

Agenda

Architecture and deployment

Design principles and best practices

Relationships

Naming conventions

Data normalization





Architecture and Deployment

On-Premise

Control

Compliance

Speed

Reliability



Private cloud.





Public cloud

Setup

Costs

Elasticity and scale

Services



Deployment

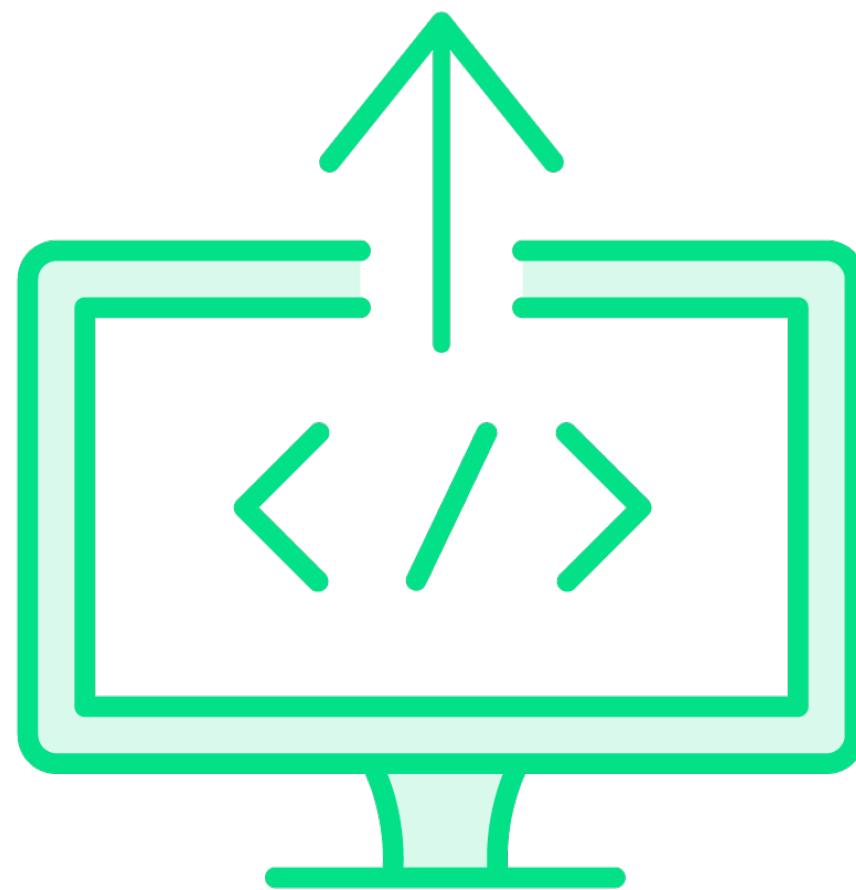
Infrastructure-as-a-service or IaaS

Platform-as-a-service or PaaS

Software-as-a-service or SaaS



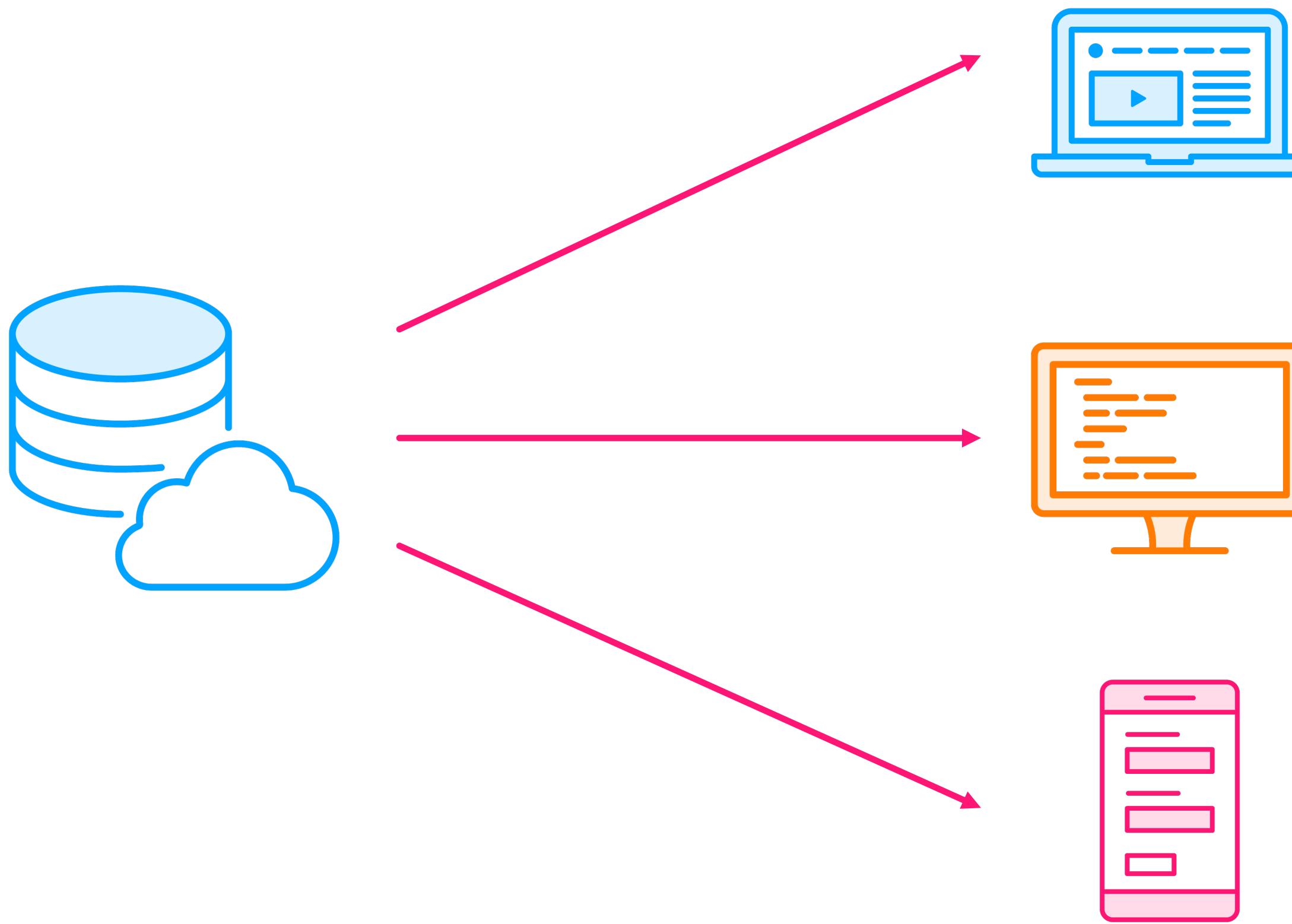
Hybrid Cloud



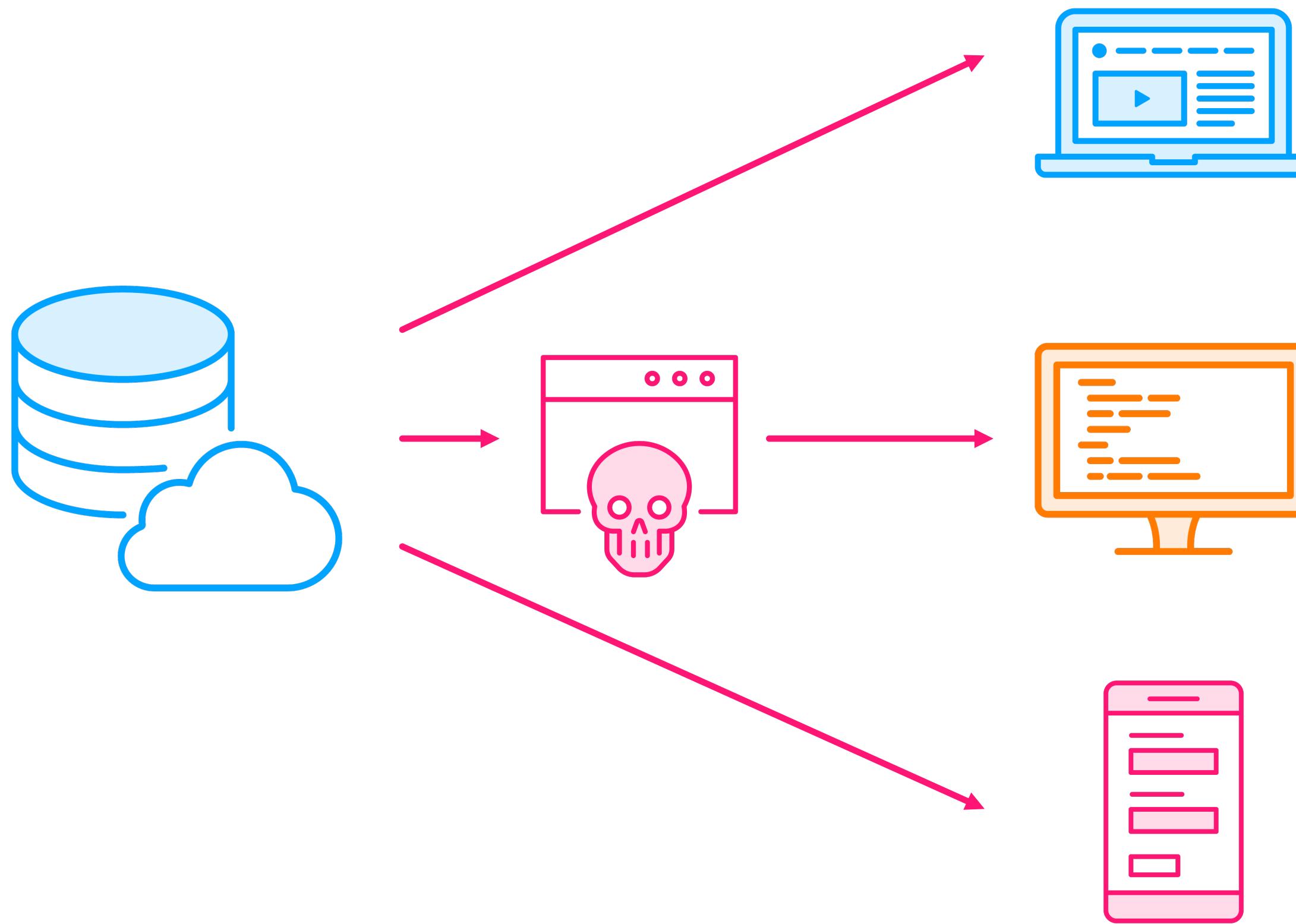
Blend of the public and private cloud
Control, security and compliance
Reduce costs



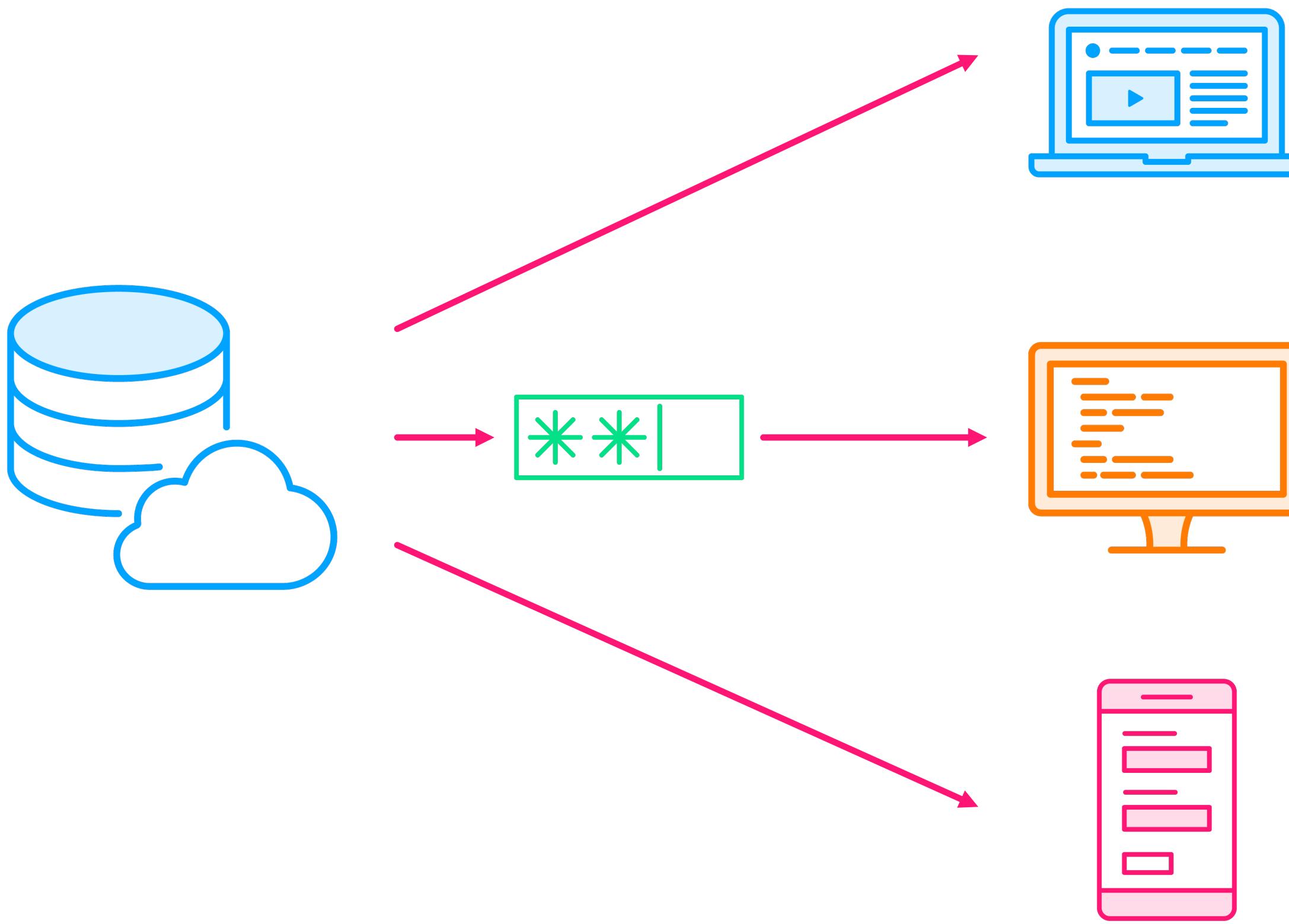
Remote Access



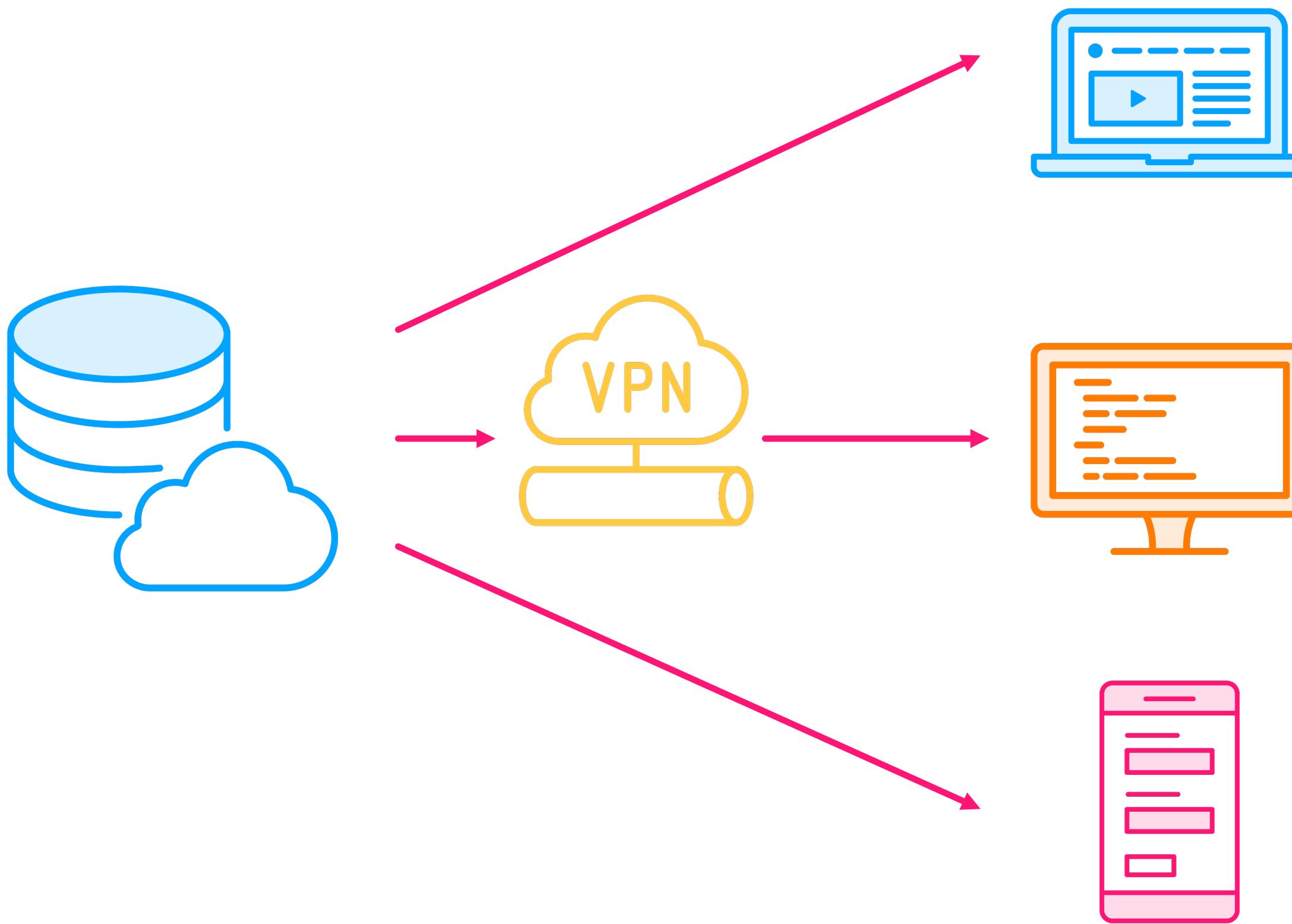
Remote Access



Remote Access



Remote Access





Design Principles and Best Practices

Planning

Requirements
document

Review data and
systems

Problems and new
approaches

People

Compliance



Think of the potential scenarios.



Start small.





**Lucidchart, Diagrams.net, DrawSQL
and ERD Plus**

Project management tools

Database system

White board





Relationships



One-to-One Relationship

One record in a table is associated with one – and only one – record in another table.



One-to-One Relationship

| UserNumber | UserName | Password |
|------------|----------|----------|
| 1 | janes | ***** |
| 2 | bill451 | **** |
| 3 | mary1999 | ***** |
| 4 | jillhart | ***** |



One-to-One Relationship

| UserNumber | UserName | Password |
|------------|----------|----------|
| 1 | janes | ***** |
| 2 | bill451 | ***** |
| 3 | mary1999 | ***** |
| 4 | jillhart | ***** |

| UserNumber | Phone | Email | Address |
|------------|----------------|----------------------------|-------------------|
| 1 | (213) 534-9999 | janesmith@yahoo.com | Los Angeles, CA |
| 2 | (415) 781-9353 | <u>billryan@gmail.com</u> | San Francisco, CA |
| 3 | (212) 819-3152 | <u>Marylee@outlook.com</u> | New York, NY |
| 4 | (972) 764-4400 | <u>jillhart@gmail.com</u> | Dallas, TX |



One-to-One Relationship

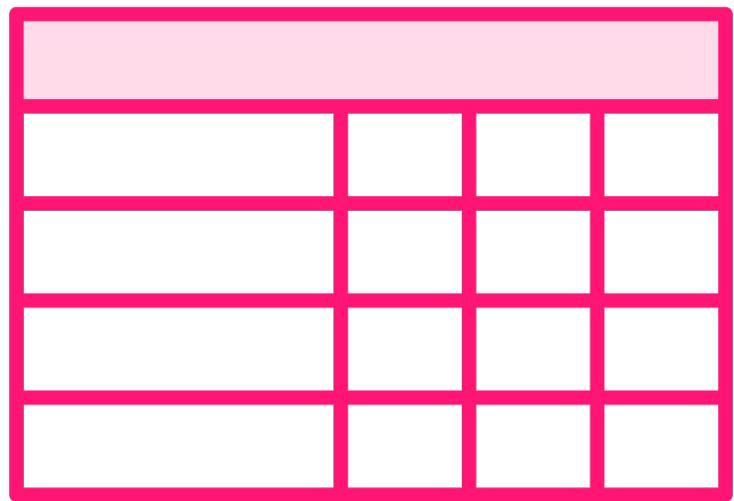
| UserNumber | UserName | Password |
|------------|----------|----------|
| 1 | janes | ***** |
| 2 | bill451 | ***** |
| 3 | mary1999 | ***** |
| 4 | jillhart | ***** |



| UserNumber | Phone | Email | Address |
|------------|----------------|----------------------------|-------------------|
| 1 | (213) 534-9999 | janesmith@yahoo.com | Los Angeles, CA |
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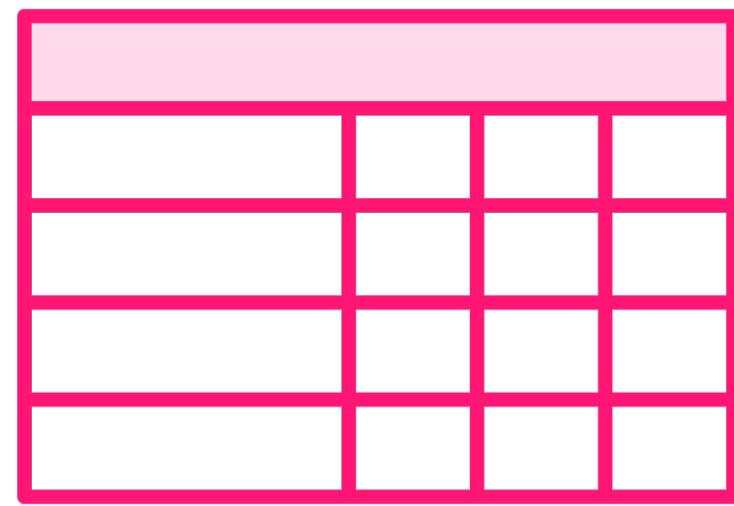
One-to-One Relationships



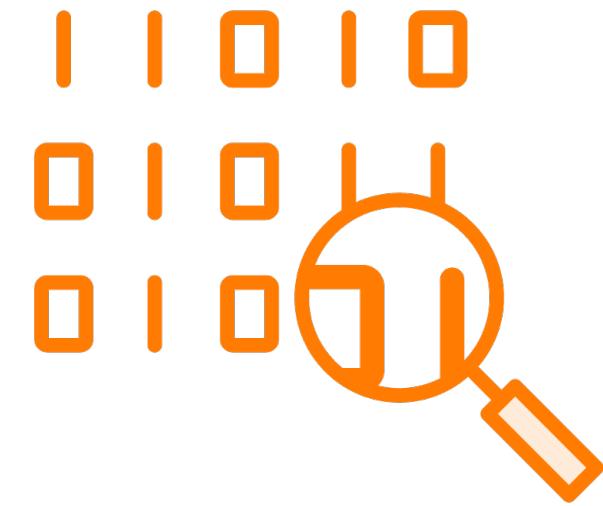
Tables and related
information



One-to-One Relationships



Tables and related
information



Optional data



Security



One-to-Many Relationship

One record in a table is associated with one or more records in another table.



One-to-Many Relationship

| UserNumber | UserName | Password |
|------------|----------|----------|
| 1 | janes | ***** |
| 2 | bill451 | **** |
| 3 | mary1999 | ***** |
| 4 | jillhart | ***** |



| UserNumber | Post |
|------------|----------------------------------|
| 1 | My Last Vacation |
| 1 | A Review of Relational Databases |
| 3 | What Is a Primary Key? |
| 2 | A Look at Data Normalization |



One-to-Many Relationship

| UserNumber | UserName | Password |
|------------|----------|----------|
| 1 | janes | ***** |
| 2 | bill451 | **** |
| 3 | mary1999 | ***** |
| 4 | jillhart | ***** |

| UserNumber | Post |
|------------|---|
| 1 | My Last Vacation |
| 1 | A Review of Relational Databases |
| 3 | What Is a Primary Key? |
| 2 | A Look at Data Normalization |



One-to-Many Relationship

| UserNumber | Post1 | Post2 | Post3 |
|------------|---|----------------------------------|--------------------------|
| 1 | My Last Vacation | A Look at Database Design | |
| 1 | A Review of Relational Databases | | |
| 3 | What Is a Primary Key? | What is a Foreign Key? | What Is an Index? |
| 2 | A Look at Data Normalization | | |



Many-to-Many Relationship

More than one record in a table is associated with multiple records in another table.



Many-to-Many Relationship

| CustomerID | CustName | OrderID | CustomerID | Date |
|------------|----------------|---------|------------|----------|
| 1 | Smith & Co. | 1 | 1 | 01-09-23 |
| 2 | Lee Inc. | 2 | 3 | 01-11-23 |
| 3 | Bay Area Diner | 3 | 4 | 01-12-23 |
| 4 | Acme Inc. | 4 | 4 | 01-14-23 |

| OrderID | ProductID | ProductID | Name |
|---------|-----------|-----------|----------|
| 2 | 3 | 1 | Printer |
| 2 | 4 | 2 | Mouse |
| 1 | 1 | 3 | Keyboard |
| 3 | 1 | 4 | Monitor |



Many-to-Many Relationship

| CustomerID | CustName | OrderID | CustomerID | Date |
|------------|----------------|---------|------------|----------|
| 1 | Smith & Co. | 1 | 1 | 01-09-23 |
| 2 | Lee Inc. | 2 | 3 | 01-11-23 |
| 3 | Bay Area Diner | 3 | 4 | 01-12-23 |
| 4 | Acme Inc. | 4 | 4 | 01-14-23 |

| OrderID | ProductID | ProductID | Name |
|---------|-----------|-----------|----------|
| 2 | 3 | 1 | Printer |
| 2 | 4 | 2 | Mouse |
| 1 | 1 | 3 | Keyboard |
| 3 | 1 | 4 | Monitor |



Many-to-Many Relationship

| CustomerID | CustName |
|------------|----------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 3 | Bay Area Diner |
| 4 | Acme Inc. |

| OrderID | Product1 | Product2 |
|---------|----------|----------|
| 1 | Printer | |
| 2 | | Keyboard |
| 3 | Printer | |
| 4 | Printer | Keyboard |



Referential Integrity

| CustomerNumber | CustName |
|----------------|----------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 3 | Bay Area Diner |
| 4 | Acme Inc. |

| OrderNumber | CustomerNumber | Date |
|-------------|----------------|----------|
| 1 | 1 | 01-09-23 |
| 2 | 2 | 01-11-23 |
| 3 | 3 | 01-12-23 |
| 4 | 3 | 01-14-23 |



Referential Integrity

| CustomerNumber | CustName |
|----------------|----------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 3 | Bay Area Diner |
| 4 | Acme Inc. |

| OrderNumber | CustomerNumber | Date |
|-------------|----------------|----------|
| 1 | 1 | 01-09-23 |
| 2 | 2 | 01-11-23 |
| 3 | 3 | 01-12-23 |
| 4 | 3 | 01-14-23 |
| | 99 | |



Deletions

| CustomerNumber | CustName |
|----------------|----------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 3 | Bay Area Diner |
| 4 | Acme Inc. |

| OrderNumber | CustomerNumber | Date |
|-------------|----------------|----------|
| 1 | 1 | 01-09-23 |
| 2 | 2 | 01-11-23 |
| 3 | 3 | 01-12-23 |
| 4 | 3 | 01-14-23 |



Deletions

| CustomerNumber | CustName |
|----------------|----------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 3 | Bay Area Diner |
| 4 | Acme Inc. |

| OrderNumber | CustomerNumber | Date |
|-------------|----------------|----------|
| 1 | 1 | 01-09-23 |
| 2 | 2 | 01-11-23 |
| 3 | 3 | 01-12-23 |
| 4 | 3 | 01-14-23 |



| CustomerNumber | CustName |
|----------------|-------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 4 | Acme Inc. |

| OrderNumber | CustomerNumber | Date |
|-------------|----------------|----------|
| 1 | 1 | 01-09-23 |
| 2 | 2 | 01-11-23 |



Deletions

| CustID | CustName |
|--------|-------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 4 | Acme Inc. |

| OrderNo | CustID | Date |
|---------|--------|----------|
| 1 | 1 | 01-09-23 |
| 2 | 2 | 01-11-23 |



Naming Conventions



Basics

A key to
database success

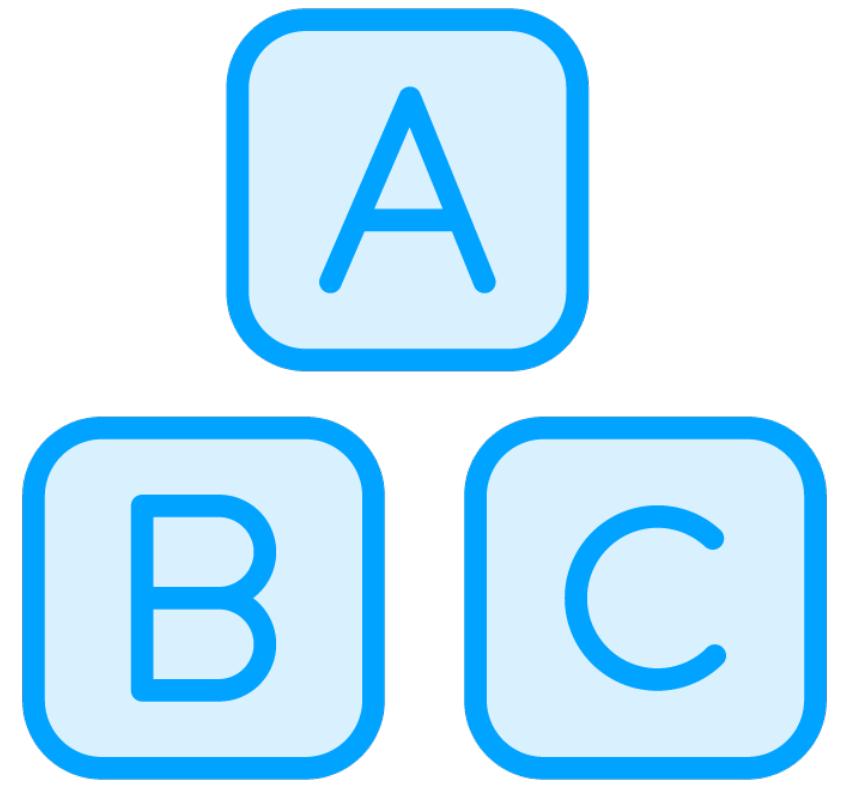
Existing
approaches

No naming
conventions



Best practices.





Upper and lower case alphabetic characters

Numbers

Underscore

Special characters

Start with alphabetic character



Pascal Case

FirstName

LastName

StateCode



Camel Case

firstName

lastName

stateCode



Case Insensitive

StateCode

statecode



Reserved Words

CREATE

SELECT

DATE



Abbreviations.



Abbreviations



Abbreviations

Table: Prod

| ProductID | ProductName |
|-----------|-------------|
| 1 | Printer |
| 2 | Mouse |
| 3 | Keyboard |
| 4 | Monitor |



Abbreviations

| CustomerID | CustName |
|------------|-------------|
| 1 | Smith & Co. |
| 2 | Lee Inc. |
| 4 | Acme Inc. |



Parts of a Database

Database name

High-level goal

Table name

Related information



Columns

| CustomerID | Shipping_Address | Billing_Address |
|------------|--|--|
| 1 | 120 Main Street, Los Angeles, CA 90001 | 120 Main Street, Los Angeles, CA 90001 |
| 2 | 300 Lemon Ave, New York, NY 10019 | 210 Maple Street, NY 10019 |
| 3 | 100 2 nd Street, Dallas, TX 75201 | 100 2 nd Street, Dallas, TX 75201 |



Primary and Foreign Keys

OrderNumber_pk

OrderNumber_fk



Data Normalization



Rules

**First Normal Form
(1NF)**

**Second Normal Form
(2NF)**

**Third Normal Form
(3NF)**



First Normal Form (1NF)

One value

Unique

No repeating columns

Mean the same thing



Employee Table

| EmployeeName | Benefits |
|--------------|-------------|
| Lucy Johnson | FSA, Health |
| John Smith | HSA, Health |
| Lisa Jackson | Health |
| John Smith | HSA, Health |



Employee Table

| EmployeeNumber | EmployeeName | Benefits |
|----------------|--------------|-------------|
| 1 | Lucy Johnson | FSA, Health |
| 2 | John Smith | HSA, Health |
| 3 | Lisa Jackson | Health |
| 4 | John Smith | HSA, Health |



Employee Table

| EmployeeNumber | EmployeeName | Benefit1 | Benefit2 |
|----------------|--------------|----------|----------|
| 1 | Lucy Johnson | FSA | Health |
| 2 | John Smith | HSA | Health |
| 3 | Lisa Jackson | Health | |
| 4 | John Smith | HSA | Health |



Second Normal Form (2NF)

| EmployeeNumber | Benefits | Age |
|----------------|----------|-----|
| 1 | FSA | 32 |
| 1 | Health | 32 |
| 2 | Health | 58 |
| 3 | HSA | 25 |
| 3 | Health | 25 |



Second Normal Form (2NF)

| EmployeeNumber | Age |
|----------------|-----|
| 1 | 32 |
| 2 | 58 |
| 3 | 25 |



| EmployeeNumber | Benefits |
|----------------|----------|
| 1 | FSA |
| 1 | Health |
| 2 | Health |
| 3 | HSA |
| 3 | Health |



Third Normal Form

Compare only the non-key columns to each other



Third Normal Form (3NF)

| QuestionNumber | RatingNumber | RatingDescription |
|----------------|--------------|-------------------|
| 1 | 1 | Positive |
| 2 | 3 | Negative |
| 3 | 2 | Neutral |
| 4 | 3 | Negative |
| 5 | 1 | Positive |



Third Normal Form (3NF)

| QuestionNumber | RatingNumber |
|----------------|--------------|
| 1 | 1 |
| 2 | 3 |
| 3 | 2 |
| 4 | 3 |
| 5 | 1 |



| RatingNumber | RatingDescription |
|--------------|-------------------|
| 1 | Positive |
| 2 | Neutral |
| 3 | Negative |



Third Normal Form (3NF)

| EmployeeNumber | EmployeeName | Zip | City | State |
|----------------|--------------|-------|---------------|-------|
| 1 | Lucy Johnson | 90001 | Los Angeles | CA |
| 2 | John Smith | 94016 | San Francisco | CA |
| 3 | Lisa Jackson | 73301 | Austin | TX |



Third Normal Form (3NF)

| EmployeeNumber | EmployeeName | Zip |
|----------------|--------------|-------|
| 1 | Lucy Johnson | 90001 |
| 2 | John Smith | 94016 |
| 3 | Lisa Jackson | 73301 |



| Zip | City | State |
|-------|---------------|-------|
| 90001 | Los Angeles | CA |
| 94016 | San Francisco | CA |
| 73301 | Austin | TX |



Approaches to Data Normalization

Check periodically

Denormalization



Summary



Main functions and capabilities

Architecture and deployment

- On-premise
- Cloud
- Hybrid cloud

Design and planning

Relationships

Naming conventions

Normalization

