Car-as-a-Sensor – EB's backend approach

Elektrobit

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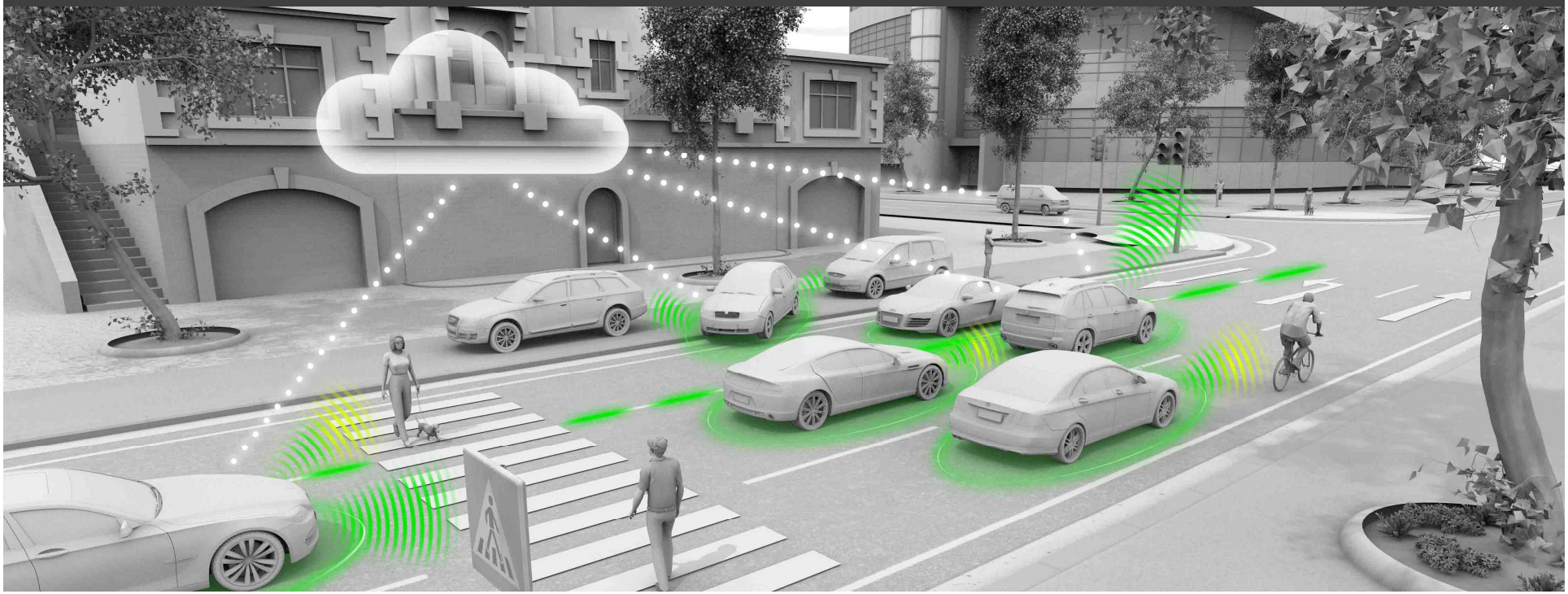
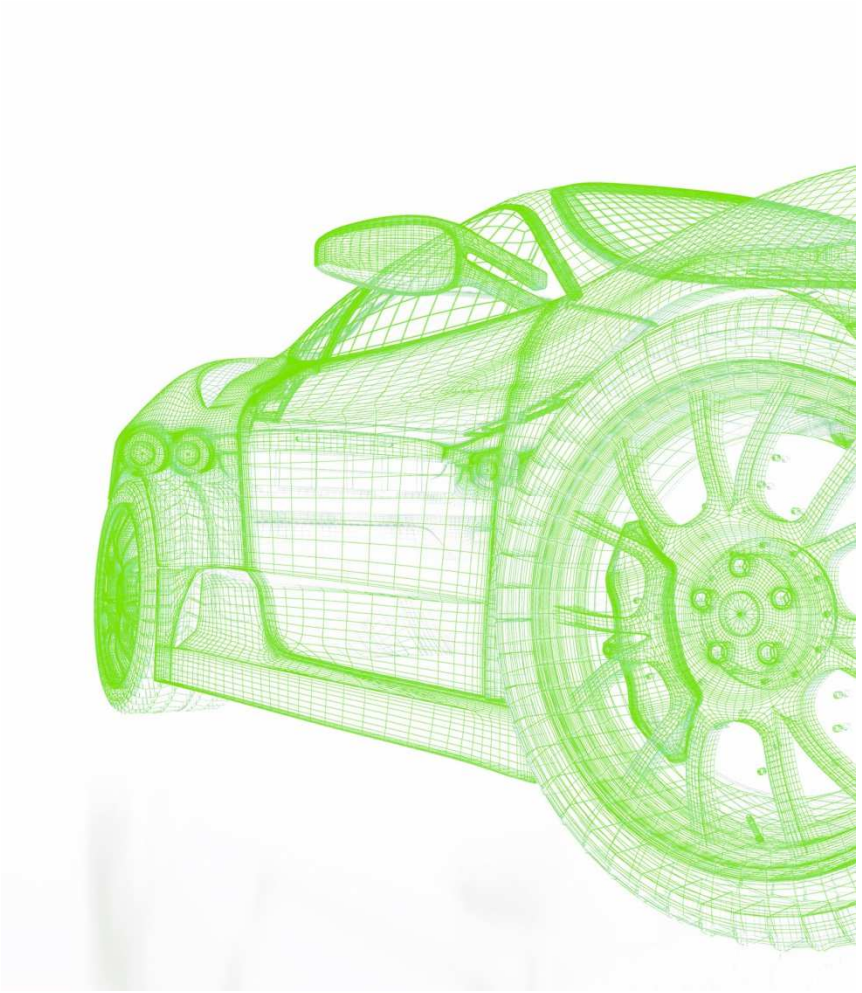
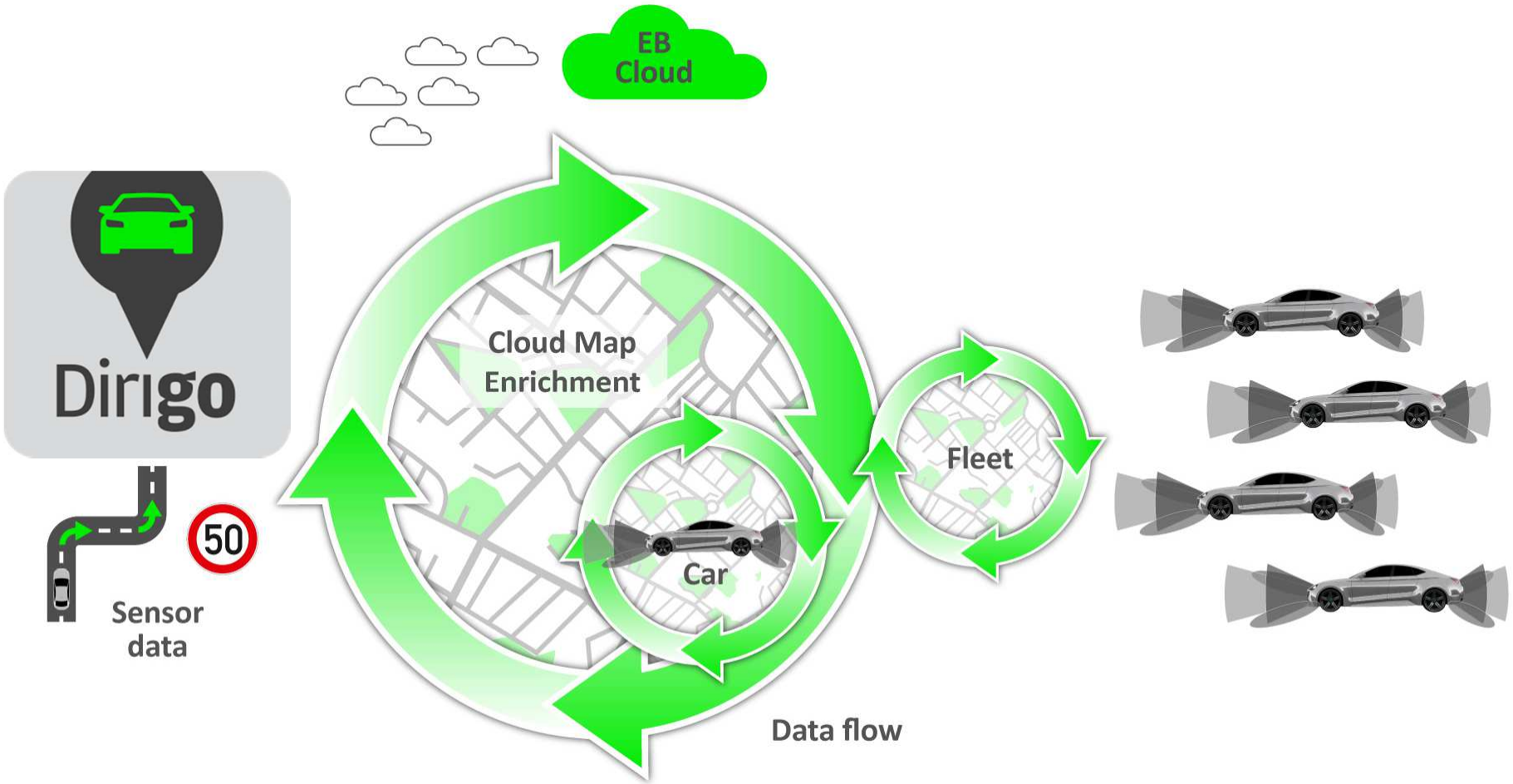


Agenda

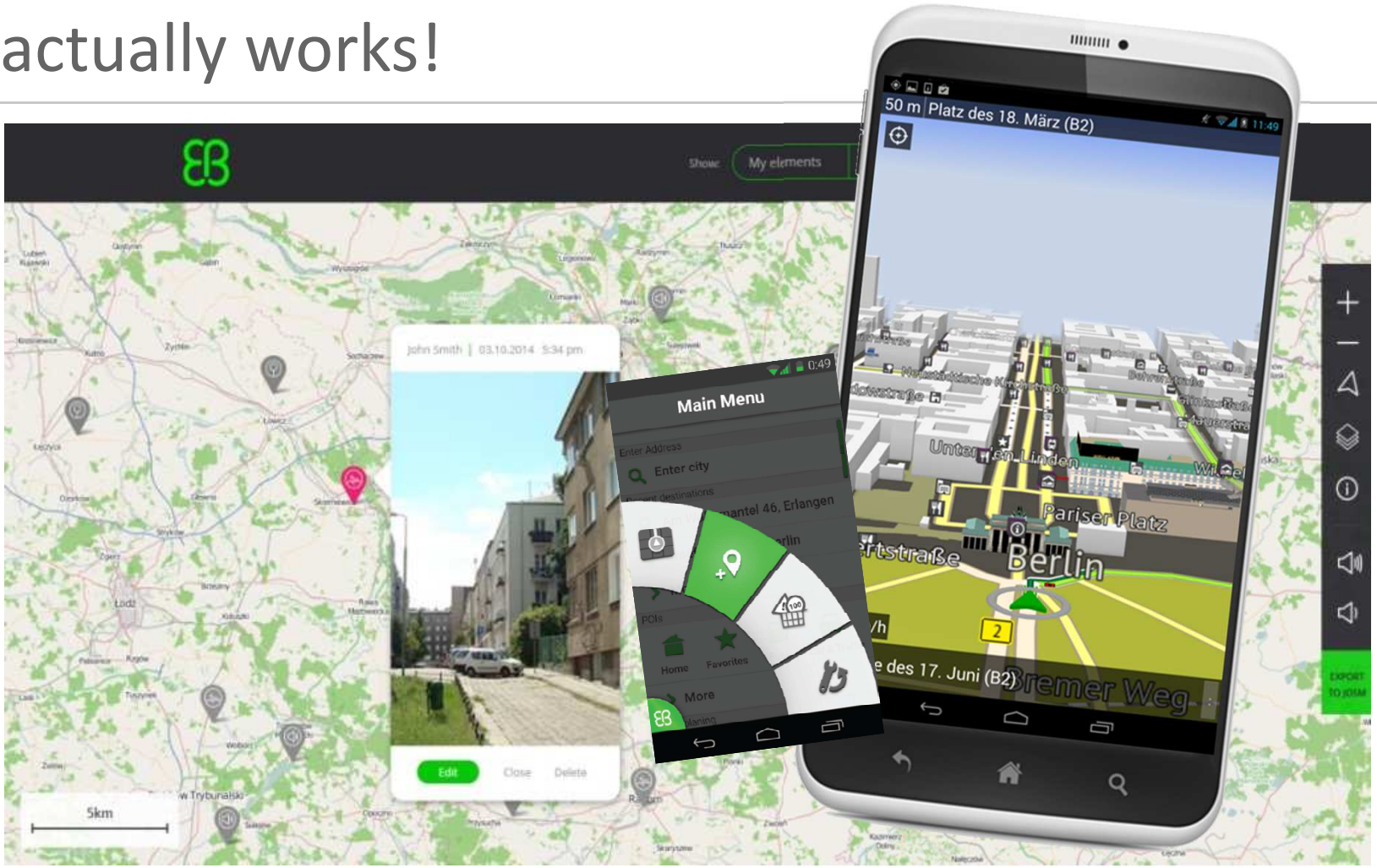
- EB Cloud
- How things were done in the past
- Cloud Computing
- Scalability
- Availability
- Cost & Operations
- Overview & Outlook



EB Dirigo to kickstart the learning cloud



It actually works!



www.ebdirigo.com

EB Cloud main features

- **based on Amazon Web Services (AWS)**
  - world‘s relevant regions covered
  - costs are scaling with actual usage
- **highly scalable architecture**
  - NoSQL database for short-term storage
  - Elastic load balancers
- **24/7 availability**
  - i.p. no maintenance windows
  - seamless software updates
- **Fault tolerant**
  - different availability zones
  - automatic fail-over
  - session fail-over
- **Monitoring & testing**
  - Load tests for several 100,000 users performed
  - Ongoing monitoring of critical operational parameters

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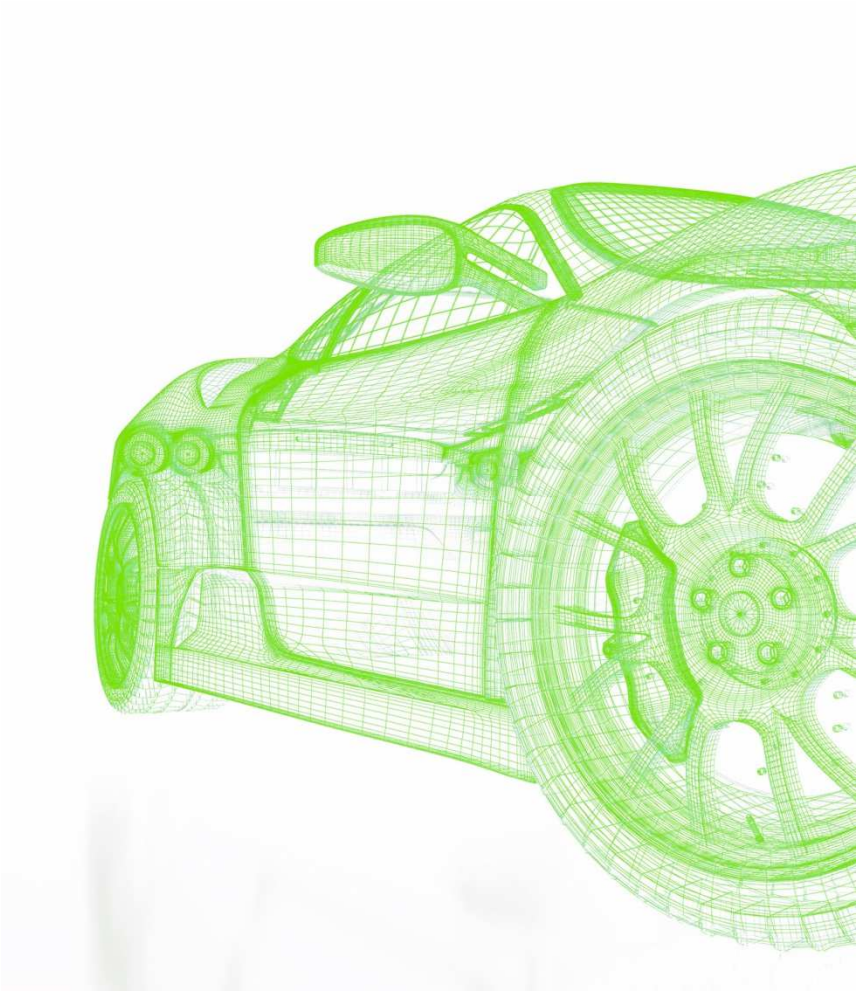
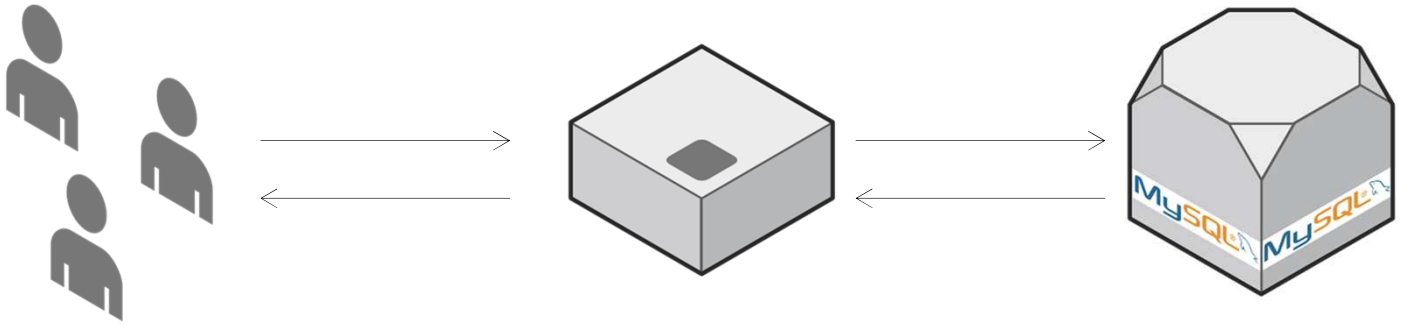


Typical Multi-Tier Web Application



Clients

Application Server

Relational DB

Rollout at the customer’s site

- Maintenance window
- Migrate database
- Deliver application (.war file) to the customer
- Customer IT responsible for keeping the server alive

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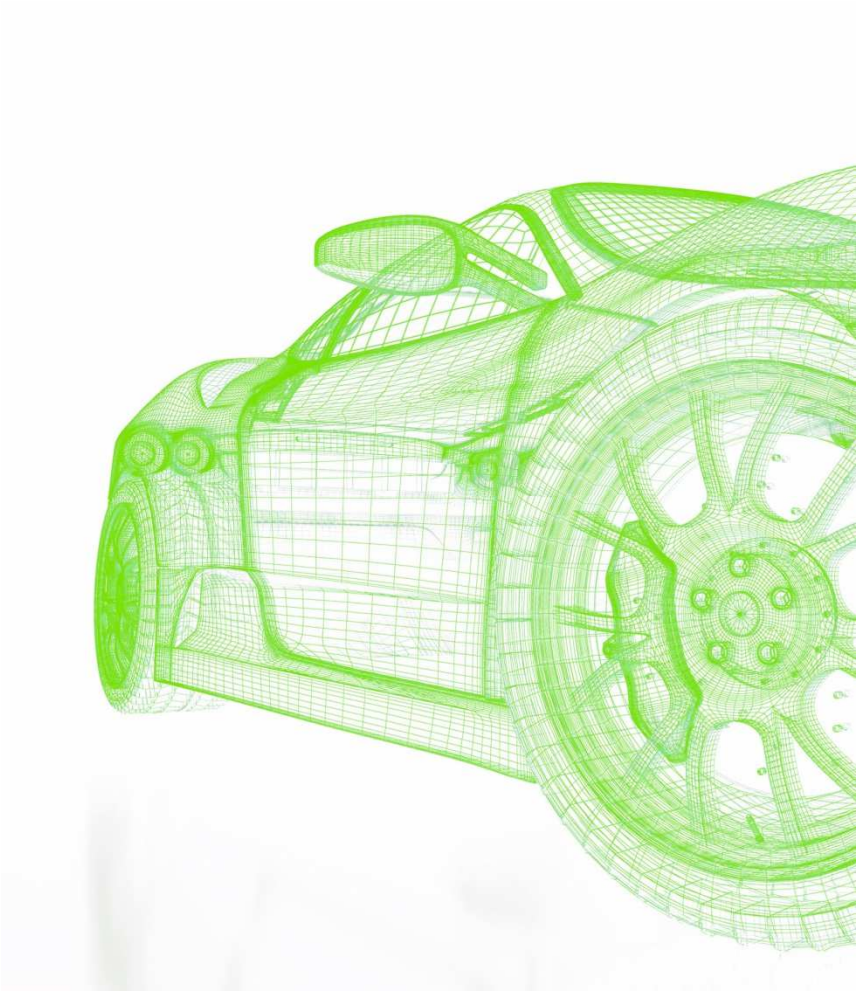

Cloud Computing

- Infrastructure as a Service (IaaS)
  - Virtual Machines
  - Load Balancers
  - Disk Storage
- Platform as a Service (PaaS)
  - Elastic Beanstalk/Lambda
- Software as a Service (SaaS)
  - Google Drive/Apple iCloud

Goals for the Dirigo cloud service

- Scalability
  - Expected a couple thousand users after launch
  - Later maybe cars in the millions
  - Fast response times for users
- Availability
  - No maintenance windows
  - Seamless software updates
  - Fault tolerance
- Cost reduction
  - Save cost in operations
  - Scale hardware costs with amount of users
- Security and Privacy

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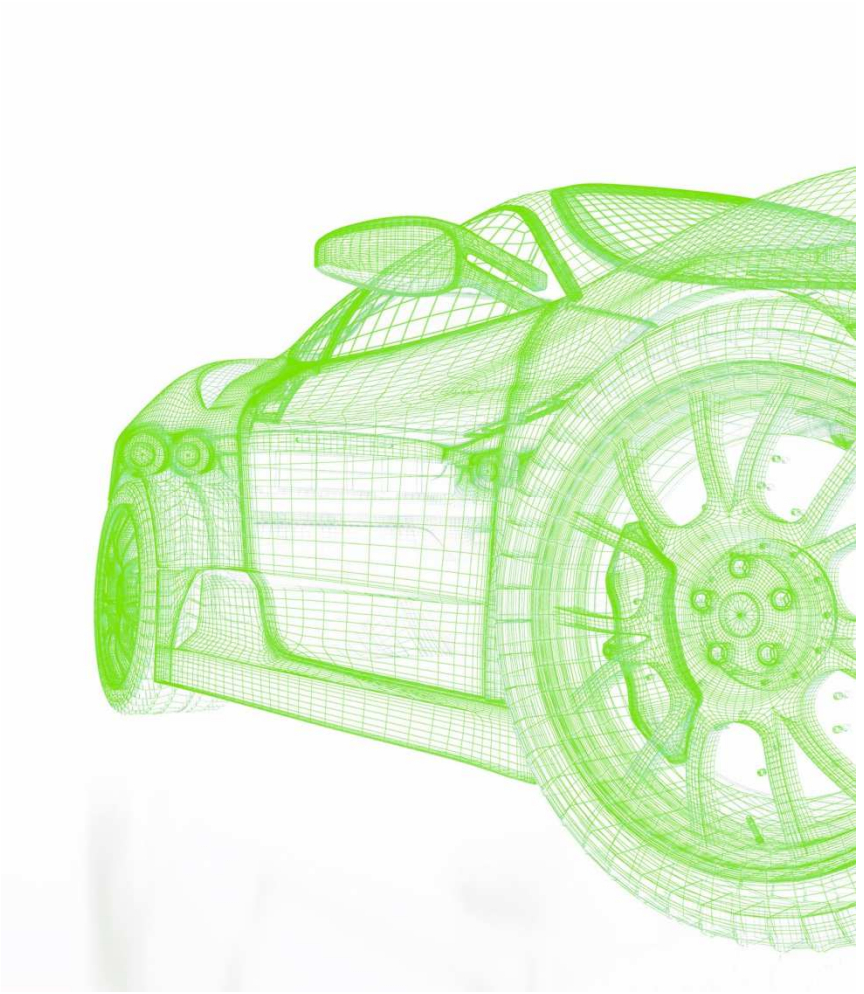
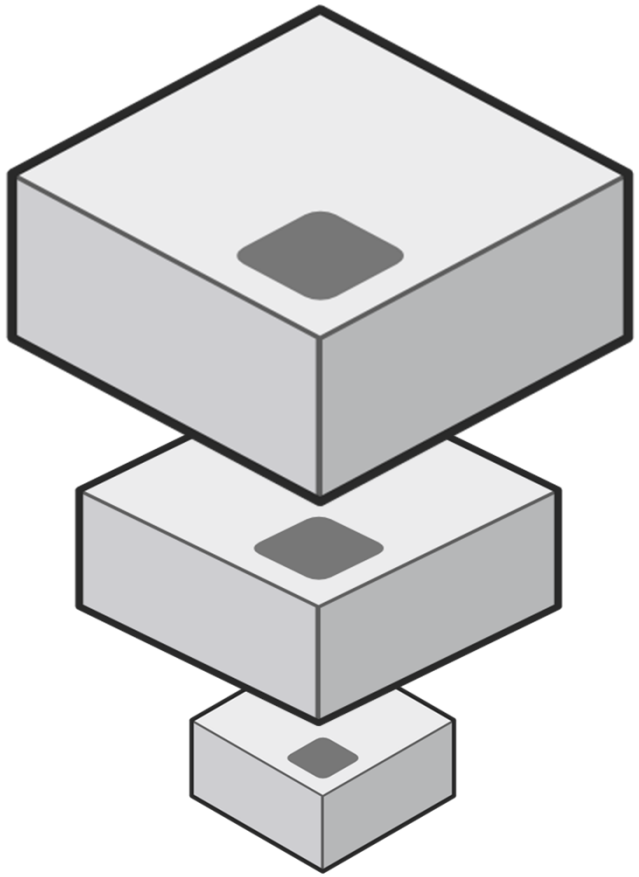
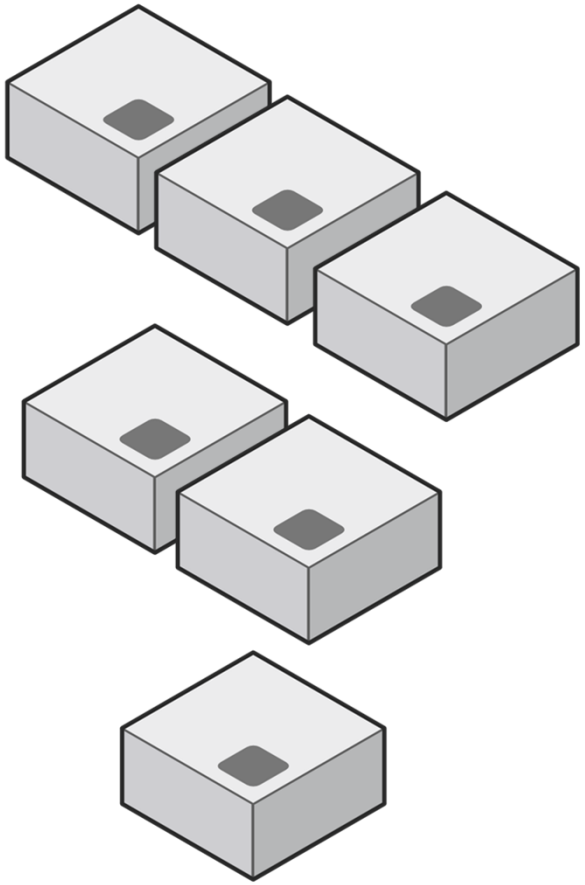


Scaling types

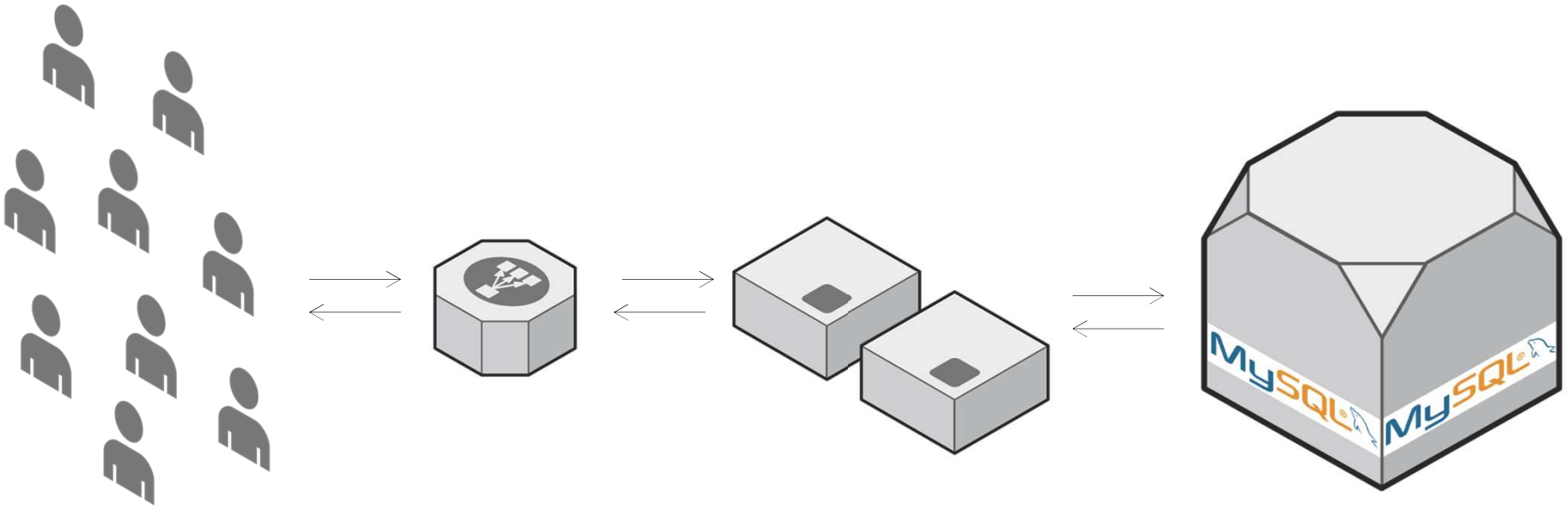
Vertical / Scale up



Horizontal / Scale out



Scaled web application



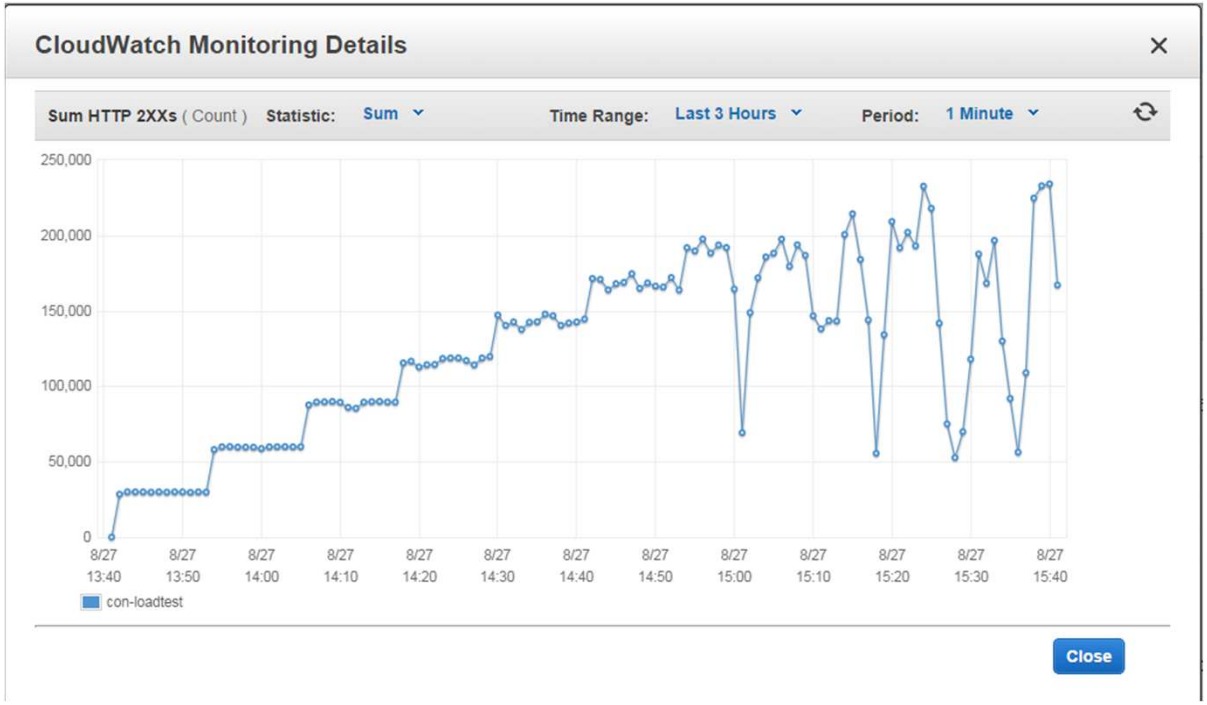
Clients Load Balancer Application Servers Relational DB

NoSQL Databases

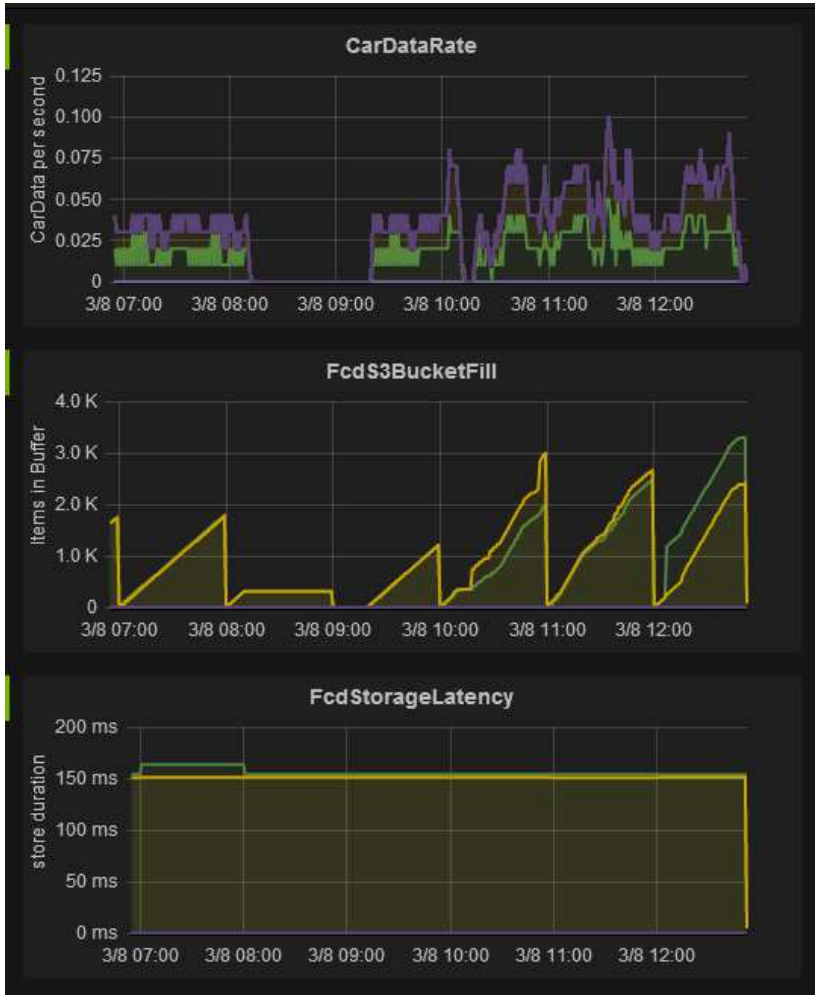
- Different types for different problems
- Often horizontally scalable
- Schema-less
- Select the right type of storage
- Think about data usage, then store for optimized access
- Good shard key is important
  - Avoid sequences
  - Pick one with a good distribution

Performance tests

- Find bottlenecks in the system
- Simulate typical workloads
- Ramp up the load until system saturates/collapses



Monitoring



- Environment
  - Amazon Cloudwatch
  - MongoDB MMS
- In-Application
  - Codahale Metrics
  - Graphite
  - Grafana

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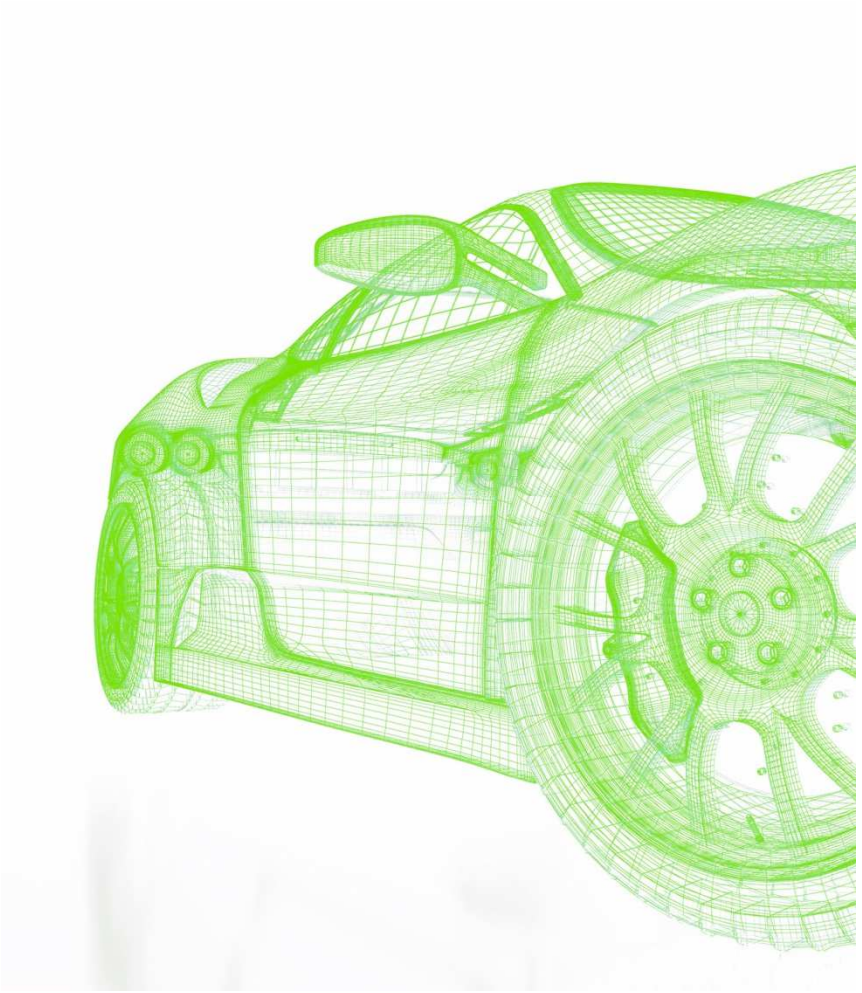
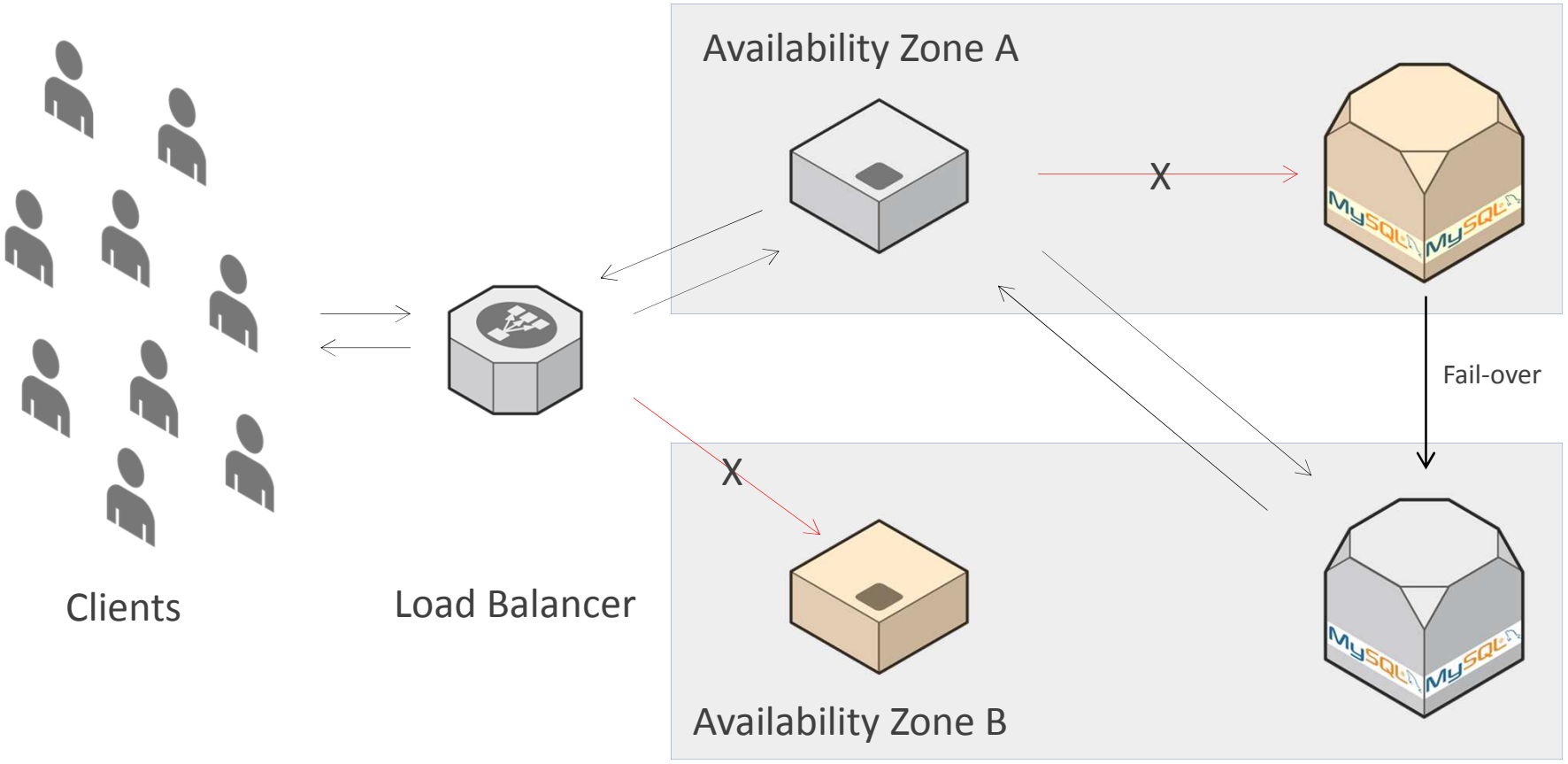


Fault-tolerant web application



Avoid single points of failure

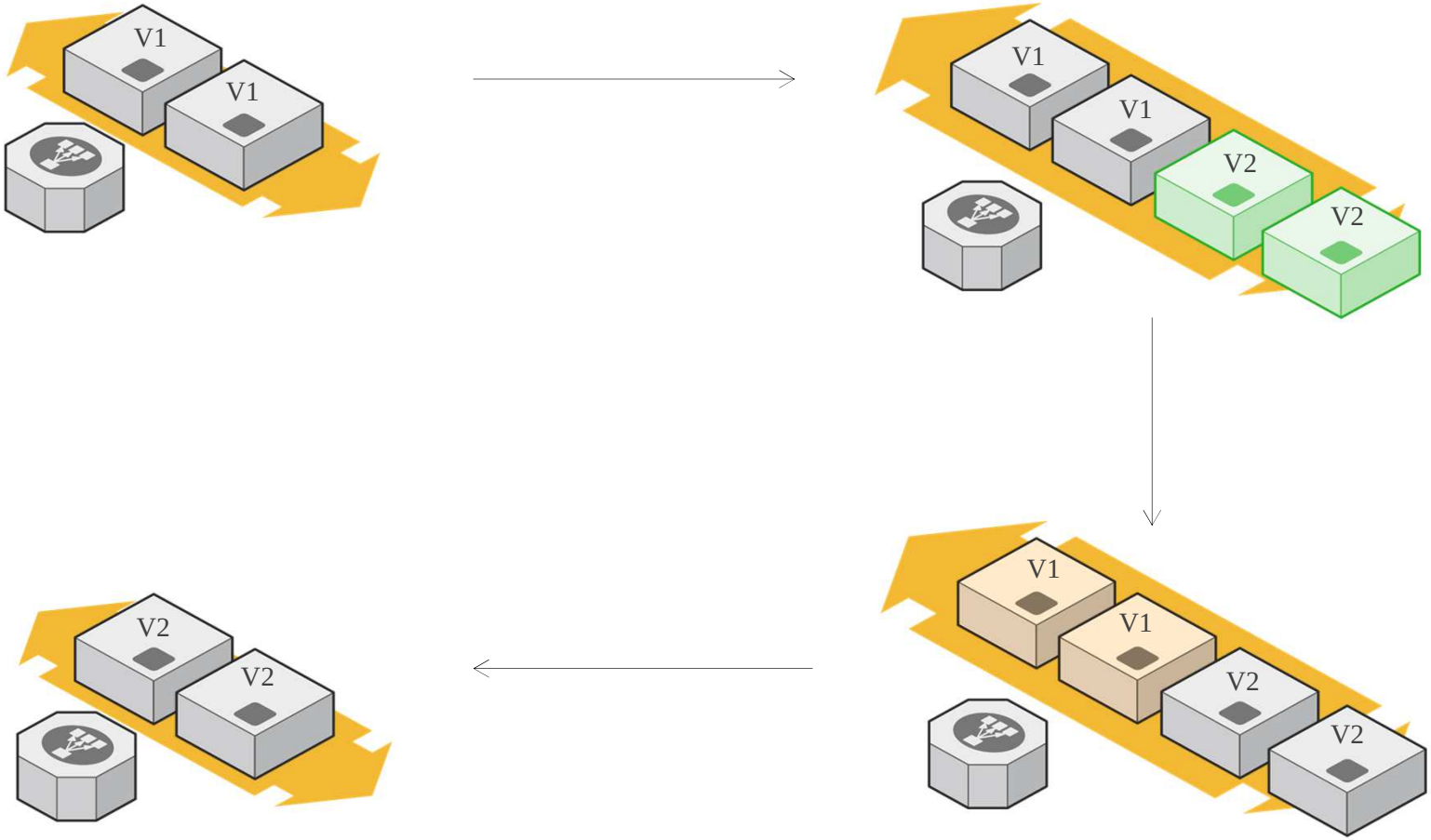
- Stateless application
- Disposable nodes
- Single LDAP server (Multi-Master setup proved to be very difficult) was replaced by DynamoDB
- PostgresDB was replaced by MongoDB Cluster
- WebMapper session fail-over using Hazelcast

Auto scaling

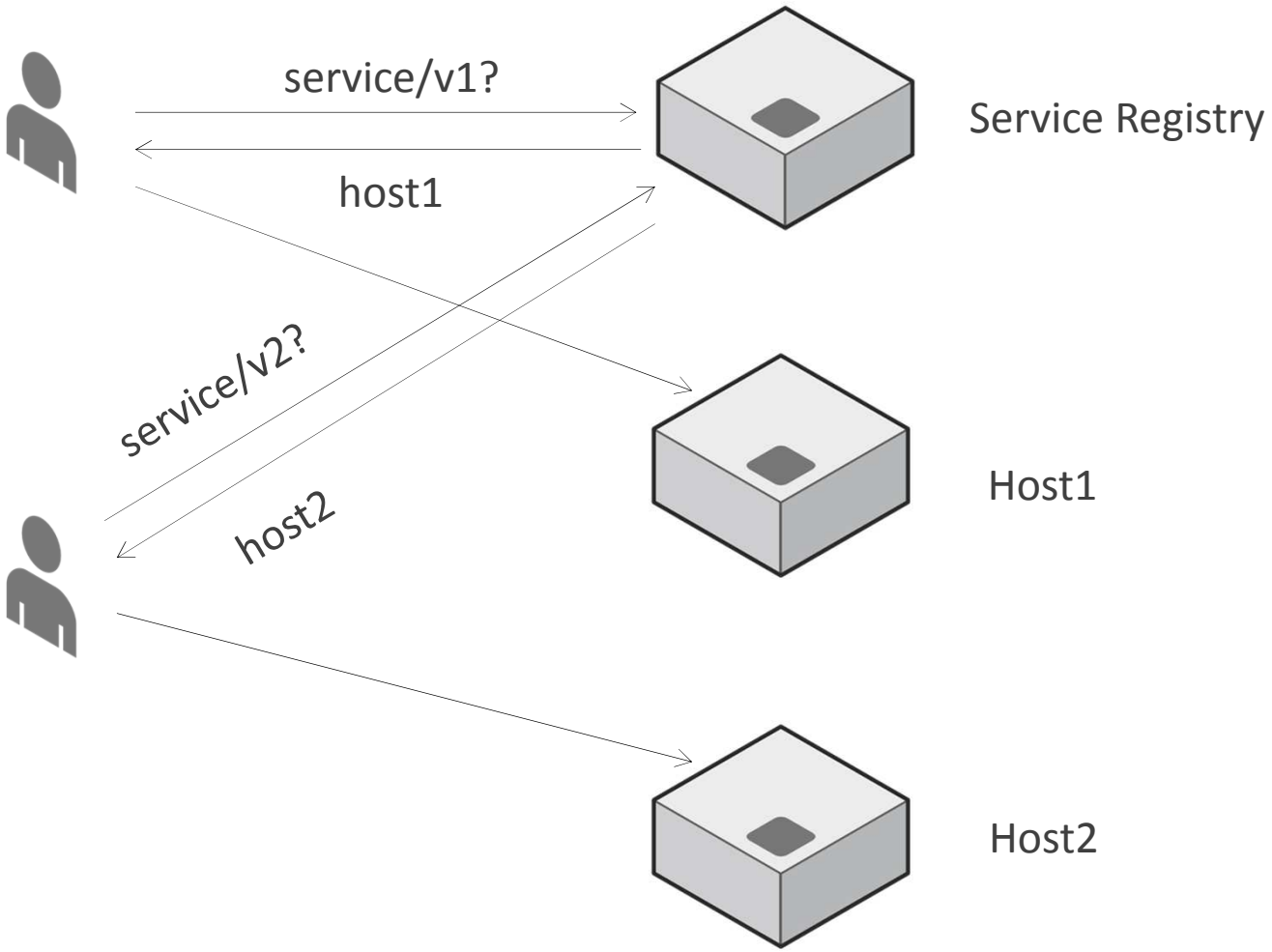
- Amazon automatically starts and stops nodes to match system load
- Auto scaling supports multiple availability zones
- Auto scaling even for a single instance (Watchdog for cron job node)

What happened?

Rolling Updates



Service Discovery



Global scaling and fail-over

- Cloudfront used for fast global map download
- Global request routing using DNS (Route53)
- Potential deployment in different AWS regions world wide

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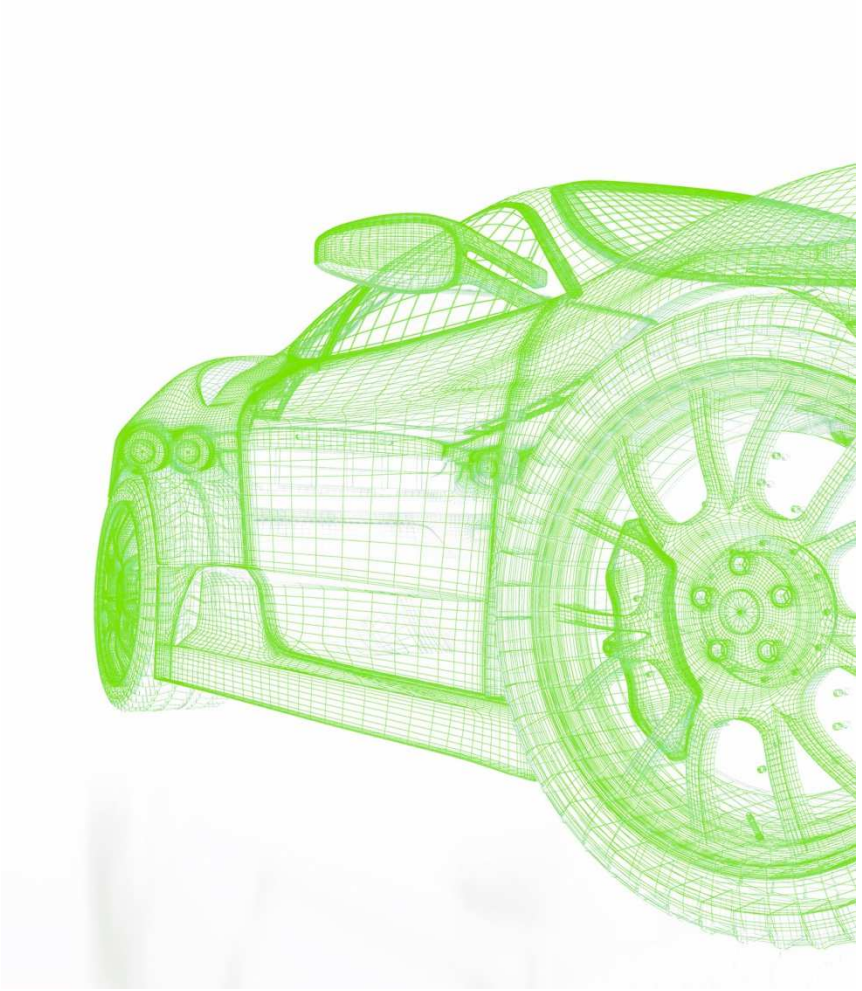

Deployment

- Automate using auto-scaling (No manual intervention necessary)
- Create AMI images for auto-scaling
- Use PaaS when possible (No overhead maintaining machine images)
- Select the right machine type for the job
- Avoid DIY, use managed services where possible (Potential drawback: Vendor lock-in)

Security & Operation

- Separate AWS account for production data
- Strict role & rights management
- External company for security audit
- External company for operation of production account
- Limited access to production data to avoid privacy leaks

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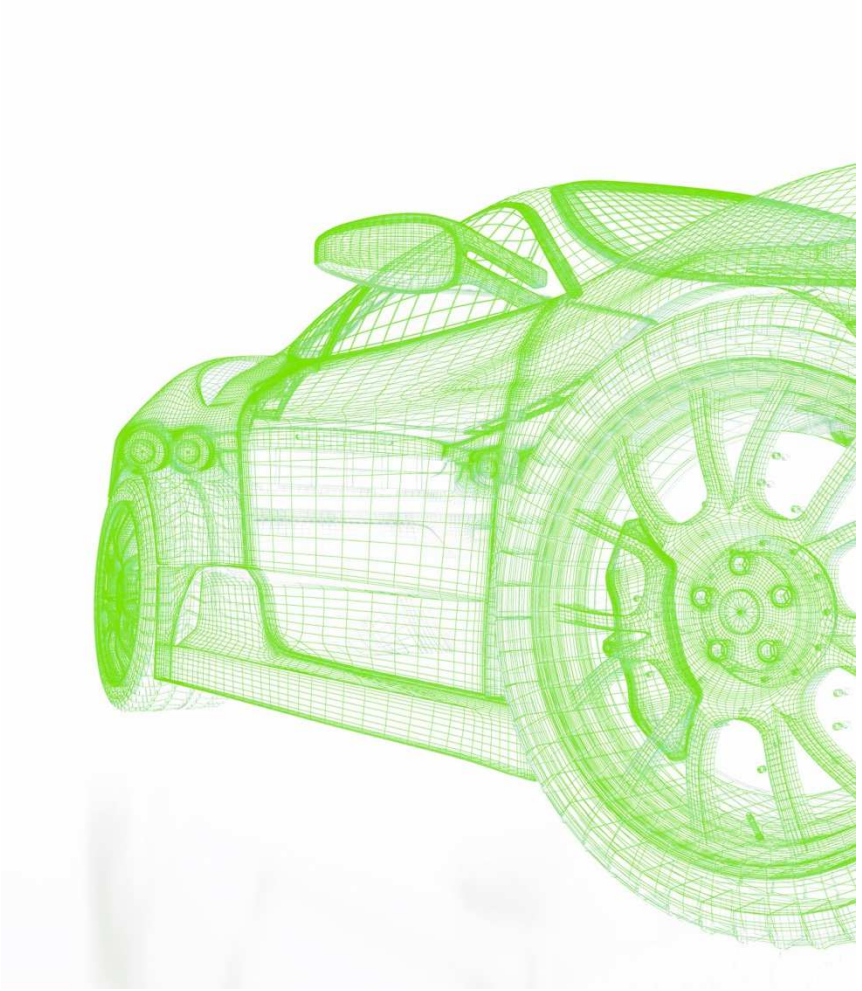

EB Cloud Overview

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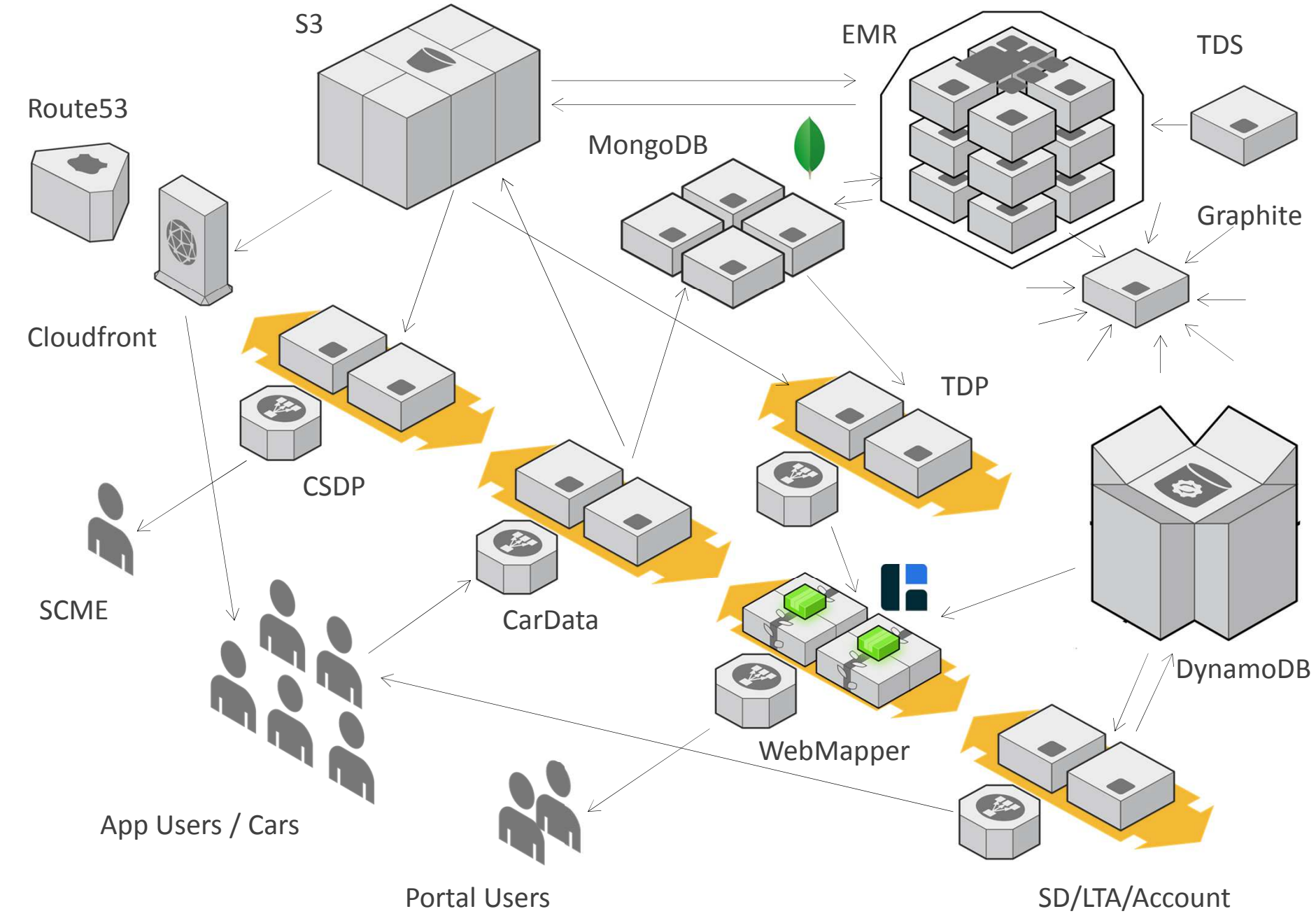

Outlook

- Replace Map-Reduce with streaming framework ✓
- More real-time services
- Global operation
- Additional customers for rebranded Mobile App
- Reuse EB Cloud backend for connected navigation and other projects

Contact us!

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