
  -a / --all           Installs everything
  -g / --groups        Installs dev + specified groups of packages and casks.
                       Can be space separated array, eg -g 'ruby js monitoring'
                       Note that dev group is always installed, unless --no-dev.
  -d / --no-dev        Skips dev when used with -g flag.

  -C / --no-callbacks  Skip executing group callbacks when installing
  -c / --only-callbacks Skip main installers, and only run the callbacks.

  -r / --ruby-version VERSION  Ruby version, overrides default
  -p / --pg-version VERSION    PostgreSQL version, overrides
  -m / --mysql-version VERSION  MySQL version, overrides

  -v / --verbose          Print extra debugging info
  -e / --exit-on-error    Abort if an error occurs. Default is to keep going.
  -n / --dry-run          Only print commands, but do not run them
  -q / --quiet            Do not print as much output.

GROUPS:
  bazel, caching, cpp, dev, fonts
  gnu, go, java, js, load-balancing, monitoring
  mysql, postgres, python, ruby

This script installs groups of Brew packages and Casks, organized by a programming
language or a stack. Each group may register some of its members as Brew services
to be started (such as PostgreSQL and MySQL).

Additionally, each group may optionally register a shell function to run as a
callback at the end. For instance, Ruby's callback might be to run bundle install
if the Gemfile file is found.

You can disable running of callbacks with -C / --no-callbacks flag.

EXAMPLES

# Installs the following packages, and ruby 2.7.1 with PostgreSQL version 10
> dev-setup -g 'dev caching fonts gnu js postgres ruby' -r 2.7.1 -p 10

# Dry run to see what would be installed
> dev-setup -n -g 'cpp gnu fonts load-balancing'
```

In the example below we'll use `dev-setup` script to install the following:

- Dev Tools
- PostgreSQL
- Redis
- Memcached
- Ruby 2.7.1
- NodeJS/NPM/Yarn

Despite that this is a long list, we can install it all in one command.

We'll run this from a folder where our application is installed, because then the Ruby Version will be auto-detected from our `.ruby-version` file, and in addition to installing all the dependencies the script will also run `bundle install` and `npm install` (or `yarn install`). Not bad, huh?

```
${BASHMATIC_HOME}/bin/dev-setup \
-g "ruby postgres mysql caching js monitoring" \
-r $(cat .ruby-version) \
-p 9.5 \ # use PostgreSQL version 9.5
-m 5.6  # use MySQL version 5.6
```

This compact command line installs a ton of things, but don't take our word for it - run it yourself. Or, at the very least enjoy this [one extremely long screenshot](#) :)

5.4. Example (D): Installing GRC Colourify Tool

This is a great tool that colorizes nearly any other tool's output.

Run it like so:

```
${BASHMATIC_HOME}/bin/install-grc
```

You might need to enter your password for SUDO.

Once it completes, run `source ~/.bashrc` (or whatever shell you use), and type something like `ls -al` or `netstat -rn` or `ping 1.1.1.1` and notice how all of the above is nicely colored.

5.5. Example (E): Database Utilities & `dbtop`


If you are using PostgreSQL, you are in luck! Bashmatic includes numerous helpers for PostgreSQL's CLI utility `psql`.

Before you begin, we recommend that you install file `.psqlrc` from Bashmatic's `conf` directory into your home folder. While not required, this file sets up your prompt and various macros for PostgreSQL that will come very handy if you use `psql` with any regularity.

What is `dbtop` anyway?


Just like with the regular `top` you can see the "top" resource-consuming processes running on your local system, with `dbtop` you can observe a self-refreshing report of the actively running queries on up to **three database servers** at the same time.

Here is the pixelated screenshot of **dbtop** running against two live databases:

Database:  Active Queries (refresh: 0.5secs, Max Queries Shown: 16):

pid	client	state	duration	query
19069	172.16.0.10:32:16316	active		
660	172.16.0.10:32:43534	active		
16544	172.16.0.10:2:60204	active		
29311	10.10.10.10:2:58516	active	07:44:05.646319	INSERT INTO "public"."table" (
13290	10.10.10.10:46914	idle in tr	04:00:26.564217	SELECT typinput='array_in':reg
13290	10.10.10.10:46914	idle in tr	04:00:26.564217	SELECT typinput='array_in':reg
11666		active	01:00:50.898285	autovacuum: VACUUM ANALYZE publ
6031	10.10.10.10:/32:55831	active	00:00:00.027319	SELECT "public"."locator", "R
5636	10.10.10.10:/32:24581	active	00:00:00.027105	SELECT "public"."locator", "R
5536	10.10.10.10:/32:54956	active	00:00:00.012701	SELECT "public"."locator", "R
6032	10.10.10.10:/32:46837	active	00:00:00.012451	SELECT "public"."locator", "R
5537	10.10.10.10:/32:8876	active	00:00:00.012141	SELECT "public"."locator", "R
22660	10.10.10.10:/32:42844	active	00:00:00.004722	SELECT "public"."locator", "R
27035	10.10.10.10:2:59587	active	00:00:00.002956	SELECT "public"."locator", "R
26320	10.10.10.10:32:57713	active	-00:00:00.002206	SELECT "key", "expiration", "cr
20566	10.10.10.10:2:24593	active	-00:00:00.002813	SELECT "key", "expiration", "cr

(16 rows)

Database:  Active Queries (refresh: 0.5secs, Max Queries Shown: 6):

pid	client	state	duration	query
8709		active	1 day 02:19:57.296904	autovacuum: VACUUM public.
25369	/32:55421	active	02:02:49.011236	select count(id) from analyzed_
25380		active	02:02:49.011236	select count(id) from analyzed_
25381		active	02:02:49.011236	select count(id) from analyzed_
9845		active	01:52:28.102444	select count(*)from analyzed_co
9846		active	01:52:28.102444	select count(*)from analyzed_co

(6 rows)

Press Ctrl-C to quit.

In order for this to work, you must first define database connection parameters in a YAML file located at the following PATH: `~/.db/database.yml`.

Here is how the file should be organized (if you ever used Ruby on Rails, the standard `config/database.yml` file should be fully compatible):

```
development:
  database: development
  username: postgres
  host: localhost
  password:
staging:
  database: staging
  username: postgres
  host: staging.db.example.com
  password:
production:
  database: production
  username: postgres
  host: production.db.example.com
  password: "a098098safdaf0998ff79789a798a7sdf"
```

Given the above file, you should be able to run:

```
$ db connections
```

And see the newline separated list:

```
development
staging
production
```

Once that's working, you should be able run **dbtop**:

```
db top development staging production
```



At the moment, only the default port 5432 is supported. If you are using an alternative port, and as long as it's shared across the connections you can set the **PGPORT** environment variable that **psql** will read.

DB Top Configuration:

You can configure the following settings for **db top**:

1. You can change the location of the **database.yml** file with **db.config.set-file <filepath>**
2. You can change the refresh rate of the **dbtop** with eg. **db.top.set-refresh 0.5** (in seconds, fractional values allowed). This sets the sleep time between the screen is fully refreshed.

Chapter 6. Usage

Welcome to **Bashmatic** – an ever growing collection of scripts and mini-bash frameworks for doing all sorts of things quickly and efficiently.

We have adopted the [Google Bash Style Guide](#), and it's recommended that anyone committing to this repo reads the guides to understand the conventions, gotchas and anti-patterns.

6.1. Function Naming Convention Unpacked

Bashmatic® provides a large number of functions, which are all loaded in your current shell. The functions are split into two fundamental groups:

- Functions with names beginning with a `.` are considered "private" functions, for example `.run.env` and `.run.initializer`
- All other functions are considered public.

The following conventions apply to all functions:

- We use the "dot" for separating namespaces, hence `git.sync` and `gem.install`.
- Function names should be self-explanatory and easy to read.
- DO NOT abbreviate words.
- All public functions must be written defensively: i.e. if the function is called from the Terminal without any arguments, and it requires arguments, the function *must print its usage info* and a meaningful error message.

For instance:

```
$ gem.install
« ERROR » Error - gem name is required as an argument
```

Now let's run it properly:

```
$ gem.install simple-feed
installing simple-feed (latest)...
[] $ gem install simple-feed .....[] 5685 ms [] 0
[] $ gem list > ${BASHMATIC_TEMP}/.gem/gem.list .....[] 503 ms [] 0
```

The naming convention we use is a derivative of Google's Bash StyleGuide, using `.` to separate BASH function namespaces instead of much more verbose `::`.

6.2. Seeing All Functions

After running the above, run `bashmatic.functions` function to see all available functions. You can also open the [FUNCTIONS.adoc](#) file to see the alphabetized list of all 422 functions.

6.3. Seeing Specific Functions

To get a list of module or pattern-specific functions installed by the framework, run the following:

```
$ bashmatic.functions-from pattern [ columns ]
```

For instance:

```
$ bashmatic.functions-from docker 2
docker.abort-if-down      docker.build.container
docker.actions.build      docker.containers.clean
.....
docker.actions.update
```

6.4. Various Modules

You can list various modules by listing the `lib` sub-directory of the `${BASHMATIC_HOME}` folder.

Note how we use *Bashmatic*® helper `columnize [columns]` to display a long list in five columns.

```
$ ls -l ${BASHMATIC_HOME}/lib | sed 's/\.sh//g' | columnize 5
7z                deploy          jemalloc          runtime-config    time
array             dir              json              runtime           trap
audio             docker           net               set               url
aws               file             osx               set               user
bashmatic         ftrace          output            settings          util
brew              gem              pids              shell-set         vim
caller            git-recurse-updat progress-bar      ssh               yaml
color             git              ruby              subshell
db                sedx             run               sym
```

6.5. Key Modules Explained

At a high level, the following modules are provided, in order of importance:

6.5.1 1 Runtime

The following files provide this functionality:

- `lib/run.sh`
- `lib/runtime.sh`
- `lib/runtime-config.sh`.

These collectively offer the following functions:

```
$ bashmatic.functions-from 'run*'

run
run.config.detail-is-enabled
run.config.verbose-is-enabled
run.inspect
run.inspect-variable
run.inspect-variables
run.inspect-variables-that-are
run.inspect.set-skip-false-or-blank
run.on-error.ask-is-enabled
run.print-variable
run.print-variables
run.set-all
run.set-all.list
run.set-next
run.set-next.list
run.ui.ask
run.ui.ask-user-value
run.ui.get-user-value
run.ui.press-any-key
run.ui.retry-command
run.variables-ending-with
run.variables-starting-with
run.with.minimum-duration
run.with.ruby-bundle
run.with.ruby-bundle-and-output
```

Using these functions you can write powerful shell scripts that display each command they run, it's status, duration, and can abort on various conditions. You can ask the user to confirm, and you can show a user message and wait for any key pressed to continue.

Runtime Framework in Depth

One of the core tenets of this library is it's "runtime" framework, which offers a way to run and display commands as they run, while having a fine-grained control over the following:

- What happens when one of the commands fails? Options include:
 - ❑ Ignore and continue (default): **continue-on-error**
 - ❑ Ask the user if she wants to proceed: **ask-on-error**
 - ❑ Abort the entire run: **abort-on-error**
- How is command output displayed?
 - ❑ Is it swallowed for compactness, and only shown if there is an error? (default): **show-output-off**
 - ❑ Or is it shown regardless? **show-output-on**
- Should commands actually run (**dry-run-off**), or simply be printed? (**dry-run-on**).

Examples of Runtime Framework

NOTE, in the following examples we assume you installed the library into your project's folder as **.bashmatic** (a "hidden" folder starting with a dot).

Programming style used in this project lends itself nicely to using a DSL-like approach to shell programming. For example, in order to configure the behavior of the run-time framework (see below) you would run the following command:

```
#!/usr/bin/env bash

# (See below on the location of .bashmatic and ways to install it)
source ${BASHMATIC_HOME}/init.sh

# configure global behavior of all run() invocations
run.set-all abort-on-error show-output-off

run "git clone https://github.com/user/rails-repo rails"
run "cd rails"
run "bundle check || bundle install"

# the following configuration only applies to the next invocation of `run()`
# and then resets back to `off`
run.set-next show-output-on
run "bundle exec rspec"
```

And most importantly, you can use our fancy UI drawing routines to communicate with the user, which are based on familiar HTML constructs, such as `h1`, `h2`, `hr`, etc.

6.5.2 2 Output Modules

The `lib/output.sh` module does all of the heavy lifting with providing many UI elements, such as frames, boxes, lines, headers, and many more.

Here is the list of functions in this module:

```
$ bashmatic.functions-from output 3
abort                error:                left-prefix
ascii-clean          h.black              ok
box.blue-in-green    h.blue              okay
box.blue-in-yellow   h.green             output.color.off
box.green-in-cyan     h.red               output.color.on
box.green-in-green    h.yellow            output.is-pipe
box.green-in-magenta  h1                  output.is-redirect
box.green-in-yellow   h1.blue             output.is-ssh
box.magenta-in-blue   h1.green            output.is-terminal
box.magenta-in-green  h1.purple           output.is-tty
box.red-in-magenta    h1.red              puts
box.red-in-red        h1.yellow           reset-color
box.red-in-yellow     h2                  reset-color:
box.yellow-in-blue    h2.green            screen-width
box.yellow-in-red     h3                  screen.height
box.yellow-in-yellow  hdr                  screen.width
br                    hl.blue             shutdown
center                hl.desc             stderr
columnize             hl.green            stdout
command-spacer        hl.orange           success
cursor.at.x           hl.subtle           test-group
cursor.at.y           hl.white-on-orange  ui.closer.kind-of-ok
cursor.down           hl.white-on-salmon  ui.closer.kind-of-ok:
cursor.left           hl.yellow            ui.closer.not-ok
cursor.rewind         hl.yellow-on-gray   ui.closer.not-ok:
cursor.right          hr                   ui.closer.ok:
cursor.up             hr.colored           warn
debug                inf                  warning
duration              info                 warning:
err                   info:
error                 left
```

Note that some function names end with `:` - this indicates that the function outputs a new-line in the end. These functions typically exist together with their non-`:`-terminated counter-parts. If you use one, eg, `inf`, you are then supposed to finish the line by providing an additional output call, most commonly it will be one of `ok:`, `ui.closer.not-ok:` and `ui.closer.kind-of-ok:`.

Here is an example:

```
function valid-cask() { sleep 1; return 0; }
function verify-cask() {
  inf "verifying brew cask ${1}...."
  if valid-cask ${1}; then
    ok:
  else
    not-ok:
  fi
}
```

When you run this, you should see something like this:

```
$ verify-cask TextMate
██ verifying brew cask TextMate....
```

In the above example, you see the checkbox appear to the left of the text. In fact, it appears a second after, right as `sleep 1` returns. This is because this paradigm is meant for wrapping constructs that might succeed or fail.

If we change the `valid-cask` function to return a failure:

```
function valid-cask() { sleep 1; return 1; }
```

Then this is what we'd see:

```
$ verify-cask TextMate
❑ verifying brew cask TextMate...
```

Output Components

Components are BASH functions that draw something concrete on the screen. For instance, all functions starting with `box.` are components, as are `h1`, `h2`, `hr`, `br` and more.

```
$ h1 Hello
```

```
Hello
```

These are often named after HTML elements, such as `hr`, `h1`, `h2`, etc.

Output Helpers

Here is another example where we are deciding whether to print something based on whether the output is a proper terminal (and not a pipe or redirect):

```
output.is-tty && h1 "Yay For Terminals!"
output.has-stdin && echo "We are being piped into..."
```

The above reads more like a high level language like Ruby or Python than Shell. That's because BASH is more powerful than most people think.

There is an [example script](#) that demonstrates the capabilities of Bashmatic.

If you ran the script, you should see the output shown [in this screenshot](#). Your colors may vary depending on what color scheme and font you use for your terminal.

6.5.3. 3. Package management: Brew and RubyGems

You can reliably install ruby gems or brew packages with the following syntax:


```
#!/usr/bin/env bash

source ${BASHMATIC_HOME}/init.sh

h2 "Installing ruby gem sym and brew package curl..." \

gem.install sym
brew.install.package curl

success "installed Sym version $(gem.version sym)"
```

When you run the above script, you should see the following output:

```
Installing ruby gem sym and brew package curl...
Please standby...

installing sym (latest)...
> gem install sym ----- ( 2354 ms ) 0
> gem list > /tmp/.bashmatic/.gem/gem.list.2.7.0p0 ----- ( 520 ms ) 0
checking if package curl is already installed...

« SUCCESS » ✓ installed Sym version 2.8.5
```

6.5.4. 4. Shortening URLs and Github Access

You can shorten URLs on the command line using Bitly, but for this to work, you must set the following environment variables in your shell init:

```
export BITLY_LOGIN="<your login>"
export BITLY_API_KEY="<your api key>"
```

Then you can run it like so:

```
$ url.shorten https://raw.githubusercontent.com/kigster/bashmatic/master/bin/install
# http://bit.ly/2IIPNE1
```

Github Access

There are a couple of Github-specific helpers:

```
github.clone          github.setup
github.org            github.validate
```

For instance:

```
$ github.clone sym

▯ Validating Github Configuration...

Please enter the name of your Github Organization:
$ kigster

Your github organization was saved in your ~/.gitconfig file.
To change it in the future, run:

$ github.org <org-name>

▯▯ $ git clone git@github.com:kigster/sym ▯▯▯▯▯▯▯ 931 ms ▯
```

6.5.5. 5. File Helpers

```
$ bashmatic.functions-from file

file.exists_and_newer_than    file.list.filter-non-empty
file.gsub                     file.size
file.install-with-backup      file.size.mb
file.last-modified-date       file.source-if-exists
file.last-modified-year       file.stat
file.list.filter-existing
```

For instance, **file.stat** offers access to the **fstat()** C-function:

```
$ file.stat README.md st_size
22799
```

6.5.6. 6. Array Helpers

```
$ bashmatic.functions-from array

array.to.bullet-list          array.includes
array.has-element             array.includes-or-exit
array.to.csv                  array.from.stdin
array.join                    array.join
array.piped                   array.to.piped-list
array.includes-or-complain
```

For instance:

```
$ declare -a farm_animals=(chicken duck rooster pig)
$ array.to.bullet-list ${farm_animals[@]}
• chicken
• duck
• rooster
• pig
$ array.includes "duck" "${farm_animals[@]}" && echo Yes || echo No
Yes
$ array.includes "cow" "${farm_animals[@]}" && echo Yes || echo No
No
```

6.5.7. 7. Utilities

The utilities module has the following functions:

```
$ bashmatic.functions-from util

pause.long                util.install-direnv
pause                     util.is-a-function
pause.short               util.is-numeric
pause.medium              util.is-variable-defined
util.append-to-init-files util.lines-in-folder
util.arch                  util.remove-from-init-files
util.call-if-function      util.shell-init-files
shasum.sha-only            util.shell-name
shasum.sha-only-stdin      util.ver-to-i
util.functions-starting-with util.whats-installed
util.generate-password     watch.ls-al
```

For example, version helpers can be very handy in automated version detection, sorting and identifying the latest or the oldest versions:

```
$ util.ver-to-i '12.4.9'
112004009
$ util.i-to-ver $(util.ver-to-i '12.4.9')
12.4.9
```

6.5.8. 8. Ruby and Ruby Gems

Ruby helpers abound:

```
$ bashmatic.functions-from ruby

bundle.gems-with-c-extensions      ruby.install-ruby-with-deps
interrupted                        ruby.install-upgrade-bundler
ruby.bundler-version              ruby.installed-gems
ruby.compiled-with                ruby.kigs-gems
ruby.default-gems                 ruby.linked-libs
ruby.full-version                 ruby.numeric-version
ruby.gemfile-lock-version         ruby.rbenv
ruby.gems                         ruby.rubygems-update
ruby.gems.install                 ruby.stop
ruby.gems.uninstall              ruby.top-versions
ruby.init                         ruby.top-versions-as-yaml
ruby.install                      ruby.validate-version
ruby.install-ruby
```

From the obvious `ruby.install-ruby <version>` to incredibly useful `ruby.top-versions <platform>` – which, using `rbenv` and `ruby.build` plugin, returns the most recent minor version of each major version upgrade, as well as the YAML version that allows you to pipe the output into your `.travis.yml` to test against each major version of Ruby, locked to the very latest update in each.

```
$ ruby.top-versions
2.0.0-p648
2.1.10
2.2.10
2.3.8
2.4.9
2.5.7
2.6.5
2.7.0
2.8.0-dev

$ ruby.top-versions jruby
jruby-1.5.6
jruby-1.6.8
jruby-1.7.27
jruby-9.0.5.0
jruby-9.1.17.0
jruby-9.2.10.0

$ ruby.top-versions mruby
mruby-dev
mruby-1.0.0
mruby-1.1.0
mruby-1.2.0
mruby-1.3.0
mruby-1.4.1
mruby-2.0.1
mruby-2.1.0
```

Gem Helpers

These are fun helpers to assist in scripting gem management.

```
$ bashmatic.functions-from gem

g-i          gem.gemfile.version
g-u          gem.global.latest-version
gem.cache-installed  gem.global.versions
gem.cache-refresh   gem.install
gem.clear-cache     gem.is-installed
gem.configure-cache  gem.uninstall
gem.ensure-gem-version gem.version
```

For instance

```
$ g-i awesome_print
  []  gem awesome_print (1.8.0) is already installed
$ gem.version awesome_print
1.8.0
```

6.5.9. 9. Additional Helpers

There are plenty more modules, that help with:

- [Ruby Version Helpers](#) and (Ruby Gem Helpers)[lib/gem.sh], that can extract current gem version from either [Gemfile.lock](#) or globally installed gem list..
- [AWS helpers](#) - requires [awscli](#) and credentials setup, and offers some helpers to simplify AWS management.
- [Docker Helpers](#) - assist with docker image building and pushing/pulling
- [Sym](#) - encryption with the gem called [sym](#)

And many more.

See the full function index with the function implementation body in the [FUNCTIONS.adoc](#) index.

Chapter 7. How To...

7.1. Write new DSL in the Bashmatic® Style

The following example is the actual code from a soon to be integrated AWS credentials install script. This code below checks that a user has a local `~/.aws/credentials` file needed by the `awscli`, and in the right INI format. If it doesn't find it, it checks for the access key CSV file in the `~/Downloads` folder, and converts that if found. Now, if even that is not found, it prompts the user with instructions on how to generate a new key pair on AWS IAM website, and download it locally, thereby quickly converting and installing it as a proper credentials file. Not bad, for a compact BASH script, right? (of course, you are not seeing all of the involved functions, only the public ones).

```
# define a new function in AWS namespace, related to credentials.
# name of the function is self-explanatory: it validates credentials
# and exits if they are invalid.
aws.credentials.validate-or-exit() {
  aws.credentials.are-valid || {
    aws.credentials.install-if-missing || bashmatic.exit-or-return 1
  }
}

aws.credentials.install-if-missing() {
  aws.credentials.are-present || { # if not present
    aws.access-key.is-present || aws.access-key.download # attempt to download the key
    aws.access-key.is-present && aws.credentials.check-downloads-folder # attempt to find it in
~/Downloads
  }

  aws.credentials.are-present || { # final check after all attempts to install credentials
    error "Unable to find AWS credentials. Please try again." && bashmatic.exit-or-return 1
  }

  bashmatic.exit-or-return 0
}
```

Now, **how would you use it in a script?** Let's say you need a script to upload something to AWS S3. But before you begin, wouldn't it be nice to verify that the credentials exist, and if not – help the user install it? Yes it would.

And that is exactly what the code above does, but it looks like a DSL. because it is a DSL.

This script could be your `bin/s3-uploader`

```
aws.credentials.validate-or-exit
# if we are here, that means that AWS credentials have been found.
# and we can continue with our script.
```

7.2. How can I test if the function was ran as part of a script, or "sourced-in"?

Some bash files exists as libraries to be "sourced in", and others exist as scripts to be run. But users won't always know what is what, and

may try to source in a script that should be run, or vice versa - run a script that should be sourced in.

What do you, programmer, do to educate the user about correct usage of your script/library?

Bashmatic® offers a reliable way to test this:

```
#!/usr/bin/env bash
# load library
if [[ -f "${Bashmatic__Init}" ]]; then source "${Bashmatic__Init}"; else source
${BASHMATIC_HOME}/init.sh; fi
bashmatic.validate-subshell || return 1
```

If you rather require a library to be sourced in, but not run, use the code as follows:

```
#!/usr/bin/env bash
# load library
if [[ -f "${Bashmatic__Init}" ]]; then source "${Bashmatic__Init}"; else source
${BASHMATIC_HOME}/init.sh; fi
bashmatic.validate-sourced-in || exit 1
```

7.3. How do I run unit tests for Bashmatic?

The framework comes with a bunch of automated unit tests based on the fantastic framework *bats*.

To run all tests:

```
cd ${BASHMATIC_HOME}
bin/specs
```

While not every single function is tested (far from it), we do try to add tests to the critical ones.

Please see [existing tests](#) for the examples.

7.4. How can I change the underscan or overscan for an old monitor?

If you are stuck working on a monitor that does not support switching digit input from TV to PC, NOR does OS-X show the "underscan" slider in the Display Preferences, you may be forced to change the underscan manually. The process is a bit tricky, but we have a helpful script to do that:

```
$ source init.sh
$ change-underscan 5
```

This will reduce underscan by 5% compared to the current value. The total value is 10000, and is stored in the file */var/db/.com.apple.iokit.graphics*. The tricky part is determining which of the display entries map to your problem

monitor. This is what the script helps with.

Do not forget to restart after the change.

Acknowledgements: the script is an automation of the method offered on [this blog post](#).

7.5. Contributing

Submit a pull request!

Chapter 8. License

This project is distributed under the MIT License.