

# Microservices Development with Examples in NServiceBus

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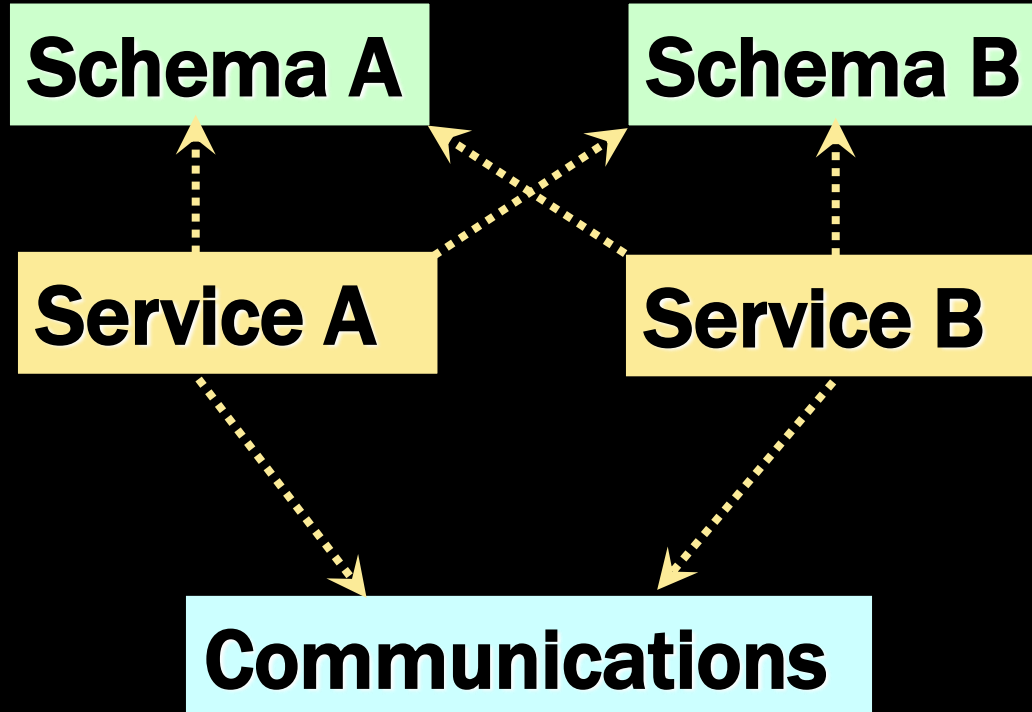
# SOA Building Blocks

# What is a service?

## Tenets of Service Orientation:

1. Services are autonomous.
2. Services have explicit boundaries
3. Services share contract & schema,  
not class or type
4. Service interaction is controlled by policy.

# Service Orientation



# What is a service?

A service is the technical authority for a specific business capability.

All data and business rules reside within the service.

Nothing is “left over” after identifying services

Everything must be in some service

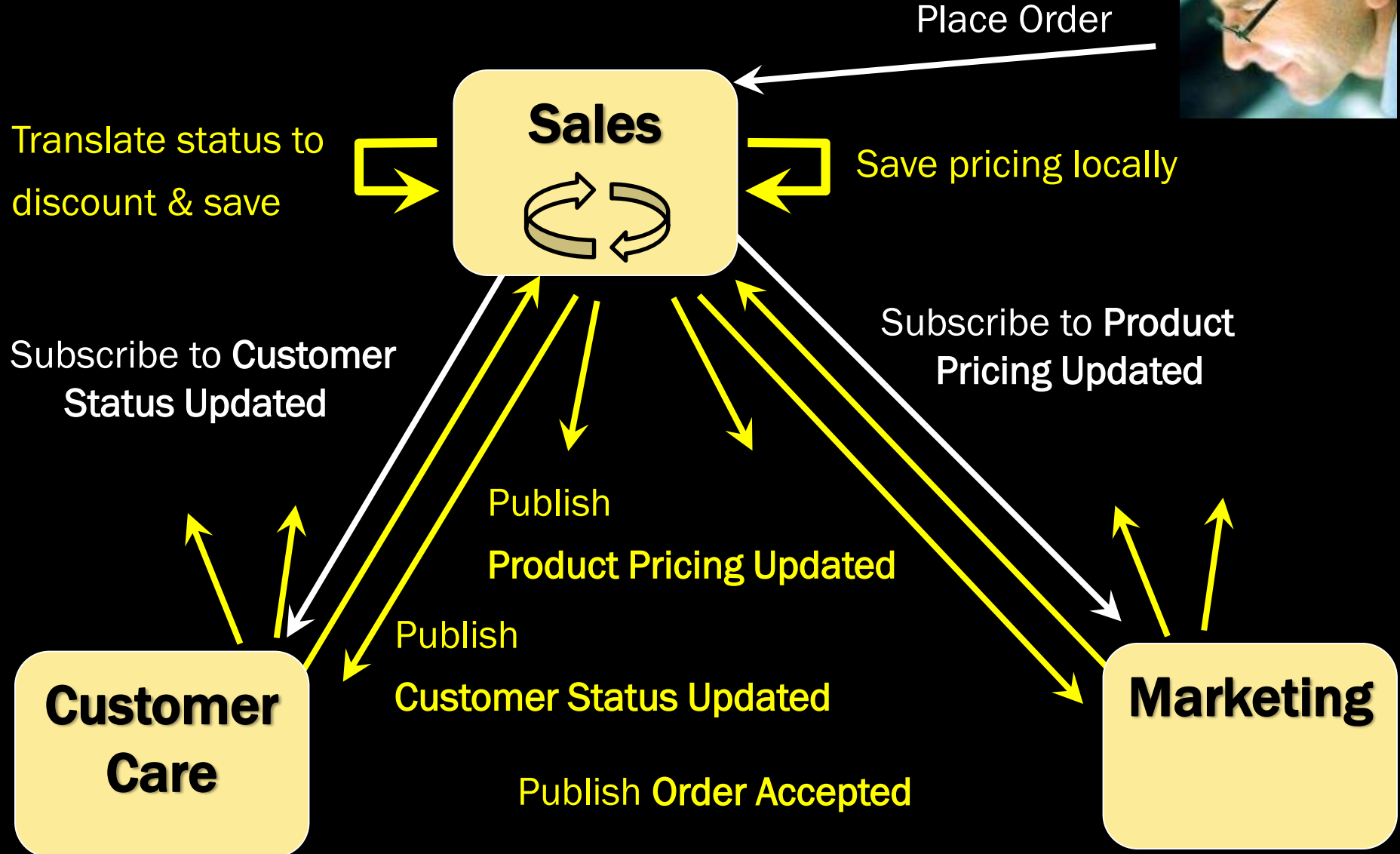
# What a service is NOT

- A service that has only functionality is a function not a service.
  - Like calculation, validation
- A service that has only data is a database, not a service.
  - Like [create, read, update, delete] entity
- WSDL doesn't change logical responsibility

# 4+1 views of software architecture

- Services are in the logical view
- Mapping to the development view, a service could be a source control repository

# Service Examples

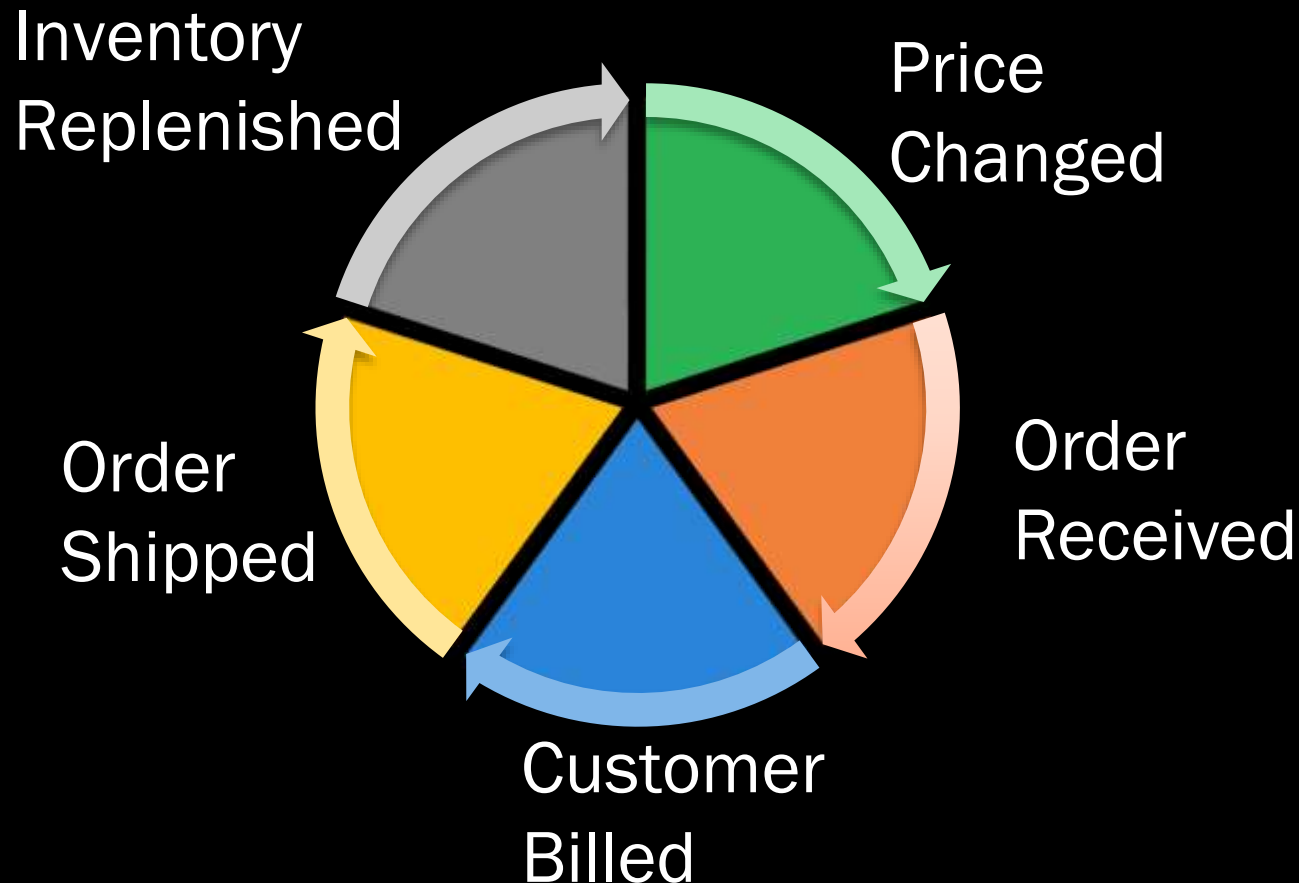




# Service Event Lifecycles

Business processes remain within services

Cascading events give rise to enterprise processes



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**PATTERNS OF ENTERPRISE APPLICATION ARCHITECTURE**

MARTIN FOWLER  
With contributions from:  
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# Service Deployments

- Many services can be deployed to the same box
- Many services can be deployed in the same app
- Many services can cooperate in a workflow
- Many services can be mashed up  
in the same page

# Same page composition



**Product Catalog**

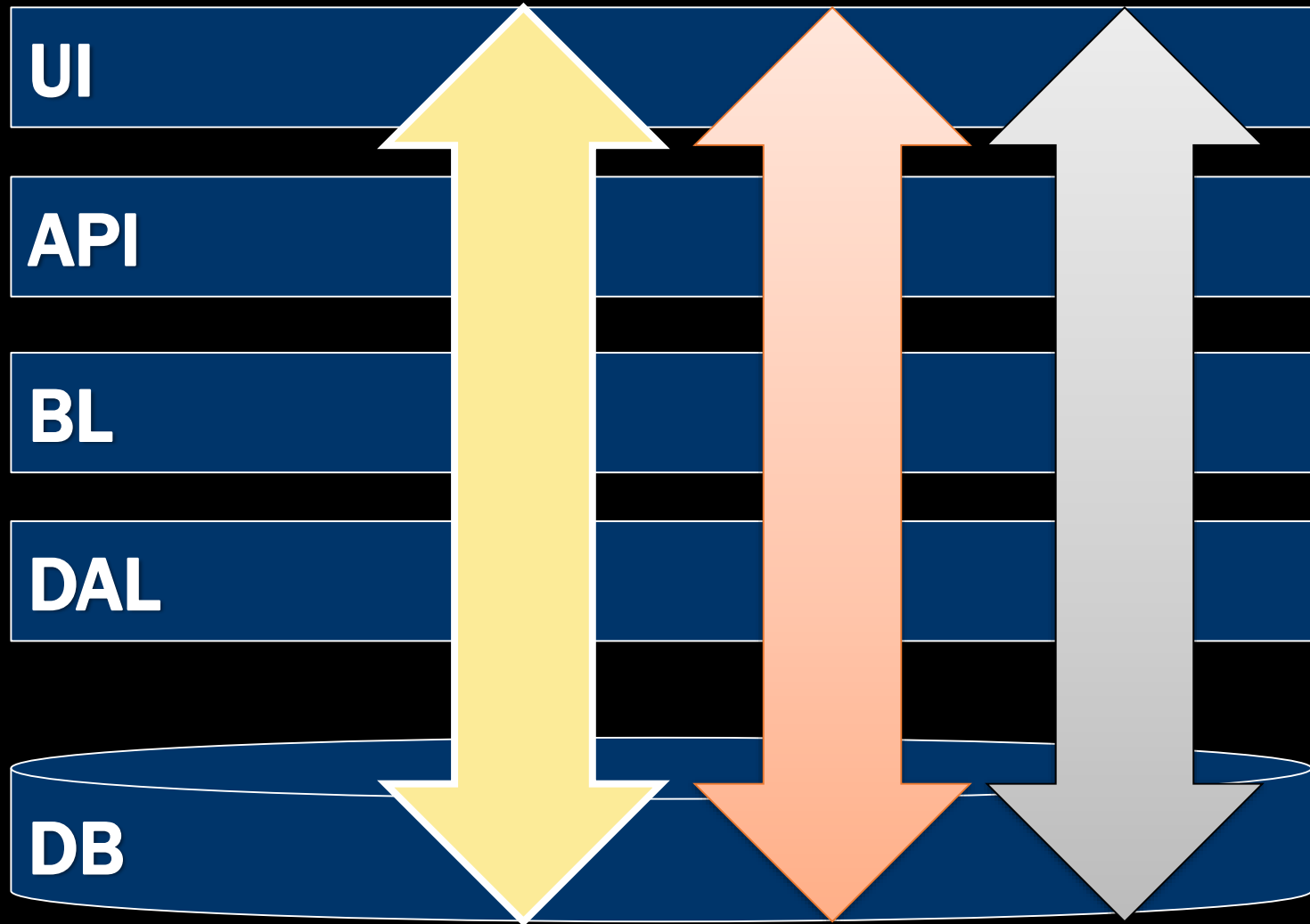
**Pricing**

**Inventory**

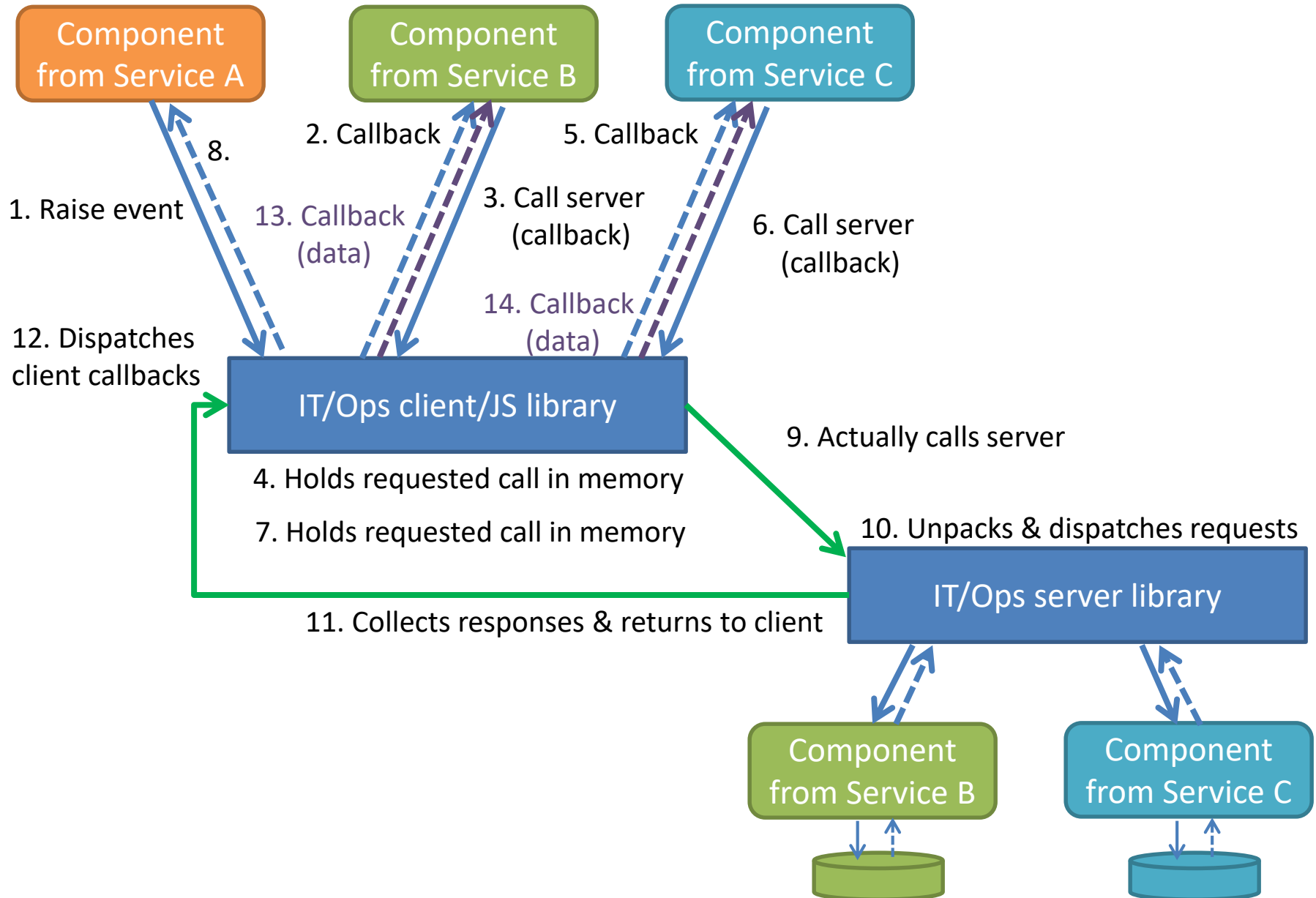
**Cross Sell**

**Server**

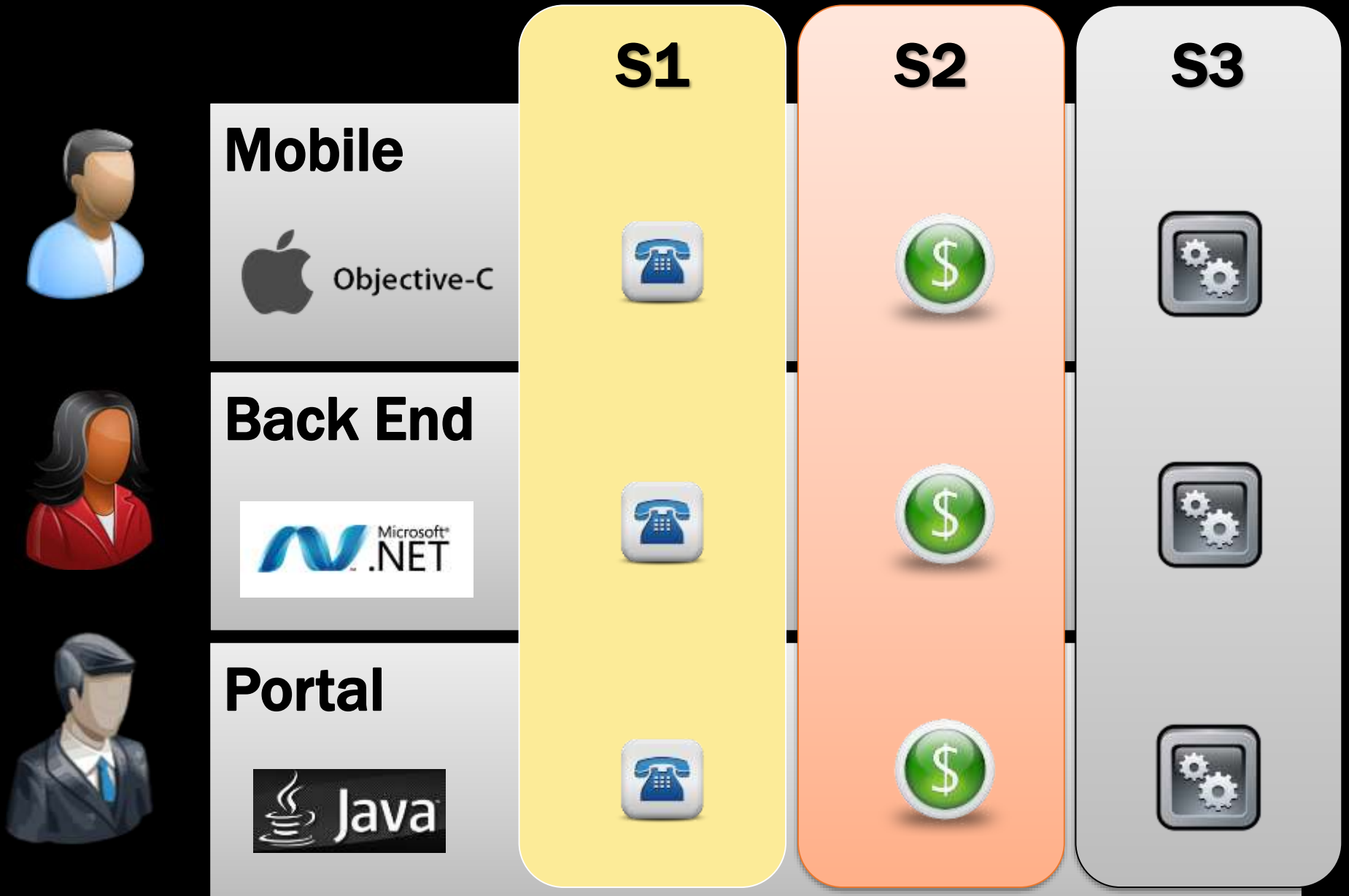
# Top-to-bottom services



# Performance Optimization



# Across the enterprise services





# Amazon.com checkout workflow



## Choose a shipping address

Is the address you'd like to use displayed? Click the "address" button. Or you can [enter a new address](#).

### Address Book

Ship to this address

#### Udi Dahan

20 Uri Tzvi Greenberg street  
Haifa, IL 34757  
Israel  
Phone: +972-522888426

Edit

Delete

## How would you like to pay?

Get \$40 Back

Your cost could be **\$16.85 instead of \$56.85!** Get the **Amazon.com Visa® Card INSTANTLY** and you'll **automatically get \$40.00 back** after your first purchase.

### Your credit cards

	Name on card	Expires on
<b>Visa</b> ending in 1448	EHUD DAHAN	08/2010

Continue

(You can review this order before it's final.)

## Other payment options

## Choose your shipping options

### Shipping Details [\(Learn more\)](#)

### Choose a shipping speed:

- ☒ Standard International Shipping (average 18-32 days)
- ☐ Expedited International Shipping (average 8-16 business days)
- ☐ Priority International Courier (average 3-5 days)

Item: Need to [Change quantities or delete?](#)

Shipping to: Udi Dahan, 20 Uri Tzvi Greenberg street

#### • Patterns of Enterprise Application Architecture - Martin Fowler

**\$45.87** - Quantity: 1 - In Stock  
Condition: New  
Sold by: Amazon.com, LLC

## Does your order contain gift items?

☐ Ordering a gift? Check this box to mark items as gifts.

Continue

Review the information below, then click "Place your order."

[Place your order](#)

Shipping Details	Order Summary
<b>Shipping to:</b> <a href="#">Change</a> Udi Dahan 20 Uri Tzvi Greenberg street Haifa, IL 34757 Israel Phone: +972-522888426	Items: \$45.87 Shipping & Handling: \$10.98 Total Before Tax: \$56.85 Estimated Tax: \$0.00 <b>Order Total: \$56.85</b> <a href="#">Why didn't I qualify for FREE Super Saver Shipping?</a>
<b>Shipping Options:</b> <a href="#">(Learn more)</a> <b>Choose a shipping speed:</b> <input checked="" type="radio"/> Standard International Shipping (averages 18-32 days) <input type="radio"/> Expedited International Shipping (averages 8-16 business days) <input type="radio"/> Priority International Courier (averages 3-5 days) Need to <a href="#">Change quantities or delete?</a> <b>Estimated delivery date for this item: May 4, 2010 - May 24, 2010</b> Estimated ship date for this item: April 8, 2010 <b>Patterns of Enterprise Application Architecture - Martin Fowler</b> <b>\$45.87</b> - Quantity: 1 - In Stock Condition: New Sold by: Amazon.com, LLC <b>Gift options</b> None <a href="#">Change</a>	<b>Have any gift cards, gift certificates or promotional claim codes?</b> <a href="#">(Learn more)</a> Enter them here (one at a time): <input type="text"/> <a href="#">Apply</a> <b>Payment Method:</b> <a href="#">Change</a> Visa : ****-1448 Exp: 08/2010 <b>Billing Address:</b> <a href="#">Change</a> Udi Dahan 20 Uri Tzvi Greenberg street Haifa, IL 34757 Israel Phone: +972-522888426

Review the information above, then click "Place your order."

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# Which service owns this flow?



## Choose a shipping address

Is the address you'd like to use displayed? Click the "address" button. Or you can [enter a new address](#).

### Address Book

[Ship to this address](#)

#### Udi Dahan

20 Uri Tzvi Greenberg street  
Haifa, IL 34757  
Israel  
Phone: +972-522888426

[Edit](#)

[Delete](#)

## How would you like to pay?

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### Your credit cards

	Name on card	Expires on
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### Other payment options

## Choose your shipping options

### Shipping Details [\(Learn more\)](#)

### Choose a shipping speed:

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Shipping to: Udi Dahan, 20 Uri Tzvi Greenberg street

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Condition: New  
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### Does your order contain gift items?

☐ Ordering a gift? Check this box to mark items as gifts.

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Review the information below, then click "Place your order."

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Shipping Details	Order Summary
<b>Shipping to:</b> <a href="#">Change</a> Udi Dahan 20 Uri Tzvi Greenberg street Haifa, IL 34757 Israel Phone: +972-522888426	Items: \$45.87 Shipping & Handling: \$10.98 Total Before Tax: \$56.85 Estimated Tax: \$0.00 <b>Order Total: \$56.85</b> <a href="#">Why didn't I qualify for FREE Super Saver Shipping?</a>
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# Which service owns this flow?



## Choose a shipping address

Is the address you'd like to use displayed? If not, click the "Add a new address" button. Or you can [enter a new address](#).

### Address Book

Ship to this address

#### Udi Dahan

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Edit

Delete

## How would you like to pay?

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### Your credit cards

	Name on card	Expires on
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### Other payment options

# None

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# Workflow composition



## Shipping

**Choose a shipping address**  
Is the address you'd like to use displayed? If not, click "Add new address" button. Or you can enter a new address.

**Add new address**

**Udi Dahan**  
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Haifa, IL 34757  
Israel  
Phone: +972-522888426

**Choose your shipping options**

**Shipping Details** ([Learn more](#))

**Choose a shipping speed:**

- ☒ Standard International Shipping (averages 18-32 days)
- ☐ Expedited International Shipping (averages 8-16 business days)
- ☐ Priority International Courier (averages 3-5 days)

**Item:** Need to [Change quantities or delete](#)?

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- Patterns of Enterprise Application Architecture**  
\$45.87 - Quantity: 1 - In Stock  
Condition: New  
Sold by: Amazon.com, LLC

**Does your order contain gift items?**

☐ Ordering a gift? Check this box to mark items as gifts.

**Billing**

**How would you like to pay?**

Get the **Amazon.com Visa® Card** INSTANTLY and you will automatically get \$40.00 back after your first purchase.

**Your credit cards**

	Name on card	Expires on
<input checked="" type="radio"/> <b>VISA</b> Visa ending in 1448	EHUD DAHAN	08/2010

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**Other payment options**

**Sales**

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**Shipping Details**

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Israel  
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**Shipping Options:** ([Learn more](#))

**Choose a shipping speed:**

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- ☐ Expedited International Shipping (averages 8-16 business days)
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**Patterns of Enterprise Application Architecture** - Martin Fowler  
\$45.87 - Quantity: 1 - In Stock  
Condition: New  
Sold by: Amazon.com, LLC  
 **Gift options** None

**Order Summary**

Items:	\$45.87
Shipping & Handling:	\$10.98
<b>Total Before Tax:</b>	<b>\$56.85</b>
Estimated Tax:	\$0.00
<b>Order Total: \$56.85</b>	

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**Billing**

Have any gift cards, gift certificates or promotional codes? Enter them here to save at a discount. ([Learn more](#))

**Payment Method:** [Change](#)

Visa : \*\*\*\*-1448  
Exp: 08/2010

**Billing Address:** [Change](#)

Udi Dahan  
20 Uri Tzvi Greenberg street  
Haifa, IL 34757  
Israel  
Phone: +972-522888426

**Sales**

Review the information above, then click "Place your order"

# Other common elements

- Color scheme, layout, fonts, CSS, images, etc
- All communicate the “corporate brand”
- The responsibility of the branding service

# Layout in the Branding Service

- View Models created with Knockout.js
- Each service binds its model to part of the view model

# Leverage CSS classes

```
<div class="price">$49.99</div>
```

Makes it bold, red, large

```
<div class="inventory.InStock"></div>
```

Makes it bold and green

Go even farther with JS CSS preprocessors:  
Mustache, LESS, Sass

# What about the technical stuff?

- Authentication, Authorization, etc
- A service should own this  
shouldn't it?



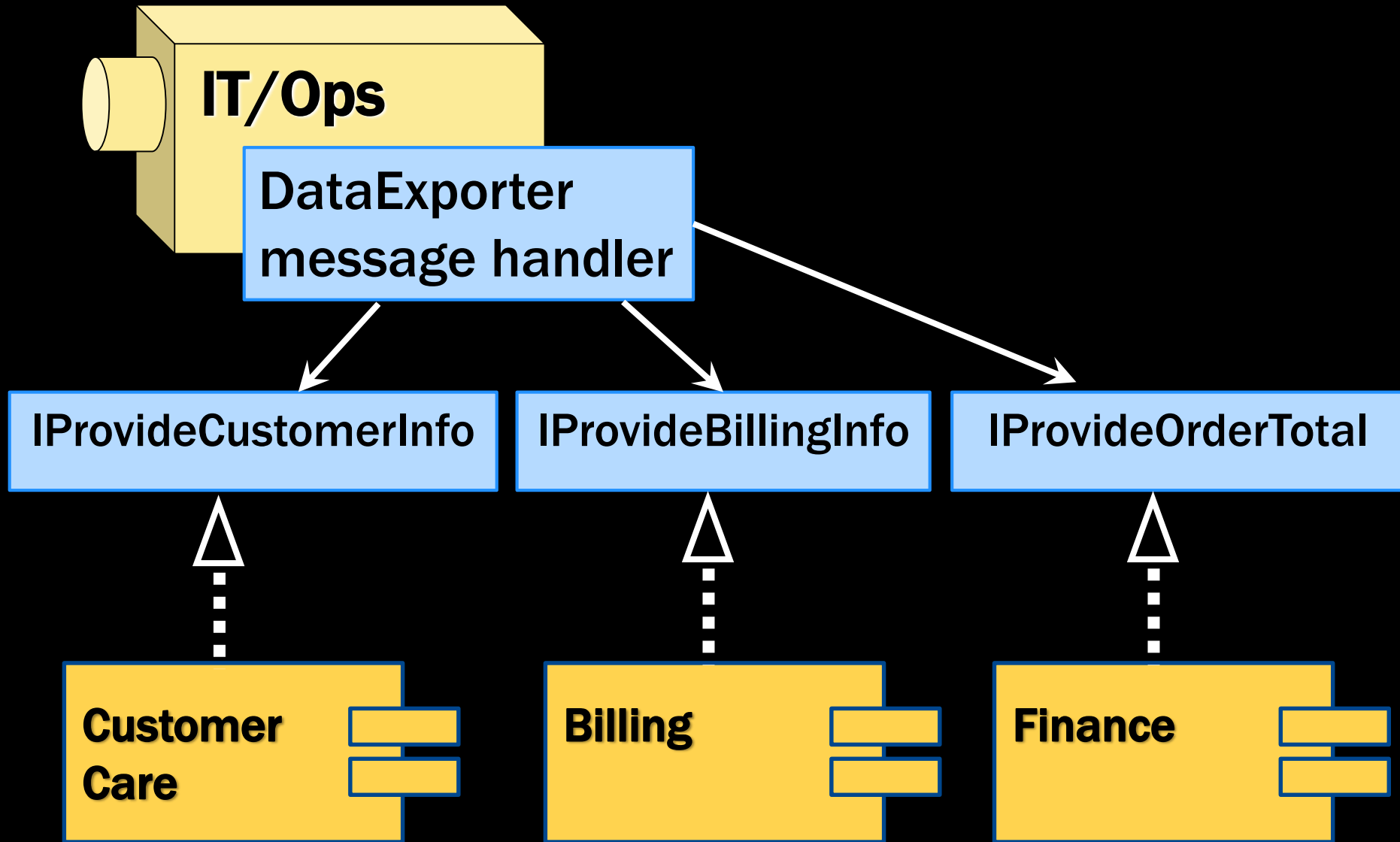
# The IT/Operations Service

- Responsible for keeping information flowing (and secure) in the enterprise
- Focused on the deployment & physical views:
  - Responsible for hosting (web servers, DBs, etc)
  - Owns connection strings, queue names
    - Authentication, authorization – LDAP/AD access

# IT/Ops hardly ever subscribes

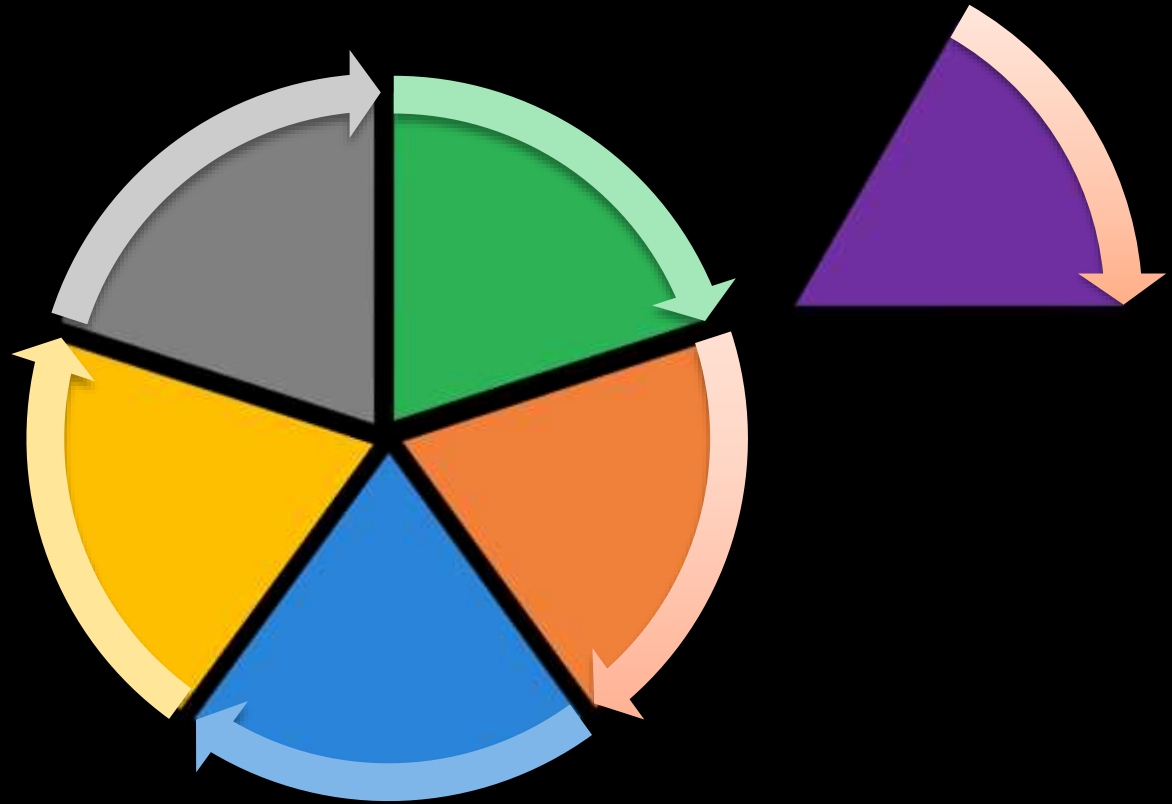
- Doesn't really do pub/sub with other services
- One (rare) case
  - HR – employee hired, employee fired
  - Provisions / De-provisions machines, accounts, etc
  - Don't introduce this unless necessary

# Integration Endpoints ( + email )



# Referential Integrity & Reporting

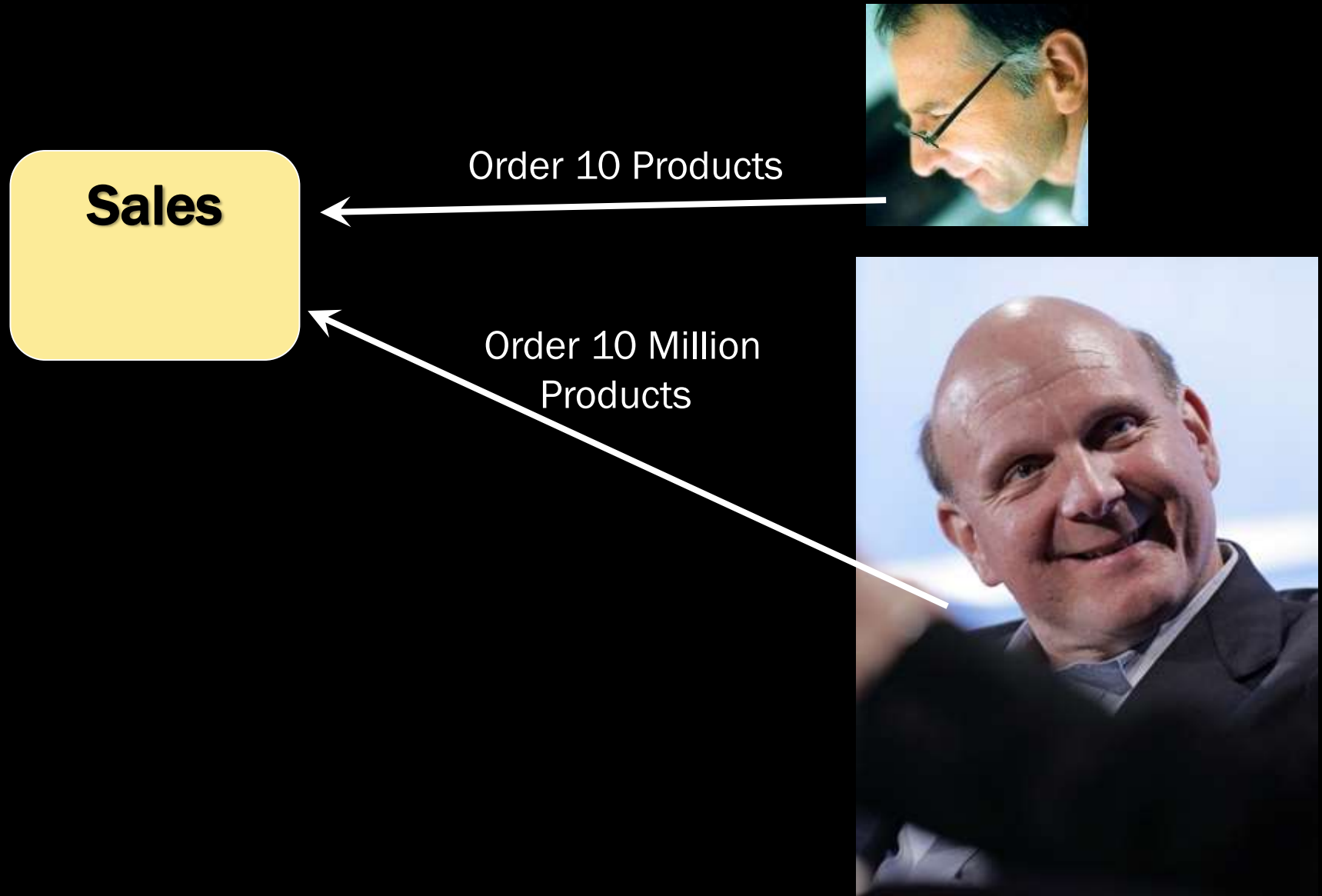
Consider using the audit log in IT/Ops



# Service Decomposition

- The large-scale business capability that a service provides can be further broken down
- “Business Components” refer to the technical elements that implement the capability’s constituent parts

# Quality of Service Requirements



# Business Components

**Sales**

**Regular  
Customers**

**Strategic  
Customers**

Order 10  
Products

Order 10 Million  
Products

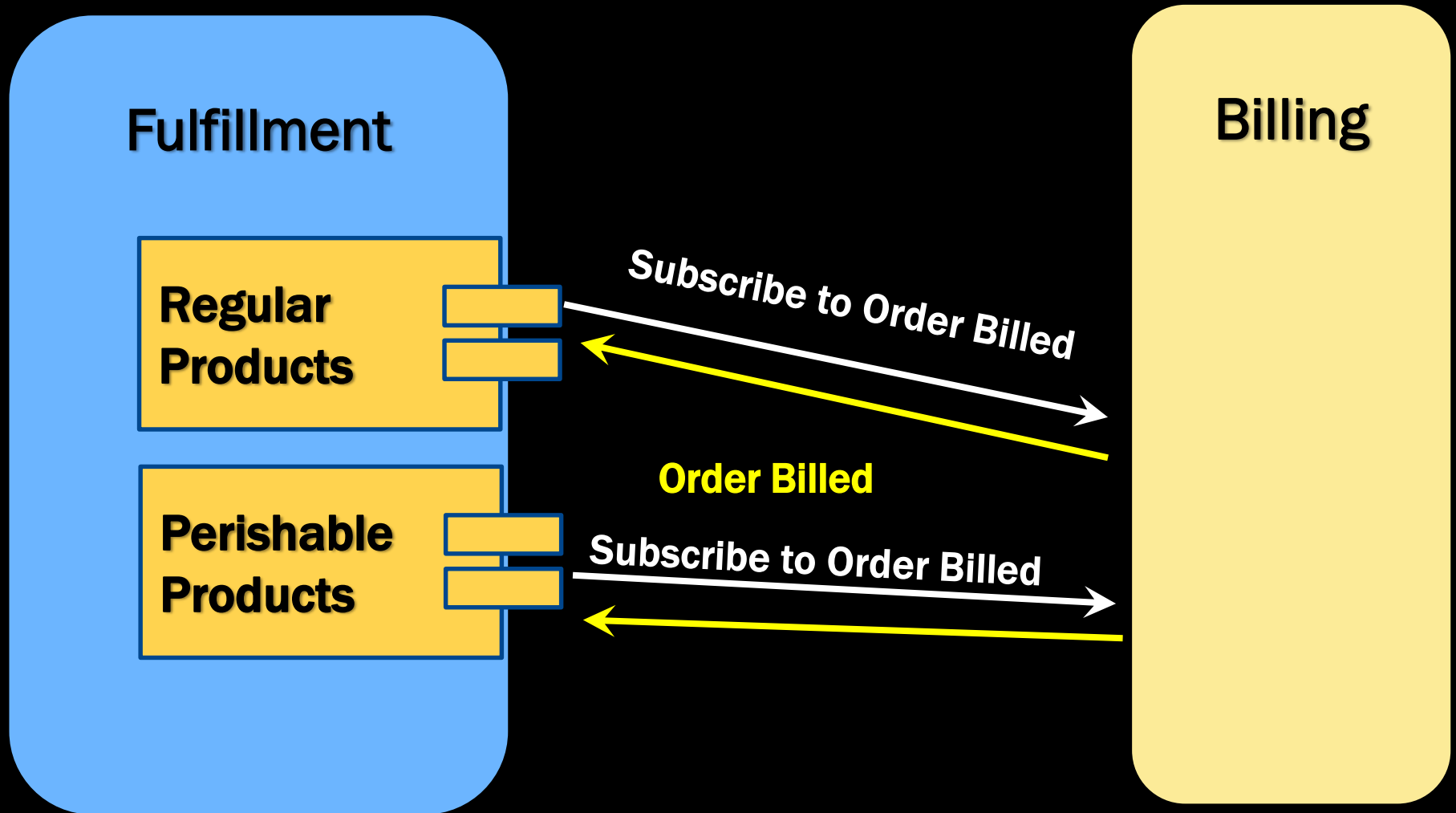


# More Examples

- Airlines
  - Different counters for business class customers
- Shipping
  - Need to track temperatures for frozen goods / meat
  - Can use regular trucks for toilet paper
- Billing
  - Monthly invoicing for customers with an agreement
  - Others billed directly to credit card



# Business Components & Pub/Sub



# Transactions

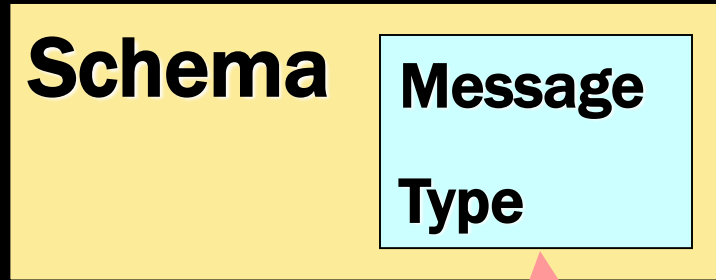
- Some kinds of messages don't change state
- Other kinds of messages can get lost in case of failure (volatile data like stock quotes)
- We can divide a Business Component along transactional lines for improved performance, into "Autonomous Components"
  - Transactions stay within the boundary of a component

# Autonomous Components

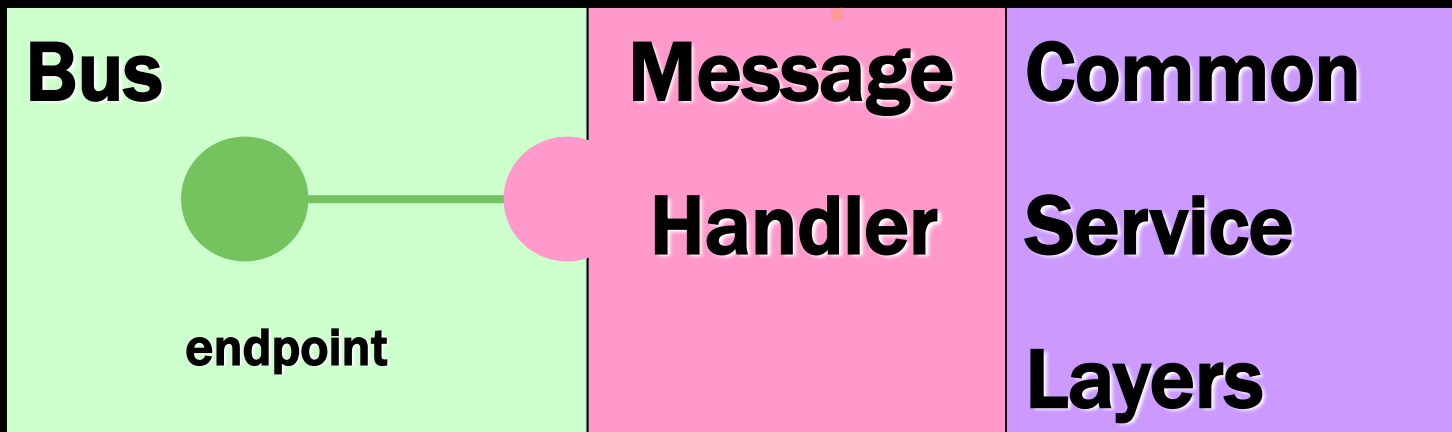
- A Business Component is composed of one or more Autonomous Components
- An Autonomous Component is responsible for one or more message types
  - Composed of one or more message handlers and the rest of the layers in the service

**Could be independently deployed**

# Autonomous Component Makeup

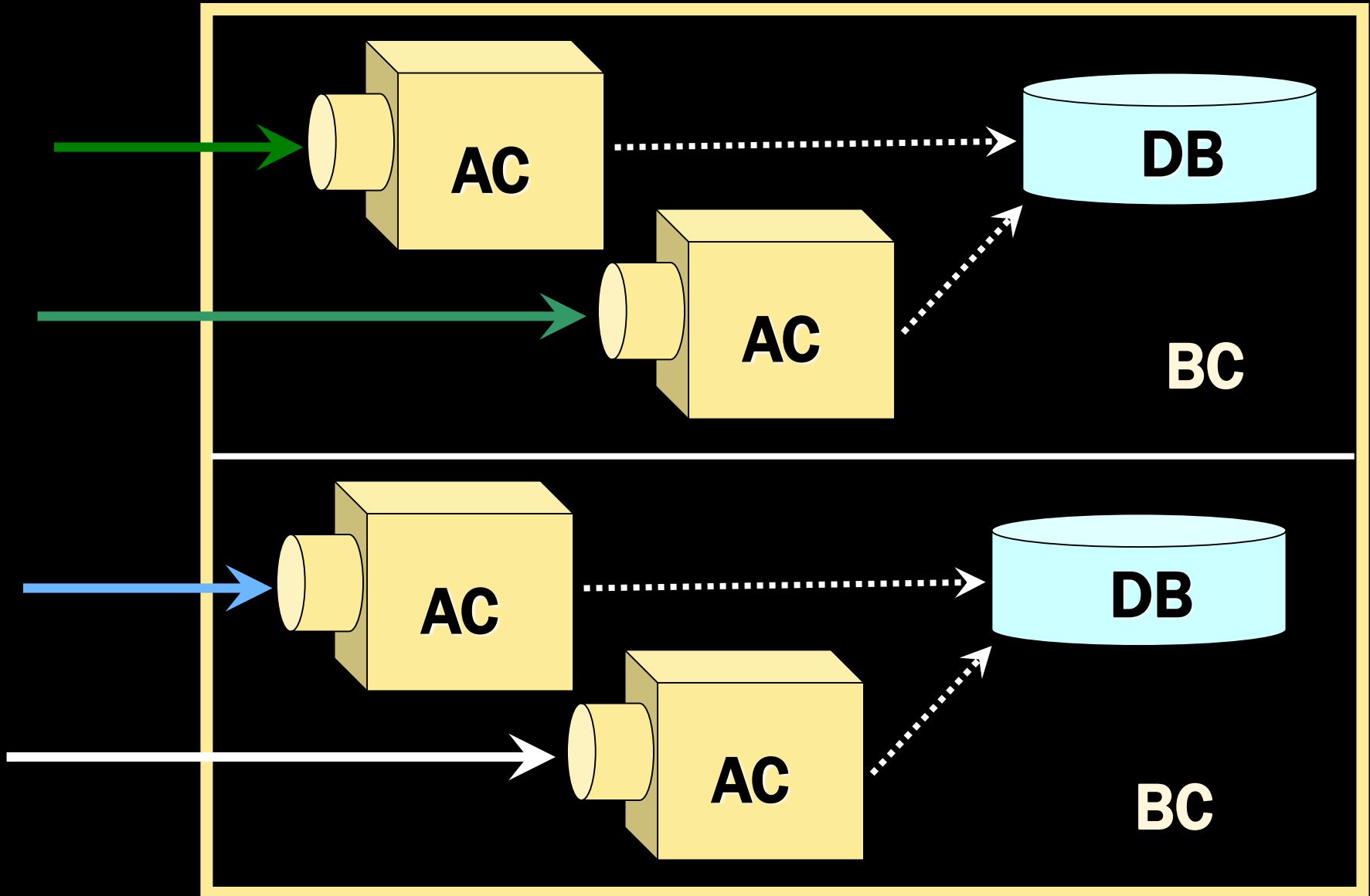


Multiple ACs can be hosted together



# AC's , BC's, and Services

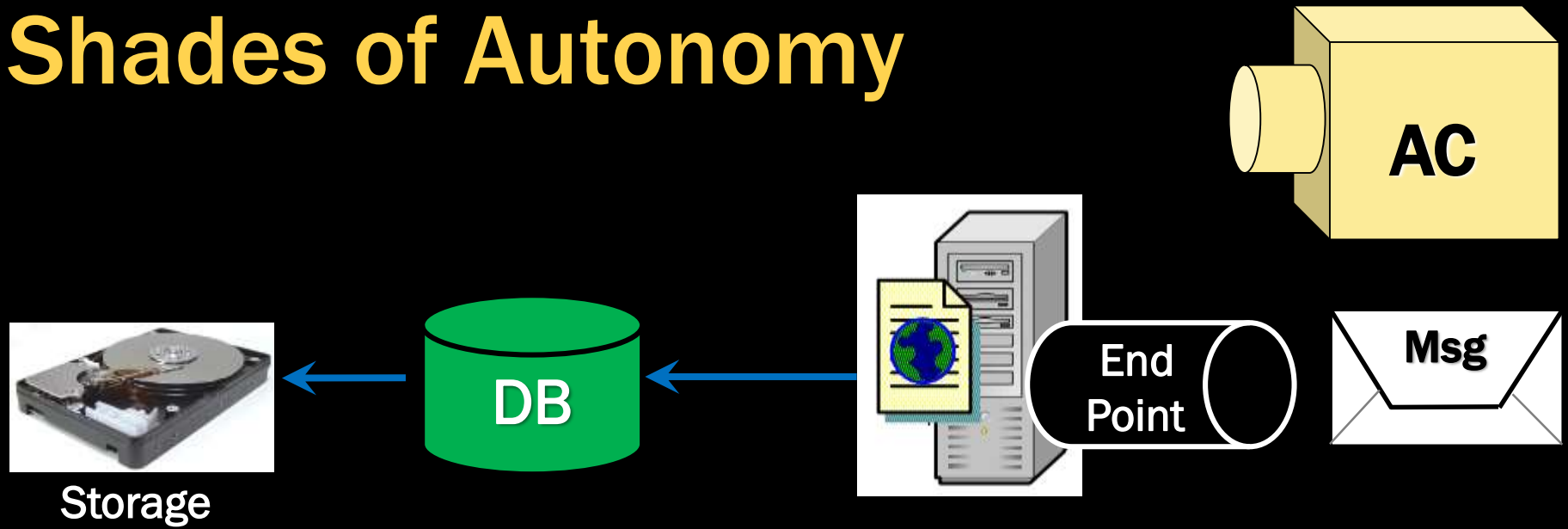
Service



# Coupling between ACs

- Don't try to reuse code between ACs
- Strive for “disposable” code
- Solve for today's problem – not tomorrow's
  - JFHCI

# Shades of Autonomy



Shared

Shared

Shared

Shared

Shared

Own

Shared

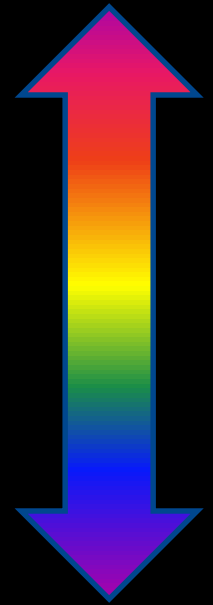
Own

Own

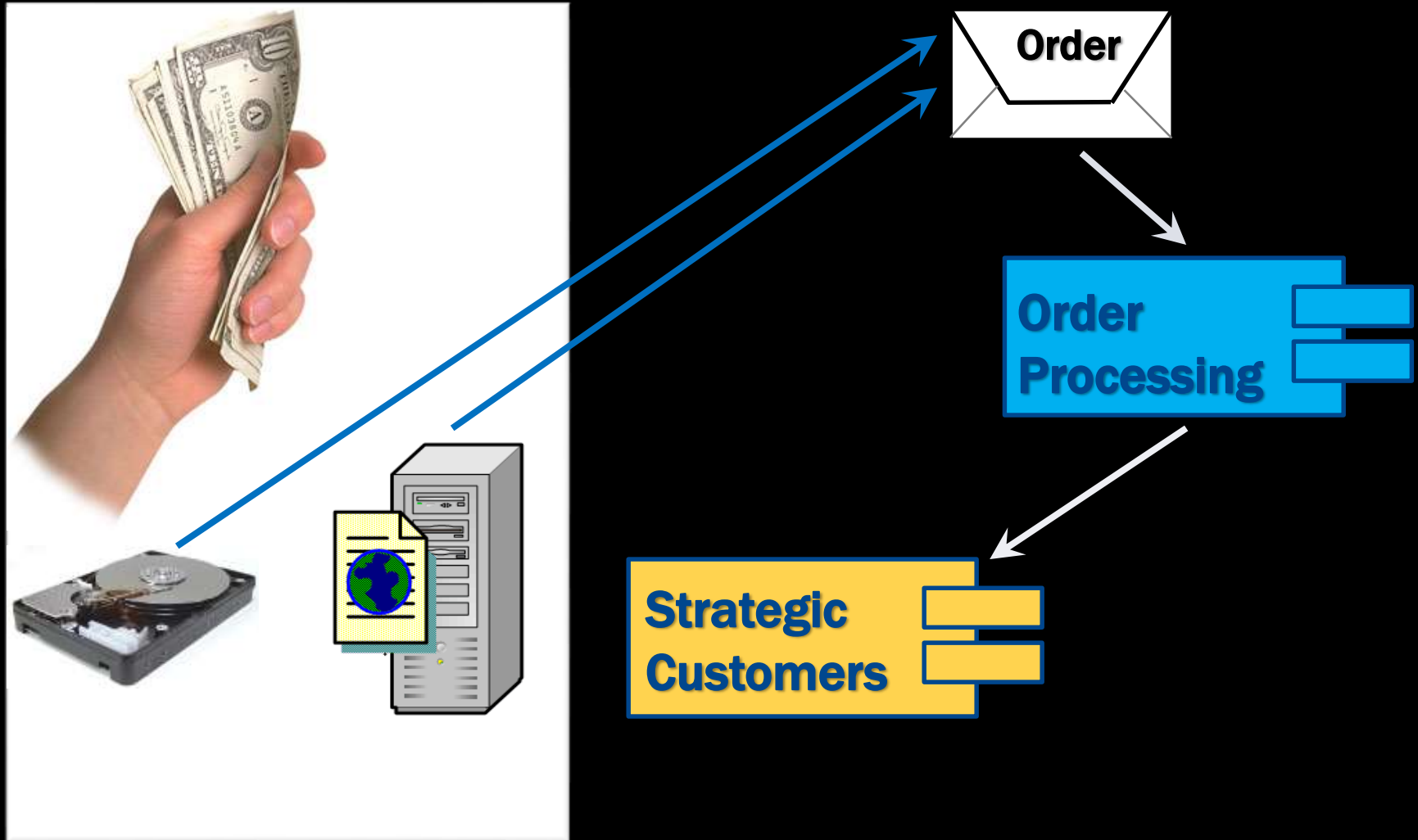
Own

Own

Own



# SOA => Business Value





# Summary

- Autonomous Components are the unit of deployment in SOA
- An AC takes responsibility for a specific set of message types in the service (ideally 1).
- An AC often uses the bus style to communicate with other ACs.

# Questions?