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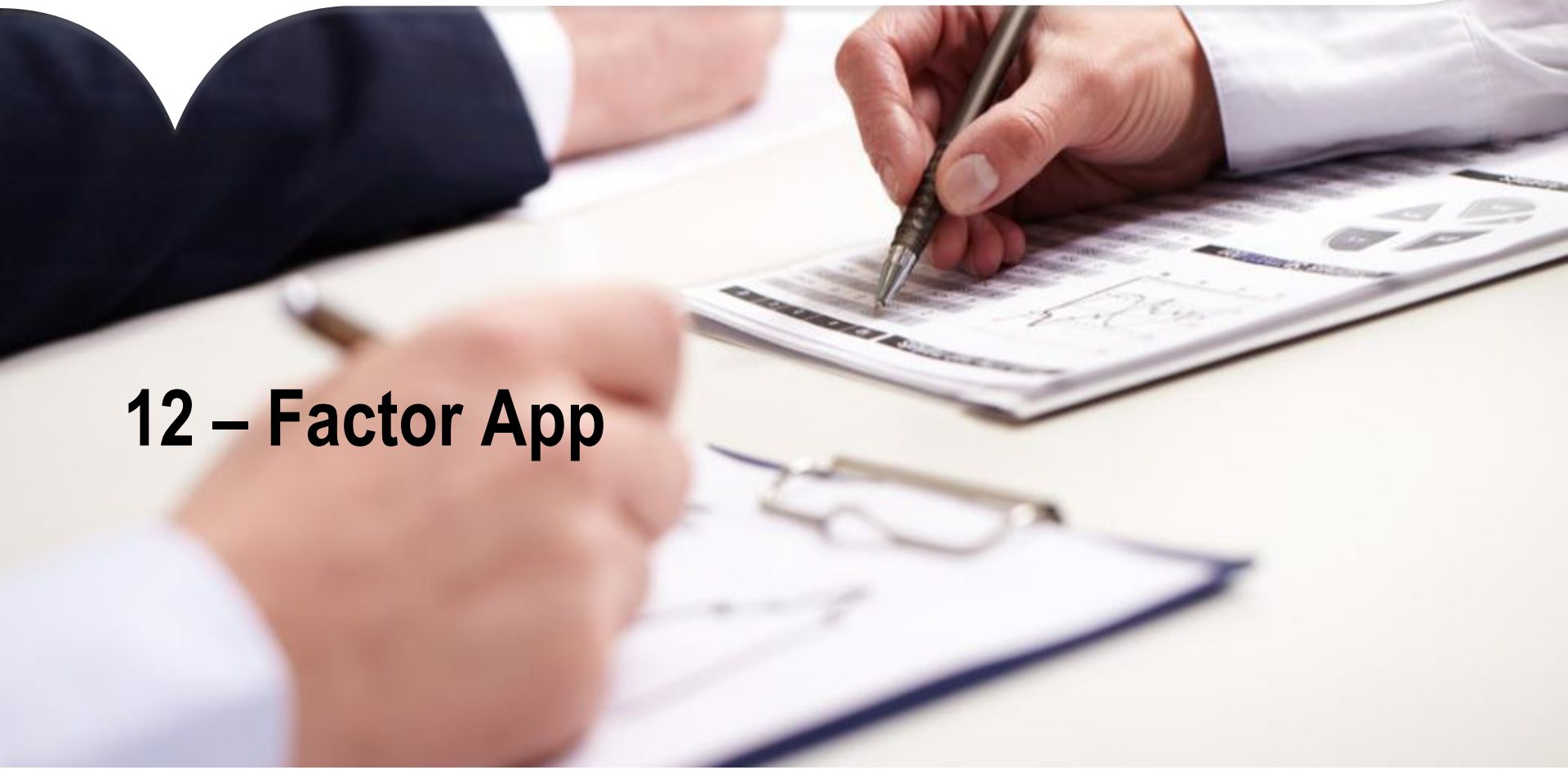

12 – Factor App

12-FACTOR APPLICATIONS

12-Factor Application

- http://12factor.net

- Outlines architectural principles for modern apps
  - Focus on scaling, continuous delivery, portable and cloud ready

12-Factor Application

I. Codebase One codebase tracked in SCM, many deploy	**II. Dependencies** Explicitly declare and isolate dependencies	**III. Configuration** Store config in the environment
IV. Backing Services Treat backing services as attached resources	**V. Build, Release, Run** Strictly separate build and run stages	**VI. Processes** Execute app as stateless processes
VII. Port binding Export services via port binding	**VII. Concurrency** Scale out via the process model	**IX. Disposability** Maximize robustness with fast startup and graceful shutdown
X. Dev/ prod parity Keep dev, staging, prod as similar as possible	**XI. Logs** Treat logs as event streams	**XII. Admin processes** Run admin/ mgmt tasks as one-off processes

12- Factor Application

I. Codebase
One codebase tracked in SCM, many deploy

II. Dependencies
Explicitly declare and isolate dependencies

III. Configuration
Store config in the environment

- Codebase
  - An application has a single codebase
    - Multiple codebase = distributed system (not an app)
      - Each component in a codebase can (should) be an app
    - Tracked in version control
      - Git, Subversion, Mercurial, etc.
    - Multiple deployments
      - i.e development, testing, staging, production, etc.

12- Factor Application

I. Codebase
One codebase tracked in SCM, many deploy

II. Dependencies
Explicitly declare and isolate dependencies

III. Configuration
Store config in the environment

- Dependencies
  - Packaged as jars (java), RubyGems, CPAN (Perl)
  - Declared in Manifest
    - Maven POM, Gemfile / bundle exec, etc.
  - No reliance on specific system tools
    - i.e Linux tool not available on windows

12- Factor Application

I. Codebase	II. Dependencies	**III. Configuration**
One codebase tracked in SCM, many deploy	Explicitly declare and isolate dependencies	**Store config in the environment**

- Configuration
  - Separate from the code
  - Also separate from the application
    - i.e. DB credentials; hostnames, passwords
    - Acid test – could the code base be made open source?
    - Internal writing (i.e. Spring Configuration) considered part of codebase.
  - Environment variables recommended.

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IV. Backing Services
Treat backing services as attached resources

V. Build, Release, Run
Strictly separate build and run stages

VI. Processes
Execute app as stateless processes

- Backing Services
  - Service consumed by app as part of normal operations
    - DB, Message Queues, SMTP servers
    - May be locally managed or third-party managed
  - Services should be treated as resources
    - Connected to vis URL / Configuration
    - Swappable (change in – memory DB for MySQL)

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IV. Backing Services
Treat backing services as attached resources

V. Build, Release, Run
Strictly separate build and run stages

VI. Processes
Execute app as stateless processes

- Build, Release, Run
  - Build stage – converts codebase into build (version)
    - Including managed dependencies
  - Release stage – build + config = release
    - Ready to run
  - Run – Runs app in execution environments

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IV. Backing Services
Treat backing services as attached resources

V. Build, Release, Run
Strictly separate build and run stages

VI. Processes
Execute app as stateless processes

- Processes
  - One or more discrete running processes
  - Stateless
    - Processes should not store internal state (HTTP Sessions)
  - Shared Nothing
    - Data needing to be shared should be persisted
  - Memory / local tmp storage considered volatile
  - Processes may intercommunicate via messaging / persistent storage

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VII. Port binding
Export services via port binding

VII. Concurrency
Scale out via the process model

IX. Disposability
Maximize robustness with fast startup and graceful shutdown

- Port binding
  - App should not need a “Container”
    - Java App Server, Apache HTTPD for PHP …
    - PaaS now takes that role
  - Apps should export HTTP as a service
    - Define as a dependecncy (#2)

      Tornado (Python) , Thin (Ruby), embedded Jetty/Tomcat (Java)
    - Execute at runtime
  - One App can become another App’s service (#4, #6)

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VII. Port binding
Export services via port binding

VII. Concurrency
Scale out via the process model

IX. Disposability
Maximize robustness with fast startup and graceful shutdown

- Concurrency
  - Processes are first class citizens
    - Like Unix service daemons
    - Unlike Java threads
  - Individual processes are free to multithread
    - BUT a VM can only get so large (vertical scaling).
    - Must be able to span multiple machines (horizontal scaling)

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VII. Port binding
Export services via port binding

VII. Concurrency
Scale out via the process model

IX. Disposability
Maximize robustness with fast startup and graceful shutdown

- Disposability
  - Processes should be disposable
    - Remember, they're stateless!
  - Should be quick to start and stop
    - Should exit gracefully / finish current requests.
    - Or should be idempotent / reentrant
  - Enhances scalability and fault tolerance
  - Design *crash-only* software

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X. Dev/ prod parity
Keep dev, staging, prod as similar as possible

XI. Logs
Treat logs as event streams

XII. Admin processes
Run admin/ mgmt tasks as one-off processes

- Development, Staging, Production should be similar
  - Dev / prod environments often different
    - Tool gap – dev use SQLLite / Nginx prod uses Apache/ Oracle
    - Personnel gap – developers develop, admins deploy
    - Time gap – (development over weeks / months)
  - Keep differences minor
    - Reduce tool gap – use same software
    - Reduce time gap – small changes & continuous deployment
    - Reduce personnel gap – involve developers in deployment and monitoring

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X. Dev/ prod parity	**XI. Logs**	XII. Admin processes
Keep dev, staging, prod as similar as possible	Treat logs as event streams	Run admin/ mgmt tasks as one-off processes

- Logs are streams of aggregated , time –ordered events
  - Apps are not concerned with log management
    - Just write to sysout.
  - Separate log managers handle management
    - Logging as a service
- Can be managed via tools like papertrail, Splunk …
  - Log indexing and analysis

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X. Dev/ prod parity
Keep dev, staging, prod as similar as possible

XI. Logs
Treat logs as event streams

XII. Admin processes
Run admin/ mgmt tasks as one-off processes

- Admin Processes / Management Tasks Run as One-Off Processes.
  - DB Migrations, one time scripts, etc.
  - Use same environment, tool, language as application processes
    - REPL

Read – Eval – Print Loop = command-shell for running non-interactive shell scripts

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