

What's covered here?

- Database System History

History of Database Theory

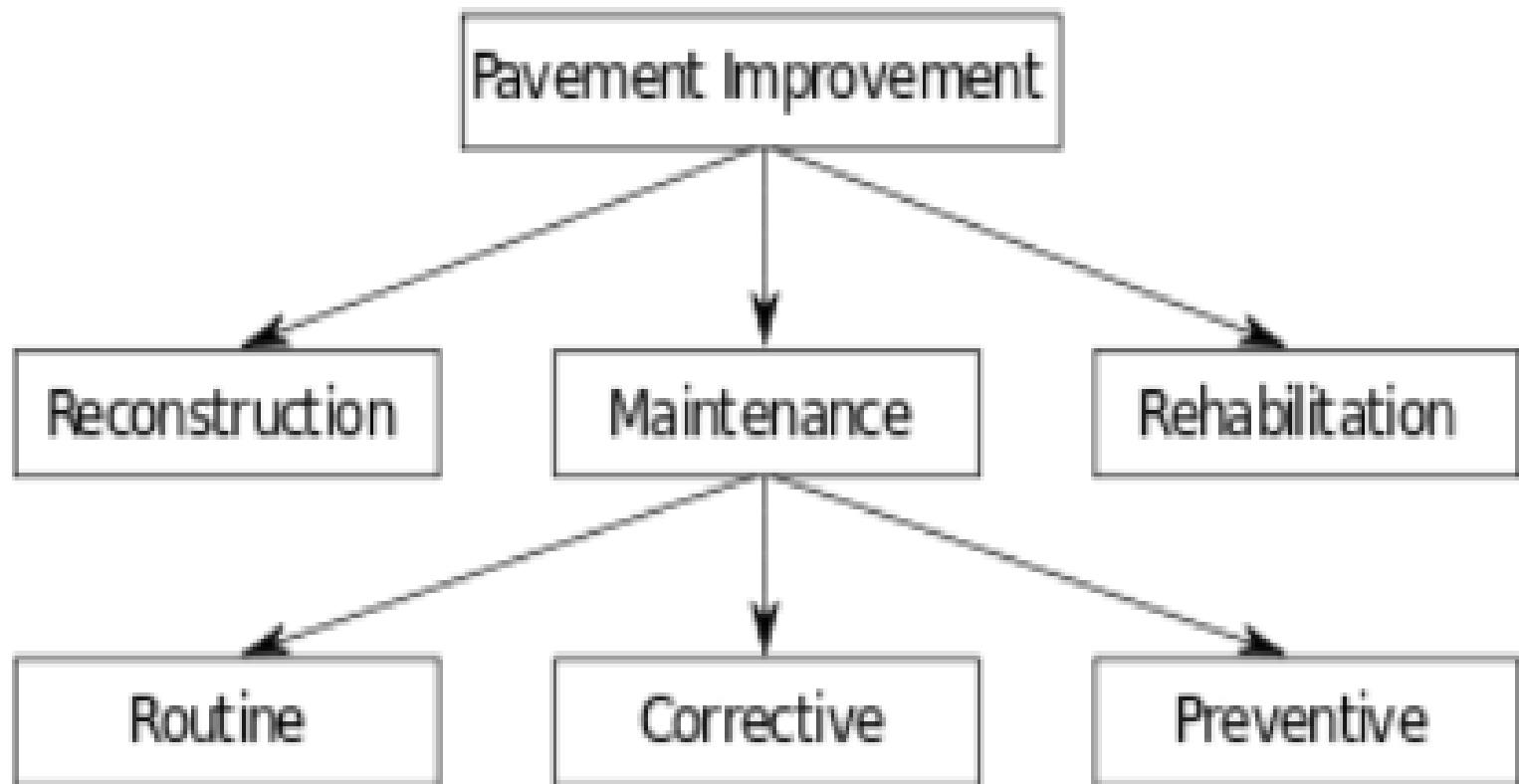
- 'File Cabinet' Database (paper systems)
- Hierarchical Database
- Network Database
- Relational Database
- Object Database
- NoSQL



Hierarchical Databases

- Introduced by IBM in late 1950's & early '60s
- Followed 'File Cabinet' line of thinking

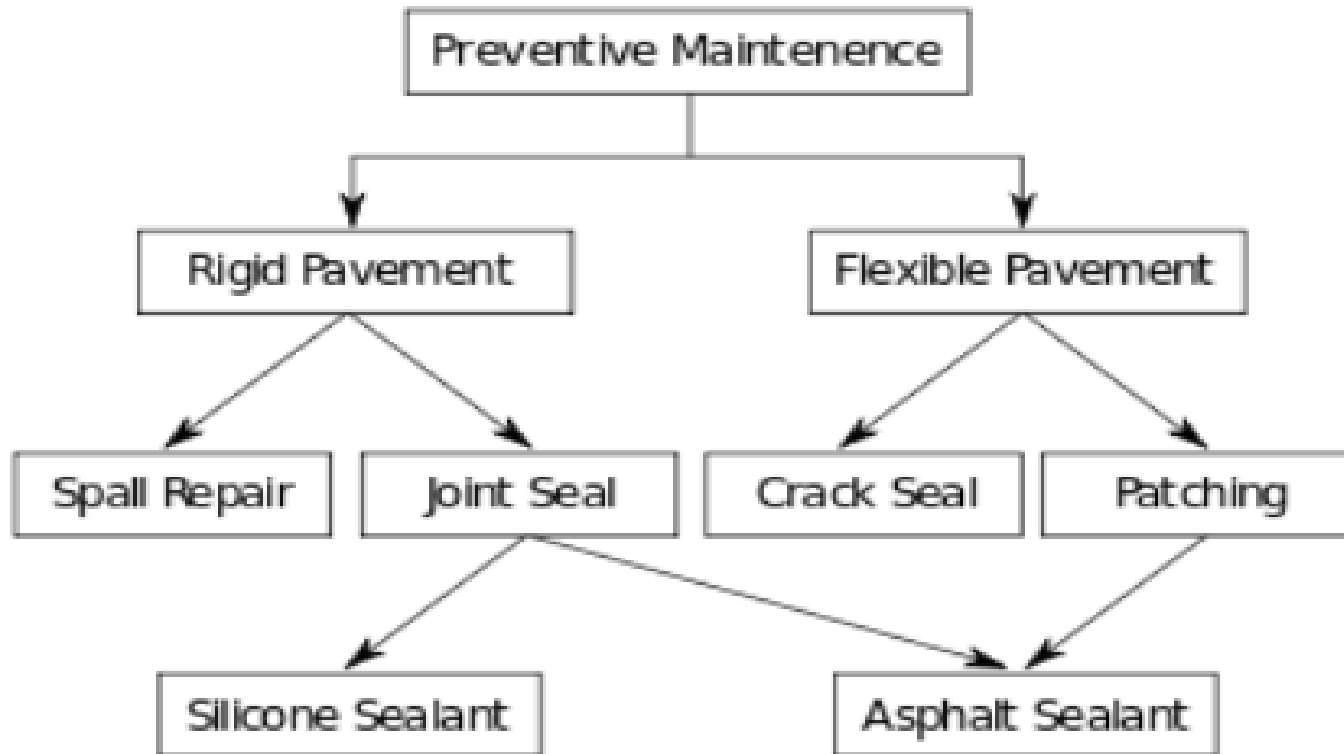
Hierarchical Data Model



Network Databases

- Introduced by IBM in late 1960's & early '70s
- Intended to fix problems of hierarchical model

Network Data Model



How to fix problems of databases?

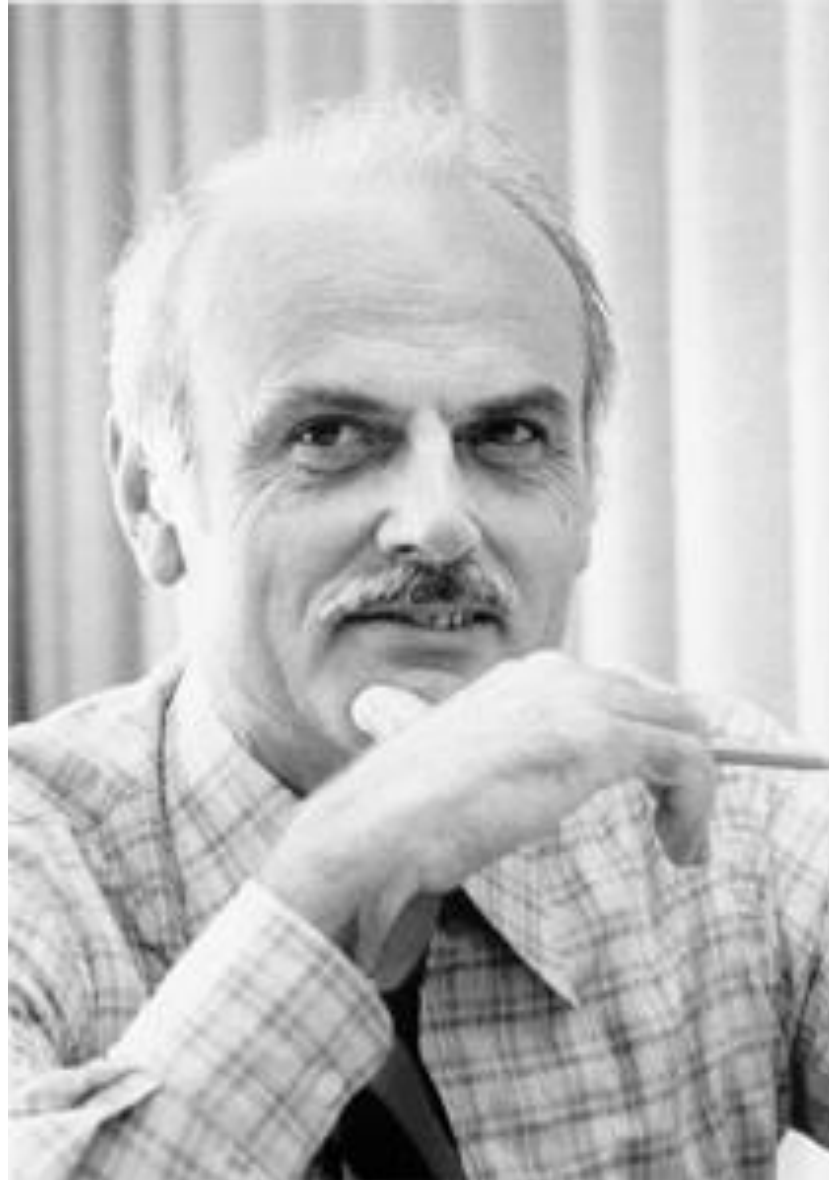
- Less expensive to implement & maintain
- Less dependent on experts
- Efficient use of physical resources
- Able to scale
- Guaranteed accurate data



Jimi Hendrix

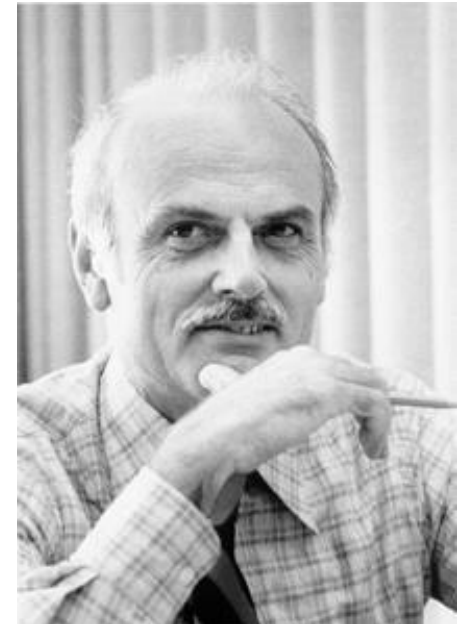
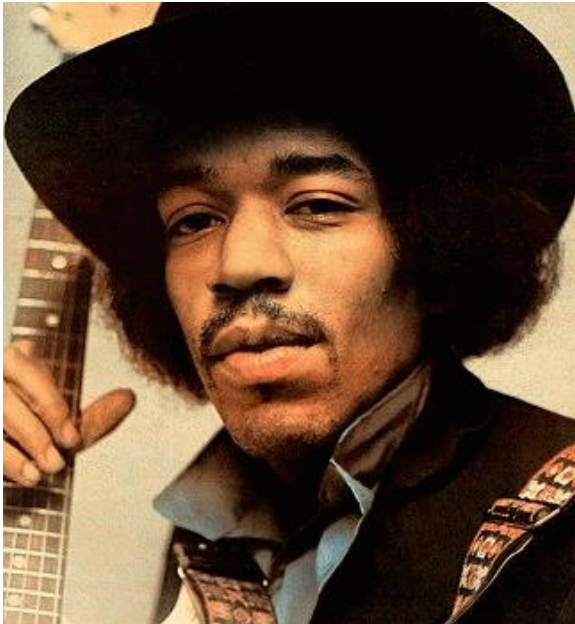


Dr. Edgar Codd



Very similar impact...

- Giants...Innovators...legends
 - Creativity and brilliance changed decades of status quo
 - Single-handedly revolutionized their industry
 - 40 years later still not only current but highly influential



Relational Data Model

- Introduced in early '70s and gradually implemented beginning ~1980
- ELIMINATED (*almost*) all previous problems
 - Records linked together by ALL relationships

Big Picture on Relational Model

- Efficiency: Data is stored in exactly ONE place
- Standards Developed
 - SQL is used to manage systems and data
 - Design methodology (Normalization)

Hierarchical & Network Databases

- *Due to limitations no longer prevalent after 1980...*



Object Database

- Started in 1990s
- Provided Object Oriented features, such as **encapsulation** and **polymorphism**
- Object databases suffered due to lack of standardization

Object Database

- Implemented for specialized applications such as engineering or molecular biology databases
- Object database features were extended to RDBMS and SQL language

Object-Oriented Model

Object-Oriented Model

Object 1: Maintenance Report

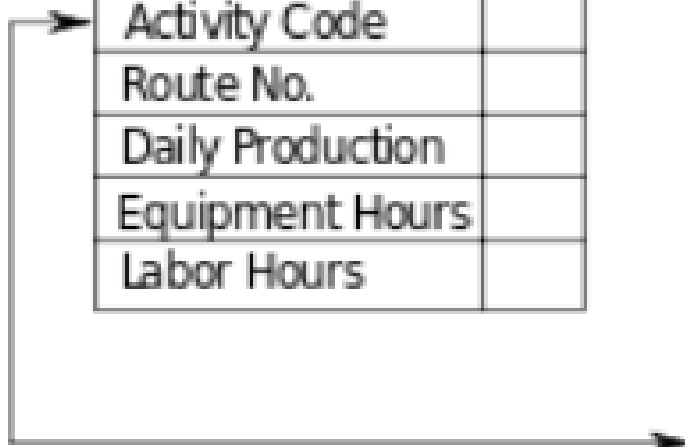
Date	
Activity Code	
Route No.	
Daily Production	
Equipment Hours	
Labor Hours	

Object 1 Instance

01-12-01
24
I-95
2.5
6.0
6.0

Object 2: Maintenance Activity

Activity Code	
Activity Name	
Production Unit	
Average Daily Production Rate	



Big Picture on NoSQL

- **Umbrella term** for all databases and data stores that don't follow strict RDBMS principles
- Often relate to **large data sets** accessed and manipulated on **Web scale**
- Represents collection of diverse, and sometimes related, concepts about **data storage** and **manipulation**.
- Often provide SQL-like interface

RDBMS vs NoSQL

Denormalizing tables, dropping constraints, and relaxing transactional guarantee can help an RDBMS scale, but after these modifications, an RDBMS starts resembling a NoSQL product.