



Buildpacks for Ops Teams

Photo by [Michele Bitetto](#) on [Unsplash](#)

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Slides



<https://github.com/dmikusa/buildpacks-for-ops>

Why are we here today?

1. A Quick primer
2. Problems Solved
3. Why Ops Teams Should Care?



What are Cloud Native Buildpacks?

What they are?

- Source Code => OCI
- Multiple Languages
- Integrated into Platforms
- A specification

What they're not?

- Total replacement for Dockerfiles
- Replacement for CI/CD
- Dev-only Tool
- An implementation

What are Cloud Native Buildpacks?

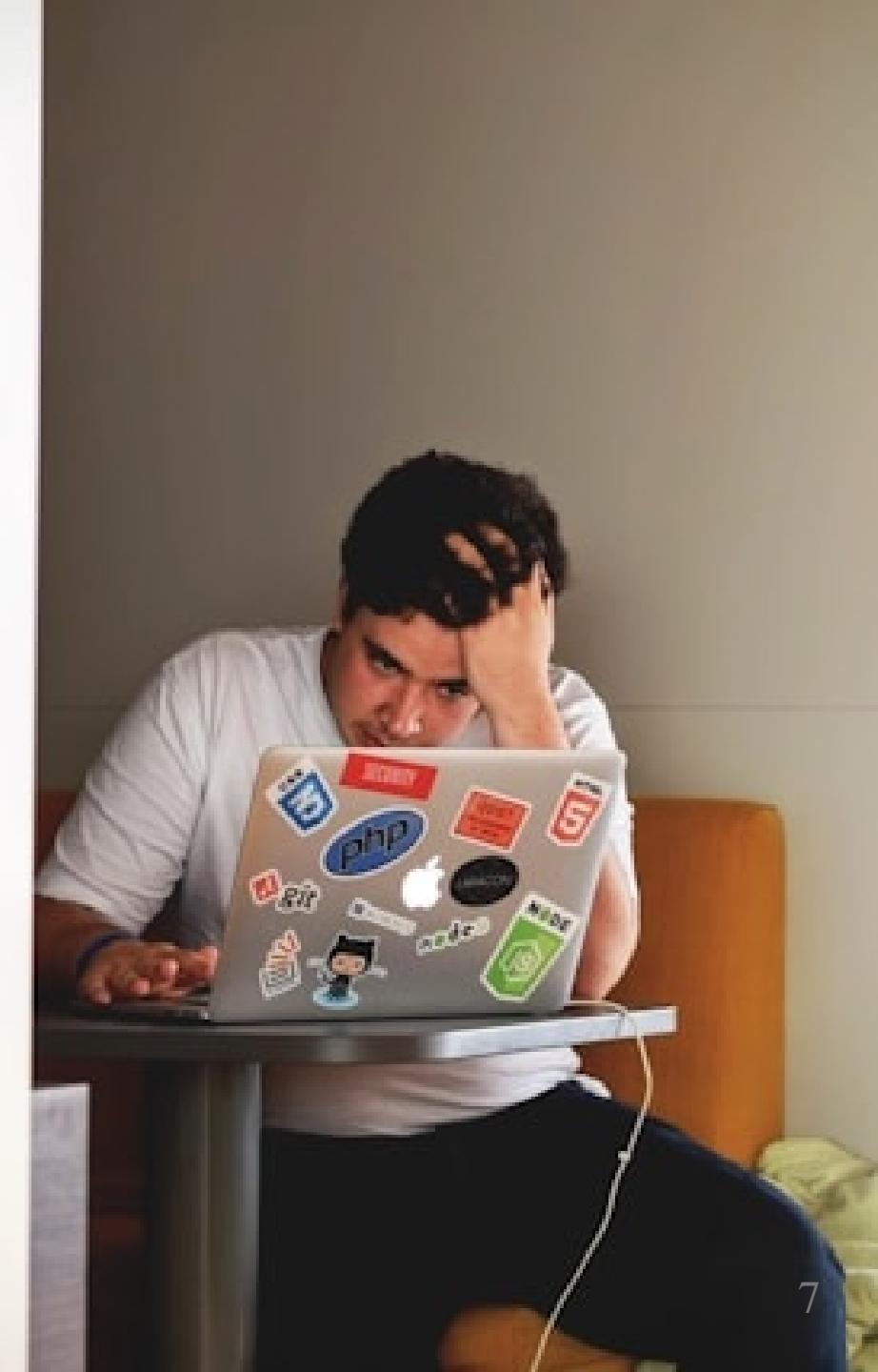
Technically:

- A build + run executable
- A metadata config file called
buildpack.toml
- Bundled as an OCI image

Current Layer Contents			
Permission	UID:GID	Size	Filetree
	0:0	12 MB	cnb
	0:0	12 MB	└── buildpacks
drwxr-xr-x	0:0	12 MB	└── paketo-buildpacks_bellsoft-liberica
drwxr-xr-x	0:0	12 MB	└── 11.5.4
-rw-r--r--	0:0	11 kB	├── LICENSE
-rw-r--r--	0:0	493 B	├── NOTICE
-rw-r--r--	0:0	29 kB	├── README.md
drwxr-xr-x	0:0	12 MB	└── bin
-rwxr-xr-x	0:0	0 B	└── build → main
-rwxr-xr-x	0:0	0 B	└── detect → main
-rwxr-xr-x	0:0	5.0 MB	└── helper
-rwxr-xr-x	0:0	7.4 MB	└── main
-rw-r--r--	0:0	28 kB	└── buildpack.toml

Problems Solved: Dockerfiles

- Dockerfile copy & paste
- Dockerfile sprawl



Problems Solved: Best Practices

- Base image too big
- Base image too small
- Base image not maintained
- Not your golden base image
- Forgets to use multi-stage builds
- Implements multi-stage incorrectly
- Bad layer ordering (cache invalidation)
- Bad layer breakdown (decreases sharing)
- Runs the app as root
- No PID1 handler
- Forget company CA certs
- exec vs shell to start process

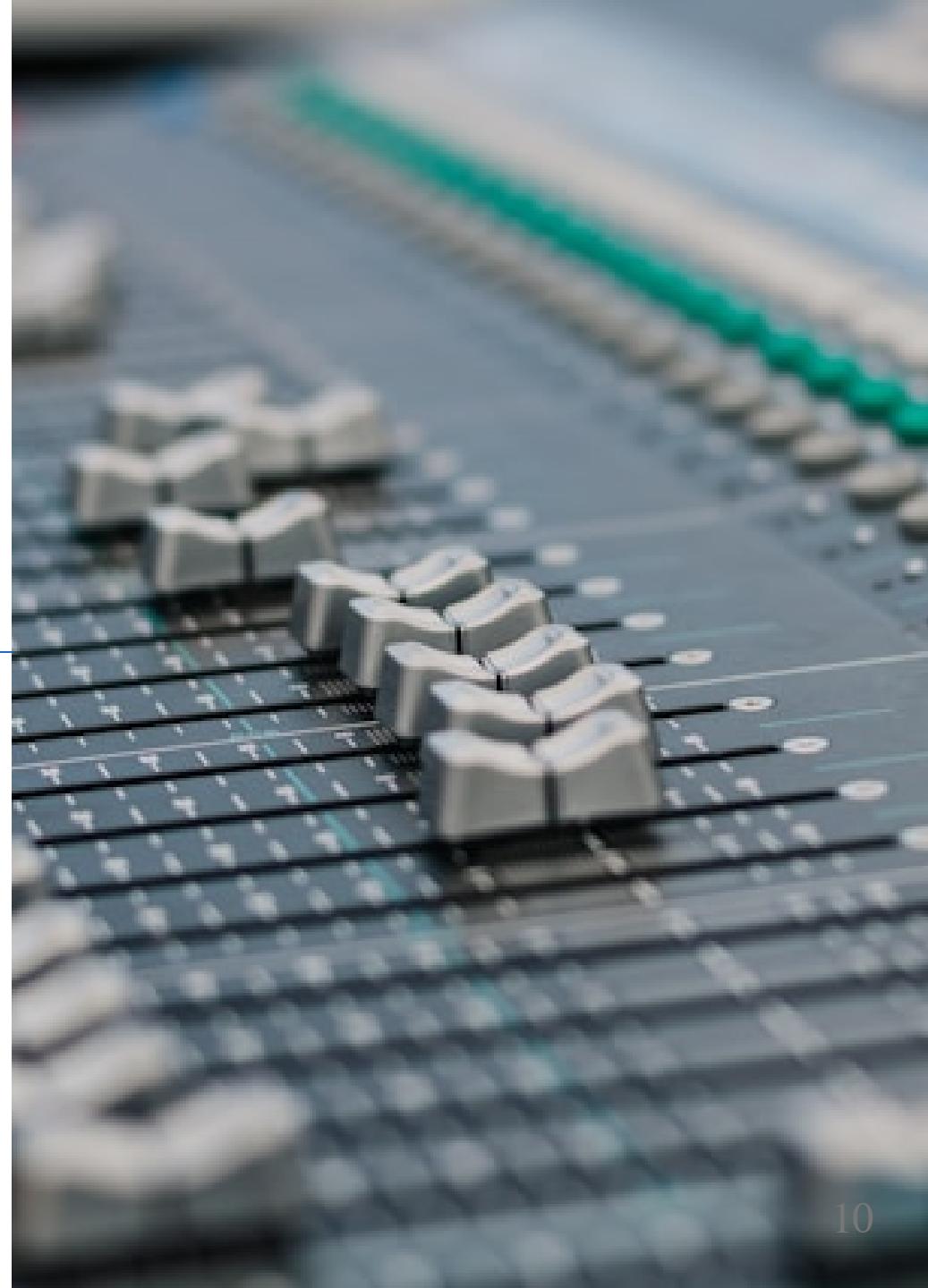


Why should Ops care?

App Problems == Ops Problems

How can Buildpacks Help Ops

1. Ops gets control





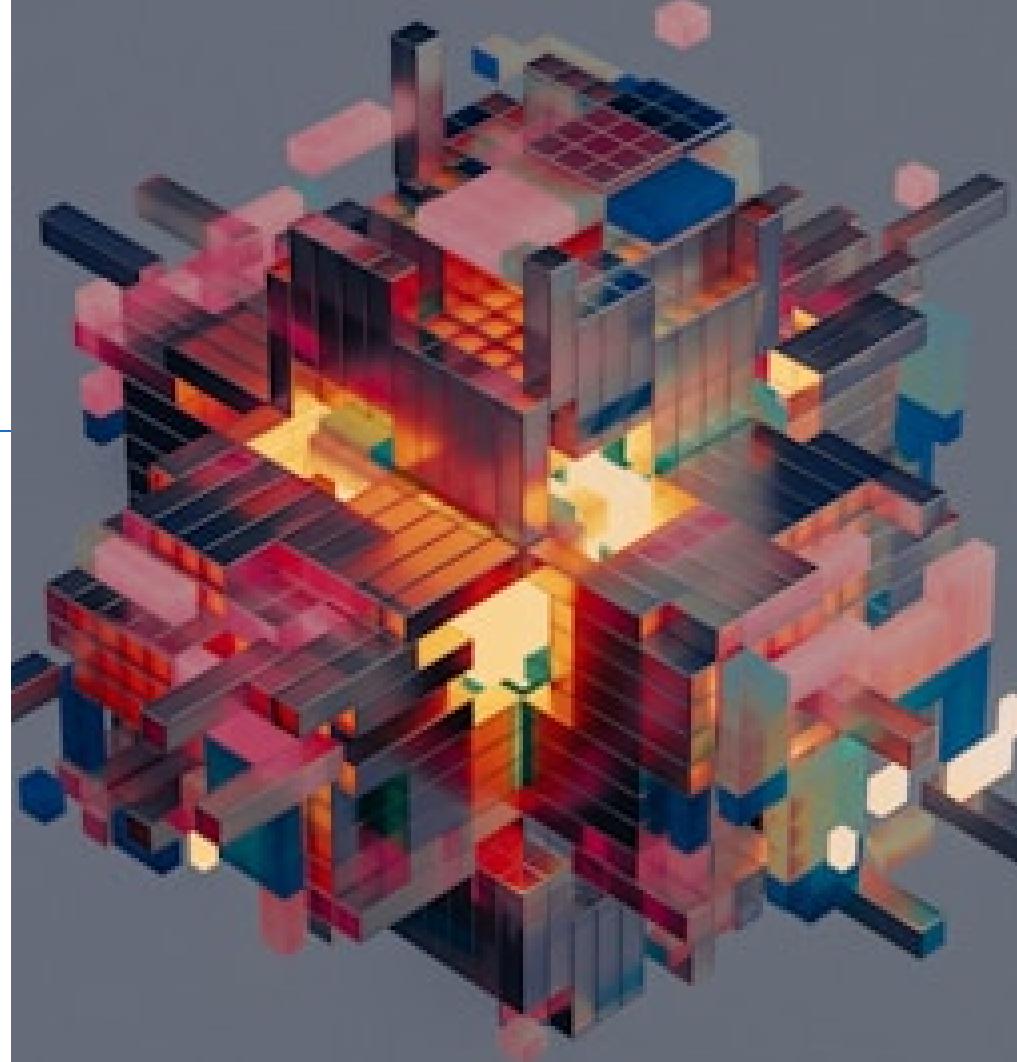
How can Buildpacks Help Ops

1. Ops gets control
- 2. Know what's running**

Photo by [Lucas Vasques](#) on [Unsplash](#)

How can Buildpacks Help Ops

1. Ops gets control
2. Know what's running
- 3. Building a Platform**



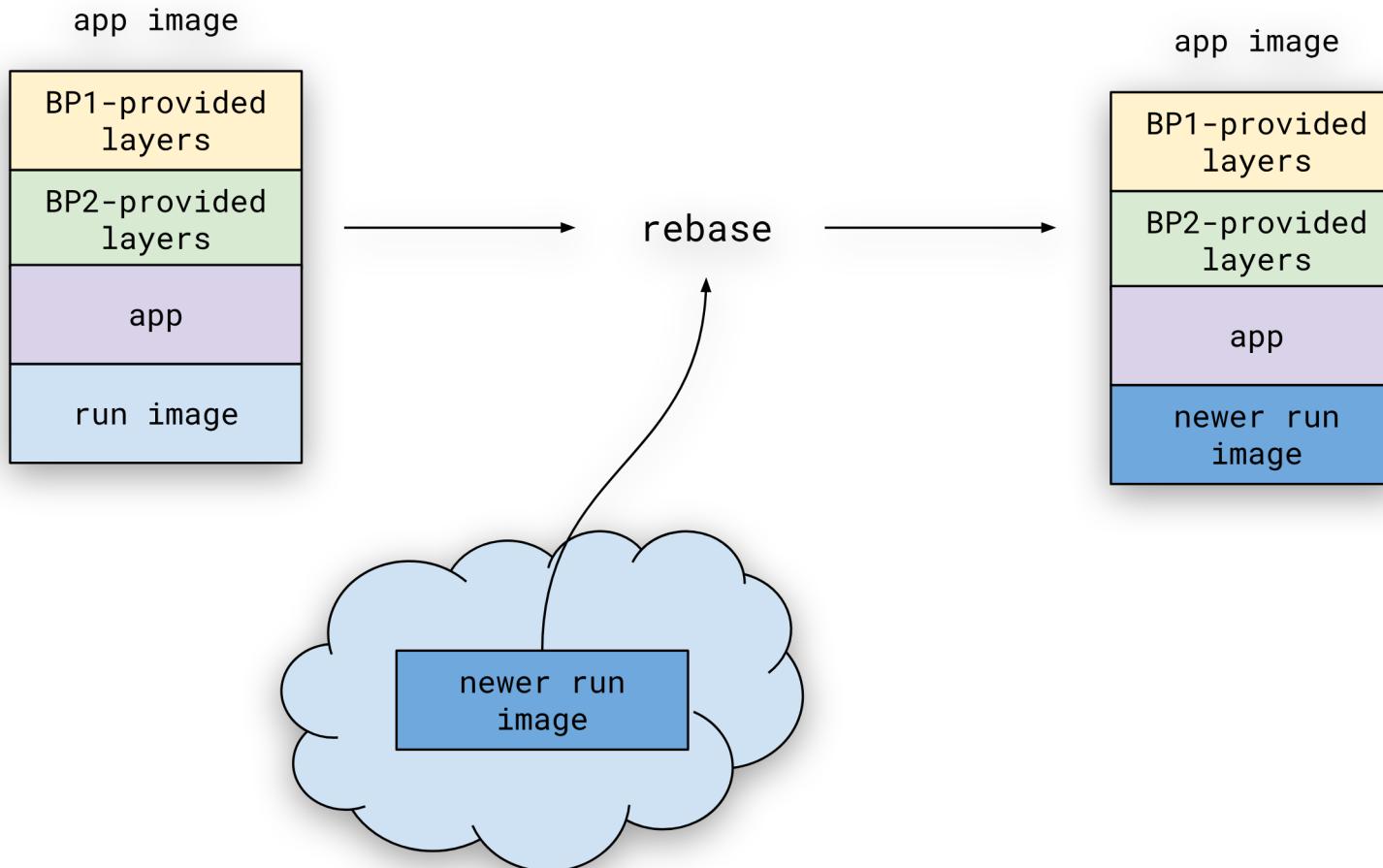


How can Buildpacks Help Ops

1. Ops gets control
2. Know what's running
3. Building a Platform
- 4. Fast rebuilds & rebase support**

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Rebase Explained



How can Buildpacks Help Ops

1. Ops gets control
2. Know what's running
3. Building a Platform
4. Fast rebuilds & rebase support

**5. Buildpacks are multi-language
& multi-arch**



Levels of Customization

None

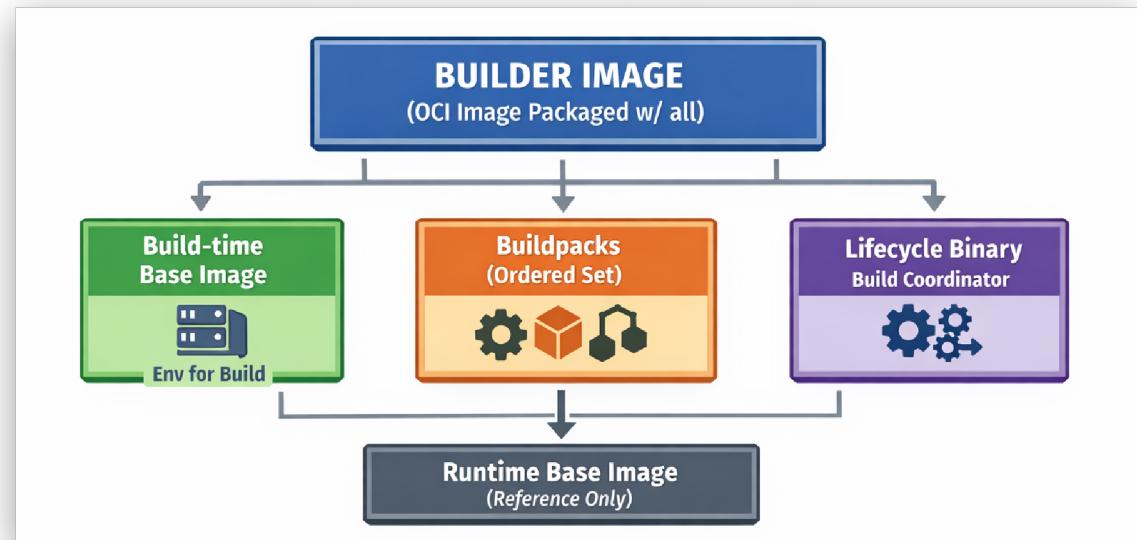
- Base images: Ubuntu Jammy, Ubuntu Noble, or UBI 8-10
- Four run image sizes: static, tiny, base & full
- Languages: Java, Java Native Image, Go, .NET, Node.js, Python, Ruby, Rust, & web servers
- Buildpack-less builders too



Levels of Customization

Custom Builders

- Build image
- Run image
- Set of buildpacks
- Optional custom env variables



Levels of Customization

Custom Paketo Run Image

- Add more packages
- Add CA certs
- Customize the OS layer

Custom Run Image

Use a Dockerfile to customize:

```
FROM docker.io/paketobuildpacks/run-jammy-base

USER root:root

# Install additional packages that we want to make available at run time
RUN apt-get update && \
    apt-get install -y net-tools netcat && \
    rm -rf /var/lib/apt/lists/*

USER cnb:cnb
```

Custom Run Image

Run Image

```
| • Layers |
Cmp Size Command
109 MB FROM c0f0e65edcf573a

| Layer Details |
Tags: (unavailable)
Id: c0f0e65edcf573ae35e032e0b7f8acec7f0c7763ef4dc82d8f86228c949ebc66.tar
Size: 109 MB
Digest: sha256:c0f0e65edcf573ae35e032e0b7f8acec7f0c7763ef4dc82d8f86228c949ebc66
Command:
#(nop) USER cnb:cnb

| Image Details |
Image name: dmikusa/my-run-image
Total Image size: 109 MB
Potential wasted space: 0 B
Image efficiency score: 100 %

Count Total Space Path
```

App Image

```
| • Layers |
Cmp Size Command
109 MB FROM c0f0e65edcf573a
11 MB Layer: 'nginx', Created by buildpack: paketo-buildpacks/nginx@1.0.13
46 kB Software Bill-of-Materials
8.2 kB Application Layer
2.8 MB Buildpacks Application Launcher
382 B Buildpacks Launcher Config
0 B Buildpacks Process Types

| Layer Details |
Tags: (unavailable)
Id: c0f0e65edcf573ae35e032e0b7f8acec7f0c7763ef4dc82d8f86228c949ebc66.tar
Size: 109 MB
Digest: sha256:c0f0e65edcf573ae35e032e0b7f8acec7f0c7763ef4dc82d8f86228c949ebc66
Command:

| Image Details |
Image name: apps/nginx
Total Image size: 122 MB
Potential wasted space: 0 B
Image efficiency score: 100 %

Count Total Space Path

^C Quit | Tab Switch view | ^F Filter | ^L Show layer changes | ^A Show aggregated changes
```



Levels of Customization

Custom Images

- Totally different build + run images
- A different base OS, distroless or alpine
- Requires creating custom build and run images, plus a custom builder

Levels of Customization

Custom Buildpacks

- Enforce requirements
- Add files or resources to the image
- Set env variables/embed env variables into image
- Custom image labels
- Add CA certificates
- Interact with other buildpacks

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Automating App Builds

CI/CD Support

- `pack` cli runs in some CI/CD systems like GitHub Actions
- `kpack` can build on top of Kubernetes
- CircleCI, Gitlab, Jenkins and Tekton are also supported
- `lifecycle` direct

Photo by [Simon Kadula](#) on [Unsplash](#)

Enterprise Ready

Paketo Buildpacks Support

- Custom CA certificates
- Proxies for Internet access
- Local mirrors
- Air Gapped Environments





Summary

Buildpacks are...

- Great for Ops Teams
- Great for Dev Teams
- Everyone can be happy

Photo by [Vitaly Gariev](#) on [Unsplash](#)

Slides



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Questions?

