

# Database Administration:

The Complete Guide to Practices and Procedures

## Chapter 1

### Introduction: What is a DBA?

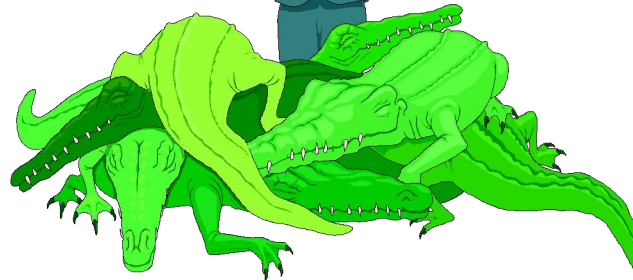
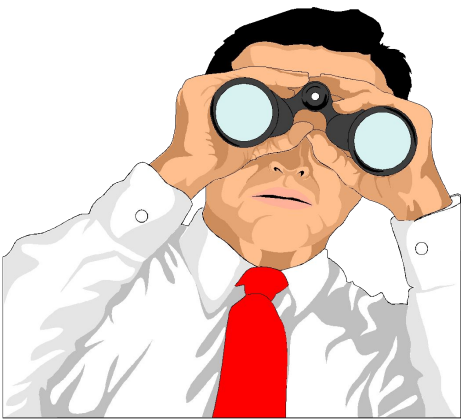


# Agenda

- Introduction
- Why Learn Database Administration?
- The Management Discipline of Database Administration
- Database, Data, and System Administration
- DBA Tasks
- Types of DBAs
- Environments: Production, Test, QA, etc.
- The Impact of Newer Technology
- DBA Certification
- Questions

# What is a DBA?

- A day in the life of a DBA...



# The Curmudgeon in the Corner

- In many companies the DBA is viewed as a curmudgeon with vast technical knowledge, but limited people skills.
- This comes with the job but should be avoided
  - DBAs often must sit down and work things through on their own
  - DBAs work long hours and are “on call”
- The DBA must have good communication skills to succeed

# Avoid This

- Don't become the prima donna DBA!



# What is a DBA

- A DBA is the information technician responsible for ensuring the ongoing operational functionality and efficiency of an organization's databases and the applications that access those databases.

# Why Learn Database Administration?

- The DBA is responsible for designing and maintaining an enterprise's databases.
- This places the DBA at the center of the business.
- The DBA has the opportunity to learn about many facets of business and how business uses data.
- From a technology standpoint the DBA has many opportunities to learn about new and interesting technologies as they are adopted by the organization.

# What Makes a Good DBA?

- Problem solver
- Enjoys challenges
- Likes technology
- Constantly learning
- Can work alone or as part of a group
- Experience as a programmer





# The Need for DBAs is Growing

- Good DBAs are hard to find & costly to acquire
  - It takes more than three months to hire a DBA and training a new DBA in his new environment takes months beyond that
- According to The U.S. Bureau of Labor Statistics (BLS) Occupational Outlook Handbook, 2010-11 Edition, “(e)mployment is expected to grow much faster than the average, and job prospects should be excellent.”
  - Indeed, between the years of 2008 and 2018 the U.S. Bureau of Labor Statistics estimates that the number of DBA jobs will increase by 20 percent.

# Earn a Good Salary as a DBA

- According to a salary study conducted by Global Knowledge and TechRepublic the average DBA salary is \$78,468, while their managers average \$87,261.
  - For full-time employees functioning as a DBA, the mean salary ranges in the high \$80 thousands
- According to the Dice 2010-11 Tech Salary Survey, Oracle experience is requested in more than 15,000 job postings on any given day.
  - Demand for Oracle skills is up 57% year over year, and the national average salary for technology professionals with experience in Oracle Database is \$90,914.
- The BLS (May 2010) reports that the median annual wage of database administrators was \$73,490 and the mean annual wage was \$75,730.

# So What's Not to Like?

- DBAs are well-paid, highly employable, possess challenging jobs, and are likely to be engaged in the most visible and important projects. What's not to like?
  - DBAs are expected to know everything, not just about database technology, but anything remotely connected to it.
  - DBAs almost never work simple 8 hour days, instead working long days with a lot of overtime, especially when performance is suffering or development projects are behind schedule.
    - According to industry analysts, the average DBA works more than 50 hours per week, including an average of six hours on weekends.
    - DBAs frequently have to work on weekends and holidays to maintain databases during off-peak hours.



# A DBA Danger



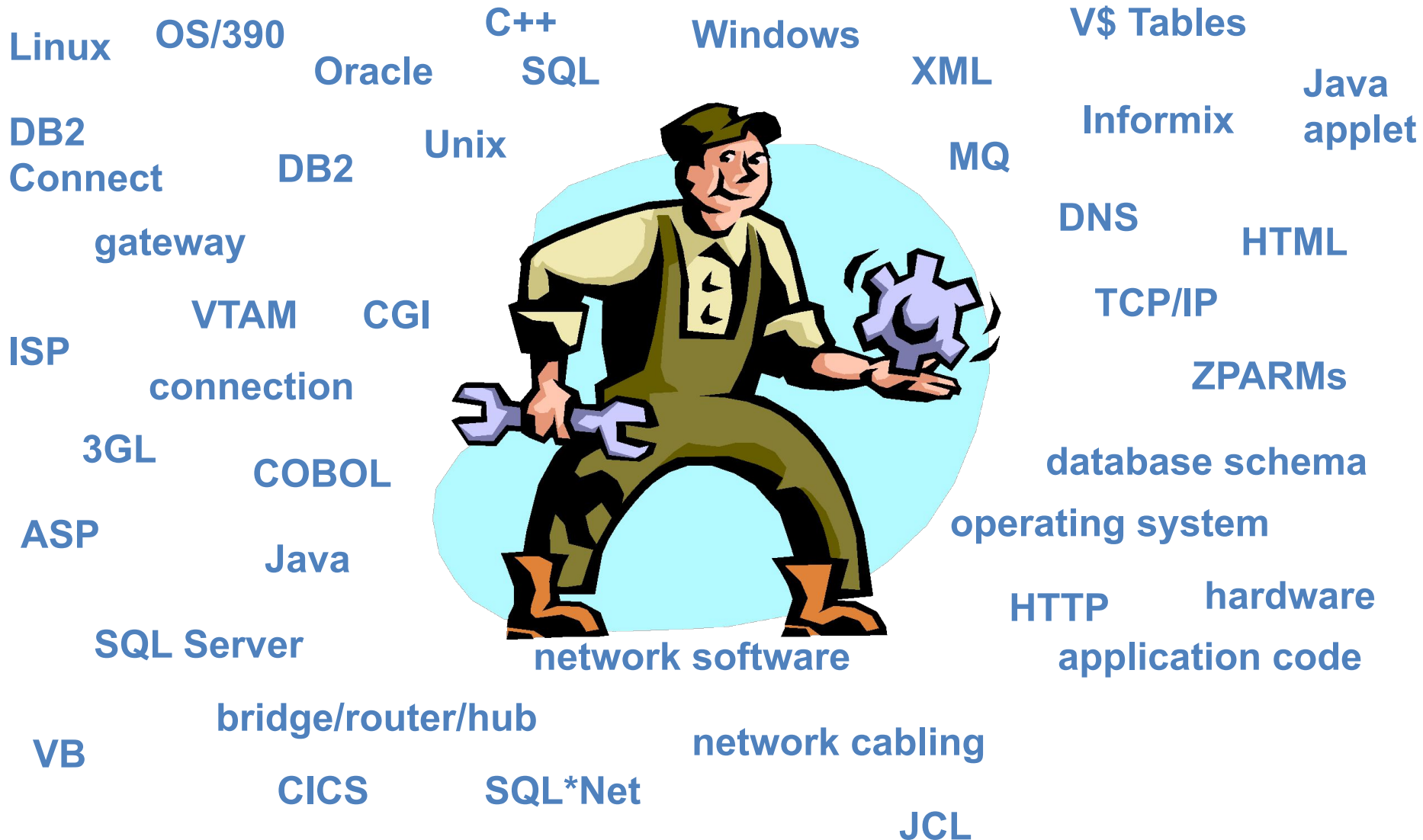
# The Management Discipline of Database Administration



# DBA as a Management Discipline

- The term *discipline* implies planning and then implementing according to that plan.
  - Creating the Database Environment
  - Database Design
  - Application Design
  - Design Reviews
  - Database Change Management
  - Data Availability
  - Performance Management
    - System Performance
    - Database Performance
    - Application Performance
  - Data Integrity
  - Database Security
  - Regulatory Compliance
  - Backup and Recovery
  - Disaster Planning
  - Storage Management
  - Distributed Database Management
  - Data Warehouse Administration
  - Database Utility Management
  - Database Connectivity
  - Procedural DBA
  - Soft Skills

# The DBA is a “Jack of all Trades”



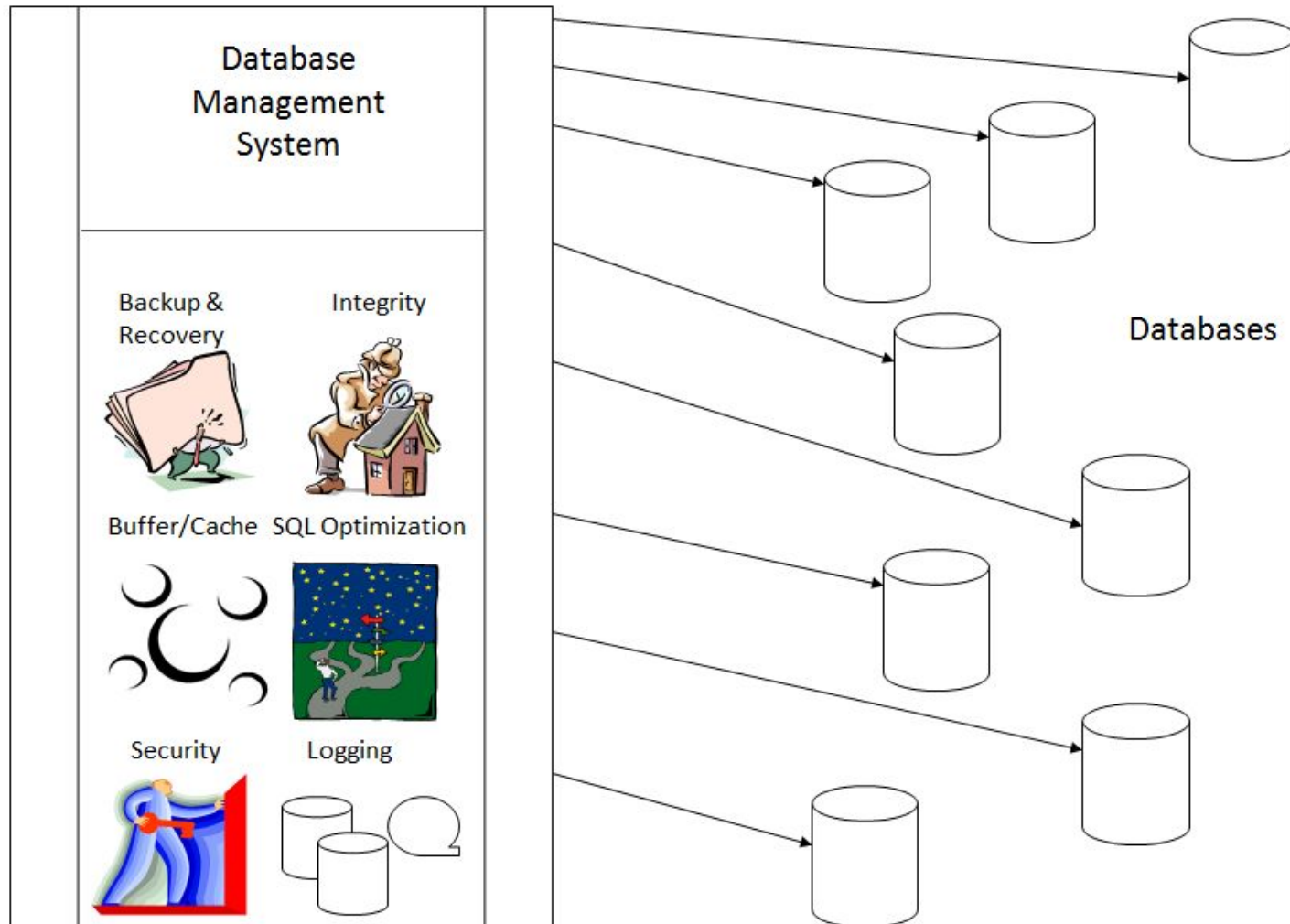
# Database 101

- A database is an organized store of data wherein the data is accessible by named data elements(for example, fields, records, and files)
- A DBMS is software that enables end users or application programmers to share data. It provides a systematic method of creating, updating, retrieving and storing information in a database.
  - DBMSs also are generally responsible for data integrity, data security, data access control and optimization, automated rollback, restart and recovery.
- In layman's terms, you can think of a database as a file folder. You can think of the filing cabinet holding the files along with the file labels as the DBMS.





# DBMS vs. Database



# Database, Data, and System Administration

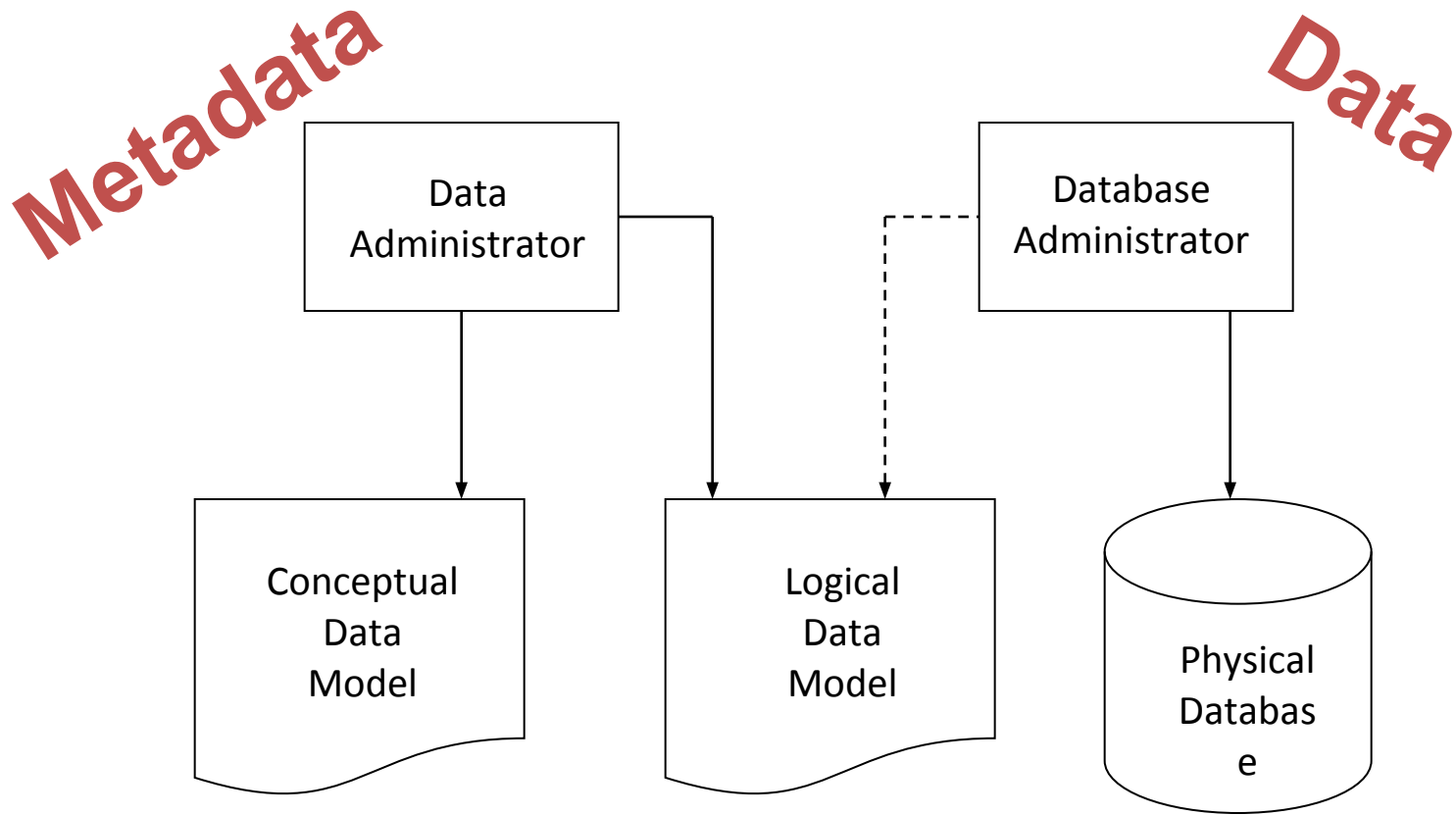


# Data Administrator

The DA is responsible for issues such as:

- Identifying and cataloging the data required by business users
- Production of conceptual and logical data models to accurately depict the relationship among data elements for business processes
- Production of an enterprise data model that incorporates all of the data used by all of the organization's business processes
- Setting data policies for the organization
- Identifying data owners and stewards
- Setting standards for control and usage of data

# Metadata vs. Data



# Data Administrator = Chief Data Officer

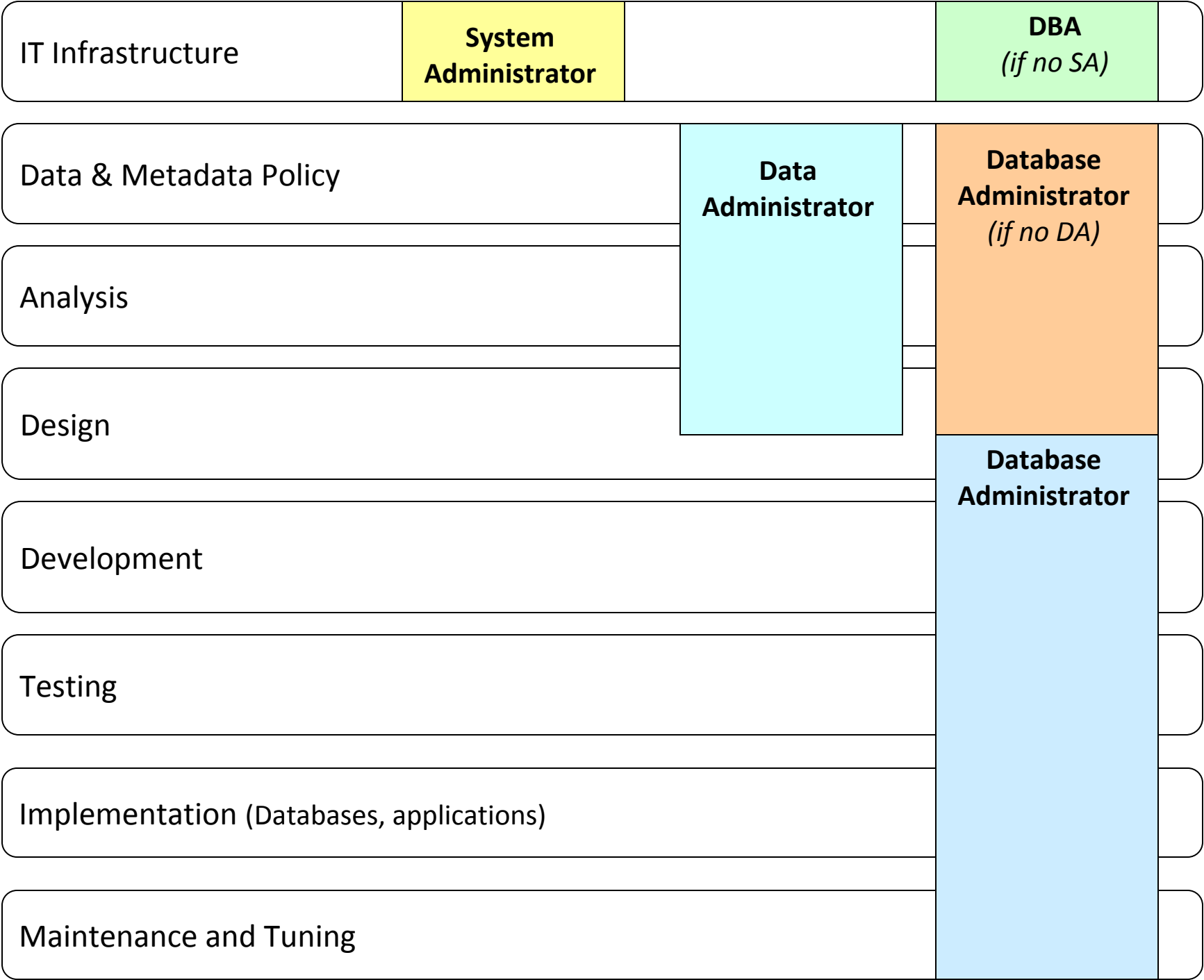
- Not about technology, about data and its meaning in the organization
- Responsible for rallying the organization to treat data as the corporate asset it truly is
- Deal with metadata as well as data
- Organizations truly concerned about data quality, integrity, and reuse will invariably implement and staff the DA function.

# System Administrator

- Installation and setup of computing resources
- Pure technologist
  - No responsibility for database design and support
- Infrastructure support
- Sometimes called a systems programmer

# Database Administrator

- Works with DA and SA
- Accepts logical models from DA to implement as physical databases
- Works with SA to schedule and implement system software (e.g. DBMS) and to tune the environment appropriately





# DBA Tasks

- Remember our earlier discussion on the Management Discipline of Database Administration?
  - These are the required DBA tasks to ensure optimal database environment for applications and users
    - Creating the Database Environment
    - Database Design
    - Application Design
    - Design Reviews
    - Database Change Management
    - Data Availability
    - Performance Management
      - System Performance
      - Database Performance
      - Application Performance
    - Data Integrity
    - Database Security
    - Regulatory Compliance
    - Backup and Recovery
    - Disaster Planning
    - Storage Management
    - Distributed Database Management
    - Data Warehouse Administration
    - Database Utility Management
    - Database Connectivity
    - Procedural DBA
    - Soft Skills

# Types of DBAs

- System DBA
- Database Architect
- Database Analyst
- Data Modeler
- Application DBA
- Task-Oriented DBA
- Performance Analyst
- Data Warehouse Administrator

# System DBA

- Installing new DBMS versions and applying maintenance fixes supplied by the DBMS vendor
- Setting and tuning system parameters
- Tuning the operating system, network and transaction processors to work with the DBMS
- Ensuring appropriate storage for the DBMS
- Enabling the DBMS to work with storage devices and storage management software
- Interfacing with any other technologies required by database applications
- Installing DBA tools and utilities

# Database Architect

Typical tasks performed by the database architect include:

- Creation of a logical data model (if no DA or data modeler position exists)
- Translation of logical data models into physical database designs.
- Implementing efficient databases including physical characteristics, index design, and mapping database objects to physical storage devices.
- Analysis of data access and modification requirements to ensure efficient SQL and to ensure that the database design is optimal.
- Creation of backup and recovery strategies for new databases.

# Database Analyst

- There is really no standard definition for the Database Analyst job
- Could be:
  - Junior DBA
  - Database Architect
  - Data Administrator or Data Analyst
- Or could just be another term used for DBA

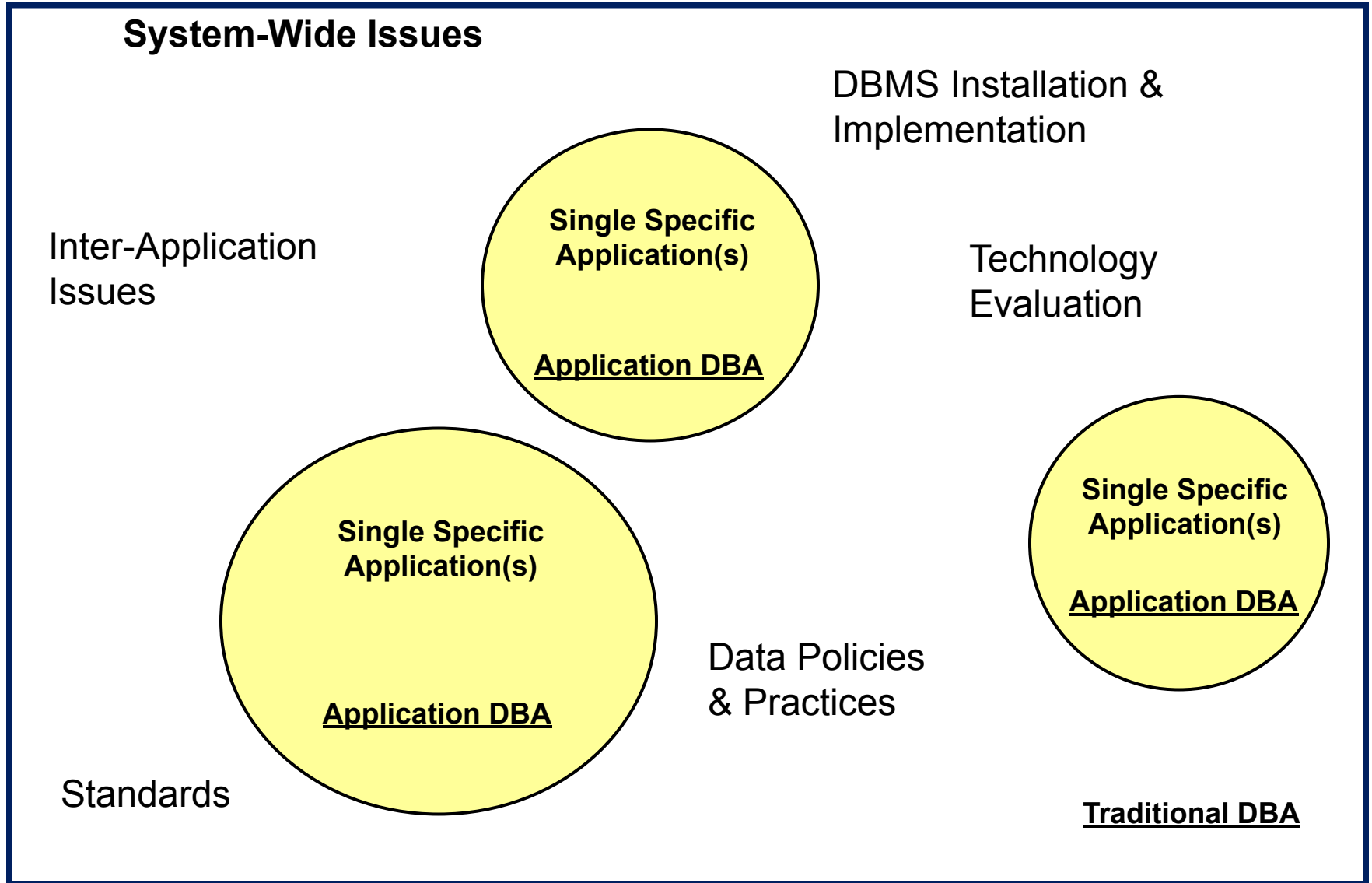
# Data Modeler

When the DA role is not defined or staffed there may be a data modeler role defined. A *data modeler* is usually responsible for a subset of the DA's responsibilities.

Data modeling tasks include:

- the collection of data requirements for development projects
- analysis of the data requirements
- design of project-based conceptual and logical data models
- creation of a corporate data model and keeping the corporate data model up-to-date
- working with the DBAs to ensure they have a sound understanding of the data models

# Application DBA



# Application DBA: Pros and Cons

## Pros

- Application DBAs can better focus on an individual application which can result in better service to the developers of that application.
- The Application DBA is more often viewed as an integral component of the development team and therefore is better informed about new developments plans and changes to plans.
- Because the application DBA consistently works on a specific set of applications he can acquire a better overall understanding of how each application works enabling him to better support application developers.
- With a more comprehensive understanding of the application, an application DBA will have a better understanding of how the application impacts the overall business. This knowledge will likely result in the execution of DBA tasks to better support the organization.

## Cons

- Application DBAs can lose sight of the overall data needs of the organization because of their narrow focus on a single application.
- The application DBA can become isolated. Lack of communication with a centralized DBA group (if one exists) can result in diminished sharing of skills.
- When application DBAs implement useful procedures it takes more effort to share these procedures among the other DBAs.
- Due to the application-centric nature of an application DBA he can lose sight of new features and functionality being delivered by the DBMS group.



# Task-Oriented DBAs

- DBAs who focus on a narrow subset of database administration tasks
- For example:
  - Backup & Recovery DBAs
  - Database Designer
  - Performance Analysts

# Data Warehouse Administrator

Common data warehouse administration tasks and requirements include:

- Experience with business intelligence, data analytics, query, and reporting tools
- Database design for read only access
- Data warehousing design issues such as star schema
- Data warehousing technologies such as OLAP (including ROLAP, MOLAP, and HOLAP)
- Data transformation and conversion skills
- An understanding of data quality issues
- Experience with data formats for loading and unloading of data
- Middleware implementation and administration

# Staffing Considerations

- How many DBAs?
- DBA Reporting Structures



# How Many DBAs Do You Need?

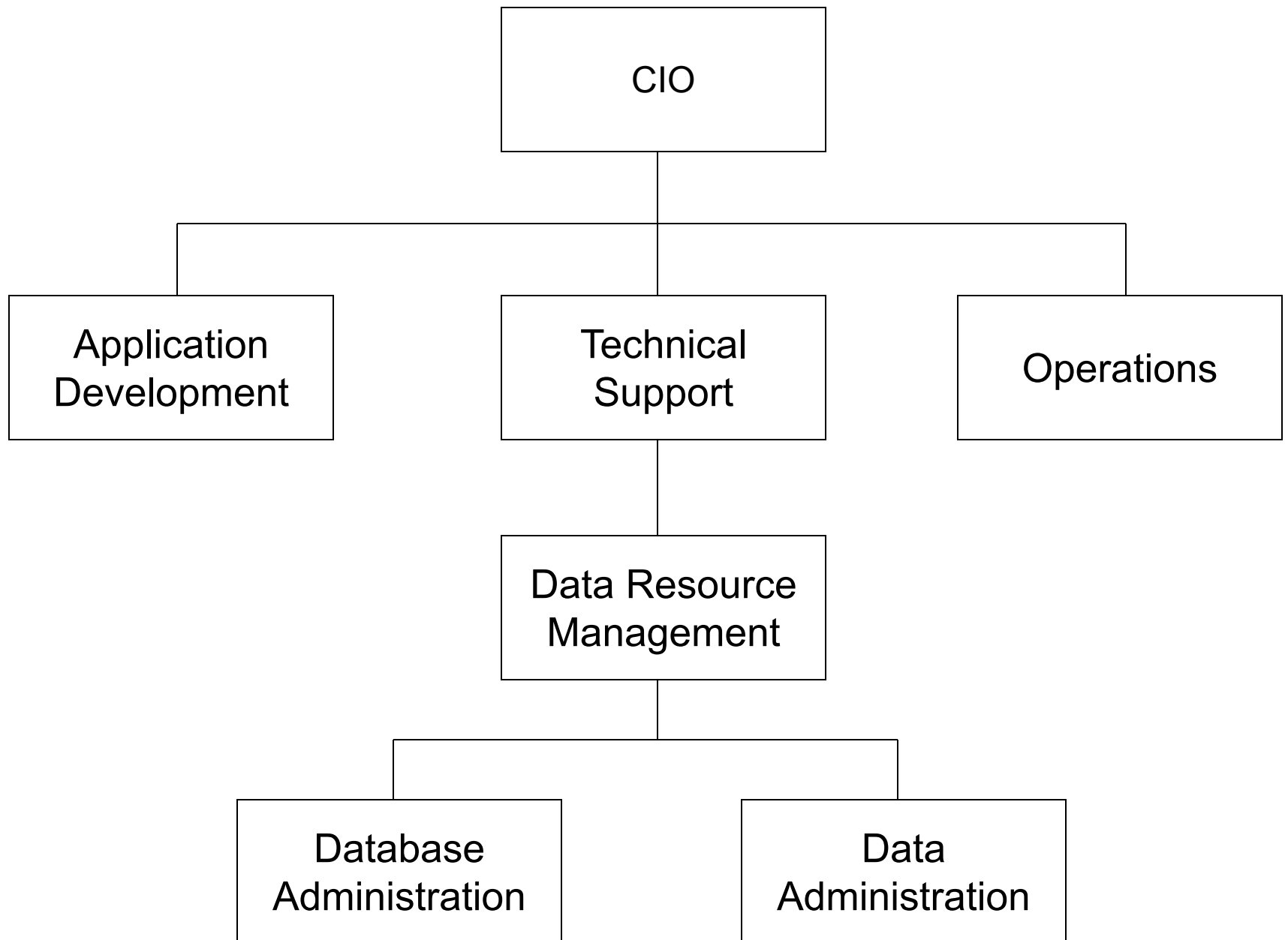
**Determining how many DBAs is optimal is not a precise science. It depends on many factors, including:**

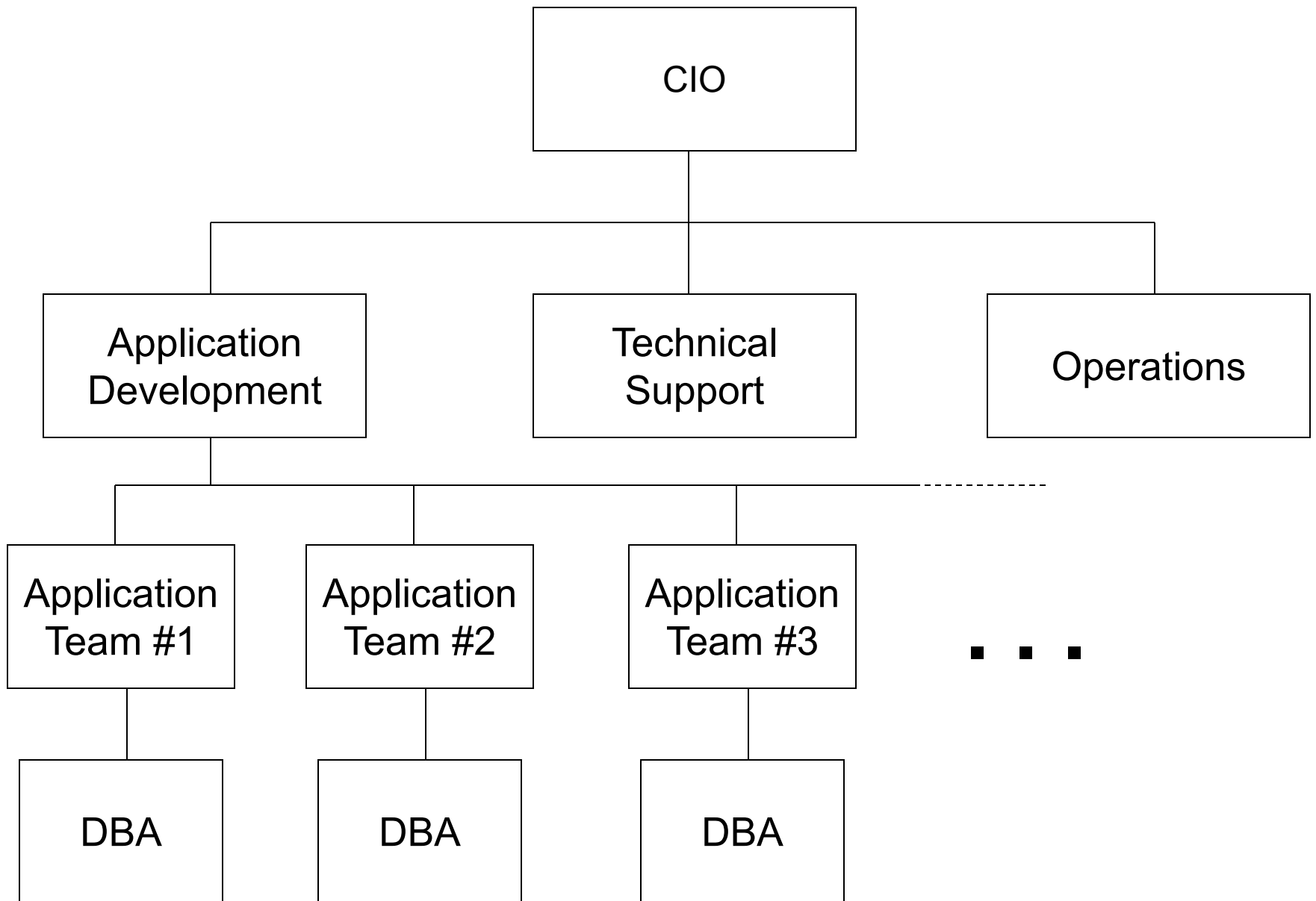
- **Number of databases** – the more databases that need to be supported the more complex the job of database administration becomes.
- **Number of users** – as additional users are brought online as clients of the applications that access databases, it becomes more difficult to ensure optimal database performance. Additionally, more users means more problems and calls, further complicating the DBA's job.
- **Number of applications** – as more applications are brought online, additional pressure is exerted on the database in terms of performance, availability, and resources required.
- **Service Level Agreements (SLAs)** – the more restrictive the SLA the more difficult it becomes for the DBA to deliver the service.
- **Availability requirements** – when databases have an allowable period of scheduled downtime database administration becomes easier because some DBA tasks either require an outage, or are easier when an outage can be taken.
- **Impact of downtime** – the greater the financial impact of a database being unavailable, the more difficult DBA becomes because pressure will be applied to assure greater database availability.
- **Performance requirements** – as the requirements for database access become more performance-oriented and faster and more frequent access is dictated, DBA become more complicated.
- **Type of Applications** – the DBMS and database needs of a mission critical application differ from a non-mission critical application. Mission-critical applications are more likely to require constant monitoring and more vigilance to ensure availability. Likewise, OLTP application will have different characteristics and administration requirements than OLAP applications.
- **Volatility** – a static database environment requiring few changes will not require the same level of DBA effort as a volatile, frequently changing database environment.
- **DBA staff experience** – the skill of the existing DBA staff will impact whether or not additional DBAs are required.
- **Programming staff experience** – as the experience of the programming staff increases, the complexity of DBA decreases.
- **End user experience** – when end users access databases directly with ad hoc SQL, their skill level has a direct impact on the complexity of DBA.
- **DBA tools** – the more tools that are available and the degree to which they are integrated can make DBA tasks less complex.

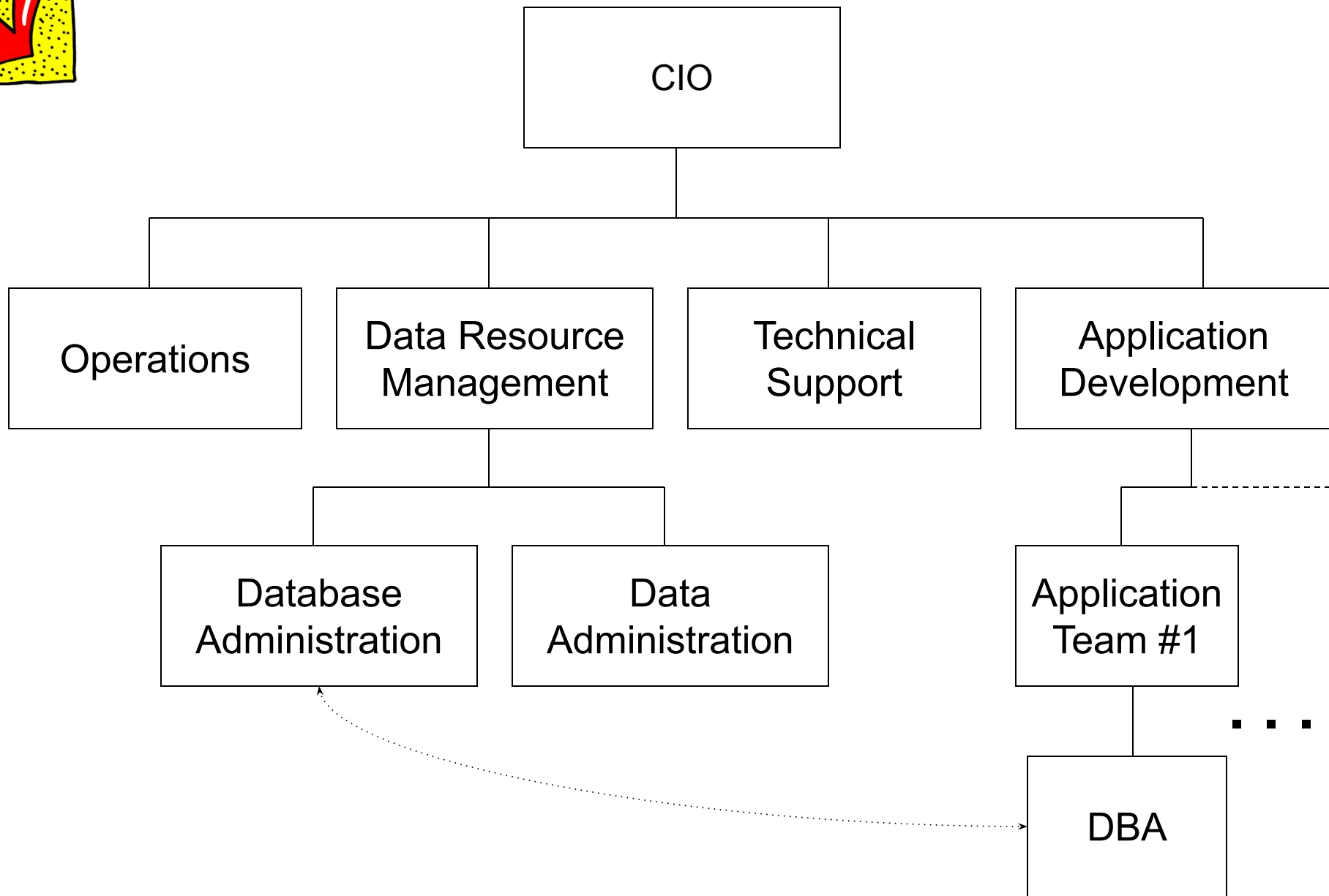
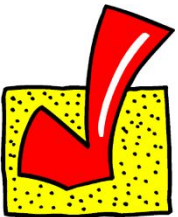
# DBA Reporting Structure

- Placement of the DBA group within the IT infrastructure is important
- There is no one correct answer as to where the DBA group should reside but...
  - There are several common reporting hierarchies for DBA



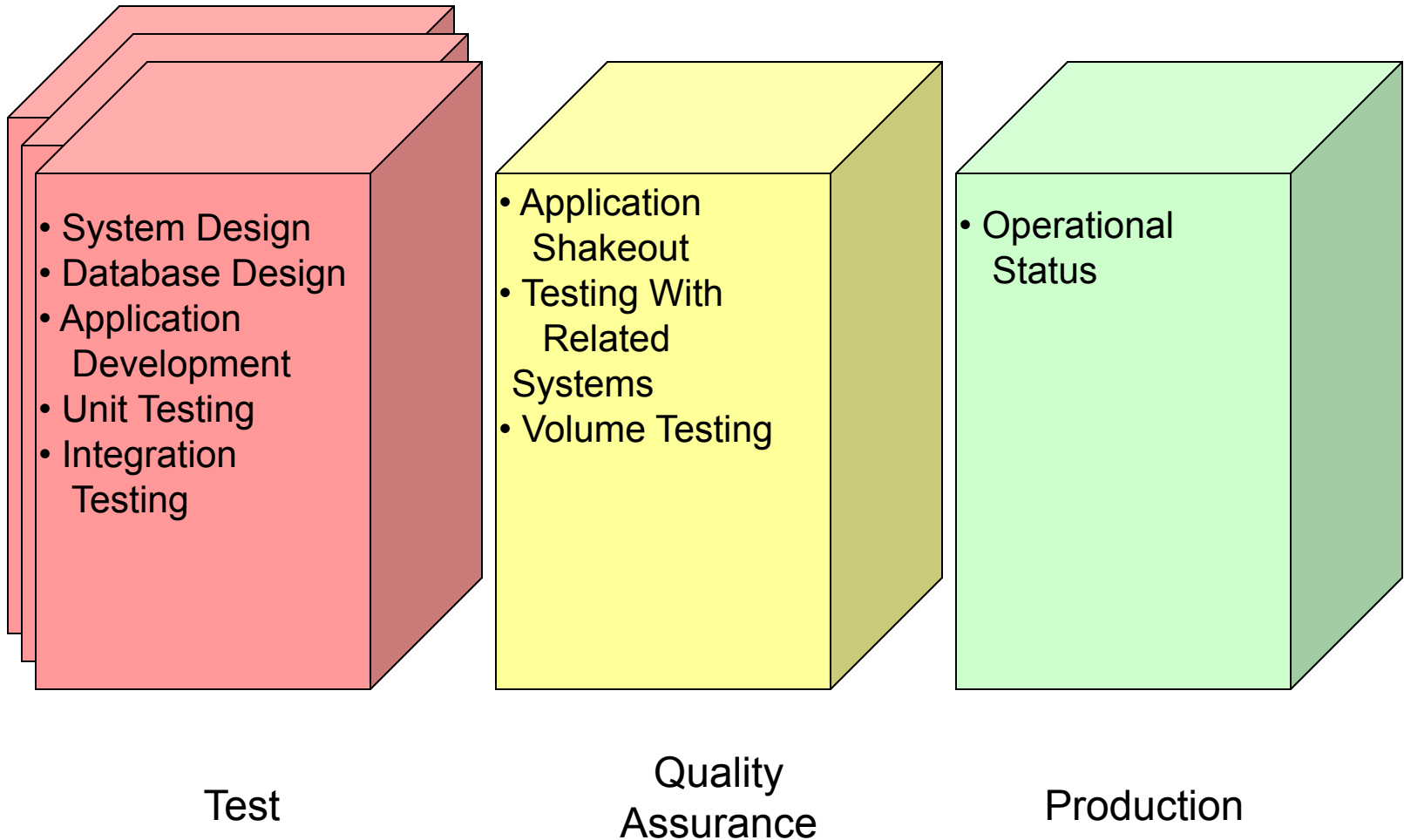








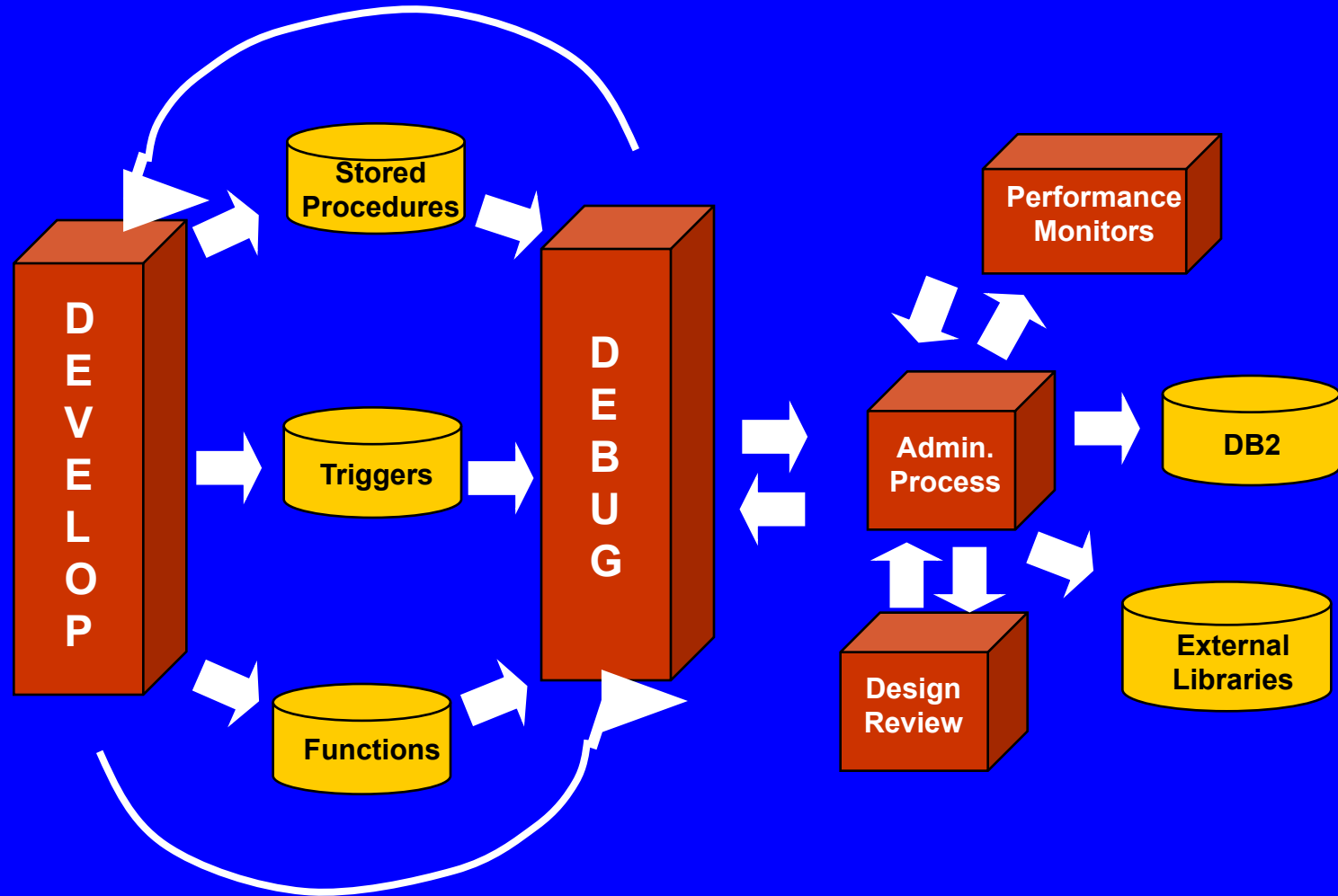
# Environments



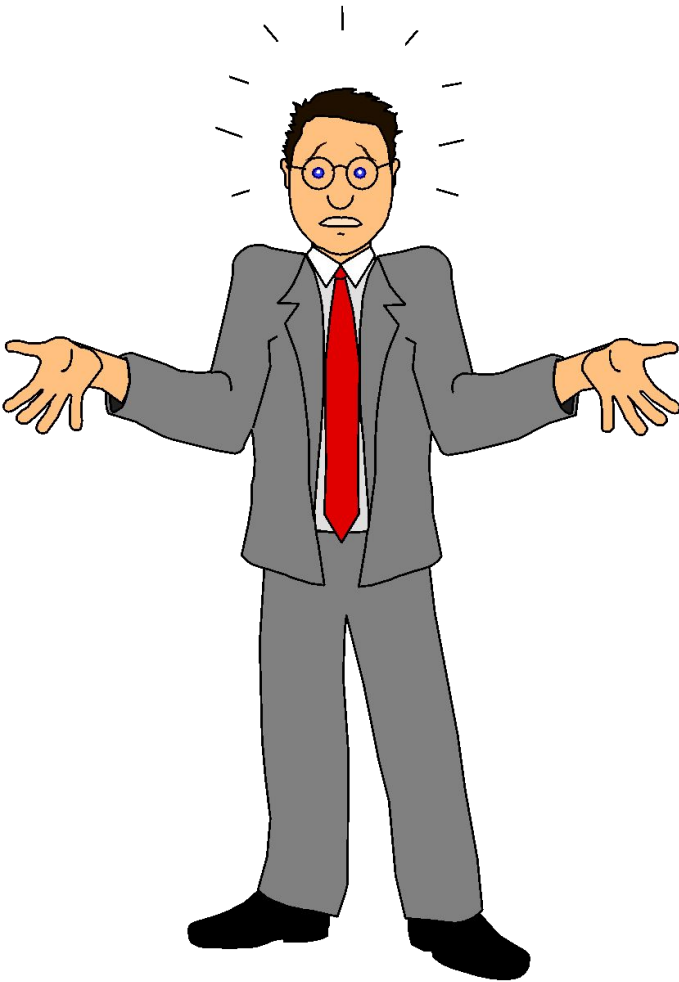
# The Impact of Newer Technology on the DBA

- DBAs need to keep abreast of new technologies
- Most new technology impacts data as it is adopted by application developers
- Examples:
  - Triggers, stored procedures, etc.: Procedural DBA
  - Internet: eDBA
  - Cloud Computing

# Procedural DBA Duties



# Role of the Procedural DBA



DBCO Implementation  
(COMMIT in proc, write or guide)

Ensuring  
Reuse

DBCO Administration  
(trigger firing order, proc set)

Design  
Reviews

On Call  
for DBCO  
Abends

EXPLAIN  
Analysis

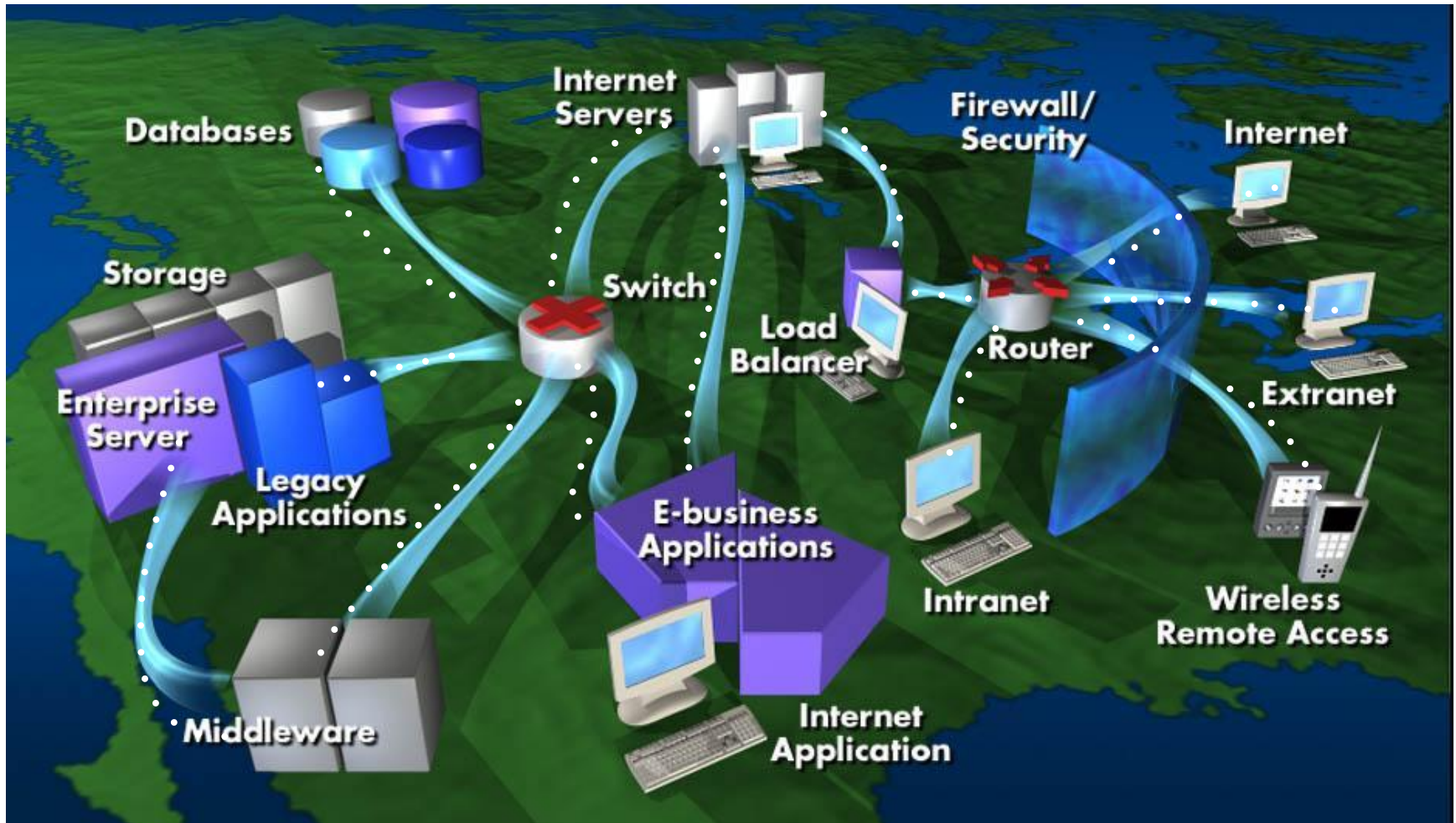
Coding  
Complex  
Queries

Schema  
Resolution

Tuning SQL

Debugging  
SQL

# Increasingly Complex Enterprise Infrastructure



# A Virtual, Extended Infrastructure



# Cloud Computing

- Cloud computing offers a new model for the delivery of IT resources to users. The primary defining characteristic of Cloud Computing is to give the illusion of on-demand access to an infinite amount of computing resources.
  - A good example of a Cloud Computing service is offered by Salesforce.com, which delivers access to a CRM application over the web.
- Another aspect prevalent with Cloud computing offerings is that users can rent computing power with no commitment. Instead of buying a server, you can rent the use of one and pay just for what you use.
  - This used to be referred to as utility computing because it mimics how people pay for utilities, such as water or electricity.
  - It is a “pay as you go” service.
- Pervasive devices such as smart phones often are used to interact with data in the cloud.



# The DBA in the Cloud?

- DBAs may be called upon to administer the databases used by cloud computing
- Similar duties, availability becomes more of an issue





# DBA Certification

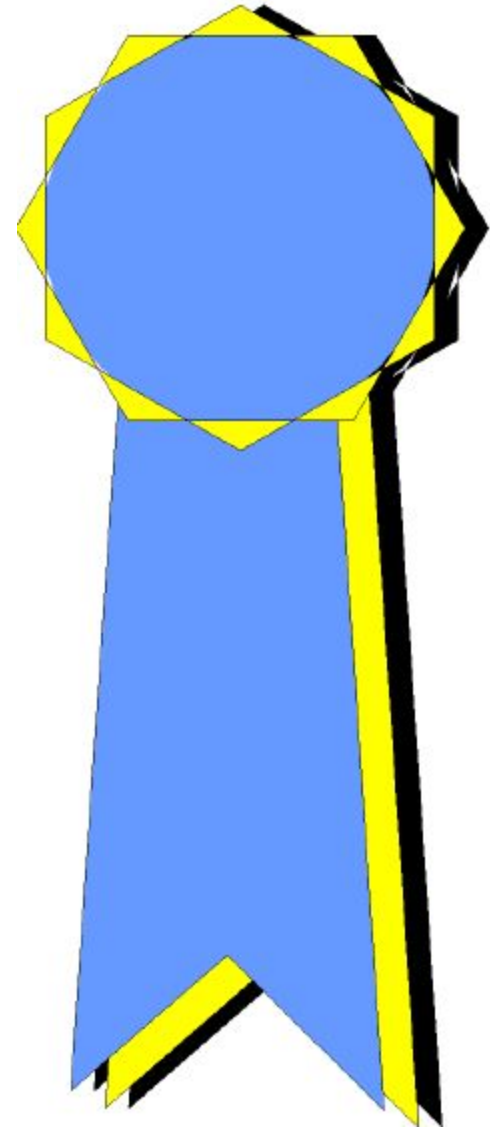
- Professional certification is offered by the leading DBMS vendors
  - IBM, Oracle, Microsoft, others
- General concept: a certified DBAs should be capable of performing DBA tasks and duties
- But passing a test is not always a viable indicator of being able to perform a complex job like DBA.

# Should You Certify?

- Yes, it can make you more employable
- Some companies hire only certified DBAs
- But on-the-job experience is probably a better indicator of DBA capabilities than passing a certification exam...

# Preparing to Certify

- DBA certification tests sometimes ask arcane syntax questions
- You will need to study
  - Books, self-learning software
- If you earn certification, display it proudly on your resume
  - and business card, if allowed



# Questions

