OGSA Architecture

Adapted from

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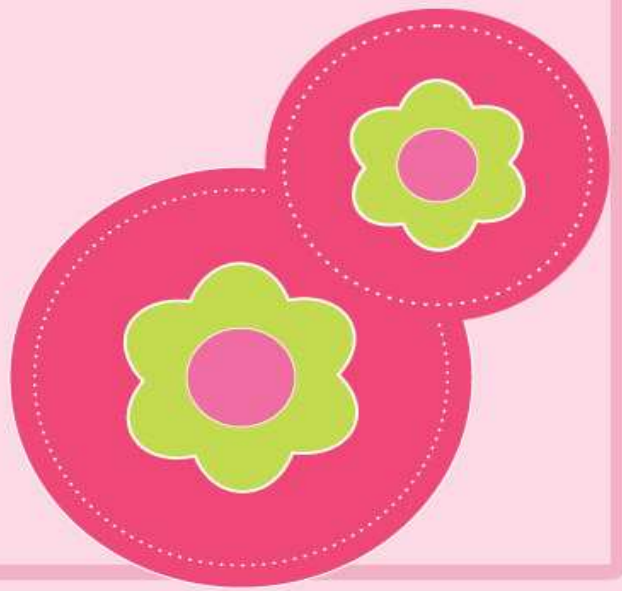
UNIT II GRID SERVICES

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

Overview

- Motivation of OGSA
- Design goals of OGSA
- OGSA Architecture
- Example Grid Service
- Components of OGSA

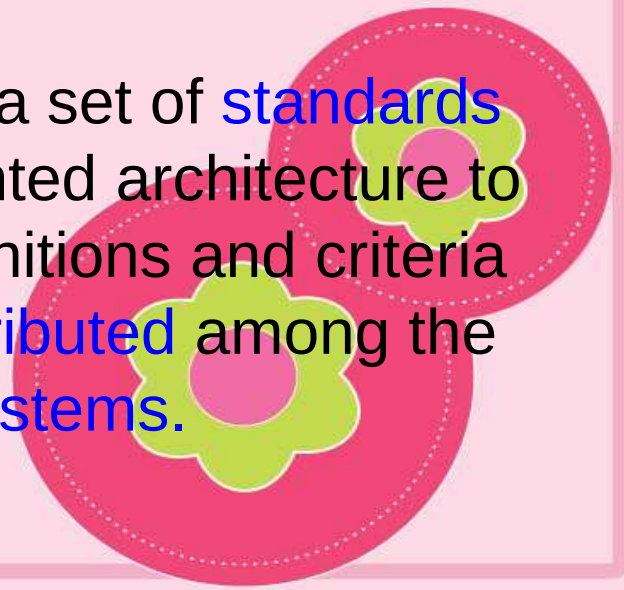


What is the OGSA Standard?

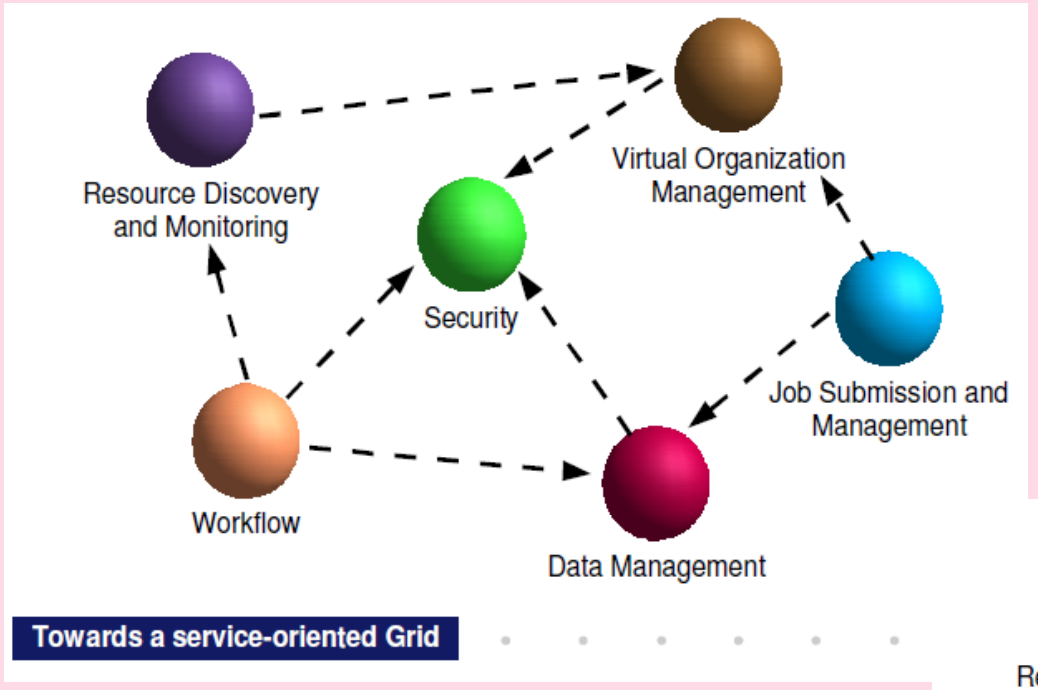
- Open Grid Service Architecture
- OGSA define how different components in grid interact
- Open Grid Services Architecture (OGSA) is a set of standards defining the way in which information is shared among diverse components of large, heterogeneous grid systems. In this context, a grid system is a scalable wide area network (WAN) that supports resource sharing and distribution.

Definition

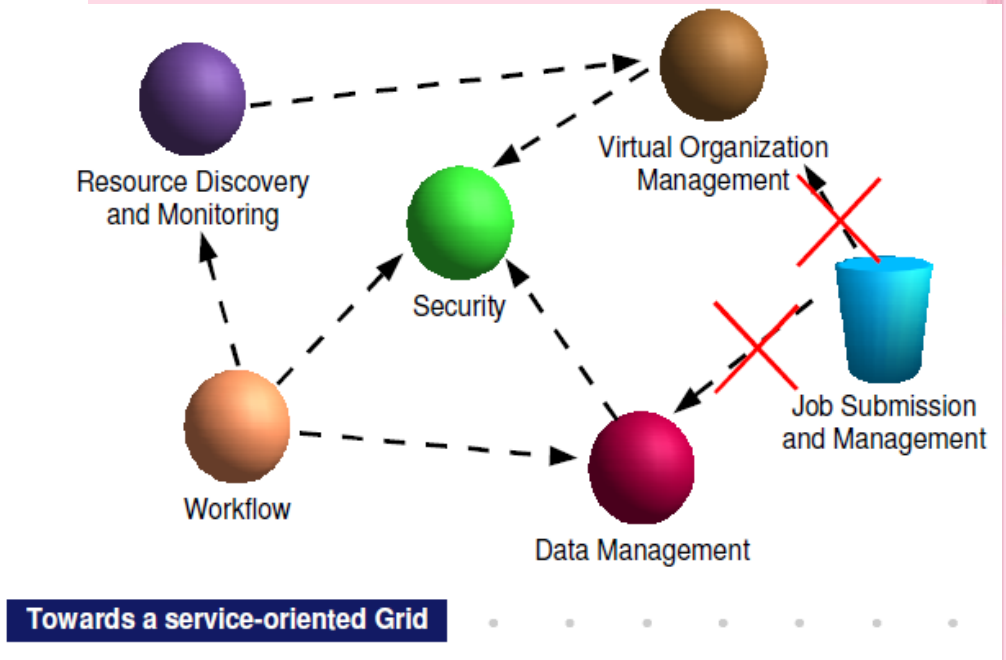
- Open Grid Services Architecture (OGSA) is a set of standards that extends Web services and service-oriented architecture to the grid computing environment. OGSA definitions and criteria describe how information is shared and distributed among the components of large, heterogeneous grid systems.



OGSA goals

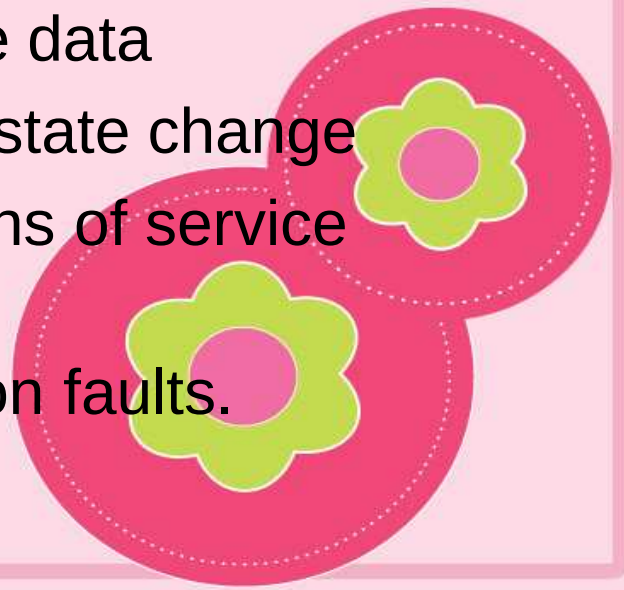


The actual standardization process is being carried out by the Global Grid Forum (GGF) http://www.ggf.org/



Motivation of OGSA

- Defines a set of conventions and extensions on the use of Web Service Definition Language and XML Schema to enable stateful Web services.
- It introduces the idea of a stateful Web services and defines approaches for the following
  - creating, naming, and managing the lifetime of instances of services
  - for declaring and inspecting service state data
  - for asynchronous notification of service state change
  - for representing and managing collections of service instances and
  - for common handling of service invocation faults.



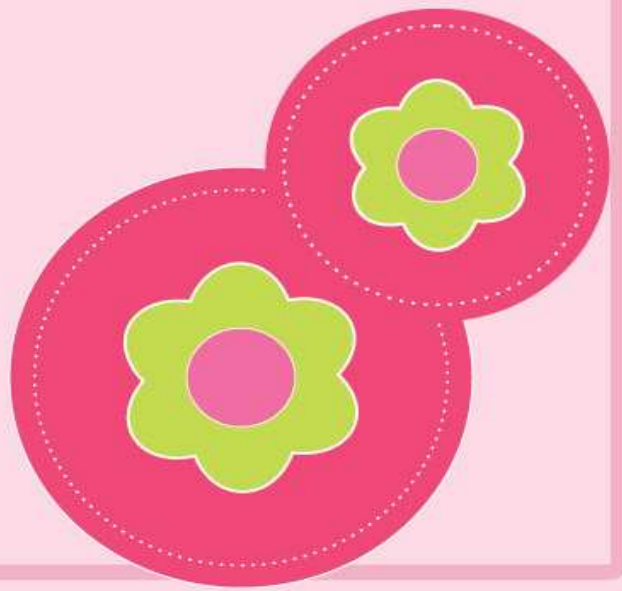
Design goals of OGSA

- Operations are grouped to form interfaces, and interfaces are combined to specify a service.
  - Encourages code-reuse
  - Simplifies application design
- Ease of composition of services
- Service Virtualization: isolate users from details of service implementation and location.

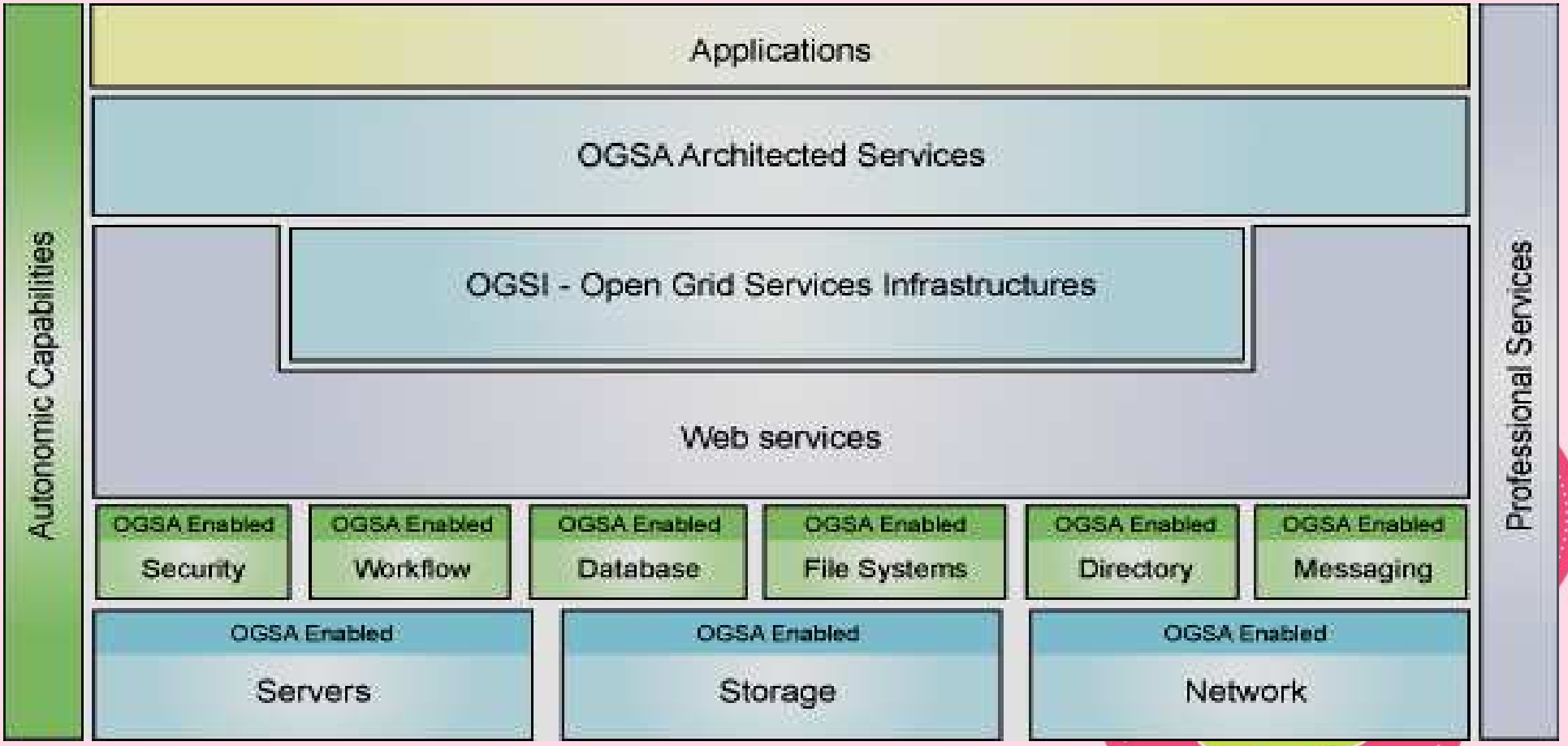
Architecture of OGSA

Comprised of 4 main layers

- Physical and Logical Resources Layer
- Web Service Layer
- OGSA Architected Grid Services Layer
- Grid Applications Layer



OGSA Architecture



OGSA Architecture - Physical and Logical Resources Layer

- Physical resources are: servers, storage, network
- Logical resources manage physical resources
- Examples of logical resources: database managers, workflow managers

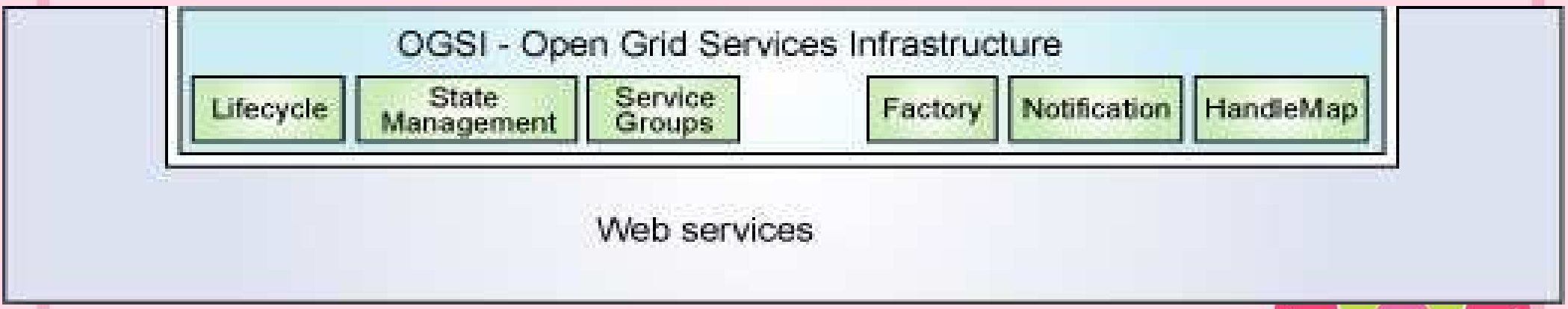
OGSA Architecture - Web Services Layer

- Web service is software available online that could interact with other software using XML
- Consists of Open Grid Services Infrastructure (OGSI) sub-layer which specifies grid services and provide consistent way to interact with grid services
- Also extends Web Service Capabilities

Consists of 5 interfaces:

1. **Factory:** provide way for creation of new grid services
2. **Life Cycle**: Manages grid service life cycles
3. **State Management**: Manage grid service states
4. **Service Groups**: collection of indexed grid services
5. **Notification**: Manages notification between services & resources

OGSA Architecture - Web Services Layer (OGSI)



OGSA Architecture – OGSA Architected Services - Layer

Classified into 3 service categories

1.Grid Core Services

2.Grid Program Execution Services

3.Grid Data Services

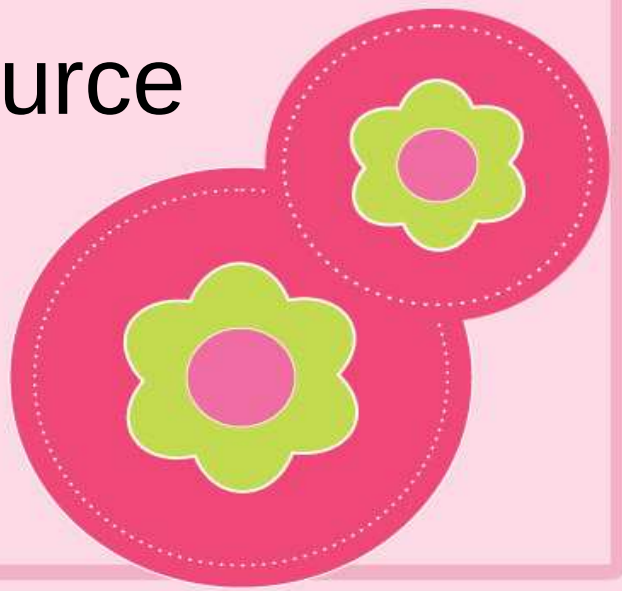
OGSA Architected Services – Grid Core Services

Composed of 4 main types of services:

1. **Service Management**: assist in installation, maintenance, & troubleshooting tasks in grid system
2. **Service Communication**: include functions that allow grid services to communicate
3. **Policy Services**: Provide framework for creation, administration & management of policies for system operation
4. **Security Services**: provide authentication & authorization mechanisms to ensure systems interoperate securely

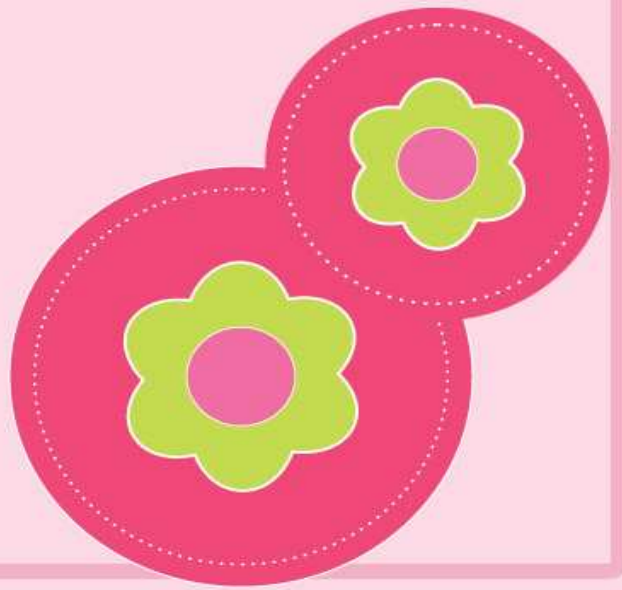
OGSA Architected Services – Grid Program Execution Services

- Supports unique grid systems in high performance computing, collaboration, parallelism
- Support virtualization of resource processing

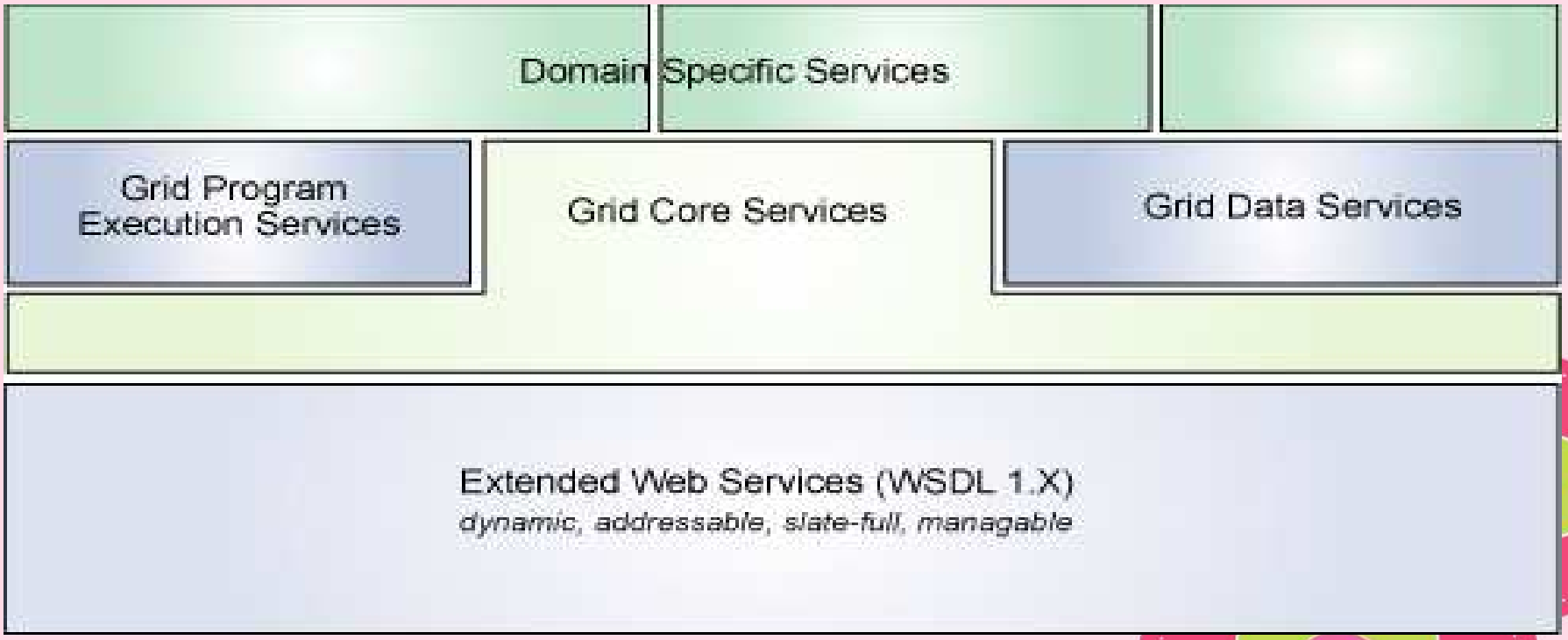


OGSA Architected Services – Grid Data Services

- Support data virtualization
- Provide mechanism for access to distributed resources such as databases, files

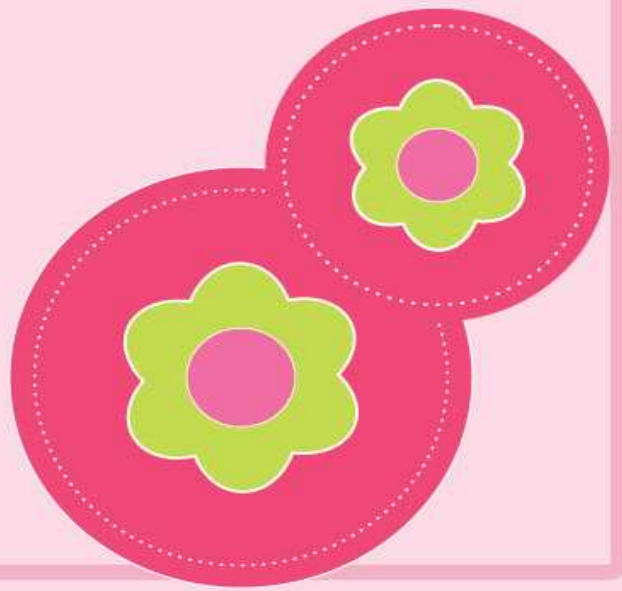


OGSA Architecture – OGSA Architected Services - Layer



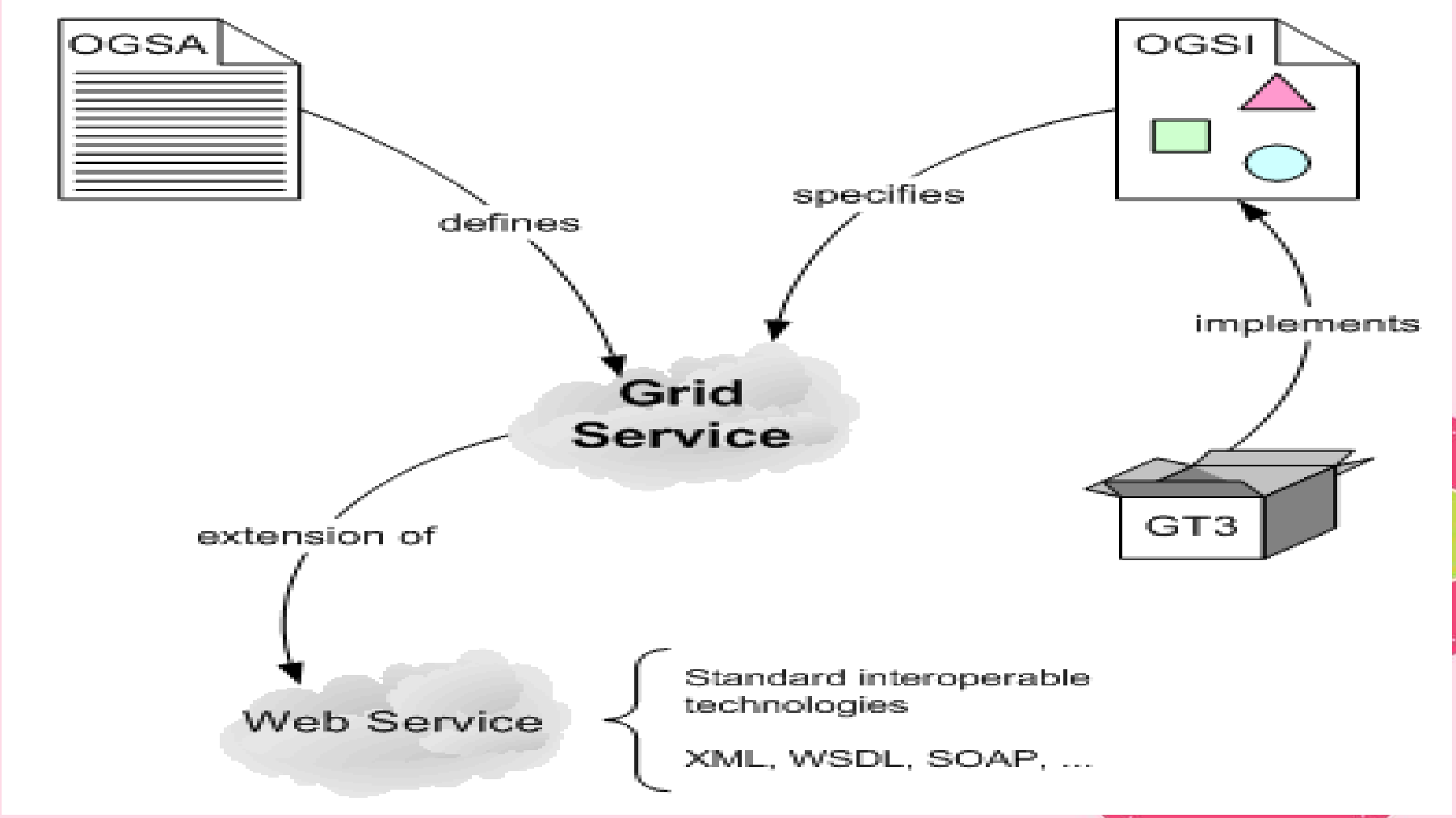
OGSA Architecture – Grid Applications Layer

- This layer comprise of applications that use the grid architected services



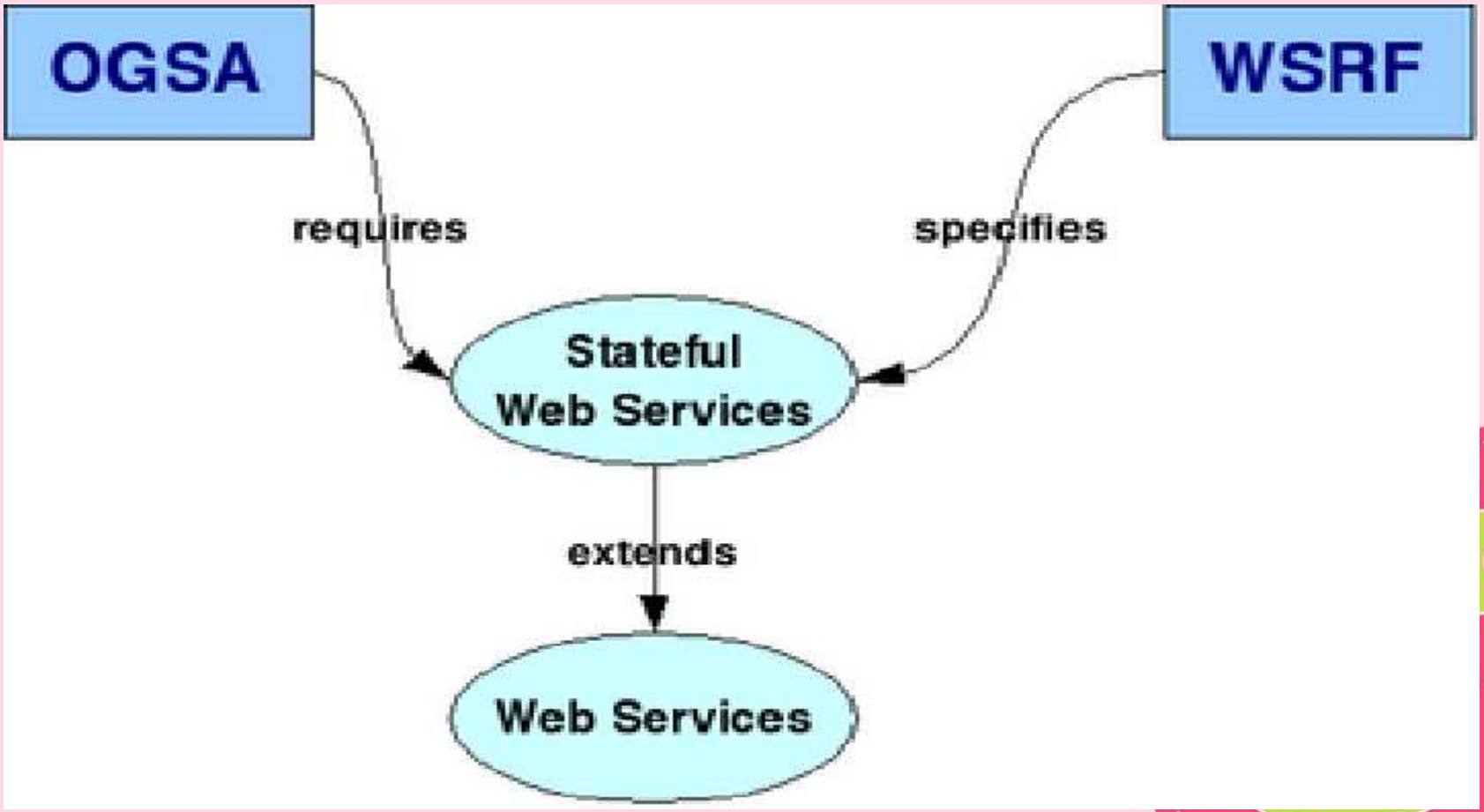
Services in the Web and the Grid

OGSA, OGSI, GT3



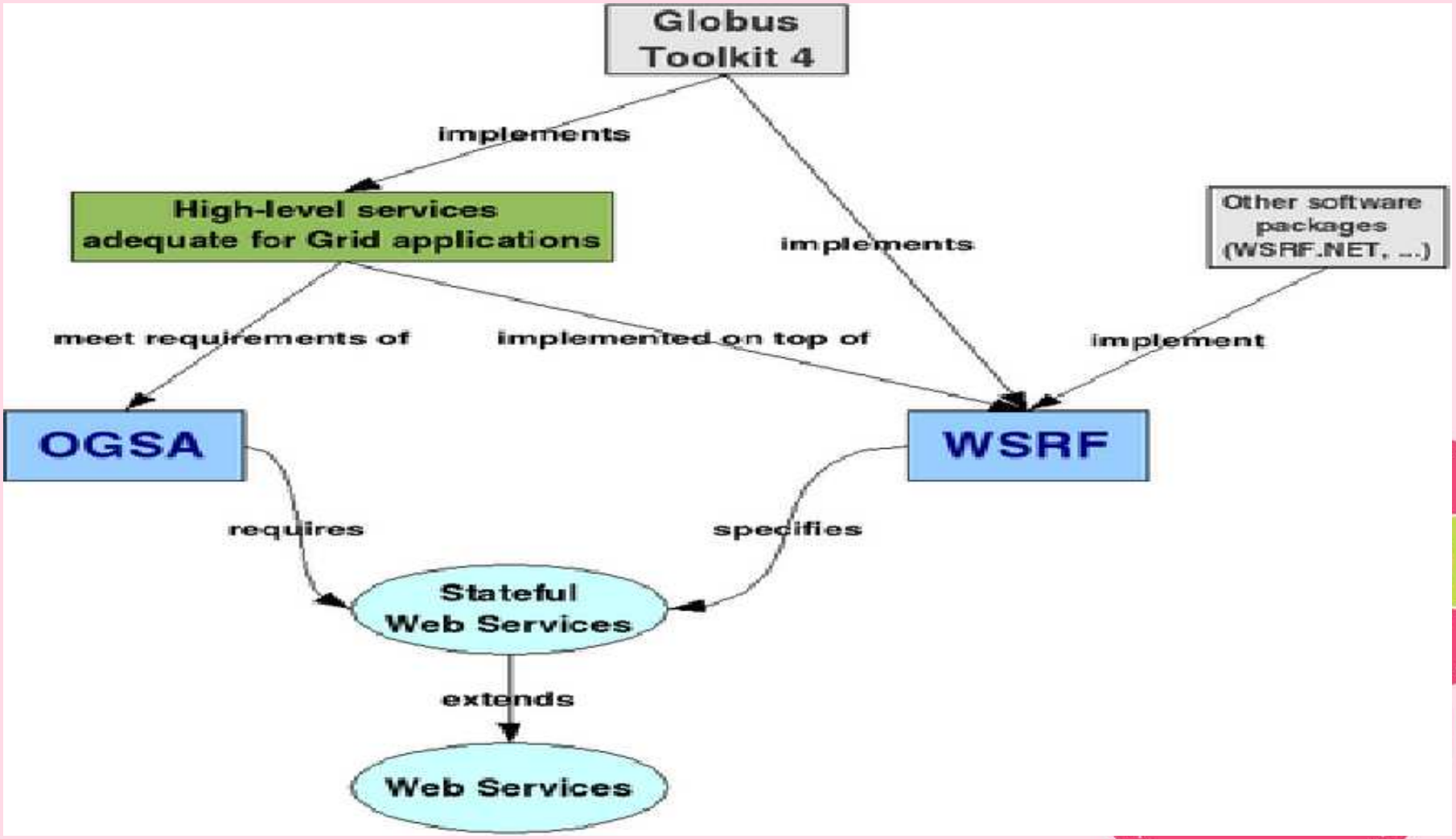
Services in the Web and the Grid

OGSA, WSRF

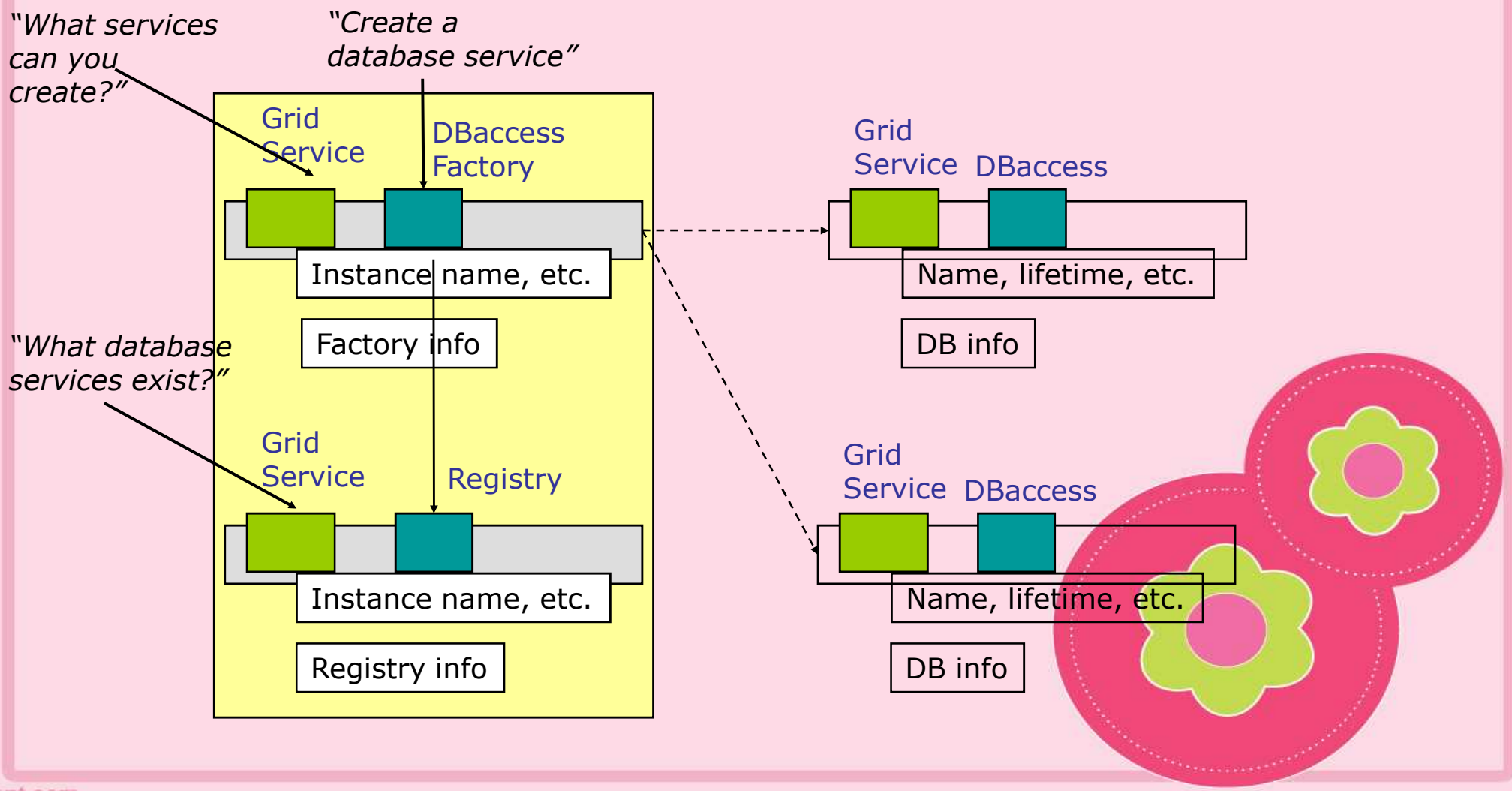


Web services and the Grid

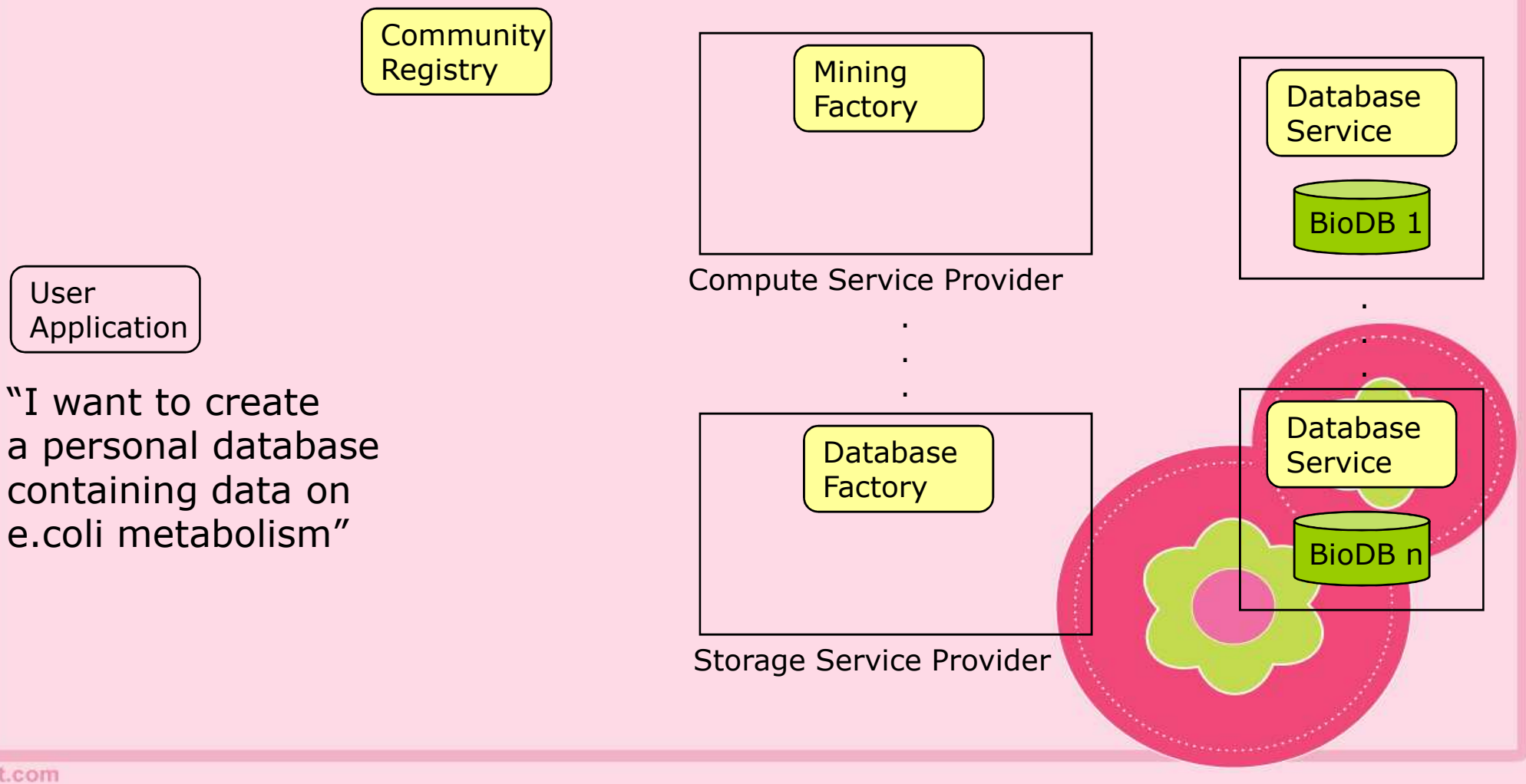
OGSA, WSRF, GT4



Transient Database Services



Example:
Data Mining for Bioinformatics



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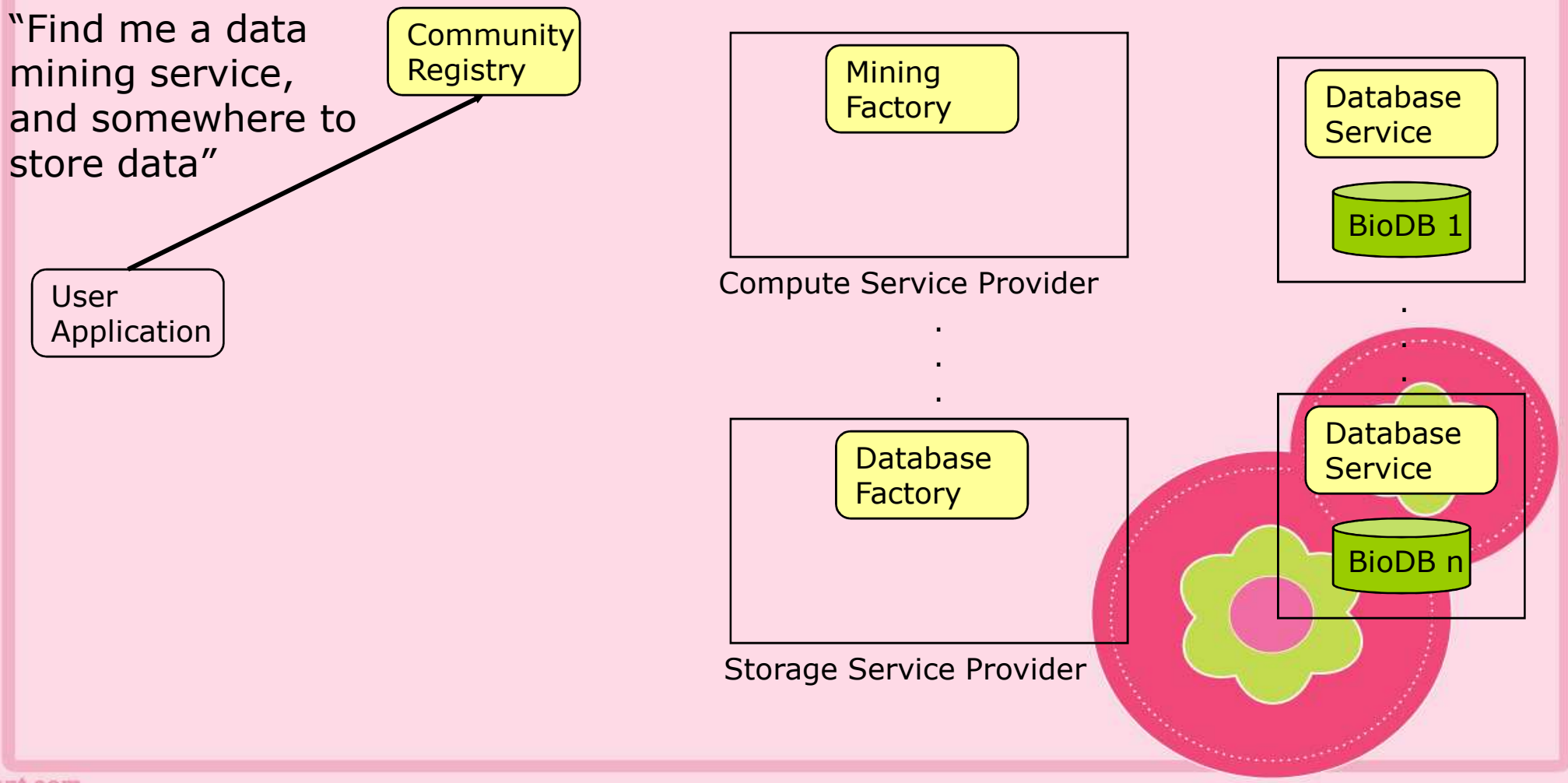

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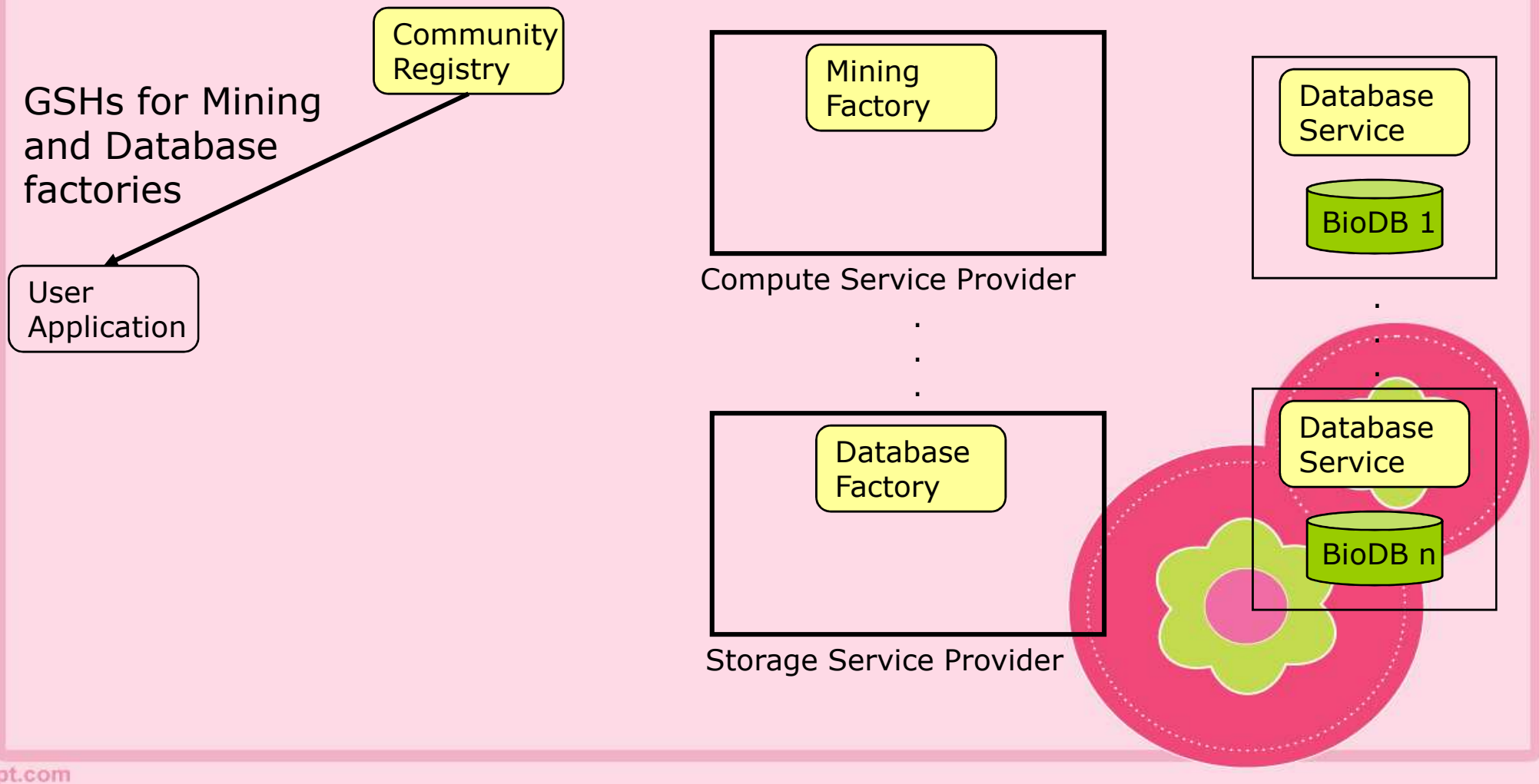

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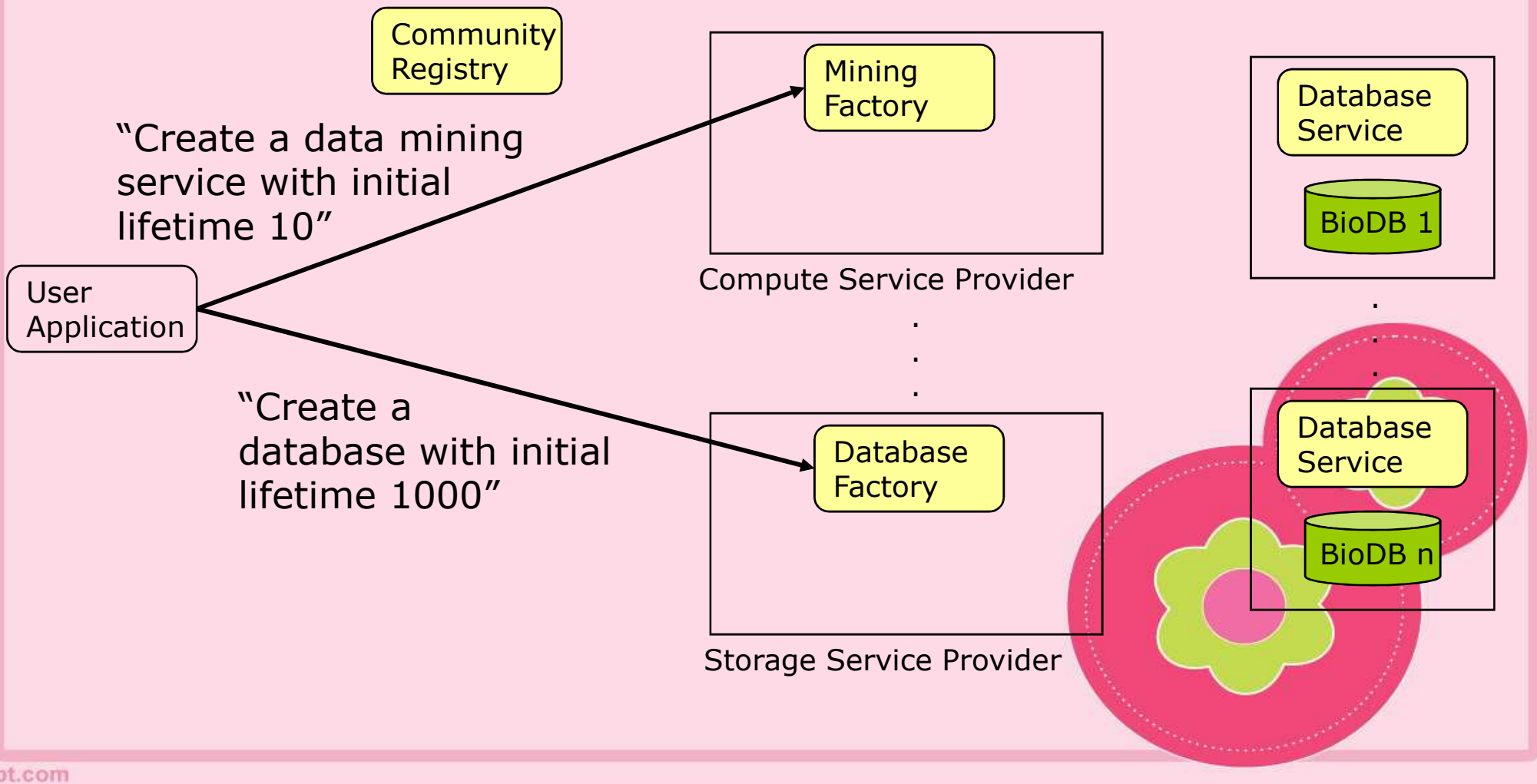

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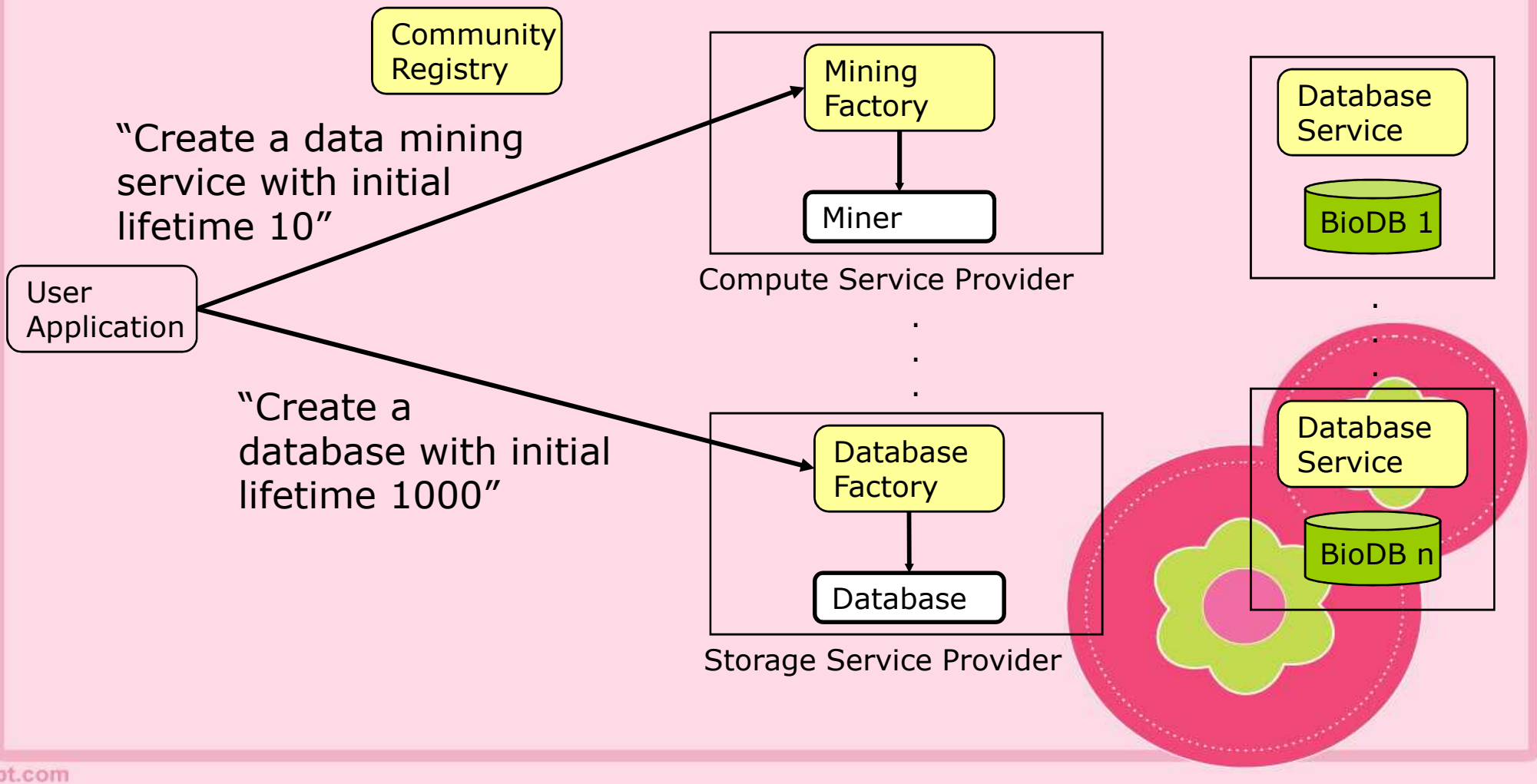

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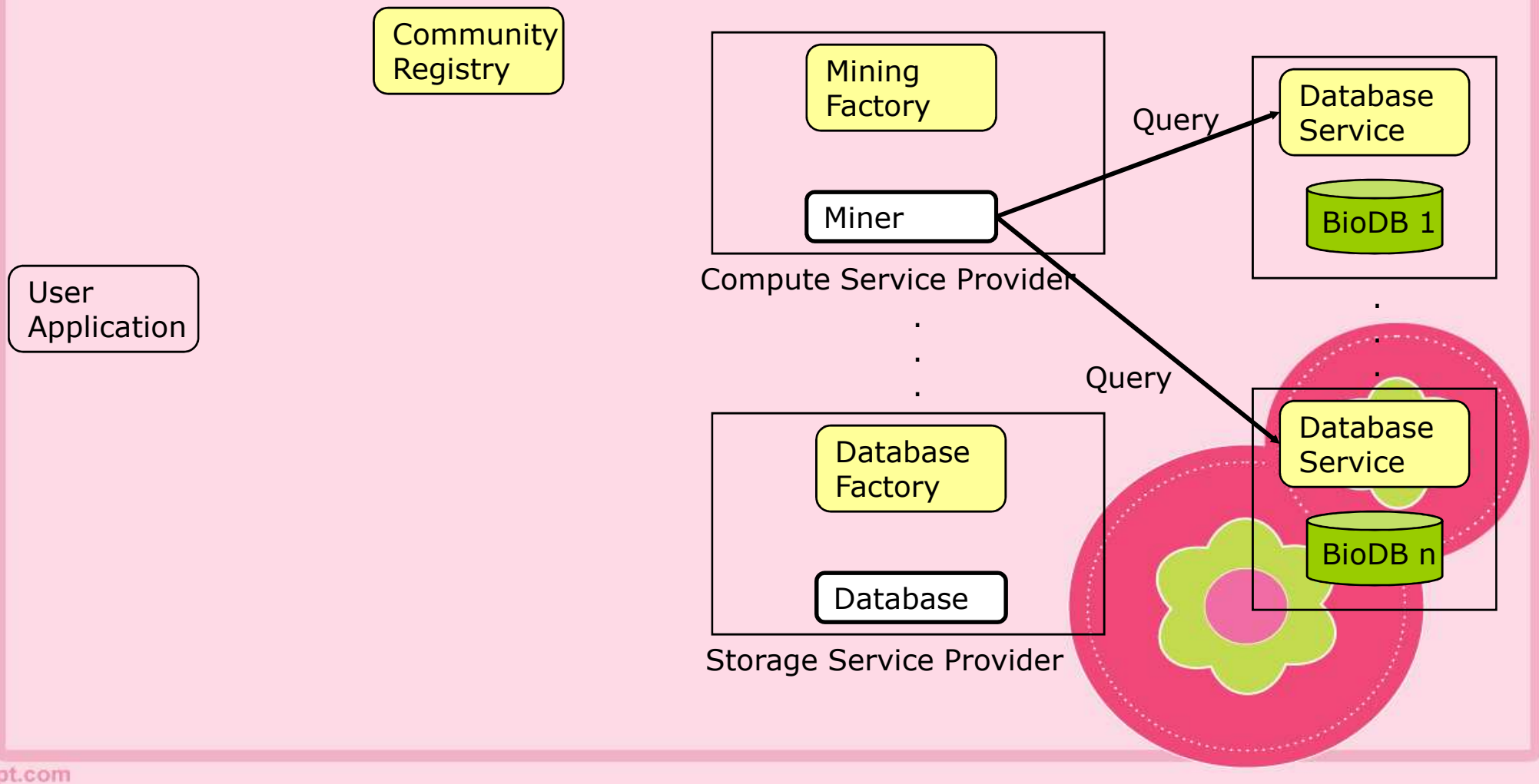

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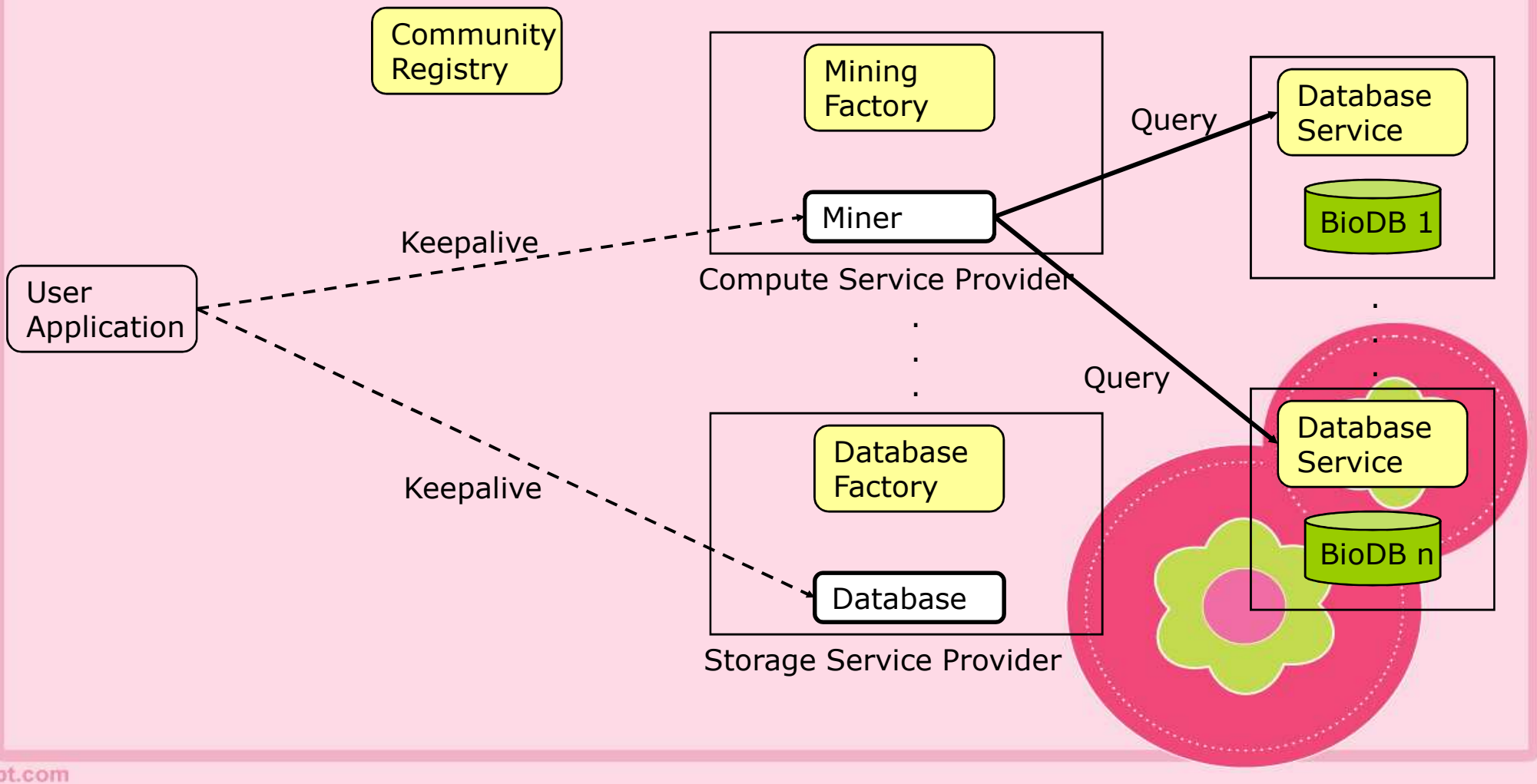

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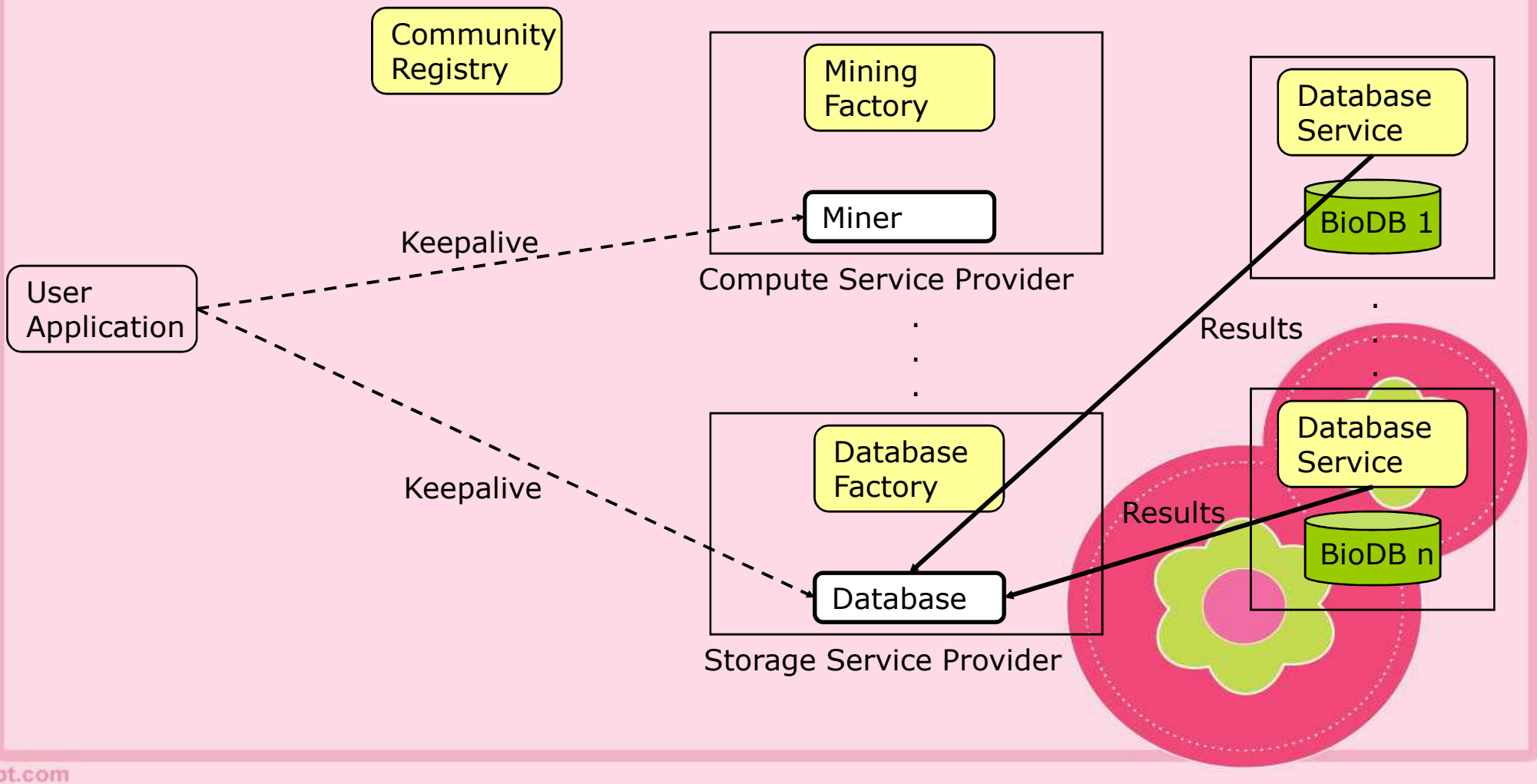

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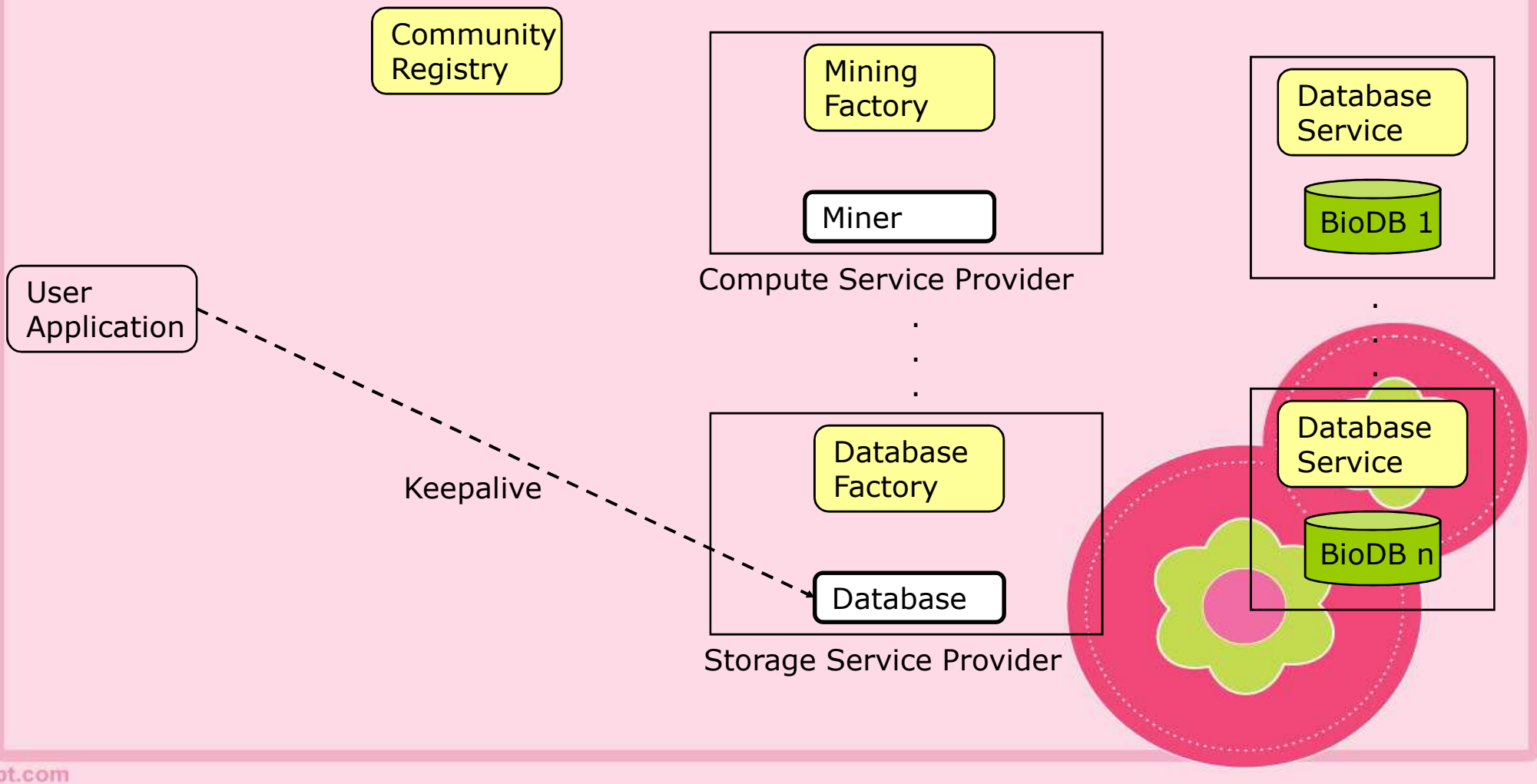

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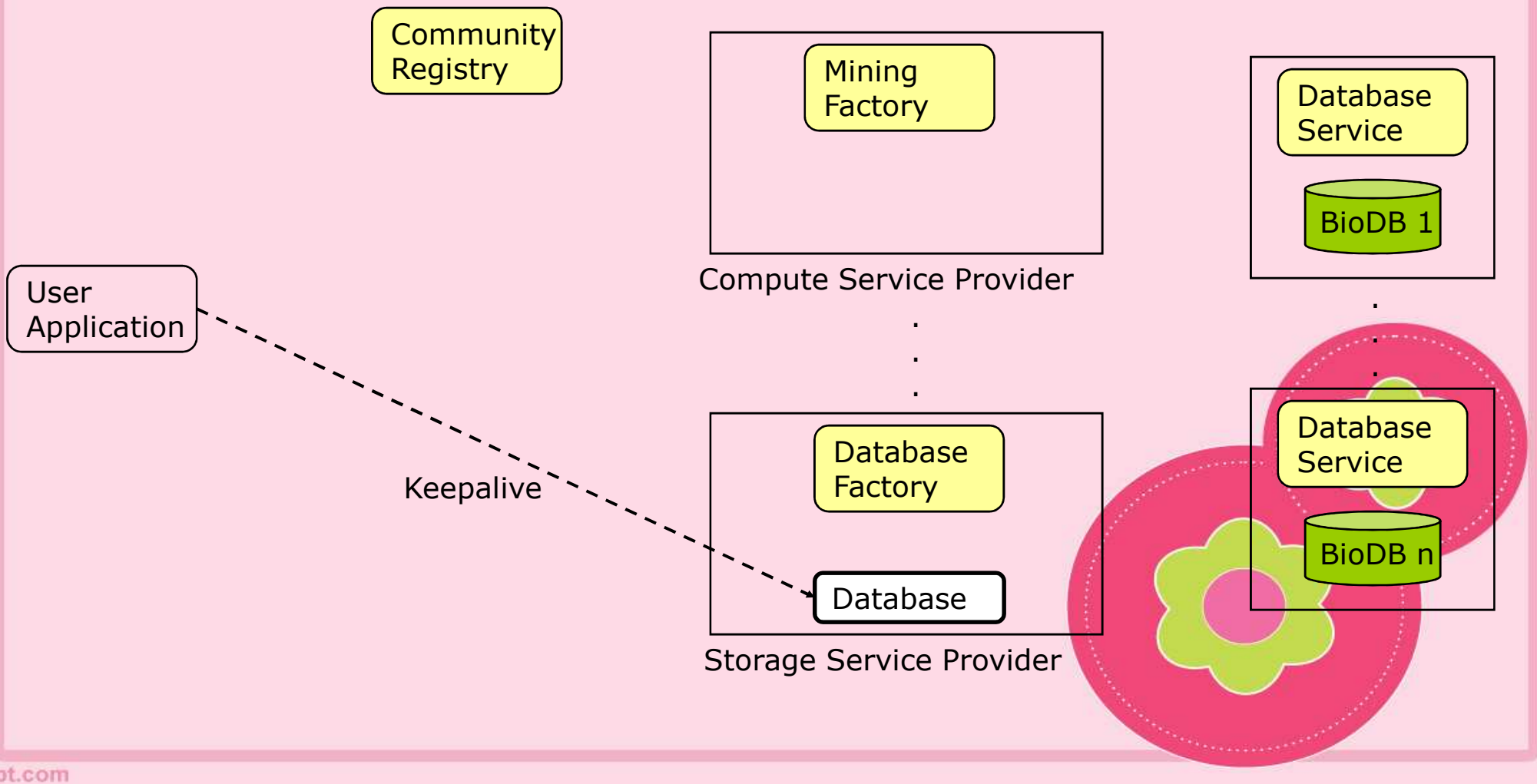
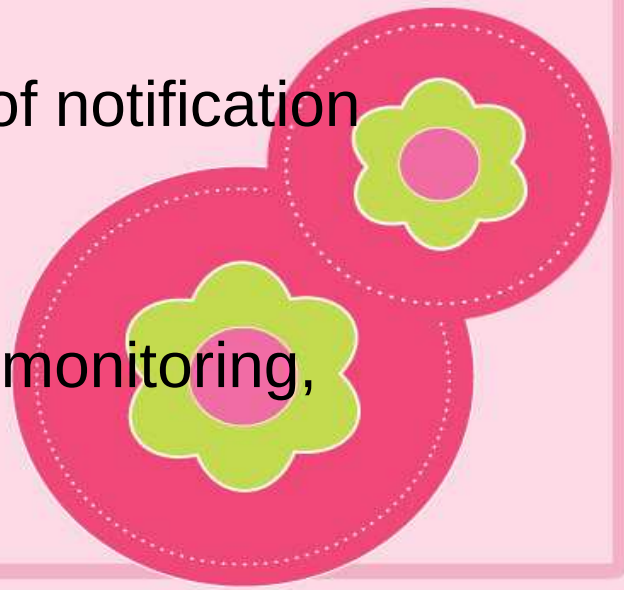


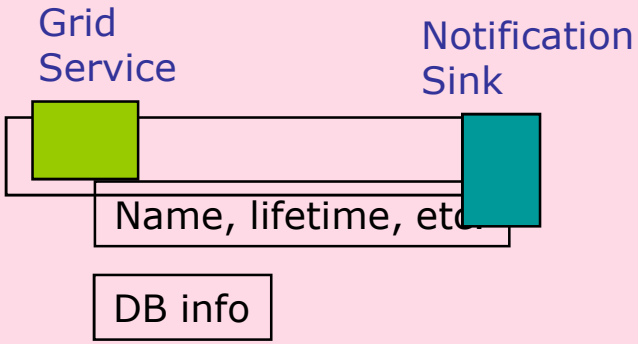
Notification Interfaces

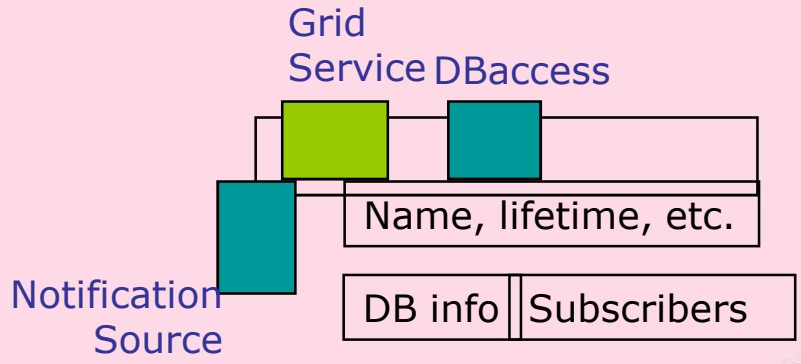
- **NotificationSource** for client subscription
  - One or more *notification generators*
    - Generates notification message of a specific type
    - Typed *interest statements*: E.g., Filters, topics, …
    - Supports messaging services, 3rd party filter services, …
  - Soft state subscription to a generator
- **NotificationSink** for asynchronous delivery of notification messages
- A wide variety of uses are possible
  - E.g. Dynamic discovery/registry services, monitoring, application error notification, …

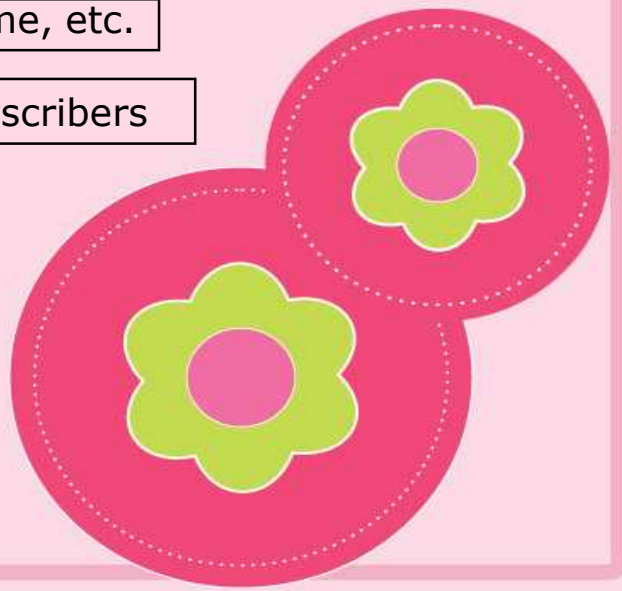


Notification Example

- Notifications can be associated with any (authorized) service data elements







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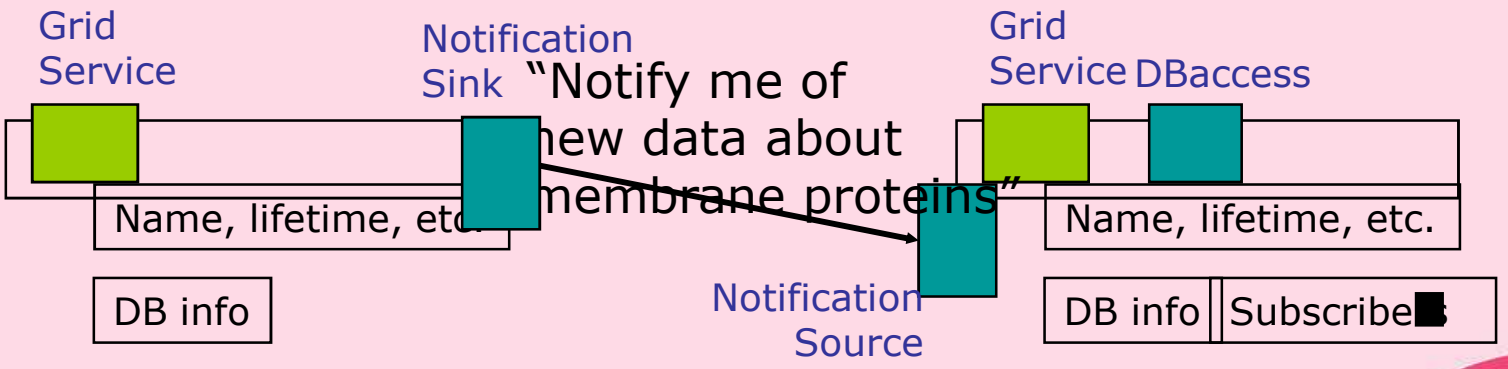

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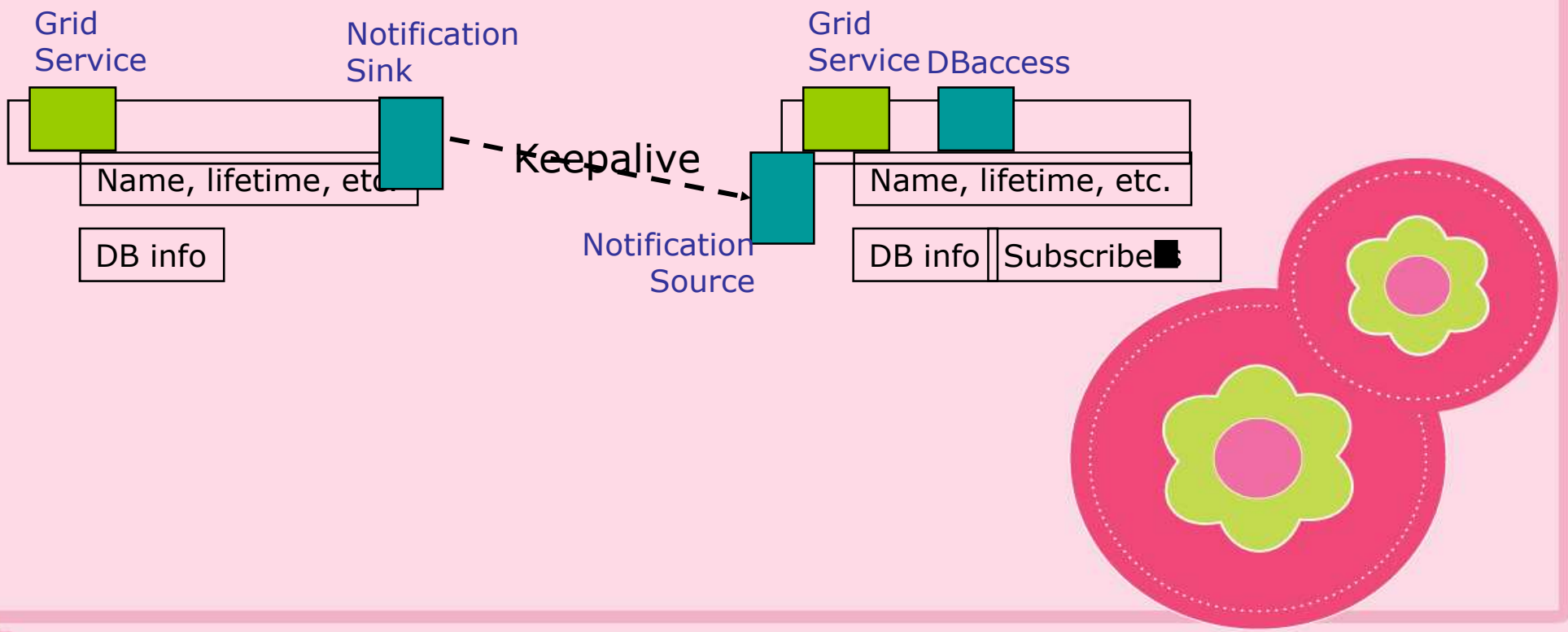

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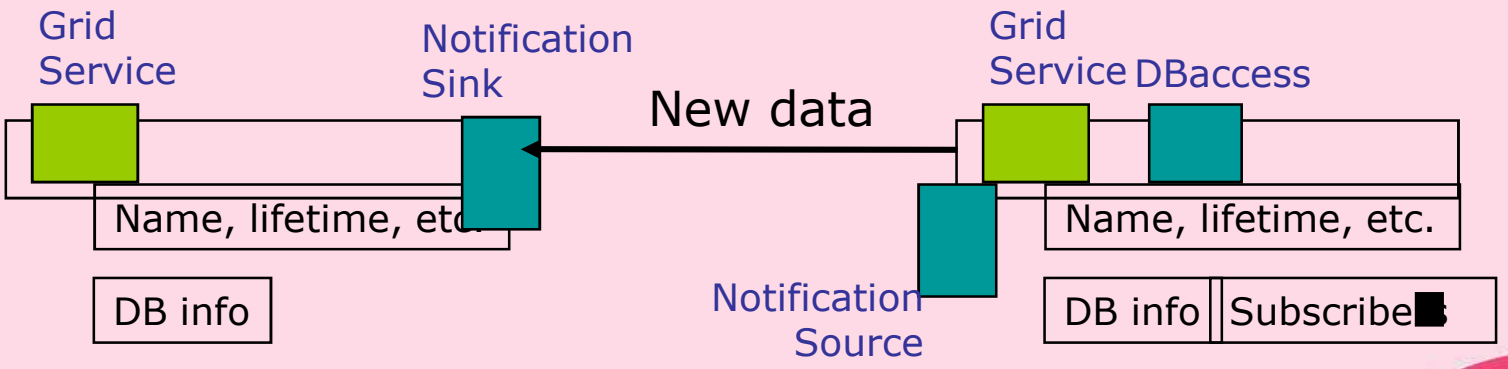
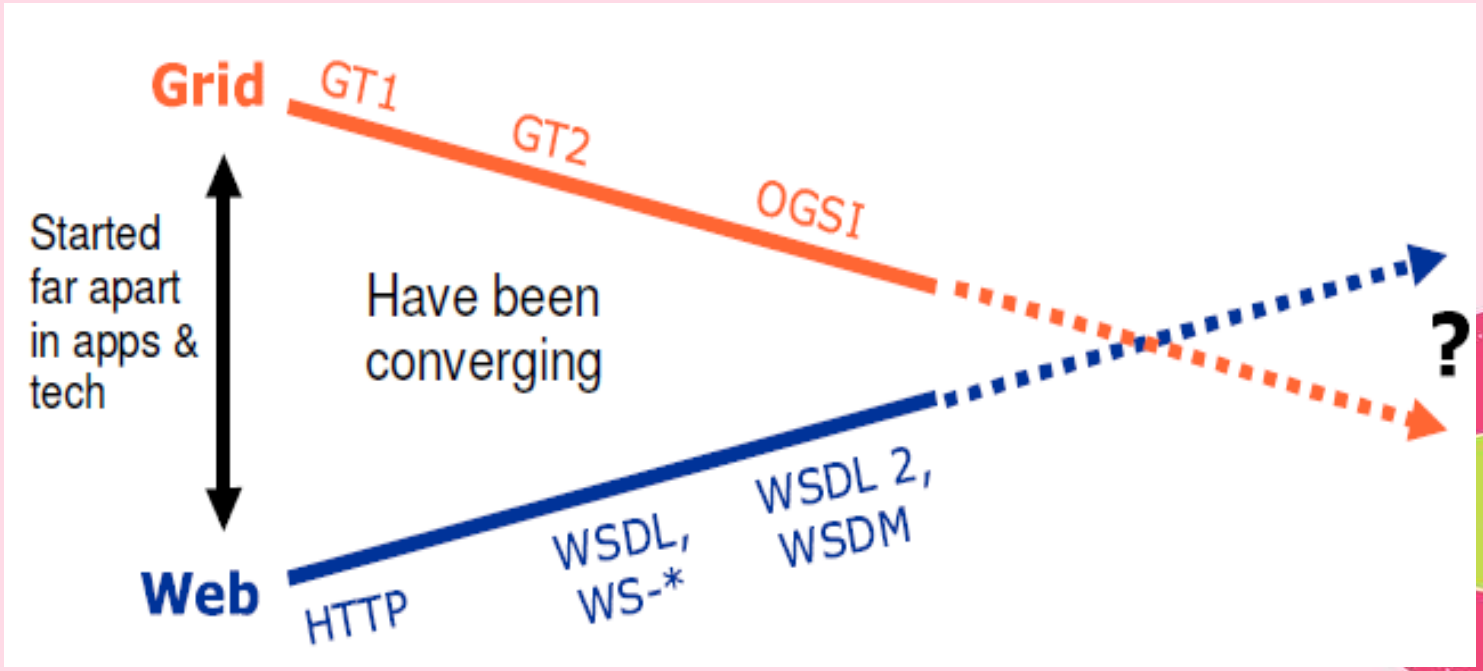


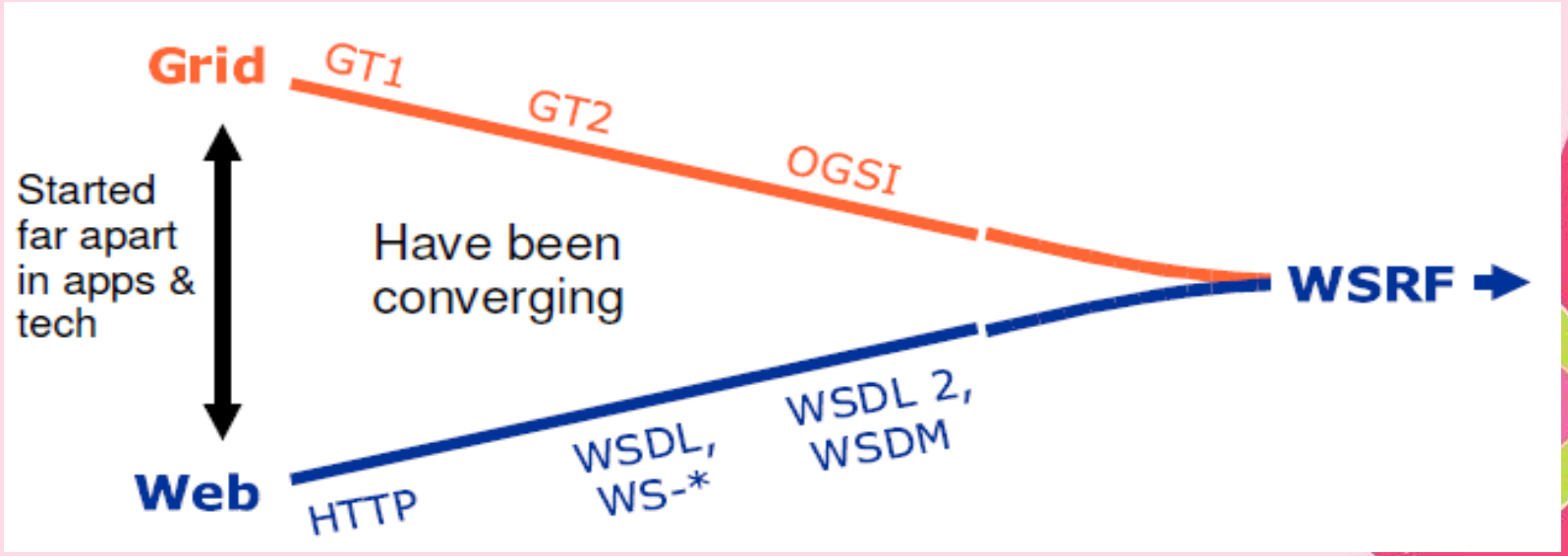
Web Service and Grid Service

- GGF had hoped that Web Services standards and OGSI would converge, but that convergence is not happening.



Web Service and Grid Service

- To achieve Web Service & Grid Service convergence, a new standard was announced during GlobusWORLD 2004 (January 2004)
- This new standard will supersede OGSI.
- **WSRF – Web Services Resource Framework**



Open Grid Services Architecture:Summary

- Service orientation to virtualize resources
  - Everything is a service
- From Web services
  - Standard interface definition mechanisms: multiple protocol bindings, local/remote transparency
- From Grids
  - Service semantics, reliability and security models
  - Lifecycle management, discovery, other services
- Multiple “hosting environments”
  - **C**, J2EE, .NET, …

OGSA Components

- Open Grid Services Infrastructure (OGSI)
- OGSA services
- OGSA schemas
- Built on Web services
  - Extended by OGSI to specify
    - How services are created
    - How long services live
    - How to manage faults
    - How to manage long-lived state, etc.
- A Web service that adheres to OGSI is called a Grid service.

Conclusion

- Grid-Computing allows networked resources to be combined and used
- Grid-Computing offers great benefit to an organization
- OGSA are comprehensive standards which governs grid-computing

References

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet”,
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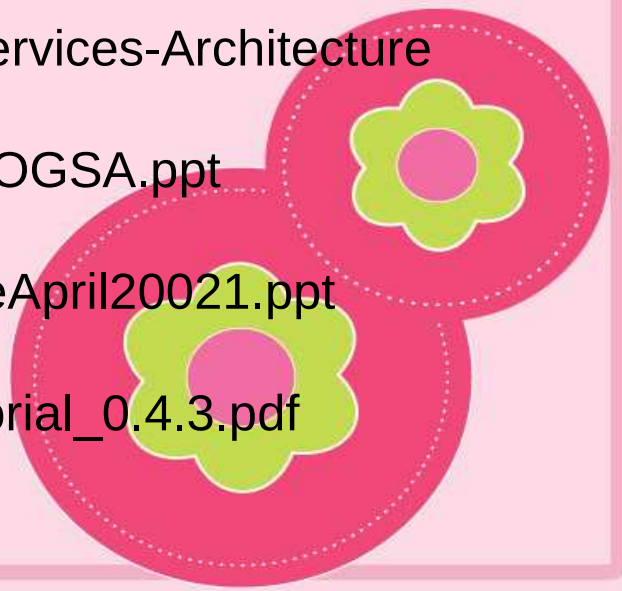

Thank You

Questions and Comments?