The Microsoft data platform

Grid computing presentation
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Outline

- Application development: the old way, and the data-centric perspective
- The trends of new developing environment for data-centric applications
- Microsoft data platform: key tenets and the architecture
- Summary

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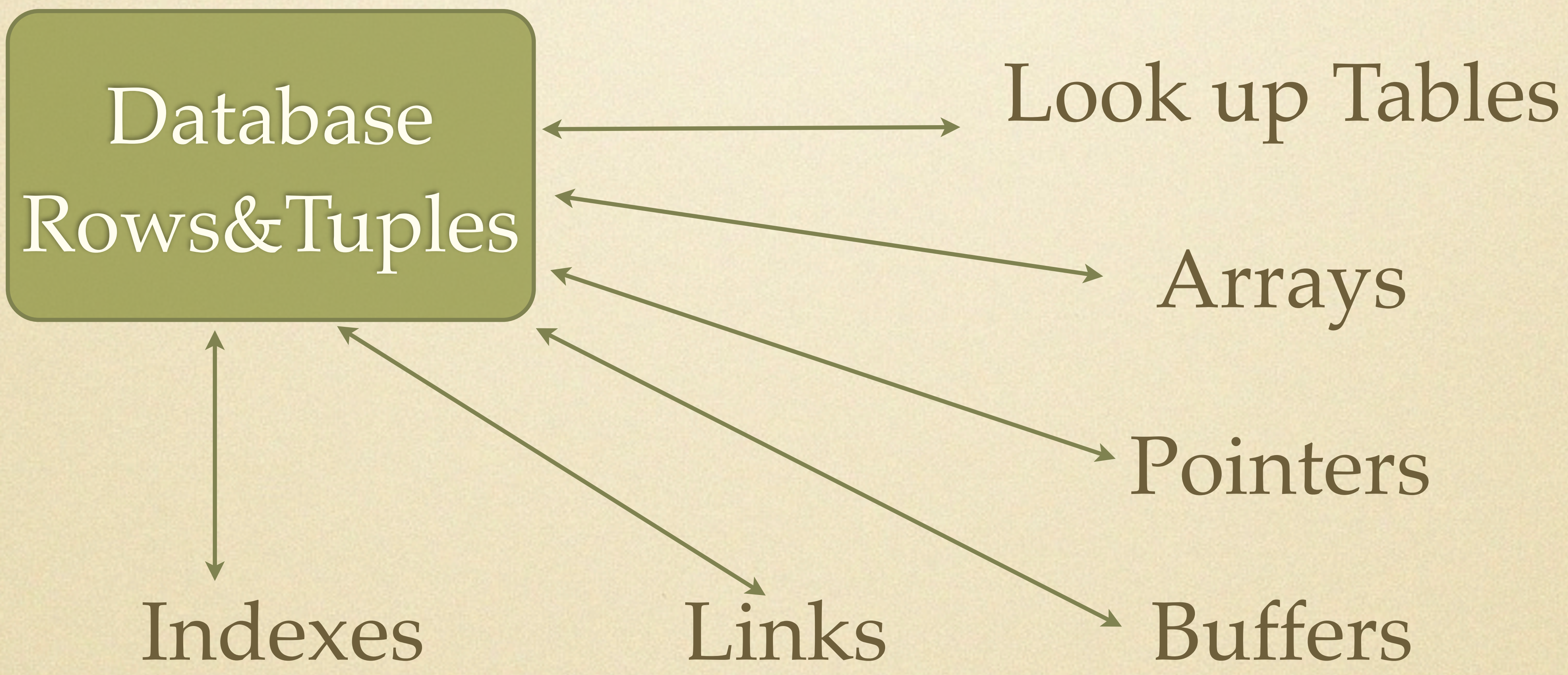
Application Development

The old way

- Defining, initializing, and managing data structures such as look-up tables, arrays, linked lists, indexes, pointers, buffers
- Acquiring, aggregating, and transforming data with such mechanisms as message queues, filters, data logging, fill and stop buffers, circular buffers, device drivers
- Using data to drive control and event processes such as control loops, events, alarms, and signal analysis

Application Development

The old way



Database Rows&Tuples

Look up Tables

Arrays

Pointers

Indexes

Links

Buffers

Application Development

The old way

- Approximately 50% of application code is for data-management
- Nearly 90% of the serious bugs can be traced back to that data-management code.

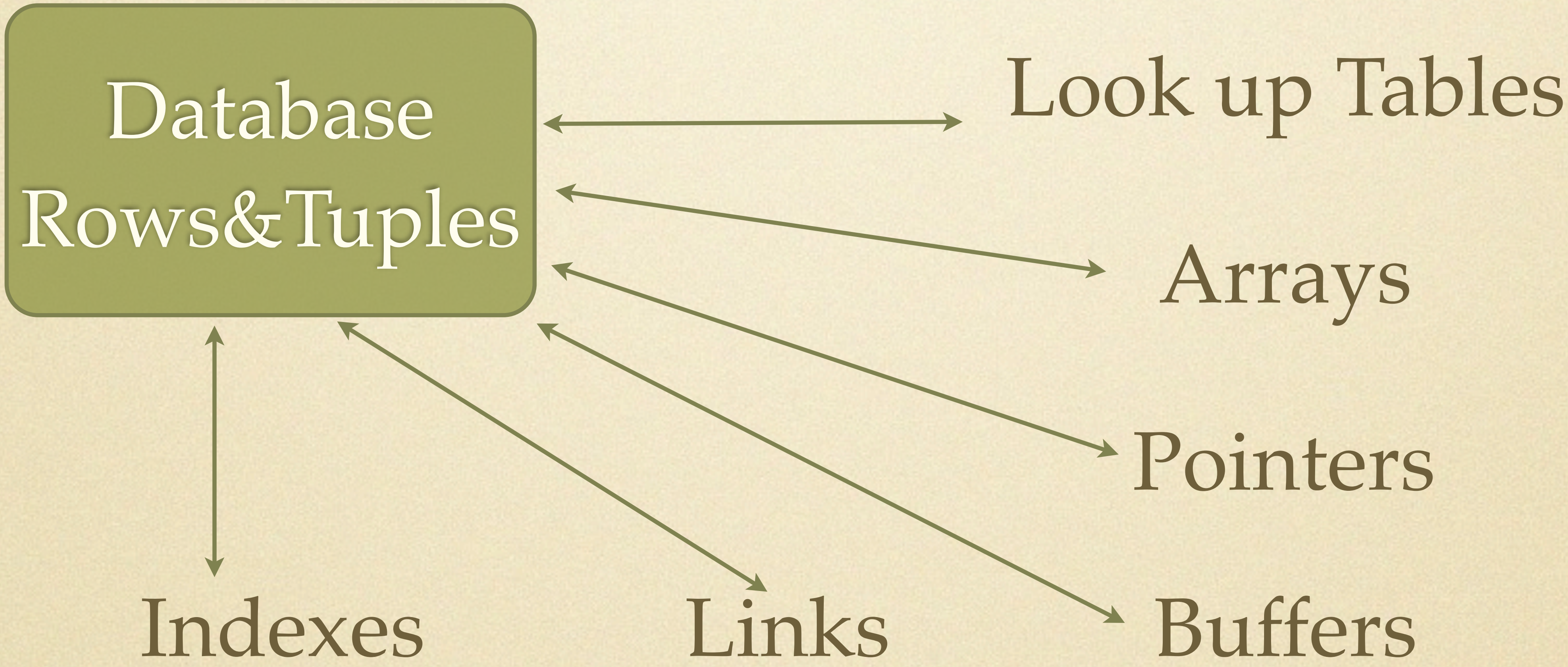
Application Development

Data-centric characteristics

- Data flows in from one or more sources
- Some data is static and stored, but other data is dynamic and accessed in different ways
- Data can be ordered and structured or unstructured
- Data is replicated from one system to another
- Data must be integrated and shared across multiple tables or applications (or both)
- Data may have to be stored in different storage media internal and external to the device or the cloud
- The amount of data to be managed is growing in both size and complexity
- Data can be large while the devices operating on that data have limited system resources (usually for cost reasons)

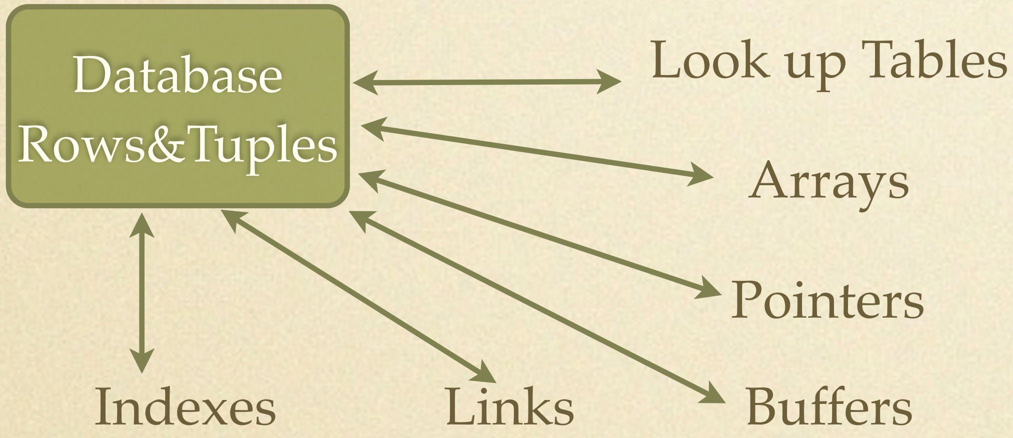
Application Development

The old way



Application Development

The old way



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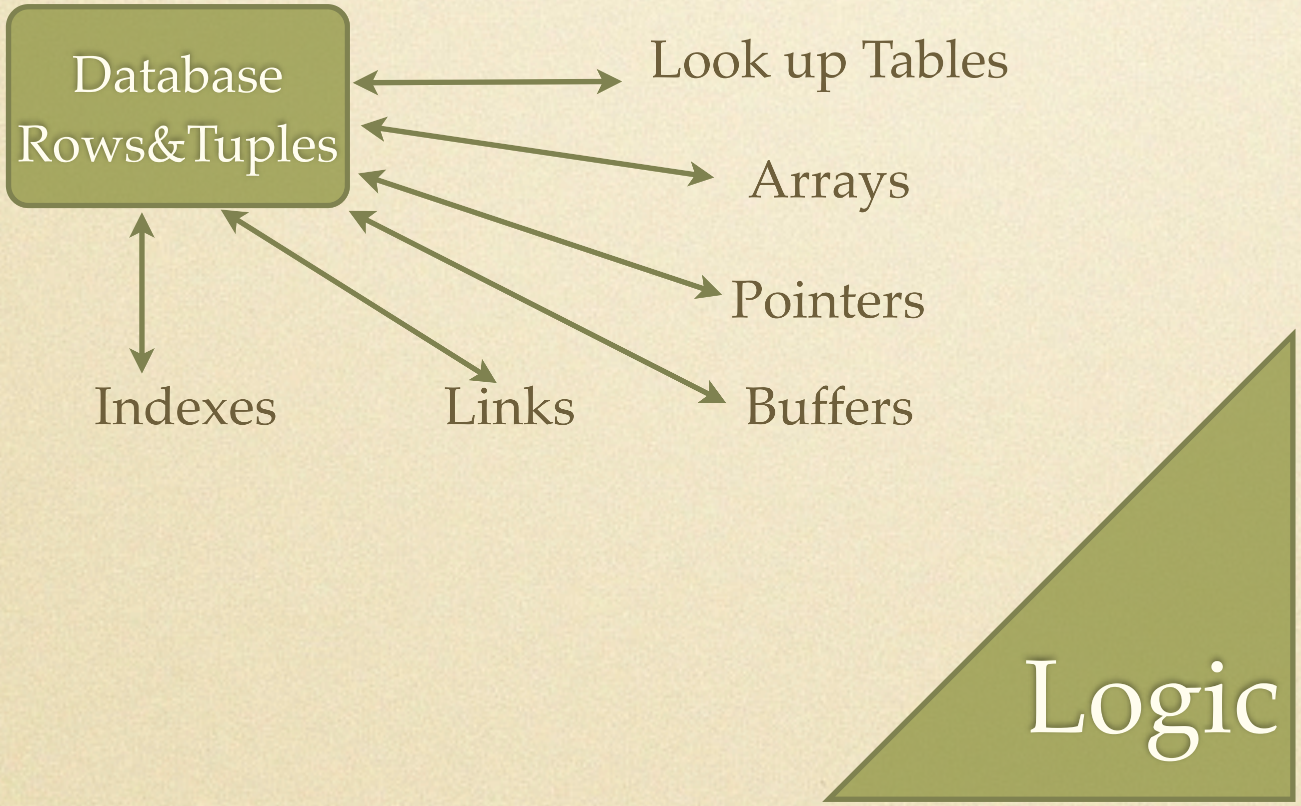

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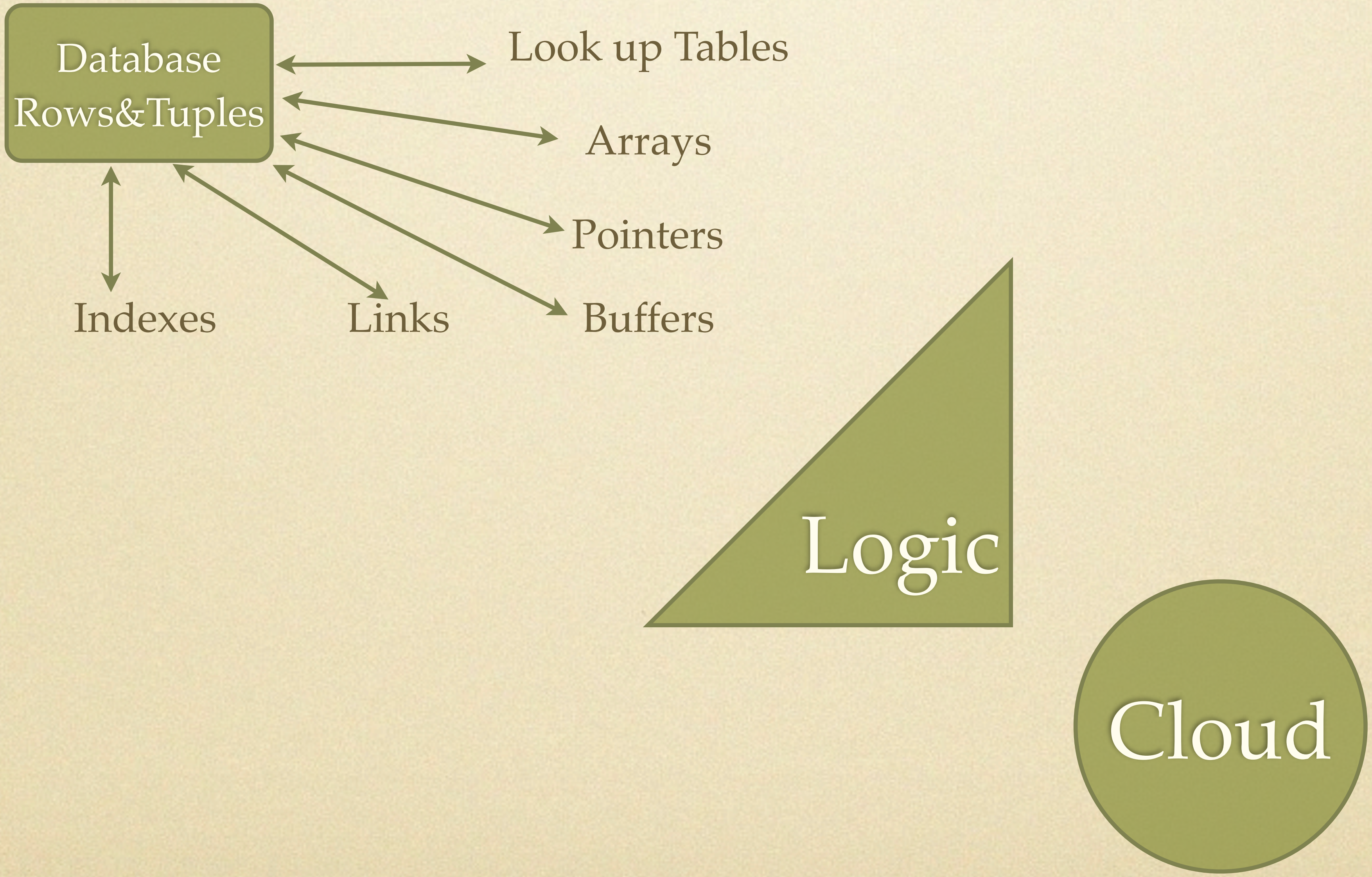
The old way



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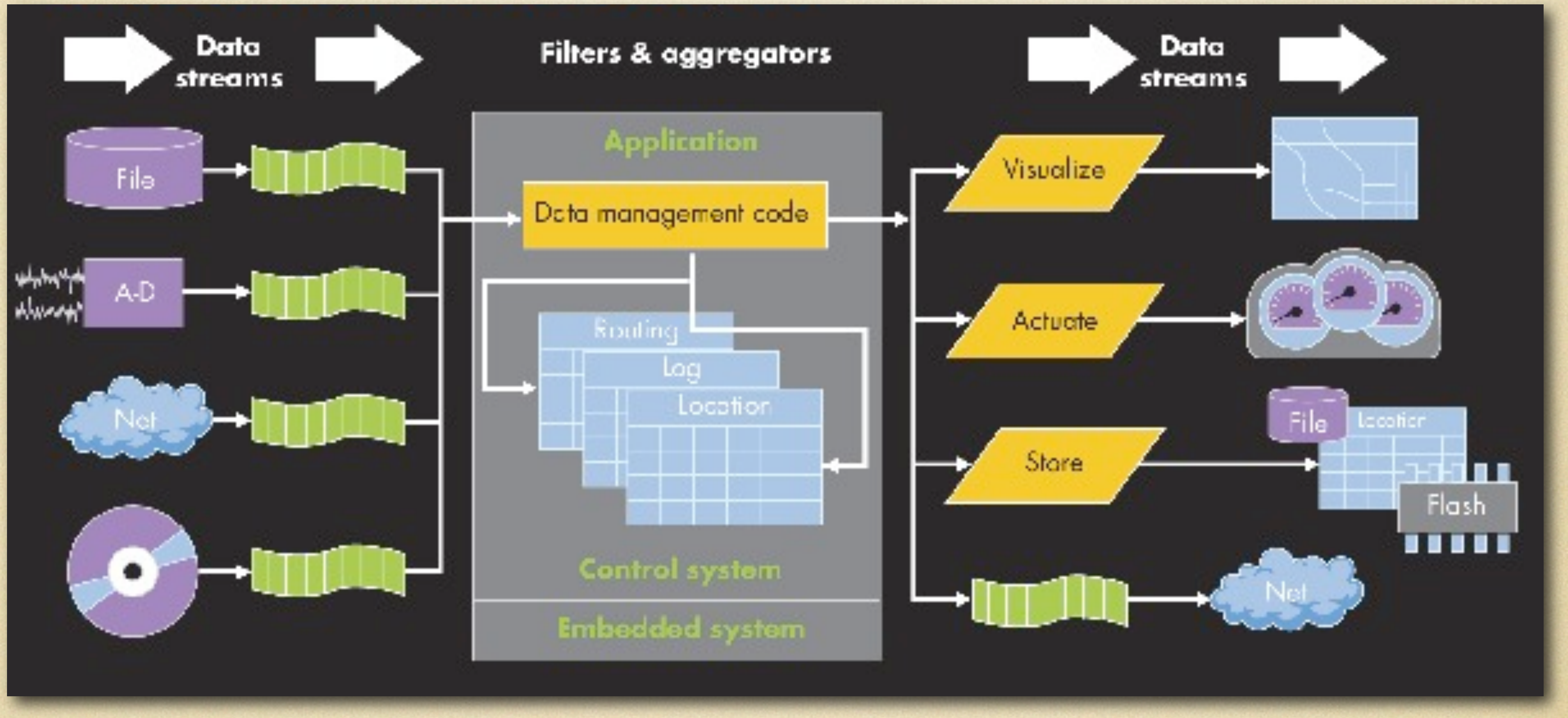
Logic

Cloud

Application Development

Data-centric application model



Eugene K. Buechele - Embedded Development Community 11/09/05

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Data-centric Environment

Hardware Trends

- 64 bit CPUs, and 64 bit OSs
- Multi-core CPUs
- Main memory sizes are growing
- Non-violate RAMs, Flash

Data-centric Environment

Storage Trends

- Low cost commodity storage
- Data operational cost exceeds hardware cost
- Merging of structured data and unstructured data

Data-centric Environment

Device and Client Trends

- More capable & powerful Devices
- Mobility dramatically increases
- Streaming technology
- Occasionally Connected to the Cloud

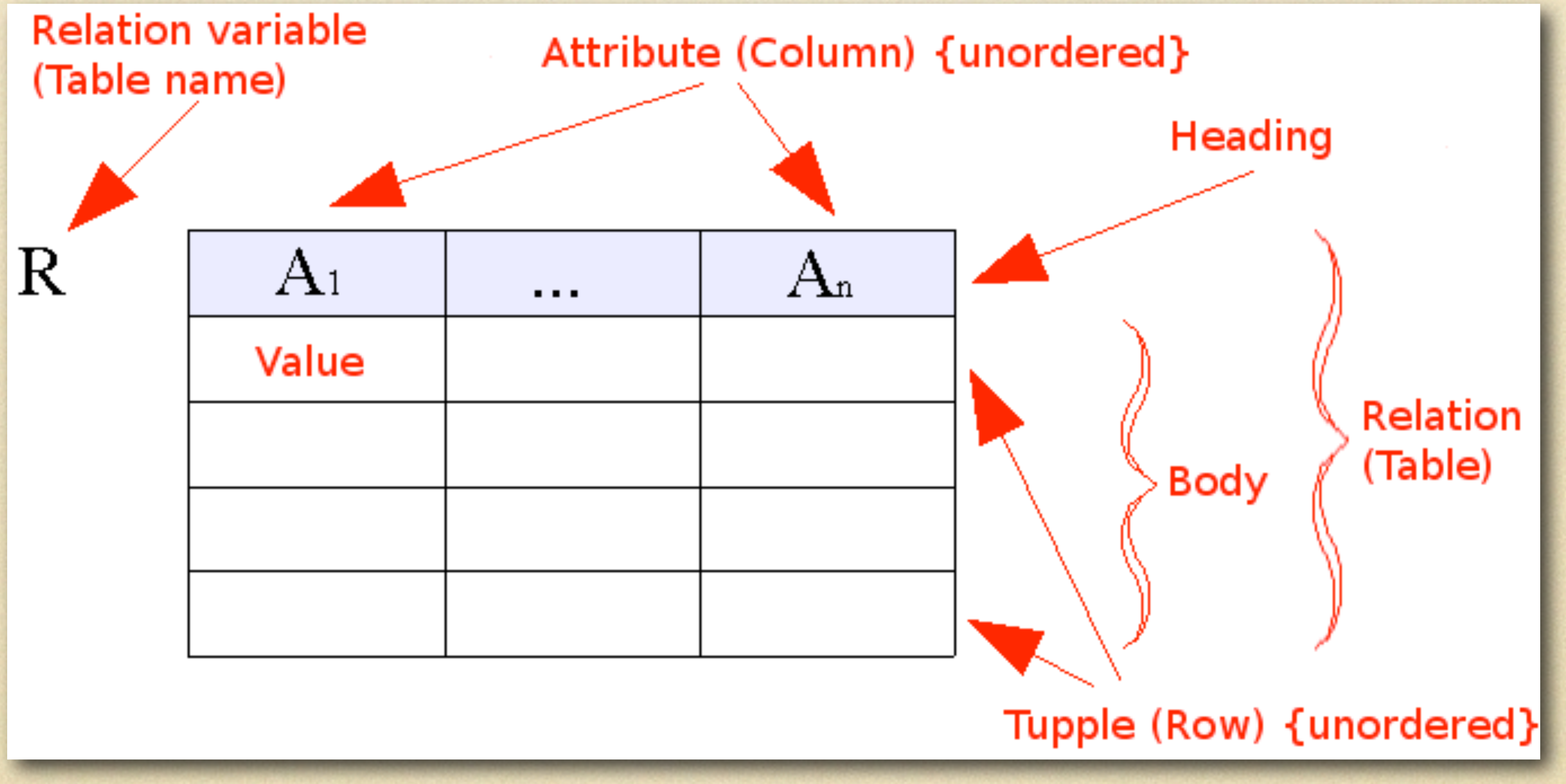
Data-centric Environment

Data and Applications Trends

- Data everywhere(devices, cloud...), every tier
- Data Proximity: Form & Process
- Embedding data application in other application
- Shifting from relational data model to entity-relationship data model

Data-centric Environment

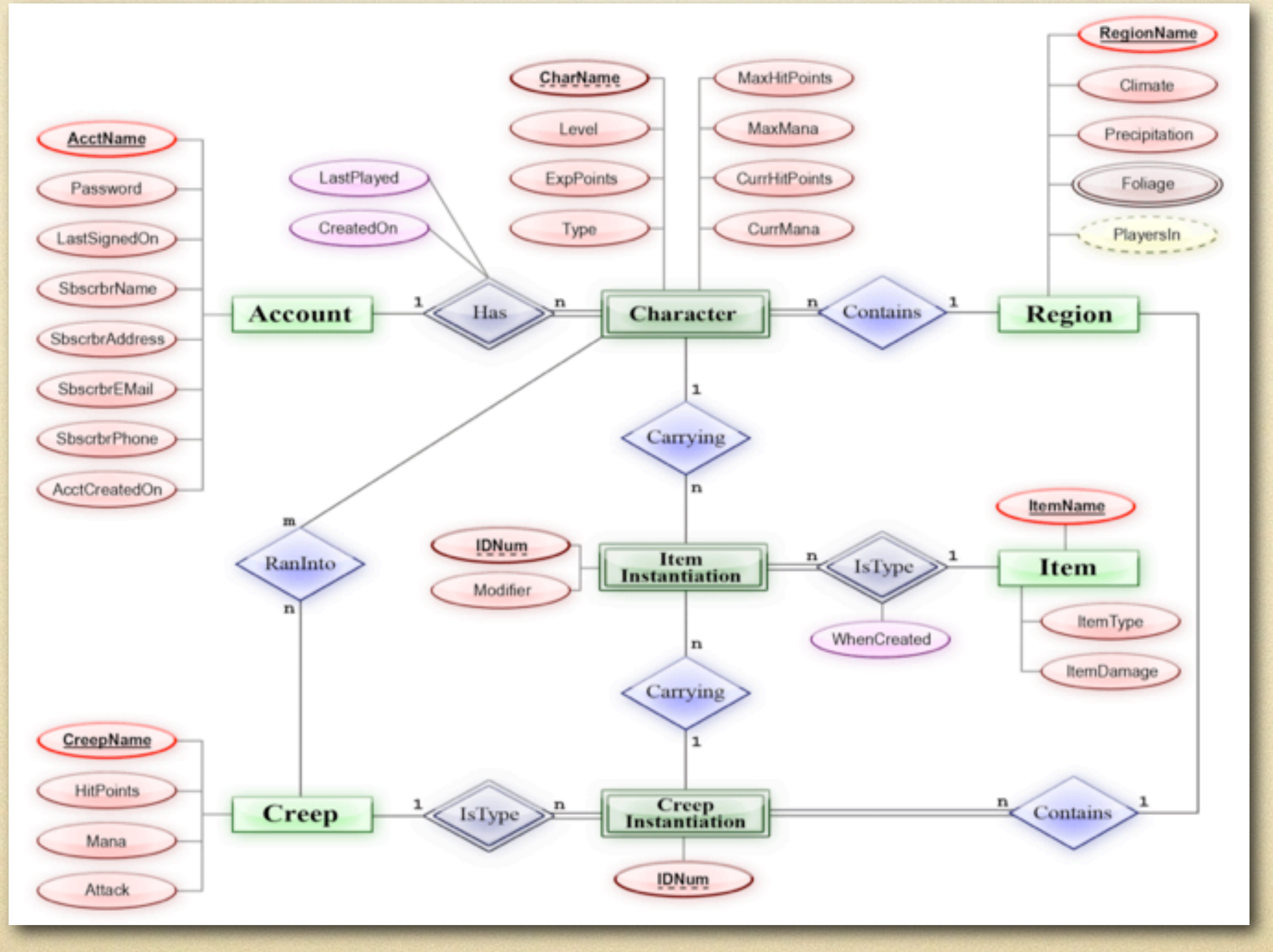
Relational data model(table-tuple)



A_1	...	A_n
Value		

Data-centric Environment

Entities datamodel



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Microsoft Data Platform

Key Tenets: Platform for all data

- Traditional structured data; Byte stream data (audio, video); Semi-structured data; Web clickstream, feeds, audit logs...
- Better integration of database system (for query-ability) and file system (for performance and functionality)

Microsoft Data Platform

Key Tenets: Low cost, reliable storage

- Deliver significant improvement in database maintenance and management costs.
- Enable friction free addition of necessary resource such as process and disk, with zero-touch provisioning and resource balancing

Microsoft Data Platform

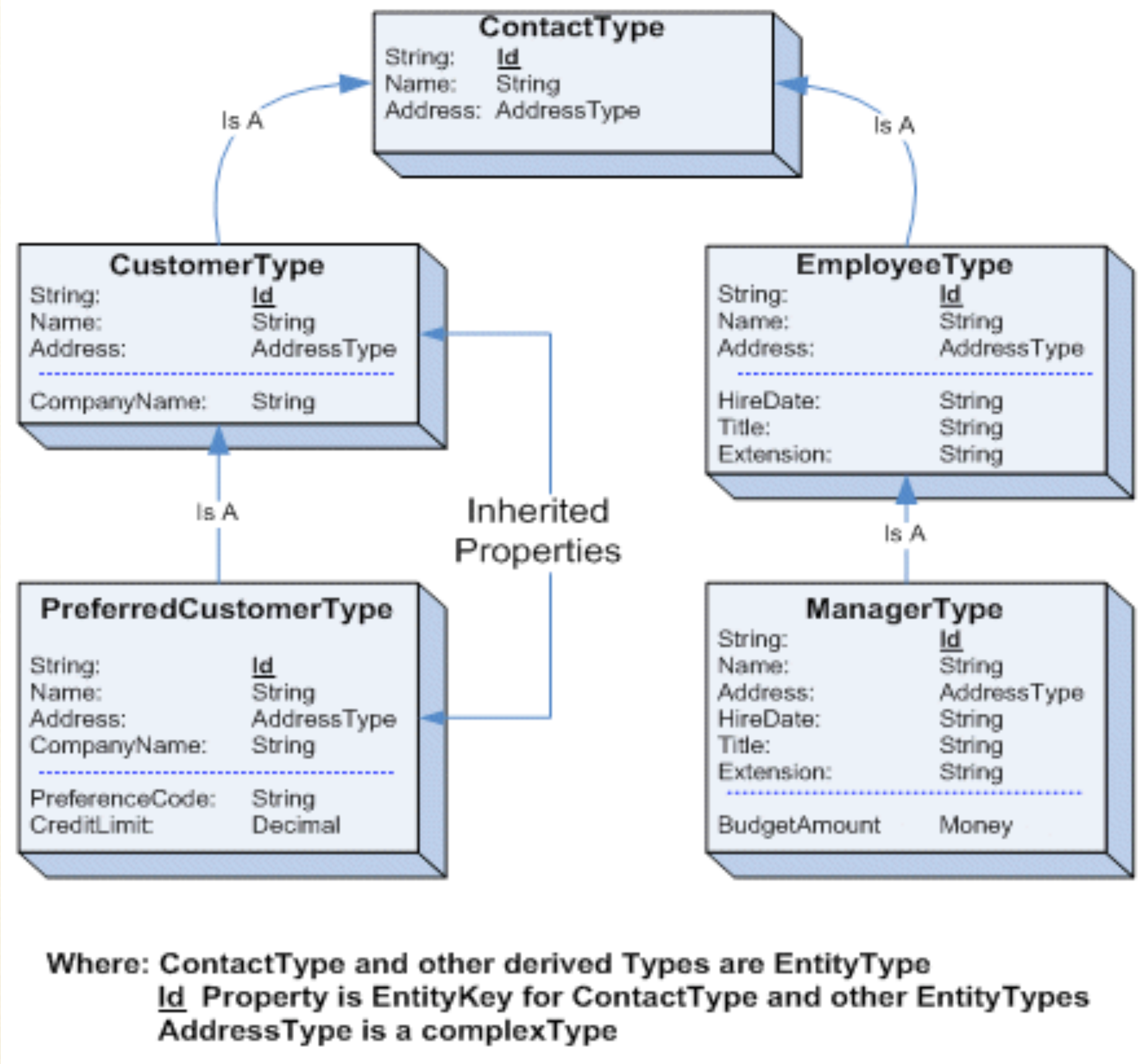
Key Tenets: Reach and Rich

- Allowing users to store data locally and to synchronize, to access their personal devices such as Phones, PCs, USBs, Cameras...
- Provide better offline experience for web applications.

Microsoft Data Platform

Key Tenets: Entity data model(EDM)

- Type: Each item (entity) are described by a type, can be inherited from another type



ContactType

String:	Id
Name:	String
Address:	AddressType

CustomerType

String:	Id
Name:	String
Address:	AddressType
CompanyName:	String

EmployeeType

String:	Id
Name:	String
Address:	AddressType
HireDate:	String
Title:	String
Extension:	String

PreferredCustomerType

String:	Id
Name:	String
Address:	AddressType
CompanyName:	String
PreferenceCode:	String
CreditLimit:	Decimal

ManagerType

String:	Id
Name:	String
Address:	AddressType
HireDate:	String
Title:	String
Extension:	String
BudgetAmount	Money

Where: ContactType and other derived Types are EntityType
Id Property is EntityKey for ContactType and other EntityTypes
AddressType is a complexType

Microsoft Data Platform

Key Tenets: Entity data model(EDM)

- Instances:
  - EntitySet: a set of instances of an entity type.
  - RelationshipSet: hold two or more entities which has same relation for a given relationship type.

Microsoft Data Platform

Key Tenets: Data Integration

- Dropping of data storage cost, data operation cost allow us focus on data mining
- MDP allows users and analysts to access, enrich and report on the data they need to do their job
- Allow data manager to control source quality, thus improve productivity.

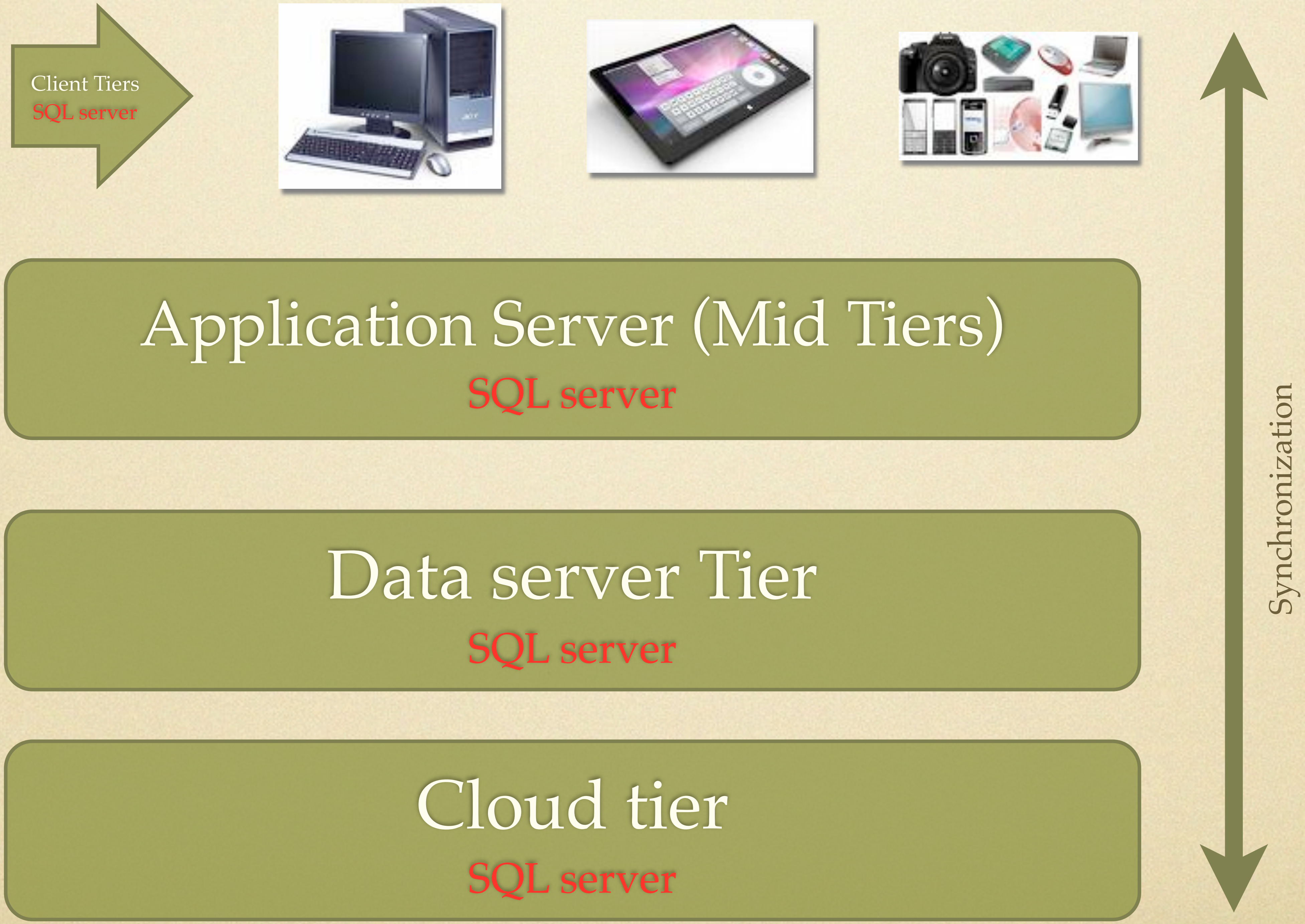
Microsoft Data Platform

Key Tenets: Cloud scale data service

- Provide a reference data service, that allows web clients to navigate entities via HTML.
- Provide means to upgrade shared data
- Provide space for third parties host application logic which integrates with existing storage and services.

Microsoft Data Platform

Architecture: The tiers



Client Tiers
SQL server

Application Server (Mid Tiers)
SQL server

Data server Tier
SQL server

Cloud tier
SQL server

Synchronization

Microsoft Data Platform

Architecture: Characteristics of data in tiers

- Cloud tier: Large data size, highly partitioned data, data operations such as maintenance, monitoring is essential
- Data server tier: data tends to be mostly structured, highly transactional
- Application server tier: Typically cached data, tends to be application-centric, must be self-managed
- Client tier: Data sizes are not very large, self-management is critical

Microsoft Data Platform

Architecture: Uniform application Development(1)

- Uniform database model:
  - The entity model, which supports row, XML and BLOB data (Binary Large OBject), is desired across all tiers.
- Uniform programming model:
  - Uniform query and data definition language such as Entity SQL, XQuery
  - Uniform APIs

Microsoft Data Platform

Architecture: Uniform application Development(2)

- Uniform development environment
  - Use same tools to develop applications such as Visual Studio
  - Possibility of deploy applications in different tiers
- Uniform management across tiers
  - Although data management experience is different on each tiers, however declarative management is crucial for achieve uniform management

Microsoft Data Platform

Architecture: Synchronization across tiers

- Synchronization from and to all tiers such as between servers, server and client, server and application
- Synchronization over different communication protocols and media such as wireless network, or connected network using HTTP
- Synchronization of data at different abstraction, such as file, tuples, entities

Summary

- Application development changes to data-centric due to huge impact of cloud to trends of hardware, software, storage, and applications
- Microsoft Data Platform is designed for supporting data processing of developer in all tiers

References

- The Microsoft data platform, David Campbell and Anil Noir, Microsoft Corp. WA 98052-6399
- ADO.NET Network. http://msdn.microsoft.com/data/ref/adonetnext/
- Embedded Development Community. http://www.embedded.com/